Closing the Cancer Divide:

A BLUEPRINT TO EXPAND ACCESS IN LOW AND MIDDLE INCOME COUNTRIES

A Report of the Global Task Force on Expanded Access to Cancer Care and Control

HARVARD School of Public Health

HARVARD Medical School

DANA-FARBER CANCER INSTITUTE

Closing the Cancer Divide:

A BLUEPRINT TO EXPAND ACCESS IN LOW AND MIDDLE INCOME COUNTRIES

A REPORT OF THE GLOBAL TASK FORCE ON EXPANDED ACCESS TO CANCER CARE AND CONTROL

Global Task Force on Expanded Access
to Cancer Care and Control
in Developing Countries

Closing the Cancer Divide:

A Blueprint to Expand Access in Low and Middle Income Countries.

First published in October 2011 by President and Fellows of Harvard College acting through the Harvard Global Equity Initiative.

Suggested citation

Knaul, Felicia Marie, Frenk, Julio and Shulman, Lawrence for the Global Task Force on Expanded Access to Cancer Care and Control in Developing Countries. Closing the Cancer Divide: A Blueprint to Expand Access in Low and Middle Income Countries. Harvard Global Equity Initiative, Boston, MA, October 2011.

http://gtfccc.harvard.edu

**See Table of Contents for authorship of specific sections and text boxes.*

Cover Design and Layout: Oliver Gantner and Marycarmen Vázquez, arte i diseño.

The views expressed in this publication are those of the GTF.CCC and do not necessarily represent the views of HGEI or the President and Fellows of Harvard College. The authors have made every effort to ensure accuracy of the information within this publication; however, all errors remain our own.

Global Task Force on Expanded Access to Cancer Care and Control in Developing Countries

Harvard Global Equity Initiative, Secretariat
651 Huntington Avenue
FXB Building, Room 632
Boston, MA 02115
Email: gtfccc@harvard.edu

Table of Contents

Global Task Force on Expanded Access to Cancer Care and Control in Developing Countries

Global Task Force on Expanded Access to Cancer Care and Control in Developing Countries

Membership

HONORARY CO-PRESIDENT

Her Royal Highness Princess Dina Mired
Director-General
King Hussein Cancer Foundation
Honorary Chairperson
Jordan Breast Cancer Program
Hashemite Kingdom of Jordan

HONORARY CO-PRESIDENT

Lance Armstrong
Founder
LIVESTRONG
Lance Armstrong Foundation

CO-CHAIRPERSON

Lawrence Shulman, MD
Chief Medical Officer and
Sr. Vice-President Medical Affairs
Dana-Farber Cancer Institute

CO-CHAIRPERSON

Julio Frenk, MD, MPH, PhD
Dean, Harvard School of Public Health
Former Minister of Health, Mexico

SECRETARIAT

Felicia Marie Knaul, MA, PhD
Director, Harvard Global Equity Initiative
Associate Professor of Medicine, Harvard Medical School
Founder, "Tómatelo a Pecho, A.C."

Members

Sir George Alleyne, OCC, MD, FRCP, FACP (Hon.), DSc (Hon.)
Director Emeritus, Pan American Health Organization
Chancellor, University of the West Indies

Rifat Atun, MBBS, MRCGP, MBA, DIC, MFPHM
Director, Strategy, Performance and Evaluation Cluster, The Global Fund to Fight AIDS, Tuberculosis and Malaria

Agnes Binagwaho, MD
Minister of Health, Rwanda
Visiting Lecturer on Social Medicine, Harvard Medical School

Douglas Blayney, MD
Ann and John Doerr Medical Director, Stanford Cancer Center

Lincoln C. Chen, MPH, MD
President, China Medical Board

Salomon Chertorivski Woldenberg, MPP
Minister of Health, Mexico

Lawrence Corey, MD
President and Director, Fred Hutchinson Cancer Research Center
Head, Virology Division, Department of Laboratory Medicine, University of Washington
Professor, Medicine and Laboratory Medicine, University of Washington

Paul Farmer, MD, PhD
Kolokotrones University Professor and Chair, Department of Global Health and Social Medicine, Harvard Medical School
Chief, Division of Global Health Equity, Brigham and Women's Hospital
United Nations Deputy Special Envoy for Haiti
Co-founder, Partners In Health

Sir Richard Feachem, KBE, FREng, DSc(Med), PhD
Director, Global Health Group, University of California, San Francisco
Professor of Global Health, University of California, San Francisco and Berkeley
Former Executive Director, Global Fund to Fight AIDS, Tuberculosis and Malaria

Roger Glass, MD, MPH, PhD
Director, Fogarty International Center, National Institutes of Health
Associate Director for International Research, National Institutes of Health

Mary Gospodarowicz, MD, FRCPC, FRCR
Medical Director, Cancer Program, Princess Margaret Hospital
Professor and Chair, Department of Radiation Oncology, University of Toronto
President-Elect, Union for International Cancer Control

Julie Gralow, MD
Professor, Medicine/Oncology, University of Washington School of Medicine
Associate Member, Fred Hutchinson Cancer Research Center
Director, Breast Medical Oncology, Seattle Cancer Care Alliance

Sanjay Gupta, MD
Chief Medical Correspondent, Health and Medical Unit, CNN
Assistant Professor of Neurosurgery, Emory University School of Medicine
Associate Chief of Neurosurgery, Emory University Hospital and Grady Memorial Hospital

Ana Langer, MD
Coordinator of the Dean's Special Initiative in Women and Health, Department of Global Health and Population, Harvard School of Public Health
Former President and Chief Executive Officer, EngenderHealth

Julian Lob-Levyt, MD, MSC
Senior Vice President, DAI
Managing Director of DAI Europe, DAI
Member, International AIDS Vaccine Initiative

Anthony Mbewu, MD
Visiting Professor in Cardiology and Internal Medicine, University of Cape Town

Elizabeth G. Nabel, MD
President, Brigham and Women's Hospital
Professor of Medicine, Harvard Medical School

Peter Piot, MD, PhD
Director, London School of Hygiene and Tropical Medicine
Former Executive Director, UNAIDS and Under Secretary General of the United Nations

Jonathan D. Quick, MD, MPH
President and Chief Executive Officer, Management Sciences for Health
Department of Global Health and Social Medicine, Harvard Medical School

Olivier Raynaud, MD
Senior Director, Global Health and Healthcare Sector, World Economic Forum

K. Srinath Reddy, MD, DM
President, Public Health Foundation of India

Jeffrey D. Sachs, PhD
Director, Earth Institute, Columbia University
Quetelet Professor of Sustainable Development, and Professor of Health Policy and Management, Columbia University
Special Advisor to United Nations Secretary-General Ban Ki-moon

John R. Seffrin, PhD
Chief Executive Office, American Cancer Society

Jaime Sepulveda, MD, MPH, DrSc
Executive Director, Global Health Sciences, University of California, San Francisco

George W. Sledge, Jr., MD
President, American Society of Clinical Oncology
Ballvé-Lantero Professor of Oncology, Indiana University
Professor of Medicine and Pathology, Indiana University
Co-director of the Indiana University Simon Cancer Center Breast Program

---

Secretariat
Harvard Global Equity Initiative

Felicia Marie Knaul, PhD, MA
Director

Afsan Bhadelia, MS
Research Associate

Kathy Cahill, MPH
Senior Advisor

Amanda Berger
Research Assistant

Maja Pleic
Research Assistant

Technical Advisory Committee

Hans-Olov Adami, MD, PhD
Chair, Department of Epidemiology, Harvard School of Public Health
Professor, Department of Epidemiology, Harvard School of Public Health

Cary Adams, MBA, BSc
Chief Executive Officer, Union for International Cancer Control (UICC)

Clement Adebamowo, BMChB (Hons), FWACS, FACS, ScD
Associate Professor, Department of Epidemiology and Preventive Medicine, School of Medicine, University of Maryland
Associate Professor, Institute of Human Virology, University of Maryland
Director, Office of Strategic Information and Research, Institute of Human Virology, Nigeria

Samia Al-Amoudi, MD
CEO and Founder, Sheikh Mohammed Hussein Al-Amoudi Center of Excellence in Breast Cancer
Chairwoman, Scientific Chair, Breast Cancer Researches
Associate Professor, Consultant and Obstetrician Gynecologist, King Abdulaziz University

Benjamin Anderson, MD
Chairman and Director, Breast Health Global Initiative
Joint Member, Division of Public Health Sciences, Fred Hutchinson Cancer Research Center
Professor of Surgery and Joint Professor, Department of Global Health, University of Washington
Director, Breast Health Clinic, Seattle Cancer Care Alliance

Jon Kim Andrus, MD
Lead Technical Advisor, Comprehensive Family Immunization Project, Pan American Health Organization
Professor, Department of Global Health and Director of the Global Health Program, George Washington University

Kate Armstrong, BMed, DCH, MPH
Founder & President, Caring & Living as Neighbours (CLAN)
Chair, NCD Alliance Child-focused Working Group

Hector Arreola-Ornelas, MSc
Coordinator of Economic Research, Health and Competitiveness, Fundación Mexicana para la Salud

Rashid Bashshur, MS, PhD
Director of Telemedicine, University of Michigan Health System
Professor Emeritus of Health Management and Policy, University of Michigan School of Public Health

Zaid Bitar, BSc
Head, International Development Department, King Hussein Cancer Foundation

Gene Bukhman, MD, PhD
Assistant Professor, Harvard Medical School
Director of Program in Global Noncommunicable Disease and Social Change, Harvard Medical School
Associate Clinical Director, Partners in Health, Rwanda
Senior Technical Advisor on Noncommunicable Diseases, Ministry of Health, Rwanda

Maira Caleffi, MD, PhD
President, Federação de Instituições Filantrópicas de Apoio á Saúde da Mama (FEMAMA)

Corey Casper, MD, MPH
Associate Professor, Medicine, University of Washington
Assistant Member, Program in Infectious Diseases, Clinical Research Division, Fred Hutchinson Cancer Research Center
Assistant Member, Epidemiology, Public Health Sciences Division, Fred Hutchinson Cancer Research Center

Dov Chernichovsky, MA, PhD
Professor, Department of Health Systems Management, Ben-Gurion University of the Negev
Research Associate, National Bureau of Economic Research
Head, Health Team, the Taub Center for the Study of Social Policy, Israel

James F. Cleary, MD
Associate Professor of Medicine (Medical Oncology), University of Wisconsin School of Medicine and Public Health
Director, Palliative Care Service, University of Wisconsin Hospital and Clinics
Director, UW WHO Collaborating Center for Pain Policy and Palliative Care

Téa Collins, MD, MPH
Executive Director, The NCD Alliance

David Cutler, PhD
Otto Eckstein Professor of Applied Economics, Harvard University

Alessandra Durstine, MS, MBA
Vice President for Regional Strategies, International Division, American Cancer Society

Barbara Ferrer, PhD, MPH, MEd
Executive Director, Boston Public Health Commission

Lindsay Frazier, MD, ScM
Attending Physician, Dana Farber Cancer Institute
Associate Professor of Pediatrics, Harvard Medical School
Associate Professor of Epidemiology, Harvard School of Public Health

Emmanuela Gakidou, MSc, PhD
Associate Professor of Global Health, University of Washington
Director, Education and Training, Institute for Health Metrics and Evaluation, University of Washington

Amanda Glassman, MSc
Director of Global Health Policy and Research Fellow, Center for Global Development

Ramiro Guerrero, MSc
Director, PROESA – Centro de Estudios en Protección Social y Economía de la Salud

Susan Higman, PhD, MA
Director, Research & Analysis, Global Health Council

David Hunter, MBBS, MPH, ScD
Dean for Academic Affairs, Harvard School of Public Health
Vincent L. Gregory Professor in Cancer Prevention, Department of Epidemiology and Nutrition, Harvard School of Public Health

Amy Judd, MS
Director of Program Development, Division of Global Health Equity, Brigham and Women's Hospital

Nancy Keating, MD, MPH
Associate Professor, Department of Health Care Policy, Harvard Medical School
Associate Physician, Division of General Internal Medicine, Brigham and Women's Hospital

Niranjan Konduri, MS (Pharm), MPH, CHA
Senior Program Associate, Technical Strategy and Quality, Center for Pharmaceutical Management, Management Sciences for Health

Constance Lehman, MD, PhD
Professor and Vice Chair of Radiology, University of Washington Medical Center
Section Head of Breast Imaging, University of Washington Medical Center
Director of Imaging, Seattle Cancer Care Alliance

H. Kim Lyerly, MD
George Barth Geller Professor of Research in Cancer
Director, Duke Comprehensive Cancer Center

Ian Magrath, DSc (Med), FRCP, FRCPath
President, Medical & Scientific Director, International Network for Cancer Research and Treatment
Adjunct Professor of Pediatrics, Uniformed Services University of the Health Sciences

Alejandro Mohar, MD, ScD
General Director, National Cancer Institute of Mexico

Claire Neal, MPH, CHES
Senior Director, Lance Armstrong Foundation

Rachel Nugent, PhD
Senior Research Scientist and Associate Professor, Department of Global Health, University of Washington

Alfonso Petersen Farah, MD
Secretary of Health of the State of Jalisco, Mexico

Peggy Porter, MD
Full Member, Division of Human Biology, Fred Hutchinson Cancer Research Center
Co-Head, Women's Cancer Research Program, Fred Hutchinson Cancer Research Center
Professor, Pathology, University of Washington

Doug Pyle, MBA
Senior Director, International Affairs, American Society of Clinical Oncology

Johanna Ralston, MA, MS
Chief Executive Officer, World Heart Federation

Magdalena Rathe, MA
Executive Director, Fundacion Plenitud
Coordinator, Dominican Health Observatory (OSRD)
Coordinator, Network of Health Accounts of the Americas (REDACS)

Anne Reeler, PhD
Chief Technical Officer, Axios International

Raul Ribiero, MD
Member, St. Jude Faculty, St. Jude Children's Research Hospital
Director, International Outreach Program, St. Jude Children's Research Hospital
Director, Leukemia / Lymphoma Division, Oncology Department, St. Jude Children's Research Hospital
Associate Director for Outreach Program, Cancer Center , St. Jude Children's Research Hospital

Carlos Rodriguez-Galindo, MD
Attending Physician, Dana-Farber Cancer Institute
Medical Director, Pediatric Oncology Clinical Trials, Dana-Farber/Children's Hospital Cancer Center
Associate Professor of Pediatrics, Harvard Medical School

Isabelle Romieu, MD, MPH, ScD
Head, Section on Nutrition and Metabolism, International Agency for Research on Cancer

Joanna Rubinstein, DDS, PhD
Chief of Staff to Jeffrey Sachs, The Earth Institute, Columbia University
Director of the Center for Global Health and Economic Development, The Earth Institute, Columbia University

María del Rocío Sáenz Madrigal, MPH, MD
Coordinator of Health Policies, Health and Work Program, Central America's National University
Professor, School of Public Health, University of Costa Rica

Gloria Inés Sánchez, MSc, PhD
Coordinator, Infection and Cancer, University of Antioquia
Associate Professor, Faculty of Medicine, University of Antioquia

Nina Schwalbe, MPH
Managing Director, Global Alliance for Vaccines and Immunization

Rola Shaheen, MD, FRCPC
Chief of Radiology and Director of Women's Imaging, Harrington Memorial Hospital
Instructor in Radiology, Harvard Medical School

Tatiana Soldak, MD
Director of Programs, The Resource and Policy Exchange

Jeffrey Sturchio, PhD
Senior Partner, Rabin Martin
Former President and CEO, Global Health Council

Vivien Davis Tsu, PhD, MPH
Director, HPV Vaccines Project, PATH
Associate Director, Reproductive Health, PATH
Affiliate Professor, Epidemiology, School of Public Health, University of Washington

Anita K. Wagner, PharmD, MPH, DrPH
Assistant Professor, Department of Population Medicine,
Harvard Medical School and Harvard Pilgrim Health Care Institute
Member, Drug Policy Research Group and WHO Collaborating Center in Pharmaceutical Policy,
Department of Population Medicine, Harvard Medical School and Harvard Pilgrim Health Care Institute

Acknowledgements

GTF.CCC gratefully acknowledges financial and in-kind support received for the preparation of this Report and for related research from:

Harvard University

Susan G. Komen for the Cure©

Lance Armstrong Foundation

Individual Anonymous Donors

Management Science for Health

King Hussein Cancer Foundation and Center

Seattle Cancer Care Alliance

American Cancer Society

China Medical Board

Fogarty International Center

Fundación Mexicana para la Salud

GlaxsoSmithKlein

EMD Serono

NCI and Fogarty International Center

Union for International Cancer Control

Hoffman & Hoffman PR

The GTF.CCC and Secretariat would like to express their sincerest gratitude to collaborators within Harvard University, including President Drew Faust, Dean Jeffrey S. Flier, Steven Hyman, Barbara J. Grosz, as well as members of the Harvard Global Equity Initiative (HGEI) Steering Committee including its Chair Amartya Sen and members Sudhir Anand, Harvey Fineberg, Paula Johnson, Jennifer Leaning and Tony Saich. Further, we thank the Office of the Provost, including Provost Alan M. Garber, Doreen Koretz, Patricia Harrington and Radha Suraj, the Department of Global Health and Social Medicine at the Harvard Medical School, particularly Jennifer S. Puccetti, Debra Keaney and Emily Durrant, the Francois-Xavier Bagnoud Center, the Dean's Office at the Harvard School of Public Health (HSPH), including Linda Brady McDonald, the HSPH Operations Office, including Mary Jane Curran, the Office of General Counsel, the Connors Center for Women's Health and Gender Biology and last but not least, the information technology (IT) departments in HSPH, Harvard Medical School and within Central Administration.

The GTF.CCC expresses its appreciation to the Secretariat staff. The number of people who supported the development of this report over the course of its writing is too many to list, but to name a few we thank Amanda Berger, Afsan Bhadelia, Kathy Cahill, Grace Cho, Isabel Davis, Courtney Dickerson, Sophia Michelen, Gustavo Nigenda and Maja Pleic.

In addition to all authors and contributors as listed in the table of contents, many more were instrumental in bringing this work to fruition. Numerous patients and many other contributors gave of their time to help make this Report a reality. The GTF.CCC and Secretariat take this opportunity to specifically list some of the many individuals and institutions who collaborated and contributed to this Report and to whom we are indebted for generous support and partnership.

Institutions and initiatives

- American Society of Clinical Oncology
- Avon Foundation
- Axios International
- Beth Israel Deaconess Medical Center
- Ben-Gurion University of the Negev
- Breast Health Global Initiative
- Brigham and Women's Hospital
- Center for Social Protection and Health Economic (PROESA)
- China Medical Board
- Clinton Global Initiative
- Cluster on Family and Community Health, World Health Organization
- Cluster on Non-Communicable Diseases, World Health Organization
- Earth Institute, Columbia University
- FEMAMA
- Forum of African First Ladies Against Breast & Cervical Cancer
- Fred Hutchinson Cancer Research Center
- Fundacion Plenitud
- Global Access to Pain Relief Initiative, UICC
- Global Alliance for Vaccines and Immunization
- The Global Fund to Fight AIDS, TB and Malaria
- Global Health Council
- Harrington Memorial Hospital
- Harvard University Press
- Instituto Jaliscense de Cancerología
- International Agency for Research on Cancer
- International Network for Cancer Research and Treatment
- International Society of Pediatric Oncology
- Institute of Medicine of the National Academies
- Jordan Breast Cancer Program
- London School of Hygiene and Tropical Medicine
- Ministry of Health of Rwanda
- Medtronic
- Milford Regional Medical Center
- Ministry of Health of Mexico
- Ministry of Health of Rwanda
- Ministry of Health of the State of Jalisco
- Ministry of Heath of the State of Morelos
- Ministry of Health of the State of Nuevo Leon
- National Institute of Public Health of Mexico
- National Cancer Institute of Mexico
- National Cancer Institute of the US
- National Commission for Social Protection in Health (Seguro Popular) of Mexico
- NCD Alliance
- PATH
- Pan American Health Organization
- Partners in Health
- Pediatric Oncology Group of Ontario
- Princeton University
- Public Health Foundation of India
- RTI International
- Sheikh Mohammed Hussein Al-Amoudi Center of Excellence in Breast Cancer
- Stand up to Cancer
- St. Jude's Children's Research Hospital, IOP
- The Lancet
- Tómatelo a Pecho, A.C.
- Uganda Cancer Institute

- Union for International Cancer Control (UICC)
- Universidad del Pacifico
- University of Washington
- University of Wisconsin School of Medicine and Public Health
- World Economic Forum

Individuals

- Marian Affarah
- Marcella Alsan
- Ala Alwan
- Ana Maria Amaris
- Islene Araujo de Carvalho
- Martha del Socorro Arias Novoa
- Larry Bagley
- Emily Bahnsen
- Anna Barker
- Matthew Basilico
- Janine Barnaby
- John Beard
- Sarah Bearse
- Shenieque Bennett
- Morgan Binswanger
- Nancy Brinker
- Barri M. Blauvelt
- Kelly Bogaert
- Silvana Bouhlal
- Donna Bowers
- Flavia Bustreo
- Lori Buswell
- Francisco Caballero
- Victor Manuel Caballero Solano
- Christopher Cahill
- Miguela Caniza
- Emily Carwell
- Gail Cassell
- Héctor Castro
- Franco Cavalli
- Eduardo Cazap
- Tia Chester
- Lilian Cheung
- Lee Chin
- Shu-Ti Chiou
- Tea Collins
- Michael Constantine
- Gerard Cunningham
- Diana Currea
- Sara Day
- Fausta Debones
- Javier Dorantes
- Elizbeth De Ocampo
- Henry Drew
- Dean Eastwood
- Robin Eisner
- Martha Embrey
- Amy Kate Eussen
- Sophia Faris
- Rebecca Firestone
- James Fitzgerald
- David Forman
- Harold Freeman
- Francis D. Fuller
- Kathryn Galvin
- Pat García-González
- Atul Gawande
- Gary Ginsberg
- Jennifer Goldsmith
- Luz María González
- María Celicia González
- Chris Gray
- Gregory Harper
- Sarah Hagan
- Mary Hager
- Laurie Hall
- Ana Cecilia Hidalgo
- Susan Higman
- Marshall Hoffman
- Richard Horton
- James Hospedales
- Omar Ishrak
- Salma Jaouni
- Prabhat Jha
- Mercedes Juan López
- Ilana Kadmon
- Hugh Kelleher
- Chelsea Kelley
- Patrick Kelley
- David Kerr
- Heidi Kleedtke
- Eric Krakauer
- Suneeta Krishnan
- Ksenia Koon
- Eric Krakauer
- Garrett Krik
- Richard Laing
- Mary Ann Lane
- Jeremy Lauer
- David Lee
- Daisy Leo
- Ana Ley
- Douglas Lowy
- Leslie Lemann
- Guohong Li
- Tatiana Lingos
- Yuanli Liu
- Amalia Lizárraga
- Silvana Luciani
- Roberto Rivera Luna
- Jing Ma
- Maricela Macias
- Laura Magaña
- Joanne Manrique
- Angela Marmo
- Jaime Andres Giraldo Marmolejo
- Mario Márquez
- Sarah Marsh

- Jarred Mcateer
- Miguel Angel Mejía
- Bethany Maylone
- Terri McDonald
- Kathryn McNaught
- Oscar Méndez Carniado
- Fortunate Mendlula
- Vickie Monta
- Andy Miller
- Mary Lisa Miller
- Beth Minnich
- Edmundo Morocho
- Nour Nasif
- Esperance Ndenga
- Fidele Ngabo
- Andrew Norden
- Jason Obedzinski
- Meg O'Brien
- Faith Oliver
- Olufunmilayo Olopade
- Sonia Xochitl Ortega Alanis
- James Ossman
- Sheena Patel
- Erin Pearson
- Sonia Peña
- Mirta Roses Periago
- Gerardo Pérez
- Teresa Pérez
- Alfonso Petersen
- Malebogo Pusoentsi
- Ibrahim Qaddoumi
- You-Lin Qiao
- Yuri Quintana
- Taghreed Rabaa
- Astha Ramaiya
- Jim Rankin
- Scott Ratzan
- Chie Ri
- Herb Riband
- Dee Dee Ricks
- Gaston Rivera
- Elizabeth Reid
- Jospeh Roberts
- Horacio Robles
- Daniel Rodriguez
- Debasish Roychowdhury
- Greg Ruisi
- Joseph Rhatigan
- Julie A. Roberts
- Rusty Robertson
- Francis Saba
- Massoud Samiei
- Jasmine Samuel
- Silvia Sánchez
- Ramon Sánchez Pina
- Mahmoud Sarhan
- Zaina Sarhan
- Peer M. Schatz
- David Scheer
- Ellen Sheets
- Maria Schenider
- Edna Senato
- Jacqueline Sherris
- Katy Stout
- Ana Shuler
- David Shulman
- Amy Sievers
- Patricia Spellman
- Blaine Smith
- Claudia Smith
- Butch Staley
- Bettina Stevens
- Anna Standertskjold
- Paul Stoffels
- Kathleen Stover
- Sara Stulac
- Jeff Sturchio
- Ana Teasdale
- Christopher Ternan
- Elizabeth Thompson
- Amber Thomson
- Julie Torode
- Vivien Tsu
- Harold Varmus
- Cassia van der Hoof Holstein
- Jesús Zacarias Villarreal Pérez
- Ludmila Vite Torres
- Doug Ulman
- Leopoldo Valentín Vargas
- Marcela Vallejo
- Wim Van Damme
- Cassia van der Hoof Holstein
- George Vélez
- Kim Vitols
- Claire Wagner
- Rebecca Weintraub
- Iain Wilson
- Hyun Ju Wooh
- Christopher Wild
- Eric Winer
- Scott Wittet
- Kevin Wnek
- Miri Ziv
- Jerome Zeldis

Messages from

Honorary Co-President

When I was first asked to be the Honorary Co-President of the Global Task Force for Expanded Access to Cancer Care and Control in Developing Countries (GTF.CCC) two years ago, I immediately accepted, because beyond the long and prestigious title and the ambitious goals, this Task Force struck a deep chord. Every item the GTF.CCC sought to address, we had experienced or were experiencing at the King Hussein Cancer Foundation and Center in Jordan. Whether it was the high cost of drugs or the access to care, we faced it. Whether it was the use of telemedicine or doable solutions within constraints, we faced it. These challenges were all extremely real to us, and remain real to us today as we continue to provide international quality cancer care in a resource-poor, middle income country and in a region where many countries still do not have access to quality cancer care.

What is unique about the GTF.CCC is that it applies a two pronged approach: First, the idealist prong which pushes for best practices in global funding and sustainable international support for cancer – similar to the support afforded to AIDS, Malaria and TB. And second, the realistic prong which recognizes the limitations on the ground and works despite them, through them and around them to reach its objectives. One of the many examples of this is Rwanda where, rather than leave a patient untreated, chemotherapy was safely prepared, administered and monitored despite the lack of an on-site oncologist, but with backup from off-site specialists internationally through coordination between the Government of Rwanda and Partners in Health. This is a concrete example of how collaboration and international partnerships are at the core of achieving any success against cancer.

Cancer, a disease plagued by stigma and discrimination within many communities, itself displays no discrimination in how it targets its victims. It affects everyone, all ages and all races. However, today, with approximately two-thirds of the annual cancer mortality worldwide in low and middle income countries (LMICs), it is clear that the burden of the disease is disproportionately faced by the poor who either have no access to cancer care at all or cannot afford the exorbitant costs associated with such catastrophic illnesses.

I witnessed this harsh inequity and disparity between the developed and developing world in a very personal way when, just two days shy of his second birthday, my son was diagnosed with leukemia. Rather than the joys of celebration, we faced a cancer diagnosis and the paralyzing fear that we could lose what is most precious. Fortunately, I was one of the privileged few able to travel the distance necessary to provide my son with life-saving treatment at Dana Farber, one of the best cancer centers in the United States. Others are not so lucky.

The reality of leukemia cure rates is sadly reflective of the inequity in care; children with leukemia in the developed world have a 90% chance of a cure, while 90% of their counterparts in the world's 25 poorest countries will die. While cancer patients in the developed world are asking "Where will I be treated?" their counterparts in the developing world are asking "Will I be treated?" I firmly believe that it remains every individual's right to receive the best possible treatment – regardless of where they live.

This is why the GTF.CCC's work is so critical. This report contains real examples of successfully achieving cancer care in resource-poor settings. The lessons documented in this report about Jordan and other countries such as China, Mexico and Rwanda provide the groundwork for cross-country exchanges and serve as a guideline on best practices, expertise and resource sharing that will benefit any LMIC struggling not only with cancer care but with the care of other non-communicable diseases. Moreover, this report highlights the fact that there is no "one size fits all", and therefore, an analysis of each country's capabilities, competing priorities, national key actors, and long-term and short-term needs is necessary to better delineate appropriate strategies that should be applied.

I am delighted to serve as Honorary Co-President of the GTF.CCC alongside the unconquerable Lance Armstrong who has done and continues to do so much for cancer worldwide. I also cannot thank the GTF.CCC members, co-Chairs and Secretariat enough. This report culminates two years of intense efforts and hard work to garner evidence and distill recommendations for on-going and coordinated action on cancer care and control in LMICs. The GTF.CCC has been guided in its efforts by our wonderful co-Chairs, Dr. Julio Frenk and Dr. Lawrence Shulman, and carried out through the Secretariat at the Harvard Global Equity Initiative, led by the unstoppable Dr. Felicia Knaul. We are so fortunate to have a membership that is a diverse and unique merger of extraordinary leaders from the cancer and global health communities. Their diversity of expertise, innovative thinking and strong commitment to the issue have been instrumental in producing the result embodied in this report, the seminal product of the GTF.CCC.

I am thrilled to share this report as a starting point to a unified vision and as a testament that change is within our grasp. Our success story at the King Hussein Cancer Foundation and Center in Jordan lends me the complete confidence to say that cancer care and control can be achieved in low and middle income countries. Despite the many challenges faced along the way our center stands tall, a beacon of hope in the region and a real-life example of how, despite the backdrop of a low-resource middle income country cancer care is feasible.

However, in most of the developing world, the landscape for cancer care remains bleak. There is no time to waste; we must act now. We have an epidemic on our hands. It is our moral responsibility to not only save lives, but also alleviate undue suffering. We, the GTF.CCC, challenge the global community to seize the momentum generated by the UN High Level Meeting on the Prevention and Control of Non-Communicable Diseases and garner the political will needed to ensure that cancer receives its own line item on the global agenda and obtains the support and funding needed to make it a disease of the past.

I hope that this report serves as a springboard to help produce the necessary action needed to end this disparity. The chance for a cure, the chance to live, should no longer remain an accident of geography.

HRH Princess Dina Mired
Honorary co-President, GTF.CCC

October 23, 2011
Amman, Jordan

Unity is strength and knowledge is power in the fight against cancer. We are entering a time of great hope for our cause and one in which we can envision a more equitable future. The change we envision can only be accomplished through coordinated and informed action. The combined efforts of the Global Task Force on Expanded Access to Cancer Care and Control in Developing Countries (GTF.CCC) and the cancer and global health communities are leading to increased awareness of the truth about cancer. We have begun to dispel the misconceptions that have impeded our progress. No longer is the perception of cancer as a low-impact disease in the developing world tenable. We have shown that cancer control is both affordable and achievable, even in remote and modest settings. And we are making progress with efforts to cement the idea that a disease-centric approach to health must become a thing of the past.

As a cancer survivor and Honorary co-President of the GTF.CCC, alongside the leadership of Her Highness Princess Dina Mired of the Hashemite Kingdom of Jordon, I am pleased to have been a part of the effort to launch this timely report and its critical recommendations to address the challenge of cancer in low and middle income countries. I am grateful for the commitment of each of the GTF.CCC co-Chairs, members and Secretariat, among others, to make the report a reality. This commitment transcends the words written herein on paper and serves to propel the wider movement for change, fueled with evidence and determination to act.

We recently celebrated the attention brought to cancer and other non-communicable diseases at the United Nations High Level Meeting in September. Hundreds of disparate groups spoke with one voice in their call for action by governments and world leaders. United, we challenged member states to end the gap between what we know saves lives and what we are willing to do to save them.

It was a significant moment in our fight.

We must end the inefficient use of global health investments. Our resources must be used to build health systems that serve people and all of our various health needs. Only then will we turn the tide of the cancer epidemic which threatens to claim 17 million of us every year by 2030.

If we fail, the cost in human and economic terms will be more devastating than the toll taken by any previous plague in human history. Failure, therefore, is not an option. Survivorship is the only option.

The progress we make today will save millions of lives in years to come. With this and future such efforts, we must continue our urgent calls for policy reform and effective investment. We must embrace the hope promised by our current successes. And we must stand together, calling for change with one powerful, indelible voice.

Lance Armstrong
Honorary co-President, GTF.CCC

October 17, 2011
Austin, Texas, USA

Forewords

I lost both my parents when I was six years old. I was taken to an orphanage with my older brother and younger sister. In the orphanage, I played all sorts of games, especially soccer. I was also a choir member. I loved spending my time with friends and going to school. In the orphanage I did activities any child might do, like laundry and fetching water. During my childhood, I always dreamed of becoming a doctor or a teacher, even though at that point I had never met a doctor. Then I got sick...

When I was finishing fourth grade, while I was playing soccer, the ball hit my knee. It wasn't a heavy shot that could break the bone, but it was very painful. I went to the nurse from the orphanage who gave me pain killers, thinking that I had a simple fracture. He told the care takers from the orphanage to put a compress on my leg since the swelling kept getting worse. This nurse treated me for months, and instead of getting better, I got worse.

The orphanage sent me to several hospitals including one in Kigali, the capital city of Rwanda. There, they did surgery to try to reduce the swelling, but they didn't explain this to me. After my recovery I was taken back to the orphanage where I started getting ready for school, since another year had already started. I managed to go to school for one day, but then I got sick again. Things became even more serious. I could not eat, walk or do anything. I could only sit up and lie down because the pain had gotten so severe. It was then that I got a visit from Dr. Joia Mukherjee and others from Partners In Health. They came and told me how they were going to help me get better, but by that time I didn't know what to believe anymore.

They asked me what I thought was wrong with me, I told them that I thought I had AIDS. I knew that AIDS was the only disease that had no cure, and all the doctors I saw had a hard time figuring out what I had. They assured me that I didn't have AIDS. At first they thought that I had TB and left me with some medicine, but there was no progress. I kept getting more and more sick. The woman who ran the orphanage decided to take me to a hospital in Congo, there I spent a long time. Dr. Paul Farmer visited me, but I didn't know who he was at that time and I couldn't understand any-thing he said because he spoke in English.

During my time in Congo, the doctors put a cast on my leg which did nothing but cause more pain. They took it off in less than a week due to the pain it was causing. Later, another surgery was done and I was sent home. The nurse from the orphanage took care of my stitches but my leg wasn't getting better. Finally, the orphanage invited some other doctors to come look at me. It was a Sunday evening. Those doctors told me that I had cancer and that there was nothing they could do to save my leg. They had to amputate it. When I heard what they said, I felt lost and confused. I didn't know what to say to them. I screamed and yelled at them, thinking that they hated me. I could not believe what my ears were hearing. I started thinking of all that I have been through. I could not understand why they were unable to save my leg. I was faced with the most difficult decision of my life. I didn't know that I would ever have to choose between life and death. Of course I had no choice, other than letting my leg go. The amputation was done the next day. After my amputation, it was discovered that the cancer had gone into my lungs.

In May 2005, Partners In Health sent me to Massachusetts General Hospital in Boston for chemotherapy because there was no hospital in Rwanda that could treat cancer. I spent 11 months at MGH. There, I went through more surgeries in my lungs and my leg. I was given a prosthetic leg which felt like a dream to me, because I never thought of being able to walk again. While going through my treatment, I lived with a host family who helped me get used to the American culture and acted as my parents. When I recovered, I came to realize that having cancer could not stop me from following my dreams.

After my recovery, I returned back home to Rwanda in 2006, where I got to see my siblings and friends once again. It felt so wonderful to see their surprised faces. It seemed as though they could not believe I was the one standing with them. I cannot explain the joy I felt.

PIH helped me get into one of the best boarding schools in Rwanda, where I excelled in my studies. This year, Dr. Sara Stulac helped me come to the USA where I am a junior at Dana Hall School in Wellesley, MA. I hope to go to college and medical school in the USA, and to become a pediatric oncologist in Rwanda, so that I can help other kids with cancer.

I know I was one of the lucky few children in Rwanda who was able to receive treatment for my cancer. Most people with cancer in Rwanda and in Africa die without ever receiving treatment. I know from my experience that cancer can be treated, and my life is now full of hope and possibility. I want these same opportunities to be available to other children in Rwanda who are suffering from cancer.

Since I returned to Rwanda after my cancer treatment, I have seen doctors begin treating children with cancer in Rwandan hospitals, with medications and advice from doctors and hospitals in the USA I hope that more doctors in Rwanda can be trained to provide cancer care, since most kids with cancer would never have the opportunity to leave Rwanda for treatment. I hope to see kids with cancer in Rwanda finding treatment more quickly and easily than I did, by doctors in their own country, and being able to stay near their homes and families while they are sick.

Claudine Humure

October 17, 2011
Greenwich, Connecticut

My name is Abish Guillermina Romero Juárez and I am 24 years old. I have always considered myself very lucky to be a member of a close-knit family where my parents always worked hard to educate and provide for our development and necessities. I would say that I had the perfect childhood: I only had to worry about playing, attending school and obeying my parents. I always knew that I could count on them because they were my best friends. Throughout my adolescence, things did not change and me and my brother received their complete support. When it was time for us to attend university, one of our greatest desires, I studied Hotel Administration and Tourism for 4 years in the Banking and Accounting School in Mexico City, and I was very happy during this time.

I never imagined that in a few months my life, and that of my family, would drastically change.

Our family suffered the attacks of that terrible and painful disease, breast cancer, in one of our most loving family members, my mother. Even though she had self-examined herself, no one listened to her. The doctors did not adequately examine her and told her that the mass she had was only fatty substance, and that it was not necessary to do any testing. Over the months to come, my mom noticed that the lump grew and began to feel light stinging, but relying on her doctor's advice, we let time pass, allowing the disease to make threatening advances, and when she was finally diagnosed with breast cancer, it was already in stage III. We fought it and suffered every instant during this time until the cancer was apparently eliminated. It returned with fury three years later in that women who was so sweet and loving to us and to all to those who knew her. Together with my father and brother we lovingly cared for her day and night in the last few months. After a long and painful struggle, my mother died.

In September of 2010, right after suffering the death of my loving mother and having finished my studies, I decided to register in a cultural exchange program to work and study in the US for a year. When I lived in Boston for 7 months everything looked okay. It seemed that I was recovering from such great suffering, but having been raised in the habit of self-examination and learning about my breasts, one day I discovered a lump in one of them. Since I had insurance from my job in the US I called and explained the situation. They said they would cover the cost of diagnostic tests so I went to the doctor and had an ultrasound. They observed that the image was suspicious, gave me a mammogram and a biopsy, and then things began to get more serious than I wanted. Finally I got the results and one of my worst fears came true. The nightmare returned. I was being diagnosed with breast cancer, stage II, and my world seemed to collapse. Why me? Why again?

I talked to my insurance agent who told me that because of my diagnosis they could not cover my treatment and that I would also have to leave my job because I was no longer going to be able to do it. That was the worst part, seeing the plans I worked so hard for months go to the trash. At that time I was not only concerned about the fact that I was sick, but also that I did not have any insurance in Mexico either to cover me in this situation. I knew that cancer treatment is expensive and that it can have many implications. I talked to my employer in the US and she contacted some friends to see if anyone could inform me of a place or a doctor that I could see in Mexico. I was fortunate to meet Felicia Knaul (Director of HGEI, who works on issues of health and breast cancer in Mexico) to whom I will be forever grateful for all the help and information she gave me when I needed it most.

She told me about the social health protection system, Seguro Popular, and the National Cancer Institute (INCAN) which is a tertiary level care center under the Ministry of Health, which provides specialized cancer care. Before that, I was not aware of these institutions, but Felicia told me that breast cancer was totally covered by Seguro Popular and not to worry. In that moment, and after all the anguish I had lived through, I had a bit of good news. She connected me with Seguro Popular and so I went back to Mexico, very sad but hopeful that I would receive treatment. I went to register at the Seguro Popular office - I only needed my basic identification, to be a Mexican citizen and to not be affiliated to a social security institutions such as IMSS, ISSSTE, PEMEX, SEDENA, etc. In less than an hour I was being registered. They explained to me that there is a fund that is part of the social health protection system that seeks to provide highly specialized medical services to people who do not have Social Security and that are affected by expensive illnesses that may put at risk their lives and family property. The fund, called the Catastrophic Expenses Protection Fund, allows me to access everything I need in order to receive full treatment. I was relieved to know that all expenses would be covered by my new insurance, and that I would be treated at the National Cancer Institute of Mexico. Some people have access to health insurance institutions such as IMSS, ISSSTE, PEMEX, SEDENA, etc, or pay for private health insurance, and now we all have the option of enrolling in Seguro Popular, which covers many illnesses, including breast cancer since 2007.

Approximately mid May 2011, I started to have tests again to confirm the previous diagnosis and to learn in what condition my body was in order to receive treatment. There were ultrasounds, blood tests, some nuclear medicine tests, placement of a catheter, and a study called a BRCA1 genetic study, which would be useful for determining the type of surgery I would require in a few months.

I had a couple of consultations with my INCAN oncologist to determine my treatment plan. My plan indicated 16 rounds of chemotherapy, 12 of which would have to be weekly with medication to prevent side effects caused by Taxol. I must confess that I did very well with the exception of a neuropathy that occurred after the 4th infusion for which I took a special medication (Gabapentin) that reduced the annoying sensations. I finished this first stage and about 2 months ago I started the second and final round, consisting of 4 infusions every 21 days which have been aggressive. My body has suffered considerably with these infusions but, fortunately, I have been prescribed various medications for nausea, headaches and other symptoms that have come up. I am also receiving a drug called Herceptin which raises the cost of treatment but at the same time promises better results.

At the end of this year the chemotherapy treatment will end and with the help of my oncologist, we will determine what the best surgical procedure for me will be. I know that many women do not have the choice at the end of the treatment to have reconstructive surgery due to the high cost of the procedure. Thanks to Seguro Popular, I have that choice. I would like to have the bilateral mastectomy and reconstruction at the end of radiation. All these surgical procedures are covered by Seguro Popular, too. I feel relieved as otherwise it would have been much more complicated to receive treatment. One of the objectives of this initiative is to reduce the number of women detected in advanced stages (III and IV), and to expand access to care and quality treatment for women with breast cancer. No doubt this is being met and I am a witness to it.

It is very stressful to make decisions for people who have no knowledge on health issues, from knowing what hospital to go to, to the type of studies we need to have in order to have the proper diagnosis of the disease we suffer, what drugs can be best in response to treatment or to simply choose a doctor in whom we can trust our care; it is a long process. I admit it is hard to accept the illness and especially at such a young age as mine. But I believe it is even more stressful to think that you don't have the means to seek treatment, and have nowhere to go for treatment. I feel deeply grateful and fortunate that I have Seguro Popular, an initiative that has been driven and supported by my country, Mexico. Thousands of women like me are being saved and with that, also the well-being of our families. I know that with initiatives like this one, access to health services will be expanded to all sectors of Mexico's society that does not have social security.

I have met extraordinary people that have survived this illness and they inspire me to forge ahead and help others. Information is and will be the most important tool to avoid thousands of deaths worldwide. The authorities of every country must continually train their doctors and nurses so that they are able to make correct diagnoses, like in the case of my breast cancer. It is extremely important for all of us to become promoters of self-examination and of Seguro Popular in order to save thousands of lives with this information.

Our economic status should not be an impediment to obtaining access to treatment. I wish every country would guarantee financial protection and health coverage so that no more mothers, children, spouses or any other family members suffer death due to lack of resources.

Life is beautiful and this war, despite the difficulties we encounter, is worth fighting.

Abish Guillermina Romero Juárez

October 25, 2011
Mexico City, Mexico

This report of the Global Task Force on cancer in low and middle income countries promises much, and it delivers. If you believe that cancer is not a severe and growing problem in poor countries, your misconception will be corrected. If you suspect that programs to prevent, detect, diagnose and treat cancer are unaffordable in low and middle income countries, this report will show the opposite. If you believe that high quality care is unattainable in non-affluent settings, examples in these pages will demonstrate that it is possible to deliver effective, high quality care even in relatively poor countries. This report dispels every excuse for inaction against cancer in low and middle income countries, and it makes a powerful case that the time for action is now.

The Task Force lays the foundation for its case on three levels: the burden of cancer on health, disproportionately borne in low and middle income countries; the economic consequences of inaction, and the gains in productivity and income that follow from effective cancer prevention and treatment; and the inequity of circumstance that exposes those who live in economically disadvantaged settings to heightened risks of cancer and diminished chances of successful treatment. Rejecting any contradiction between disease-based approaches and strategies to improve the health system generally, the Task Force adopts a diagonal strategy, where improvements in cancer strategies and strengthening of the health system are mutually reinforcing. The approach proposed here is comprehensive, encompassing prevention, detection, diagnosis, treatment, survivorship, and palliation. The report covers the spectrum of major cancer threats and leading opportunities for intervention, and it uses a combination of data, illustrative examples, and analysis to convey a persuasive and encouraging message: the burden of cancer in the world can be dramatically reduced if we are willing to do what it takes.

It will take a five-part strategy, outlined in these pages: first, innovation in delivery systems to get preventive services and treatment to those who need it; second, increased access to affordable vaccines, medications, and technologies; third, innovative financing mechanisms to make care accessible and affordable; fourth, strengthened analysis of evidence to inform decision making about cancer policies and practices; and fifth, leadership for a sustained and successful effort. As the report demonstrates, virtually nothing is required that has not already been demonstrated somewhere in low and middle income countries. The global challenge is to make what has been proven somewhere available everywhere.

In 2007, an Institute of Medicine report on *Cancer Control Opportunities in Low and Middle Income Countries* called on international organizations, bilateral aid agencies, national agencies, and academic institutions all to contribute to a concerted effort to reduce the burden of cancer in the world. The goal is achievable. This report of the Global Task Force serves as a valuable guide to all who are willing to do their part to convert the attainable reduction in cancer in low and middle income countries into a reality.

Harvey V. Fineberg, M.D., Ph.D.

October 25, 2011
Washington, D.C.

The world in which we live is characterized by many terrible problems, but it also produces deeply enlightened and visionary attempts to tackle these adversities. The suffering and mortality that cancer causes around the globe are immense, and the fact that the disease is severely neglected in the poorer countries in the world makes it a monumental tragedy as well. There is much needless agony and preventable death that make the tragedy especially intense. What the massive global affliction demands is a well thought out and well planned response to the calamity that has gone unchallenged too long. In providing a sharply reasoned and powerfully analyzed report on cancer care and control in the developing countries, the Global Task Force has provided an extraordinarily important service to the suffering humanity. It is a great privilege for me to have the opportunity of welcoming this deeply informed report that shows how we can reduce the human distress and the loss of lives that cancer causes in the developing world.

The Task Force is not only endowed with remarkable expertise, it is fortunate in having the leadership of Julio Frenk and Lawrence Shulman as co-chairs, aided by Her Royal Highness Princess Dina Mired and Lance Armstrong as honorary co-Presidents. Their superb knowledge of the problems to be encountered, combined with their human understanding - to invoke David Hume's well-chosen expression – has helped to give clear-headed direction to the work of the Task Force. And that, along with the very insightful and penetrating research that the members of the team (with 115 authors and contributors) has done for the report has made it a truly major step forward in dealing with an extremely difficult but urgent global problem.

The institutional affiliations on which the report draws are, of course, stellar, with the Medical School and the School of Public Health at Harvard joining hands with Dana-Farber Cancer Institute. The Harvard Global Equity Initiative, under its Director Felicia Knaul, has been able to play a valuable coordinating function in what is a new - and extremely fruitful - direction for the Initiative. Just as global problems arise from a combination of circumstances, and involve the shortcomings of many institutions, the solutions to these problems also call for coordinated efforts of experts in many different fields, drawing on a range of expertise that needs to be harnessed together. This the Task Force has done with great perspicacity and success.

The adversities of poverty are pervasively relevant to the curse of cancer, since people who also suffer from serious social deprivations are hit much harder by cancer. This happens in a variety of ways: through their lack of opportunity to have regular medical check ups; through their inability to arrange and pay for the needed diagnostics and to get professional medical advice; through the lack of means for securing appropriate treatment; through the unaffordability of expensive drugs (indeed sometimes any drugs at all); through the lack of freedom of the poor patient to withdraw from normal duties of job, family work or child care in order to concentrate on treatment and healing; and - not least - through the way unnecessary pain and agony are taken as inescapable in societies that have come to tolerate adversity as something that is impossible to overcome. But each one of these problems, the Report shows, can be addressed, with immense benefit to the quality of human life across the world.

The Report of the Global Task Force has broken fresh ground in many different areas related to expanding access to medical care, and to related social support, to overcome, or at least blunt, the cruelty of a supremely powerful disease that causes so much misery and demise in every continent of the earth. New knowledge has been skilfully combined with better use of already known connections to provide a state-of-the-art answer to the agonizing question: What can we practically do to prevent the unnecessary agony and avoidable mortality caused by cancer in the developing countries?

Nothing is as heartening for humanity as the recognition that the terrifying problems we have to encounter can be met with astute answers. We cannot make the world perfectly just, but we certainly can do a lot more than is being done to make it far less unjust than it is. Closing the Cancer Divide is a wonderful contribution in that positive and constructive direction.

Amartya Sen

October 27, 2011
Cambridge, MA

Preface

Global Task Force on Expanded Access to Cancer Care and Control in Developing Countries

The mandate of the **Global Task Force on Expanded Access to Cancer Care and Control in the Developing Countries (GTF.CCC)** is to design, promote, and evaluate innovative, multi-stakeholder strategies for expanding access to cancer prevention, detection, and care in low and middle income countries (LMICs).

Working with local partners, the GTF.CCC participates in the design and implementation of innovative service delivery models to scale up access to cancer care and control (CCC) and to strengthen health systems in developing countries.

The Harvard Medical School, the Harvard School of Public Health, the Dana-Farber Cancer Institute, and the Harvard Global Equity Initiative convened the GTF.CCC in November 2009. GTF.CCC is composed of 30 members, and assisted by a Technical Advisory Committee, Private Sector Engagement Group, and Strategic Advisory Committee; the Task Force brings together cancer and global health leaders from all regions of the world. Further, the GTF.CCC includes researchers, members of civil society, patients and family members, and the private sector, in addition to clinicians and policy makers who contribute invaluable support to advocacy, research, and action.

The GTF.CCC is co-chaired by Julio Frenk, Dean of the Harvard School of Public Health, and Lawrence Shulman, Chief Medical Officer and Senior Vice President for Medical Affairs at the Dana Farber Cancer Institute. Her Royal Highness Princess Dina Mired of the Hashemite Kingdom of Jordan and Lance Armstrong serve as honorary co-Presidents. The Harvard Global Equity Initiative, under the direction of Felicia Knaul, serves as the Secretariat.

In addition to strongly supporting efforts to prevent the cancers of tomorrow by reducing risk factors, especially tobacco use, the GTF.CCC proposes and supports actions to improve treatment and palliation.

The GTF.CCC applies the knowledge and ability of its members, combining expertise in global health and cancer, to:

- Raise global awareness of the impact of cancer on developing countries at the global, regional, and national levels through an evidence-based call-to-action;
- Expand the required stewardship and evidence base for implementing the most efficient approaches to CCC in low and middle income countries;
- Identify suitable packages of essential services and treatments to provide care in low-resource settings for cancers that can be cured or palliated with currently available therapies;
- Reduce human suffering from all cancers by promoting universal access to pain control and palliation, and increased access to the best treatment for cancer through the procurement of affordable quality assured drugs and services;
- Support development and implementation of multi-sectoral, multi-stakeholder plans to expand access to CCC through health systems that provide comprehensive health coverage;
- Develop and evaluate innovative service delivery models that effectively utilize existing human, physical and technological resources in different economic and health system settings, and to share the lessons and evidence gained.

The GTF.CCC is predicated on the conviction that solutions to access barriers exist and that the reasons for scaling-up cancer care rapidly are compelling enough to merit an immediate and vigorous global response. Many of these solutions can be built into existing programs and platforms by harnessing health systems and involving multiple stakeholders.

The History of this Report

In 2010 *The Lancet* published "Expansion of cancer care and control in countries of low and middle income: a call to action" signed by the members of the GTF.CCC. The paper argued that much could be done to prevent and treat cancer by deploying primary and secondary caregivers, using global financing mechanisms effectively, making off-patent drugs available and all drugs and inputs more affordable, and by using global and regional procurement mechanisms. Further, the paper argued, increasing access to CCC can strengthen health systems so they also can meet the challenges of other diseases.

This Report, *Closing the Cancer Divide: A Blueprint to Expand Access in Low and Middle Income Countries*, is a product of the first two years of work of the GTF.CCC and a response to the Call-to-Action published in 2010. The Report aims to present the evidence that supports the case for expanded access to CCC, describe innovative models for achieving this goal, and provide a blueprint for future action on CCC in resource-constrained settings as part of efforts to improve health systems strengthening.

The Report draws on the work of more than 115 authors and contributors, including members of the GTF.CCC and its Technical Advisory Committee, as well as patients and representatives of academic, civil society, private sector, multi-lateral and governmental institutions from countries at all resource levels. It is the product of virtual and in-person discussions with members of the GTF.CCC and of meetings in February of 2010, June of 2010, November of 2010 and May of 2011, as well as on-going bilateral exchanges with the Secretariat.

The Report summarizes information from 56 countries. The analysis is based on work with clinicians, researchers, policy makers, and civil society organizations in, or working with institutions from LMICs that span all regions of the developing world. While this is not an exhaustive account of the innovative projects and programs that are currently underway, it offers a large and encompassing sample and a wealth of lessons learned.

The research also draws on an extensive literature review based on more than 400 search terms that uncovered close to 2850 published reports, journal articles, books, and web-based information. A list of search topics is available at the GTF.CCC web site (gtfccc.harvard.edu). Several earlier reports provided a basis from which to develop much of the analysis including the Institute of Medicine of the National Academies 2007 "Cancer Control Opportunities in Low and Middle Income Coutries", and the World Health Organization "Global Status Report on NCDs: 2010".

Organization of the Report

Closing the Cancer Divide: A Blueprint to Expand Access in Low and Middle Income Countries is organized in three parts:

- Part I: **MUCH SHOULD BE DONE**;
- Part II: **MUCH COULD BE DONE**; and
- Part III: **MUCH CAN BE DONE.**

The main text and analysis of the Report is reinforced by material contained in text boxes and panels. Each section begins with a summary of key messages.

The first part of the Report, "Much should be done," is divided into three sections. Part I, including the overview, presents the overarching arguments that support a call for action. The second section demonstrates that preventing, treating, and palliating cancer is an equity imperative. The third section identifies the significant economic costs of failure to act.

The second part of the Report, "Much could be done," also describes the diagonal approach to health system strengthening across the cancer care control continuum, with a focus on chronicity, and outlines possible strategies and core elements for CCC programs in LMICs.

The third part of the Report, "Much can be done," offers responses to the fundamental barriers to expanding CCC in a framework of universal coverage: limited access to services, inefficient and inequitable use of global resources, overreliance on out-of-pocket payments, lack of evidence and information on cancer and CCC, and the dearth of global and local leadership. Through an analysis of cases based on both primary in-country research and existing literature, this part of the Report identifies opportunities to reduce cancer incidence, mortality, suffering, and impoverishment in LMICs. This section of the Report also highlights a series of interventions in each of the six areas of the CCC continuum.

The information in the third part is organized in five sections that correspond to each of the areas where the Task Force identified opportunities for action: innovative delivery; pricing and procurement of drugs and services; novel global and national financing; improving evidence; and, strengthening stewardship and leadership. Each section draws on global and national experiences and lessons learned. Most of these are described in summary cases and text boxes. The findings detail the benefits of involving all stakeholders, including the private sector, civil society, patients, academia, bilateral and global institutions, donor organizations, and national governments. Each section concludes with a set of recommendations specific to the five areas of action.

The work of the GTF.CCC and this Report concentrate on aspects of secondary prevention, treatment, and palliation that have been largely ignored in the literature and policy spheres. In contrast, as a wealth of convincing evidence already exists, the Report does not dwell on population-based primary prevention programs associated with tobacco control, physical activity, and nutrition. However, the need for continued and increased investment in these efforts is emphasized throughout the Report.

Using the evidence garnered for the Report, the GTF.CCC developed recommendations and lessons for resource-constrained settings some of which should also prove useful in high resource settings.

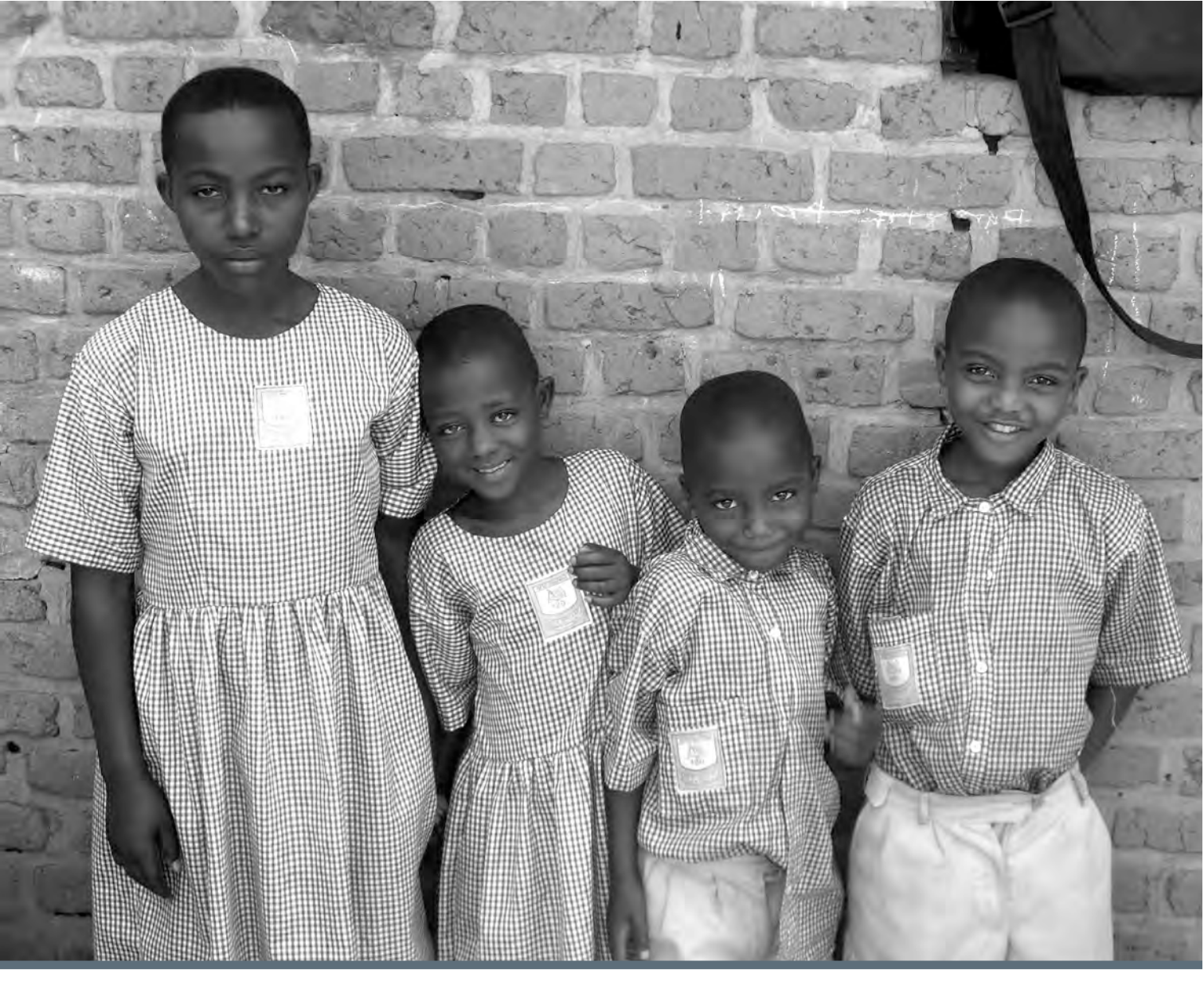
As the principal author of this Report, I offer my thanks to the members of the GTF.CCC and the Technical Advisory Committee, and especially to Honorary co-Presidents HRH Princess Dina Mired of the Hashemite Kingdom of Jordan and Lance Armstrong, and co-Chairs Drs. Julio Frenk and Lawrence Shulman for their dedication, encouragement, investment, and belief in this project. I am most grateful to those who accompanied me closely in preparing the Report: George Alleyne, Rifat Atun, Paul Farmer, Mary Gospodarowicz, Julie Gralow, Nancy Keating, Ana Langer, Peter Piot, Peggy Porter, Jonathan Quick, Magdalena Rathe, and David Scheer. It is impossible to adequately express my thanks in these short paragraphs to our staff, the Secretariat, based at the Harvard Global Equity Initiative and the Department of Global Health and Social Medicine of the Harvard Medical School, and my collaborators at the Mexican Health Foundation and Tómatelo a Pecho. This includes Héctor Arreola-Ornelas, Amanda Berger, Afsan Bhadelia, Kathy Cahill, Grace Cho, Isabel Davis, Courtney Dickerson, Emily Durrant, Debra Keaney, Oscar Méndez, Sophia Michelen, Gustavo Nigenda, Sonia Xochitl Ortega, Maja Pleic and Jennifer Puccetti, as well as collaborators Zaid Bitar and Claire Neal. My personal thanks also to all those listed in the Acknowledgments and particularly supporting institutions Harvard University and Lance Armstrong Foundation which are represented on the GTF.CCC.

On behalf of the members of the GTF.CCC, I thank each and every one of the many people and institutions that contributed to making this Report a reality, especially those who did so while facing the adverse effects of illness. The Task Force also recognizes with great respect and admiration the work of the many patients whose experiences provided invaluable insights, as well as that of the healthcare providers based in LMICs who struggle daily to expand access to CCC in resource-constrained environments.

Felicia Marie Knaul
Director, Harvard Global Equity Initiative
Founder, *Tómatelo a Pecho*

Sudbury, MA and Cuernavaca, Mor., Mexico
October, 2011.

Much should be done



Much should be done

Part I

Overview

Section 1

Overview

Low and middle income countries (LMICs) share a common, emerging, and largely unrecognized challenge: the burden of increasingly prevalent chronic and non-communicable diseases. This emerging challenge compounds the difficulty of responding to the backlog of disease and illness associated with poverty and "underdevelopment" often associated with preventable infections and reproductive health problems.[1] Cancer –itself a complex set of devastating diseases– epitomizes the complexities and inequities of the epidemiological challenge faced by LMICs.

Cancer is also a challenge to economic and human development, as it is both a cause and an effect of poverty. The long-term disability and ongoing health care costs of cancer impoverish families and health systems, and contribute to social exclusion. At the same time, poverty, lack of access to education and health care, and discrimination expose populations to additional risks for presenting and dying from many cancers.

There are glaring disparities between rich and poor in incidence and death from preventable cancers and death from treatable cancers, as well as in the pain, suffering, and stigma associated with the disease. These disparities constitute a cancer divide and demonstrate that increasing access to cancer care and control is also an issue of equity.

Yet, many believe –and these myths persist– that meeting the challenge of cancer in LMICs –with the exception of some basic prevention– is unnecessary, unaffordable, unattainable, and –perhaps the most pernicious– inappropriate because such an effort would take away resources from other high burden, communicable diseases. These four myths plague and undermine the work of the global community in cancer care and control (CCC), as well on other non-communicable disease (NCDs) and chronic illness.

The facts that disprove the four myths that undermine efforts to narrow the cancer divide by increasing access to CCC in LMICs:

- **CCC is unnecessary because the burden of cancer is not large in LMICs.**
  - Each year over half of all new cancer cases and two-thirds of cancer deaths occur in LMICs.
  - Tobacco, which accounts for at least 30% of all cancer deaths, will kill one billion people in the 21st century based on current trends – the vast majoirty in LMICs where 80% of today's smokers live.
  - Breast cancer is the second leading cause of death among Mexican women aged 30 to 54. For children aged 5-14, cancer is the third leading cause of death in upper-middle, fourth in lower-middle, and eighth in low income countries.
  - Just two cancers – breast and cervical – account for almost the same number of deaths among women in reproductive age in LMICs as maternal mortality (see Section 2).

- **CCC is unaffordable for most LMICs.**
  - Too little –only 5%– of global spending on cancer is in LMICs, although these countries account for almost 80% of the global cancer burden, resulting in a staggering 5/80 cancer disequilibrium.
  - The global value of lost productivity from cancer outstrips the estimated cost of prevention and treatment. Further, cancer is a disease that drives families into poverty.
  - The total economic cost of tobacco alone reduces gross domestic product by as much as 3.6% per year. Between 2020 and 2030, the global economic costs of tobacco are expected to double. Yet accelerated implementation of tobacco control would cost less than $US 0.16 per person per year for countries like China and India.

- Many CCC interventions are less expensive than assumed: 26 of the 29 key agents for treating many of the most prevalent, treatable cancers in LMICs are off-patent, making drug treatment relatively low cost at less than $US 100 per course of treatment for most drugs. The total cost of covering drug treatments for unmet needs for cervical cancer, Hodgkin's lymphoma, and acute lymphoblastic leukemia in children 0-14 in LMICs is approximately $US 115 million. Reductions of 90% in the price of HPV and hepatitis B vaccines have been achieved for low income countries.

CCC is unattainable because LMICs do not have adequate human or physical resources to support treatment and care.

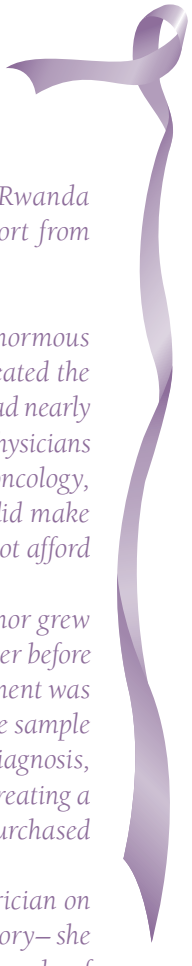
- Early detection programs for breast and cervical cancer can be integrated into anti-poverty, maternal and child health, sexual and reproductive health, and HIV/AIDS programs.
- The King Hussein Cancer Center in Jordan is Joint Commission certified as a specialty treatment center.
- Telemedicine has been effectively used to expand capacity for treatment of cancer and especially children's cancers in LMICs. In El Salvador, links between St. Jude hospital in Memphis and local hospitals helped achieve an increase in survival rates for children with acute lymphoblastic leukemia from 10% to 60% during the first five years of collaboration.
- In extremely resource-poor settings such as Haiti, Malawi and Rwanda, primary and secondary care providers and facilities with no on-site oncologist can safely provide some chemotherapy with links to specialists and specialty centers.
- Since including childhood cancers in Seguro Popular in Mexico to eliminate financial barriers to accessing treatment, 30-month survival has increased from approximately 30% to almost 70%.
- For the estimated 5.5 million terminal cancer patients who needlessly suffer moderate to severe pain with no pain control, effective national programs can increase availability and accessibility of this essential and inexpensive intervention.

CCC is inappropriate in LMICs because it takes resources away from high burden diseases that have proven treatments and interventions.

- Expanding CCC can strengthen health systems in ways that benefit all populations and increase capacity to respond to a wide variety of health needs. An example is pain control, which is crucial for many patients, and for undertaking surgery.
- The distinctions between communicable and non-communicable disease are increasingly irrelevant. Many cancers that burden LMICs are associated with underlying and unresolved infections associated with poverty (KS (HIV/AIDS); cervical cancer (HPV), liver cancer (hepatitis B); gastric cancer (H-pylori); bladder cancer (schistosomiasis).
- Failure to protect populations from preventable health risks associated with cancer and other chronic illness will detract from both economic development and social well being, placing countries at further risk of failing to meet many Millennium Development Goals.
- 50-60% of cancer mortality in LMICs is avoidable by applying country-specific strategies for prevention and treatment. Deaths from cancers that strike children and young adults account for many years of healthy life unnecessarily lost.

Indeed, these four myths are familiar to the global health community because they were the arguments used only a decade ago as justifications for inaction for HIV/AIDS. Fortunately, they went unheeded and each of the myths has been dispelled in the case of HIV/AIDS, which has now been transformed from an acute and fatal disease to a chronic illness.[2]

This Report takes issue with each of these myths and proves that they do not apply for many cancers and for many types of interventions. Control of risk factors and prevention of cancer are of the highest priority in LMICs. Treatments, care options, financial protection programs, and delivery models exist and can be applied in resource-constrained settings. Pain control should and can be managed in all settings. Further, many of these findings also apply to a broad range of NCDs and chronic illness.



Francine's Story

Francine was 11 years when she arrived at Rwinkwavu Hospital in Rwanda in 2005. This was just a few months after the hospital opened with support from Partners In Health.

She and her father had traversed Rwanda looking for a cure for the enormous tumor protruding from Francine's right cheek. It was obvious that left untreated the cancer would eventually take her life. In Francine's own words, "My parents had nearly given up hope". Before coming to Rwinkwavu, the family consulted numerous physicians and traditional healers. But lacking diagnostic equipment or expertise in oncology, the medical community could offer few answers. And even when a doctor did make a tentative diagnosis, Francine's family –poor, subsistence farmers– could not afford the fees for treatment.

At Rwinkwavu, Francine sat in the pediatric ward for months as her tumor grew and as hospital doctors and nurses tried to determine if cancer treatment, never before provided there, was possible in their small, rural hospital. Eventually, treatment was made possible through links with colleagues at institutions in the US. A tissue sample was sent to the Centres for Disease Control and Prevention laboratory for diagnosis, a pediatric oncologist at Dartmouth-Hitchcock Medical Center advised on creating a treatment regimen that was safe in the local setting, and Partners In Health purchased chemotherapy and other medications.

After several family meetings and training of local staff by a PIH pediatrician on site –Dr. Sara Stulac, who is also the author of this summary of Francine's story– she began receiving chemotherapy. Her tumor shrank each week, and after nine weeks of chemotherapy, she was able to have surgery to remove the residual tumor. The surgery was performed at Rwanda's national referral hospital.

Francine subsequently returned to Rwinkwavu for a total of 48 weeks of chemotherapy. Her father was employed at the hospital farm and so was able to support his family even during his daughter's lengthy hospitalization. The hospital doctors, nurses, and social workers developed close relationships with Francine and her family as they accompanied her through treatment.

As of 2011, 6 years after her arrival at Rwinkwavu, Francine remains cancer-free, and is a happy and healthy student at her local elementary school. She returns often to the Rwinkwavu Hospital pediatric ward to visit patients and her friends among the hospital staff, and often mentions how important it is that other kids who are suffering find access to medications just as she did.

Francine's story continues to provide inspiration and guidance for programs to expand access to cancer care and control in LMICs.

At the same time, developing programs to meet the challenge of cancer and other NCDs in low resource settings is even more complex than was the case with HIV/AIDS. There are major differences in cancer programs because of the complexity of care, the many specialists and medications involved, and the special procedures that are required. Pathology, for example, is a huge hurdle to overcome in many settings. For this reason, this Report, like earlier documents, focuses on the many compelling opportunities that exist for reducing cancer incidence, improving survival and survivorship, and offering better palliative care.[3] The evidence in the Report steers policy toward all that can, rather than detracting resources towards what cannot be accomplished in countries at different resources levels.

The *High-level Meeting of the General Assembly of the United Nations on the Prevention and Control of Non-communicable Diseases* (UNHLM on NCDs), held in September of 2011, set the stage for the action that is required to reduce the global inequities in access and outcomes in prevention and care for NCDs. The Declaration agreed upon at the UNHLM positions NCDs as a priority for development, as well as for health. It also places new focus on the importance of research, and international cooperation, including trade. The lead-up and the meeting involved a myriad of actors. This is reflected in the high level of participation by heads of state and governments, as well as through the incorporation of many recommendations made by civil society.[4]

While the Declaration falls short of establishing necessary targets and goals for reducing the burden of NCDs, it does set out specific short-term tasks. In particular, the development of a comprehensive global monitoring framework that includes voluntary global targets and national indicators, and proposals for carrying forward multisectoral action by the end of 2012; strengthened multisectoral national policies by 2013; and a report on commitments by 2014.[5]

This Report follows on the global milestone of the UNHLM on NCDs. It seeks to contribute to the process of establishing the global monitoring framework and the partnership for multisectoral action that are outlined in the Declaration.

To move forward, the GTF.CCC suggests that appropriate and effective evidence-based policies –blueprints for action– must be identified, developed, evaluated, and scaled up by involving all participants in inclusive, multi-stakeholder programs and forums. The Report offers blueprints for action for cancer that can also augment the agenda on NCD and chronic illness.

There are reasons for ***emphasizing cancer within the NCD agenda***. First, an effective response to cancer requires developing the capacity to offer prevention and treatment. This ***capacity-building around cancer can strengthen health systems overall***.

Further, cancer advocacy can reinforce the global health and NCD agenda. One of the obstacles to promoting action and financial commitment is that advocacy around NCDs and chronic illness is often not inspirational and does not create a sense of urgency. This is especially true when compared with communicable diseases, especially HIV/AIDS.[6,7] History demonstrates, though, that cancer advocacy to galvanize communities through movements led by patients and their families can be highly effective.[8] Indeed, cancer advocacy mobilizes stakeholders and constituencies in unique ways that can be leveraged to bridge the false divide between communicable diseases and NCDs.

Cancer is in fact a "communicable" NCD - it is one of the diseases for which ***effective communication can catalyze a global movement***.[9] Advocacy and activism around cancer, if positioned with an agenda for health system strengthening, can provide a human face to NCDs and convert cancer and other chronic illness into a priority for global and national health agendas.

Advocating for increased access to CCC in LMICs need not, and should not, be at the expense of meeting other health priorities.[10] The evidence presented in this Report demonstrates that CCC can be designed to reinforce health systems in ways that support efforts to meet the challenge of NCDs, achieve the Millennium Development Goals (MDGs), and promote a broad economic and human development agenda.

Controlling risk factors must be at center stage of any NCD control effort in LMICs. Evidence clearly signals that a set of high-priority, effective, low-cost interventions must be put in place immediately to avoid an impending crisis, and massive increases in the toll of NCDs on health, as well as social, economic and human development. Tobacco control is key and requires an accelerated implementation of the WHO Framework Convention on Tobacco Control (FCTC) as indicated in the Declaration of the UNHLM on NCDs. In addition, preventing harmful alcohol use and promoting healthy diet and physical activity are priorities for LMICs.[11-13] These are important lessons for both high and lower income countries.

At the same time, an approach focusing solely on the management of risk factors is not sufficient to respond to the challenge of cancer in LMICs. Many cancers are not associated with known risk factors, especially in the case of children. Thus, in addition to strongly supporting efforts to prevent the cancers of tomorrow by reducing risk factors, the GTF.CCC calls for the ***immediate action required around early detection, diagnosis, treatment, and palliation***.

This Report takes issue with the prevention-only, minimalist view of what can be done for cancer. The assumption that cancers will remain untreated in poor countries must be challenged, just as was done more than a decade ago with similarly unfounded arguments against provision of treatment for HIV/AIDS. In the case of cancer, just as was the case with HIV/AIDS, prevention is critically important, but so are treatment, survivorship, and palliation. The following was said about HIV/AIDS in 2001, and continues to apply to HIV/AIDS as a chronic illness, as well as to cancers: "The belief that treatment may be reserved for those in wealthy countries whereas prevention is the lot of the poor might be less repugnant if we had highly effective preventive measures".[14] In fact, expanded access to prevention and care for HIV/AIDS has to be considered one of the greatest achievements in the history of global health.

"The belief that treatment may be reserved for those in wealthy countries whereas prevention is the lot of the poor might be less repugnant if we had highly effective preventive measures."

The either-or debates –prevention or treatment, infectious or non-communicable disease– provide excuses for inaction and generate barriers. The current debates place cancer in a position that pits communicable against non-communicable, and fosters competition, rather than complementarity, in the face of scarce resources, and detracts from effective communication of the urgent need for action.

Global health requires a framework that embraces the neglected area of work on NCDs and at the same time bridges the false divide between communicable and non-communicable disease.[15] This framework must also encourage and facilitate work across NCDs, something that is important in both wealthy and lower income countries.

The ***diagonal approach*** put forward in this Report offers such a framework.[16] It moves away from misunderstandings that currently detract from effective action and promotes a "Yes, we can" response emphasizing what can be done rather than what cannot be done. The diagonal approach transforms zero-sum debates about what to deny poor patients with cancer into a search for opportunities that will strengthen health systems for all.

The diagonal approach:[17] a framework that transforms zero-sum debates about what to deny poor patients with cancer into a search for opportunities that will strengthen health systems for all.

The ***diagonal approach*** is a strategy in which priority interventions drive necessary improvements into the health system. Rather than focusing on disease-specific vertical programs or on horizontal initiatives that address system-wide constraints, a diagonal approach seeks to do both.

Applications of the diagonal approach to CCC include: tobacco control to help prevent certain cancers as well as reduce cardiovascular and respiratory diseases; promoting increased physical activity and healthy eating to reduce the risk of several NCDs; empowering women through better knowledge of cervical cancer prevention and early detection of breast cancer with interventions implemented through sexual and reproductive health programs; and, strengthening health systems to support access to pain control medication for all patients (see Section 4).

Closing the Cancer Divide: A Blueprint to Expand Access in Low and Middle Income Countries demonstrates that health systems should, could, and can be strengthened to respond to the complex array of diseases, epitomized by cancer, that today characterize the epidemiological profile of all countries, rich and poor alike.

I.i. MUCH SHOULD BE DONE:
CLOSING THE CANCER DIVIDE IS AN EQUITY IMPERATIVE AND A PRIORITY FOR ECONOMIC AND HUMAN DEVELOPMENT

The cancer landscape has changed dramatically in less than a generation. While the challenge of cancer is far from met, the horizon is promising. Many cancers once considered a death sentence can today be prevented or cured. For a number of patients, cancer is a chronic illness, one that they "live with" rather than "die from."

Survivorship is an emerging dimension of cancer care. This is because for some –though unfortunately not all– cancers, a large proportion of patients survive both the disease and the treatment to enjoy a healthy life. In the face of these successes the stigma of the "C Word" has faded, thanks largely to the efforts of the flourishing survivorship movement. Both the gains in survival and the reductions in stigma are revolutionary for a disease that, not too many years ago, was universally synonymous with suffering, stigma, and death for people at all income levels.[18]

Yet, the improvements in the opportunity to survive and the reduction in the hardships faced in trying to do so are far from universal. Successes are restricted primarily to wealthy countries and individuals. *Too few of the benefits of progress in understanding, preventing, treating,* and *caring for people with cancer have reached LMICs.*

However, it is precisely in LMICs that more than half of newly reported cancers and two-thirds of deaths occur. Once considered a problem exclusive to high income countries ***cancer has become a leading cause of death and disability in the developing world.*** More than 55% of the 12.7 million cancer cases and 64% of the 7.6 million cancer deaths in the world in 2008 were in LMICS.[19] By 2030, LMICs will bear the brunt of an estimated 27 million new cancer cases and 17 million cancer deaths.[20,22]

Cancer is no longer a disease confined to the wealthy, and the same is true of NCDs overall. For women 15-49 living in sub-Saharan Africa, death or disability from an NCD is four times more likely than for women who live in high income countries.[23,24]

The motivation for action must not be based solely on absolute numbers. Increasing access to CCC in LMICs is also an ***equity imperative.*** While the rich are often able to live with cancer; the poor die –painfully– from the same diseases. Access to the opportunities to prevent and to survive cancer should not be determined by income or geography; yet they are.

A "protracted and polarized epidemiologic transition" –through which populations simultaneously face emerging chronic and non-communicable disease, while still battling diseases associated with poverty and underdevelopment–[25] is also occurring in cancer. This ***cancer transition*** is further spreading the already gaping divide between rich and poor (see Section 2).

"The chance for a cure, the chance to live, should not be an accident of geography."

HRH Princess Dina Mired of Jordan

Preventable cancers, such as cervical, liver, and lung cancers that are declining in incidence in high income countries are far from controlled in LMICs. Simultaneously, cancers historically less common in those countries, such as breast cancer, are increasing in incidence. As policies to control risk factors, access to vaccination, and early detection become universal in high income countries, the concentration of these cancers in LMICs will become more evident. This backlog of preventable yet unaddressed cancers is combining with the emerging challenge of all other cancers that cannot be prevented, only appropriately treated or palliated. This is creating a *double cancer burden for LMICs*.

The disparity –referred to in this Report as the *cancer divide*– in cancer outcomes between rich and poor directly relates to inequities in access to health care and to differences in underlying socio-economic, environmental, and health conditions (see Section 2).[26] The cancer divide is caused and fueled by concentrating preventable risk, disease, suffering, impoverishment from ill health, and death among poor populations. Further, the divide is likely to continue to widen and deepen over the coming decades if the fruits of progress in science and medicine continue to be largely unavailable in LMICs.

Five facets of the cancer divide

1. Risk factors associated with cancers amenable to prevention through behavior change (e.g. smoking and lung cancer) or reduced exposure to environmental risk (e.g. indoor air pollution and lung cancer).
2. Preventable infections for which no vaccine exists that are associated with cancer (e.g. HIV/AIDS and KS), and infections that can be prevented through vaccination or detected and controlled in pre-cancerous stages (HPV and cervical cancer).
3. Cancers for which treatment exists and is often made more effective by early detection (e.g. breast cancer).
4. Suffering associated with the social and psychological aspects of disease or survivorship, including discrimination and stigma.
5. Pain and physical suffering associated with all cancers, including those for which neither effective treatment nor prevention is possible.

(See Section 2)

The divide affects the full range of cancers: those amenable to prevention with behavior change or reduced exposure to environmental risk; cancers for which preventable infection is the origin and cancers for which effective treatment exists, especially with early detection (some of these cancers are also preventable).

For survivorship and palliative care and pain control, the divide applies to all cancers. Access to services, state-of-the-art treatment, advocacy, and financial protection create an environment in rich countries where healthy survivorship is now possible for many cancers. The opposite is true in developing countries where cancer is still seen as a death sentence and the stigma around the disease and the effects of treatment –compounded by discrimination associated with gender, ethnicity, and socio-economic status– too often prevent care-seeking, almost guaranteeing a fatal outcome even where cure is feasible and affordable.

Pain control, an issue for all cancers and many other diseases, offers the most distressing and insidious example of the cancer divide. Controllable pain is considered unacceptable in most high income countries, at least for the wealthy. Yet, and despite the generally low cost of pain control, many populations lack access to this fundamental health intervention, one that might well be considered a basic human right.

When quantified, these disparities are appalling. Approximately 90% of cervical cancer occurs in LMICs. It is also the case that more than half of women with breast cancer die from their disease, compared to less than a quarter of women in the developed world. In Canada, some 90% of children with acute lymphoblastic leukemia are cured, but in the poorest countries of the world the inverse is true: more than 90% of children will die of the disease. High income countries account for less than 15% of the world population, yet more than 94% of global morphine consumption.[27] Sub-Saharan Africa records 1.1 million deaths in pain and yet consumes enough medicinal opioids to treat just 85,000 people.[28]

The breadth of the cancer divide in prevention, treatment, and pain control

Global disparities in outcomes for preventable and treatable cancers, and in access to even the most basic reprieve from suffering, pain control, are enormous. Cervical cancer mortality, the ratio of mortality to incidence for childhood cancers and breast cancer, and non-methadone opioid consumption per death from HIV/AIDS or cancer in pain, each illustrates the breadth of the cancer divide. These disparities are evident both within countries and across regions, as well as by income.

For the poorest decile (10%) of countries of the world, the average mortality rate for adult women from cervical cancer –which is highly preventable if detected in pre-cancerous stages– is 36 compared to 3 in the richest decile of countries. The lethality (approximated by mortality/incidence in a given year)[29] of both childhood cancers and breast cancer is much higher for the poorest countries. A child diagnosed with cancer who lives in one of the poorest countries has an 80% probability of dying, compared to less than 30% in one of the wealthiest countries. The spread in access to pain control is tremendous: ranging from 54 milligrams per death in pain from HIV/AIDS or cancer in the poorest decile to almost 97,400 in the richest decile of the world's countries.

Within income regions, the differences are also large. This indicates that the level of economic development is not the only determinate of outcomes or access. It also suggests that some countries, despite low income, are better able to meet the challenge of cancer. The average for the five low income countries with the highest mortality rate for cervical cancer is 57, compared to 6 for the five low income countries with the lowest mortality rate. For lethality of childhood cancers the spread is 0.9 compared to 0.42: 90% of children are likely to die from the disease in the countries with the worst outcomes, compared to 40% in other countries with low income where treatment options are likely to be more available. Access to pain control is 31 milligrams compared to over 500.

Even within high income countries there is considerable variation in performance. For cervical cancer mortality, the figures are 16 compared to 1; for lethality of childhood cancers they are particularly wide with a 16-fold difference; and, for breast cancer 0.61 to 0.14. This suggest that some high income countries have mortality to incidence ratios for childhood and breast cancers that are similar to those of the poorest nations of the world. The extreme variation in milligrams of pain control medication reflects lack of access, but also very high levels in a few high income countries.

For LMICs across geographic regions, the patterns also demonstrate that the cancer divide is large. In the African region, all of the averages are relatively poor. Even in the countries with the best outcomes, 70% of children with cancer and almost 50% of women with breast cancer are likely to die, and access to pain control is below 1,750 milligrams for patients with HIV/AIDS who will experience pain in death. In Asia, the spread in the indicators is especially large for cervical, breast and childhood cancers.

For childhood cancers, the five countries with the highest lethality for childhood cancer average 0.94, suggesting that almost all children die from their disease. Even in the five countries with the best indicators, more than 40% of children die from the disease. For breast cancer, the figures range from 25% to almost 60%. For the Eastern Mediterranean region, cervical cancer mortality is relatively low. All the other indicators are poor. The ratio of mortality to incidence for childhood cancers is 0.82 for the five countries with the highest rates, and .71 for the five countries with the lowest rates. For breast cancer, the figures are 0.62 and 0.45. Pain control medication access varies from 422 milligrams to just over 7,100 milligrams. For the LMICs of the European region, the probability of surviving childhood cancer is more than three times as high in the best performers compared to those countries with the worst outcomes. For breast cancer the different is more than double. In Latin America and the Caribbean, levels and differences in cervical cancer mortality are high and lethality varies by a factor of more than 2 for childhood cancers. For breast cancer the levels and spread tend to be lower. For pain control, there is also less variation, but the average level even for the countries with the highest consumption is only 6,600 milligrams per death from cancer or HIV/AIDS in pain.

Table 1

Cervical Cancer Mortality, Ratio of Mortality to Incidence for Childhood and Breast Cancer, and Non-methodone Opiod Consumption per Death from HIV/AIDS or Cancer in Pain; Averages by Income and Geographic Region

			Cervical cancer[b] (15 or more years of age)	All cancers in children (0-14 years of age)[b]	Breast cancer (40 - 69 years of age)[b]	Non-methadone opioid consumption[c] (morphine-equivalents)
			Mortality (rate per 100,000)	Mortality/ Incidence	Mortality/ Incidence	Per death from HIV or cancer in pain (mg)[c]
Country Income	Decil 1 (poorest 10% of countries)		36	0.80	0.60	54
	Decil 10 (most wealthy 10% of countries)		3	0.28	0.25	97,396
	Low income	Average of Bottom 5	57	0.9	0.7	31
		Average of Top 5	6	0.42	0.35	522
	Lower middle income	Average of Bottom 5	35	0.98	0.64	148
		Average of Top 5	1	0.29	0.30	4,716
	Upper middle income	Average of Bottom 5	24	0.88	0.56	964
		Average of Top 5	4	0.19	0.25	8,970
	High income	Average of Bottom 5	16	0.83	0.61	7,456
		Average of Top 5	1	0.05	0.14	150,869

Table 1

Cervical Cancer Mortality, Ratio of Mortality to Incidence for Childhood and Breast Cancer, and Non-methodone Opiod Consumption per Death from HIV/AIDS or Cancer in Pain; Averages by Income and Geographic Region *(continued)*

			Cervical cancer[b] (15 or more years of age)	All cancers in children (0-14 years of age)[b]	Breast cancer (40 - 69 years of age)[b]	Non-methadone opioid consumption[c] (morphine-equivalents)
			Mortality (rate per 100,000)	Mortality/ Incidence	Mortality/ Incidence	Per death from HIV or cancer in pain (mg)[c]
Geographic Region	Africa	Average of Bottom 5	57	0.93	0.66	19
		Average of Top 5	13	0.69	0.47	1,724
	Asia[d]	Average of Bottom 5	25	0.94	0.58	358
		Average of Top 5	7	0.42	0.25	9,656
	Eastern Mediterranean[d]	Average of Bottom 5	15	0.82	0.62	422
		Average of Top 5	2	0.71	0.45	7,136
	Europe[d]	Average of Bottom 5	16	0.61	0.53	330
		Average of Top 5	5	0.20	0.30	11,332
	Latin America and the Caribbean[d]	Average of Bottom 5	29	0.68	0.39	748
		Average of Top 5	10	0.30	0.25	6,612

NOTES:

[a] World Development Indicators, 2008. World Bank. (http://data.worldbank.org/data-catalog/world-development-indicators/).

[b] Source for cervical cancer mortality 15+; M/I cancers in 0-14; M/I breast cancer 40-69; and M/I NHL 15+ Globocan 2008; http://globocan.iarc.fr/. Taken directly from the online data base.

[c] Source for opioid consumption per capita and per HIV or cancer deaths: GAPRI methodology available at (http://www.treatthepain.com/methodology) and University of Wisconsin Pain & Policy Studies Group (http://www.painpolicy.wisc.edu/). See Appendix 1, Section 2 of the full Report and full GAPRI methodology available at (http://www.treatthepain.com/methodology).

[d] Excluding high income countries.

These differences between rich and poor are hardly surprising given that only 5% of global spending on cancer is in LMICs. These countries account for almost 80% of the global cancer burden in terms of years of life lost to cancer, resulting in a staggering *5/80 cancer disequilibrium* in global investment in prevention, treatment, palliation, and research on cancer.[30,31]

As a result, *LMICs face a severe shortage of human and physical infrastructure to confront cancer.*[32-35] In Honduras, for example, fewer than twenty oncologists are available for a country with a population of eight million. In Ethiopia, four oncologists care for more than 80 million people.[36]

Similar shortages are faced in other specialty services that are essential to treat cancer such as pathology, and in access to tertiary centers where diagnosis, surgery, and specific treatments such as radiation therapy are performed. According to the International Atomic Energy Association, high income countries account for 70% of the world's radiation facilities, and 30 countries, half of them in Africa, do not have a radiation therapy machine. In North America, there are 6 megavoltage units per million inhabitants, compared to 0.5 in LMICs. These inequities tend to disproportionately affect women who constitute the majority of patients requiring radiotherapy.[37]

Treating health as an investment rather than a cost is now the predominant philosophy that inspires human, economic, and environmental development agendas (see Section 3). Illness, especially chronic and catastrophic diseases such as cancer, reduce productivity and drive families into poverty as well as detracting from economic growth and human development.[38] Still, this investment framework remains largely ignored in global and national policy-making surrounding cancer and other chronic illness.

Human life and well being have an intrinsic and incommensurable value, including an economic dimension related to the stream of income individuals would generate if they survived and the contributions they make to family and community well-being and productivity.

"Most countries in the developing world lack the infrastructure for quality cancer treatment and are struggling with the high costs of cancer drugs. Prevention and early detection programs in these countries are virtually non-existent. This is why today the cost of cancer in the developing world is actually paid in human life." -HRH Princess Dina Mired of Jordan

The World Economic Forum (WEF) considers *chronic disease one of the three leading global economic risks* based on the potential impact of these diseases on global productivity and economic growth.[39] WEF cautions against taking a short-term view of the benefits of investing in chronic disease prevention and management. Failure to protect populations from preventable health risks associated with chronic illness will inevitably and severely detract from both economic development and social well being.[40] *Ignoring NCDs actually places countries at further risk of failing to meet many Millennium Development Goals* (MDGs).[41]

Further, *cancer, chronic illness, and NCDs, are both an outcome and a cause of poverty.* As Amartya Sen observes: "The poorest groups not only bear higher risks for non-communicable diseases but, once they develop such a disease, they also face larger medical and economic adversity. The poor have less resources and less access to medical care, and often have delayed diagnosis. Diseases like cancer tend, as a result, to progress to more advanced states than in the case of the rich, and this leads to higher levels of mortality and disability. The costs and economic handicaps related to these diseases are also a major cause for tipping already poorer households further into abject poverty." [42]

"The poorest groups not only bear higher risks for non-communicable diseases but, once they develop such a disease, they also face larger medical and economic adversity. The poor have less resources and less access to medical care, and often have delayed diagnosis. Diseases like cancer tend, as a result, to progress to more advanced states than in the case of the rich, and this leads to higher levels of mortality and disability. The costs and economic handicaps related to these diseases are also a major cause for tipping already poorer households further into abject poverty." -Amartya Sen

The cancer divide will further worsen the economic disparities between and within countries. Each year, new cases of cancer in the world –close to 13 million and growing– bring an enormous burden, not only in terms of years of life lost and human suffering, but also in economic terms.[43] The economic consequences of each cancer case include the direct and indirect costs of treatment, the income forgone by patients and their families as a result of being unable to work during treatment, and, more importantly, the lost productivity of the patient and the family from premature death and disability and the demands of care giving that often fall hardest on young women.

Tobacco is a huge economic risk for LMICs. Tobacco's estimated $US 500 billion drain –mainly from tobacco-related illness and treatment costs– exceeds the total annual health expenditure of all LMICs. Tobacco's total economic costs reduce gross domestic product by as much as 3.6% per year. Further, the future does not portend well if trends in smoking continue. Between 2020-2030, the global annual economic costs of tobacco are expected to reach $US 1 trillion.[44]

Unlike in the case of HIV/AIDS, cancer is a complex set of many diseases and several types of cancers are not treatable, or even preventable with existing medical knowledge. Yet, the evidence presented in this Report paints a clear picture of the subset of cancers that can be prevented or treated successfully in low resource settings. For LMICs, a focus on the subset of cancers that can be prevented or treated using current knowledge and medical advances could reduce mortality significantly.

Based on an analysis of avoidable mortality undertaken for this Report, ***between 2.4 and 3.7 million avoidable deaths from cancer occur each year.***[45] LMICs account for approximately 80% of this avoidable mortality. These estimates consider only those cancers for which prevention or treatment can produce cure or substantially increase healthy life expectancy.

The economic cost of cancer and the benefits of care and control

- Between 2.4 and 3.7 million avoidable deaths from cancer occur each year; 80% are from LMICs.
- Deaths from cancers that strike children and young adults account for many of the years of healthy life unnecessarily lost.
- Tobacco use is a huge and preventable economic risk that reduces gross domestic product by as much as 3.6% per year in LMICs, according to the American Cancer Society.
- The economic cost of productivity losses combined with treatment costs for cancer is close to $(2010) US 1.16 trillion, which is approximately 2% of total global GDP.
- The value that individuals place on the losses they experience from cancer due to income not earned, out of pocket spending on health, and pain and suffering totals $(2010) US 2.5 trillion, or more than 4% of global GDP, according to estimates published by the World Economic Forum.
- WHO estimates that the cost of reducing risk factors such as tobacco and harmful alcohol use is $US 2 billion per year, for all LMICs – less than $US 0.40 cents per person.
- WHO also demonstrates that including a limited set of individual interventions for NCDs –such as Hepatitis B immunization to prevent liver cancer, and measures to prevent cervical cancer– costs less than $US 1 per capita in low income, $US 1.50 in lower-middle income, and $US 3 in upper-middle income countries.
- The economic value of productivity lost due to preventable cancer deaths exceeds the cost of cancer care and control by more than $US 130 billion. Potential savings are much higher –between $US 540 billion and $(2010) US 850 billion– taking into account the individual perception of the value of lost income and suffering.

(See Section 3)

A larger proportion of deaths from cancer are avoidable in LMICs. Depending on the income region, 50-60% of cancer mortality in LMICs is avoidable, compared to 35% in high income countries.

Deaths from cancers that strike children and young adults account for many years of healthy life unnecessarily lost. Wealthy countries have been able to prevent many of these deaths, while lower income countries have not. These *"candidate cancers"* make ideal targets for advocacy and action in LMICs.

The total productivity cost of premature death and disability from cancer in the world is estimated at $(2010) US 921 billion.[46] This figure is based on the total Disability Adjusted Life Years (DALYs) lost and the value of lost individual productivity from early death.

The global economic cost of new cancer cases, including medical costs, prevention costs, and the time of care-givers and transportation to treatment facilities, and prevention is $(2010) US 310 billion dollars.[47]

The value that individuals place on lost income, out-of-pocket spending on health, and pain and suffering is $(2010) US 2.5 trillion – more than 4% of global GDP. This estimate is based on a Value of Statistical Life (VSL) approach.[48] A more conservative estimate, combining costs of treatment and productivity losses places the total annual economic cost of cancer at close to $(2010) US 1.16 trillion, which is approximately 2% of total global GDP. This figure does not include the substantial longer-term costs to patients, families and care givers that are not directly related to the period of treatment.

For all estimates, the ***economic value of the human life that could be saved exceeds the cost of CCC***. The driving factor in these calculations is the value of lost years of healthy, productive life to both the economy and the individual. A reasonable estimate of what the world could have saved in 2010, based on the economic value of lost DALYs and by investing in CCC, is $US 131 billion. Estimated savings are much higher –between $US 543 billion and $US 850 billion– taking into account the value reported by individuals of lost income and suffering.

Expanding coverage of prevention, detection, and treatment, especially in LMICs, requires additional investment. This investment will be more than compensated for by the projected reductions in the economic burden of the disease. Indeed, the future total economic burden from chronic disease overshadows any health costs yet experienced –including that from HIV/AIDS, tuberculosis and malaria– if the growth of NCDs is not halted.[49]

Findings from a WHO study indicate that the price tag for scaled-up implementation of a core set of NCD interventions and strategies is comparatively low. The cost of reducing risk factors, such as tobacco and harmful alcohol use is estimated at $US 2 billion per year for all LMICs –less than $US 0.40 per person. Including a limited set of individual interventions– in the case of cancer – Hepatitis B immunization to prevent liver cancer, and measures to prevent cervical cancer– the cost increases to $US 9.4 billion per year. Overall, this amounts to an annual per capita investment that is less than $US 1 in low income, $US 1.50 in lower-middle income, and $US 3 in upper-middle income countries.[50]

Yet, neither the costs of prevention nor treatment should be taken as fixed over time. Scientific innovations for preventing and treating cancer, while often costly, emerge quickly, changing both the field and the cost structure. Thus, the current price tag on the total cost of prevention and treatment for cancer care for incident cases is highly permeable, even with the increasing costs of new technologies and drugs. The ***economics of hope*** suggests a future where prevention and treatment become more accessible to patients and health systems in LMICs.

Successes in lowering the cost of vaccines for LMICs

- **Hepatitis B vaccine:** The decline from a launch price in 1982 of over $US 100 to $US 0.20 a dose has enabled developing countries to dramatically increase vacci-nation rates with support from the Global Alliance for Vaccines and Immunizations (GAVI).
- **HPV vaccine:** Before 2011, prices ranged from $US 30 to $US 100 per dose in LMICs. Through the Pan American Health Organization Revolving Fund, prices decreased from $US 32 per dose in January 2010 to $US 14 per dose in April 2011 for eligible countries. As a result of effective work through the GAVI Alliance, in June 2011 Merck offered the vaccine at $US 5 per dose for low income countries.[51]

(See Section 7)

Closing the cancer divide is an equity imperative. Yet, the very existence of that divide remains shrouded by ignorance. Even the global health community is just becoming aware of its existence.

One of the goals of this Report and the GTF.CCC is to remove that shroud and reveal the looming challenge of cancer for global health. The world faces a huge cost from failure to address the challenge of cancer in LMICs. This challenge requires an immediate and large-scale global response.[52]

I.ii. MUCH COULD BE DONE: A SOLUTION-ORIENTED FRAMEWORK

In the face of the growing burden of chronic disease, epitomized by cancer, health systems must reinvent themselves. This means replacing the conventional either-or model of treating only specific diseases with *interactive and synergistic health systems.* Re-invented health systems will be strengthened as they adapt and adopt new methods of delivery, pricing, procurement, and financing. Indeed, the 2010 Lancet Series on chronic illness argues that investment in a systems approach to chronic diseases in LMICs is strategic.[53]

Improving access to CCC and strengthening health systems are mutually reinforcing. Strong health systems are needed to prevent, diagnose, and treat cancer and other chronic illness. At the same time, expanding CCC can be accomplished in a way that strengthens health systems overall.[54] This Report proposes a *diagonal approach* to health care to mutually reinforce CCC and health system strengthening by simultaneously considering the overall goals of a health systems and disease-specific priorities and interventions (see Section 4).[55,56]

Expanded CCC can contribute to health systems strengthening and to economic and social development

- **Prevention – healthy lifestyles:**
  - Tobacco control is key to preventing certain cancers as well as reducing the risk of cardiovascular and respiratory diseases.
  - Promoting healthy lifestyles reduces the risk of cancer and of many other NCDs.
  - Anti-tobacco and health promotion activities are an integral component of education, anti-poverty, economic, and human development policy programs.

- **Early detection – secondary prevention:**
  - Early detection programs for breast and cervical cancer empower women and contribute to poverty reduction, overall health, child health, and controlling specific diseases such as HIV/AIDS.
- **Diagnostics and treatment:**
  - Establishing the telecommunications systems needed for teleoncology facilitates diagnosis and treatment for other diseases and health conditions, and for training and capacity building.
- **Treatment:**
  - Basic inputs like pulse oximeters improve the effectiveness of surgery for cancer, as well as for other diseases and conditions.
  - Establishing stringent procedures to prevent infection and manage waste and toxic substances for CCC will benefit all patients by helping to reduce the risk and incidence of infections acquired in health facilities.
- **Survivorship:**
  - Efforts to reduce stigma around cancer empowers communities to reduce discrimination suffered by other groups –including patients with HIV/AIDS or tuberculosis, women, and families living in poverty– and promotes social cohesion and reduces the exclusion of marginalized populations.
- **Pain control and palliation:**
  - Strengthening health systems to increase access to pain control medication is essential for cancer, for many other diseases, and for surgery.

(See Section 4)

The diagonal approach argues that expanding cancer treatment can improve the capacity of health systems in LMICs to deal with all diseases and health problems. Strong health systems are needed to treat cancers effectively, and expanding CCC can strengthen health systems. An example is pain control, which is crucial for cancer palliation and for many other patient needs, but often is not available despite its low-cost.

The distinctions between chronic and acute, and communicable and non-communicable that have been used for decades are increasingly irrelevant. These false dichotomies that shaped public health in the past place a heavy burden on research and on policy. The nomenclature stifles the most effective translation of research into evidence, advocacy, and policymaking. Health systems must not become trapped in static thinking and fail to respond to epidemiological change, medical breakthroughs, or opportunities for innovation in delivery and financing of care.

Health systems in LMIC were largely designed to respond to acute illness, and consequently tend to treat chronic disease as a series of unrelated episodes of illness, not as a single disease with continuing and long-term care needs. The current approach must be reformulated to respond to the ongoing needs of cancer and other chronic conditions. Health system innovations must address the six overlapping ***components of the cancer-control continuum*** and develop integrated programs that incorporate all six: primary prevention, early detection, diagnosis, treatment, survivorship, and palliation.

This Report presents and applies the diagonal approach across the cancer care continuum to respond to the challenges of ***chronicity***. One of the key benefits of this approach is to use existing horizontal, population-wide systems and programs –such as education, infrastructure, reproductive health initiatives, regulatory structures for pain control, health insurance, and surgical equipment– in ways that also respond to the health needs of different disease groups.

The evidence suggests that much should and could be done in LMICs. At the same time, because resources are scarce, identification of the most effective treatments and the cancers most susceptible to these treatments is needed in order to set priorities. This defines a set of *candidate cancers and compelling CCC opportunities* for immediate action to expand prevention and/or treatment (see Section 5). Resource stratification aids in defining the interventions most useful and appropriate at different income levels, and a careful analysis should be applied to each cancer for each country setting.[57,58]

Candidate cancers and compelling CCC opportunities

- **Prevention**
  - Lifestyle related
    - Tobacco: lung cancer, head and neck cancer, bladder cancer, throat cancer; increased risk from secondhand exposure
    - Alcohol: hepatocellular carcinoma
  - Infection related
    - HPV: cervical cancer
    - Hepatitis B: hepatocellular carcinoma
    - H pylori: stomach cancer
- **Early detection and treatment**
  - Cervical cancer
  - Breast cancer
  - Retinoblastoma in children
- **Treatment based primarily on systemic therapy**
  - Burkitt's lymphoma (particularly childhood)
  - Hodgkin's lymphoma
  - Childhood acute lymphocytic leukemia
  - Non-Hodgkin's lymphomas
- **Life extension and palliation with systemic therapy**
  - Kaposi's sarcoma
  - Chronic myelogenous leukemia
  - Survivorship
  - All cancers and population groups
- **Pain palliation**
  - All cancers

(See Section 5)

A particular challenge in cancer treatment is the recognition that ***treatments span a spectrum from highly effective, low-cost options to minimally effective, and sometimes even experimental or unproven high-cost treatments***. This contrasts with the scale-up of HIV medications where most of the applicable medications had rapid and visible initial efficacy, and the problem was one of driving costs down to the point where scale-up was possible. In high income countries minimally effective drugs are often the newest and thus most expensive, sometimes extending life only a few weeks and with serious side effects and catastrophic financial implications for families and health systems. Cost of surgery has also spiraled for reasons that often have little to do with improved patient outcomes. Indeed, futile care and treatments can detract from palliative care that could improve the quality of life for the patient and the family, and sometimes even prolong survival.[59]

Saddling LMICs with minimally effective solutions at great cost would not be sound public health policy and should be avoided. Thus, this Report focuses on determining how to *choose effective cancer treatment regimes in LMICs that respond to the complex issues of equity and resource allocation*.

The lessons that can be learned from the innovations in delivery that are proposed for LMICs could indeed also be of use in high income countries. Some of these innovations are low-cost, basic, and increasingly proving to benefit all patients. One example is the surgical checklist.[60]

The analysis and recommendations around core elements of a CCC strategy for LMICs are anchored in five key assumptions:

1. Many cancers are preventable through infection control, risk factor reduction, and lifestyle modifications, especially eliminating the use of tobacco.
2. An accurate cancer diagnosis is critical to determine an appropriate and successful treatment plan.
3. Many cancers are highly curable with affordable drugs and add many years of life, which means
   - Denial of therapy for diseases for which effective, affordable treatments exist is unacceptable.
   - Treatment of more complex, less curable diseases requires evaluations specific to each country and available resources.
4. Palliation of pain and suffering from cancer is a basic human right. Such programs should not be based on cost-benefit calculations that are measured in extending life. Dignity and equity are equally as important as efficiency.
5. Understanding the magnitude of the cancer burden and the potential impact of CCC interventions requires reliable data.

Based on resource availability and the cancer burden, specific strategies and an appropriate set of candidate cancers must be defined by each country. Priority setting should be laid out in *a national cancer strategy or plan* that also identifies the investments needed for research and to build an evidence base. A country-specific strategy can clearly identify the cancers most amenable to interventions along the continuum of care and control.

This Report provides a framework to help countries develop cancer plans by delineating the foundations of adequate CCC and the core components for basic, effective cancer control that can apply even in settings of resource scarcity. This is coupled with a description of the core elements for a subset of cancers that are among the most significant challenges to health in low income countries.

National cancer plans should apply a diagonal approach and be well-integrated into horizontal health system programs. Further, cancer plans should be part of national strategies around NCD and chronic illness that take full advantage of opportunities to apply a diagonal approach.

An adequate cancer plan should include improved options for diagnosis through better pathology, as well as surgery and radiation treatment for the cancers where these are essential. This requires linkages and referrals to a center of excellence. International agencies can play an important role, as has been demonstrated by the International Agency for Atomic Energy through the Program of Action for Cancer Therapy.[61]

While a goal should be to establish a national center of excellence in each LMIC, this will take time in many countries. Examples from several countries provide both lessons and encouragement. The Cancer Institute at Chennai in India, the Ocean Road Cancer Institute in Tanzania, and the National Institute of Neoplastic Disease of Peru have been highlighted.[62] This Report adds the examples of the King Hussein Cancer Center and Foundation of Jordan, the Uganda Cancer Institute, and the network in Mexico of the National Cancer Institute of Mexico and regional centers such as the Jalisco Cancer Institute.

To bridge the gap, this Report proposes a series of innovations in delivery, including international partnerships and twinning using information and communications technology and telemedicine such as telepathology. A set of models exist, many of which are derived from pediatric oncology. If shared globally and well-evaluated, these models can provide the necessary lessons for scale-up.

The identification of candidate, priority cancers and interventions in low income settings does much to dispel the myth that "little can be done". The Report identifies a substantial set of candidate cancers for which important opportunities exist for prevention, diagnosis, treatment and palliation in LMIC. For example, 26 of the 29 key agents for treating many of the most prevalent, treatable cancers in LMICs are off-patent, making drug treatment relatively low cost.

The *cost of increasing access to treatments in LMICs that can most help to close the cancer divide may be far less than many fear.* The cost of curative or life-extending cancer medicines is less than $US 500 per patient for cervical cancer, Kaposi's sarcoma, and Burkitt's lymphoma (primarily a childhood cancer endemic in Africa). Most of the off-patent generic cancer medicines required for LMICs are available for less than $US 100 per course of treatment, and nearly all for under $US 1,000.

In addition, this Report estimates, based on Globocan 2008 data, that the total cost of covering drug treatments in LMICs for unmet needs for cervical cancer, Hodgkin's lymphomas, and acute lymphoblastic leukemia in children 0-14 is approximately $US 115 million, and for one year of incident cases is $US 280 million. While this does not include diagnostics, surgery, or radiation therapy it is still a relatively low figure. Breast cancer treatment, by contrast, is orders of magnitude more costly, especially if highly effective, on-patent drugs are used for HER2 positive cases. Yet, in the case of breast cancer early detection, which is much less costly, not only increases the probability of cure or lengthening healthy life expectancy. It also significantly reduces the requirements for, and hence the total cost of, medicines and other interventions (see Sections 5 and 7).

The cost of treatments that can close the cancer divide may be far less than many fear

- Observed reductions of 90% in the price of HPV and hepatitis B vaccines have been achieved for low income countries.
- Early detection of breast cancer substantially increases healthy years of life, and reduces the requirements for, and hence the total cost of, medicines and other interventions.
- 26 of the 29 key agents for treating many of the most prevalent, treatable cancers in LMICs are off-patent.
- Most of the off-patent generic cancer medicines required for LMICs are available for less than $US 100 per course of treatment, and nearly all for under $US 1,000.
- The cost of curative or life-extending cancer medicines is less than $US 500 per patient for cervical cancer, Kaposi's sarcoma, and Burkitt's lymphoma.
- The total cost of covering drug treatments for unmet needs for cervical cancer, Hodgkin's lymphoma and acute lymphoblastic leukemia in children 0-14 in LMICs is approximately $US 115 million. The cost of drug treatment for one year of incident cases is $US 280 million.

(See Section 5 and 7)

An array of opportunities exists for actions that can be taken to close the cancer divide, and the cost of many of the necessary interventions is relatively low. *Prevention of risk factors beginning with tobacco control* is a high priority for all countries and all income levels. *Several cancers affecting children, youth, and women that are highly curable, and cancers associated with preventable infections* are among the most obvious and frequent candidate cancers for action. *Reducing stigma, improving survivorship, and providing pain control and palliative care* are necessary and feasible for all patients. Interventions in all of these areas and cancers are mutually reinforcing, will benefit other patients and population groups, strengthen health systems and promote economic and human development.

Based on the findings outlined above, GTF.CCC members propose five overarching recommendations to improve global equity and to close the cancer divide:

6. PROMOTE *prevention policies* that reduce cancer risk.
7. EXPAND *access* across the cancer care control continuum through *universal financial protection for health*, an *explicit package of guaranteed benefits*, and *efficient use of all levels of care*.
8. STRENGTHEN *national health systems* to respond to cancer and other chronic illness by integrating interventions into existing programs and institutions and by translating evidence into policy through strong information systems, research, and monitoring and evaluation frameworks.
9. LEVERAGE *global institutions* and in particular those that could offer financing, pricing and procurement, evidence generation, capacity building, and stewardship and leadership for cancer care and control.
10. MOBILIZE *all public and private stakeholders in the cancer arena*, through new and existing global and national forums and networks dedicated to improving health outcomes and equity.

1.iii. MUCH CAN BE DONE

The GTF.CCC Report outlines specific actions in five strategic areas where a diagonal approach can significantly narrow the cancer divide. The proposals in each of the strategic areas for action are designed around the five overarching recommendations outlined above.

The strategic areas for action are

- *Innovations in delivery* (see Section 6) that optimize the use of human and physical resources, utilize information and communication technologies both across and within countries, and involve the primary and secondary level of care to the fullest extent.
- Improve *Access to affordable medicines, vaccines, and health technologies for cancer* (see Section 7) through global and national strategies that reduce price and non-price barriers.
- *Innovations in financing* (see Section 8) that take advantage of both local and global opportunities to expand social protection in health that incorporates cancer care and control.
- Production and application of more and better *Evidence for decision-making* (see Section 9) through enhanced health information systems and research, frameworks for monitoring and evaluation, and performance measures that promote accountability and results.

- More effective *Stewardship and leadership by national and global actors* to take full advantage of the energy generated by the UN High-level Meeting on NCDs and galvanize multi-stakeholder action, including communities, patients, and the private sector, through effective national cancer plans.

Each strategic action area is discussed in a section of the final part of the Report and includes a set of specific, enabling recommendations. The core ideas and recommendations of each section of the Report are summarized below.

Innovative delivery

The GTF.CCC identified a number of innovative service delivery models and mechanisms, which could be implemented in LMICs to improve the delivery of CCC. The Task Force concluded that, even where specialized services are not available, a range of CCC interventions could be offered using innovative delivery strategies. Examples from Mexico, Uganda, Jordan, Partners In Health and the St. Jude International Outreach Program demonstrate some of these innovations. Examples of innovations in high income countries where populations live far from specialty services provide additional evidence. The examples are supported by a comprehensive literature review on innovative delivery for other diseases and health services (see Section 6).

Non-specialized medical personnel must be trained in order to shift substantial components of CCC to less specialized facilities. Use of telecommunications and other formal and informal links with specialized centers in high and middle income countries around the world, as well as in urban centers in LMICs, can enhance the potential and capacity of the non-specialized health personnel and infrastructure available in LMICs. This strategy can bridge the distance between the patient and the point of care to ensure accessibility and acceptability.

While much more can be accomplished with available resources, it is also evident that to diagnose and treat most cancers additional investment is required, particularly in low income countries. Building human resource capacity is crucial in many areas. Further, on-site facilities are essential to improve diagnostic capacity especially in processing pathology. While telemedicine can help to build this capacity, basic investment is also required on-site.

Breast and cervical cancer: examples of innovative delivery

- **Prevention – healthy lifestyles:**
  - Integrating health promotion activities including tobacco control and healthy lifestyles into anti-poverty and social welfare programs.
  - Promoting HPV vaccination through adolescent, sexual and reproductive, and maternal and child health programs.
- **Early detection – secondary prevention:**
  - Integrating early detection programs for breast and cervical cancer into anti-poverty, maternal and child health, sexual and reproductive health, and HIV/AIDS programs.
  - Training expert patients, community health workers, nurses, and primary care physicians to provide early diagnosis especially for high-risk women.
- **Diagnosis:**
  - Using telemedicine to expand capacity for breast imaging by linking specialists and specialty centers to primary and secondary providers of health care for diagnosis, and training.
  - Where pathology processing facilities exist, strengthening these by using telemedicine for pathology consultation.

- **Treatment:**
  - Training primary and secondary care providers and facilities to safely provide some chemotherapy and adjuvant therapy with a strong link to specialists and specialty centers, thus reducing costs for patients, the need for young women to leave children for long periods, and the demand placed on tertiary facilities.
- **Survivorship:**
  - Training expert patients, community health workers, nurses, and primary care physicians to provide long-term emotional support, guidance in symptom management, and patient navigation including knowledge of rights and health care benefits.
- **Pain control and palliation:**
  - Putting systems in place to enable the safe and effective management of pain medications at the primary and secondary care levels, including administering drugs through simpler presentations.

Pilot projects must be evaluated formally so that the most promising can be scaled-up to demonstration programs that will provide the necessary evidence to show that innovative delivery is consistent with high-quality care, effectiveness, and reduced costs, both for the patient and the health system. These lessons may prove useful in high income countries where the cost of care is especially high and very focused on specialty services. An international data bank of experiences and lessons learned from projects undertaken by government, international agencies, the private sector, and civil society is a much needed input to promote more effective action.

Access to affordable medicines, vaccines, and health technologies

High cost and poor availability of cancer medicines, vaccines, and health technologies constitute significant barriers to cancer prevention, detection, diagnosis, treatment, and palliation in many low and middle income countries. Expanding access to these technologies requires a pharmaceutical systems approach that links cost-effective selection, vigorous price reduction, transparent information on prices and sources, reliable procurement, assured quality, engagement of key stakeholders, actions to address barriers to palliation and pain control, and "frugal" innovation (see Section 7).

Barriers can be overcome in a number of ways. For example, most chemotherapy and hormonal medicines considered essential for low-resource settings are off-patent. For these products, the best price and quality will be obtained through competitive, pooled procurement/bulk purchasing from qualified suppliers by a reliable procurement and supply organization. Low income countries regularly receive reductions of more than 90% from the launch price in the purchase price for drugs for other diseases.

Expanded access to cancer medicines, vaccines and health technologies in LMICs requires:

- Three vital levers: financial resources, political will, and a health-systems approach.
- "Frugal innovations" such as new bioavailable oral chemotherapy and low-cost radiation therapy.
- International guidelines for all components of CCC and an expanded WHO model list of essential medicines and vaccines.
- Optimal pricing to reduce the variations faced by LMICs for off-patent generics.
- Transparent, web-based information on prices and sources of CCC inputs.
- For off-patent chemotherapeutic agents, engaging middle income country producers of both finished products and active pharmaceutical ingredients.

- For on-patent cancer agents, differential pricing by companies and sustained targeted donations.
- An expanded range of cancer agents for global, regional and national procurement agencies.
- National CCC plans and programs that work systematically to adapt global guidelines, strengthen procurement and distribution systems, ensure regulation of quality and safety, and establish effective regulatory strategies for pain medicines to break down non-price barriers.
- Joint efforts by multilateral agencies, the international community, national govern-ments, the private sector, civil society and patient groups.

Innovative financing

Innovative global financing and domestic health system funding are two potential sources of new revenue that need to be explored to meet the growing burden of cancer and other NCDs and chronic illness (see Section 8).

Expanding and improving global financing

To date, international donor support for cancer and NCDs has been far too limited compared to the rapidly increasing health burden in LMICs. Mobilization and investment of new international funding is required for CCC, focusing on low income countries where domestic financing is most lacking. New funding should be:

- *Additional* to existing international and domestic investments for CCC;
- *Supplementary* to local alternatives when these have been exhausted and used in ways that do not diminish local efforts;
- *Synergistic and non-duplicative* by being channeled through existing innovative global financing mechanisms to reduce costs and create synergies by leveraging investments for both disease control and health system strengthening using the diagonal approach; and,
- *Stable* and predictable over time.

Innovative global financing that focuses on non-traditional approaches to external donor financing for health provides potential solutions.

- The Global Alliance for Vaccines (GAVI) provides a powerful tool for ensuring better prices and access.
- Innovative, integrated financing mechanisms that have worked at scale for disease- and population-specific initiatives, such as the Global Fund and GAVI, could be utilized to create synergies for CCC.
    - The Global Fund will have to continue to invest in health systems to manage HIV/AIDS as a chronic illness.
    - The Reproductive, Maternal, Newborn and Child Health (RMNCH) initiative is an example where synergies have been achieved. Significant growth in financing since 2006 has come not from targeted investments, but through cross-investments largely driven by GAVI and the Global Fund.
    - GAVI and the Global Fund financing mechanisms have been able to channel large amounts of funding to LMICs to strengthen health systems in ways that benefit cancer and other NCD and chronic illness.

- The newly established Health Systems Funding Platform, which includes the Global Fund, GAVI, the World Bank, and WHO, provides an opportunity to invest in health systems in a coordinated manner and NCD-related health outcomes.
- New financing commitments for RMNCH announced at the 66th UNGAS and the Pink Ribbon Red Ribbon initiative on cancer and HIV/AIDS provide additional opportunities for engagement and for channeling new funds.
- The UN Secretary General's Every Woman Every Child strategy provides a commitment-based model that could be adopted for increasing funding for CCC and NCDs to bring together stakeholders –national governments, international agencies, bilateral donors, private foundations, the private sector and civil society– and highlight the significant investments that are already being made by many countries, especially large and middle income countries.

Strengthening domestic financing

Domestic funding finances the majority of health in almost all LMICs and much of this is out of pocket and leads to financial catastrophe for families, especially in the case of chronic illness like cancer. Stronger health financing mechanisms are needed to introduce, or to expand existing packages, of cost-effective interventions that include CCC.

Several LMICs have taken on the challenge of providing universal financial protection through significant investment in health that includes CCC. The level of investment made by many LMICs contrasts starkly with the lack of global financing for cancer and other NCDs.

It also contrasts with the lack of financial protection available to low income groups in certain high income countries. Indeed, LMICs that are successfully working to offer financial protection that includes catastrophic diseases like cancer, offer lessons for those high income countries that maintain systems with differential access to insurance.

Important lessons can be learned from the experiences of a select group of countries that have embarked on achieving universal health coverage with financial protection. This Report reviews lessons from Mexico, Colombia, China, Taiwan, India, the Dominican Republic, Peru and Rwanda. The successful inclusion of cancers in the package of covered services could be replicated in other countries.

Innovative domestic financing examples that include CCC demonstrate that:

- Social protection in health based on pre-payment and pooling reduces catastrophic health spending by families.
- CCC can be effectively integrated into broader health insurance initiatives using the diagonal approach.
- Establishing entitlements around a guaranteed benefits package that includes cancer leads to improved access.
- Domestic financing should balance prevention, early detection and treatment and focus on cost-effective interventions across the CCC continuum.
    - Investing in treatment is made much less effective if prevention and early detection are neglected.
    - Separate funds for personal versus catastrophic health services should be established.
- Financial protection for health care is less effective if other financial and non-financial barriers –transportation costs, care-giving for the patient, and stigma– are neglected.
- A strong evidence base, including rigorous evaluation, is needed for developing innovative financing mechanisms for CCC.

Evidence for decision making

High quality evidence that is relevant to decision-making is essential to closing the cancer divide and to improving CCC. Both global and local evidence is needed to help decision-makers allocate resources among competing needs and priorities. Evidence also provides the core of accountability (see Section 9).

Yet, most LMICs lack both the health information systems (HIS) and the research to generate the kind of evidence needed for effective decision-making on cancer. The divide between rich and low resource settings is not only in treatment and specialty care but also in the availability of data and research.

The Declaration of the High-level Meeting of the UN General Assembly on the Prevention and Control of NCDs (UNHLM) highlights the importance of research on all aspects of prevention and control, as well as for innovation and science technology. It also reflects the gap that must be filled by translating this research into knowledge and evidence that can be used for action. Additional investment by global and national actors is required to make this possible.

Several strategies can be followed to improve evidence for decision-making for CCC in LMICs by strengthening HIS and the research base. These will contribute to the global monitoring framework that must be developed in response to the UN HLM on NCDs:

- Increase the availability of global and domestic funding for HIS and for research on cancer in LMICs.
- Strengthen cancer registries in LMICs through additional investment by IARC, participating states, and/or bi-lateral agencies.
- Expand training opportunities for researchers and evidence-builders, and decision-makers based in LMICs.
- Extend free access to journals and public digital libraries.
- Apply novel methodologies and metrics to research on cancer, including pain relief, and institutionalize these analyses in LMICs to support better decision-making.
- Expand the capacity and funding for evaluation, health system, and implementation research of CCC projects.
- Establish a clearinghouse of programs, policies, and projects that acknowledges the multiple stakeholders and providers (governmental, civil society, and private sector), and the opportunity to promote global learning by making this information free and easily accessible to stewards of health systems in LMICs.
- Ensure that national cancer plans include specific indicators and time-bound targets for reducing morbidity and mortality and that these are tied to the global monitoring frameworks of the UNHLM Declaration and to health system performance.

These strategies are low-cost and will produce several global public goods that should be financed by international and bi-lateral agencies. Further, cancer has a privileged position among NCDs as the International Agency for Research on Cancer (IARC) exists and can be strengthened alongside the World Health Organization (WHO) to produce, manage, and disseminate global evidence. New initiatives such as the US National Cancer Institute's Center for Global Health have much to contribute in this area.

By the end of 2012, the Declaration of the UN HLM charges WHO with developing a comprehensive global monitoring framework and recommendations for a set of voluntary, global targets for the prevention and control of NCDs. Measurable health system performance targets directly related to cancer are needed to develop these global and national frameworks for monitoring progress. These must be disease-specific, yet also integrated into health information systems and linked to horizontal health system goals.

The lessons learned from frameworks for accountability on investment in women's and children's health can, and should, be applied to work on cancer and NCDs. This will encourage global and national players to establish and meet specific time-bound targets for reducing cancer mortality and closing the cancer divide.

Academic, research, donor, and national and international agencies should work together to ensure that these targets and measures are developed. Local policy and academic institutions can and should play important roles and this will serve to build national capacity.

Stewardship and leadership

One of the most important limitations, both globally and locally, to increasing access to CCC in LMICs is a dearth of leadership in health systems. This limitation has hindered the production and dissemination of essential global and local public goods, such as knowledge and information. Yet, recent advances in knowledge, and the expansion of institutions, collective action, and international interest offer significant new opportunities to strengthen the production of local and global public goods for cancer, as well as for other NCDs and chronic conditions (see Section 10).

Improved stewardship and leadership are essential for implementing the recommendations of this Task Force. Stronger stewardship will be accomplished by leveraging global institutions and national health systems, and by mobilizing stakeholders through new and existing global and national forums and networks dedicated to improving health outcomes and equity.

The global cancer arena appears well poised to take off, based on the surge of institutional activity around chronic illness, combined with the opportunities that have presented themselves with the UN High-level Meeting on NCDs. This surge provides an opportunity to advocate for better and more effective individual and institutional leadership to engage a broader set of participants. However, to establish global leadership capacity in cancer, disease-specific cancer organizations must work together and with government and the private sector, reaching out to the communicable disease community to seek joint and mutually beneficial solutions.

Both at the national and international levels, new players have emerged who are actively and successfully swaying leaders. The key to moving forward and taking full advantage of this opportunity for generating stable and sustainable programs will be identifying institutional spaces for collective action.

The announcement of the 2011 UN High-level Meeting on NCDs led to many breakthroughs. One of the most noteworthy is the formation of the NCD Alliance, in which the Union for International Cancer Control actively represents the interests and contributes the know-how of players from the cancer community.

The Declaration that came out of the meeting provides a host of recommendations and proposals to improve global stewardship and leadership. The focus is rightly on the World Health Organization as the global entity charged with health. Yet, an effective response must be whole-of-government and whole-of-society, as the Declaration states. The Declaration calls for proposals by the end of 2012 for partnerships that will strengthen and facilitate global, multisectoral action. This means that in the future, all relevant international and national organizations should be more involved to ensure that NCDs are treated as an integral part of a development agenda.

The Declaration calls for establishing or strengthening national multisectoral policies and plans by 2013. This should include engaging all relevant stakeholders and will likely be disease-specific and then work across diseases with proposals that are integrated into health systems. The cancer community, because of the leadership that can be played in advocacy, can be catalytic in galvanizing awareness, interest, and action to establish these multi-stakeholder platforms and partnerships.

The following actions will strengthen the cancer community and enable it to play a leadership role in implementing the proposals set out in the Declaration of the UN HLM on NCDs:

- Strengthen the capacity of WHO to work as the steward of the global cancer agenda, and of IARC to provide evidence for decision making.
- Strengthen the capacity and recognition of UICC as a global umbrella and stewardship organization.
- Engage the multilateral agencies, the Global Fund and GAVI in CCC and promote better coordination among international agencies and the UN system.
- Engage actors related to specific cancers such as UNICEF and the children's rights community for childhood cancers, and women and health, empowerment, sexual and reproductive health and maternal and child health programs for cancers of women.
- Encourage and support governments to integrate cancer into national health plans and to formulate national cancer plans.
- Actively engage the private sector in the production of solutions, knowledge and in opportunities to implement results.
- Encourage and support in-country, multi-stakeholder commissions on CCC that can be linked to other disease groups and system-wide initiatives and can contribute to monitoring performance in achieving specific goals.
- Identify agencies, working with IARC and WHO, to develop a system of measurable and implementable targets and goals specific to cancer that can be integrated into global targets for NCDs.
- Establish a multi-stakeholder partnership within the cancer community to monitor the goals and targets on cancer.

1.iv. Moving forward

This GTF.CCC Report identifies key elements and examples that together form a blueprint for expanding access to CCC in low and middle income countries. In resource-constrained countries without specialized services, experience has shown that much can be done to prevent and treat cancer by training and deploying primary and secondary caregivers, using off-patent drugs, and applying regional and global mechanisms for financing and procurement.

To achieve an effective response to the burgeoning cancer burden, GTF.CCC members believe that concerted action is needed from the global health community, together with the participation of national and local governments and expanded primary health-care networks. The agenda for action should catalyze expansion of cancer care, control, and prevention through strategies that are appropriate to the health systems of LMICs. Achieving an effective response requires the coordinated efforts of multiple stakeholders, including government, the private sector, civil society, professional medical associations, academic institutions, patient groups, and international agencies.

The authors of this Report share with the global community a number of conclusions:

i. It is necessary and feasible to extend the opportunities to meet the challenge of cancer to the poor.

ii. If people in rich countries have the opportunity to live healthy and productive lives after cancer, those same opportunities should be extended to people living in poor countries.

iii. As survivorship is the standard of care in developed countries, survivorship also should be the standard of care in poor countries.

Kofi Annan, then UN Secretary General, made the following statement in reference to HIV/AIDS: "People no longer accept that the sick and dying, simply because they are poor, should be denied drugs which have transformed the lives of others who are better off." [63] The same should be true for cancer and all other diseases for which effective, known options for prevention or treatment exist.

"People no longer accept that the sick and dying, simply because they are poor, should be denied drugs which have transformed the lives of others who are better off." -Kofi Annan

The evidence presented in this Report demonstrates that there are many necessary, affordable, feasible, and appropriate ways to reduce the burden of cancer in LMICs. The world can and we must respond to the moral, equity, and economic imperative of closing the cancer divide.

The GTF.CCC proposes the following specific and immediate activities to narrow the Cancer Divide

1. ***PROMOTE*** **prevention policies** that reduce cancer risk.
   - Early detection saves lives. In LMIC, many barriers to access to early detection exist, but the greatest is stigma and ignorance. At a minimum, all countries should develop knowledge and awareness campaigns to reduce stigma and increase cancer awareness.
   - Effective management of behavioral and environmental risk factors should be top priority for countries and donors, beginning with full implementation of the Framework Convention for Tobacco Control.
   - Global donors should fully support financing through the GAVI Alliance for hepatitis B and HPV vaccines in low income countries.

2. ***EXPAND*** **access** across the cancer care control continuum through **universal financial protection in health**, an **explicit package of guaranteed benefits,** and **efficient use of all levels of care.**
   - National insurance or social protection programs in LMIC should include a basic CCC package of for selected cancers that are preventable and treatable.
   - Countries should be encouraged and supported to implement health financing models that promote social protection in health for cost-effective packages of services that include at least the core elements of CCC for candidate cancers.
   - Countries should create multi-stakeholder cancer commissions to work with government to develop, implement, and monitor national cancer and NCD plans.

3. ***STRENGTHEN*** **national health systems** to respond to cancer and other chronic illness by integrating interventions into existing programs and institutions and by translating evidence into policy making through strong information systems, research, and monitoring and evaluation frameworks.
   - Innovative delivery models for CCC should be developed, evaluated, scaled up and shared to accelerate expanded access.
   - CCC should be integrated into health programs that serve women, children, and people at risk or living with HIV/AIDS. These populations are vulnerable to a set of cancers that can be prevented or treated.
   - Access to pain control that avoids preventable suffering should be considered a basic human right and countries and the global health community should strive to fulfill this right.

- Aggregated procurement channels are required to help countries achieve volume discounts on purchases of drugs and other inputs. CCC should be included in existing revolving fund and regional and global purchasing mechanisms.
- Countries should invest in cancer registries and in knowledge sharing, and the International Agency for Research on Cancer should be strengthened to provide more support to LMICs.
- Standard treatment guidelines and an expanded list of essential medicines should be developed by WHO as these are essential to expand CCC in LMICs. Rigorous standards of cost-effectiveness should be incorporated to locate medicines on a spectrum that enables countries to identify the most useful strategies.

4. ***LEVERAGE*** **global institutions** and in particular those that could offer financing, pricing and procurement, evidence generation, capacity building, and stewardship and leadership platforms for cancer care and control.
    - Donors and global financing institutions should increase investments to encourage countries to implement innovative delivery models that include the private sector and civil society and strengthen health systems by using a diagonal approach.
    - The Global Fund mechanisms that promote health system strengthening should be fully supported and expanded.

5. ***MOBILIZE*** **all stakeholders in the cancer arena, public and private,** through new and existing global and national forums and networks dedicated to improving health outcomes and equity.
    - A commitment-based funding initiative, similar to the UN Every Woman Every Child initiative, should be established for cancer and other NCDs, building on existing investments by large LMICs that can attract additional donors and funds.
    - Donors should invest in health services and implementation research to evaluate models and a global database of programs and projects should be developed. IARC, WHO and the new US NCI Centre for Global Health should take up this charge.
    - The NCD monitoring framework to be developed by WHO in response to the Declaration of the UN HLM should include specific and time-bound goals to reduce mortality, and should be linked to global and national health system performance targets.
    - The private sector should be included in the solution process and be encouraged to share knowledge and participate in developing solutions, especially through demonstration projects in their countries.
    - To strengthen stewardship and leadership capacity, global cancer civil society organizations should support the development of country-led civil society groups. UICC is ideally placed to undertake this role.
    - The application of the proposals set out in the Declaration of the UN HLM on NCDs should be fully supported by the global cancer community.

References

1. Frenk J, Bobadilla JL, Sepúlveda J, Cervantes ML. Health transition in middle-income countries: new challenges for health care. ***Health Policy and Planning*** 1989;4(1):29.
2. Atun R, Bataringaya J. Building a Durable Response to HIV/AIDS: Implications for Health Systems. ***Journal of Acquired Immune Deficiency Syndrome*** 2011; 57(Suppl 2):S91-S95
3. Sloan FA, Gelband H (Eds.). ***Cancer control opportunities in low-and middle-income countries***. Washington DC: National Academy Press, 2007.
4. Beaglehole R, Bonita R, Alleyne G, Horton R. NCDs: celebrating success, moving forward. ***Lancet*** 2011; 378(9799):378.
5. Ibid.
6. Stuckler D, Basu S, McKee M. Commentary: UN high level meeting on non-communicable diseases: an opportunity for whom? ***British Medical Journal*** 2011;343:d5336.
7. Reardon S. A world of chronic disease. ***Science***. 2011; 333(6042);558-559.
8. Mukherjee S. ***The emperor of all maladies: a biography of cancer***. New York: Scribner, 2010.
9. Judt T. Night. Letter. ***The New York Review of Books***, 2010.
10. Institute of Medicine. ***The US Commitment to Global Health: Recommendations for the public and private sectors***. Washington, DC: The National Academies Press, 2009.
11. U.N. General Assembly, 66th Session. Political declaration of the High-level Meeting of the General Assembly on the Prevention and Control of Non-communicable Diseases: Draft resolution submitted by the President of the General Assembly (A/66/L.1). 16 September 2011.
12. World Economic Forum and the Harvard School of Public Health. ***From Burden to "Best Buys": Reducing the Economic Impact of Non-Communicable Diseases in Low- and Middle-Income Countries***. Geneva, Switzerland: World Health Organization. 2011.
13. World Health Organization. ***Global Status Report on noncommunicable diseases 2010***. Geneva, Switzerland; World Health Organization. 2011.
14. Farmer P, Léandre F, Mukherjee JS, et al. Community-based approaches to HIV treatment in resource-poor settings. ***Lancet*** 2001;358:404-409.
15. Knaul F, Frenk J. Strengthening Health Systems to Address New Challenge Diseases (NCDs). ***Harvard Public Health Review***. Fall 2011. http://www.hsph.harvard.edu/news/hphr/fall-2011/new-challenge-diseases.html (accessed October 15, 2011).
16. Sepúlveda J, Bustreo F, Tapia R, et al. Improvement of child survival in Mexico: the diagonal approach. ***Lancet*** 2006; 368(9551): 2017-2027.
17. Ibid.
18. Mukherjee S, 2010.
19. GLOBOCAN 2008. Cancer fact sheet: all cancers (excluding non-melanoma skin cancer) incidence and mortality worldwide in 2008, 2010. http://globocan.iarc.fr/factsheets/cancers/all.asp (accessed July 23 2011).
20. Sloan FA, Gelband H (Eds.), 2007.
21. Beaulieu N, Bloom D, Bloom R, Stein R. Breakaway: the global burden of cancer-challenges and opportunities. Economist Intelligence Unit. 2009.
22. Kanavos P. The rising burden of cancer in the developing world. ***Annals of Oncology*** 2006;17(Suppl 8): viii15-viii23.
23. Stuckler D, Basu S, McKee M, 2011.
24. Alwan A, Galea G, Stuckler D. Development at risk: addressing noncommunicable diseases at the United Nations high-level meeting. ***Bulletin of the World Health Organization*** 2011; 89(8):546-546a.
25. Frenk J, Bobadilla JL, Sepúlveda J, Cervantes ML. Health transition in middle-income countries: new challenges for health care. ***Health Policy and Planning*** 1989;4(1):29.
26. International Atomic Energy Agency. Inequity in cancer care: a global perspective. Vienna, Switzerland; International Atomic Energy Association. 2011.
27. Liberman J. O'Brien M, Hall W, Hill D. Ending inequities in access to effective pain relief? ***Lancet***. 2010;376(9744):856
28. O'Brien M. Global Access to Pain Relief Initiative. Presentation for the Union of International Cancer Control. http://www.africacncl.org/HIV_AIDS/initiative_activities/NCD_Session_3_Obrien.pdf (accessed September 20, 2011).
29. Knaul F, Frenk J, 2011.
30. Farmer P, Frenk J, Knaul FM, Shulman LN, Alleyne G, Armstrong L, et al. Expansion of cancer care and control in countries of low and middle income: a call to action. ***Lancet*** 2010 Aug 13; 376(9747):1186-93.
31. Sloan FA, Gelband H (Eds.), 2007.
32. Frenk J, Chen L, Bhutta ZA, et al. Health professionals for a new century: transforming education to strengthen health systems in an interdependent world. ***Lancet*** 2010; 76(9756):1923-58.
33. World Health Organization. ***The World Health Report 2006: working together for health***. Geneva, Switzerland: World Health Organization, 2006.
34. Ferlay J, Shin H, Bray F, Forman D, Mathers C, Parkin D. GLOBOCAN 2008: cancer incidence and mortality worldwide. ***International Journal of Cancer***. 2010; 127(12):2893-917.
35. Joint Learning Initiative, Global Equity Initiative. Human resources for health: overcoming the crisis. The President and Fellows of Harvard College 2004. http://www.who.int/hrh/documents/JLi_hrh_report.pdf (accessed October 4, 2011).
36. American Society of Clinical Oncology/Health Volunteers Overseas. International Cancer Corps Needs Assessment Reports on Honduras. 2008.
37. International Atomic Energy Agency, 2011.
38. World Health Organization. ***Macroeconomics and health: Investing in health for economic development***. Report of the Commission on Macroeconomics and Health. Geneva, Switzerland: World Health Organization, 2001.
39. World Economic Forum. ***Global Risks 2010: A global risk network report***: Geneva, Switzerland: World Economic Forum, 2010.
40. Ibid.
41. WHO. ***Global Status Report on noncommunicable diseases 2010***. 2011.
42. Amartya Sen. Personal communication, October 17th, 2011.
43. John RM, Ross H. ***The global economic cost of cancer***. The American Cancer Society and LIVESTRONG, 2010. http://www.cancer.org/acs/groups/content/@internationalaffairs/documents/document/acspc-026203.pdf (accessed July 30, 2011).
44. Shafey O, Eriksen M, Ross H, Mackay J. ***The Tobacco Atlas***, Third Edition. American Cancer Society. 2009. http://www.tobaccoatlas.org/downloads/TobaccoAtlas_sm.pdf (accessed September 27, 2011).
45. Castelli A, Nizalova O. ***Avoidable mortality: What it means and how it is measured***. Centre for Health Economics (CHE) Research Paper 63. 2011. http://www.york.ac.uk/media/che/documents/papers/researchpapers/CHERP63_avoidable_mortality_what_it_means_and_how_it_is_measured.pdf (accessed September 27, 2011).
46. John RM, Ross H, 2010.
47. Beaulieu N, Bloom D, Bloom R, Stein R, 2009.
48. Bloom DE, Cafiero ET, Jané-Llopis E, et al. ***The Global Economic Burden of Non-communicable Diseases***. Geneva, Switzerland: World Economic Forum. 2011.
49. WHO. ***Global Status Report on noncommunicable diseases 2010***. 2011.
50. World Economic Forum and the Harvard School of Public Health. ***From Burden to 'Best Buys': Reducing the economic impact of non-communicable diseases in low- and middle-income countries***, 2011.
51. Global Alliance for Vaccines and Immunization. GAVI welcomes lower prices for life-saving vaccines. Press Release; 6 June, 2011. http://www.gavialliance.org/media_centre/press_releases/vaccine_prices.php (accessed June 10, 2011).
52. Farmer P, Frenk J, Knaul FM, Shulman LN, Alleyne G, Armstrong L, et al. 2010.
53. The Lancet. Chronic Disease and Development Series. 2010. http://www.thelancet.com/series/chronic-diseases-and-development# (accessed October 15, 2011).
54. Institute of Medicine, 2009.
55. Sepúlveda J, Bustreo F, Tapia R, et al. Improvement of child survival in Mexico: the diagonal approach. ***Lancet*** 2006; 368(9551): 2017-2027.
56. Frenk J. Bridging the divide: global lessons from evidence-based health policy in Mexico. ***Lancet*** 2006; 369(9539): 954-61.
57. Sloan FA, Gelband H (Eds.), 2007.
58. Anderson BO, Yip CH, Ramsey CD, et al. Breast Cancer in Limited-Resource Countries: Health Care Systems and Public Policy. ***The Breast Journal*** 2006;12(Suppl. 1): S54-S69.
59. Sullivan R, Purushotham A. The Goldilocks' problem of cancer medicines. ***Lancet Oncology*** 2010;11(11):1017-8.
60. Gawande A. A challenge for practitioners worldwide: WHO safe surgery saves lives. Journal of Perioperative Practice. 2009;19(10):312.
61. International Atomic Energy Agency. Programme of Action for Cancer Therapy (PACT). 2011. http://cancer.iaea.org/ (accessed October 15, 2011).
62. Sloan FA, Gelband H (Eds.), 2007.
63. Médecins sans Frontières South Africa, the Department of Public Health at the University of Cape Town, the Provincial Administration of the Western Cape, South Africa. Antiretroviral therapy in primary health care: Experience of the Khayelitscha programme in South Africa: Case Study. Genva, Switzerland; World Health Organization. 2003.
64. Ibid.

The Global Cancer Divide: an Equity Imperative

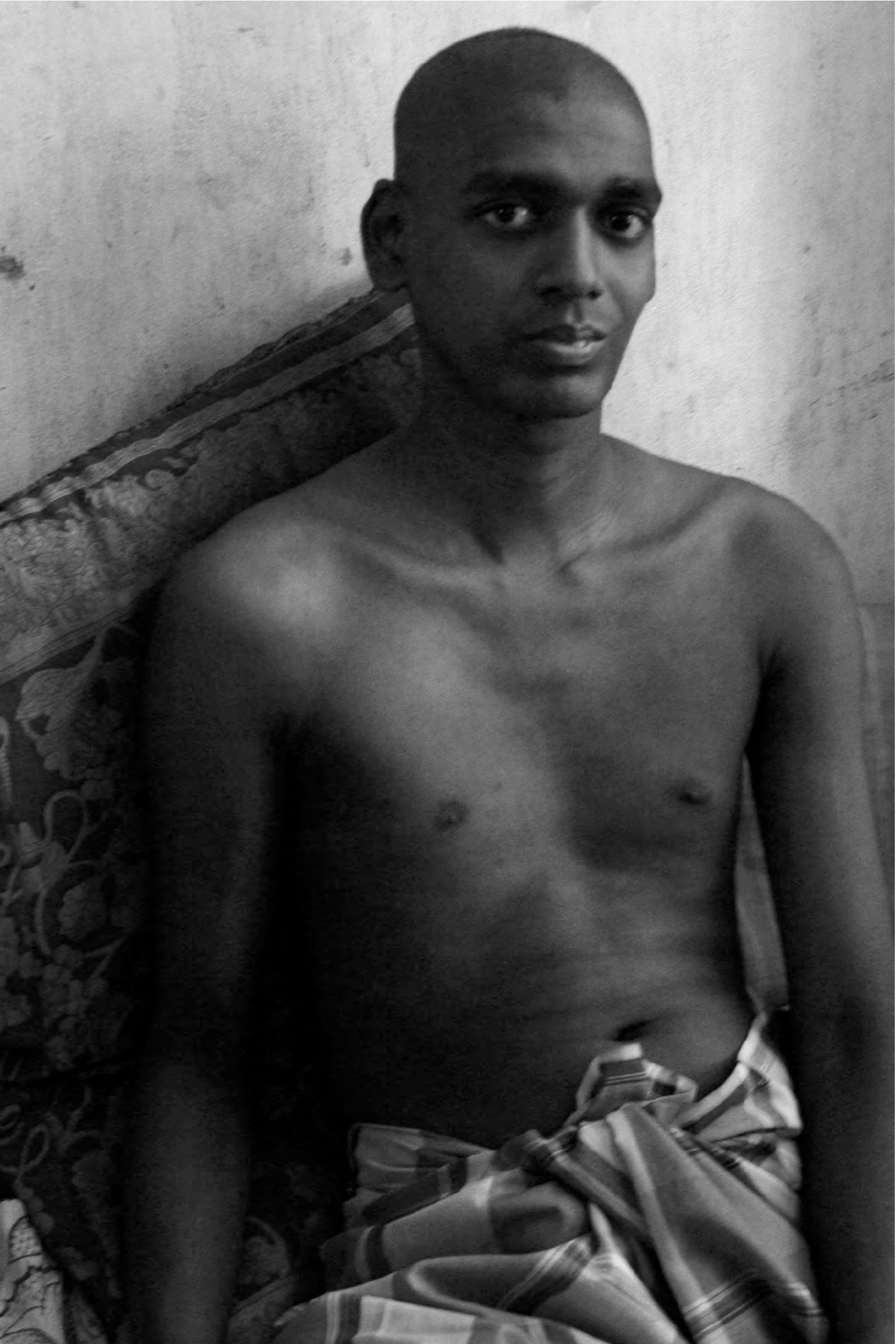
Section 2

Section 2

The Global Cancer Divide: an Equity Imperative

Key messages

- The cancer transition mirrors the overall epidemiological transition, which means that low and middle income countries (LMICs) increasingly face both cancers associated with infection as well as all other cancers.
- The cancer divide is a result of disparities in access to cancer care and control (CCC) that include prevention, early detection, diagnosis, treatment, survivorship care and palliation.
- All aspects of the cancer divide are increasingly concentrated in LMICs, which means that avoidable morbidity, mortality, and suffering from disease that can be prevented, treated, or palliated will become even more concentrated among the poor.
- CCC efforts in resource-poor settings, guided by the explicit needs of each country, should focus limited resources on the specific cancers and interventions that would maximize reductions in cancer incidence and mortality, as well as improve access to palliation and pain control.
- Evidence from high income countries demonstrates that increased coverage of cancer prevention strategies, access to early detection, and effective treatments result in decreased incidence, morbidity, and mortality for a set of targetable, candidate cancers for CCC in LMICs.
- Risk factors, beginning with tobacco consumption but also including obesity and unhealthy lifestyles, as well as environmental and safety risks in the workplace and in the home, are prime targets for interventions in LMICs.
- A focus on infectious agents in the primary prevention of cancer can produce enormous gains in the short and medium term, the most obvious being Kaposi's sarcoma and cervical cancer, but also stomach cancer and liver cancer.
- Countering stigma and discrimination can reduce suffering and increase the impact of health policies around prevention, early detection, and treatment. This can be a virtuous cycle as greater access to early detection and effective treatment can translate into increased awareness.
- The glaring gap in access to pain control and palliation can, and must, be closed. An almost 580 – fold difference exists in opioid consumption per death from HIV/AIDS or cancer in pain, between the 20% poorest countries of the world and the 20% richest. Huge variations in access, even within the 20% richest and poorest, can be reduced by strengthening health systems and regulatory frameworks.



2.i. Introduction

A protracted and polarized epidemiologic transition is occurring in cancer and generating a divide that reflects the inequity in access in all components of CCC.[1,2] This cancer divide refers to the disparities in incidence, mortality, and all other outcomes between the poor and the rich – both countries and individuals – that are directly related to inequities in access as well as differences in underlying socioeconomic, environmental, and health conditions that are not caused by biological or genetic factors.

Protracted, polarized epidemiological transition[3]

The term "protracted" describes a pattern of epidemiological transition typical of countries where the process of change in levels of mortality and fertility, and hence life expectancy, is non-linear. The coexistence of pre- and post-transitional diseases leads to an epidemiological polarization where the poorer sector of the population not only experiences higher rates of diseases such as infections or nutritional disorders, but also of many non-communicable diseases (NCDs). Diseases that were once considered only of the poor, now cease to be the only diseases of the poor.

The cancer divide refers to the disparities in incidence, mortality and all other outcomes between poor and rich – countries and individuals.

The divide is the result of a concentration of ***preventable*** risk, disease, and suffering from cancer-related ill health and death, among poor populations. Further, the divide is likely to continue to widen and deepen over the coming decades, fueled by progress in cutting-edge science and medicine in high income countries that are largely unavailable in LMICs.

The most insidious example of the cancer divide is pain control. Controllable or preventable pain is considered unacceptable at every point in the life cycle in most high income countries. Yet, and despite the generally low cost of pain control, many poor populations lack access to this most basic of health interventions – an intervention that one might term a fundamental human right.

Indeed, social determinants of health – differences in income, education, occupation, gender, and ethnicity – correlate highly with risk factors and therefore, prevalence of NCDs, including cancer.[4,5] This provoked a recent WHO report to conclude that: "Vulnerable and socially disadvantaged people get sicker and die sooner as a result of NCDs than people of higher social positions."[6] Further, po verty intensifies lack of access, and the costs of the disease itself are compounded by the burden of financing the illness (see Section 8).

Closing the cancer divide is a glaring equity imperative. Yet, even the existence of that divide remains shrouded in ignorance. The first step in closing the gap is to generate global awareness of its existence, and that is the purpose of this chapter.

Text Box 2.1
The cancer transition

The cancer transition demonstrates the "double burden" of diseases faced by less developed countries. Cancers that are uncommon and sometimes even declining in incidence in high income countries –for instance, cancer of the cervix, liver, and stomach– are far from controlled, while cancers historically less common, such as breast and colorectal cancer, are increasing in incidence. Thus, LMICs face a cancer burden that includes both the backlog of preventable cancers and the emerging challenge of all other cancers that cannot be prevented with existing scientific knowledge. The following summary table illustrates the transition for several tracer cancers.

Closing the cancer divide is a glaring equity imperative. Yet, even the existence of that divide remains shrouded in ignorance.

	% of Cancers of infectious origin		Childhood Cancers			Childhood Leukemia			Cervical			Breast		
	I	M	I	M	M/I	I	M	M/I	I	M	M/I	I	M	M/I
Norway	12%	10%	6.0	0.9	15%	2.4	0.3	14%	7.2	2.4	34%	72.5	17.3	24%
Canada	9%	8%	7.0	1.1	15%	2.4	0.3	12%	5.0	1.9	38%	81.7	18.0	22%
Saudi Arabia	10%	9%	4.7	3.3	69%	1.2	1.1	90%	1.0	0.4	36%	11.6	4.9	42%
Costa Rica	23%	26%	6.6	1.9	29%	2.5	0.8	32%	12.3	4.8	39%	28.3	8.3	29%
Colombia	25%	26%	4.4	2.1	48%	1.9	1.0	55%	14.5	6.6	45%	20.4	6.5	32%
Egypt	17%	16%	5.0	4.0	80%	1.1	1.1	99%	0.9	0.5	58%	22.9	11.9	52%
India	24%	22%	4.0	1.9	46%	1.3	0.7	53%	17.2	9.3	54%	14.7	6.8	46%
Uganda	46%	45%	8.6	7.0	81%	0.3	0.3	100%	22.0	15.1	69%	12.5	7.0	56%
Zimbabwe	50%	50%	5.2	4.3	83%	0.8	0.8	100%	23.6	16.3	69%	8.1	4.6	56%

Even in the poorest regions, several cancers that are not of infectious origin now rank among the top killers for particular population groups. For children aged 5-14, cancer is the third leading cause of death in upper middle, fourth in lower middle, and eighth in low income countries. It is the second cause of death in high income countries. Overall, according to Globocan data, more than 85% of pediatric cancer cases and 95% of deaths occur in LMICs that have 90% of the global population of children aged 0-14. The fact that cancer has become a leading cause of death among children in developing countries reflects the substantial gains in preventing childhood mortality from communicable diseases and underdevelopment, which extends even to some of the poorest countries of the world.

The cancer transition is most clearly shown by comparing breast and cervical cancer. Based on data from Globocan, in all parts of the world other than the poorest countries of sub-Saharan Africa and South East Asia, breast cancer (a non-communicable disease for which primary prevention is very difficult) kills more women than cervical cancer (a cancer associated with an infection which can be prevented by vaccination and for which pre-cancerous lesions can be detected and treated). Further, breast cancer mortality has risen over time, while cervical cancer has declined in many middle and even low income countries.

The Cancer Transition: Summary Table*

Table 1

Liver			Hodgkin's Lymphoma (Rate*100,000)			Testicular			Colorectal			GNI per capita (2005 US$)
I	M	M/I	I	M	M/I	I	M	M/I	I	M	M/I	
3.5	3.4	98%	2.9	0.3	11%	14.3	0.4	3%	91.1	42.0	46%	$ 58,810
6.7	6.5	97%	3.1	0.4	12%	6.7	0.2	4%	83.8	28.2	34%	$ 38,668
2.6	2.5	96%	1.7	1.2	69%	0.6	0.3	44%	9.8	6.7	68%	$ 24,726
6.9	6.8	98%	2.3	1.1	46%	3.1	0.7	21%	18.8	11.4	61%	$ 10,870
2.9	5.8	200%	1.4	0.5	35%	2.6	0.5	21%	13.0	7.5	58%	$ 8,589
10.0	9.7	97%	1.4	1.1	84%	0.7	0.4	55%	5.3	4.0	76%	$ 5,889
2.4	2.2	91%	0.7	0.4	58%	0.9	0.4	45%	4.5	3.2	70%	$ 3,337
7.4	7.3	99%	0.8	0.7	90%	0.1	0.1	100%	4.8	3.9	80%	$ 1,224
6.4	6.4	100%	0.6	0.6	93%	0.3	0.2	73%	5.0	4.0	80%	$ 176

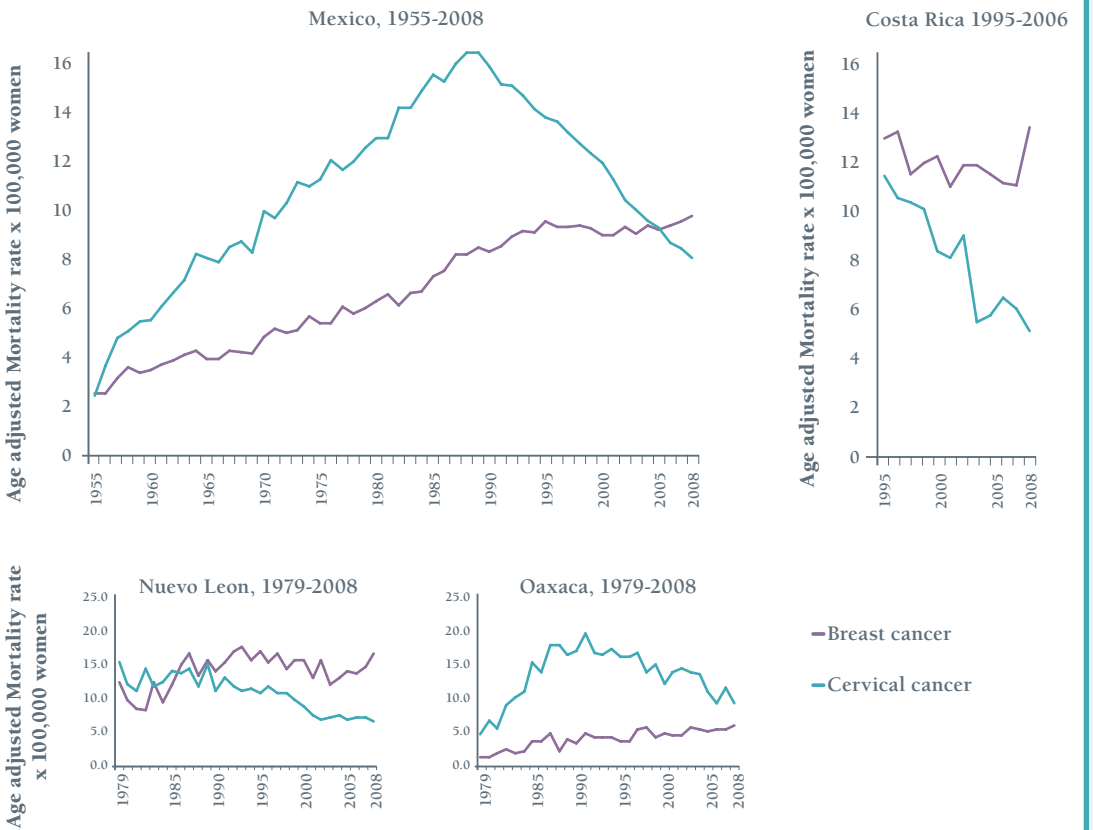
Source: Author calculations based on GLOBOCAN 2008.
Selection of countries included in Cancer Incidence in Five Continents
http://www-dep.iarc.fr/
* rates are per 100,000 population

LMICs face a cancer burden that includes the backlog of preventable cancers and the emerging challenge of all other cancers that cannot be prevented with existing scientific knowledge.

The mortality time series for Mexico and Costa Rica demonstrate this transition. Data from within Mexico also support the transition hypothesis. Trends from 1979-2008 for wealthier states (e.g. Nuevo Leon) differ from poorer states (e.g. Oaxaca). In many of the wealthier states, breast cancer mortality surpassed cervical cancer mortality early on, while in the poorer states, cervical cancer still exceeds breast, although the gap is narrowing.

Transition in Breast and Cervical Cancer Mortality, Mexico and Costa Rica

Figure 1



Source Mexico, 1955-2008:
Knaul et al. Reproductive Health Matters, 2008; and updated by Knaul, Arreola-Ornelas and Méndez based on WHO data, WHOSIS (1955-1978), and Ministry of Health in Mexico (1979-2006).

Source Costa Rica, 1995-2006:
Instituto Nacional de Estadística y Censos, Ministerio de Salud, Unidad de Estadística, Registro Nacional de Tumores de Costa Rica.

The country-specific results are borne out by global data covering the period 1980-2010, generated by the Institute for Health Metrics and Evaluation.[7] In the case of breast cancer, both incidence and mortality are increasing in all income regions. Yet, the increase is more pronounced in LMICs. In LMICs, breast cancer incidence increased 60% and mortality 53%, compared to 47% and 20% in high income countries. The proportion of deaths from breast cancer that occur in LMICs increased from 49% to 63%.

In the case of cervical cancer, incidence increased by 24% and mortality by 19% between 1980 and 2010. By comparison, there was an impressive decline in high income countries of approximately 30% in both incidence and mortality. As a result, cervical cancer is becoming a disease much more concentrated in poor countries. In 1980, LMICs accounted for approximately 80% of both incident cases and deaths from cervical cancer. In 2010, both figures were close to 90%.

As of 2010, breast cancer deaths (~262,700) have surpassed cervical cancer deaths (~174,500) in LMICs. By contrast, in 1980 cervical cancer (~142,000) accounted for more deaths than breast (~122,500). Even in the lowest income countries, the gap is closing as breast cancer incidence and deaths are increasing at a faster rate. In high income countries, breast cancer deaths outnumbered cervical cancer deaths by a factor of 4:1 in 1980, and by 2010 this was approaching 7:1.

The cancer divide has five facets and these are associated with specific types of interventions:

1. Preventable cancers:
    a. cancers amenable to prevention with behavior change (smoking and lung cancer), or
    b. reduced exposure to environmental risk (workplace contamination and associated cancers; indoor air pollution/stoves and lung cancer);
2. Cancers associated with preventable infection:
    a. associated with, or worsened by existing infections for which no vaccine exists (HIV/AIDS and KS), and
    b. from infections that can be prevented through vaccination or detected and controlled in pre-cancerous stages (HPV and cervical cancer; H pylori and stomach cancer; shistosomiasis and bladder cancer);
3. Cancers for which treatment exists and is often made more effective by early detection (e.g. breast cancer, colorectal); some of these cancers are also preventable (e.g. cervical cancer);
4. Suffering associated with the social and psychological aspects of disease or survivorship, including discrimination and stigma;
5. Pain and physical suffering associated with all cancers, including those for which neither effective treatment nor prevention is possible.

Low income countries will face increasing burdens in all groups of cancers with little access to the tools needed to meet these challenges. Middle income countries are in an intermediate position, in which groups 1 and 3 cancers are likely to increase in incidence and mortality, group 2a cancers are relatively low in incidence, and group 2b have declined and will continue to do so. By contrast, high income countries have effectively controlled or evaded groups 1 and 2, and scientific advances, coupled with access, provide increasing ability to manage cancers that are not preventable.

Low -income countries will increasingly face burden in all groups of cancers and have least access to the tools for meeting these challenges.

Text Box 2.2
CCC in high income countries: elements of progress

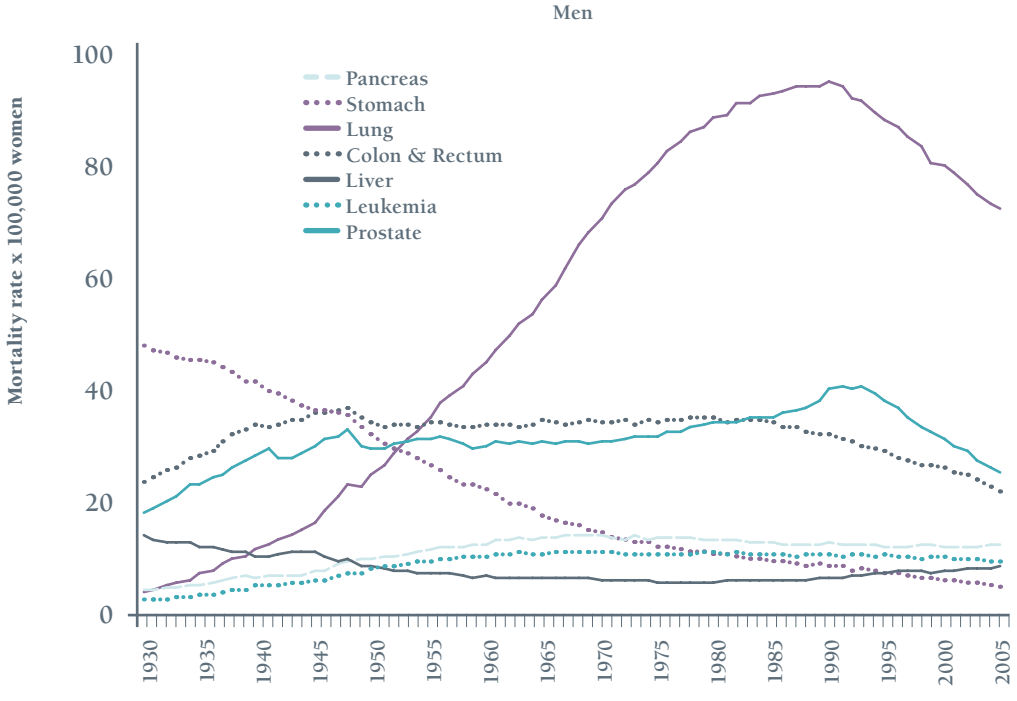
Identifying the cancers most amenable to prevention, early detection, and treatment, and assessing incidence and mortality patterns in LMICs versus high income countries, can initiate a roadmap for action. A first step for estimating the burden of avoidable cancer in LMICs is to examine what high income countries have achieved through prevention and little restriction on access to best care practices. The site-specific changes in cancer incidence and mortality that have been achieved in developed countries over the last 50 years provid a framework to identify the scope for action and have been applied in work on estimating avoidable risks.[8]

Cancer is the second leading cause of death in the US, after heart disease. Although heart disease death rates have declined dramatically over the last 50 years, total cancer mortality rates have remained remarkably constant, despite high levels of spending in a country where more than 17% of GDP is devoted to health.[9]

Cancer mortality in the US –for men and, more recently, for women– is dominated by lung cancer. A steep increase in lung cancer deaths associated with increased rates of smoking, was followed by declines for men and a leveling-off for women, reflecting the fact that smoking rates, too, have declined.[10-12] *(Figure 2).*

Cancer Mortality Rates by Site, US 1930-2005

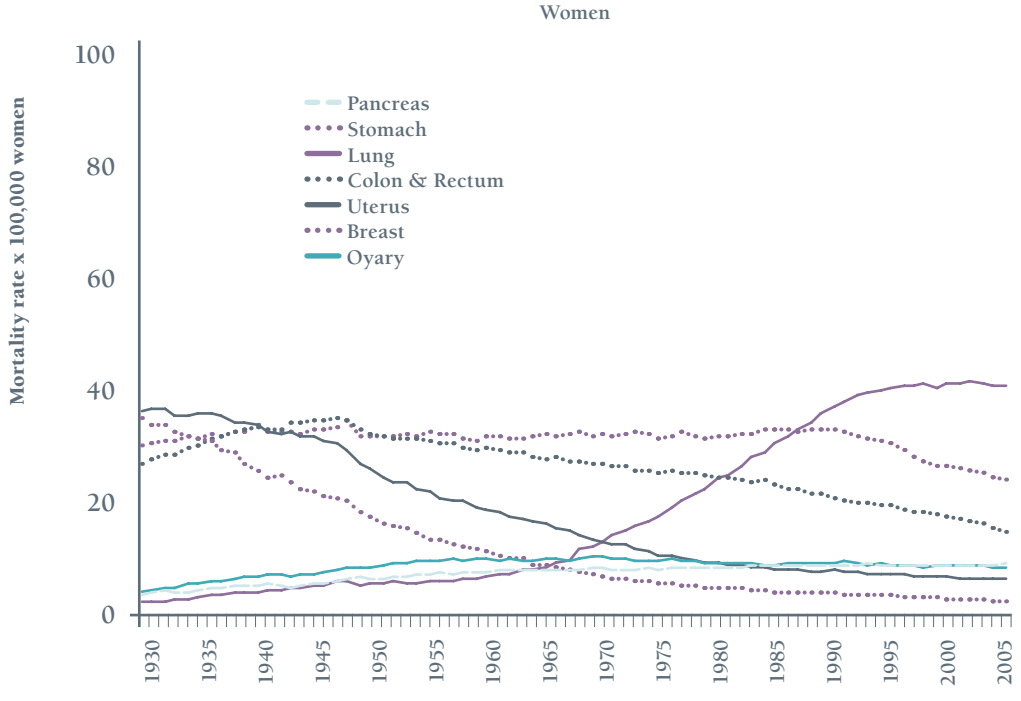
Figure 2



For many cancers, particularly infection – related cancers, large and impressive reductions in mortality over the past decades can be attributed to reduced incidence or earlier detection. Some of the greatest reductions in mortality have been for cervical cancer, where incidence and mortality have decreased sharply with the availability of screening and the treatment of pre-cancerous lesions. Incidence and mortality are likely to decline even further with the availability of the HPV vaccine. Deaths from stomach cancer have decreased substantially for reasons that are not completely understood.

Other cancers are registering declines in mortality due to earlier detection and more effective treatments. Breast cancer death rates were constant until the last decade of the 20th century, when they began to decline as a result of both earlier detection due to education and mammographic screening, and the availability of more effective systemic adjuvant treatments.[13,14] Deaths from colorectal cancer for men and women also show some recent decline, as do deaths from prostate cancer.

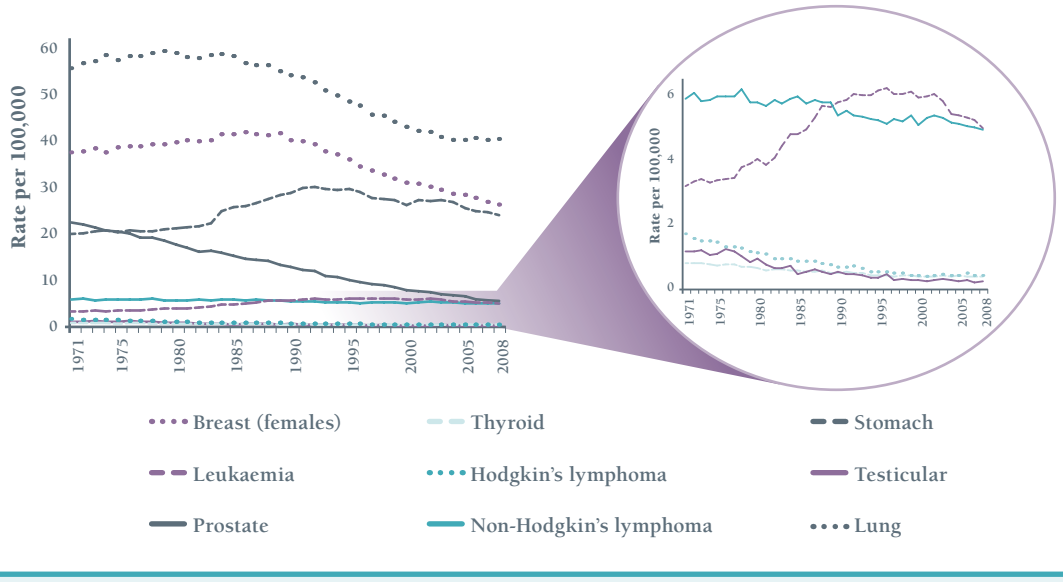
The other cancer sites for which improved treatment is responsible for large reductions in mortality are less common. Data for three decades from the UK show impressive declines in testicular and thyroid cancers, and Hodgkin's lymphoma (Figure 2).



Source: Health, United States, 2005, with chartbook on trends in health of Americans; 2005. (http://www.cdc.gov/nchs/data/hus/hus05.pdf)

Figure 3

Age-standardised (European) Mortality Rates by Cancer Site, UK 1971-2008



Source:Statistics on the most commonly diagnosed types of cancer in the UK. Cancer Research UK. (http://info.cancerresearchuk.org/cancerstats/types/index.htm.)

Dramatic improvements have also occurred in cancer survival for children. Whereas the vast majority of cases ended in death until a few decades ago, survival from acute lymphoblastic leukemia is now more than 80% overall, and close to 90% in high income countries.[15,16]

By contrast, for several types of cancer (lung, esophagus, liver, brain and pancreas), even optimal and cost-unfettered treatment has failed to delay disease morbidity and mortality, and is far less likely to provide long-term remission, control, or a cure. For many of these cancers, even the ability to prolong life with the disease is very limited and extremely costly. Thus, for some cancers –for example, pancreatic– little change has been seen in mortality over time, even in high income countries.[17]

In sum, the historical evidence on cancer mortality from high income countries demonstrates major success for an important subset of cancers through treatment and for another subset through primary and secondary prevention. This historical evidence helps define the set of ***candidate cancers*** *on which LMICs could focus resources to reduce both incidence and mortality. Reduction of suffering should be important for all cancers.*

2.ii. Facets of the cancer divide and sources of disparities

Facet 1: Risk factors and primary prevention

Cancer incidence rates vary substantially around the world, and many of these differences are due to differences in the prevalence of risk factors for specific cancers.

The first dimension of the cancer divide is the distribution of risk factors and their prevention. As was the case in high income countries, much of the increasing prevalence of cancer in developing countries is due to an increase in the number of people living to older ages. At the same time, cancer incidence rates vary substantially around the world, and these disparities are due chiefly to differences in the prevalence of risk factors for specific cancers. Some of these are not readily modifiable. For example, increased breast cancer risk is linked to early age at menarche, and late age at menopause. Others, such as behavioral risk factors, are theoretically modifiable, although not necessarily easy to change (examples are alcohol consumption, weight gain after menopause, lower birth rate, and late age at first birth).[18-20]

Risk factors for some cancers are increasingly prevalent among the poor (e.g. smoking and obesity). By contrast, smoking is declining in some wealthy populations. Unless behavior is modified significantly in LMICs, the burden of cancers associated with these risk factors will increase disproportionately.

Unless behavior is modified significantly in LMICs, the burden of cancers associated with these risk factors will also increase disproportionately.

The major modifiable risk factor for cancer is tobacco use, which is causally associated with 15 different types of cancers and estimated to cause some 20% of cancers worldwide.[21] The rise in prevalence of cigarette smoking has made lung cancer the most common form of cancer and cause of death in LMICs. The epidemic of cancers associated with such well-established risk factors has contributed significantly to the large increase in the absolute numbers of cancer deaths.[22] Approximately 6 million people die annually from tobacco use and exposure, and the figure is projected to rise to 7.5 million by 2020.[23]

Countries can implement effective policies for reducing tobacco use, inexpensively.[24] Recognizing this, most high income countries have developed and institutionalized a series of policies to reduce tobacco consumption over the past several decades.[25] These policies include education and social communication. Many effective tobacco control interventions are legal or regulatory in nature, including taxes, smoke-free spaces, and bans on advertising and promotion.

As a result, tobacco consumption has declined (measured both in terms of cessation among older populations, and the increase in the proportion of younger adults who have never smoked), especially among men.[26-28] By contrast, poorer countries show persistent and increasing rates of tobacco consumption. Among men, the prevalence of smoking declines as income rises, with the highest prevalence of smoking seen in lower middle income countries. For women, rates are lower in LMICs, and preventing them from rising is an important public health goal.[29] As a consequence, tobacco-related deaths and lung cancer rates are declining in high income countries, while they are predicted to rise in LMICs.[30] Declining tobacco consumption in high income countries may also be an important reason for the dramatic fall in cardiovascular mortality. Similar public health success could be achieved through tobacco control in LMICs, which might prevent the expected increase in mortality in future decades.

Obesity is a more recently recognized risk factor for certain cancers.[31] According to predictions, slowing the worldwide epidemic of obesity would substantially reduce future cancer incidence. Again, high income countries have developed credible policy tools that include promoting physical activity, healthier food at schools, and education about the nutrient content of packaged foods. Within high income countries, weight is negatively associated with socio-economic status.[32] Overweight is positively associated with income across LMICs, where rates are high and increasing.[33] Obesity rates are particularly high in upper middle income countries, and this contributes to the cancer divide as well as to the increased risk for and concentration of several other NCDs (e.g. diabetes mellitus and cardiovascular disease), placing enormous strains on the health systems.[34]

Environmental pollution and lack of safety in the home, workplace, and community are other preventable sources of disparity that fuel the cancer divide. Indoor air pollution from reliance on solid fuels, including biomass and coal, in cramped living conditions, is intimately linked to poverty.[35] With regards to occupational risk, some authors posit a ***risk transition*** as populations in developing countries are exposed to the workplace risks that are both traditional and emerging, and, at the same time, synergistic (e.g. asbestos and tobacco).[36] Further, for many families, the workplace and the home are one, which means that any contamination from pesticides or other agents quickly comes in contact with young children.

Knowledge gained from experience makes the divide in risk factors between the poor and rich especially insidious. Decades ago, many of the same behavioral, workplace, and environmental risks were prevalent in high income countries. Yet, at the time when high income populations were exposed, little was known on the effects of many risk factors. Today, laws and policies to reduce exposure and share information that can change behavior increasingly protect the wealthy. In Norway, for example, the ILO lists 97 general and 42 specific laws against occupational health hazards, compared to 12 and 4, respectively, in India.[37] The poor are being exposed at a time when the consequences of many risk factors are well-known, and effective, low cost policies exist to mitigate those risks.[38,39]

Many of the risk factors for cancer overlap with other diseases, such as CVD and diabetes, as mentioned above. The diagonal approach to health system strengthening highlights these overlapping and often undervalued benefits (see Section 4).

These risk factors also detract from overall economic and social development. They lead to declines in workplace productivity and have a negative impact on climate change that affects the global community. Further, there are implications for the well-being of vulnerable groups, such as children who are exposed to second-hand risks of tobacco. Thus, policies to reduce risk factors for cancer can have important benefits for broader goals in economic (see Section 3), and human development.

Many of the risk factors for cancer overlap with other diseases such as CVD and diabetes, and detract from economic and social development.

Facet 2: Cancers associated with infections that are amenable to primary prevention [40]

A majority of infections associated with cancers today are diseases of the poor – in terms of both incidence and mortality. This is due to lack of access to the kind of prevention that is increasingly the norm, in high income populations.

Overall, almost one-fifth of the global burden of cancer is attributable to infection-related disease. In low income countries, however, almost one-third of cancers are infection-related, compared to just over 10% in high income countries. In many parts of sub-Saharan Africa, nearly 50% of cancer cases are caused by infections.[41] In fact, seven of the ten most common cancers in Uganda are attributable to infectious diseases.[42,43] In the majority of LMICs, especially the poorest of Africa and Asia, cervical cancer continues to rank among the top three causes of death, especially in young women. In South Africa, cervical cancer is reported to be the leading cause of death among adult women, and is especially concentrated among the poorer, black population.[44]

Infections associated with cancers are diseases of the poor due to lack of access to prevention that is the norm for high income populations.

In many regions of sub-Saharan Africa, nearly 50% of cancer cases are caused by infections.[45]

ANITE:

A woman in search of care will spend all she has and more[46]

A young woman takes my arm... in rural Haiti. "Look at this, doctor." She lifts a left breast mass. This lesion... has almost completely replaced the normal breast. It is a "fungating mass," in medical jargon, and clear yellow fluid weeps down the front of a light-blue dress. Flies are drawn to the diseased tissue, and the woman waves them away mechanically. On either side of her, a man and a woman help her with this task, but they are not kin, simply other patients waiting in the line.

"Good morning," I say, although I know that she is expecting me to say next to nothing and to be the speaker. She lifts the tumor toward me and begins speaking rapidly.

"It's hard and painful," she says. "Touch it and see how hard it is." Instead, I lift my hand to her axilla and find large, hard lymph nodes there –likely advanced and metastatic cancer– and I interrupt her as politely as I can... I need to know how long this woman has been ill.

But the woman, whose name is Anite... is going to tell the story properly... We are surrounded by hundreds... I think to pull her from the line, but she wants to talk in front of her fellow sufferers... She carries, in addition to a hat and a small bundle of oddments, a white vinyl purse. Please, I think, let there be useful information in there. Surely she has seen other doctors for a disease process that is, at a minimum, months along?

...We do not have a surgeon on staff just now. We have been promised, a weary functionary at the Ministry of Health has told me, that the Cuban government will soon be sending us a surgeon and a pediatrician. But for this woman, Anite, time has run out.

...She has let go of my arm to lift the mass, but now she grips it again. "I am from near Jeremie," she says, referring to a small city on the tip of Haiti's southern peninsula – about as far from our clinic as one could be and still be in Haiti. To reach us, Anite must have passed through Port-au-Prince, with its private clinics, surgeons, and oncologists.

"I first noticed a lump in my breast after falling down...

"How long ago was that?" I ask again.

"I went to many clinics," she says in front of dozens of people she has met only that morning or perhaps the night before. "I went to 14 clinics." Again, many nod assent...

"Fourteen clinics," I respond. "What did they say was wrong with you? Did you have an operation or a biopsy?" The mass is now large and has completely destroyed the normal architecture of her breast; it is impossible to tell if she has had a procedure, as there is no skin left to scar.

"No," replies Anite. "Many told me I needed an operation, but the specialist who could do this was in the city, and it costs $700 to see him. In any case, I had learned in a dream that it was not necessary to go to the city."...

...I think uncomfortably of the privacy of a US examination room and of the fact that I have never seen there a breast mass consume so much flesh without ever having been biopsied. But I have seen many in Haiti, and almost all have proven malignant.

...[when] she discovered the mass. It was "small and hard," she says. "An abscess, I thought, for I was breastfeeding and had an infection while breastfeeding once before." ...Anite returns to the real tale. She hurt her back in the fall. How was she to care for her children and for her mother, who was sick and lived with her? "They all depend on me. There was no time."

And so the mass grew slowly "and worked its way under my arm." I give up trying to establish chronology. I know it had to be months or even years ago that she first discovered this "small" mass. She had gone to clinic after clinic, she says, "spending our very last little money. No one told me what I had. I took many pills."

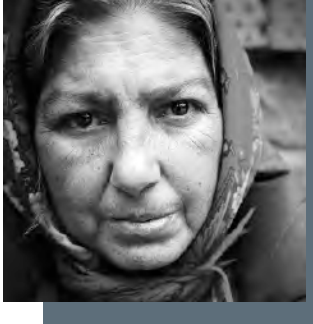
"What kind of pills?" I ask.

Anite continues. "Pills. I don't know what kind." She had given biomedicine its proper shot, she seems to say, but it had failed her. Perhaps her illness had more mysterious origins? "Maybe someone sent this my way," she says. "But I'm a poor woman – why would someone wish me ill?"

... "...The mass was growing, and there were three other small masses growing under my arm. I had a dream in which a voice told me to stop taking medicines and to travel far away for treatment of this illness. "She had gone to a voodoo priest for help in interpreting this dream. ...

..."In order to cure this illness, he told me, I would have to travel far north and east."

It has taken Anite over a week to reach our clinic. A diagnosis of metastatic breast cancer is later confirmed.

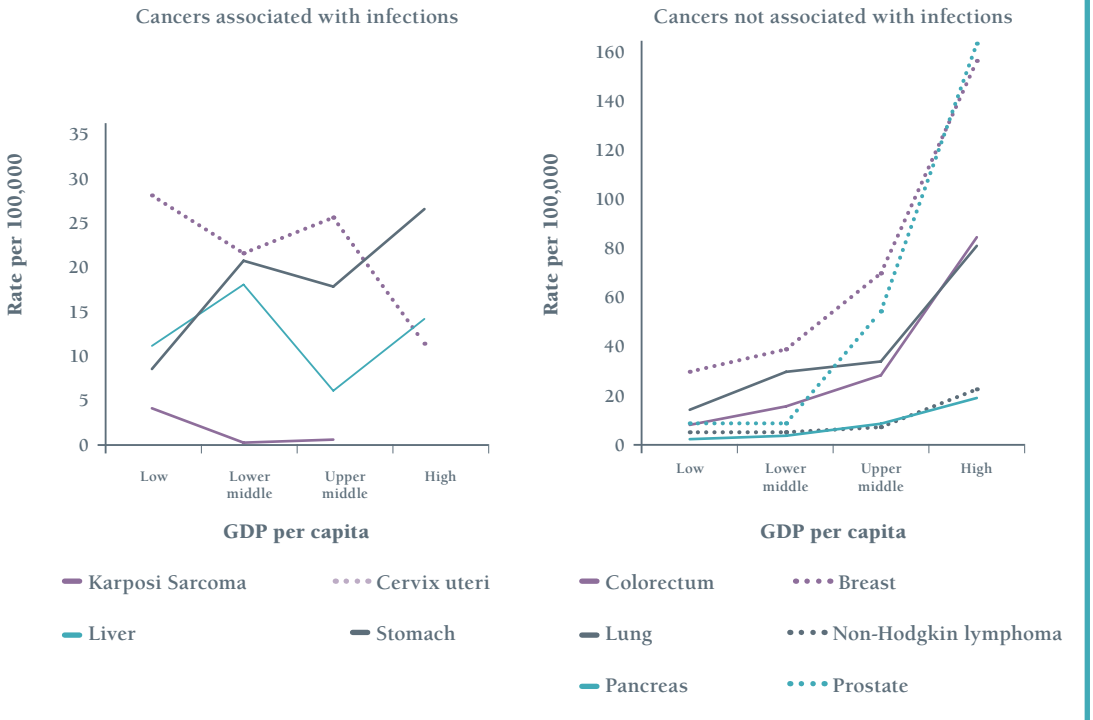


Kaposi's sarcoma is basically restricted to low income countries and the Africa region. HIV/AIDS infection emerged in the last few decades as an important risk factor for cancer, particularly in Africa, where 70% of the 33 million people living with HIV, reside.[47] Since its origin, HIV/AIDS infection has been closely associated with increased incidence of certain cancers like cervical cancer, non-Hodgkin's lymphoma, and Kaposi's sarcoma, which were collectively described as AIDS-defining cancers because of their association with untreated HIV/AIDS infection.[48] Because all these cancers are associated with oncogenic virus infections, and the prevalence of some of them increases with other immuno-suppressed states, the role of HIV/AIDS infection appears to be permissive, except in the case of cervical cancer, where shared risk factors are important. With the advent of effective anti-retroviral treatment, the incidence of these cancers, except for cervical, has been reduced. The incidence of other cancers among people living with HIV/AIDS, such as anal, oropharyngeal, and lung, now often referred to as Non-AIDS Defining Cancers, started to rise at about the same time, and has continued to do so.[49] In countries with mature epidemics, one third of all deaths among people living with HIV/AIDS, are cancer related, but the picture is less clear in other LMICs because of incomplete treatment coverage and a lack of good quality data.[50]

There are striking differences in the distribution of incidence by country income-level for cancers related to infection, compared to other cancers (Figure 4). While for most cancers, incidence increases by country incomelevel, for cervical cancer and Kaposi's sarcoma incidence declines as income increases. The incidence of liver and stomach cancer tend to be unrelated to income. This relationship may also vary, depending on the part of the developing world. The epidemiology of liver cancer, for example, is different in high and low income countries, and within developing regions in Asia.

Cancer Incidence by Country per Capita Income, 15 or More Years of Age

Figure 4



Source: Authors calculations based on GLOBOCAN 2008 http://globocan.iarc.fr/, and World Bank, World Development Indicators, 2010. http://data.worldbank.org/data-catalog/world-development-indicators

The size of the equity divide is shown by the distribution of cancer where screening is particularly effective and vaccines exist. A study of survey data from 57 countries indicates that coverage of cervical cancer screening in developing countries is, on average, 19%, compared to 63% in high income countries. The figures range from 1% in Bangladesh to 73% in Brazil. Further, the highest risk groups –older and poor women– are the least likely to be screened. In China, crude coverage is 70%, yet effective screening coverage (periodicity, inclusion of PAP smear) is only 23%.[51] Coverage of the HPV and HPB vaccines are similarly skewed, although recent reductions in price to LMICs should help to close part of this divide (see Text Box 7.1).

Important opportunities exist for meeting the challenge of several infection-related cancers, especially if prices are brought down for LMICs.[52] Increased investment in HIV/AIDS treatment and coverage of disease management will eliminate a significant proportion of the HIV/AIDS – associated cancers that threaten countries with a large burden of HIV/AIDS infection. Effective methods of controlling the spread of the infection will produce increased benefits, in terms of cancer prevention. Secondly, institution

There are important opportunities for meeting the challenge of several infection-related cancers, especially if prices are brought down for LMICs.

of effective, wide-coverage screening programs for cervical cancer in LMICs will substantially reduce morbidity and mortality in the short- and medium-term. In addition, the deployment of a vaccine against HPV could eventually prevent the majority of future cervical cancer cases, especially as interventions become better informed by epidemiological research to the prevalent strains of HPV in each country.[53] Another example, is vaccination of young children against Hepatitis B. In Taiwan, universal vaccination has nearly eradicated pediatric liver cancer, which was previously one of the most common cancers in Taiwanese children.[54] Taken together, the focus on infectious agents in the primary prevention of cancer may lead to enormous gains in the fight against these malignancies, in the short- and medium-term.

Taken together, the focus on infectious agents in the primary prevention of cancer may lead to enormous gains in the fight against these malignancies in the short- and medium-term.

Facet 3: Cancers amenable to treatment, which are often made more effective with early detection[55]

While income and geography should not determine the probability of dying from the disease, in large part, they do. LMICs suffer a larger share of global mortality, as compared to the global incidence, for almost all cancers that are screening-detectable or treatable, whether or not they are of infectious origin. Indeed, even as science discovers new methods for early detection, treatment, and cure, the suffering and death from these cancers becomes more "exclusive" to the poor. The probability of dying from these cancers is much higher for a person diagnosed in a developing country.

While income and geography should not determine the probability of dying from the disease, in large part they do.

Certain cancers that were once uniformly fatal, now have high potential for many years of remission, and possibly cure, with treatment. This is especially true for those cancers where early detection makes a difference including cancers of the breast, prostate, and colon.[56] Testicular cancer, childhood leukemia, thyroid cancer, Hodgkin's lymphoma, and chronic myeloid leukemia were all once uniformly fatal, but current treatments have produced higher survival rates, at least in wealthy countries.

Breast cancer cure rates are closely associated with stage of detection. Yet, late stage presentation is the norm in most LMICs. In the case of breast cancer, for example, 60-70% of cases in LMICs are detected in late stages with regional disease and metastasis, compared to less than 20% in most high income countries.[57,58] Cervical and colorectal cancer can be detected and managed at a pre-cancerous stage by screening people in the age groups in which cancer is more common for the presence of cancer or its precursor lesions.

The most important cancer for which screening in LMICs can have major impact is cervical cancer.

Cervical cancer screening is likely to have a major impact in LMICs. Developed countries have substantially reduced cervical cancer incidence through the use of Papanicolaou (Pap) smears and liquid-based cytology in well-developed health care systems, although the incidence of cervical cancer started dropping before screening was instituted. However, given the paucity of well-developed healthcare systems and the funding constraints in LMICs, methods have not been widely and systematically adopted in most LMICs. In recent years, two trends have emerged in cervical cancer screening. One is HPV test based screening programs that have been widely adopted in developed countries but are still too expensive for most LMICs. The other trend, is the use of low-cost, minimal visit screening tests like visual inspection, and application of either acetic acid or Lugol's iodine (VIA or VILI). These two methods have been validated for different environments and deserve wide adoption.

Breast cancer, is the leading cause of death for women below age 60 in high income countries, and among the top five causes in LMICs. Incidence and mortality rates from breast cancers are higher in wealthy countries due to differences in risk factor distribution and the stage of demographic transition. Yet, both incidence and mortality are rising rapidly in poorer countries. Evidence from 1990 to 2010 shows a cumulative increase of more than 30% in many parts of Africa, Asia, and the Middle East, and a decline in North America.[59]

The difference in the probability of surviving a treatable cancer (beyond those associated with factors directly related to the nature or genetics of the disease), is caused by differences in access to quality treatment. For adults aged 15 and over, lethality varies significantly by country incomelevel, except for those cancers for which no effective treatments exist and early detection is not possible (Figure 5). No gap exists if a disease is uniformly and universally fatal over a short period of time. Pancreatic cancer, for example, falls into this category, and in the graph, it appears as a straight line, indicating that the probability of death in a short period of time following diagnosis, is very high – regardless of country income or socio-economic status. For all other cancers, where early detection and/or treatment can significantly affect outcomes, the lines slope downward and are particularly steep for cancers such as thyroid and testicular. When reviewed by geographic region, the levels also follow a pattern related to country income.

The difference in the probability of surviving a treatable cancer that is not associated with factors directly related to the nature of the disease is caused by differences in access to quality treatment.

Ratio of Mortality to Incidence by Cancer Type and Country per Capita Income

Figure 5

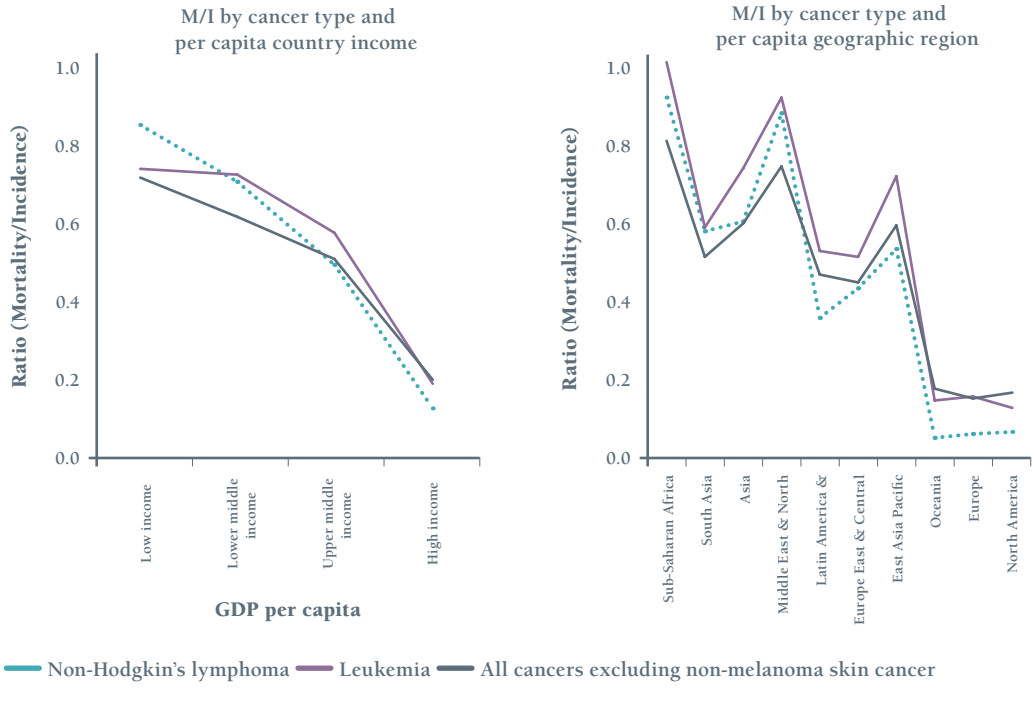
Source: Authors calculations based on GLOBOCAN 2008 http://globocan.iarc.fr/, and World Bank, World Development Indicators, 2010. http://data.worldbank.org/data-catalog/world-development-indicators.

For cancers in children aged 15 and under, the differences in lethality are particularly steep (Figure 6). For leukemia, which is the most common childhood cancer by far, the rate of mortality to incidence is over 70% in low income countries, compared to below 20% in high income countries. The survival inequality gap is almost as large when childhood cancers are viewed as a whole. When broken down by geographic region, the high rates for sub-Saharan Africa, Middle East and North Africa, and East Asia and the Pacific are evident when compared to other parts of the developing world and to high income regions. Using data from hospitals and in-depth country reviews, Ribeiro et al. also demonstrated the inverse relationship between lethality and health spending, per capita.[60]

In the poorest 25 countries of the world, the ratio of mortality to incidence is approximately 90%, while it is just over 10% for children diagnosed in Canada.

Figure 6

Ratio of Mortality to Incidence by Cancer Type, Country per Capita Income and Geographic Region; Children 0-14



Source: Authors calculations based on GLOBOCAN 2008 http://globocan.iarc.fr/, and World Bank, World Development Indicators, 2010.
http://data.worldbank.org/data-catalog/world-development-indicators.

Although the limitations of the data make it unreasonable to claim precision in measuring the slope of each line and the levels for each country or group of countries, the trends are clear. Further, data are robust to excluding countries for which incidence, mortality, or both, are projected in the Globocan database, as well as to replacing per capita country income with level of education and per capita health spending. Even so, significant differences exist within regions and between countries at similar levels of income. These differences merit further review to isolate those countries that are particularly good performers for their incomelevel, and to analyze why and how this good performance has been achieved.

Facet 4: Social and psychological aspects of life with disease and after treatment

Eliminating the social and psychological elements of suffering should be a core component of reducing the burden of all cancers in LMICs. Often, these elements are associated with long-term disability that is intensified by social exclusion and neglect. Further, these aspects of suffering tend to be poorly measured and greatly undervalued, and they receive little recognition in resource allocation and decision-making.

Cancer is still one of the world's most stigmatized diseases.[61] Stigma refers to the perception that the person affected by cancer differs from the norm in a negative or undesirable way. This perception often leads to discrimination, which in turn, results in a loss of status, and rejection or isolation.[62] Further, stigma exacerbates the social, emotional, and financial devastation that all too often accompany a diagnosis of cancer.[63]

Social and physchological elements of suffering from cancer are associated with long-term disability that is intensified by social exclusion and neglect.

Although cancer is too often acute and death rapid, this report highlights that in many cases, and especially with earlier detection, this should not be the case. Cancer can be a chronic illness and the effects of treatment long-term. Indeed, recognizing this represents a fundamental change in how cancer is perceived in many communities, and can provide important incentives for prevention and early detection.

People living with cancer may encounter numerous physical, psychological, social, spiritual, and financial issues during their diagnosis and treatment, and then throughout their lives. The after-effects of cancer and its treatment may be medical or physical, along with non-medical or practical concerns.[64] The specific late medical effects that cancer survivors experience vary, but can include physical impairments, psychological distress, sexual dysfunction, infertility, impaired organ function, cosmetic after-effects, and limitations in communication, mobility, and cognition.[65] Non-medical late effects can include issues such as unemployment, poverty, debt, and loss of insurance.[66]

These effects –forms of disability that vary in severity– change the capability of persons diagnosed with cancer to manage daily life, and often, to earn income. When fully taken into account, they exacerbate the cancer divide and constitute a tremendous source of inequity, particularly for populations that are already poor or vulnerable.[67]

These effects –forms of disability that vary in severity– change the capability of persons diagnosed with cancer to manage daily life and often to earn income.

In LMICs where protective legislation is weaker, and ignorance about the etiology, prevention, and treatment of cancer is widespread, cancer patients, and often their family members, face discrimination and exclusion. Populations that already suffer discrimination both inside and outside the home –women, children, certain ethnic groups, and the poor in general– have to face yet another layer of obstacles. Social exclusion can exacerbate capability deprivation –the lack of basic freedoms to choose and achieve a state of well-being– and can cause families to fall into poverty.[68,69] Illness compounds exclusion, especially with diseases like cancer where treatment often makes the disease impossible to hide and requires physical mutilation.

Illness compounds exclusion, especially with diseases like cancer where treatment often makes the disease impossible to hide and requires physical mutilation.

The lack of survivorship care, financial protection, and protection from stigma at the personal, community, and workplace levels combine to intensify the long-term hardships and costs of the disease. By contrast, addressing survivorship issues from the moment of diagnosis, can help to prevent secondary cancers and recurrence of cancer; promote disease management following diagnosis and treatment to ensure the maximum number of years of healthy life for people surviving with cancer; minimize preventable pain, disability, and psychosocial distress; and help cancer patients obtain support and resources to cope with life, both during and after treatment.[70]

Without greater access to treatment, cancer will remain a stigmatized disease not to be discussed. Greater access to treatment can lead to more humane treatment of cancer patients by their communities, because the disease will not be seen as inevitably fatal, and this greater optimism will translate to an increased awareness. Evidence on the history of cancer and awareness in high income countries tends to support this hypothesis.[71]

In LMICs, survivorship care is sorely lacking and has not been adequately incorporated into health systems as an integral part of treatment. It is an area of care – giving rarely considered as cancer continues to be equated with a death sentence. Further, health care systems are designed to manage acute illnesses, rather than chronic diseases (see Section 4).

In LMICs, survivorship care is sorely lacking. Few resources are available for prevention and treatment so long-term care is a luxury that few can access.

At the same time, most cancer patients –and indeed most people– in LMICs, are uninsured and lack any form of financial protection for health care. Just as with any health shock, cancer can drive a family into, or deeper into, poverty.[72-75] The chronic nature of the disease intensifies this phenomenon as care is ongoing. Unemployment and the inability to work compound the costs of treatment and the risks that a family will fall into poverty.

In LMICs cancer continues to be equated with a death sentence.

Stigma can hamper advances in the struggle with cancer. For example, people may be detracted from engaging in practices that reduce their cancer risk, and diagnosis may be delayed if fear of stigma creates a barrier to getting symptoms checked by a doctor. At a population level, governments are less likely to devote resources to reduce their cancer burden if individuals affected by the disease fail to express their needs or to advocate for themselves and others.[76,77]

While stigma is a global problem, it is a greater obstacle in LMICs and among poorer populations, for the stigma of cancer is layered onto other forms of discrimination associated with gender, age, ethnicity, religion, and poverty.[78]

Further, policies and institutions to cope with stigma tend to be weak in LMICs. Advocacy movements are relatively new and not well developed, although they are evolving (see Section 10).[79,80] Legislation to prevent workplace discrimination and to protect and promote the rights of women, for example, is more frequently found in higher income countries. Most LMICs have few laws or services for disabled workers, and even where these laws and services do exist, they do not apply to the majority of the labor force who work in the informal sector.[81]

Finally, survey evidence suggests that ignorance about cancer that causes stigma is more pervasive in LMICs. For example, between one-fifth and one-third of respondents from Mexico, India, China, South Africa, and Argentina reported concerns about "catching cancer" from people who have it, compared to approximately 5% in Italy, Japan, and France.[82] In another study, 77% of women living inside Gaza consider breast cancer to be contagious, as compared to 16% of Gazan women residing in countries with greater access to services.[83]

Stigma and exclusion may be particularly severe for patients who are in uncontrolled pain or living with a terminal illness.[84] This is another reason to advocate for increased access to pain control and palliation, especially at end of life.

Text Box 2.3
Understanding and combating stigma: a livestrong research and outreach program[85]

*The LIVE**STRONG** global cancer research study sought to give people affected by cancer, a chance to share their experiences and perspectives with the aim of gaining a better understanding of stigma. The research draws on multiple sources of data – including media coverage, public opinion surveys, and semi-structured interviews– on how cancer is portrayed and perceived. Argentina, Brazil, China, France, India, Italy, Japan, Mexico, Russia, and South Africa were sites for the study. The study included more than 4,500 interviews with healthcare practitioners, cancer survivors, organizational leaders, and community members, investigating the nature of the stigma associated with cancer and its impact. The data illustrated that stigma is pervasive – existing across countries, cultures, and communities.*

Six "lessons learned" were derived from the global research results:

1. *Around the world, cancer continues to carry a significant amount of stigma; however, there are opportunities to capitalize on shifting perceptions for positive change.*
2. *Awareness of cancer prevention, early detection, treatment, and survival are on the rise; however, too many people still report that they feel uninformed, when it comes to cancer.*
3. *Communication is critical to decreasing cancer-related stigma, raising cancer awareness, and disseminating cancer education. People with a personal history of cancer –especially well-known or celebrity survivors– and multiple mass media channels are key resources for raising awareness and disseminating cancer education.*
4. *The school system represents a potential venue for cancer education, and increasing cancer awareness among children may be an investment with high returns.*
5. *When facing cancer, people around the world want information and emotional support for themselves and for their families.*
6. *Tobacco use and obesity are widely acknowledged cancer risks. Programs and policies that help people translate awareness into action are needed.*

Facet 5: Pain and physical suffering

An abyss in the global cancer divide, and perhaps the most striking example of the equity imperative, is pain control and palliation. Even for the cancers where neither treatment nor prevention is possible, a crater of controllable pain and suffering separates the poor and rich. Much can be done to close this most unacceptable of divides.

Yet, the importance of investing in pain control and palliation is largely missed in the outcome measurements that typically guide health policy-makers. The focus on income, incidence of disease, or mortality as guides and metrics for fairness, equity, and efficiency excludes or severely undervalues the control of pain. This is because neither income nor extension of life are the primary purpose of palliation, and because the impact on productivity and other health outcome measures is assumed to be nil.[86] Yet, in addition to the obvious and tremendously important function of reducing pain, especially at end of life, palliative care has been associated with improved quality of life, reduced symptoms of depression, and longer survival.[87] Palliative care at end of life has, in fact, given insufficient attention in both high and low income countries.

The focus on income, incidence of disease, or mortality as guides and metrics for fairness, equity and efficiency necessarily excludes or severely undervalues the control of pain.

The lack of access to pain relief, and specifically to opioids, represents one of the most appalling and unnecessary global health disparities between rich and poor countries, and also within countries, including the United States, by socio-economic group.[88] Given the low cost of opiate drugs and other analgesics, perhaps the greatest disparities in cancer control are the immense international differences in the availability of pain relief.

The lack of access to pain relief, and specifically to opioids, represents one of the most appalling and unnecessary global health disparities between rich and poor countries.

WHO estimates suggest that the majority of terminal cancer patients worldwide have no access to pain-relieving medications, despite their low cost.[89] High income countries account for less than 15% of the world population, yet more than 94% of global morphine consumption.[90] Sub-Saharan Africa records 1.1 million deaths in pain and yet consumes enough medicinal opioids to treat just 85,000 people (<1% of the global total).[91]

High -income countries account for less than 15% of the world population yet more than 94% of global morphine consumption.[92]

Over the last decade, consumption of opioids for pain treatment has more than doubled worldwide, but very little of the increase has occurred in low income countries.[93] A recent study demonstrated that access to adequate pain management is exceptionally rare. In the case of strong opioid analgesics, and considering a wide spectrum of types and causes of pain, including cancer, 83% of the world's population (5.5 billion people) lives in countries with low to nonexistent access, 4% has moderate access, and only 7% has adequate access.[94]

Country-specific data are available for several key indicators of opioid consumption and demonstrate the huge range in access as well as use. Non-methodone, morphine-equivalence opioid consumption in mg per capita, per death from HIV/AIDS or cancer, and per death from HIV/AIDS or cancer in pain are reproduced in Appendix 1, with permission from UICC-Global Access to Pain Relief Initiative and the University of Wisconsin Pain and Policy Studies Group. These are multi-year averages, making the data less subject to single-year variations.

These data show tremendous variation in access. There is an an almost 580-fold difference in morphine-equivalence opioid consumption per death from HIV/AIDS or cancer in pain between the 20% poorest countries of the world and the 20% richest countries of the world.

Yet, there is also variation in access that is only partially explained by income, and must also be related to health system weaknesses and cultural barriers. In several low, and a few lower-middle income countries, mg consumed per death from HIV/AIDS or cancer in pain is extremely low -less than 100. In these cases, there is likely to be almost no access to pain control for patients, and even surgical pain control is often lacking.[95]

By contrast, Uzbekistan, Uganda, Ghana, Bangladesh, and Viet Nam –all low income countries– report consumption between 450 and 790 mg. Again, these refer to mg per death from HIV/AIDS or cancer in pain. Further, the level of consumption in Jordan is the highest of all lower-middle countries at over 9900 mg. Other lower-middle income

countries with similar levels of per capita income have much lower levels of consumption and access: Armenia at just over 600 mg and Egypt at just below 2000. China has a higher per capita income, yet a consumption level of just below 1300 mg. Botswana, Mexico, Chile, and Turkey are all upper-middle income countries with similar levels of per capita income, yet there is a 10, 25, and 50 fold difference in use of pain control medication – approximately 250 versus 2400 and 6200, 12000 mg respectively.

Noteworthy differences are evident across high income countries, even at similar income levels, although these countries do not report very low absolute figures. Portugal, at an income of approximately $22,000 registers close to 32,000 mg, compared to the Czech Republic, at 23,000 mg per death. Hungary, with a somewhat lower level of income, consumes 21,500. The level in Japan, is just over 9100 mg, compared to 35,400 in the UK, 57,100 in Ireland, 83,350 in Sweden, and 155,000 in Germany. All of these countries have an income per capita in the $35,000 range. Spain, with an income per capita of $29,600, consumes almost 70,000 mg, while the level in Italy, with a similar level of income, is approximately 18,800 mg. Further, Canada and Australia have similar income levels per capita, yet Canada consumes more than double. The US and Canada register similar levels of approximately 270,000 mg per death in pain from cancer and HIV/AIDS.

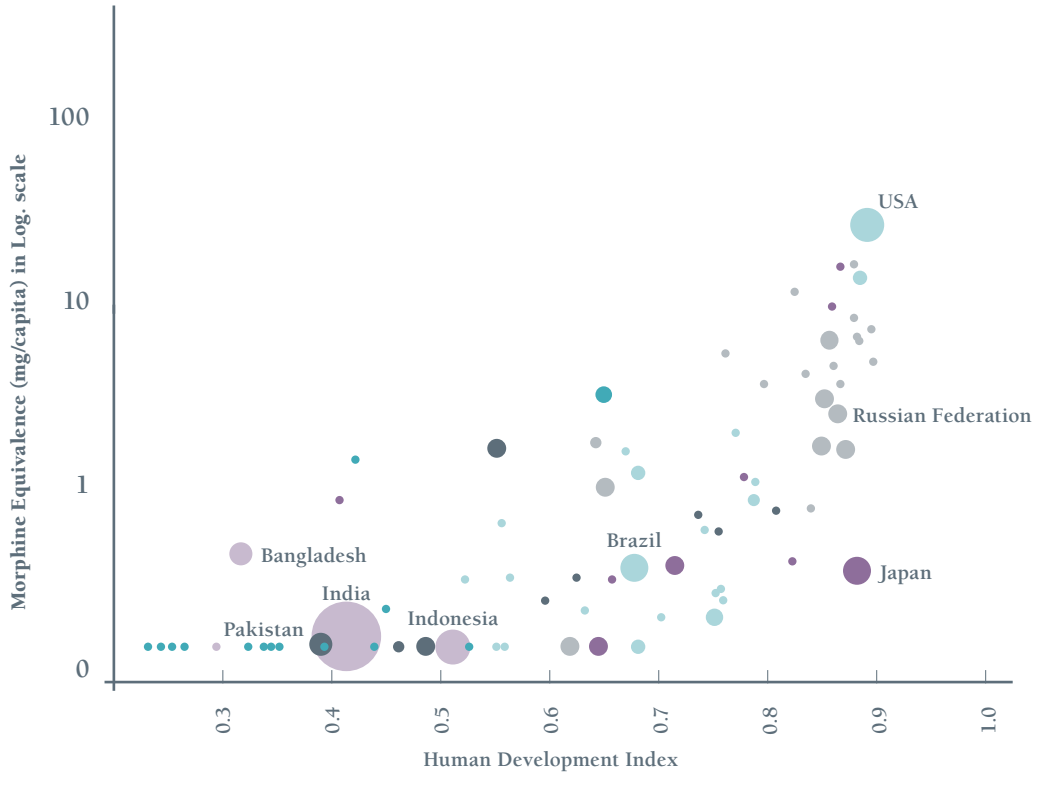
Further, the gap between LMICs and high income countries has been increasing. In 1980, consumption was approximately 10-20 mg/capita (morphine equivalence) for high income countries, compared to less than 1 mg/capita, and close to zero, for most developing countries. In the USA and Canada, in 2007, opioid consumption was close to 650 mg/capita, compared to 100 in the UK, and less than 1 in most countries of Africa, as well as in India, Pakistan, Bangladesh, and Indonesia, among others. In China, Brazil, Mexico, and South Africa, consumption was around 5-7 mg/capita (Figure 7).[96]

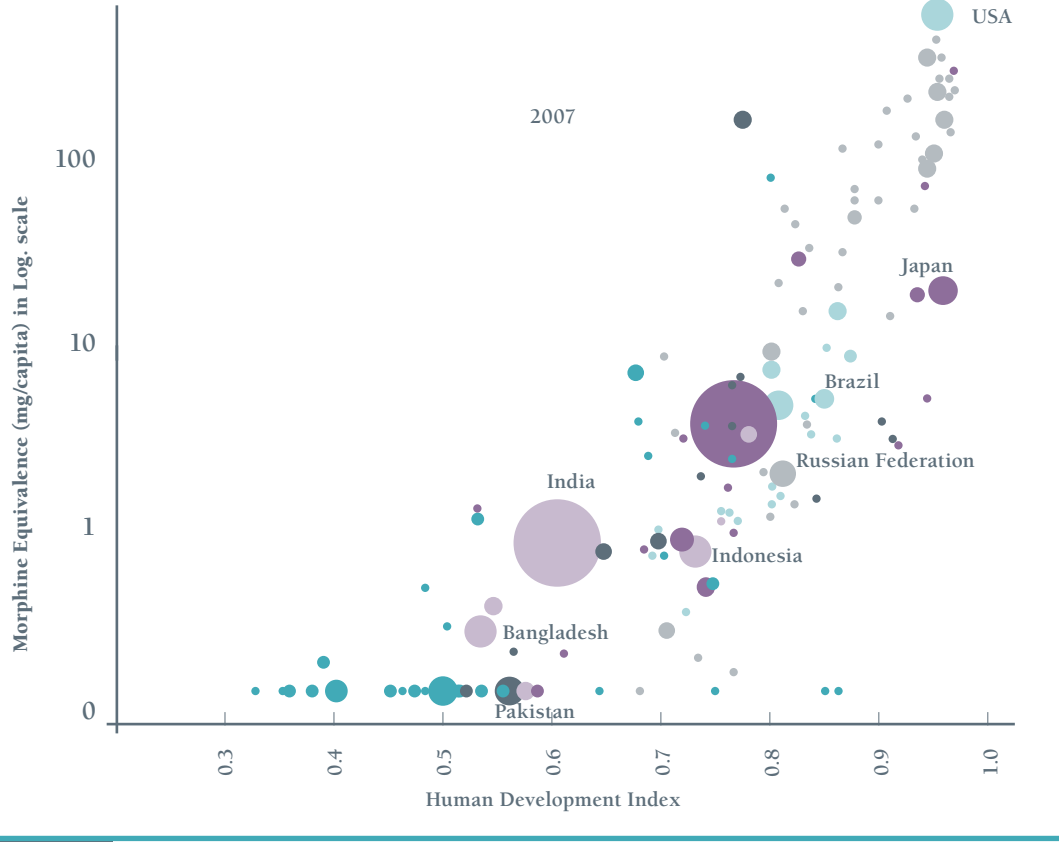
At least in the case of opioids, price should not be the issue. The global divide in access to pain control is compounded by differential prices for the poor and rich. An immediate release, 1 mg tablet of morphine sulfate should cost less than one cent, and a one-month supply between $1.80 and $5.40. Yet, the documented costs in some developing countries range between $60 and $180.[97] Even in the high-end middle income countries of Latin America, the cost is the equivalent of as much as 200% of average monthly income.[98] Lack of medical personnel to prescribe and monitor analgesics plays a large role in determining access, as do government policies, and the interpretation of international treaties designed to limit the illicit use of opioids and curb the potential for trafficking while ensuring access for medical purposes. Outdated regulations at both the national and international levels also affect both opioid availability and accessibility.[99] Weak and inappropriate –excessive and poorly defined– regulatory frameworks in many developing countries make it difficult to get adequate pain medication to patients. In these countries, it is illegal to dispense opioids, dosage and duration are limited in ways that do not match the needs of patients, or extensive licensing requirements make it impossible for most pharmacies, clinics, and medical personnel to dispense opioids.[100] Too often, some population groups, such as children or those with cancer, are excluded under the false assumptions that pain is less severe, other drugs will suffice, or that opioid use will generate addiction.[101] International agencies dedicated to managing the legal framework and implementing the 1961 Single Convention on Narcotic Drugs, appear to have worked harder on preventing illicit use than on guaranteeing access where required for the relief of pain and suffering.[102]

Access to pain relief is also hampered by market failures. The low price of and low demand for morphine are disincentives for pharmaceutical companies to register and sell morphine in LMICs, particularly when doing so exposes them to increased regulations and inspections by government authorities. In several countries, pharmaceutical distributors have stopped importing morphine, preferring instead to import more expensive products with higher margins, such as fentanyl.

Country Opioid Consumption by Human Development Index

Figure 7





Source: Pain & Policy Studies Group. Opioid Consumption Motion Chart. University of Wisconsin for 2007. http://ppsg-production.heroku.com/chart (accessed April 22 2011).

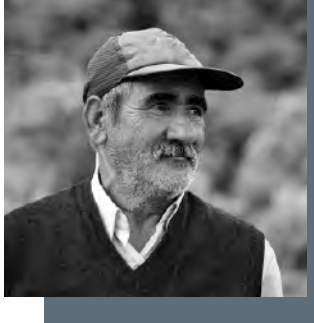
In the case of pain control and access to opioids, much can be done with relative ease and speed, compared to many other aspects of the cancer divide. Given the low price, availability of proven interventions, existence of international legal treaties and agencies, availability of global data and evidence resulting from the strong controls to avoid illicit trade, relative ease of administration, and few human and infrastructure requirements, dealing with this piece of the divide is an obvious area for immediate action.[103-107] Pain control might even be considered an absolute minimum requirement at any level of economic development, even with severe resource constraints. Moreover, access to appropriate pain medication is an effective horizontal strategy that can improve quality of life for all patients.[108] Thus, improving pain control represents an opportunity to impact across-the-board on all diseases, and expanding access to pain control and palliation through better access to opioids, is a good starting point for a diagonal approach to better CCC.

2.iii. Conclusions

Improving pain control represents an opportunity to impact across-the-board on all diseases.

Cancer, sometimes thought to be a disease mainly of developed countries, is now seen as a distinct set of health challenges, many of which are associated with poverty. The evidence demonstrates the substantial size and nature of the cancer divide, and why closing it is an equity imperative. As the many specific diseases that make up cancer globally become increasingly preventable and treatable, the global divide will continue to widen. The poor are the ones who contract preventable cancers and die from them. They will also become the most likely to die of treatable cancers. Painful death is concentrated among the poor who lack access to the means to control suffering. Finally, it is the poor who become impoverished by the costs of trying to manage the disease. Without policies to close this divide, death from cancer will increasingly become the painful lot of the poor.

Opportunities to reduce the divide abound, and many of the lowest-cost interventions and treatments can be the most useful. First, the policies that have been effective in high income countries to reduce risk factors, especially around tobacco consumption, need to be applied in LMICs. Second, the technologies to prevent those cancers that are produced by known infections need to become widely available, and new ones need to be developed. Third, investment in environmental and workplace health is needed, along with steps to reduce pollution in the home. Fourth, treatments for cancers that are curable with effective low-cost interventions, combined with earlier detection, should be expanded. Fifth, stigma and discrimination need to be eliminated in the context of improving survivorship care and reducing social and psychological suffering. And sixth, pain control and palliative care for all patients must be guaranteed, but especially for those for whom cure and meaningful prolongation of survival is not possible.



References

1. Omran AR. The Epidemiologic Transition: A theory of the epidemiology of population change. *Milbank Memorial Fund Quarterly*. 1971. Vol 49 (4): 509-538.
2. Frenk J, Bobadilla JL, Sepúlveda J, Cervantes ML. Health transition in middle -income countries: new challenges for health care. *Health Policy and Planning*. 1989; 4(1): 29-39.
3. Frenk J, Bobadilla JL, Sepúlveda J, Cervantes ML. Health transition in middle -income countries: new challenges for health care. *Health Policy and Planning*. 1989; 4(1): 29-39.
4. Marmot M, Friel S, Bell R, Houweling T, Taylor S. Closing the gap in a generation: health equity through action on the social determinants of health. *Lancet*. 2008; 372(9650):1661-9.
5. World Health Organization. *Global Status Report on Noncommunicable Diseases 2010*. World Health Organization; 2011.
6. Ibid.
7. Forouzanfar MH, Forman KJ, Delossantos AM, et al. Breast and cervical cancer in 187 countries between 1980 and 2010: a systematic analysis. *Lancet*. 2011: Epub ahead of print. http://www.thelancet.com/journals/lancet/article/PIIS0140-6736(11)61351-2/fulltext (accessed October 1, 2011).
8. Doll R, Peto R. The causes of cancer: quantitative estimates of avoidable risks of cancer in the United States today. *Journal of the National Cancer Institute*. 1981; 66(6):1191 -308.
9. National Center for Health Statistics. Health, United States, 2005, With Chartbook on Trends in the Health of Americans. Hyattsville, Maryland: 2005.
10. Thun MJ, Wingo PA. Chapter 23: Cancer Epidemiology. In Bast RC, Kufe DW, Pollock RE, et al. (Eds.): *Holland-Frei Cancer Medicine*. 5th edition. Hamilton (ON): BC Decker; 2000.
11. Cancer: On-Line Information. Table of Contents and Programmed Study: Oncology Content, Practice Questions and Practice Exams. 2011. http://cancer2000.net/. (accessed September 30, 2011).
12. Mukherjee S. *The emperor of all maladies: a biography of cancer*. New York: Scribner; 2010.
13. Berry DA, Cronin KA, Plevritis SK, et al. Effect of screening and adjuvant therapy on mortality from breast cancer. *New England Journal of Medicine*. 2005; 353:1784-92.
14. Shulman LN, Willett W, Sievers A, Knaul FM. Breast Cancer in Developing Countries: Opportunities for Improved Survival. *Journal of Oncology*. 2010:1-6.
15. Ribeiro RC, Pui CH. Saving the children – improving childhood cancer treatment in developing countries. *New England Journal of Medicine*. 2005; 352(21):2158-60.
16. Mukherjee S. *The emperor of all maladies: A biography of cancer*. New York: Simon & Schuster. 2010.
17. Statistics on 27 common types of cancers. Cancer Research UK. 2011. http://info.cancerresearchuk.org/cancerstats/types/index.htm. (accessed on September 30, 2011).
18. Smith-Warner SA, Spigelman D, Yuan SS, et al. Alcohol and breast cancer in women: a pooled analysis of cohort studies. *Journal of the American Medical Association*. 1998; 279(7): 535-40.
19. Key TJ, Schatzkin A, Willett WC, Allen NE, Spencer EA, Travis RC. Diet, nutrition and the prevention of cancer. *Public Health Nutrition*. 2004; 7(1a):187-200.
20. Hunter DJ, Willett WC. Diet, body size, and breast cancer. *Epidemiological Reviews*. 1993; 15(1): 110-32.
21. Thun MJ, DeLancey JO, Center MM, Jemal A, Ward EM. The global burden of cancer: priorities for prevention. *Carcinogenesis*. 2010;31(1):100-10.
22. Thun MJ, Wingo PA, 2000.
23. World Health Organization. Global Status Report on Noncommunicable Diseases 2010, 2011.
24. Sloan FA, Gelband H. *Cancer control opportunities in low-and middle -income countries*. Washington DC: National Academy Press; 2007.
25. Mukherjee S. *The emperor of all maladies: a biography of cancer*. New York: Scribner; 2010.
26. Jha P, Chaloupka FJ, Moore J, et al. Chapter 46: Tobacco Addiction. In: Jamison DT, Breman JG, Measham AR, et al. (Eds.). *Disease Control Priorities in Developing Countries*. 2nd ed. Washington (DC): World Bank; 2006.
27. Ames BN, Gold LS, Willett WC. The causes and prevention of cancer. *Proceedings of the National Academy of Sciences of the Unites States of America*. 1995; 92(1): 5258-65.
28. Thun MJ, DeLancey JO, Center MM, Jemal A, Ward EM, 2010.
29. World Health Organization. Global Status Report on Noncommunicable Diseases 2010, 2011.
30. Jha P, Chaloupka FJ, Moore J, et al. Chapter 46: Tobacco Addiction. In: Jamison DT, Breman JG, Measham AR, et al. (Eds.). *Disease Control Priorities in Developing Countries*. 2nd ed. Washington (DC): World Bank; 2006.
31. Calle EE, Thun MJ. Obesity and cancer. *Oncogene*. 2004; 23:6365-78.
32. Flegal KM, Carroll MD, Ogden CL, Curtin LR. Prevalence and trends in obesity among US adults, 1999-2008. JAMA: *The Journal of the American Medical Association*. 2010; 303(3):235-41.
33. Subramanian S, Perkins JM, Özaltin E, Davey Smith G. Weight of nations: a socioeconomic analysis of women in low-to middle -income countries. *The American Journal of Clinical Nutrition*. 2011; 93(2):413-21.
34. World Health Organization. Global Status Report on Noncommunicable Diseases 2010, 2011.
35. Bruce N, Rehfuess E, Mehta S, Hutton G, Smith K. Chapter 42: Indoor Air Pollution. In: Jamison DT, Breman JG, Measham AR, et al. (Eds.). *Disease Control Priorities in Developing Countries*. 2nd ed. Washington (DC): World Bank; 2006.
36. Rosenstock L, Cullen M, Fingerhut M. Chapter 60: Occupational Health. In: Jamison DT, Breman JG, Measham AR, et al. (Eds.). *Disease Control Priorities in Developing Countries*. 2nd ed. Washington (DC): World Bank; 2006.
37. International Labour Organization (ILO). NATLEX database. http://www.ilo.org/dyn/natlex/natlex_browse.home?p_lang=en (accessed September 30. 2011).
38. Rosenstock L, Cullen M, Fingerhut M. Chapter 60: Occupational Health. In: Jamison DT, Breman JG, Measham AR, et al. editors. *Disease Control Priorities in Developing Countries*. 2nd ed. Washington (DC): World Bank; 2006.
39. World Health Organization. Global Status Report on Noncommunicable Diseases 2010. World Health Organization; 2011.
40. All data are based on Globocan 2010 (http://globocan.iarc.fr/) to allow for comparisons across cancers and by age group. Somewhat different estimates of mortality and incidence are presented in Forouzanfar MH, Forman KJ, Delossantos AM, et al. Breast and cervical cancer in 187 countries between 1980 and 2010: a systematic analysis. *Lancet*. 2011: Epub ahead of print. http://www.thelancet.com/journals/lancet/article/PIIS0140-6736(11)61351-2/fulltext (accessed October 1, 2011).
41. Boyle P, Levin B editors. *World cancer report 2008*. Lyon: International Agency for Reasearch on Cancer Press; 2008.
42. Curado MP, Edwards B, Shin HR, Storm H, Ferlay J, Heanue M, Boyle P eds. *Cancer incidence in five continents. Volume IX*. IARC Scientific Publications 160. 2007.
43. Casper C, Sessle E, Phipps W, Yager J, Corey L, Orem J. Uganda Program on Cancer and Infectious Diseases. GTF.CCC Working Paper Series, Paper No. 2, Harvard Global Equity Initiative, 2011.
44. Denny L. Cervical cancer in South Africa: an overview of current status and prevention strategies. *CME*. 2010; 28(2):70-73.
45. Boyle P, Levin B editors. World cancer report 2008. Lyon: International Agency for Reasearch on Cancer Press; 2008.
46. Excerpt from: Farmer P. An anthropology of structural violence. In: *Partner to the Poor*. Berkeley, CA: University of California Press, 2010; 350-375.
47. UNAIDS. *Report on the global AIDS epidemic 2008*. Joint United Nations Programme on HIV/AIDS. Geneva; 2008.
48. Patel P, Hanson DL, Sullivan PS, et al. Incidence of types of cancer among HIV-infected persons compared with the general population in the United States, 1992-2003. *Annals of Internal Medicine*. 2008; 148:728-36.
49. Casper C. The Increasing Burden of HIV-Associated Malignancies in Resource-Limited Regions. *Annual Review of Medicine*. 2010; 62:157-70.
50. Bonnet F, Burty C, Lewden C, et al. Changes in cancer mortality among HIV-infected patients: the Mortalité 2005 Survey. *Clinical Infectious Diseases*. 2009; 48(1):633-9.
51. Gakidou E, Nordhagen S, Obermeyer Z. Coverage of Cervical Cancer Screening in 57 Countries: Low Average Levels and Large Inequalities. PLoS *Medicine*. 2008;5(6):e132.
52. Casper C, Sessle E, Phipps W, Yager J, Corey L, Orem J. Uganda Program on Cancer and Infectious Diseases. GTF.CCC Working Paper Series, Paper No. 2, Harvard Global Equity Initiative, 2011.
53. Garland SM, Hernandez-Avila M, Wheeler CM, et al. Quadrivalent vaccine against human papillomavirus to prevent anogenital diseases. *New England Journal of Medicine*. 2007; 356(19):1928-43.
54. Chang MH, Chen CJ, Lai MS, et al. Universal Hepatitis B Vaccination in Taiwan and the Incidence of Hepatocellular Carcinoma in Children. *New England Journal of Medicine*. 1997; 336(26):1855-9.
55. All data are based on Globocan 2010 (http://globocan.iarc.fr/) to allow for comparisons across cancers and by age group. Somewhat different estimates of mortality and incidence are presented in Forouzanfar MH, Forman KJ, Delossantos AM, et al. Breast and cervical cancer in 187 countries between 1980 and 2010: a systematic analysis. *Lancet*. 2011: Epub ahead of print. http://www.thelancet.com/journals/lancet/article/PIIS0140-6736(11)61351-2/fulltext (accessed October 1, 2011).
56. Cancer Research UK. Statistics on 27 common types of cancer. http://info.cancerresearchuk.org/cancerstats/types/ (accessed September 30, 2011).
57. American Cancer Society. Breast Cancer Facts & Figures 2009-2010. American Cancer Society. 2010.

58. Shulman LN, Willett W, Sievers A, Knaul FM. Breast Cancer in Developing Countries: Opportunities for Improved Survival. ***Journal of Oncology***. 2010; 2010:1-6.
59. Forouzanfar, M. Estimating trends in mortality of cancers in the world: The case of breast cancer. Global Health Metrics and Evaluation: Noncommunicable disease transitions: rich and poor countries, Seattle, WA (March 14, 2011).
60. Ribeiro RC, Steliarova-Foucher E, Magrath I, et al. Baseline status of paediatric oncology care in ten low -income or mid-income countries receiving My Child Matters™ support: A descriptive study. ***Lancet Oncology***. 2008; 9:721-9.
61. Sontag S. ***Illness as metaphor***; and, ***AIDS and its metaphors***. Picador; 2001.
62. Link BG, Phelan JC. Stigma and its public health implications. ***Lancet***. 2006; 367:528-529.
63. Lagnado, L. In Some Cultures, Cancer Stirs Shame. ***The Wall Street Journal***. 2008 Oct 4 Sec A1. Retrieved September, 30 2010, from http://online.wsj.com/article/SB122304682088802359.html.
64. Hoffman KE, McCarthy EP, Reckiltis CJ, Ng AK. Psychological distress in long-term survivors of adult-onset cancer: Results from a national survey. ***Archives of Internal Medicine***. 2009; 169 (14):1274-1281.
65. Hewitt M, Greenfield S, Stoval E. ***From cancer patient to cancer survivor: Lost in transition***. 2006. Washington, D. C.: National Academies Press.
66. Wolff SN, Nichols C, Ulman D, et al. Survivorship: An unmet need of the patient with cancer – implications of a survey of the Lance Armstrong Foundation. 2005. Poster presented at the American Society of Clinical Oncology Annual Meeting, Chicago, IL.
67. Sen A. ***The Idea of Justice***. United States: Library of Congress Cataloging-in-Publication Data, 2009.
68. Sen A. ***Social Exclusion: Concept, Application, and Scrutiny***. Social Development Papers No. 1. Office of Environment and Social Development: Asian Development Bank, June 2000. http://www.adb.org/documents/books/social_exclusion/Social_exclusion.pdf (accessed October 1, 2011).
69. Sen A. ***Inequality Reexamined***. Cambridge, MA: Harvard University Press. 1992.
70. Centers for Disease Control and Prevention and the Lance Armstrong Foundation. A National Action Plan for Cancer Survivorship: Advancing Public Health Strategies. 2004.
71. Faust DG. Opening Session: Breast cancer in the developing world: meeting the unforeseen challenge to women, health and equity. Harvard University. Joseph B. Martin Conference Center, Harvard Medical School, Boston, MA. November 4, 2009.
72. Knaul F, Arreola-Ornelas H, Mendez-Carniado O, et al. Health system reform in Mexico 4. Evidence is good for your health system: policy reform to remedy catastrophic and impoverishing health spending in Mexico. ***Lancet***. 2006; 368(9549):1828-41.
73. World Health Organization. World Health Report 2010, 2010.
74. Krishna A. Pathways out of and into poverty in 36 villages of Andhra Pradesh, India. ***World Development***. 2006; 34(2):271–88.
75. Anand S. Human security and universal health insurance. ***Lancet***. Epub ahead of print. 2011**.** http://www.thelancet.com/journals/lancet/article/PIIS0140-6736(11)61148-3/fulltext (accessed October 1, 2011).
76. Keusch GT, Wilentz J, Kleinman A. Stigma and global health: developing a research agenda. ***Lancet***. 2006:367:525-527.
77. Castro A, Farmer PE. Understanding and addressing AIDS-related stigma: from anthropological theory to clinical practice in Haiti. ***Public Health Matters***. 2005: 95(1).
78. Sen A. ***Development as Freedom***. New York: Random House. 1999.
79. Durstine A, Leitman E. Building a Latin American cancer patient advocacy movement: Latin American cancer NGO regional overview. ***Salud Publica de Mexico***. 2009; 51(Supplemento 2):s316-s323.
80. Koon K, Soldak T, Gralow J. Breast cancer advocacy: Changing perceptions. ***Salud Publica de Mexico***. 2009; 51(Supplemento 2):s323-s329.
81. International Labour Organization (ILO). NATLEX database. accessed on September 20, 2011 at: http://www.ilo.org/dyn/natlex/natlex_browse.home?p_lang=en.
82. Neal C, Beckjord E, Rechis R, Schaeffer J. Cancer stigma and silence around the world: A LIVESTRONG report. 2010. TX: LIVESTRONG. Available at http://livestrong.org/pdfs/3-0/LSGlobalResearchReport (accessed September 20, 2011).
83. Shaheen R, Slanetz P, Raza S, Rosen M. Barriers and opportunities for early detection of breast cancer in Gaza women. ***Breast***. 2011; 20(2):s30-s4.
84. Epley RJ, McCaghy CH. The Stigma of Dying: Attitudes towards the terminally ill. ***Journal of Death and Dying***. 1978; 8(4): 379-393.
85. Neal C, Beckjord E, Rechis R, Schaeffer J. Cancer stigma and silence around the world: A LIVESTRONG report. 2010. Austin, TX: LIVESTRONG. Available at http://livestrong.org/pdfs/3-0/LSGlobalResearchReport (accessed September 20, 2011).
86. Sen A, 2009.
87. Temel JS, Greet JA, Muzikansky A. Early palliative care for patients with metastatic non-small-cell lung cancer. ***New England Journal of Medicine***. 2010; 363:733-42.
88. Taylor AL, Gostin LO, Pagonis KA. Ensuring Effective Pain Treatment: A National and Global Perspective. ***JAMA: The Journal of the American Medical Association***. 2008; 299(1):89-91.
89. Scholten W, Nygren-Krug H, Zucker HA. The World Health Organization paves the way for action to free people from the shackles of pain. ***Anesthesia and Analgesia***. 2007; 105:1-4.
90. Liberman J. O'Brien M, Hall W, Hill D. Ending inequities in access to effective pain relief? ***Lancet***. 2010; 376(9744):856.
91. O'Brien M. Global Access to Pain Relief Initiative. Presentation for the Union of International Cancer Control. http://www.africacncl.org/HIV_AIDS/initiative_activities/NCD_Session_3_Obrien.pdf (accessed September 20, 2011).
92. Liberman J. O'Brien M, Hall W, Hill D, 2010.
93. International Narcotics Control Board. ***Report of the International Narcotics Control Board for 2009***. New York: United Nations. 2010.
94. Seya MJ, Gelders SFAM, Achara OU, Milani B, Scholten WK. A first comparison between the consumption of and the need for opioid analgesics at country, regional, and global levels. ***Journal of Pain & Palliative Care Pharmacotherapy***. 2011; 25:6-18.
95. Murthy S, Antwi-Kusi A, Jabir AR, Ofori-Amanfo G. Patient and healthcare practitioner perspectives of postoperative pain control in Kumasi, Ghana. American Society of Anesthesiologists. 2010. http://www.asaabstracts.com/strands/asaabstracts/abstract.htm;jsessionid=2D9F6DB2089C25D23ABF47CC0AD0FFCC?year=2010&index=17&absnum=1361 (accessed October 1, 2011).
96. Pain & Policy Studies Group. Opioid Consumption Motion Chart. University of Wisconsin for 2007. http://ppsg-production.heroku.com/chart (accessed September 22, 2011).
97. Brennan F, Carr DB, Cousins M. Pain management: a fundamental human right. ***Anesthesia and Analgesia***. 2007; 105(1):205-221.
98. De Lima L. Opioid availability in Latin America as a global problem: a new strategy with regional and national effects. ***Journal of Palliative Medicine***. 2004; 7(1):97-103.
99. Joranson DE, Ryan KM. Ensuring opioid availability: methods and resources. ***Journal of Pain and Symptom Management***. 2007; 33:527-32.
100. Anderson T. The politics of pain. ***British Medical Journal***. 2010; 341:328-30.
101. Taylor AL, Gostin LO, Pagonis KA. Ensuring Effective Pain Treatment: A National and Global Perspective. ***JAMA: The Journal of the American Medical Association***. 2008; 299(1):89-91.
102. Liberman J. O'Brien M, Hall W, Hill D, 2010.
103. Mosoiu D, Ryan KM, Joranson DE, Garthwaite JP. Reforming drugcontrol policy for palliative care in Romania. ***Lancet***. 2006; 367(9528):2110-7.
104. Bosnjak S, Maurer MA, Ryan KM, Leon MX, Madiye G. Improving the availability and accessibility of opioids for the treatment of pain: The International Pain Policy Fellowship. ***Journal of Supportive Care in Cancer***. 2011; 19:1239-47.
105. World Health Organization. ***Ensuring balance in national policies on controlled substances: Guidance for availability and accessibility of controlled medicines***. Second and revised edition ed. Geneva, Switzerland: World Health Organization; 2011.
106. Gilson AM, Maurer MA, Ryan KM, Skemp-Brown M, Husain A, Cleary JF. Ensuring patient access to essential medicines while minimizing harmful use: A revised WHO tool to improve national drug control policy. ***Journal of Pain and Palliative Care Pharmacotherapy***. 2011; 25(3):246-51.
107. Joranson DE, Ryan KM, Maurer MA. Opioid policy, availability and access in developing and nonindustrialized countries. In: Fishman SM, Ballantyne JC, Rathmell JP, editors. ***Bonica's Management of Pain***. 4th ed. Pages 194-208. Baltimore, MD: Lippincott Williams & Wilkins; 2010.
108. Taylor AL, Gostin LO, Pagonis KA, 2008.

Section 2, Appendix:
Non-methodone Opioid Consumption (Morphine Equivalent), 2008
Ordered by "per death from HIV or cancer in pain"

Income Region (World Bank)[4]	Country[1]	GNI per capita (PPP 2008)[4] $	Non-methadone opioid consumption (morphine-equivalents)[2]		
			Per capita (mg)	Per death from HIV or cancer (mg)	Per death from HIV or cancer in pain[3] (mg)
Low Income	Tanzania	1,344	0/NA	–	–
	Rwanda	1,190	0.0	10	18
	Mali	1,171	0.0	16	23
	Myanmar	1,596	0.0	16	24
	Burkina Faso	1,215	0.0	17	26
	Central African Republic	758	0.1	18	31
	Chad	1,067	0.0	19	31
	Ethiopia	992	0.0	21	35
	Cambodia	1,868	0.0	26	39
	Niger	675	0.0	31	42
	Haiti	949	0.0	28	47
	Malawi	911	0.1	26	49
	Burundi	402	0.1	29	50
	Sierra Leone	809	0.1	39	57
	Madagascar	953	0.0	46	58
	Senegal	1,816	0.0	52	68
	Democratic Republic of Congo	291	0.1	42	70
	Togo	844	0.1	45	75
	Mozambique	854	0.2	44	80
	Zimbabwe	176	0.7	43	85
	Zambia	1,359	0.3	45	86
	Benin	1,499	0.1	87	130
	Tajikistan	2,020	0.1	134	170
	Eritrea	643	0.1	117	182
	Lao PDR	2,321	0.1	198	249
	Kenya	1,628	0.6	149	280
	Mauritania	2,118	0.2	211	283
	Yemen	2,387	0.2	309	388
	Nepal	1,201	0.2	313	394
	Kyrgyzstan	2,291	0.2	319	400
	Uzbekistan	3,085	0.2	360	451
	Uganda	1,224	0.9	243	452
	Ghana	1,385	0.5	318	513
	Bangladesh	1,587	0.2	416	520
	Viet Nam	2,995	0.6	597	792
	Democratic Republic of Korea		0.8	825	1,032
Lower -middle Income	Bolivia	4,357	0/NA	–	–
	Honduras	3,750	0/NA	–	–
	Nigeria	2,156	0.0	6	10
	Cote d Ivoire	1,625	0.0	11	19
	Lesotho	2,021	0.4	44	85
	Sudan	2,051	0.1	57	87
	Republic of Congo	3,258	0.1	51	92
	Pakistan	2,678	0.1	107	135
	Indonesia	3,957	0.1	159	199
	Iraq		0.2	181	226
	Azerbaijan	8,747	0.2	209	261
	Turkmenistan	7,052	0.2	294	369
	Angola	4,941	0.4	268	407
	Armenia	5,495	1.1	505	634
	Guyana	3,302	0.7	438	671

Section 2, Appendix: *(continued)*
Non-methodone Opioid Consumption (Morphine Equivalent), 2008
Ordered by "per death from HIV or cancer in pain"

Income Region (World Bank)[4]	Country[1]	GNI per capita (PPP 2008)[4] $	Non-methadone opioid consumption (morphine-equivalents)[2]		
			Per capita (mg)	Per death from HIV or cancer (mg)	Per death from HIV or cancer in pain[3] (mg)
Lower -middle Income	India	3,337	0.4	542	717
	Bhutan	5,607	0.4	637	797
	Philippines	4,002	0.4	656	820
	Mongolia	3,619	1.1	710	888
	Paraguay	4,585	0.7	702	911
	Thailand	8,001	1.6	703	1,039
	Sri Lanka	4,886	0.8	837	1,049
	Albania	7,976	1.5	1,016	1,271
	China	7,258	1.4	1,016	1,276
	Republic of Moldova	3,149	1.6	1,028	1,287
	Guatemala	4,694	0.9	1,106	1,487
	Morocco	4,628	0.6	1,246	1,585
	Ecuador	7,931	1.2	1,255	1,628
	Nicaragua	2,567	1.0	1,335	1,704
	Ukraine	6,535	2.9	1,336	1,737
	Egypt	5,889	0.8	1,508	1,890
	Islamic Republic of Iran	11,764	1.0	1,570	1,991
	Cape Verde	3,306	0.8	1,635	2,057
	Papua New Guinea	2,227	1.2	1,992	2,664
	Georgia	4,902	2.1	2,290	2,863
	El Salvador	6,498	2.1	2,221	3,050
	Samoa	4,126	1.8	3,002	3,759
	Vanuatu	3,908	2.0	4,155	5,197
	Syrian Arab Republic	4,760	1.5	5,428	6,787
	Tunisia	7,979	3.1	7,014	8,873
	Jordan	5,956	4.8	7,917	9,924
Upper -middle Income	Botswana	13,204	1.1	126	244
	Dominican Republic	8,273	0.7	470	660
	Namibia	6,323	2.0	379	723
	Kazakhstan	10,234	0.9	578	725
	Belarus	12,926	1.5	714	906
	Russian Federation	15,258	1.5	738	937
	Suriname	7,093	0.9	747	1,041
	Romania	12,844	1.7	850	1,065
	Peru	8,424	1.1	819	1,071
	Algeria	8,320	0.5	878	1,108
	South African Republic	9,812	7.1	977	1,817
	Cuba	–	2.6	1,503	1,883
	Jamaica	7,207	2.6	1,522	2,111
	Uruguay	13,808	4.5	1,862	2,347
	Mexico	13,971	1.4	1,846	2,363
	Venezuela	11,846	1.5	1,973	2,536
	Mauritius	13,344	1.8	2,314	2,916
	Panama	13,347	2.6	2,443	3,362
	Costa Rica	10,870	2.5	2,673	3,381
	Malaysia	13,927	2.6	2,804	3,619
	Libya	17,068	1.8	3,561	4,633
	Lebanon	13,475	3.5	4,285	5,462
	Chile	13,561	6.6	4,920	6,196
	Bulgaria	11,139	10.7	4,957	6,199
	Bosnia Herzegovena	8,222	8.5	5,173	6,471

Section 2, Appendix: *(continued)*
Non-methodone Opioid Consumption (Morphine Equivalent), 2008
Ordered by "per death from HIV or cancer in pain"

Income Region (World Bank)[4]	Country[1]	GNI per capita (PPP 2008)[4] $	Non-methadone opioid consumption (morphine-equivalents)[2]		
			Per capita (mg)	Per death from HIV or cancer (mg)	Per death from HIV or cancer in pain[3] (mg)
Upper -middle Income	Brazil	10,607	5.8	5,130	6,612
	Argentina	14,603	8.9	5,493	6,936
	Colombia	8,589	5.1	5,395	7,101
	Latvia	12,944	17.1	6,574	8,226
	Lithuania	14,824	21.1	9,003	11,258
	Turkey	13,359	7.7	9,508	11,893
	Poland	17,803	38.2	15,041	18,811
	Montenegro	12,491	15.3	–	–
	Serbia	10,449	20.0	–	–
High Income	Equatorial Guinea	22,218	0/NA	–	–
	Oman	25,653	1.3	2,920	3,708
	Trinidad and Tobago	24,233	4.6	2,978	4,236
	Brunei	49,915	1.8	3,414	4,268
	Singapore	48,893	4.8	3,915	4,916
	Malta	21,004	11.9	6,469	8,093
	Estonia	17,168	19.7	7,283	9,124
	Japan	34,692	18.5	7,308	9,135
	Saudi Arabia	24,726	3.5	7,450	9,336
	Bahamas	25,201	10.9	7,278	10,597
	Bahrain	26,664	4.7	8,738	11,150
	Cyprus	21,962	11.4	10,092	12,615
	Republic of Korea	29,518	18.9	10,843	13,559
	Kuwait	55,719	2.4	11,022	13,828
	Barbados	21,673	23.0	11,741	15,536
	Croatia	16,389	37.1	13,049	16,313
	Qatar	79,426	2.3	12,883	17,408
	Italy	29,619	41.1	14,985	18,769
	Hungary	17,472	56.6	17,235	21,546
	United Arab Emirates	58,006	3.1	17,444	22,531
	Czech Republic	22,678	53.4	18,572	23,216
	Portugal	22,105	61.0	25,374	32,073
	United Kingdom	35,087	75.5	28,315	35,411
	Slovakia	21,658	62.4	28,443	35,557
	Greece	27,580	76.8	31,047	38,817
	New Zealand	25,438	62.3	32,142	40,196
	Slovenia	25,857	105.5	38,700	48,383
	Israel	27,831	64.4	45,219	56,588
	The Netherlands	40,658	113.6	45,299	56,673
	Luxembourg	51,109	98.5	45,614	57,108
	Ireland	33,078	93.6	45,655	57,137
	France (metropolitan)	34,341	132.9	48,438	60,702
	Norway	58,810	154.9	63,354	79,261
	Sweden	36,936	152.2	66,647	83,350
	Iceland	22,917	128.6	71,753	89,709
	Belgium	34,873	222.6	79,798	99,835

Section 2, Appendix: *(continued)*
Non-methodone Opioid Consumption (Morphine Equivalent), 2008
Ordered by "per death from HIV or cancer in pain"

Income Region (World Bank)[4]	Country[1]	GNI per capita (PPP 2008)[4] $	Non-methadone opioid consumption (morphine-equivalents)[2]		
			Per capita (mg)	Per death from HIV or cancer (mg)	Per death from HIV or cancer in pain[3] (mg)
High Income	Finland	33,872	161.6	80,098	100,151
	Switzerland	39,849	194.1	87,044	109,131
	Australia	38,692	174.2	90,237	112,913
	Denmark	36,404	278.1	94,800	118,586
	Germany	35,308	324.3	123,894	155,014
	Austria	37,056	345.8	146,319	183,096
	Canada	38,668	449.8	213,586	267,645
	United States of America	47,094	428.6	216,229	272,612

1) Countries/territories not included due to lack of data: Chinese Taipei, France (La reunion, Guadaloupe, Martinique), French Guyana and Polynesia, Guam, Maldives, New Caledonia, Puerto Rico, Timor-Leste, Wesern Sahara, Fiji, Gabon, Belize, Cameroon, Djibouti, Gaza Strip and West Bank, Solomon Islands, Swaziland, Afghanistan, Comoros, Guinea, Guinea-Bissau. Liberia, Somalia, The Gambia. Tanzania, Bolivia, Honduras and Equatorial Guinea report an absolute zero for consumption which is treated as missing data. FYR Macedonia is excluded for lack of classification on income per capita.

2) Full GAPRI methodology available at http://www.treatthepain.com/methodology. Morphine equivalent is a metric to standardize doses of opioids and allow combination and comparison of different medicinal opioids. It is calculated as Mor Eq=(1*morphine)+(83.3*fentanyl)+(5*hydromorphone)+(1.33*oxycodone) +(0.25*pethidine)+(4*methadone) This equation is taken from the ratios of the defined daily dose (oral dosing for all except fentanyl, which is trans-dermal) as described by the WHO Collaborating Centre for Drug Statistics Methodology. Because of methadone's widespread use as opioid substitution therapy, non-methadone morphine equivalent is also used in some instances and is calculated as Non-meth Mor Eq= (1*morphine)+(83.3*fentanyl)+(5*hydromorphone)+(1.33*oxycodone)+(0.25*pethidine)Opioid consumption data are taken from the International Narcotics Control Board annual report for narcotics consumption in 2008 that was published in 2009. Where data are missing in the 2009 report, values are taken from the International Narcotics Control Board report for 2007 that was published in 2008 (3). For estimates that are reported as below ½ of the unit of measure, a value that is 0.25 of the unit of measure is used. For each drug, the average of non-missing consumption data over the last 3 years (2006-2008) is used.

3) Full GAPRI methodology available at http://www.treatthepain.com/methodology. Deaths in Pain: It is assumed that 80% of cancer deaths and 50% of HIV/AIDS deaths require morphine and that the morphine required for each death in pain is 67.5mg/day for 91.5 days. The number of deaths due to cancer and HIV/AIDS is estimated by applying the mortality rates from the 2008 update of the WHO 2004 cause of death dataset to national population estimates for 2008 from the WHO. Untreated deaths in pain: It is assumed that all of the morphine is used for deaths in pain due to cancer and HIV. The number of untreated deaths in pain is calculated by subtracting the number of deaths in pain that could be treated with the total morphine equivalent in the country from the total number of deaths in pain.

4) World Development Indicators, 2008. World Bank. (http://data.worldbank.org/data-catalog/world-development-indicators/).

Investing in Cancer Care and Control

Section 3

Section 3

Investing in Cancer Care and Control

Key messages

- Health as an investment, rather than a cost, is now the predominant philosophy among policy makers. This philosophy is shaping human, economic, and environmental development agendas.
- Planning for chronic illness prevention and management must be integrated into health and economic development agendas.
- The World Economic Forum (WEF) labeled chronic disease one of the three leading global economic risks in 2010.
- Tobacco is a huge economic risk. Tobacco's estimated $US 500 billion drain –mainly from tobacco-related illness and treatment costs– exceeds the total annual expenditure on health- of all low and middle income countries (LMICs).
- Between one-third and one-half of cancer deaths can be avoided with prevention, early detection and treatment. This amounts to between 2.4 and 3.7 million avoidable deaths each year, 80% of which are in low and middle income countries (LMICs).
- LMICs have larger proportions of avoidable cancer deaths: close to 60% in low- and lower-middle -income countries, and 50% in upper-middle -income countries. Even in high -income countries, the proportion of avoidable deaths is significant: 20-30%.
- The total annual economic cost of cancer was approximately $1.16 trillion in 2010, more than 2% of the global GDP. This figure underestimates total costs as it does not include the substantial longer-term costs to families and care givers.
- A WEF study showed that global cancer losses in 2010 amounted to $2.5 trillion; $1.7 trillion for high -income countries and $800 billion for LMICs. This figure corres-ponds to the value that individuals place on lost income, out-of-pocket spending on health, and pain and suffering.
- Investing in cancer care and control (CCC) yields an annual return on prevention and treatment of between 1.5:1 and 3.7:1, applying an optimistic estimate that approximately 50% of deaths are avoidable.
- A reasonable estimate shows that the world could have saved $131 billion in 2010 by investing in CCC due to losses of healthy years of life. Savings are much higher –between $533 billion and $850 billion– taking into account the individual perception of the value of lost life.
- Huge gains in the ability to prevent and treat many cancers have been achieved over the past decades, and these advances have led to reductions in costs. This means, at any given point in time, neither the costs of prevention nor cost of treatment should be taken as fixed.
- Investments that generate system-wide improvements benefit cancer but also accrue for other diseases, thereby spreading and reducing per capita cost.
- The "economics of hope" foresees a future when drugs and other forms of treatment will become more accessible.

3.i. Introduction

Human life and well-being have intrinsic value, but also economic value, to individuals and countries. Viewing health as an investment, rather than a cost, is now the philosophy that inspires human, economic, and environmental development agendas. Still, this investment philosophy –with a few notable exceptions, described later in the report– remains largely ignored in the global and national policy-making that deals with cancer and other chronic illness.

Health is considered an investment, rather than a cost. This is now the philosophy that inspires human, economic, and environmental development agendas.

The World Economic Forum identified chronic disease (including cancer, diabetes, cardiovascular disease, and chronic respiratory disease) to be one of the three leading global economic risks.[1] This assessment by the Forum was based on the potential severity and likelihood of the impact of these diseases on global productivity and economic growth, as well as the risks posed to the entire economic system. Similarly, the World Bank highlights the negative economic effects of non-communicable diseases (NCDs) on country productivity and competitiveness, fiscal pressure, other health outcomes due to pressure on health systems, and on poverty, financial security, and inequity.[2]

The World Economic Forum identified chronic disease to be one of the three leading global economic risks.

The economic impact of NCDs on LMICs will become more severe over time, as a result of the increasing burden on younger and working-age populations. Although globally, the proportion of NCD deaths that occur among 15-59 year-olds is expected to fall globally by 2030, this proportion is likely to increase in LMICs. Further, LMICs are facing higher NCD burdens –age standardized NCD-related disability adjusted life years (DALYs) per capita– at lower levels of economic development, compared to high -income countries, while facing other challenges such as rising food prices.[3]

The economic impact of NCDs on LMICs will become more severe over time, as a result of the increasing burden on younger and working-age populations.

Tobacco is a huge economic risk for LMICs. Tobacco's estimated $500 billion* drain –mainly from tobacco-related illness and treatment costs– exceeds the total annual health expenditure of all LMICs. Tobacco's total economic costs reduce gross domestic product by as much as 3.6% per year. Further, the future does not portend well if trends in smoking continue. Between 2020-2030, the global annual economic costs of tobacco are expected to reach $1 trillion.[4]

Tobacco is a huge economic risk for LMICs. Tobacco's total economic costs reduce gross domestic product by as much as 3.6% per year. Further, the future does not portend well if trends in smoking continue. Between 2020-2030, the global annual economic costs of tobacco are expected to reach $1 trillion.

The WEF and WHO estimate potential income loss of $558 billion in China and $237 billion in India, between 2005 and 2015, due to stroke, heart disease, and diabetes, alone.[5] Overall, the economic losses due to loss of life and productivity are estimated to be as much as 400% higher than the costs of treatment. For the US, the $1 trillion in lost economic output from NCD, compared to $300 billion in health expenditures, suggests an avoidable impact on GDP of $700 billion.[6] In Egypt, the projected loss from the impact of NCD on the work force is placed at 12% of GDP.[7,8]

One study estimated that a 50% rise in chronic disease incidence and mortality, such as that projected for Latin America from 2002 to 2030, could produce a slowdown of more than 2% in annual economic growth.[9] This decline would widen the existing economic divide and the disparities between HICs and LMICs, as the increases in NCD mortality and morbidity would be concentrated in poor countries. The WHO notes that this projected economic burden dwarfs any level of burden seen in the past– including burdens due to malaria and HIV/AIDS.[10]

* All monetary values in this section are in $US.

A variety of studies demonstrate the impact of chronic illness on the economic well-being of families. NCDs, and especially cancer, increase the risk of catastrophic health expenditure, which in turn, increases the financial vulnerability of families and impairs their ability to invest in areas such as education and nutrition. In South Asia, the chances of catastrophic expenditures from hospitalization are 160% higher for cancer patients, compared to those with a communicable disease requiring hospitalization.[11] Both the patient and their family members are often forced to leave the labor force or reduce their hours of work. In Egypt, for example, people with NCDs have a 25% lower probability of being employed.[12] Further, the burden of care giving may fall especially heavily on women and girls, reducing both their labor force participation and their access to educational opportunities, thereby further exacerbating existing gender inequities.[13]

NCDs, and especially cancer, increase the risk of catastrophic health expenditure, which in turn, increases the financial vulnerability of families.

The burden of care giving may fall heavily on women and girls, reducing both their labor force participation and their access to educational opportunities, thereby further exacerbating existing gender inequities.

The WEF Global Risk Assessment Report also cautions against making shortsighted and misguided decisions about investing in health.[14] In the face of resource constraints, a short-term view would encourage LMICs to focus only on achieving the MDGs. Yet, failure to protect populations from preventable health risks will inevitably and severely detract from both economic development and social well-being.[15] Planning for chronic disease prevention and management must therefore be integrated into both health and economic development agendas, to reach beyond the existing MDGs and meet broader development goals. Indeed, ignoring NCDs places many countries at further risk of not meeting many of the MDGs because of escalating health costs and the health risks to mothers, infants, and young children.[16]

Chronic disease prevention and management must therefore be integrated into both health and economic development agendas. Indeed, ignoring NCD places many countries at further risk of not meeting many of the MDGs because of esca-lating health costs and the health risks to mothers, infants, and young children.

3.ii. The "avoidable" cancer burden

A significant proportion of the cancer burden is avoidable through prevention, early detection, and treatment. In addition, though difficult to measure, better access to pain control would alleviate tremendous suffering.

A significant proportion of the cancer burden is avoidable through prevention, early detection, and treatment.

Analysis of avoidable mortality assumes a goal for life expectancy of a population and identifies all deaths from specific causes that occur before that age. These deaths may be due to lack of prevention, or a lack of early detection and treatment. For this GTF.CCC Report, three scenarios of life expectancy are applied to a select group of cancers: 1) age of 65, which is often used in literature; 2) the highest average life expectancy for each cancer among countries in each income region; 3) age of 75, which is closer to high -income countries. The first scenario is a minimum attainable level; the second scenario can be considered what is feasible among countries in a similar income group;[17] the third scenario is the highest attainable standard of treatment in high -income countries.[18-20] The latter two scenarios correspond to an ideal of social justice.[21] Estimates consider only the cancers where prevention should have been possible, or where treatment, with or without earlier detection, might have resulted in either a cure or an increase in life expectancy.[22] The selection of cancers is based on earlier research[23-26] as well as on Sections 2 and 5 of this Report. Notably, the estimates include Kaposi's sarcoma – a cancer that could be prevented to the extent that HIV/AIDS can be prevented or managed. Each desired life expectancy scenario is applied to countries' income-group-specific, Globocan estimates of mortality for each cancer.[27]

Using "75 years of life expectancy" as the standard, an estimated 49% of cancer deaths are considered avoidable with prevention, early detection, and/or treatment. Setting the standard at the best performing countries in each income region, the figure is lower but still shows that 36% of deaths could be avoided. Even using the minimum standard of "65 years of life expectancy", the figure is 32%.

These estimates suggest there are 3.7, 2.7 and 2.4 million avoidable deaths from cancer, respectively, each year. LMICs account for approximately 80% of this avoidable mortality in each life expectancy scenario.

There is a clear gradient from low- to high -income countries in the proportion of avoidable deaths. A much larger proportion of deaths in LMICs are avoidable –approximately twice as many in low- as in high -income countries– and many are associated with infection-related (see Section 2). Still, the proportion of avoidable deaths from prevention and treatment is considerable, even in high -income countries – between one-fifth and one-third of deaths. Using the age-of-75 definition, 60%, 57%, and 48% of all cancer mortality is avoidable in low-, lower-middle-, and higher-middle -income countries, respectively, compared to 35% in high -income countries.

Between 2.4 and 3.7 million avoidable deaths from cancer occur each year. LMICs account for approximately 80% of this avoidable mortality.

Depending on the income region, 50-60% of cancer mortality in LMICs is avoidable, compared to 35% in high -income countries.

Figure 1

Avoidable Cancer Mortality, by Income Region

		Scenario 1: Normative minimum (LE*: 65 years)		Scenario 2: Feasibility (LE*: Best in each income region)		Scenario 3: Social justice (LE*: 75 years; close to LE of high -income countries)	
		% of all avoidable deaths	% of deaths considered avoidable as a % of all cancer deaths	% of all avoidable deaths	% of deaths considered avoidable as a % of all cancer deaths	% of all avoidable deaths	% of deaths considered avoidable as a % of all cancer deaths
Low income	%	11.5	46.5	11.6	52.0	9.7	60.2
	Number of deaths	277,480		310,090		358,969	
Lower middle income	%	56.4	38.7	56.7	43.5	53.6	56.5
	Number of deaths	1,356,424		1,522,597		1,978,640	
Upper middle income	%	14.8	30.1	14.6	33.2	15.3	47.8
	Number of deaths	355,653		392,243		564,960	
High income	%	17.3	18.5	17.1	20.5	21.4	35.2
	Number of deaths	414,787		458,652		788,532	
Global	%		32.0		35.7		49.1
	Number of deaths	2,404,344		2,683,583		3,691,101	

* LE: Life Expectancy.
Estimates Knaul y Arreola-Ornelas (2011) based on GLOBOCAN 2008 data. Metodology: Tobias y Jackson, 2001; Franco-Marina, Lozano, et al., 2006; and Castelli A, Nizalova O, 2011.
http://gtfccc.harvard...page420088.
http://gtfccc.harvard.edu/icb/icb.do?keyword=k69586&pageid=icb.page420088.

Many deaths due to cancers that strike children and young adults –notably cervical cancer, testicular cancer, and certain leukemias and lymphomas– can be avoided with relatively low-cost treatment or prevention options (see Sections 5 and 7). These cancers account for many potential years of healthy life lost. Wealthy countries have been able to prevent many of these deaths, while lower income countries have not. These "candidate" cancers make ideal targets for advocacy and action in LMICs.

Deaths due to cancers that strike children and young adults account for many years of healthy life unnecessarily lost. Wealthy countries have been able to prevent many of these deaths, while lower income countries have not. These "candidate" cancers make ideal targets for advocacy and action in LMICs.

3.iii. The economic value of investing in CCC

Each year, nearly 13 million estimated new cases of cancer in the world result in enormous economic cost and as human suffering.[28,29] As discussed above, much of the cost could be avoided by expanding coverage for prevention, early detection, and treatment. While this implies additional investments, these investments would be more than counterbalanced by reductions in the economic toll caused by the disease.

Investment in expanding coverage for prevention, early detection, and treatment would be more than counterbalanced by reductions in the economic toll caused by the disease.

Human life and well-being have an intrinsic and immeasurable value. They also have an economic value, which can be measured by the income individuals would have generated if they had lived, their lost contributions to family and community, and the value they place on well-being. The economic consequences of each cancer case include the direct and indirect costs of treatment, the income forgone by patients and families unable to work during treatment, and, more importantly in economic terms, the productivity lost due to premature death and disability. Broader estimates of economic consequences also, and appropriately, seek to take into account the losses from catastrophic health spending that undermine the economic stability of families, as well as perceived costs of human suffering.

The annual, global economic cost of new cancer cases has been estimated at $(2010) US 310 billion in other studies.[30] Of this, 53% ($164 billion) is due to medical costs, and 24% to productivity losses due to time spent in treatment and disability associated with treatment. The remaining 23% is attributed to the time of caregivers and the cost of transportation to treatment facilities.

The total global economic cost of premature death and disability from cancer has been estimated at $(2010) 921 billion.[31] This figure, from earlier research studies, is based on DALYs for 17 categories covering all cancer sites.[32]

The total annual economic cost of cancer, considering premature death and disability, is close to $(2010) US 1.16 trillion, which is approximately 2% of total global GDP. According to a study from the Harvard School of Public Health, using a Value of Statistical Life approach, it is $2.37 trillion.

Combining these two estimates and taking into account overlap, the total annual economic cost of cancer is close to $(2010) 1.16 trillion, which is approximately 2% of total global GDP. This cost represents the sum of lost DALYs (losses due to death and disability), the cost of one year of treatment, direct treatment costs, an estimated cost of prevention of 7% of total treatment costs,[33] time of caregivers during the treatment year, and costs of transportation to treatment facilities.[34] The figure of $1.16 trillion underestimates total costs for many reasons. In particular, it does not include the substantial longer-term costs to families and caregivers, which are not directly related to the period of treatment.

Using a Value of Statistical Life (VSL) approach that accounts for the value that individuals place on lost income, out-of-pocket spending on health, and pain and suffering, in 2010, the total estimated value of lost income totaled $2.5 trillion. Of

this, close to $1.7 trillion corresponds to high -income countries, and $800 billion to LMICs.[35] To arrive at a VSL figure for cancer net of costs, it is necessary to account for out-of-pocket health spending by families that might be considered part of the cost of care. Subtracting off the out-of-pocket spending by families, the VSL estimate of cancer is $2.37 trillion.[36]

The economic value of human life exceeds, for all estimates, the cost of CCC. Investing in CCC yields an annual return on prevention and treatment of between 1.5:1 and 3.7:1, applying the optimistic estimate of avoidable deaths of 49%, and using the VSL figures less out-of-pocket spending. The return is between 1.1:1 and 2.8:1, using 36% as the estimate of avoidable deaths and the estimated value of lost DALYs. The driving factor in these calculations is the value of lost years of healthy, productive life to both the economy and the individual.

In other words, a reasonable estimate of what the world could have saved in 2010, based on the economic value of lost DALYs and by investing in CCC, is $131 billion. Estimated savings is much higher –between $850 billion and $543 billion– taking into account the individual perception of the value of lost income and suffering (VSL).[37]

A reasonable estimate of what the world could have saved in 2010, based on the economic value of lost DALYs and by investing in CCC, is $131 billion. Estimated savings is much higher –between $850 billion and $543 billion– taking into account the individual perception of the value of lost income and suffering.

Further, estimates of the total value of lost output from cancer, based on macro-economic modeling for 2011 to 2030, show a cumulative loss of $2.9 trillion to LMICs and of $5.4 trillion for high -income countries.[38] The same study shows that between 2011 and 2030, NCDs –including cancer, CVD, chronic respiratory disease, diabetes, and mental health– represent a global, cumulative output loss of up to $47 trillion, based on macroeconomic models.[39]

Findings from a WHO study indicate that the price tag for scaled-up implementation of a core set of NCD "best buy" intervention strategies, is comparatively low. The cost of reducing risk factors such as tobacco and harmful alcohol use is estimated at $2 billion per year, for all LMICs – less than $0.40 per person. Including a limited set of individual-based NCD "best buy" interventions –in the case of cancer, Hepatitis B immunization to prevent liver cancer, and measures to prevent cervical cancer– the cost increases to $9.4 billion per year. Overall, this amounts to an annual per capita investment that is less than $1 in low -income, $1.50 in lower-middle -income, and $3 in upper-middle -income countries.[40]

Future studies should evaluate the expected rate of return on investments in prevention, treatment, and control of NCD. These calculations should take into account the many opportunities for shared investments across diseases (see Section 4).

3.iv. "Optimalizing" costs and benefits

Both costs and benefits of interventions can change over time, or can be changed by taking advantage of markets. This suggests asking how much prices or costs would need to decline or how much expected benefit would need to increase, for an intervention to be adopted within a health system.

The costs of neither prevention nor treatment should be taken as fixed over time. Thus, the $310 million price tag on the total cost of prevention and treatment for cancer care for incident cases is highly permeable, even with the increasing costs of new technologies and drugs. New discoveries can reduce costs and increase the options for implementing cost-effective interventions (see Section 7).

The last decades have witnessed huge improvements in the prevention and treatment of some cancers.[41] Further, prices of prevention and treatments –most recently the HPV vaccine– and the associated costs of delivering them, have declined substantially. Similarly, there have been reductions in the time spent and in the symptoms and after-effects suffered by patients in treatment, as well as in the distances patients must travel to get care.

Prevention is clearly the most desirable outcome for any cancer, from both the economic and the human perspective. Effective prevention and early detection avoids unnecessary morbidity and mortality, and thereby helps reduce costs and achieve significant savings. WHO recommends a series of "best buys" that are high-impact and cost-effective, even in the poorest countries.[42,43] Many of these interventions will affect a number of NCDs simultaneously. Reduced consumption of tobacco is the most obvious example.

Prevention is clearly the most desirable outcome for any cancer, from both the economic and the human perspective.

In practice, the dimensions and boundaries of prevention and treatment are fluid. Cancers such as those of the liver and cervix, once amenable only to early detection or treatment, can now be prevented. Hence, estimates of future costs of cancer care may be overstated as science progresses and identifies new options for prevention that are less-costly than treating cancer. Further, the costs of care for several prevalent cancers like breast, colorectal, and cervical –and hope for cure– depends on the stage in which they are diagnosed.

Text Box 3.1
The economic benefits of early detection and prevention: cervical, breast and colorectal cancer

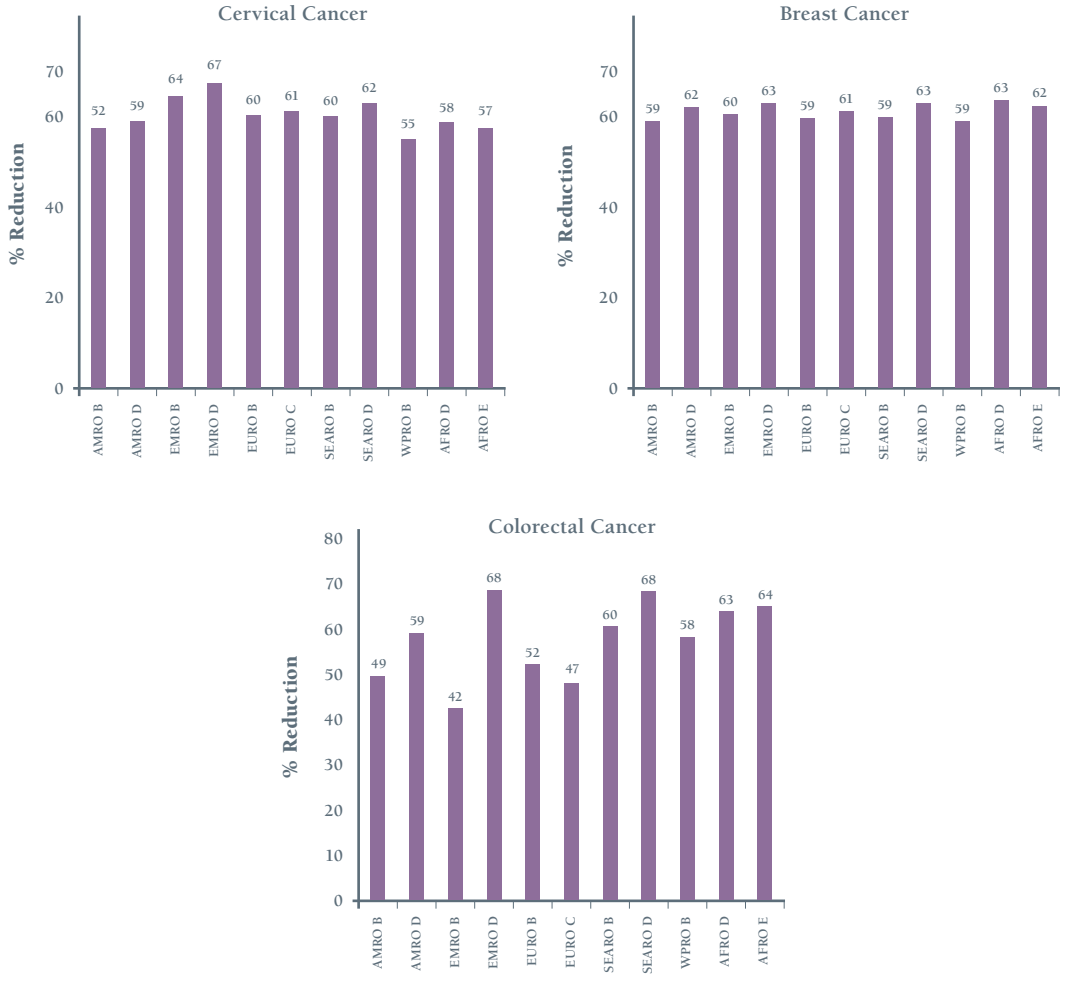
A background study for this Report analyzed total economic cost –including medical costs and DALYs averted– for cervical, breast, and colorectal cancers across WHO regions, comparing a "prevention + early detection + treatment" strategy with a "treatment only" strategy (with no early detection or prevention).[44] The study draws on existing literature and reconfirms that cost savings are significant with the preventive scenario,[45] compared to the non-prevention scenario, in all WHO regions.

Results coincide with studies that recommend implementing vaccination for HPV –depending on cost per dose and duration of efficacy– and global screening programs to reduce the burden of disease from cervical cancer.[46] For cervical cancer, prevention (3-dose vaccination plus screening with PAP and coloposcopy) represents a 55% to 65% saving, with the greatest savings in WHO regions where the HPV type 16/18 is most widespread. The total economic cost of cervical cancer-medical costs and the value of DALYs lost- is significantly higher than the cost of prevention and early detection, especially in WHO regions where the HPV type 16/18 is most widespread.

The results are similar for colorectal and breast cancer. Prevention of colorectal cancer (sigmoidoscopy every 5 years, for every person between 50 and 80 years, and, if positive, colonoscopy and lesion removal), is cheaper than the scenario of treatment with no investment in early detection. The figures vary substantially, from 40% to close to 70% For breast cancer, the economic saving of the prevention-plus-treatment-scenario, is approximately 60%, across all regions (without considering the cost of Herceptin).

Figure 2

Economic Costs of "Prevention/Early Detection/Treatment" Compared to "Treatment Only" Scenarios for Cervical, Breast and Colorectal Cancers; by WHO Geographic Regions



Notes:

1. Based on Seinfeld J., Beltran A. and Morocho E. (2011). "Cost-benefit analysis of cancer care and control: The case of cervical, colorectal and breast cancer in LMIC". Centro de Investigación de la Universidad del Pacífico. Lima. Forthcoming. GTF.CCC/HGEI working paper http://gtfccc.harvard.edu/icb/icb.do?keyword=k69586&pageid=icb.page420088
2. For each cancer type, the bar graph represents the cost savings -medical costs and DALYs averted- from prevention, early diagnosis and treatment when necessary, versus just treating the cancer.
3. The results are based on a disease and protocol model for each cancer type. Then, cost information was used for a person-typr for each WHO region. Information on DALYs provided by WHO where also considered.
4. WHO classifies Member States into 6 geographic regions: AFRO (Africa), AMRO (Americas), EMRO (Eastern Mediterranean), EURO (Europe), SEARO (South-East Asia) and WPRO (Western Pacific). These 6 WHO regions are also divided based on patterns of child and adult mortality in groups ranging from A (lowest) to E (highest).

Source data:

1. Ginsberg G. M., Tan–Torres T., Lauer J. A. and Sepulveda C. (2009). "Screening, prevention and treatment of cervical cancer–A global and regional generalized cost–effectiveness analysis".
2. World Health Organization (2008). "The global burden of disease: 2004 update".

The cost of prevention will likely also decline over time. With existing screening technologies, certain cancers can be detected either in pre-cancerous stages or at stages early enough to almost guarantee cure. While screening for many cancers is costly, innovation can reduce costs.

Resource stratification techniques offer options for selecting the most appropriate interventions for the level of resources and the development of each country. To date, a complete analysis and effective tools are available only for breast cancer and a complete analysis should be undertaken for other cancers.[47]

Resource stratification techniques will assist countries to select the most appropriate interventions for their level of resources and development.

The diagonal approach[48,49] –presented in Section 4 of this Report– is an "optimalist" strategy that calls for the identification of the horizontal applications and vertical interventions that spread costs and benefits, and decrease the cost-effectiveness ratio for many services. Synergistic investments that generate system-wide improvements are possible, and benefits apply not only for cancer, but also for other diseases and population groups. For these interventions, costs are spread across diseases and population groups, reducing unit costs. A simple example recently highlighted in the literature, is pulse oximeters, which are used extensively in surgery.[50]

Horizontal applications of vertical interventions spread costs and benefits across diseases and population groups, and decrease the cost-effectiveness ratio.

With prevention, the fact that some diseases share common risk factors, can lead to important savings. For example, smoking and diet are risk factors for both cancer and cardiovascular disease. This means that the return on investment for prevention and health promotion is higher when more than one NCD is considered. This "diagonal approach" to prevention and health promotion is particularly important for LMICs that have higher cost constraints.

Spreading prevention and health promotion across NCD using a diagonal approach is particularly important for LMICs that have higher cost constraints.

Innovative delivery solutions –such as working with community health workers, nurses, and primary care physicians– can lead to the most effective use of human and physical resources, and to lower costs. Further, effective use of information and communication technology can expand the boundaries for providing high-quality care, and reduce its price. (see Section 6).

The cost of producing and delivering drugs can drop, as shown by the experience with ARVs for HIV/AIDS and MDR-TB among others, and prices can be reduced. This is true even for drugs that are off-patent as LMICs often pay higher prices than larger purchasers. The GAVI-spurred 96% drop in the price of the HPV vaccine in June 2011, from $120 per dose in 2006 to $5, is a recent and notable example. Earlier, the PAHO Revolving Fund garnered an 88% reduction to $14 per dose. While still unaffordable for many countries, this price reduction marks a huge step forward, and was accomplished in only half a decade (see Section 7).

New techniques for marketing and packaging agents, such as oral chemotherapy or patches for pain relief, can ease production, transportation, and provision of care. Expanding demand is one way to drive down prices. Pooled purchasing, negotiated rates for low -income countries, and frugal innovation are other interventions that can help reduce prices. Further, many older variants of drugs and inputs are only marginally less effective, yet far less costly than new front-line technologies and medications. Finally, pooling funds can generate more secure financing for population groups, reducing the prices for individual patients. All of these options are discussed in greater detail in the next section of the report.

The cost of producing and delivering drugs can drop, as shown by the experience with ARVs. In addition, better techniques for marketing and packaging agents, such as oral chemotherapy, can ease provision of care, reducing the costs faced by patients.

Often ignored, are the positive economic benefits that accrue from establishing CCC systems for cancer. These include increased local employment for health care personnel and expanded local industries.

Non-medical costs account for almost 50% of total costs of cancer treatment and must be considered when seeking to reduce the costs of investing in CCC.[51] For example, families spend large sums to pay for transport, lodging, and child-care during treatment, often for the patient and a friend or family member. Bringing care closer to home through task and infrastructure shifting, as described in Section 6, can reduce costs faced by patients. Many trips are made for adjunct therapy, which could be provided in a nearby clinic or secondary level hospital. Further, innovation in prevention and early detection can reduce the number of visits by combining interventions and using mobile units.

For similar reasons, effectiveness cannot be taken as a given. Innovations in delivery and financing can increase DALYs averted and the effectiveness of interventions, even if unit costs remain unchanged. Scientific innovations for preventing and treating cancer, while often costly, emerge quickly, changing both the field and the cost structure.

3.v. Conclusions

Given the huge and avoidable suffering caused by cancer, meeting the unmet need for CCC in developing countries, is a moral imperative. From an economic standpoint, expanding prevention, detection, and treatment of cancer yields benefits that far exceed the costs. These economic benefits could be much greater if the potential cost savings from innovative delivery and financing, combined with more equitable pricing of drugs and other therapies, could be achieved. A future where drugs and other forms of treatment become more accessible to patients and health systems in LMICs, is one that represents the "economics of hope."

Scientific innovations for preventing and treating cancer, while often costly, emerge quickly, changing both the field and the cost structure. The "economics of hope" suggests a future where prevention and treatment become more accessible to patients and health systems in LMICs.

References

1. World Economic Forum. Global Risks 2010: A global risk network report: Global Risk Network of the World Economic Forum. 2010.
2. Nikolic IA, Stanciole AE, Zaydman M. Health, Nutrition and Population (HNP) Discussion Paper: Chronic Emergency: Why NCDs Matter. The International Bank for Reconstruction and Development. World Bank. 2011.
3. Ibid.
4. Shafey O, Eriksen M, Ross H, Mackay J. The Tobacco Atlas, Third Edition. American Cancer Society. 2009. http://www.tobaccoatlas.org/downloads/TobaccoAtlas_sm.pdf (accessed September 27, 2011).
5. World Health Organization. Global Status Report on noncommunicable diseases 2010. World Health Organization. 2011.
6. DeVol R, Bedroussian A, et al. An Unhealthy America: The Economic Burden of Chronic Disease. Charting a New Course to Save Lives and Increase Productivity and Economic Growth. Santa Monica: Milken Institute. 2007.
7. Rocco L, Tanabe K, Suhrcke M, Fumagali E. Chronic Diseases and Labor Market Outcomes in Egypt. Policy Research Working Paper 5575. Washington DC: World Bank. 2011.
8. Nikolic IA, Stanciole AE, Zaydman M, 2011.
9. Stuckler D. Population Causes and Consequences of Leading Chronic Diseases: A Comparative Analysis of Prevailing Explanations. ***The Milbank Quarterly*** 2008; 86(2): 273-326.
10. World Health Organization. Global Status Report on noncommunicable diseases 2010, 2011.
11. Engelgau MM, El-Saharty S, Kudesia et al. Capitalizing on the Demographic Transition: Tackling Noncommunicable Diseases in South Asia. The International Bank for Reconstruction and Development. World Bank. 2011.
12. Rocco L, Tanabe K, Suhrcke M, Fumagali E, 2011.
13. Nikolic IA, Stanciole AE, Zaydman M, 2011.
14. World Economic Forum. Global Risks 2010: A global risk network report: Global Risk Network of the World Economic Forum. 2010.
15. Ibid.
16. World Health Organization. Global Status Report on noncommunicable diseases 2010. World Health Organization. 2011.
17. Another option is to use the average or median life expectancy in the region. This might be closer to feasibility given the large range of incomes and conditions in each group of countries and is will be part of future analysis.
18. Franco-Marina F, Lozano R, Villa B, Soliz P. La Mortalidad en México, 2000-2004 "Muertes Evitables: magnitud, distribución y tendencias". México, D. F. Dirección General de Información en Salud, Secretaría de Salud. 2006.
19. Nolte E, McKee CM. Does health care save lives? Avoidable mortality revisited. London: The Nuffield Trust. 2004.
20. Castelli A, Nizalova O. Avoidable Mortality: What it Means and How it is Measured. Centre for Health Economics (CHE) Research Paper 63. 2011. Acessed at http://www.york.ac.uk/media/che/documents/papers/researchpapers/CHERP63_avoidable_mortality_what_it_means_and_how_it_is_measured.pdf (accessed September 27, 2011).
21. The social justice approach assumes that people living in poorer countries should have the right to be able to achieve the same life expectancy as high -income countries, or at least what is feasible in the best-performing country in terms of life expectancy in the income group to which a country belongs.
22. The cancer groups considered are: Stomach; colorectal; liver; lung; melanoma of the skin; breast; cervix-uterus; Hodgkin lymphoma; leukemias (in children); larynx, oral cavity and pharynx; thyroid; bladder; prostate; KS; endometrial; and, non-hodgkin lymphoma. The calculations were also undertaken excluding the last five categories with similar patterns of results.
23. Gispert R, Serra I, Barés MA, Puig X, Puig A, Freitas A. The impact of avoidable mortality on life expectancy at birth in Spain: changes between three periods, from 1987 to 2001. ***Journal of Epidemiology and Community Health*** 2008; 62: 783-789.
24. Gómez-Arias RD, Nolasco Bonmatí A, Pereyra-Zamora P, Arias-Valencia S, Rodríguez-Ospina FL, Aguirre DC. Diseño y análisis comparativo de un inventario de indicadores de mortalidad evitable adaptado a las condiciones sanitarias de Colombia. ***Revista Panamericana de Salud Pública*** 2009; 26(5): 385-97.
25. Humblet PC, Lagasse R, Levêque A. Trends in Belgian premature avoidable deaths over a 20 year period. ***Journal of Epidemiology and Community Health*** 2000; 54: 687-691.
26. Weisz D, Gusmano MK, Rodwin VG, Neuberg LG. Population health and the health system: a comparative analysis of avoidable mortality in three nations and their world cities. ***European Journal of Public Health*** 2007; 18(2): 166-172.
27. A more detailed description of the methodology and cancer-specific estimates are provided in a background note. Knaul F, Arreola H. Estimates of avoidable cancer deaths by country income. 2011. http://gtfccc.harvard.edu/icb/icb.do?keyword=k69586&pageid=icb.page420088 (accessed September 27, 2011).
28. Beaulieu N, Bloom D, Bloom R, Stein R. Breakaway: the global burden of cancer – challenges and opportunities. Economist Intelligence Unit. 2009.
29. John RM, Ross H. Economic value of disability-adjusted life years lost to cancers, 2008. http://media.marketwire.com/attachments/EZIR/627/18192_FinalJournalManuscript.pdf (accessed September 27, 2011).
30. The estimates of new cases are for 2009 and the economic value is brought forward to 2010. New cases in 2010 are not included in these figures due to lack of data.
31. The estimates of DALYs are for 2008 and the economic value is brought forward to 2010. Increases in incident cases between years due to population growth and trends in cancer incidence are not included in these figures due to lack of data.
32. The John and Ross (2011). Study placed DALYs were placed into World Bank income groups and gave a fixed economic value for a year of healthy life by multiplying by average GDP per capita in 2008 USD. While these are accepted methodologies, future research needs to monetize DALYs using alternate approaches and re-examine the total economic burden. For example, consistent with the social justice approach as described above, one could monetize DALYs by using a standard, global average income per capita figure which is higher for high -income countries and perhaps reflects a more just estimate of the value of work.
33. 7% corresponds to proportion of total health spending that Canada spends on prevention based on data from OECD. OECD Stat Extracts. 2010. http://stats.oecd.org/Index.aspx (accessed September 27, 2011).
34. The year of lost productivity due to treatment is subtracted out to avoid double counting. The estimate of prevention assumes a zero cost for KS because the cost of preventing HIV/AIDS is considered part of other programs that are not directed at cancer specifically.
35. Bloom DE, Cafiero ET, Jané-Llopis E, et al. The Global Economic Burden of Non-communicable Diseases. Geneva: World Economic Forum. 2011.
36. Out of pocket spending on health tends to be over 50% in many LMICs. In some countries it can be much higher. In order to avoid any bias, an exaggerated estimate of 80% is used for these calculations.
37. A more detailed description of the methodology and cancer-specific estimates are provided in a background note. Knaul and Arreola (2011). Estimates cost of treatment versus productivity losses from cancer: literature review and sensitivity analysis. http://gtfccc.harvard.edu/icb/icb.do?keyword=k69586&pageid=icb.page420088 (accessed September 27, 2011).
38. Bloom DE, Cafiero ET, Jané-Llopis E, et al., 2011.
39. Ibid.
40. World Health Organization. From Burden to "Best Buys": Reducing the economic impact of non-communicable diseases in low- and middle -income countries. World Health Organization. 2011. http://www.who.int/nmh/publications/best_buys_summary.pdf (accessed September 27, 2011).
41. Mukherjee S. The emperor of all maladies: a biography of cancer. New York: Scribner; 2010.
42. World Health Organization. Global Status Report on noncommunicable diseases 2010. World Health Organization. 2011.
43. World Health Organization. From Burden to "Best Buys": Reducing the economic impact of non-communicable diseases in low- and middle -income countries. World Health Organization. 2011. http://www.who.int/nmh/publications/best_buys_summary.pdf (accessed September 27, 2011).
44. Seinfeld J, Beltran A, Morocho E. Background paper: Cost-benefit analysis of cancer care and control: The case of cervical and colorectal cancer in LMIC. 2011.
45. Groot MT, Baltussen R, Uyl-de Groot CA, Anderson BO, Hortobágyi GN. Costs and health effects of breast cancer interventions in epidemiologically different regions of Africa, North America, and Asia. Breast Journal. 2006;12(1):81.
46. Ginsberg G, Edejer TT, Lauer JA, Sepulveda C. Screening, prevention and treatment of cervical cancer – A global and regional generalized cost-effectiveness analysis. ***Vaccine*** 2009; 27(43): 6060-6079.
47. Anderson BO, Yip CH, Smith RA, Shyyan R, Sener SF, Eniu A, et al. Guideline implementation for breast healthcare in low income and middle income countries. Cancer. 2008;113(S8):2221-43.
48. Sepúlveda J, Bustreo F, Tapia R, et al. Improvement of child survival in Mexico: the diagonal approach. ***Lancet*** 2006; 368(9551): 2017-2027.
49. Frenk J. Bridging the divide: global lessons from evidence-based health policy in Mexico. ***Lancet*** 2006; 369(9539): 954-61.
50. Kirby T. Pulse oximeters breathe life into surgery in poorer nations. ***Lancet*** 2011; 377(9759): 17-18.
51. Beaulieu N, Bloom D, Bloom R, Stein R. Breakaway: the global burden of cancer – challenges and opportunities. The Economist Intelligence Unit. 2009.

Much could be done

Much could be done

Part II

Health System Stengthening and Cancer: a Diagonal Response to the Challenge of Chronicity

Section 4

Section 4

Health System Stengthening and Cancer: a Diagonal Response to the Challenge of Chronicity

Key messages

- The classifications of disease by poor/rich, communicable/non-communicable, or acute/chronic detract from efforts to strengthen health systems in low and middle income countries (LMICs) to meet the challenges of chronic illness.
- Focusing on the chronic nature of many communicable and non-communicable diseases (e.g. HIV/AIDS) provides a point of reference for reinventing health systems.
- Cancer, a set of many diseases, several of which originate from infection or develop in patients with underlying disease of communicable origin, provides an example of the overlap between communicable and non-communicable disease.
- Health systems must be reformulated; originally designed to respond to acute illness, they now tend to deal with chronic disease as a series of unrelated episodes, and fail to provide a continuum of care.
- Strong health systems are essential to prevent and treat cancer effectively. At the same time, expanding cancer care and control (CCC) can strengthen health systems by producing synergies and opportunities that will benefit other chronic illness as well as basic primary care.
- A diagonal approach generates mutual reinforcement between CCC, on the one hand, and health system strengthening, on the other. This approach simultaneously addresses health systems' goals and deals with specific disease.
- Health system innovations must encompass the six overlapping components of the CCC continuum by developing integrated programs for primary prevention, early detection, diagnosis, treatment, survivorship and long-term follow-up, and palliation.
- The response to cancer can serve as a tracer of performance in each health system component.

4.i. Introduction

Health systems in LMICs must be reinvented in order to respond to the growing burden of cancer and other chronic illness. This requires rejecting the either-or, minimalist model of treating only specific, communicable diseases in favor of an "optimalist" approach, which seeks synergy among different health priorities to respond to patient needs.

The 2010 *Lancet* Series on chronic illness argued that investment in a systems approach to chronic diseases in LMICs, is strategic.[1,2] Effective interventions exist to address the growing burden of chronic diseases in LMICs,[3] but the weakness of national health systems often prevents them from providing this care. Yet, discussions and studies on how to strengthen health systems in LMICs rarely consider chronic illness or specific diseases. Similarly, research and policy around specific diseases seldom includes an analysis of the impact on health systems or of how to take better advantage of system-wide platforms.[4]

This Report of the GTF.CCC outlines a diagonal framework for health systems strengthening in LMICs, using cancer as a tracer condition for chronic diseases.[5,6] This framework emphasizes the challenges of chronicity and the diagonal interventions appropriate for each phase of the CCC continuum. The Task Force used this framework to guide this Report and to develop a set of recommendations that respond to cancer, one of the most challenging and complex chronic diseases to treat.

Health systems in LMICs must be reinvented in order to respond to the growing burden of cancer and other chronic illness.

4.ii. Changing disease patterns and the importance of chronicity in health system strengthening for cancer

The epidemiological transition, combined with new and more effective ways to prevent and treat disease, has transformed the meaning of several diseases. Diseases such as HIV/AIDS and several types of cancer –once considered a death sentence– are now chronic illnesses if treated appropriately.

Yet, conventional approaches to the health needs of the poor and the priorities for health systems have not moved at the same pace. As a result, the priorities traditionally used to define policies are increasingly irrelevant. Health care providers and policy makers are still taught to choose between so-called diseases of the rich and the poor, usually described as communicable versus non-communicable.

Similarly, the traditional differentiation between diseases of the poor and the rich no longer applies. What were previously considered 'problems of the poor,' are no longer the only problems of the poor.[7] A double and over-lapping burden of communicable and non-communicable disease now afflicts the poor, with a mix of acute episodes and chronic conditions. The response to these challenges requires a well integrated health system; not a system that provides fragmented and episodic care.[8,9] This transition has created new challenges to health in LMICs by combining the *unfinished* agenda of infections, malnutrition, and reproductive health problems with an *emerging* agenda of non-communicable and chronic illness. Further, the unfinished and untouched agendas overlap.

Poverty intensifies the burden of illness and generates a vicious cycle: loss of health ▸ lack of treatment ▸ higher morbidity ▸ lost income ▸ deeper impoverishment ▸ reduced health.[10] Chronic diseases such as cancer inflict repeated financial onslaught on families. As Nobel Laureate and economist Amartya Sen warns: "The poorest groups not only bear higher risks for non-communicable diseases but, once they develop a non-communicable disease, they also face higher health and economic impacts. The poor have less access to medical care, allowing non-communicable diseases to progress to advanced states resulting in higher levels of mortality and disability. Given their complexity and chronic character, medical expenditures for treatment of non-com-municable diseases are a major cause for tipping households into poverty."[11]

Diseases such as HIV/AIDS and several types of cancer – once considered a death sentence – are now chronic illnesses if treated appropriately.

"Problems of the poor" are no longer the only problems of the poor. The unfinished agenda of infections, malnutrition, and reproductive health problems combines and overlaps with an emerging agenda of non-communicable and chronic illness.

Another outdated dichotomy, which classifies diseases as communicable or non-communicable, refers to the transmission mechanism. Yet, patients are not confined to a single disease over a lifetime; they may suffer numerous communicable and non-communicable diseases, often simultaneously or consecutively.

Patients are not confined to a single disease over a lifetime; they may suffer numerous communicable and non-communicable diseases, often simultaneously or consecutively.

The distinctions between communicable and non-communicable disease, and between chronic and acute conditions, referring to the long-term or episodic care required, are increasingly blurred by scientific advances in both prevention and treatment, and in knowledge of the origin of disease. Some communicable diseases are chronic while some non-communicable diseases are acute (Section 4, Figure 1). Several acute infections, only some of which are communicable, generate long-term sequela. By contrast, some non-communicable diseases are characterized by acute exacerbations of underlying longer-term illnesses.

Risk factors add another layer of complexity to the communicable/non-communicable taxonomy. Some behaviors, notably smoking, alcohol consumption, and unhealthy eating, increase the risk of cancer and other non-communicable diseases. Further, these behaviors are beginning to be considered "communicable" across communities and countries.[12]

Cancer, although typically considered a non-communicable disease, is, in fact, a set of diseases,[13] many of which originate or are associated with an infection. Cancers associated with infection disproportionately affect poor populations, generating a set of endemic non-communicable diseases. Infectious agents are responsible for almost 25% of cancer deaths in the developing world, and only 6% in industrialized countries.[14] It is when primary prevention through vaccination, early detection, and treatment of certain infections fail that a disease becomes a cancer that behaves like a chronic illness. Another example that testifies to the inadequacy of current classifications, is HIV/AIDS. This is a communicable disease that today, thanks to wider access to effective treatment, must be managed as a chronic illness with an associated cancer – Kaposi's sarcoma.[15]

Although typically considered a non-communicable disease, cancer is, in fact, a set of diseases, many of which originate or are associated with an infection and disproportionately affect poor populations.

Further, several cancers are actually classified as acute, and the goal in many cancer cases is the cure and eradication of illness. Yet, the long-term nature of treatment and the issues of survivorship (see below) are chronic, and make cancer a chronic problem that requires appropriate health system response.

Figure 1

Characterization of Disease by Chronicity and Association with Infection

	Communicable or associated with infection	Non-communicable
Chronic	KS (HIV/AIDS); cervical cancer (HPV), hepatocellular carcinoma/liver cancer (hepatitis B); gastric cancer (H-pylori); bladder cancer, chronic pulmonary disease (schistosomiasis); tuberculosis Chronic sequelae of acute infections: physical disability (polio), Chagas' cardiomyopathy (Chagas'disease), rheumatic valvular disease (rheumatic fever), chronic kidney disease (streptococcus), brain disease (meningitis), blindness (measles), Burkitt's lymphoma (EBV, infectious mononucleosis)	Most cancers (e.g. breast, pancreas, lung, leukemia, most lymphoma, testicular, prostate, brain); most CVD; hypertension; diabetes Chronic disease with acute exacerbations: asthma, mental health disorders, chronic obstructive pulmonary disorder, congestive heart failure
Acute	Infectious diarrheal diseases, respiratory infections	Acute myocardial infarction Cancers: acute myelogenous leukemia, acute lymphoblastic leukemia in children, high grade lymphomas

With increasing life expectancy, living with disease is becoming more common, which makes chronicity a defining characteristic of illness in both rich and poor countries, whether or not the origin is infectious. New successes in treatment will continue to push more diseases from the realm of acute into the realm of chronic.

Efforts to strengthen health systems in LMICs must address the growing burden of chronic illness.[16,17] Yet, most health systems were originally designed to respond to acute episodes of illness, leading to either cure or death.[18,19] In the traditional "acute-repeat" model, chronic diseases are treated by health systems as a series of discrete, unrelated acute episodes rather than as a set of interrelated events that progress over time. Health care providers and policy makers are taught and encouraged to choose between so-called diseases of the rich and the poor, which are usually described as communicable versus non-communicable, or acute versus chronic. This approach fails to respond to the complexity of long duration, slow progression diseases with multiple acute complications, the likelihood of simultaneous diseases (co-morbidity), and the need for long-term treatment to alleviate symptoms, follow-up, and survivorship care.[20,21]

Chronicity adds a new dimension and set of challenges to care for a disease such as cancer. To the three standard dimensions for assessing coverage – who is covered, which services are covered, and with what degree of financial protection – chronicity adds a fourth: for which parts of the cancer care and control (CCC) continuum.

Even health systems in countries with innovative and comprehensive financing programs for cancer and other illness have failed to effectively deal with chronic conditions. Policy makers, particularly in LMICs, have few tools to guide their response to the long-term nature of chronic illness, both in general and to a specific disease like cancer. The few projects, policies, and tools that do exist, such as the Partners in Health, integrate chronic care with a focus on endemic non-communicable disease.[22] These need to be piloted, evaluated, and scaled up if proven to be effective.[23-25]

The artificial division of diseases as acute/chronic, communicable/non-communicable, or rich/poor diverts health systems from planning and organizing around the challenges represented by co-morbidity in individual patients, coexisting epidemiologic profiles in populations, and long-term rather than episodic care. A more appropriate model is one that makes optimal use of existing health system programs that respond to other health priorities (e.g. maternal, newborn and child health, HIV/AIDS, sexual and reproductive health) or broad, systemic functions (e.g. health financing). This model uses a diagonal approach that adapts to the chronic and overlapping nature of diseases with a set of linked policies and interventions that target the full spectrum, from prevention to palliation of specific diseases.

The diagonal approach to health systems strengthening is a strategy in which priority interventions force necessary improvements into the health system. Rather than focusing on disease-specific vertical programs or on horizontal initiatives that address generic system constraints, such as limited resources, a diagonal approach seeks to do both. The approach identifies interactions and synergies that build upon and interact with each other, providing an opportunity to tackle disease-specific priorities while addressing the gaps within a system.

Indeed, synergy should be a goal of high-performing health systems. A malfunctioning health system lacks synergy, and is governed by entropy.

Efforts to strengthen health systems in LMICs must address the growing burden of chronic illness. Living with disease is becoming more common, making chronicity a defining characteristic of illness in both rich and poor countries. New successes in treatment will continue to push more diseases from the realm of acute into the realm of chronic.

Policy makers in LMICs have few tools to guide their response to the long-term nature of chronic illness, both in general and to a specific disease like cancer.

The diagonal approach responds to the chronic and overlapping nature of diseases with a set of linked policies and interventions that target the full spectrum, from prevention to palliation of specific diseases.

Text Box 4.1
The diagonal approach:

Vertical programs focus on specific diseases, and often on only one aspect of care, such as prevention or early detection on a large scale, using a resource, information, and financing system that is managed separately from the rest of the health system and is frequently donor-driven. Vertical, disease-specific programs often do not interact with the larger health system.

Horizontal programming refers to resource-sharing across disease and population groups. Often, it is part of an effort to strengthen health systems. Typically, such efforts address system-wide constraints, such as shortages of trained health care workers, lack of financial protection, or inadequate information systems. Evidence suggests that, in practice, few (if any) programs are purely vertical or horizontal.[26] Typically, vertical and horizontal programs are system-wide with little intent to adapt to specific diseases or the CCC.

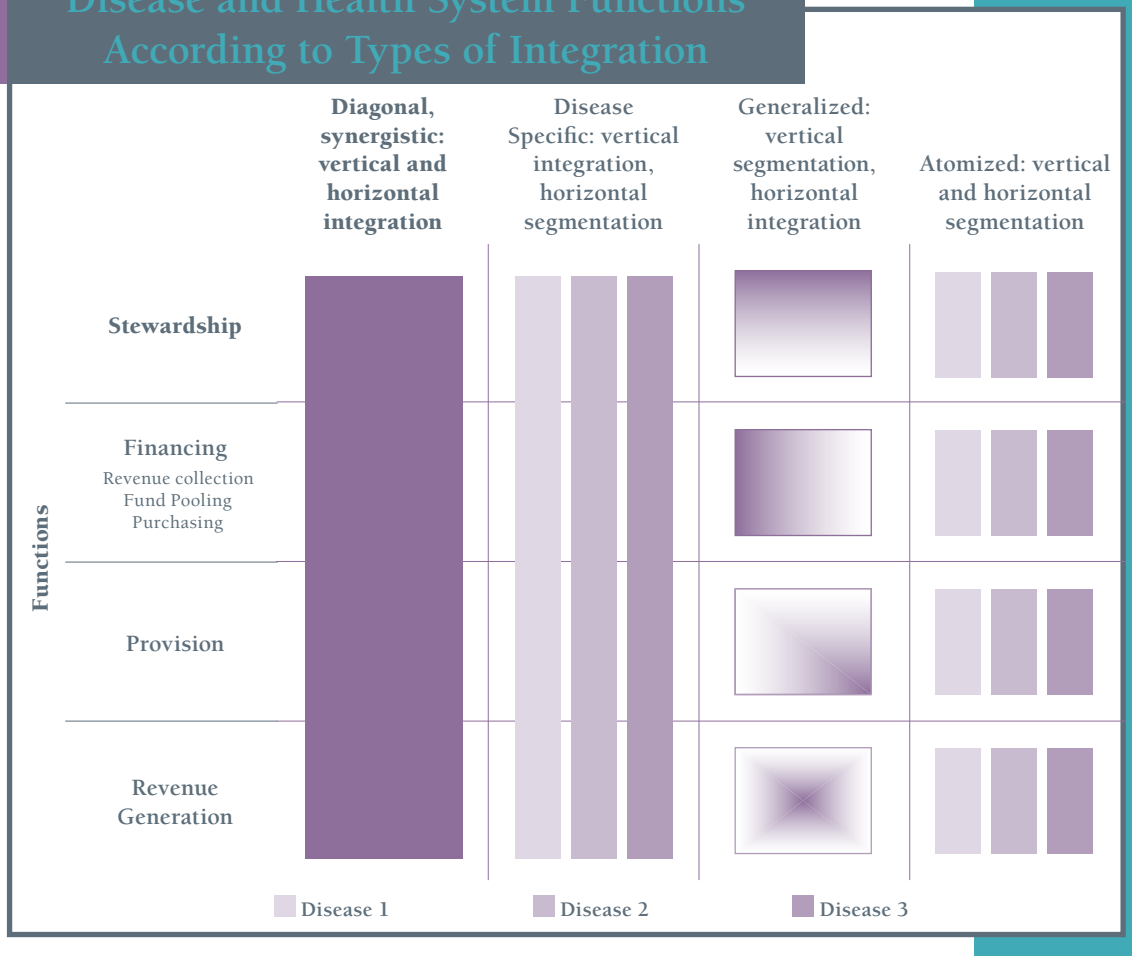
The literature on the diagonal approach and its application covers the past half-decade.[27-31] One example demonstrates how vaccination and child health programs can be integrated with large-scale anti-poverty and maternal, newborn and child health initiatives, to expand coverage within a broad-based program.[32]

Several authors propose approaches that are diagonal but not referred to as such. Extensive literature focuses on the integration of health services, including integrating NCD prevention and management into primary health care.[33,34] The Maximizing Positive Synergies Academic Consortium, for example, identified the benefits and many opportunities to create mutually reinforcing links between disease-specific global initiatives and health system strengthening.[35] This review also summarizes the areas of greatest risk for drawing resources away from other programs, and suggests ways to mitigate this problem. Finally, the 2010 Lancet Series on NCDs points out that when broader needs and benefits have been identified as goals from the outset, disease-specific investments have contributed to health system strengthening and population health improvements.[36] Rwanda, wherein stewardship has channeled HIV/AIDS investment into health systems strengthening, is an example.[37-39]

The vertical and horizontal integration of health system functions and disease programs can create the kind of interactions and synergies envisaged by the diagonal approach (Figure 1, Section 4).[40,41] The vertical-only model typifies the disease-specific approach that has been criticized for being duplicative and wasteful, weakening fragile health systems as it fails to take advantage of system-wide financing and service delivery.[42-46] The horizontally integrated model is also lacking, for it ignores the specialization that must be developed to treat specific diseases in each component of a health system. The purely horizontal model assumes an inappropriate "one-size-fits-all" approach. Even linkages between functions within disease-specific programs can be missed so that, for example, financing for cancer care may not align with service delivery. The most important limitation of this model is its failure to deal with the crucial policy goal of setting priorities.

Figure 2

Disease and Health System Functions According to Types of Integration



Source: Adapted from Murray and Frenk; WHO Bulletin, 2000.

The diagonal approach provides a cross-cutting and comprehensive framework that encompasses: (i) interrelationships between diseases; (ii) requirements for targeted approa-ches that correspond to individual diseases and place specific demands on health systems; and (iii) ways to manage interrelationships between diseases across health systems, to improve coverage for many diseases and population groups.

The diagonal approach takes advantage of complimentary interventions and optimizes use of resources. Providing coverage for a specific intervention for one disease can promote expanded coverage for other diseases and population groups. For example, improving the regulatory framework for opioids use, improves access for all patients who need pain control. Further, the diagonal approach requires new ways to analyze costs and benefits since an investment in controlling or treating one disease can affect other diseases, and improve overall cost-effectiveness. Finally, the diagonal approach encourages investment in public goods, and promotes coordinated and joint action across diseases.

Providing coverage for a specific intervention for one disease can promote expanded coverage for other diseases and population groups.

The diagonal approach emphasizes joint learning, collective action, and collaboration between the cancer community and other disease-specific groups to further the development of national and global public goods. This approach also applies to other NCDs and chronic communicable diseases like AIDS and TB, and is especially important because of the opportunities created by the 2010 United Nations General Assembly resolution on the prevention and control of non-communicable diseases.[47]

Joint learning, collective action, and collaboration between the cancer community and other disease-specific groups can further the development of national and global public goods.

Thus, a main hypothesis of this report is that diagonal programs can be developed and successfully applied to cancer. The report presents country cases and examples of how better prevention, early detection, treatment, survivorship, and palliation of cancer can strengthen health systems, reduce overall costs, and provide expanded access to prevention, treatment, and control of other diseases. Additional examples of integrated approaches are provided below.

Diagonal programs can be developed and successfully applied to cancer.

JUANITA PART 1:*

A hypothetical case study of late diagnosis turned into lessons for implementing a diagonal response

(See Section 6: Innovative delivery for Part 2 of Juanita's story)

Juanita's experience was one of late diagnosis, the need for more aggressive treatment, and a much higher chance of future relapse. Fortunately, all this is now changing as a diagonal approach for early detection has been integrated into strong programs for women and health, in Mexico. Juanita's story is a composite of the experiences of far too many women with breast cancer, in LMICs.

Juanita comes from the small town of Tilancingo, population about 650, located 3 hours by bus from the district hospital in Yautepec, State of Morelos, in Mexico. From Tilancingo, it is 3.5 hours by bus to the nearest tertiary-level hospital with a full-range of cancer diagnosis and treatment services. Juanita arrived at the women's hospital in Yautepec with a 6 cm lump in her left breast and lymphedema in her left arm. Mammography and biopsy confirmed the obvious diagnosis of locally advanced Stage III breast cancer.

Juanita is 42 and has 4 children (ages 23, 15, 11, and 5), all of whom were born in the local primary-care clinic with a physician at hand, and breast-fed. Juanita works six days a week, cleaning one of the local beauty salons and earning close to the minimum wage if she gets tips –about $US 80, per month. Her job is not covered by social security, and she is not paid for the days that she does not work. Juanita finished primary school, is literate, and she reads magazines and short books– especially at the salon where she works.

Due to her low income and having young children, Juanita is a beneficiary of the social welfare program, ***Oportunidades–*** *a conditional cash-transfer program that targets health, nutrition, and education. The program now covers 5.8 million poor households in Mexico, more than 22% of the population, and is available in almost all low -income municipalities of Mexico.*[48,49] *As part of* ***Oportunidades****, for many years, Juanita has attended monthly health promotion sessions at the local clinic. All of her children have an up-to-date health card, which is required to attend school and to participate in the* ***Oportunidades*** *program. Juanita has the women's health card, and hers has been regularly filled-out at the clinic. The card says that she does not need a mammogram – a term she is not familiar with, anyway – until age 50.*[50]

When she first realized she had the lump, nearly 2 years earlier, she went to see the physician at the primary health clinic who prescribed an antibiotic and sent Juanita home without a diagnosis or follow-up instructions. Mobile mammography vans had been to the town the previous year, but the test was offered only to women ages 50 and over. Younger women were encouraged to go to Cuernavaca, the State's capital, for routine testing or if they had particular concerns, but the trip meant losing a full day of work and so Juanita chose to not go.

As the lump grew, Juanita became more frightened – too frightened to act. A recent ***Oportunidades*** *health promotion session at the clinic was devoted to the early detection of breast cancer, and she had read a section in the orientation manual.*[51] *The health promoter spoke about 'knowing your own body' and told the women that if they ever found a "bolita"– a small lump – they should ask for a clinical examination. The session gave Juanita courage as the women were assured that the disease could be cured, and that they had access to free treatment through the new insurance program, Seguro Popular.*

Juanita asked to be examined and was referred to the district hospital. Unfortunately, what was a small lump when she first noticed it two years ago, had become a large mass encompassing much of her breast with obvious lymph node involvement in her armpit.

What could have been done better in detecting Juanita's breast cancer?

The health system failed to integrate early detection interventions into maternal and child health, sexual reproductive health, and anti-poverty programs. Early detection and prevention of cancer is not given sufficient emphasis in medical training programs. The physicians and nurses –mostly recent graduates doing a year of social service at the primary clinic– had received almost no training in breast cancer early detection. Instead, the focus of primary caregivers was on infections and what are considered to be more common ailments. Further, they were taught that breast cancer is a disease of much older and wealthier women – a mistaken and outdated belief since breast cancer is now the second leading cause of death in young women in Mexico.

Although the Ministry of Health provided materials and some training about breast cancer, that training did not reach these clinics. As well, for similar reasons, until 2009, ***Oportunidades*** *did not include breast cancer as one of the topics in the health promotion discussions, and no materials were made available to women. Finally, none of the local community organizations, several of which work to empower women, had any information on breast cancer. Although some civil society organizations do work on breast cancer, those organizations are mostly based in larger cities.*

Effective response through health system innovations:

Training about breast cancer for primary care health workers, including community promoters, is underway.[53] ***Oportunidades*** *now gives high priority to the topic of breast cancer in the manuals and guides provided to beneficiaries,*[54] *the age for free routine mammograms has been lowered to 40,*[55] *and NGOs are paying greater attention to increasing awareness, and less attention to providing direct services because of the expanded coverage offered through Seguro Popular since 2007 (see Sections 6 and 8 for more information). These concerted efforts will reduce the frequency of late detection of breast cancer and prevent many unnecessary deaths. Even so, two of every three women with breast cancer are diagnosed with late-stage disease.*[56,57]

* Juanita's story is based on the experience and information of a patient at the Women's Hospital of Yautepec, Morelos, México, interviewed by Felicia Knaul in Spring, 2010.

Applications of the diagonal approach to cancer across the CCC continuum

- ***Primary prevention – healthy lifestyles:***
  - *Tobacco control can help prevent certain cancers and reduce cardiovascular and respiratory diseases, and tuberculosis;*
  - *Obesity prevention can reduce risk of several cancers as well as diabetes and cardiovascular disease;*
  - *Hepatitis B vaccination can be integrated into existing immunization programs to prevent liver cancer;*
  - *HPV vaccination can be promoted in adolescent, sexual and reproductive, and maternal, newborn and child health programs to prevent cervical cancer;*
  - *Health promotion for the development of healthy lifestyles that allow for increased physical exercise and encourage healthy eating can reduce the risk of most NCDs.*

- ***Early detection – secondary prevention:***
  - *The integration of early detection programs for breast and cervical cancer into programs for women and health, anti-poverty, maternal, newborn and child health, sexual and reproductive health, and HIV/AIDS can broaden access to CCC.*

- ***Diagnostics and treatment:***
  - *Establishing the telecommunications needed – for highly-qualified radiologists to review images, dermatologists to examine skin lesions, pathologists to review pathology, or oncologists to remote-monitor reactions to adjuvant chemotherapy administered by primary care physicians where no oncologists are physically present – to improve access to CCC. Once these IT capabilities are in place, they can also be used to diagnose and treat other diseases and health conditions, as well as for training and capacity building.*

- ***Treatment:***
  - *Surgery is an important component of treatment for many cancers. Yet, pulse oximeters (see Text Box 7.2), an element of a safe-surgery that should form part of any checklist, are absent from most operating theatres in LMICs.[58-60] Ensuring the availability of good quality pulse oximeters globally is the goal of project LIFEBOX. Success with this project will improve the effectiveness of surgery for cancer as well as other diseases and conditions.*
  - *Establishing facilities in hospitals or primary care clinics to treat cancer patients, especially with chemotherapy, requires infection control because these patients have weakened immune systems. Stringent infection control procedures will benefit all patients by helping to reduce the incidence of infections acquired in health facilities.*

- ***Survivorship:***
  - *Cancer patients continue to be stigmatized. Efforts to reduce stigma through patient advocacy can empower communities to significantly reduce the stigma associated with other diseases like HIV/AIDS and tuberculosis, as well as stigma associated with gender and ethnicity. This will improve social cohesion and reduce the exclusion of marginalized populations.*

- ***Pain control and palliation:***
  - *Strengthening health systems and reducing price and other barriers to access to pain control medication is essential for cancer and many other diseases. It is also essential for being able to offer surgery.*

Text Box 4.2

Rwanda: Partners In health chronic care integration for endemic non-communicable diseases[61]

The Government of Rwanda considers health care a basic human right and its health care delivery system aims to serve all Rwandans, especially vulnerable populations. The country is aware of the emerging risk factors that accompany urbanization and has taken steps to expand access to integrated chronic care, to address the emerging problem of non-communicable diseases. In partnership with Partners In Health (PIH), the Rwanda Ministry of Health began to shift non-communicable disease services in East Province from central referral centers to district hospitals. This move builds on a stable, decentralized health system and the framework Rwanda began in 2003 for HIV/AIDS diagnostic care and antiretroviral therapy. In this framework, complex holistic health interventions are integrated into basic health services.

The Rwanda strategy is a model for delivering services for chronic conditions in resource-poor settings. The process of building this integrated chronic care infrastructure involves incremental decentralization of services from referral centers to district hospitals, to health centers, to community health workers. As the services move away from the referral centers, they become increasingly simplified and more integrated with similar services. Simplified diagnostic techniques based on local epidemiology are used to place patients into broad categories of disease that correspond with appropriate clinical pathways. This allows for a more effective use of specialist time, to evaluate patients to confirm diagnoses and to assess needs. While the initiative is still evolving, some goals and outcomes have been identified:

- *Each PIH-supported public district hospital has an advanced chronic care clinic that is staffed by two or three nurses. The physician's role includes overseeing initial consultations, consulting on complex cases, and meeting regularly with nurse program leaders to discuss work plans, budget, and evaluation. Every one or two months, specialists from referral centers visit to confirm diagnoses and to provide ongoing training.*
- *Transfers to referral centers can be reduced by providing high-quality services at district hospitals. Management of more advanced conditions can be moved away from tertiary facilities by developing clinical program leaders at the district level. Uncomplicated chronic care is provided at sites closer to patients' homes. Referral centers can focus on the services best delivered at the tertiary level, such as complex cases, specialized surgery, and chemotherapy.*
- *In settings with established and effective chronic care services, community-based screening may be a reasonable approach to increase case-finding. CHWs are the link between health facilities and patients, whether they are finding patients lost to follow-up or referring new cases.*
- *HIV/AIDS programs supported by PIH in Haiti and other countries have achieved exceptional patient retention and clinical outcomes. Building on the Rwandan CHWs system comprised of three CHWs in each village, the ministry of health and PIH have customized this model in East Province to address HIV/AIDS and other advanced chronic conditions such as heart failure, insulin-dependent diabetes, and malignancies. CHWs with additional training provide psychosocial support, administer medications, ensure adherence, and facilitate refills and clinic appointments through daily visits to patients.*
- *A chronic care team is designated to train and mentor health center clinicians in basic management of chronic conditions, to provide better coordination of chronic care services and program leaders. Team members serve as trainers and mentors for health workers across the country.*

Cancer requires interventions along the care-control continuum which includes primary prevention, secondary prevention or early detection, diagnosis, treatment, long-term follow-up and survivorship care, and palliation and end-of-life care.

4.iii. The CCC continuum and health system strengthening

Another defining characteristic of cancer, and many other chronic diseases, is the need for a series of interventions along the care-control continuum, which consists of overlapping phases: i) primary prevention, ii) secondary prevention or early detection, iii) diagnosis, iv) treatment, v) rehabilitation, long-term follow-up and survivorship care, and vi) palliation and end-of-life care (see Section 5).[62] Yet, few tools exist to take advantage of all aspects of health systems and respond to the entire continuum of care and control, either in general or specifically for cancer.

Text Box 4.3
Survivorship

The term "survivorship" is gaining ground –despite its relatively recent introduction– to refer to CCC in the long-term and the interventions that are not directly treatment-related.[63] It dates back to a 1985 article published in the ***New England Journal of Medicine****, written by a physician living with cancer.[64] The concept of survivorship and its application to health systems has become increasingly important, especially in the US, where, for example, the NCI created an office in 1996, dedicated to this issue.[65,66]*

The definition of survivorship has been evolving. Further, it must be continually redefined to be responsive the needs of patients and families as the standards and opportunities for care and for survival improve. While the term has been sometimes questioned and criticized as a US construct, this seems to be associated with the use of the word, 'survivor' whereas there is general acceptance of 'survivorship'.

Cancer survivorship is usually defined as beginning at the moment of diagnosis and continuing throughout the lifetime of the patient. Survivorship also includes the family, friends, caregivers, and loved ones who share the cancer experience.[67]

The introduction of the concept and the opportunities to respond to the corresponding needs of patients has been belated. Even in high income countries, health systems are struggling to make up for lost opportunities to integrate these services and respond to the longer-term needs of people who live with cancer. The concept of survivorship and hence the design of appropriate programs and policies is just beginning to be been used in LMICs. It is largely unknown, possibly because of the large proportion of patients who die from the disease soon after diagnosis. It will be important to integrate survivorship into efforts to build-up health systems in LMICs to respond to the challenge of cancer.

Survivorship implies constant struggle with a disease, years of healthy life with treatment, and active patient involvement in care. It also suggests the long-term nature of the struggle for patients and caregivers. Survivorship encompasses medical and non-medical aspects, including access to schooling, employment, and insurance coverage. As a stage of care, it focuses on issues relating to stigma that go beyond the health care system and can affect families. Survivorship poses different concerns when applied to children and chronic illness.[68]

Greater access to CCC in LMICs, and, consequently, to cure and healthy life with disease, will make it increasingly important to incorporate survivorship as part of care. There are currently more than 28 million cancer survivors worldwide, and people now diagnosed with cancer are increasingly likely to survive at least five years.[69]

The most effective way to expand survivorship care in LMICs, especially given the long-term nature of the disease, is through a diagonal approach that involves the primary care network as well as community-based programs. This approach will also help to reduce stigma and discrimination.

An effective CCC continuum requires strengthening of all health system functions –stewardship, financing, service provision, and resource generation– and all core components –health financing, governance, health workforce, health information, medical products and technologies, and health service delivery.[70-72] It also requires the engagement of all participants and stakeholders, including communities and the civil society.[73] Establishing effective delivery systems along the control care continuum involves the entire spectrum of care providers –from the expert patient and community health promoter, to the sub-specialty physician– in order to coordinate a combination of repeat-episodic and longer-term care.

Implementing effective prevention strategies, both primary and secondary, presents additional challenges and opportunities. A life-cycle approach for prevention often begins with a healthy childhood. Further, awareness of prevention strategies needs to be integrated into all programs for women, especially programs focusing on sexual and reproductive health. Effective prevention strategies for all cancers include education (teaching children about healthy lifestyles and encouraging young women to know their bodies, for instance); appropriate fiscal policy such as taxing tobacco, food and beverages; environmental and occupational safety measures; anti-discrimination policies and legislation to combat social exclusion; and agricultural and food policies that control pesticide use and promote healthy eating.[74]

Underlying social determinants affect approaches applied at every stage of the CCC continuum, just as they affect other aspects of health.[75] Gender discrimination, limited education, unhealthy living conditions, social exclusion, lack of decent employment, and social protection not only increase the risk of developing cancer but also reduce the ability of individuals and communities to access care and live with the disease, both during and after treatment.

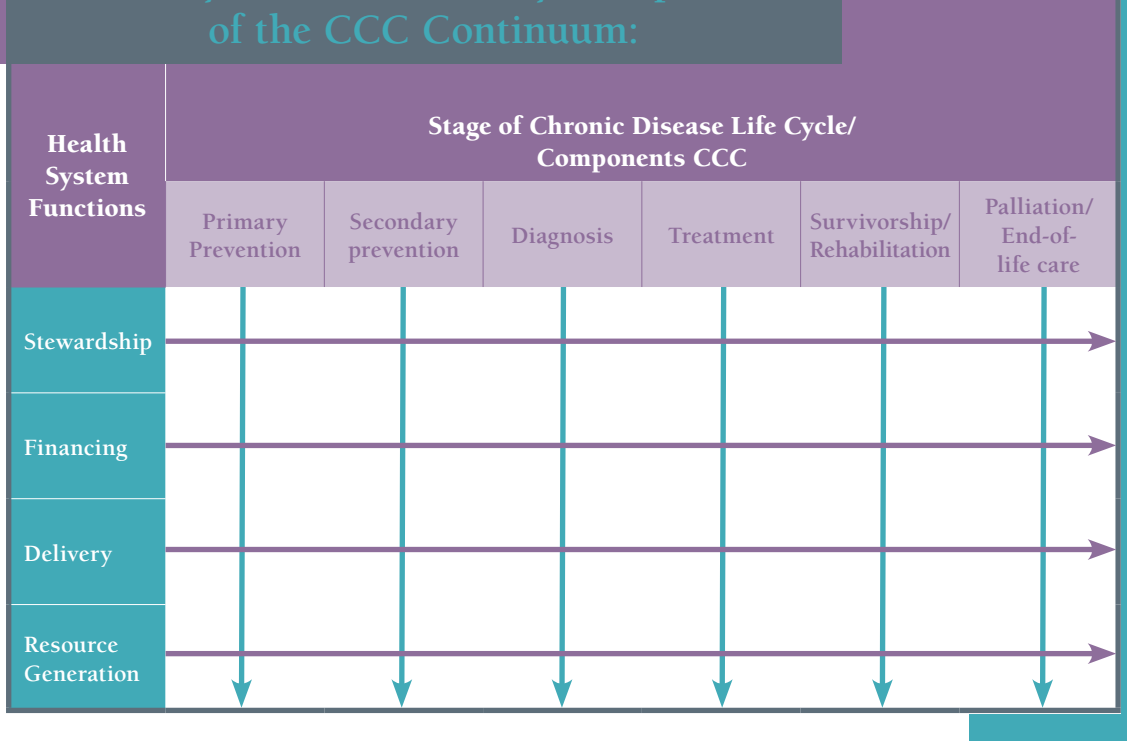
Each component of the CCC continuum requires specific stewardship, financing, delivery, and resource generation policies (vertical lines, Figure 3) usually differentiated by groups of cancers. Ideally, each function should be integrated with each of the six components, to ensure continuity and consistency (horizontal lines, Figure 3). While a comprehensive approach is ideal, a phased approach will be needed because of resource and knowledge constraints.

Establishing effective delivery systems along the control care continuum involves all participants and stakeholders and the entire spectrum of care providers –from the expert patient and community health promoter, to the sub-specialty physician– in order to coordinate a combination of repeat-episodic and longer-term care.

A life-cycle approach for prevention often begins with a healthy childhood. Further, awareness of prevention strategies needs to be integrated into programs for women, especially those focusing on sexual and reproductive health.

Figure 3

Health System Functions by Components of the CCC Continuum:



The diagonal approach can be layered onto the health system function/care continuum matrix, allowing policy makers to consider whether a horizontal or vertical disease – specific intervention is required to address needs along the CCC continuum. Yet, to apply a "litmus test" to judge how well a health system responds to a chronic illness such as cancer, each health system function should be evaluated against each of the six elements of the CCC.[76] For example, it is not sufficient to measure financial protection only in terms of treatment, for effective financial protection would also include prevention and early detection.[77]

In effect, this amounts to applying a disease –in this case, cancer– to trace how each health system function responds across the life cycle of illness. This approach can help improve both vertical and horizontal programs.

4.iv. Conclusions

This Report explores how resources can be mobilized more effectively to expand access to CCC in LMICs. It proposes a diagonal approach to investment and resource application, recognizing that a well-functioning health system should address the comprehensive needs of its beneficiaries rather than dealing only with discrete episodes.

This approach addresses the issue of competing risk – the idea that saving a person from one disease, increases the risk of incurring other diseases in the future. Applying diagonal thinking to health systems, can transform zero-sum debates about what to deny poor patients with cancer into a search for opportunities that will strengthen health systems for all.[78]

References

1. Samb B, Desai N, Nishtar S, et al. Prevention and management of chronic disease: a litmus test for health-systems strengthening in low -income and middle -income countries. Lancet2010; 376(9754): 1785-97.
2. Beaglehole R, Horton R. Chronic diseases: global action must match global evidence. Lancet2010; 376(9753): 1619-1620.
3. World Health Organization. Global status report on noncommunicable diseases 2010. World Health Organization. 2011.
4. Samb B, Desai N, Nishtar S, et al. Prevention and management of chronic disease: a litmus test for health-systems strengthening in low -income and middle -income countries. Lancet2010; 376(9754): 1785-97.
5. Sepúlveda J, Bustreo F, Tapia R, et al. Improvement of child survival in Mexico: the diagonal approach. Lancet 2006; 368(9551): 2017-2027.
6. Frenk J. Bridging the divide: global lessons from evidence-based health policy in Mexico. Lancet 2006; 369(9539): 954-61.
7. Ibid.
8. World Health Organization. Noncommunicable Diseases and Mental Health. Innovative care for chronic conditions: Global report. World Health Organization. 2002.
9. Farmer P, Frenk J, Knaul FM, et al. Expansion of cancer care and control in countries of low and middle income: a call to action. Lancet 2010; 376(9747): 1186-93.
10. World Health Organization. Global status report on noncommunicable diseases 2010. World Health Organization. 2011.
11. Alleyne G, Lloyd M, Atun R, Cooper Q. TIME TO ACT: The Global Emergency of Non-Communicable Diseases. Report on 'Health and Development: Held Back by Non-Communicable Diseases.' International Diabetes Federation; Union for International Cancer Care and Control; World Heart Federation. 2009. p. 1-20.
12. Mukherjee S. The emperor of all maladies: a biography of cancer. New York: Scribner; 2010.
13. Bukhman G. Editor in Chief. The PIH guide to chronic care integration for endemic non-communicable diseases. Partners in Health; Department of Global Health and Social Medicine, Harvard Medical School; 2011. http://www.pih.org/publications/entry/the-pih-guide-to-chronic-care-integration-for-endemic-ncd (accessed May 23, 2011).
14. Sloan FA, Gelband H. Cancer control opportunities in low-and middle -income countries. Washington DC: National Academy Press; 2007.
15. Atun RA, Gurol-Urganci I, McKee M. Health systems and increased longevity in people with HIV and AIDS. British Medical Journal 2009; 339.
16. Allotey P, Reidpath D, Yasin S, Chan C, de-Graft A. Rethinking health-care systems: a focus on chronicity. Lancet 2010.
17. Samb B, Desai N, Nishtar S, et al. Prevention and management of chronic disease: a litmus test for health-systems strengthening in low -income and middle -income countries. Lancet 2010; 376(9754): 1785-97.
18. Nolte E, McKee M. Eds. Caring for people with chronic conditions: A health systems perspective. European Observatory on Health Systems and Policy Series. McGraw Hill Open University Press. 2008.
19. World Health Organization. Noncommunicable Diseases and Mental Health. Innovative care for chronic conditions: Global report. World Health Organization. 2002.
20. World Health Organization. World Health Report 2010: World Health Organization. 2010.
21. World Health Organization. WHA 58.33: Sustainable health financing, universal coverage and social health insurance. World Health Assembly Resolution 58.33. 2005.
22. Bukhman G. Editor in Chief. The PIH guide to chronic care integration for endemic non-communicable diseases. Partners in Health; Department of Global Health and Social Medicine, Harvard Medical School. 2011. http://www.pih.org/publications/entry/the-pih-guide-to-chronic-care-integration-for-endemic-ncd (accessed May 23, 2011).
23. Nolte E, McKee M. Eds. Caring for people with chronic conditions: A health systems perspective. European Observatory on Health Systems and Policy Series. 2008. McGraw Hill Open University Press.
24. Coleman K, Austin B, Brach C, Wagner E. Evidence on the chronic care model in the new millennium. Health Affairs 2009; 28(1): 75-85.
25. World Health Organization. Noncommunicable Diseases and Mental Health. Innovative care for chronic conditions: Global report. World Health Organization. 2002.
26. Atun R, de Jongh T, Secci F, Ohiri K, Adeyi O. A systematic review of the evidence on integration of targeted health interventions into health systems. Health Policy and Planning 2010; 25: 1-14.
27. Frenk J. Bridging the divide: global lessons from evidence-based health policy in Mexico. Lancet 2006; 369(9539): 954-61.
28. Sepúlveda J, Bustreo F, Tapia R, et al. Improvement of child survival in Mexico: the diagonal approach. Lancet 2006; 368(9551): 2017-27.
29. Ooms G, Van Damme W, Baker BK, Zeitz P, Schrecker T. The 'diagonal' approach to Global Fund financing: a cure for the broader malaise of health systems. Global Health 2008; 4(6): 1744-8603.
30. World Health Organization Maximizing Positive Synergies Collaborative Group. An assessment of interactions between global health initiatives and country health systems. Lancet 2009; 373(9681): 2137-69
31. Committee on the U.S. Commitment to Global Health. The U.S. commitment to global health: Recommendations for the new administration. Institute of Medicine: National Academies Press 2009.
32. Sepúlveda J, Bustreo F, Tapia R, et al. Improvement of child survival in Mexico: the diagonal approach. Lancet 2006; 368: 2017–27.
33. World Health Organization. Noncommunicable Diseases and Mental Health. Innovative care for chronic conditions: Global report. World Health Organization. 2002.
34. World Health Organization. Global status report on noncommunicable diseases 2010. World Health Organization. 2011.
35. World Health Organization Maximizing Positive Synergies Collaborative Group. An assessment of interactions between global health initiatives and country health systems, Lancet 2009; 373(9681): 2137-69.
36. Samb B, Desai N, Nishtar Set al. Prevention and management of chronic disease: a litmus test for health-systems strengthening in low -income and middle -income countries. Lancet 2010; 376(9754): 1785-97.
37. World Health Organization Maximizing Positive Synergies Collaborative Group. An assessment of interactions between global health initiatives and country health systems. Lancet 2009; 373(9681): 2137-69.
38. Samb B, Celletti F, Holloway J, Van Damme W, De Cock KM, Dybul M. Rapid expansion of the health workforce in response to the HIV epidemic. New England Journal of Medicine 2007; 357: 2510–14
39. Price JE, Leslie JA, Welsh M, Binagwaho A. Integrating HIV clinical services into primary health care in Rwanda: a measure of quantitative effects. AIDS Care 2009; 21: 608–14.
40. Frenk J. The new public health. Annual Review of Public Health 1993; 14(1): 469-90.
41. Murray C, Frenk J. A framework for assessing the performance of health systems. Bulletin of the World Health Organization 2000; 78(6): 717-31.
42. Samb B, Desai N, Nishtar S, et al. Prevention and management of chronic disease: a litmus test for health-systems strengthening in low-incojme and middle -income countries. Lancet 2010; 376(9754): 1785-97.
43. Harries AD, Jahn A, Zachariah R, Enarson D. Adapting the DOTS framework for tuberculosis control to the Management of non-communicable disease in sub-Saharan Africa. PLoS Medicine 2008; 5: e124.
44. Committee on the U.S. Commitment to Global Health. The U.S. commitment to global health: Recommendations for the new administration. Institute of Medicine: National Academies Press. 2009.
45. Travis P, Bennett S, Haines A, Pang T, Bhutta Z, Hyder A, et al. Overcoming health-systems constraints to achieve the Millennium Development Goals. Lancet 2004; 364(9437): 900-6.
46. World Health Organization Maximizing Positive Synergies Collaborative Group. An assessment of interactions between global health initiatives and country health systems. Lancet 2009; 373(9681): 2137-69.
47. Alleyne G, Stuckler D, Alwan A. The hope and the promise of the UN Resolution on non-communicable diseases. Globalization and Health 2010; 6(15).
48. Oportunidades: Indicadores de resultados. Gobierno Federal. 2011. http://www.oportunidades.gob.mx/Portal/wb/Web/indicadores_de_resultados (accessed May 21, 2011).
49. Frenk J. Bridging the divide: global lessons from evidence-based health policy in Mexico. Lancet 2006; 368(9539).
50. Cartilla Nacional de Salud. Mujer de 20 a 59 años. Gobierno Federal. México, 2008.
51. Coordinación Nacional del Programa de Desarrollo Humano Oportunidades. Aprendemos Juntos a Vivir Mejor: Guía de orientación y capacitación para beneficiarios titulares beneficiaras del programa Oportunidades. México, DF: Coordinación Nacional del Programa de Desarrollo Humano Oportunidades, Secretaría de Desarrollo Social. 2010. http://www.oportunidades.gob.mx/Portal/work/sites/Web/resources/ArchivoContent/1158/Libro%20Guia%20Titulares%20Oportunidades%202010.pdf (accessed May 22, 2011).
52. Nigenda G, González-Robledo LM, Caballero M, Zarco A, González-Robledo MC. Proceso Social del Cáncer de Mama. Perspectiva de mujeres diagnosticadas, sus parejas y los prestadores de servicios de salud. Informe Final. Instituto Carso para la Salud-INSP, Cuernavaca, 2008.
53. Innovaciones en la prestación de servicios de detección temprana y tratamiento del cáncer de mama en México. Iniciativa inter-institucional Tómatelo a Pecho, A.C.-Comisión Nacional de Protección Social en Salud. México. 2011. http://www.tomateloapecho.org.mx/proyectos.html (accessed September 27, 2011).
54. Coordinación Nacional del Programa de Desarrollo Humano Oportunidades. Aprendemos Juntos a Vivir Mejor: Guía de orientación y capacitación para beneficiarios titulares beneficiaras del programa Oportunidades. México, DF: Coordinación Nacional del Programa de Desarrollo Humano Oportunidades, Secretaría de Desarrollo Social. 2010.
55. Norma Oficial Mexicana PROY-NOM-041-SSA2-2009, Para la prevención, diagnóstico, tratamiento, control y vigilancia epidemiológica del cáncer de mama. México, 2010.

56. Knaul FM, Nigenda G, Lozano R, Langer A, Frenk J. Breast Cancer in Mexico: A Pressing Priority. Reproductive Health Matters2008; 16(32): 113-123.
57. Mohar A, Bargalló E, Ramírez T, Lara F, Beltran-Ortega A. Recursos disponibles para el tratamiento del cáncer de mama en México. Salud Publica Mex 2009; 51(2): 263-269.
58. Kirby T. Pulse oximeters breathe life into surgery in poorer nations. Lancet 2011; 377(9759): 17-18.
59. Funk LM, Weiser TG, Berry WB, et al. Global operating theatre distribution and pulse oximetry supply: an estimation from reported data. Lancet 2010; 376(9746): 1055-1061.
60. World Health Organization, Surgical Safety Checklist, Patient Safety: World Health Organization. 2009.
61. Bukhman G. Editor in Chief. The PIH guide to chronic care integration for endemic non-communicable diseases. Partners In Health; Department of Global Health and Social Medicine, Harvard Medical School, 2011. http://www.pih.org/publications/entry/the-pih-guide-to-chronic-care-integration-for-endemic-ncd (accessed May 23, 2011).
62. Adapted from Table 2.2 The Cancer Control Continuum. IOM. From Cancer Patient to Cancer Survivor: Lost in Transition. Washington DC: Institute of Medicine; 2005.
63. Based on: IOM. From Cancer Patient to Cancer Survivor: Lost in Transition. Washington DC: Institute of Medicine; 2005.
64. Mullan F. Seasons of survival: reflections of a physician with cancer. New England Journal of Medicine 1985; 313(4): 270-273.
65. NCCS National Coalition for Cancer Survivorship. accessed at.< http://www.canceradvocacy.org/> (accessed March 31, 2011).
66. "DCCPS: OCS." Division of Cancer Control and Population Sciences – DCCPS. National Cancer Institute. accessed at < http://dccps.nci.nih/gov/ocs/ocs_factsheet.pdf >. (accessed March 31, 2011).
67. National Cancer Institute, Office of Cancer Survivorship. accessed at http://dccps.nci.nih.gov/ocs/definitions.html (accessed May 29, 2011).
68. Institute of Medicine. From Cancer Patient to Cancer Survivor: Lost in Transition. Washington DC: Institute of Medicine; 2005.
69. World Health Organization & International Agency for Research on Cancer.2008. World Cancer Report 2008. Boyle, Peter & Levin, Bernard (Eds.). France: Lyon 2008.
70. World Health Organization, World Health Report 2000. World Health Organization. 2000.
71. Murray C, Frenk J. A framework for assessing the performance of health systems. Bulletin of the World Health Organization 2000; 78(6): 717-31.
72. World Health Organization. Monitoring the building blocks of health systems: a handbook of indicators and their measurement strategies. World Health Organization. 2010.
73. World Health Organization Maximizing Positive Synergies Collaborative Group 2009. An assessment of interactions between global health initiatives and country health systems. Lancet 2009; 373(9681): 2137-69
74. Nugent R, Knaul F, Jamison D, et al. Fiscal policies for health promotion and disease prevention. Disease control priorities in developing countries. World Bank 2006(2nd Ed.): 211-23.
75. World Health Organization Commission on Social Determinants of Health. Closing the gap in a generation: Health equity through action on the social determinants of health. 2008. WHO. http://whqlibdoc.who.int/publications/2008/9789241563703_eng.pdf (accessed may 21, 2011).
76. Samb B, Desai N, Nishtar S, et al. Prevention and management of chronic disease: a litmus test for health-systems strengthening in low -income and middle -income countries. Lancet 2010; 376(9754): 1785-97.
77. Knaul F, Arreola H, et al. Managing chronic illness as part of health system strengthening: the case of HIV/AIDS and Breast Cancer in Mexico. Mimeo. Mexican Health Foundation. Year 2009.
78. Farmer P, Frenk J, Knaul FM, Shulman, et al. Expansion of cancer care and control in countries of low and middle income: a call to action. Lancet 2010; 376(9747): 1186-93.

Core Elements for Provision of Cancer Care and Control in Low and Middle Income Countries

Section 5

Section 5

Core Elements for Provision of Cancer Care and Control in Low and Middle Income Countries

Key messages

- Core elements of cancer care and control (CCC) must be decided within each country based on existing health resources and infrastructure, the burden of cancers, country-specific cancer risks, political and social conditions, and cultural beliefs and practices.
- Lack of information and education about cancer is a major barrier to effective CCC in developing countries, especially for the detection of cancers at earlier and more treatable stages.
- Education programs need to address cultural barriers to care, as well as myths and misconceptions about cancer, and stigma, and to increase awareness of what can be accomplished within existing health systems.
- Infectious agents cause almost 25% of cancers while modifiable risk factors, such as tobacco use, alcohol consumption, poor nutrition and physical inactivity, account for 9% of cancer deaths in low and middle income countries (LMICs). This makes both infectious agents and lifestyle factors obvious targets for CCC prevention programs.
- Diagnostic tests that are necessary for accurate diagnosis and treatment are essential, yet resources are lacking. Remote pathology is an alternative and can involve partnerships with leading international cancer centers.
- Surgery is an essential component of cancer treatment.
- With proper training for health care personnel, chemotherapy can be safely prepared, administered, and monitored at district hospitals in poor countries without an on-site oncologist, as long as backup is available from off-site specialists.
- Cancer patients and their families benefit from survivorship support to help them deal with the physical, psychological, and social side effects of the disease and its treatment.
- Despite a lack of treatment or ability to prolong life, all patients have a basic right to palliation and pain relief, which is an essential element of care.

5.i INTRODUCTION

Even with resource constraints, a well-conceived and well-managed national cancer care and control program can lower cancer incidence and deaths, and improve the lives of cancer patients. The core elements of a comprehensive cancer program span the entire cancer continuum, from prevention through long-term care. A national program should not only provide care, but should also incorporate education, training, metrics and data collection, and research.[1] In an ideal world, each of the core components would be available for the entire population at risk or diagnosed with cancer, and be adapted to local conditions and needs.

Even with resource constraints, a well-conceived and well-managed national CCC program can lower cancer incidence and deaths, and improve the lives of cancer patients.

The core elements of a comprehensive, national CCC program include: education, prevention and risk reduction, screening and early detection, diagnostics, staging and monitoring, treatment, survivorship care, palliative care, and research.

Unfortunately, scarce resources place limits on each of the core components of CCC and often force policy makers to make difficult decisions about how limited resources are either explicitly or implicitly invested in CCC. In these circumstances, it is critical to create service models and packages for prevention, treatment, and palliation that will be most effective and have the greatest impact on CCC. Incidence and outcomes data available through cancer surveillance and monitoring programs can guide the development of appropriate national policies and help determine priorities for resource allocation.

While cancer programs in high income countries include at least some level of disease-modifying treatment for virtually all malignancies at all stages –and these treatments can be extremely complex and costly with limited benefit– resource constraints and competing health priorities mean that this approach to cancer care is not viable in low income countries. In those settings, cancer program design and implementation should use available health system resources as a foundation for more comprehensive care, targeting areas of cancer care where the greatest impact can be made.

To aid the decision-making process, this section of the GTF.CCC Report outlines the basic elements of adequate CCC and the core components for basic, effective cancer control that can be applied, even where resources are scarce. The appendix includes a description of the core elements for a subset of specific cancers that are among the most significant challenges to health in LMICs.

Text Box 5.1

Analysis and recommendations around core elements of a CCC strategy for LMICs are anchored in these assumptions:

1. *Many cancers are preventable through infection control and lifestyle modifications.*
2. *An accurate cancer diagnosis is critical to determining an appropriate and successful treatment plan.*
3. *Many cancers are highly treatable with affordable treatments that result in the addition of many years of life:*
   - *Denial of therapy for the treatment of diseases that are highly curable with affordable drugs that result in the addition of many years of life, is unacceptable;*
   - *Treatment (or not) of more complex, less curable diseases requires evaluations specific to each country and available resources.*
6. *Palliation of pain and suffering from cancer is a basic human right and is therefore not subject to cost-benefit analysis.*
7. *Understanding the magnitude of the cancer burden and the potential impact of CCC interventions requires reliable data.*

Four principles can guide the design of cancer care models in LMICs from the outset and will result in saved lives and reduced suffering.

1. Many of the cancers that pose the greatest challenge to low and middle income countries are amenable to prevention, treatment, or palliation.
2. The majority of drugs used in cancers that are common to low-resource settings are off-patent and can be sourced at low prices.
3. Many elements of cancer prevention, screening, treatment, and palliation can be accomplished without specialized tertiary level providers or treatment centers.
4. Palliation of pain and suffering from cancer should be a priority for all types of cancer.

These principles are applied throughout this report to identify innovative strategies for the financing, procurement, and delivery of drugs and services, meticulous data collection and outcomes analysis, and stewardship of CCC in LMICs. Our understanding of the causes and biology of cancer is undergoing rapid evolution and the development of new diagnostic tests, techniques, equipment, and drug treatment options makes it clear that the essential elements of CCC will evolve accordingly.

The framework proposed here is a starting point for the expansion of CCC in LMICs. These guidelines are meant to be general, as approaches will vary in different settings. This document is consensus-based, not a “meta-analysis” of existing and relatively weak scientific evidence. The field will likely evolve quickly as understanding of cancer in developing countries increases, and knowledge of how best to deliver CCC in resource-constrained settings improves.

5.ii Core elements of CCC

The development of appropriate CCC strategies in LMICs must be country specific. It should take into account the existing health system infrastructure, the frequency of different cancer types, country-specific cancer risks and exposures, political and social conditions, and cultural beliefs and practices. The goal should be the systematic and equitable implementation of evidence-based plans that make the best use of available resources. Even in resource-poor settings, cost-effective approaches, including the "best buys" identified by WHO, exist for each stage of the CCC continuum.[2] The Breast Health Global Initiative (BHGI) has developed a guideline model for stratifying resource-appropriate breast cancer services within each of the core elements for LMICs.[3]

Prevention, through promoting lifestyle change, reducing tobacco use and exposure to environmental risk is of the highest priority, and has been extensively reviewed in the literature. Cancer prevention offers the most cost-effective, long-term strategy for cancer control in adults and can include elements that are inexpensive and within the financial capability of lower income countries.[4] Investments in diagnosis and treatment will vary depending on the resource level of the country, but should include emphasis on early detection to increase the cure rate, as well as the development of standardized, evidence-based treatment guidelines. The newest technologies and drugs are usually expensive, but low-cost alternatives that are appropriate for use in LMICs frequently exist. For the lowest income countries, where most people present with late stage cancers, cure is uncommon, yet much can be done to offer palliative therapies and improve quality of life.

Establishing capacity for CCC in a country takes time and requires the commitment of financial and human resources. Some components of cancer control can be integrated into primary health care, while others require more specialized services. For some aspects of a cancer plan, cost-effectiveness or cost-benefit analysis may be used to rank priorities. Other aspects, such as palliative care, should receive priority because relief of pain and suffering is a basic human right. Building a cancer control program should start with high-impact interventions that are the most cost-effective and beneficial for the largest part of the population. For example, in a country with no existing cancer control plan, an initial focus on tobacco control, palliative care, and basic treatment for a few common cancers can provide early successes and establish a base for adding services. Once some cancer infrastructure exists and resources grow, incremental steps can be taken.[5]

Reliable data are needed to understand the cancer patterns and burden in each country and to track progress. Few LMICs have accurate, recent data about their cancer incidence or major risk factors. Global cancer estimates produced by the International Agency for Research on Cancer (IARC) are useful for setting initial priorities, but cannot be used to track progress or define priorities. Cancer registries that record cancer cases, stages, and outcomes over time in specific hospitals or defined geographic regions are important for understanding local cancer patterns. However, in many low income countries, people often die without medical care or without a diagnosis. Collection of cause-specific mortality should be a long-term goal of every country. Where vital statistics systems are weak or nonexistent, data collection may begin in select sites, rather than nationwide.

A commitment to CCC includes some investment in facilities, trained personnel, equipment, and drugs. An Institute of Medicine 2007 report suggested that each LMIC consider supporting at least one specialized cancer center, even if capacity is limited.[6] Such a center need not be a freestanding facility, but could be a designated unit in a pre-existing hospital to maximize shared use of resources that are already part of the health care system. A cancer center of excellence can serve as the nexus for a national cancer program, and as an education and training facility, a central reference laboratory, and a site for the development of treatment guidelines and the conduct of locally relevant research. Additionally, such a center can be the focal point for partnerships at national, regional, and global levels, including twinning and partnering relationships with external cancer facilities.

Cancer prevention offers the most cost-effective, long-term strategy for cancer control in adults and can include elements that are inexpensive and within the financial capability of lower income countries.

Building a cancer control program should start with high-impact interventions that are the most cost-effective and beneficial for the largest part of the population.

A commitment to CCC includes some investment in facilities, trained personnel, equipment, and drugs.

Text Box 5.2

Jordan: Creating a regional center of excellence for cancer care as a focus for a national program on CCC[7]

The King Hussein Cancer Center (KHCC) has progressed in only 15 years from being a weak institution offering little effective care to an internationally accredited hospital that is serving, through its umbrella organization, the King Hussein Cancer Foundation, as a spearhead for improving access to CCC throughout Jordan, and, the Middle East. The foundation conducts on-going fundraising, development and outreach activities to ensure sustainability of the center. These include meeting infrastructural and highly specialized human resource needs (promoting reverse brain drain), as well as promoting collaborations and agreements to expand the center's regional and international network. It is through such parallel development activity that KHCC has generated the necessary resources to embrace the full spectrum and all facets of CCC: prevention, early detection, diagnosis, treatment, palliative care, and survivorship.

KHCC is the only provider offering comprehensive, multi-disciplinary care in accordance with international standards, and, in 2006, was the first hospital in Jordan to receive international certification from The Joint Commission.[8] *As of 2007, it also became the only hospital in the developing world to receive Joint Commission Disease or Condition-Specific Care Certification for oncology. Other certificates of distinction include those from the College of American Pathologists and the national Health Care Accreditation Council of Jordan.*

Additionally, the center has been leading the palliative care initiative in the country, starting as a WHO demonstration project, and has a strong commitment to the use of morphine for pain management. The center 80% of the morphine used in all of Jordan. It serves as a regional model for palliative care.[9]

Innovations in delivery were part of these successes. These included shifting human resource responsibilities to nurses and community health workers to optimize delivery, investments in technological advancements to conduct teleoncology, and a commitment to regional and global partnership to help bridge the gap in care at other facilities. KHCC has adopted advanced nursing practices recommended in the Strong Model of Advanced Practice and has recruited clinical nurse coordinators who have made a significant impact on patient care. The empowerment of nurses and their expanded role in pediatric oncology teams has facilitated the provision of much-needed patient education, follow-up, and survivorship care.[10]

Furthermore, the institution organized an MOH-integrated national early detection and awareness program for breast cancer, the Jordan Breast Cancer Program to combat the shortages of screening mammography and the cultural barriers that continue to challenge early detection.[11] *The center is conducting direct, comprehensive training of health auxiliary workers and creating options for training through the medical education system at teaching hospitals. The objective is to train midwives, nurses, and health promoters to identify risk factors, undertake breast clinical exams, and to promote early detection and referral of women for mammography. Further, two mobile mammography units have recently been acquired to strengthen screening efforts.*

Since 1996, KHCC has had a successful twinning collaboration with St. Jude's International Outreach Program on pediatric oncology.[12] *Other collaborations include the Hospital for Sick Children in Toronto. Impressive results of teleconsult have demonstrated significant improvements in diagnosis and treatment, and have given KHCC medical staff the opportunity to engage with expert multidisciplinary teams and, together, to develop much more appropriate treatment regimens. KHCC has shown that highly specialized management of certain cancers (for instance retinoblastoma) can be successfully implemented in a developing country setting with collaborative twinning programs.*[14,15]

Significant investments continue to be made in technology to provide better patient care. KHCC has been able to move to electronic recordkeeping, with previous records digitally archived to aid future research. Data is shared internationally with appropriate institutions and included in relevant databases: bone marrow data is reported to and exchanged with the international bone marrow registry, data on pediatric cancers is inputted into St. Jude's web-based database (POND4Kids) for cancer registration, and a tissue bank to archive biospecimens is currently being established.

Efforts are underway to ensure that as many patients as possible receive top quality care closer to their homes, and also to make it possible to rely less heavily on international support. KHCC is working to strengthen and improve the standard of care at other tertiary centers that provide cancer services by extending access to training and consult opportunities. It is currently working with one of two main teaching hospitals in the country to design and deliver more appropriate cancer treatment regimens, and seeking to expand this type of collaboration with other providers. This infrastructure shifting process will strengthen various aspects of the health system, and particularly the development of accredited facilities to improve service delivery. The Jordan Health Care Accreditation Council, launched in 2008, provides an opportunity to 'piggyback' and upgrade standards at facilities other than KHCC through a focus on cancer care, and eventually to expand and integrate other illnesses.

The Center has chosen not to remain "an island of highest quality care," but rather, led by its Foundation, to reach out to improve the quality of care at other centers in Jordan and in the region. KHCC is working to strengthen and improve the standard of care at other tertiary centers that provide cancer services by extending access to training and consult opportunities. It is currently working with one of Jordan's two main teaching hospitals to design and deliver more appropriate cancer treatment regimens.

KHCC is also extending the scope of its work to include cancer policy development. The center participates in the government's National Cancer Control Strategy expert advisory group and is now an active participant in many international institutions and activities, including operating as a sister center of the MD Anderson Cancer Center, a WHO collaborating center, as well as partnerships with organizations such as the Union for International Cancer Control (UICC).

Education and awareness-building

Lack of information and education is a major barrier to CCC in the developing world. Educating the community, as well as healthcare professionals and governmental agencies about cancer detection, diagnosis, and treatment is central to an effective national cancer program. Individuals need to understand that many cancers can be prevented through appropriate behavioral change, that cancer can often be cured, and that effective treatments are available. Knowledge and awareness-building should permeate all levels and actors, but especially policy makers and the healthcare community.

Population-based education is especially important in LMICs where patients tend to present late in the course of their disease, when the window for effective intervention may have passed, in part due to lack of information and education. In many developing countries, misconceptions about cancer, including the beliefs that cancer is incurable or contagious, may discourage people from seeking care. There is also fear that the disease will lead to ostracism from the community and family. Education to prevent stigma by the community for all patients and for specific groups, such as women, is important.[16] The personal interpretations of illness that guide health behavior vary across countries and cultures, and these can influence responses to prevention and screening campaigns, as well as the likelihood of initiating and complying with treatment and follow-up. Community education and outreach efforts must dispel common

In many developing countries, misconceptions about cancer, including the beliefs that cancer is incurable or contagious, may discourage people from seeking care.

misconceptions in a manner that is culturally sensitive, unbiased, and easy to comprehend. Cancer outcomes cannot improve unless patients and the healthcare community understand the benefits of early detection and are willing to support timely diagnosis and treatment.

Cancer education should ideally both draw from and strengthen local systems, rather than being externally imposed. Education is best accomplished when embedded into existing systems, such as the healthcare and education systems, as well as community, religious, and other social organizations. While there is widespread agreement that education and awareness are necessary, the barriers and most effective delivery methods have not been well-studied. All individuals capable of delivering messages, including community health workers, volunteers, and expert patients, in addition to medical professionals, should be involved.[17-21] Indeed, patient advocacy, a large source of cancer awareness and information in many developed nations, has not been used in resource-poor countries.[22,23] Access to the internet is essential to connect the emerging cancer program to the rest of the world, to transfer knowledge and to provide mentoring and support with diagnostic and consultation.

Cancer outcomes cannot improve unless patients and the healthcare community understand the benefits of early detection and are willing to support timely diagnosis and treatment.

Prevention and risk reduction

Prevention offers the most cost-effective, long-term strategy to control cancer. Cancer prevention should be integrated into the primary health care system, where it can also help to prevent other diseases that share the same risk factors. As suggested in the discussion of facets of the cancer divide (see Section 2), prevention and risk reduction strategies can be divided into two major categories: those that involve lifestyle alterations, and those that aim to control infectious disease. According to WHO estimates, more than 40% of cancer deaths worldwide are due to tobacco use, unhealthy diets, alcohol consumption, inactive lifestyles, and infection.[24]

The increase in cigarette smoking has made lung cancer the most common cause of cancer and cancer deaths in LMICs. Tobacco control represents the most significant and urgent intervention that will reduce the risk of developing many cancers, especially cancers of the lung, head and neck, and bladder. Countries can implement effective policies for reducing tobacco use, and they can do it inexpensively.[25] Many effective tobacco control interventions are legal or regulatory, including taxes and bans on advertising and promotion. An aggressive anti-tobacco program and adoption of the WHO Framework Convention on Tobacco Control is an essential element of any cancer prevention strategy.[26]

Prevention offers the most cost-effective, long-term strategy to control cancer.

The potential impact of programs to modify other unhealthy lifestyle behaviors will vary according to the prevalence of each behavior. Cancers of the oral cavity, pharynx, larynx, esophagus, liver, and breast can be caused by heavy alcohol use, accounting for 5% of cancer deaths in LMICs, with the risk varying by cancer site. Diet, body weight, and physical activity levels are interrelated and act in complex ways to promote or reduce the risk of cancer. While the impact of these risk factors is far greater in high-resource countries, estimates suggest that these modifiable lifestyle factors account for 9% of cancer deaths in LMICs.[27]

Infectious agents are responsible for almost 25% of cancer deaths in the developing world, compared to only 6% in industrialized countries.[28] Due to the large burden of cancer from infectious agents (see Section 2), cancer prevention through vaccination or treatment of these infections should be a major focus of CCC in LMICs. Vaccines for the prevention of HPV (associated with cervical and head and neck cancer) and hepatitis B (hepatocellular cancer) are available. In areas endemic for liver cancer, hepatitis B virus immunization should be integrated with other childhood vaccination programs. Strategies to integrate HPV vaccination during childhood vaccinations should also be considered.

Special measures to combat other infections associated with cancer are essential to a CCC program and will need to be modified to fit the conditions in each country. For example, Kaposi's sarcoma, among the most common cancers in sub-Saharan Africa, is strongly associated with HIV/AIDS infection; and most cases of gastric cancer –common in some parts of the developing world– are caused by the bacteria Helicobacter pylori.

Infectious agents are responsible for almost 25% of cancer deaths in the developing world, compared to only 6% in industrialized countries.

Screening and early detection

Early detection of cancer greatly increases the chances for successful treatment and is fundamental to reducing cancer mortality. With few exceptions, early stage cancers are less lethal and more treatable than late stage cancers. Unfortunately, many patients in LMICs do not present for formal medical care until late in the course of their disease, if at all. Early detection involves two major components: screening of asymptomatic populations, and education about early signs and symptoms of cancer. Increased awareness of possible warning signs of cancer among physicians, nurses, and other healthcare providers as well as among the general public, can have a great impact on the disease.[29] For any early detection program to be successful, both healthcare providers and the populations they serve need confidence that care will be available if cancers are diagnosed. Screening for early stages of cancer or precancerous states can reduce cancer death rates only if appropriate management is available when treatable conditions are detected.

For any early detection program to be successful, both healthcare providers and the populations they serve need confidence that care will be available if cancers are diagnosed.

Cancers for which screening is recommended in high income countries are breast, cervical, and colon. Breast cancer screening using mammography, and cervical cancer screening using cytology screening methods, including Pap smears, are proven to reduce mortality. While many early detection screening techniques used in wealthier settings are not technically feasible or affordable for widespread use in other parts of the world, education of people and providers and targeted disease programs can improve early detection. Several studies seek to evaluate low-cost approaches to screening that can be used in low-resource settings.[30-33] For example, visual inspection with acetic acid may prove to be an effective screening method for cervical cancer. More studies that evaluate low-cost, alternative methods to mammography screening, such as clinical breast examination, community health worker training, and incorporation of simple checklists are needed.[34,35]

Screening a substantial portion of the population requires infrastructure and should only be undertaken when effectiveness has been demonstrated, resources (including personnel and equipment) are sufficient to cover nearly all of the target group, facilities exist for confirming diagnoses and for treatment and follow-up care of those with abnormal results, and when prevalence of the disease is high enough to justify the effort and costs of screening.

Diagnostics and staging

Diagnosis is an integral part of CCC, and an accurate diagnosis is needed in order to receive appropriate care. Diagnostic tests include imaging, laboratory and pathology analysis, and physical examination. These techniques are also used during the course of treatment to monitor response and/or check for recurrence. With careful use of basic diagnostic resources, many patients can be assessed accurately and treated appropriately in LMICs.

Diagnosis is an integral part of CCC, and an accurate diagnosis is needed in order to receive appropriate care.

Pathologic examination of cancer requires the technical skills to obtain a tumor sample, either through a tissue biopsy or body fluids, for microscopic evaluation. High quality specimen processing is a critical component of CCC and is currently not available in many locations. Basic cancer pathology should include the capability for specimen fixation, embedding into paraffin, tissue slicing, and staining. Timely processing is important to ensure good quality (prolonged fixation degrades quality), and is critical for the care of the patient who must wait for pathological confirmation before beginning treatment.

Basic cancer pathology should include the capability for specimen fixation, embedding into paraffin, tissue slicing, and staining.

Immunohistochemistry can be an important part of pathology testing, and many LMICs can obtain this relatively simple technology, at least in specialized regional centers. Testing for estrogen receptor in breast cancer should receive priority, as hormone therapy can significantly improve outcomes for patients with hormone receptor-expressing breast cancer. Testing breast cancer for HER2 will affect outcomes only if trastuzumab or other HER2-targeted therapies are available. Documenting the frequency of HER2 positive breast cancers in a country may ultimately affect decisions about coverage of trastuzumab. Some highly specialized cancer sub-classification techniques, such as flow cytometry evaluation in leukemia, are resource-intensive and not likely to be feasible in resource-limited settings.

Remote pathology, a system with on-site specimen preparation and histology by trained technicians, and analysis by specialized pathologists in other countries, is an option for improving pathology diagnosis, preparation, and histology staining until more local pathologists can be trained as cancer diagnosticians.[36,37] This can be accomplished either by physical transportation of the slides to referral centers or by remote video reading, which can be done with a variety of affordable technologies. A remote system can provide access to specialized pathologists for difficult cases and can improve diagnostic quality overall. While remote pathology is an option to improve pathology diagnosis, it is not a substitute for developing in-country capacity in this area. A remote system of partnering with leading international centers for cancer treatment is, however, a good long-term investment as it also provides access to specialized pathologists for difficult cases and training.

Cancer staging varies by tumor type, but generally involves defining the size of the primary tumor, the spread into regional lymph nodes, and the spread to distant sites. Cancer staging requires imaging and laboratory evaluation, which may not be available in all settings. Despite this, important clinical decisions can often be made through a careful physical exam and history, basic laboratory investigations, and chest radiography and abdominal ultrasound. For many cancers, clinical stage may be assigned without extensive testing.

Treatment

The primary objectives of cancer treatment are cure, prolonging life, and improving the quality of life. An effective and efficient treatment program should be linked to screening and early detection, and follow evidence-based standards of care. Essential elements of cancer treatment include surgery, radiation therapy, systemic therapy (chemotherapy, hormonal therapy, and biological therapy), and supportive care. Some treatments require sophisticated technology and these treatments should be concentrated in relatively few places in a region to maximize efficiency and the use of resources.

Surgery remains essential for the successful and curative treatment of many cancers.[38] For solid tumors, long-term survival usually depends on surgical removal of the primary tumor, adequate resection of margins, and evaluation of regional lymph nodes. For surgery to be effective, cancers must be identified at an early stage, and surgeons must be trained to perform cancer operations. Cancer surgery will have the greatest chance of success if it is part of a larger surgical and healthcare program.

Surgery remains essential for the successful and curative treatment of many cancers.

Cancer surgeries range from basic to highly complex. Surgical choices are determined by the availability, or the lack, of related resources and services. For instance, if radiation therapy is not available, localized breast cancers are best managed surgically with mastectomy; but if radiation therapy is available, then lumpectomy and radiation may be a good alternative for patients with early stage disease. Likewise, the approach to rectal cancer will be influenced by whether radiation and/or chemotherapy are available.

Not all surgery is done with the intent of cure, although intent might not be known until after the surgery begins. When complete removal of a tumor is not possible, surgery is often used to debulk the tumor, which can prolong life and reduce symptoms and pain.

Radiation therapy is a component in the curative treatment plans for many cancers and is used in palliation and symptom relief for even more cancers.[39] Radiotherapy has limited medical uses in noncancerous conditions, and is overwhelmingly a cancer treatment modality. Radiation therapy is used in the management of most solid tumors, especially those presenting with advanced disease, and is essential in the management of cancers of the cervix, head and neck, and lung.

Radiotherapy usually requires physics support, but can be safely and simply delivered even with limited technology. Providing safe and effective radiation therapy requires an initial capital investment in radiotherapy equipment and specially designed space, as well as an investment in trained personnel and equipment maintenance. Cobalt machines or linear accelerators can deliver external beam radiation. Linear accelerators are favored in high income countries, but they require dependable access to electricity, which is not always available in developing countries, and they are more complex to maintain. These factors make cobalt machines, with replaceable cobalt sources, more appropriate for many LMICs.

Radiation therapy is a component in the curative treatment plans for many cancers and is used in palliation and symptom relief for even more cancers.

The requirements for medical, scientific, and technical expertise can be an even bigger constraint than the scarcity of radiotherapy equipment. A shortage of trained staff may limit the number of patients who can be treated, even if the equipment exists. Yet, the availability of modern information and communication technologies allows for long distance mentorship and support for small radiotherapy programs in remote areas.

Cobalt machines, with replaceable cobalt sources, may be more appropriate for establishing radiotherapy programs in many LMICs.

The requirements for developing a new radiotherapy program or facility must meet standards for safe and effective operation. In a program that can, and should, be expanded, the International Atomic Energy Agency (IAEA) provides radiotherapy to LMICs and supports monitoring and provision of radioactive sources. The IAEA has also developed a comprehensive guide for setting up radiotherapy services that include strengthened regulatory environments. The IAEA PACT Program fosters comprehensive cancer programs that include all aspects of cancer prevention, screening, therapies, and palliation.[40]

Unfortunately, the availability of radiation therapy remains limited or nonexistent in many low income countries, or it may only be available at regional hospitals and inaccessible for most patients. Strategies such as short-course therapy should be explored to minimize the burden of travel for patients and to increase the number of patients who can be treated at a facility. One fraction of radiotherapy is often enough to reduce pain for several months.

Strategies such as short-course therapy should be explored to minimize the burden of travel for patients and to increase the number of patients who can be treated at a facility.

Systemic therapy, an essential component of care for many cancers, aims to eradicate disease, prolong life, or alleviate symptoms. Some of the first successful cancer drug therapy regimens benefitted leukemia, lymphomas, testicular cancer, and childhood cancers.[41]

In some common cancers, including breast and colon, drugs can be used as an adjuvant modality in combination with surgery to reduce risk of recurrence and improve survival. Some cancers are relatively resistant to most systemic therapy, and these patients derive little benefit.

Systemic therapies fall into the categories of cytotoxic chemotherapy, hormonal therapy, and targeted cancer therapies. The common routes of administration of cancer drug therapy are oral, intravenous, intramuscular, and topical. Depending on the route of administration and the need for monitoring, treatments can be given in a medical office or clinic, or in a hospital. Periodic laboratory tests monitor the blood and organs for side effects. With proper training of personnel, chemotherapy can be safely prepared and administered at national and district hospitals, even in very poor countries (see Section 6).

With proper training of personnel, chemotherapy can be safely prepared and administered at national and district hospitals, even in very poor countries

Of particular importance to expanding access to CCC in LMICs is the fact that most of the essential anti-cancer drugs are off-patent and should be obtainable at reasonable cost (Table 1). The majority of the drugs listed in Table 1 are on complemen-tary listings of the WHO Essential Drug List for 2011, with the provision that adequate resources and specialist oversight are available.

Essential Anti-Neoplastic Agents (for adult and pediatric cancers)

Table 1

	Agent	Route of Administration	Patent Status	WHO Essential Drug List 2010
1	Anastrozole (or letrozole, exemestane)	oral	Off	**no**
2	asparaginase	parenteral	Off	yes
3	bleomycin	parenteral	Off	yes
4	carboplatin	parenteral	Off	yes
5	Cisplatin	parenteral	Off	**no**
6	cyclophosphamide	parenteral and oral	Off	yes
7	cytarabine	parenteral	Off	yes
8	dacarbazine	parenteral	Off	yes
9	dactinomycin	parenteral	Off	yes
10	daunorubicin	parenteral	Off	yes
11	dexamethasone	oral	Off	yes
12	doxorubicin	parenteral	Off	yes
13	etoposide	parenteral and oral	Off	yes
14	fluorouracil (5-FU)	parenteral	Off	yes
15	hydroxyurea	oral	Off	yes
16	ifosfamide	parenteral	Off	yes
17	Imatinib	oral	Off	**no**
18	leucovorin	parenteral and oral	Off	yes
19	melphalan	oral	**On**	**no**
20	mercaptopurine	parenteral	Off	yes
21	mesna	parenteral and oral	Off	yes
22	methotrexate	parenteral and oral	Off	yes
23	paclitaxel	parenteral	Off	**no**
24	prednisone	oral	Off	yes
25	rituximab	parenteral	**On**	**no**
26	tamoxifen	oral	Off	yes
27	trastuzumab	parenteral	**On**	**no**
28	Vinblastine	parenteral	Off	yes
29	Vincristine	parenteral	Off	yes

Most of the essential anti-cancer drugs for treatment of cancer in LMICs are off-patent and should be obtainable at reasonable cost.

Cost is only one aspect of safe and effective use of systemic treatment. A supportive infrastructure is required to administer these drugs. Chemotherapy administration and management of side effects are complex and require standardized procedures, supportive care drugs, and significant training, usually of nurses. Clinical and laboratory monitoring during treatment is needed for safe administration of chemotherapy. Preparation and administration of chemotherapy and related drugs can be hazardous and so measures must be taken to protect healthcare workers. Chemotherapy and related medications should be administered in recommended doses, since any reduction can produce sub-therapeutic doses and poor outcomes, while still creating effort, expense, and toxicity for the patients. In addition, supratherapeutic doses can increase morbidity and mortality. A reliable drug supply must be available for optimal care and to minimize harmful treatment interruptions.

It is always preferable to have an on-site oncologist directing cancer care and, in particular, administering chemotherapy. Unfortunately, the global supply of oncologists is far from sufficient to provide care for all the world's cancer patients. Because of this shortage, it must be assumed that medical professionals who are not oncologists will deliver much of the care in order to treat more cancer patients worldwide. General physicians and nurses can administer treatment such as chemotherapy with the secure and readily available backup of off-site cancer specialists. Detailed policies, procedures, and training are required as well. Using resources this way should make it possible to treat a larger percentage of cancer patients in the many settings that lack specialty oncology services (see Section 6).

Newer targeted therapies block cancer cells' ability to grow, divide, repair, and communicate with other cells by interfering with specific molecules associated with cancer cells, but usually not found on normal cells, at least not in significant numbers. About a dozen targeted therapies are approved in at least one high income country, and many more are in clinical trials. Some commonly used targeted therapies include trastuzumab and lapatinib, aimed at HER2 in breast cancer, imatinib for CML, and EGFR-targeted therapies (erlotinib, gefitinib) for lung and colon cancer. These agents can be highly effective with minimal side effects and are relatively easy to administer. Yet, because of the cost –these therapies tend to be expensive, costing tens of thousands of dollars for a course of treatment– the use of many of these agents is not feasible in most low-resource settings. Strategies need to be developed to obtain these drugs at reduced cost for LMICs. There are examples, such as the Max Foundation partnership with Novartis for imatinib, of providing certain targeted therapies at no cost in resource-poor settings.[42] Similarly, some highly effective therapies, such as trastuzumab, are being included in universal benefit packages, as is the case in Mexico (see Section 8).

Many previously expensive yet effective biologic agents (e.g., rituximab for lymphoma, imatinib for CML, and trastuzumab for HER2-positive breast cancer) will be exiting from patent protection in coming years, and health care systems in LMIC should continually re-evaluate what constitutes cost-effective healthcare based upon patent expirations.

Treatment of Side Effects and Supportive Care: The diagnosis and treatment of cancer can cause many physical and emotional side effects. Monitoring for infections and prompt antibiotic treatment of febrile neutropenia, a serious and potentially life-threatening side effect, is essential for any chemotherapy infusion center. Supportive care drugs are available to reduce many side effects, including low-cost, anti-emetics and drugs that treat diarrhea and constipation. Oral complications, which can be lessened with good mouth care, are a common side effect of both chemotherapy and radiation. Many patients experience post-surgical lymphedema and post-mastectomy problems, and some patients must deal with loss of fertility, sexuality, concerns about body image, and early menopause due to their cancer treatment.

Long-term follow-up, rehabilitation, and survivorship care

Anticipating that successful treatment will become more widely available, programs for survivorship care are needed to support patients for short- and long-term complications of their disease and treatment. Such follow-up should include screening for possible recurrence of the primary cancer or occurrence of secondary cancers, as well as monitoring and treating the physical and emotional side effects related to diagnosis and treatment. Survivorship care should be incorporated into a general medical care program, and integrated into the primary level of the health system using a diagonal approach.[43]

A reliable drug supply must be available for optimal care and to minimize harmful treatment interruptions.

Medical professionals who are not oncologists will deliver much of the care in order to treat more cancer patients worldwide.

Anticipating that successful treatment will become more widely available, programs for survivorship care are needed to support patients for short- and long-term complications of their disease and treatment.

Palliative care

The relief of suffering of any kind constitutes palliative care. It is an essential part of comprehensive cancer care as many patients suffer pain.[44-46] In LMICs, the majority of cancer patients are in advanced stages of cancer when first seen by a medical professional. For most of them, pain relief and palliative care is the treatment option that offers the most benefit and the least burden. Relief of suffering through palliative care is a fundamental human right that is also inexpensive.

Relief of suffering through palliative care is a fundamental human right that is also inexpensive.

There is no contradiction between cancer treatment and palliative care. Chemotherapy and radiation therapy often relieve pain and other symptoms, and can be excellent palliatives. Conversely, good palliative care promotes adherence to cancer treatment and can both extend life and improve its quality.[47] The diagnosis and treatment of cancer can itself cause physical and emotional side effects. Palliative care medicines, including low-cost, anti-emetics, can reduce the symptoms of chemotherapy.

Additionally, people with cancer, and those around them, benefit from psychosocial support to cope with the physical, psychological, and social impacts of the disease. Psychosocial support should begin at diagnosis and continue through treatment and recovery, or death and bereavement. In LMICs, a wide range of health care workers and lay people can offer psychosocial support.

Effective palliative care requires a broad, multidisciplinary approach that includes the family and makes use of community resources.[48] Because of the spectrum of needed services, a team of physicians, nurses, social workers, pharmacists, spiritual counselors, community health workers, and volunteers best provides palliative care. This care can be provided in tertiary care facilities, in community health centers, and even in patient homes. WHO has developed a strategy for integrating palliative care into health care systems.[49]

The International Association of Hospice and Palliative Care (IAHPC) has developed a list of essential medicines for palliative care.[50] Access to oral morphine, the most essential of palliative medicines, is severely limited in most LMICs because of overly restrictive or "imbalanced" national opioid policies and regulations. According to WHO guidelines, opioid policies and regulations should balance measures to prevent illicit opioid use with those to assure its accessibility for pain relief.[51] Experience has shown that overly restrictive opioid policies and prescription regulations can be changed quickly by working with ministries of health and by providing training in pain relief and technical assistance to public health officials, clinicians, patients, and the general public.[52]

Experience has shown that overly restrictive opioid policies and prescription regulations can be changed quickly by working with ministries of health and by providing training in pain relief and technical assistance to public health officials, clinicians, patients, and the general public.

Research

Development of a research agenda designed to address questions applicable to CCC in LMICs is not only essential to optimizing care and allocating resources effectively, but is also needed to demonstrate to governments and the public health community what can and cannot be accomplished in these settings. Further, research is needed to identify potential differences in the presentation of disease across populations and responses to specific treatments that may differ from those of high income populations.[53] In addition, research programs in LMICs can contribute evidence and knowledge to advance care and help patients worldwide.

Disease programs must be measured and monitored from their outset, prospectively, rather than retrospectively, with a primary goal of identifying the interventions that can improve cancer care most effectively, as well those that do not. It cannot be assumed that interventions and programs are accomplishing the goal of better cancer care and improved patient outcome. Data must be accrued from the initiation of a program, monitored for quality, and made available. Health systems and implementation research is an important component of developing a CCC program in any LMIC and should be incorporated from the start –including baseline data– for greatest impact.

The prime research questions for LMICs differ from those of the developed world. High income countries test new therapies to determine which are most efficacious in ideal settings. In LMICs, the questions should revolve around what approaches will bring cancer care to the population and understanding disease differences in different population groups. Some possible topics for research include identifying elements needed to implement and/or scale-up effective cancer services, innovative treatment paradigms in resource-restricted settings, relative effectiveness of treatment prototypes for LMICs, and trends in incidence, stage distribution, and survival for cohorts of cancer patients. Research priorities and strategies for building evidence are also discussed in Section 9 of this Report.

The prime research questions for LMICs differ from those of the developed world. In LMICs, the questions should revolve around what approaches will bring cancer care to the population and understanding disease differences in different population groups.

5.iii Categorization of "candidate cancers" amenable to care and control in LMICs

Many opportunities for prevention, diagnosis, treatment, and palliation of cancer can be applied in low-resource settings, especially for a subset of candidate cancers that are among the most significant challenges in LMICs. The identification of 'candidate cancers' places particular emphasis on what can be done even in a setting with limited trained personnel and limited specialized oncology facilities. The Appendix outlines basic strategies for specific cancers. This is not meant to be a comprehensive list of diseases for inclusion in a national CCC plan, and it is assumed that disease prioritization will vary from country to country and across sites.

"Candidate cancers" can be grouped into four categories for care and control in LMICs: those most amenable to prevention and risk reduction; those for which cure can be significantly increased with early detection; those with high cure rates, based primarily on systemic therapy; and those for which substantial benefit in life extension and palliation can be gained with systemic therapy and supportive care (Table 2). It is important to note that several cancers fall into more than one category, particularly depending on stage at diagnosis. Further, all cancers are amenable to pain control and end of life care.[54]

The identification of 'candidate cancers' places particular emphasis on what can be done even in a setting with limited trained personnel and limited specialized oncology facilities.

Categorization of Cancers Amenable to Care and Control in LMICs

Table 2

- **Group 1: Cancers amenable to prevention and risk reduction. Examples:**
  - Lifestyle-related
  - Tobacco and lung cancer, head and neck cancer, bladder cancer
  - Alcohol and hepatocellular carcinoma
  - Infection-related
  - HPV and cervical cancer
  - Hepatitis B and hepatocellular carcinoma
  - H pylori and stomach cancer

- **Ground 2: Cancers amenable to curative approaches with early detection and treatment. Examples:**
  - Cervical cancer
  - Breast cancer
  - Retinoblastoma

- **Group 3: Cancers amenable to curative approaches primarily based on systemic therapy. Examples:**
  - Burkitt's lymphoma
  - Hodgkin's lymphoma
  - Childhood Acute Lymphocytic Leukemia
  - Non-Hodgkin lymphomas

- **Group 4: Cancers amenable to life extension and palliation with systemic therapy. Examples:**
  - Kaposi's sarcoma
  - Chronic myelogenous leukemia

5.iv Conclusions

In the face of resource scarcity, packages of options need to be identified for countries at different levels of economic development. Two excellent examples of how to structure levels of care with different available resources are provided by the Breast Health Global Initiative guidelines for breast cancer and the adapted regimens for pediatric ALL.[55-60] In future work, this type of analysis and disease-specific recommen-dations are needed for other cancers, beginning with those of highest burden and those most amenable to prevention or treatment.

A full analysis based on Disability-Adjusted Life Years (DALYs) and cost-effectiveness should be given high priority in efforts to expand CCC in LMICs. The results of a more comprehensive analysis would be an invaluable guide to help policy makers in LMICs make more informed decisions about how to invest in CCC. The components of care that are outlined below can guide much more extensive analysis for all diseases and all possible treatment components.

References

1. World Health Organization. *National cancer control programmes: policies and managerial guidelines*. 2nd Ed. Geneva, Switzerland: World Health Organization. 2002.
2. World Health Organization. *Global status report on noncommunicable diseases 2010*. Geneva, Switzerland: World Health Organization. 2011.
3. Breast Health Global Initiative. Homepage. 2011. http://portal.bhgi.org/Pages/Default.aspx (accessed October 1, 2011).
4. WHO. *Global status report on noncommunicable diseases 2010*.
5. Bridges JFP, Anderson BO, Buzaid AC, et al. Identifying Important Breast Cancer Control Strategies in Asia, Latin America and the Middle East/North Africa. *BMC Health Services Research* 2011;11(227).
6. Sloan FA, Gelband H (Eds.). *Cancer control opportunities in low-and middle -income countries*. Washington DC: National Academy Press, 2007.
7. King Hussein Cancer Foundation and Center. Annual Report. King Hussein Cancer Foundation and Center. 2011. http://www.khcc.jo/showcontent.aspx?ContentId=265 (accessed October 11, 2011).
8. http://www.jointcommission.org/about_us/about_the_joint_commission_main.aspx (accessed October 16, 2011)
9. Stjernsward J, Ferris FD, Khleif SN, et al. Jordan Palliative Care Initiative: A WHO Demonstration Project. *Journal of Pain and Symptom Management* 2007;33(5):628-633.
10. Al-Qudimat MR, Day s, Almomani T, Odeh D, Qaddoumi I. Clinical Nurse Coordinators: a new generation of high specialized oncology nursing in Jordan. *J Pediatr Hematol Oncol* 2009;31:38-41.
11. Jordan Breast Cancer Program. Goals and Objectives. Jordan Breast Cancer Program, 2011. http://www.jbcp.jo/node/6 (accessed May 16, 2011).
12. St. Jude Children's Research Hospital. International Partners Sites. St. Jude Children's Research Hospital. 2011. http://www.stjude.org/stjude/v/index.jsp?vgnextoid=9e566f9523e70110VgnVCM1000001e0215acRCRD&vgnextchannel=48a9f8f281901110VgnVCM1000001e0215acRCRD (accessed May 16, 2011).
13. Qaddoumi I, Mansour A, Musharbash A, Drake J, Swaidan M, Tihan T, et al. Impact of telemedicine on pediatric neuro-oncology in a developing country: the Jordanian-Canadian experience. *Pediatric Blood & Cancer* 2007;48(1):39-43.
14. Qaddoumi I, Nawaiseh I, Mehyar M, Razzouk B, Haik BG, Kharma S, et al. Team management, twinning, and telemedicine in retinoblastoma: A 3 tier approach implemented in the first eye salvage program in Jordan. *Pediatric Blood & Cancer 2008*;51(2):241-4.
15. Hazin R, Qaddoumi I. Teleoncology: current and future applications for improving cancer care globally. *Lancet Oncol* 2010; 11(2):204-10.
16. LIVESTRONG. Cancer stigma and silence around the world: A LIVESTRONG Report. Austin, TX: 2010.
17. Harries AD, Zachariah R, Tayler Smith K, et al. Keeping health facilities safe: one way of strengthening the interaction between disease specific programmes and health systems. *Tropical Medicine & International Health* 2010;15(12):1407-12.
18. Hermann K, Van Damme W, Pariyo GW, et al. Community health workers for ART in sub-Saharan Africa: learning from experience–capitalizing on new opportunities. *Human Resources for Health* 2009;7(1):1-11.
19. Kober K, Van Damme W. *Expert patients and AIDS care: A literature review on expert patient programmes in high -income countries, and an exploration of their relevance for HIV/AIDS care in low -income countries with severe human resource shortages*. Berlin and Antwerp: Department of Public Health, Institute of Tropical Medicine, 2006.
20. Assefa Y, Van Damme W, Hermann K. Human resource aspects of antiretroviral treatment delivery models: current practices and recommendations. *Current Opinion in HIV and AIDS* 2010 Jan;5(1):78-82.
21. Lehmann U, Van Damme W, Barten F, Sanders D. Task shifting: the answer to the human resources crisis in Africa? *Human Resources for Health* 2009;7(1):12-4.
22. Azenha G, Bass LP, Caleffi M, et al. The role of breast cancer civil society in different resource settings. *Breast (Edinburgh, Scotland)* 2011;20(2):S81-S7.
23. Durstine A, Leitman E. Building a Latin American cancer patient advocacy movement; Latin American cancer NGO regional overview. *Salud Pública de México* 2009;51(2):316-322.
24. WHO. *Global status report on noncommunicable diseases 2010*.
25. Sloan FA, Gelband H (Eds.) 2007.
26. World Health Organization. WHO Framework Convention on Tobacco Control. World Health Organization. 2011. http://www.who.int/fctc/en/ (accessed October 11, 2011).
27. Murray CJL, Lopez AD (Eds.). *The Global Burden of Disease: A comprehensive assessment of mortality and disability from diseases, injuries and risk factors in 1990 and projected to 2020*. Cambridge, MA: Harvard University Press on behalf of the World Health Organization and the World Bank; 1996.
28. Sloan FA, Gelband H (Eds.), 2007.
29. Institute of Medicine (IOM). Ensuring quality cancer care through the oncology workforce: Sustaining care in the 21st century: Workshop summary. Washington, DC: The National Academies Press, 2009.
30. McAdam M, Sakita J, Tarivonda L, Pang J, Frazer I, Masucci M. Evaluation of a Cervical Cancer Screening Program Based on HPV Testing and LLETZ Excision in a Low Resource Setting. PLoS ONE 2010;5(10):e13266.
31. Valencia-Mendoza A, Sánchez-González G, Bautista-Arredondo S, Torres-Mejía G, Bertozzi SM. Cost-effectiveness of breast cancer screening policies in Mexico. *Salud Pública de México* 2009;51(2):s296-s304.
32. Goldie S, Gaffikin L, Goldhaber-Fiebert J, Gordillo-Tobar A, Levin C, Mahe C, et al. Cost-effectiveness of cervical-cancer screening in five developing countries. *The New England Journal of Medicine* 2005;353(20):2158.
33. Quentin W, Adu Sarkodie Y, Terris Prestholt F, Legood R, Opoku BK, Mayaud P. Costs of cervical cancer screening and treatment using visual inspection with acetic acid (VIA) and cryotherapy in Ghana: the importance of scale. *Tropical Medicine & International Health* 2011;16(3):379-89.
34. Haynes AB, Weiser TG, Berry WR, Lipsitz SR, Breizat AHS, Dellinger EP, et al. A surgical safety checklist to reduce morbidity and mortality in a global population. *New England Journal of Medicine* 2009;360(5):491-9.
35. Conley DM, Singer SJ, Edmondson L, Berry WR, Gawande AA. Effective Surgical Safety Checklist Implementation. *Journal of the American College of Surgeons* 2011:1-7.
36. Carlson J, Lyon E, Walton D, Foo W, Sievers A, Shulman L, et al. Partners in Pathology: A Collaborative Model to Bring Pathology to Resource Poor Settings. *The American Journal of Surgical Pathology* 2010;34(1):118-23.
37. American Joint Commission on Cancer (AJCC) in Edge SB, Byrd DR, Compton CC, et al (Eds.) *AJCC Cancer Staging Manual*. 7th ed. New York: Springer, 2010, pp 395-402.
38. Mukherjee S. *The emperor of all maladies: a biography of cancer*. New York: Scribner, 2010.
39. International Atomic Energy Agency. Setting Up a Radiotherapy Programme: Clinical, Medical Physics, Radiation Protection, and Safety Aspects. International Atomic Energy Agency. 2008.
40. International Atomic Energy Agency. Documents on Cancer Control and Treatment. International Atomic Energy Agency. 2011. http://cancer.iaea.org/documents.asp#content (accessed October 11, 2011)
41. Mukherjee S. *The emperor of all maladies: a biography of cancer*. New York: Scribner; 2010.
42. The Max Foundation. Homepage. Home Page. 2011 http://www.themaxfoundation.org/ (accessed October 1, 2011)
43. Institute of Medicine. Implementing Cancer Survivorship Care Planning. National Academies Press, Washington, D.C. 2007.
44. Teunissen SCCM, Wesker W, Kruitwagen C, et al. Symptom prevalence in patients with incurable cancer: A systematic review. *J Pain Symptom Manage* 2007;34:94-104.
45. Krakauer EL. Just palliative care: Responding responsibly to the suffering of the poor. *J Pain Symptom Manage* 2008;36:505-512.;
46. Black F, Brown S, Ennals D, Diego Harris J, LeBaron V, Love R. *INCTR Palliative Care Handbook*. International Network on Cancer Treatment and Research. 2008. http://inctr-palliative-care-handbook.wikidot.com/ (accessed October 1, 2011)
47. Temel JS, Greer JA, Muzikansky A, et al. Early palliative care for patients with metastatic non-small-cell lung cancer. *N Engl J Med* 2010;363:733-742.
48. Stjernswärd J, Foley KM, Ferris FD. The public health strategy for palliative care. *J Pain Symptom Manage* 2007;33:486-493.
49. World Health Organization. Palliative Care. World Health Organization. 2011. http://www.who.int/cancer/palliative/en/ (accessed October 1, 2011).
50. De Lima l, Krakauer EL, Lorenz K, et al. Ensuring palliative medicine availability: the development of the IAHPC list of essential medicines for palliative care. *Journal of Pain and Symptom Management* 2007;33:521-526.
51. World Health Organization. *Ensuring Balance in National Policies on Controlled Substances: Guidelines for Availability and Accessibility of Controlled Medicines*. Geneva: WHO Press, 2011.
52. Bosnjak S, Maurer MA, Ryan KM, et al. Improving the availability and accessibility of opioids for the treatment of pain: the International Pain Policy Fellowship. *Support Care Cancer* 2011;19:1237-1247.
53. Love RR. Defining a global research agenda for breast cancer. *Cancer* 2008;113 (suppl): 2366-2371.
54. Sloan FA, Gelband H (Eds.), 2007.
55. Anderson BO, Cazap E. Breast Health Global Initiative outline for program development in Latin America. *Salud Pública de México* 2009;51(2):S309-S15.
56. Anderson BO, Cazap E, El Saghir NS, Yip CH, Khaled HM, Otero IV, et al. Optimisation of breast cancer management in low-resource and middle-resource countries: executive summary of the Breast Health Global Initiative consensus, 2010. *Lancet Oncology* 2011;12(4):387-98.
57. El Saghir NS, Adebamowo CA, Anderson BO, Carlson RW, Bird PA, Corbex M, et al. Breast cancer management in low resource countries (LRCs): Consensus statement from the Breast Health Global Initiative. *Breast (Edinburgh, Scotland)* 2011;20(2):s3-s11.
58. Harford JB, Otero IV, Anderson BO, Cazap E, Gradishar WJ, Gralow JR, et al. Problem solving for breast health care delivery in low and middle resource countries (LMCs): consensus statement from the Breast Health Global Initiative. *The Breast*. 2011;20:S20eS9.

59. Anderson BO, Yip CH, Smith RA, Shyyan R, Sener SF, Eniu A, et al. Guideline implementation for breast healthcare in low -income and middle -income countries: overview of the Breast Health Global Initiative Global Summit 2007. *Cancer* 2008 Oct 15;113(8 Suppl):2221-43.
60. Hunger SP, Sung L. Treatment strategies and regimens of graduated intensity for childhood acute lymphoblastic leukemia in low -income countries: A proposal. *Pediatric Blood and Cancer* 2009;52(5):559-65.
61. IARC. Cervix Cancer Screening. *IARC Handbook of Cancer Prevention*, Volume 10. Lyon: IARC, 2005.
62. PATH, Child Health and Development Centre, and the Uganda National Expanded Program on Immunization. *HPV Vaccination in Latin America: Lessons learned from a pilot program in Peru*. Seattle: PATH, 2011.
63. W, IARC, PAHO, ACCP, FIGO. *Comprehensive Cervical Cancer Control: A guide to essential practice*. Geneva: WHO, 2006
64. Blumenthal PD, Lauterbach M, Sellors JW, Sankaranarayanan R. Training for cervical cancer prevention programs in low-resource settings: Focus on visual inspection with acetic and cryotherapy. *International Journal of Gynecology & Obstetrics* 2005; 89: S30-S37.
65. Alliance for Cervical Cancer Prevention. *Planning and Implementing Cervical Cancer Prevention and Control Programs. A Manual for Managers*. Seattle: ACCP, 2004.
66. El Saghir NS, Adebamowo CA, Anderson BO, Carlson RW, Bird PA, Corbex M, et al. Breast cancer management in low resource countries (LRCs): Consensus statement from the Breast Health Global Initiative. *Breast (Edinburgh, Scotland)* 2011;20(2):s3-s11.
67. Breast Health Global Initiative. Homepage. 2011. http://portal.bhgi.org/Pages/Default.aspx (accessed October 1, 2011)
68. Olov HA, Hunter D, Trichopoulos D. *Textbook of Cancer Epidemiology*. New York: Oxford University Press. 2008.
69. Shulman LN, Willett W, Sievers A, Knaul FM. Breast Cancer in Developing Countries: Opportunities for Improved Survival. *Journal of Oncology* 2010;2010:1-6.
70. Rodriguez-Galindo C, Wilson MW, Chantada G, et al. Retinoblastoma: One World, One Vision. *Pediatrics* 2008; 122:e763-770.
71. Wilimas JA, Wilson MW, Haik BG, et al. Development of retinoblastoma programs in Central America. *Pediatric Blood and Cancer* 2009; 53:42-6.
72. Chantada GL, Qaddoumi I, Canturk S, Khetan, et al. Strategies to manage retinoblastoma in developing countries. *Pediatric Blood Cancer* 2011; 56:341-348.
73. Olov HA, Hunter D, Trichopoulos D, 2008.
74. Ibid.
75. Ibid.
76. Ibid.
77. Ibid
78. The Max Foundation. Homepage. The Max Foundation. 2011 http://www.themaxfoundation.org/ (accessed October 1, 2011).

Section 5, Appendix

Categorization of "candidate cancers" amenable to care and control in LMICs

The application of a core-elements framework is applied below to a subset of cancers, with a focus on describing the elements of cancer care required for their treatment.

Cervical cancer[61-65]

As discussed above, cervical cancer is common among women worldwide, particularly in developing countries. A large number of cervical cancer deaths are in young women, and the highest incidence rates are found in sub-Saharan Africa, Latin America and the Caribbean, and Southeast Asia. Cervical cancer fits into each of the four categories of care and control, with substantial opportunities for prevention, early detection, and treatment in LMICs.

Nearly all cervical cancer is now known to be caused by HPV, which has opened a new route for prevention through vaccination. But even before HPV vaccination was developed, a dramatic decline in cervical cancer incidence and mortality was achieved in developed, and in several developing countries, through the adoption of Pap smears to screen for precancerous lesions. Treatment for cervical cancer can be effective even at more advanced stages.

Prevention

Cervical cancer is amenable to primary prevention through vaccination against HPV, which has been shown to substantially reduce the incidence of cervical cancer, and should be a major goal of healthcare systems in developing countries. The age at vaccination may depend on the specifics of the country involved. Approaches to reach the greatest number of girls, through schools or religious institutions, should be considered. In addition, research is required to determine what HPV subtypes are responsible for cervical cancer in different geographic areas and populations of patients, and to then develop appropriate strategies.

Early Detection

Even if a successful program is initiated, vaccination may not impact cervical cancer rates for 20-30 years. Furthermore, even in the best scenario, the vaccine can prevent only 70% of cervical cancer and so women will continue to develop cervical cancer, and cervical cancer screening will remain essential.

A variety of approaches can be taken for early detection of cervical cancer, and available resources will help to determine the specific program undertaken by a particular country or region. Pelvic exam and Pap smears are not likely to be practical in all parts of the world, as pelvic exams are time-consuming and Pap smears require trained personnel to both perform and interpret. By contrast, HPV DNA testing is a practical and easily performed technique that could be used in many developing countries. Ideally, it is performed as part of a pelvic examination, with a swab from the cervix. However, routine pelvic examinations on all women may not be practical, and, as an alternative in these settings, the test may be self-performed using a vaginal swab.

Treatment

Specific treatment approaches for women with positive HPV DNA testing will vary, depending on the resources available and local policies. One potential approach is that women with positive HPV DNA test results undergo visual inspection with acetic acid. Lesions limited to a small region of the cervix, with no visible evidence of cancer and no endocervical involvement, may be treated with cryosurgery. Lesions which involve the endocervical canal, or have areas visibly suspicious for small cancers, should be treated with excision, either by LOOP, cone biopsy, or simple hysterectomy.

Women found to be suffering from advanced cancer involving more than the cervix should have a small, local biopsy which may be sent to distant pathology services with referral for radiation therapy wherever possible.

Palliation

Patients with advanced cervical cancer, beyond the scope of hysterectomy, should be treated with palliation, including radiation therapy where available. Systemic therapy of metastatic cervical cancer has minimum benefit, at best.

Breast Cancer[66-68]

Breast cancer accounts for nearly 25% of all cancers in women and has become the most common cancer in women in many developing nations. Survival from breast cancer is better than for many cancers, but with a significant divide between wealthy and poorer countries (see Section 2). The incidence of breast cancer is rising globally, particularly where rates have historically been low.

Prevention

Epidemiologic studies have implicated reproductive factors (including childbearing) and lifestyle factors (including obesity and inactivity) as causes of some breast cancer. Incorporation of healthy lifestyle recommendations into primary care will impact many chronic diseases, as well as breast cancer risk.

Early Detection

Breast cancer is only curable when detected at an early stage, and the earlier the stage, the more likely a cure. Increased awareness and screening are options for secondary prevention. Education is a key component of any breast cancer program. Women must understand that breast cancer is curable if detected early and that this requires recognition of the early signs and routine breast examinations. Education can be integrated into programs such as maternal and child health.

Along with education, breast self-awareness and examination should be encouraged, and clinical breast examination by healthcare workers should become routine. Though the smallest cancers will not be detected in this manner, in many settings, this will still offer substantial opportunities for downstaging breast cancer diagnosis.

The role of mammography in developing countries remains controversial. In the most resource-poor settings, mammography simply is not feasible. In middle income countries, mammography is feasible, but only useful when given to asymptomatic women without palpable cancers. Detecting a large, palpable cancer by mammography is not a benefit of mammography, but rather a failure of overall breast care.

Implementation of mammography screening programs outside the context of a robust healthcare infrastructure has been of limited value. Mammography might be best employed when a breast care program already exists in a region, and women are well-educated and readily seek general and breast healthcare.

Existing studies of combined breast health initiatives exist only in the context of health systems where mammography is widely available. Interactions between mammography, routine care, clinical breast exams, and self-breast exams in other settings are less certain and deserve further study. Data from the US between 1950 and 1975, before the routine use of mammography, show a reduction in mortality/incidence ratios from 0.42 to 0.27, which can probably be attributed to improved breast cancer awareness, better healthcare infrastructure, and more routine physical examinations.[69]

Diagnosis

Whether found through physical examination or through imaging, the ability to biopsy and diagnose a breast lesion is essential. The diagnostic biopsy technique of choice is core needle biopsy, and ultrasound can help make this procedure more accurate. The ability to perform stereotactic, mammographically-directed biopsy should be in place before the introduction of any mammography screening program. Some nonpalpable abnormalities found on screening mammography can also be found through targeted ultrasound, although many cannot.

Core needle biopsies can be taught to general physicians, nurses, and other medical personnel. The procedure is safe and it procures an adequate tissue sample for histology and for testing for estrogen receptors (ER) and HER2, both essential tests for determining the best therapy. In addition, guided core biopsy or fine needle aspirate can be performed on suspicious axillary lymph nodes to aid in staging. Biopsy specimens must be handled properly, placed in formalin immediately, and removed at the appropriate interval for further processing.

Treatment

For patients who appear to have disease isolated to the breast and axilla, surgical removal of the tumor is key to potential cure. Successful surgical removal of the tumor can be accomplished either by mastectomy or by lumpectomy with negative surgical margins combined with breast radiation. In many locations, radiation facilities will not be available and mastectomy is the only sound option. Radiation therapy can be an important component of breast cancer treatment when used as part of breast-conserving surgery and in the palliation of locally advanced or metastatic disease.

Choice of primary systemic therapy will require the advice of an oncologist who may be off-site, and should reflect current recommendations. In general, hormone therapy consisting of tamoxifen and/or an aromatase inhibitor will be recommended for patients whose tumors are positive for ER. Chemotherapy is frequently recommended for tumors not expressing ER, and trastuzumab, if available, will be recommended for patients whose tumors over-express HER2.

Survivorship

Breast cancer survivorship rates are high in high income countries and will grow in LMICs following improvements in early detection and treatment. In the US, 5-year survival following the diagnosis of invasive breast cancer is currently above 90%. The diagnosis and treatment of breast cancer can lead to long-term physical and emotional complications that include risk of recurrence, sexual dysfunction, fertility difficulties, emotional distress, fatigue, cognitive problems, as well as side effects that may appear years after treatment. The implications are enormous for patients/survivors, their families, caregivers, and the medical community. Post-treatment interventions can further improve breast cancer survivor outcomes. For instance, studies have shown that being overweight adversely affects survival for postmenopausal women with breast cancer, and that women who are more physically active are less likely to

die from the disease than women who are inactive. Such considerations demonstrate the need for programs and services that provide long-term care and support to individuals and their families.

Palliation

Patients with locally advanced or metastatic breast cancer generally cannot be cured even with the most intensive therapies available in developed countries. Patients can be palliated with hormone therapy if tumors express ER. Chemotherapy has a modest benefit for patients with metastatic disease, and trastuzumab can benefit patients whose tumors over-express HER2. Radiation therapy, where available, can also aid palliation of locally advanced or metastatic disease.

Retinoblastoma[70-73]

Retinoblastoma is the most frequent neoplasm of the eye in childhood and the third most common intraocular malignancy in all ages, following uveal melanoma and metastatic carcinoma. An estimated 8,000 children develop retinoblastoma each year worldwide. However, the retinoblastoma burden is unequally distributed, with higher numbers and higher incidence of metastatic and recurrent disease in low and low middle income countries.

Retinoblastoma represents 2.5% to 4% of all pediatric cancers, but 11% of cancers in the first year of life. The average age-adjusted incidence rate of retinoblastoma in the US and Europe is 2-5/106 children (approximately 1 in 14,000-18,000 live births). However, it appears to be higher (6-10/106 children) in Africa, India, and among children of Native American descent in the North American continent. Whether these geographic variations are due to ethnic or socioeconomic factors is not well-known. However, even in industrialized countries, an increased incidence of retinoblastoma is associated with poverty and low levels of maternal education, suggesting a role for environment.

Retinoblastoma presents in two distinct clinical forms: 1) Bilateral or multifocal, hereditary (25% of cases), characterized by the presence of germline mutations of the RB1 gene. Multifocal retinoblastoma may be inherited from an affected survivor (25%) or be the result of a new germline mutation (75%); and 2) Unilateral retinoblastoma (75%), almost always non-hereditary.

Prevention

As with many pediatric cancers, retinoblastoma is not amenable to primary prevention. However, identification of the hereditary forms and proper counseling of these patients and their families can limit the incidence and burden of retinoblastoma on those families.

Early detection

The successful management of retinoblastoma depends on the ability to detect the disease while it is still intraocular. Disease stage correlates with delay in diagnosis; growth and invasion occur as a sequence of events, and extra retinal extension occurs only when the tumor has reached large intraocular dimensions. Although retinoblastoma is curable when diagnosed early and treated appropriately, the prognosis is dismal when early diagnosis and treatment are lacking. In high income countries, retinoblastoma typically presents intraocular, but in low and middle income countries, 60-90% of

children present with extraocular disease. For these reasons, early diagnosis initiatives are essential. In developing countries, retinoblastoma educational and public awareness campaigns have been shown to increase referrals, decrease rates of advanced disease, and improve outcomes.

Treatment

Treatment of retinoblastoma aims to save life and preserve useful vision, and needs to be individualized. Factors that need to be considered include unilaterality or bilaterality of the disease, potential for vision, and intraocular and extraocular staging. In high income countries, more than 90% of children with retinoblastoma present with intraocular disease, and clinical and research programs in retinoblastoma aim to develop treatments that improve ocular salvage and preserve vision. While enucleation is commonly performed for patients with advanced intraocular unilateral disease, more conservative approaches are followed for children with bilateral and early unilateral disease. This is often accomplished with systemic chemotherapy and intensive focal treatments that include laser thermotherapy and cryotherapy. Orbital radiation therapy is used when those methods fail. These are sophisticated treatments that usually require referral of patients to specialized treatment centers.

Countries with more limited resources present a radically different picture: patients present late and with extremely advanced disease, usually extraocular and metastatic, where the chances of cure are low. For patients presenting with orbital disease, the use of chemotherapy, surgery (enucleation), and radiation therapy may offer possibility of cure. However, patients presenting with metastatic disease, typically to the brain, bone, and bone marrow, are not curable with standard therapies, although patients without brain and leptomeningeal disease may benefit from intensive chemotherapy and consolidation with high-dose chemotherapy and autologous stem cell rescue, which is only available in high -income countries.

Survivorship

Visual impairment and integration into school and society are constant challenges for retinoblastoma survivors and so survivorship programs must coordinate with programs for the visually disabled. More importantly, survivors of bilateral or hereditary disease have an increased risk of developing second malignancies. The cumulative incidence of a second cancer is between 30% and 40%. This risk is particularly high in patients who received radiation therapy. The most common second tumor is osteosarcoma, both inside and outside the radiation field, and soft tissue sarcomas and melanomas are next in frequency. Patients with hereditary retinoblastoma are also at risk of developing epithelial cancers, frequently lung cancer, later in life.

Palliation

Children presenting with advanced extraocular retinoblastoma are not curable, so measures to decrease suffering and improve the quality of life should be maximized. Low dose, oral chemotherapy and radiation therapy may control symptoms.

Burkitt's Lymphoma (BL)[74]

Burkitt's lymphoma is a malignant disease endemic in sub-Saharan Africa, primarily in the malaria belts. It is associated with Epstein-Barr virus (EBV), though the biology of this association is poorly understood.

Diagnosis

BL tends to occur in children and frequently presents with submandibular lymphadenopathy. As it progresses, it results in extrusion of the teeth of the lower jaw. Diagnosis is established from a lymph node biopsy.

Treament

Burkitt's lymphoma is a disease amenable to curative approaches primarily based on systemic therapy. The drugs used to treat BL are inexpensive, readily available on the world market, and relatively easily administered. Systemic chemotherapy comprised of cyclophosphamide and vincristine is highly curative in the majority of patients. These drugs are well-tolerated with a low treatment-related complication rate. Given that the disease affects children and young adults and has a high cure rate, the potential number of years of life saved is very high, making BL a prime candidate cancer to target in low-resource settings.

Hodgkin's Lymphoma[75]

Hodgkin's lymphoma is a highly curable disease of uncertain etiology. It occurs most often in young adults –those between the ages of 17 and 35– and effective treatment has the potential to save many years of life.

Diagnosis

Diagnosis of Hodgkin's lymphoma is established by incisional or core biopsy. Involved lymph nodes in the neck or supraclavicular regions can often be accessed for biopsy. For patients with mediastinal involvement only, tissue can be obtained by CT guided percutaneous biopsy or thoracotomy. Both of these procedures require considerable expertise and technical support. Diagnosis can often be made on H&E sections, with the classic Reed Sternberg cells identified. Immunohistochemistry (IHC) studies can, in some circumstances, be helpful, but usually are not needed. Staging imaging, in particular CT scans, can help delineate the extent of disease, and can be useful for following the course of disease during treatment.

Treament

Hodgkin's lymphoma is amenable to curative approaches, primarily those based on systemic therapy. The mainstay of treatment is chemotherapy and the most commonly used regimen is ABVD – doxorubicin, bleomycin, vinblastine, and dacarbazine. Radiation is often used as an adjunct therapy in areas of bulk disease or to decrease the amount of chemotherapy needed. Where radiation is not available, most patients will be cured with chemotherapy alone.

Kaposi's Sarcoma[76]

Kaposi's sarcoma (KS) is an HIV/AIDS associated disease, which some speculate has become the most common cancer in some regions, including sub-Saharan Africa. Left untreated, it is progressive and life-threatening, but treatment can lead to substantial prolongation and improved quality of life. For KS to be effectively treated, the HIV/AIDS infection must be treated with anti-retroviral agents and be in good control. If the HIV/AIDS infection is not in good control, then treating the KS is not likely to be fruitful.

Diagnosis

KS often presents as an easily diagnosed, subcutaneous disease, though there can be visceral involvement as well.

Treament

Systemic chemotherapy can control, but usually not cure the disease. Control, though, often provides substantial prolongation and improvement in quality of life. A number of chemotherapy regimens are used in the treatment of KS. Because of cost and availability, bleomycin and vinblastine have been used exclusively or for patients with less advanced disease in many resource-poor settings, reserving taxanes for patients with more extensive and life-threatening disease.

Chronic Myelogenous Leukemia[77]

Chronic Myelogenous Leukemia (CML) is amenable to life extension and palliation with systemic therapy. The etiology is unknown.

Diagnosis

The disease is confirmed by molecular testing for the t(9;22) translocation and the bcr-able fusion gene. This testing is not readily available in most developing countries, but can be performed on peripheral blood at regional centers in many developed countries.

Treament

Agents, such as imatinib can be highly effective for many patients with CML, and can provide prolonged clinical and cytogenetic remissions with substantial prolongation of life and reduction or complete resolution of symptoms. Imatinib, and similar agents, are relatively well-tolerated oral agents, but a high degree of patient compliance is required for effective treatment and patients must be followed closely.

Imatinib can often be secured, free-of-charge, from the Max Foundation, with confirmation of the presence of the bcr-abl translocation.[78] *This is one of several examples of drugs, diagnostic tests, and vaccines that have been donated, or are being donated, through foundations or companies.*

Much can be done

Much can be done

Part III

Innovative Delivery of Cancer Care and Control in Low-Resource Scenarios

Section 6

Section 6

Innovative Delivery of Cancer Care and Control in Low-Resource Scenarios

Key messages

- Even where specialized cancer services are not available locally, cancer can and is being treated with the use of innovative delivery strategies. These experiences provide lessons for countries at all income levels.
- Many aspects of cancer care and control (CCC) can be integrated into programs with broad population coverage, such as maternal and child health, sexual and reproductive health, HIV/AIDS, and social welfare/anti-poverty programs.
- Non-specialized human resources, and primary and secondary levels of care can be used to deliver several components of CCC and this can help to partially overcome the shortage of specialty services.
- The potential and capacity of non-specialized health personnel and infrastructure can be increased through the use of information and communications technology and telemedicine, and through formal and informal links with specialized centers around the world. This can reduce the access barriers that patients face, and, at the same time, contain costs.
- Training and capacity-building are essential to reduce the shortage of specialized personnel and oncologists.
- Existing initiatives from hospitals in high income countries that partner with treatment centers and oncology associations in low and middle income countries (LMICs) are flourishing. These could be expanded into global, virtual treatment networks to increase access to specialty services for adults and children, and provide training and exchanges to boost human resource capacity.
- Increasing free access to information and knowledge for patients and providers can catalyze CCC in LMICs.
- Identifying and evaluating the interventions in LMICs that make use of task and infrastructure shifting could benefit the health systems of countries, at all levels of income.
- A database of existing programs and lessons learned, both positive and negative, should be produced and disseminated globally. Existing programs must be evaluated for scale-up potential, and these results must also be shared broadly.

6.i. Introduction

LMICs face a severe shortage of health care workers and an acute lack of clinicians trained in oncology[1-5] In Honduras, for example, fewer than twenty oncologists are available for a country with a population of eight million, and in Ethiopia, four oncologists care for more than 80 million people.[6,7] Similar shortages are faced in other specialty services such as pathology and in access to tertiary centers where diagnosis, surgery, and specific treatments such as radiation therapy are performed.

Still, closing the cancer divide can begin immediately, even in the most resource-constrained environments. Experience is demonstrating that early detection and treatment of many cancers is possible, even in areas that lack specialty services and specialized human resources.

Closing the cancer divide can begin immediately, even in the most resource-constrained environments. Experience is demonstrating that early detection and treatment of many cancers is possible, even in areas that lack specialty services and specialized human resources.

The gap between need and available human and physical resources must be filled by both building new capacity and expanding existing capacity by using alternative, innovative, and complementary delivery mechanisms. It is essential to increase the supply of local specialists (oncologists and others) and specialty centers to provide many of the essential core elements of care (see Section 5).

At the same time, strategies must be found to break down barriers of distance by applying delivery models that have not been sufficiently exploited for CCC. Closing the cancer divide also requires harnessing existing programs that are not often used to meet the challenge of cancer. These include programs for anti-poverty/social welfare, women's empowerment, sexual and reproductive health, HIV/AIDS, and maternal and child health. These mechanisms must be identified, evaluated, adapted, and then scaled-up.

The first part of this section reviews the literature and develops models for harnessing platforms using a diagonal approach, optimizing use of human and physical resources at the primary and secondary levels, and applying information and communication technology to bridge physical barriers. The second part includes a review of a series of projects and programs that are currently underway in several LMICs, some of which include strong links to institutions in high income countries. Each of these projects applies innovative delivery methodologies to expand access to CCC in LMICs and provide important lessons and opportunities for scale-up.

6.ii. Innovations in delivery

The Task Force focuses on three broad categories or types of health system delivery innovations that can help expand access to CCC: infrastructure or spatial shifting to use existing delivery systems that are not usually used for CCC, optimal tasking, and the use of information and communication technology (ICTs) to facilitate both. These innovations provide opportunities for more effective use of scarce human and physical resources.

Innovations provide opportunities for more effective use of scarce human and physical resources.

Harnessing platforms and system-wide interventions

A particularly important aspect of innovative delivery in CCC is the use of existing programs, some of which are designed for either specific diseases (HIV/AIDS), population groups and conditions (MCH, SRH), or social development objectives (anti-poverty or the empowerment of women). These systems can be especially important when a cancer is related to a specific group such as children or women and reproductive health. In addition, these existing programs often already have broad coverage and community acceptance.[8,9]

A particularly important aspect of innovative delivery in CCC is the use of existing programs, some of which are designed for either specific diseases, population groups and conditions, or social development objectives.

Further, elements of each component of the CCC continuum –for several cancers– can be integrated into existing programs. For example, early detection of breast and cervical cancer, and preventative risk factors like smoking and obesity, can be integrated into women and health, sexual and reproductive health, and maternal and child health programs, and the health components of anti-poverty initiatives.[10] This integration can generate the best possible use of the many care providers that make up a health system as well as the breadth of infrastructure that can be made available through better use of ICT and telemedicine.

The potential of cancer-specific innovations in delivery may be enhanced by interventions that are less disease-specific and more horizontal in application. Some of these interventions are system-wide and others are specific to a given area of health care. An example of a system-wide intervention would be the introduction of health insurance that covers rural areas or health professional certification to establish standards of quality.

Optimal Tasking

The notion that all care must be provided by highly specialized clinicians must be challenged.[11] The first mistaken assumption is that non-specialty care, or care from qualified but not specialized health staff, is inferior to traditional models for which specialty care is the norm. In the case of CCC, while access to some specialty care, and certainly to oncologists, is essential, this can be complemented in many ways.

While access to some specialty care, and certainly to oncologists, is essential, this can be complemented in many ways.

The second mistaken assumption is that no care is better than some care. Non-specialty care, or care performed by other health workers who are not physicians, does not result in poor or bad care, under adequate conditions and with appropriate training. In certain settings that are bound by geography, resource constraints, or culture, the use of trained, non-medical staff may be the best available option and can result in excellent care.

In the case of CCC in LMICs, as well as other chronic illnesses and NCDs, many tasks are new (for example, long-term survivorship care for patients who have undergone chemotheraphy and breast clinical exams) and were not undertaken because services were not available. For this reason, this report uses the term 'optimal tasking'. Most of the literature refers to 'task shifting' as the decentralization, delegation, or substitution of services, and the reorganization of the health workforce from highly trained and/or specialized health workers to existing or newly trained health workers who have less training and limited qualifications.[12,13] 'Task sharing' refers to the combination of tasks among health workers with various levels of training to enhance the effectiveness of different aspects of care, using existing skill sets within the health workforce.[14] Optimal tasking encompasses both of these strategies.

Experiences that are well documented in the literature for other diseases or more general care settings (Text Box 6.1) provide key lessons and replicable strategies for introducing and scaling-up CCC in low-resource settings, in ways that strengthen national health systems. These strategies rely on organizing and deploying available and new human, physical, technological, and information resources to support weak health systems.

Text Box 6.1

Optimal tasking: A partial review of the literature

CHWs, expert patients, and clinical officers are examples of less skilled health workers that can be used to deliver care and follow-up. This has been documented in the literature, and below, are some examples:

Community Health Workers

The potential benefits of including community members in primary health care teams have been recognized for several decades.[15] Yet, the HIV/AIDS crisis generated substantial impetus for incorporating CHWs in care delivery in LMICs and has provided important lessons for CCC. The HIV/AIDS programs demonstrate that complex drug regimens can be managed at the community level by CHWs,[16-19] with the desirable effects of expanded demand and an ensuing reduction in stigma.[20] In Bangladesh, BRAC CHWs are responsible for detecting about half of TB cases, and treatment compliance compares favorably to other programs.[21] The cost of the government program that does not use CHWs is 50% higher.[22]

Evidence for including CHWs in the delivery of NCD care and control is limited. In the US, CHWs have helped reduce disparities in management of hypertension and cardiovascular health promotion.[23,24] One cluster, randomized trial from Pakistan shows that family-based home health education from lay health workers, coupled with education of general practitioners, can help control blood pressure among hypertensive patients.[25] A randomized controlled intervention with the Hispanic population on the US-Mexico border showed that CHW intervention was associated with a 35% difference in re-screening.[26,27]

Expert Patients

Task shifting also involves the delegation of some clearly delineated tasks to newly created types of health workers, and the use of expert patients is a particularly promising innovative option.[28,29] People living with HIV/AIDS are being trained in several expert patient programs to build the capacity of health workers.[30] This makes it possible to impart firsthand knowledge of what it means to live with disease, which is an important step in strengthening health systems. In high income countries, expert patient programs in cancer are well known. Further, volunteer groups and civil society organizations often make use of this model – particularly for breast cancer.

Clinical Officers

There are examples of success in the training of teams of health professionals to undertake complex tasks, often in primary- or rudimentary, secondary-level centers. In some parts of Africa, clinical officers or medical assistants provide the majority of care, and, in many countries, they outnumber the doctors. Results of studying 25 sub-Saharan countries with non-physician clinicians who undertake varied tasks (from basic diagnosis and medical treatment to c-sections, ophthalmology, and anesthesia) showed that the costs and duration of training were lower, and rural placement was more successful.[31,32] An economic evaluation showed that major obstetric surgery by surgically trained assistant medical officers in Mozambique was 3.5 times cheaper than surgeons or OBGYNs. In Swaziland, nurse-led primary care was more effective than hospital care for ART.[33] There is some evidence of success in emergency obstetric care in Senegal and Malawi, and in surgery in Mozambique.[34,35] Challenges include resistance from senior health professionals, lack of systemic support for teams, and insufficient financial remuneration and motivation.[36,37]

Based on experience with other diseases, especially HIV/AIDS, several aspects of CCC can be managed or assisted by non-specialist or less specialized medical professionals.

Based on experience with other diseases, especially HIV/AIDS, several aspects of CCC can be managed or assisted by non-specialist or less specialized medical professionals. There are ways to engage expert patients, health promoters (sometimes called acompañateurs or community health workers), clinical health assistants, nurses, and physicians working in primary- and secondary-level care facilities to provide more and better access to CCC, including the provision of some treatment. This strategy has been proposed more broadly for NCDs to respond to the crisis in access to services.[38]

The surgical checklist is a particularly interesting tool that is being successfully applied to procedures such as childbirth should be adapted for expanding access to CCC.

Several tools exist that can facilitate optimal tasking. The surgical checklist is a particularly interesting example that is being successfully applied to procedures such as childbirth. Evaluations are demonstrating that lives can be saved with these very low-cost interventions, which do not require new infrastructure.[39-42] The idea of checklists is potentially applicable to all health care providers and the entire CCC continuum. This includes patients themselves, and it has been embodied in the use of health cards that support women in promoting both their own health and the health of their children.[43]

Task shifting and redistribution have been well-reviewed in the literature, particularly with regards to community health workers and task substitution among health professionals.[44] Overall, a strategy of task redistribution can generate improved access and coverage of similar quality, at a comparable or lower cost.[45-47] Still, research concurs that, particularly in the context of weak health systems, community health workers require focused tasks, adequate and stable remuneration, general and disease-specific training, supervision, involvement of the communities in which they work, and effective integration and team work with other health professionals, especially physicians and nurses at the primary level of care.[48-51]

Integrating CHWs and their programs into national health systems is a challenge.[52,53] Several programs have been successfully brought to scale, and examples exist from around the world.[54-56] A review of experiences demonstrates the importance of stewardship from national governments in developing CHW and other optimal tasking programs. Governments need to guarantee enabling regulatory frameworks, stable and long-term program funding, support for formal training, and the support of all stakeholders.[57,58]

JUANITA PART 2:*

Lessons for innovating delivery, from a hypothetical case study

(See Section 4 for Part 1 of Juanita's story.)

As of January 2007, all Mexicans diagnosed with breast cancer are entitled to Seguro Popular, if they do not have another form of public social security. Further, the package is generous, including trastuzumub for HER2+ cancers and some support for reconstructive surgery.

The coverage is associated with a policy to guarantee quality. Coverage is only available through certified treatment centers that have demonstrated an ability to manage all aspects of breast cancer. Several of these public centers are distributed throughout the country, and most are situated in the capital cities of larger states.

In this context, perhaps the best of any available to a breast cancer patient living in a developing country, consider the case of Juanita:

After diagnosis with Stage III breast cancer, Juanita found that she could not travel to Mexico City for treatment. Thus, the women's hospital in Yautepec, staffed by a surgical oncologist specializing in reproductive cancers, took over the case. With guidance from colleagues at the tertiary level, specialty hospital in Mexico City, where she had trained, the surgeon began administering chemotherapy to reduce the tumor size prior to surgery.

Yet, this presented a financial challenge for everyone involved. The hospital was not certified for treating breast cancer –because no clinical oncologist was available to work in the hospital– and these services could not be covered by the Seguro Popular. If Juanita could have gone to Mexico City for treatment, she would have had all of her services covered. Unfortunately, the costs of the repeated transport for herself, and for her daughter to accompany her, were prohibitive. Further, travel for treatment meant an extra day of lost income for both her and her daughter. Worse, the trip was difficult because of the nausea, and Juanita worried about being so far away from her children.

To save Juanita the cost of seeking care in Mexico City, the hospital turned to a local NGO for support for the remaining 3-4 rounds of chemotherapy (MXN 15,000 =$US 1,200 per session, plus MXN 2,500 =$US 200 for the catheter), and Juanita searched for funds to pay for the drugs to control the symptoms (MXN 63 =$US 4-5) as well as the travel costs to the hospital in Yautepec.

Juanita's search for funds delayed treatment by another three weeks. While the support of the specialty center in Mexico City, the NGO, and the local hospital helped to solve the immediate challenges that Juanita faced, it placed an extra burden on everyone involved.

Further, Juanita is ER/PR and HER2+ and will benefit from tamoxifen (MXN 2,450 =$US 196 per year for 5 years) and ongoing infusions of herceptin. These drugs cannot be financed by the NGO (it costs approximately $US 2,000 per infusion, every three weeks for up to one year).

The minimum overall costs for a patient like Juanita for one year, even if all drugs and services are covered by Seguro Popular, are significant: 30 trips to Mexico City or another urban center cost $US 25-30[59] per round-trip for each patient and caregiver, equaling a total of $US 1,500. By way of comparison, the minimum monthly wage in Mexico, which is higher than the average for about 50% of the workforce, is $US 146. A patient in treatment for breast cancer would probably be unable to work for about 1/3 of a year and so her annual income would be less than $US 1,200, if the patient were lucky enough to earn the equivalent of a minimum wage. This assumes that the patient and caregiver are able to stay at the hostel at the hospital, where costs are minimal. Otherwise, they must also pay for food and lodging. The costs of transport alone are likely to exceed the monthly income of a female-headed household if she is diagnosed with breast cancer and seeking treatment in Mexico City.

Innovations to expand access:

Qualitative research demonstrated that Juanita's story repeated itself in many district hospitals throughout the country as patients sought care close to home. This research translated into a series of lessons and led to concrete steps to perfect what is now one of the very few national programs with universal coverage for a complete range of breast cancer treatments.[60]

With funding from the Seguro Popular, several states such as Jalisco, are developing treatment sites at district hospitals located closer to patients. In addition to saving the patient the costs of transport, this strategy will reduce the strain on tertiary-level cancer centers, which often provide care that could be undertaken by a secondary-level hospital with appropriate supervision.

The patient is registered through the tertiary-level cancer center located in the capital city so that all treatment is covered through the Seguro Popular. Diagnosis, treatment design, surgery, radiation, and case management are undertaken at the specialty center – the National Cancer Institute, in Mexico City, or at one of the state-level cancer institutes. Case management is supervised by a clinical oncologist based at the tertiary hospital. This oncologist must authorize (by phone or e-mail) each drug infusion at the district hospital. Drugs are distributed to the district hospital through the tertiary center. Nurses and physicians at the district hospital receive special training from the specialty center with a particular focus on infusions, avoiding infection, and managing responses.

In Jalisco, where the project is being piloted, two secondary-level, regional hospitals are involved (Ciudad Guzmán and Tepatitán), and the anchor, tertiary-level center is the Instituto Jaliscense de Cancerología. Further, the Instituto is now offering home-based adjuvant therapy to patients living in Guadalajara.

In effect, this model turns the district hospital into a satellite of the specialty hospital and allows for the necessary certification of specific processes. This requires innovations in certification processes, funding, and supply chains – all of which are in process and will benefit not only breast cancer patients but also other cancer patients. These new sites are being designed for chemotherapy, but they will also eventually provide survivorship care.

This strategy has numerous benefits: it reduces overcrowding in specialty centers; offers the patient both specialty care and care closer to home; improves the overall capacity of the district hospitals, particularly in management of hygiene; and reduces costs for the patient and the health system. This strategy also has risks such as potentially overtaxing the local hospital staff. Thus, the project includes an imbedded qualitative evaluation component to help with scale-up to other states.

The Mexico strategy is a hybrid of the models used by many hospitals in high income countries to provide care to a large catchment area (see Case 6). It draws on the models currently in use to improve access to care in resource-constrained countries that have no specialty oncologists (see Case 1), but in this case, the specialists are located in other areas of Mexico and do not have to be sourced internationally.

There are many challenges even at the pilot stage, particularly in patient monitoring, training local physicians, and guaranteeing that funds flow between different levels of the health system. Ongoing evaluation is making it possible to document solutions and improve the delivery model to work towards scale-up. Early results suggest that this is a model that could be generalized and applied in other, mostly middle income countries where specialty providers exist, but are located in large urban centers.

* Juanita's story is based on the experience and information of a patient at the Women's Hospital of Yautepec, Morelos, Mexico, interviewed by Felicia Knaul in spring of 2010.

Task shifting refers to undertaking particular components of CCC in primary- and secondary-level facilities, although this care is often assumed to require either tertiary-level or specialty cancer centers.

Infrastructure shifting and use of ICT

Infrastructure shifting is a concept that has been less studied than task shifting. These strategies bring the point of care closer to the patient, remove geographical barriers to access, reduce costs for the patient, and provide cost-containment for the health system.

In the case of CCC, task shifting specifically refers to undertaking particular care components in primary- and secondary-level, less specialized facilities. This care is often assumed to require either tertiary-level or specialty cancer centers.

Telemedicine technology embodies the electronic acquisition, processing, dissemination, storage, retrieval, and exchange of information to promote health. Telemedicine systems have demonstrated the capacity to: improve access to all levels of care (primary, secondary, and tertiary) for a wide range of conditions (including heart and cerebrovascular disease, diabetes, cancer, psychiatric disorders, and trauma) and services such as radiology, pathology, and rehabilitation; promote patient-centered care at a lower cost and in local environments; enhance efficiency in clinical decision-making, prescription ordering, and mentoring; increase effectiveness of chronic disease management in both long-term care facilities and in the home; and promote individual self-care and adoption of a healthy lifestyle.[61]

Telemedicine refers to all systems for the delivery of personal health services that substitute electronic communications and information in exchange for in-person contact between patients and providers; communication among providers; and, patient or provider contact with sources of information, decision-making, and support systems.[62] It is, in fact, a modality of care that challenges the traditional dependence on physical presence for health promotion and care delivery.

Telemedicine is a modality of care that challenges the traditional dependence on physical presence for health promotion and care delivery.

The spread of cell phones throughout LMICs can facilitate access to CCC in many ways. Patients can be provided with general information for awareness-building and the promotion of screening. Primary health care workers can be reached easily, and they can send images and information directly from the field.

The spread of cell phones throughout LMICs can facilitate access to CCC.

In cases where no specialists are available in-country, spatial shifting can allow highly trained health workers from other countries to deliver CCC remotely, often through twinning programs. ICT facilitates resource and infrastructure shifting by providing a quick and inexpensive way to access the time and expertise of specialists and sub-specialists, without moving the patient. This allows for diagnosis and treatment by less specialized medical personnel and in less complex health care units. Management and supervision of adjuvant therapy, for example, can take place at a distance from the clinical oncologist if ICT is used in real time. Teleoncology can be improved to overcome a variety of additional CCC shortages through telepathology and teleradiology. These areas of work have advanced in high income countries and now include standards and guidelines that can be adapted for LMICs.

ICT facilitates resource and infrastructure shifting by providing a quick and inexpensive way to access the time and expertise of specialists and sub-specialists, without moving the patient.

At the opposite end of the spectrum, as treatment becomes increasingly individualized spatial shifting also becomes evermore necessary - even in high income settings and for wealthy populations (see Case 6). What was originally constrained by national boundaries, is now care that often can be more efficiently –and sometimes only– provided by specialists in far-off places.

Telecommunications can also be used for training and capacity-building. At the primary level, training for a range of primary care personnel can be enhanced by distance learning through structured courses. This is being undertaken in Mexico, for example, for health promoters, nurses, physicians, and outreach workers around breast cancer early detection through the National Institute of Public Health. Further, professionals, especially those at the specialty and sub-specialty levels, can use telecommunications for mentoring, collaboration, and networking, similar to the work being done at St. Jude (see Case 4).

Telecommunications can be used for training and capacity-building, mentoring, collaboration and networking among CCC providers, as well as to provide both patients and providers with increased access to in-formation for decision-making and awareness-building.

ICT also provides the opportunity to give both providers and patients increased access to information required for decision-making and awareness-building. Still, financial barriers continue to exist because much of this information is not available free of charge. This suggests the importance of providing access to journals and databases for institutions and users in developing countries, as well as promoting public digital libraries and open-access publishing.[63] Cure4Kids is a good example of a successful effort to share and provide expanded access to core information for providers, patients, and families (see Case 4).

Applications of ICT and telemedicine in cancer can also promote health system strengthening and contribute to health reform efforts by encouraging the adoption of innovations that can be used at the population level. The use of electronic health records is but one example.[64]

Applications of ICT and telemedicine in cancer can also promote health system strengthening by encouraging the adoption of innovations that can be used at the population level.

Some authors have promoted teleoncology as a means of reducing disparities in outcomes and access between LMICs and high income countries.[65-67] One study highlights the impressive results of the St. Jude Cure4Kids international twinning (see Case 4) but also cites examples from India, Cambodia, Solomon Islands, Brazil, and Jordan, as well as the efforts in high -income countries to reach underserved populations. The same study highlights the opportunities for teleoncology to link resource-rich and resource-poor settings, support clinical research, and improve palliation and survivorship care.[68] Indeed, the Cambodia pilot program suggests that simple communication technologies can improve cancer care, even in very impoverished communities, as the demand for acute care decreased when patients sought care earlier and showed better adherence to treatment regimes.[69]

Text Box 6.2
Applications of innovative delivery: Breast cancer

Using breast cancer as an example, many opportunities exist for optimal tasking and infrastructure shifting to expand access at each stage of the CCC continuum.

In terms of health promotion and primary prevention, all players at the primary care level, including community members and CHWs, should be trained and engaged in promoting healthy lifestyles and physical activity, and in preventing obesity. This should be part of any anti-poverty, empowerment of women, MCH, or SRH initiative.

In early detection, CHWs should be trained to identify risk factors related to family history, teach women about breast health and assist them in recognizing warning signs, and help women seek a diagnosis. CHWs can also be trained to perform effective breast clinical exams, especially where the objective is to reduce the number of very late cases that are easily detected with visual inspection. This does not require sophisticated technology such as mammography. During treatment, the CHW can play an active role by supporting the patient, and, in survivorship, by educating the community to prevent stigma.

Well-trained technicians and radiologists at the primary or secondary level of care can undertake mammography, ultrasound, and biopsy, if appropriate medical devices are available. Images and samples can be shared with experts in the remote, specialty facility, via either electronic or physical transfer of files. This can facilitate the diagnosis that must take place at the specialty level.

Much of the adjunct therapy for breast cancer is repetitive (multiple doses of the same agent over weeks, months, or years) and can be provided at the secondary or primary care level, or even at home, if support staff are trained (nurses), basic laboratory facilities are in place, hygiene is good, and effective communication is available to link-up to a specialist in case of a reaction or a needed adjustment in the treatment protocol. If initial doses are managed at a specialty center, the risk of later reactions is minimized.

Ongoing survivorship care, such as therapy for lymphodema, can also be undertaken locally with proper training. Opioid-based pain control can be managed at the primary or secondary level, if drugs are available in appropriate packaging, and if there is guidance and communication with a remote specialist.

Thus, while diagnosis, treatment management, surgery, radiation, and some adjunct treatment should take place in tertiary-level facilities, many components of CCC for breast cancer can be handled in primary- and secondary-level care facilities. All of these activities can be assisted by telemedicine and applications of ICT that increase access to knowledge and awareness.

6.iii. Case studies of CCC delivery innovations

Having identified a host of possible delivery innovations, the Task Force found a series of examples of projects and programs underway in LMICs, several of which are described in this section of the report. Formal evaluation of innovative delivery models in LMICs is non-existent and so it is necessary to rely on descriptions of a series of pilot projects in countries of different income levels with different cancers, as "proof-of-concept". The selection of projects described below is not exhaustive. There is great need for a database of programs and lessons learned.

Case 1: PIH-DFCI-BWH partnership Innovative delivery strategies for cancer care in rural Rwanda, Malawi, and Haiti

Drawing on the experience of Partners in Health (PIH) in developing successful care delivery systems in resource-limited settings, and the expertise of the Dana-Farber Cancer Institute (DFCI) and the Brigham and Women's Hospital (BWH), this collaborative model has delivered high quality cancer care at PIH sites in Haiti, Malawi, and Rwanda without the physical presence of an oncologist. The PIH-DFCI-BWH cancer program was developed within the context of existing PIH programs, in a horizontal, rather than vertical, manner – an example of the diagonal approach to health systems strengthening (see Section 4). The partnership has also developed specific disease-based protocols to set guidelines for care at all the sites, and to help guide research and planning to improve care and outcomes in the future.

The programs take advantage of PIH's proven success in treating complex infectious diseases such as HIV/AIDS and tuberculosis, and they have integrated cancer care into these existing services. PIH has expanded their *accompagnateur* model and other supportive services offered to cancer patients. Trained community health workers –a key component of the success of PIH programs in infectious disease– provide care, social and psychological support, and serve as a link to patients in settings where distances can be far and transportation, nonexistent. The community health workers not only provide companionship during treatment and palliation, but they also provide supportive care for side effects (hydration, antiemetics, analgesics) through home visits, accompaniment during clinic visits, and close contact with the hospital, which guarantees that no patient is lost during follow-up. The care model is holistic; community health workers ensure that patients have a supportive economic and social environment including food, housing, means of transportation, and family support.

Task shifting –where on-site primary-level clinicians with additional training provide care with the back-up support of specialists– has been a cornerstone of the cancer care delivery model. An important component is the use of ICT to link clinicians in the field with off-site oncologists. In Rwanda, online forums provide consultations with specialists. A clinical advisory group at DFCI provides pro bono expert consultations. For adult patients, treatment plans are developed in consultation with specialists at DFCI. Once a diagnosis is confirmed by pathology, DFCI oncologists provide advice on the selection of a chemo-therapy protocol and supportive medications via an online forum within the Global Health Delivery Online system, which was designed to aid the sharing of knowledge and collaboration between international and US physicians. An online patient database provides information on the cases for the US-based specialists and tracks patient outcomes for monitoring and evaluation.

Pathology is one area where linkages have been especially important. As discussed in Section 5, pathology is vital to ensuring the appropriate diagnosis and treatment, but is often neither available nor affordable in LMICs. In 2003, PIH and BWH began a project that allows clinicians in the field in PIH clinics to have access to pathology interpretative services.[70] They established a safe transport system for specimens between the field and the pathology department at BWH. Two pathology residents from BWH and two medical residents from PIH were trained to do individual follow-up with health care workers in the field to guarantee the proper handling and safety of specimens. The pathology department provided free pathology services. Over five years, 131 patients received biopsies, and 102 were definitively diagnosed. BWH provided pathology analysis of tumor tissues free-of-charge. The partnership has developed models for in-country-based sample preparation and electronic transmission.

In Haiti, with support from DFCI, PIH has provided chemotherapy and has performed hysterectomies, lumpectomies, and other oncologic surgeries at their location in the village of Cange, on Haiti's Central Plateau. A DFCI surgical oncologist travels regularly to Haiti to perform breast surgery. Patients requiring radiation therapy are referred to the Oncology Center of Santiago, in the Dominican Republic.

In Malawi, where the adult HIV/AIDS prevalence rate is 14%, hospital clinicians regularly encounter Kaposi's sarcoma (KS). When PIH first began working in Malawi, the organization hired hundreds of community health workers and tripled both the hospital staff and the voluntary counseling and testing (VCT) counselors to extend HIV/AIDS testing and treatment across several districts. Screening for KS was incorporated into the protocols at the VCT clinics. Now, any person who tests HIV-positive, receives a physical examination for KS lesions and symptoms of pulmonary and gastrointestinal KS during baseline clinical assessment. In February 2008, PIH opened a clinic for KS and since then, has treated more than 80 patients with chemotherapy. Because all but two of the patients were HIV-positive, follow-up could be incorporated into regular patient visits to HIV/AIDS clinics as well as daily ***accompagnateur*** visits to the patients' home.

In Rwanda, adult and pediatric patients are logged into an online cancer database and followed. On-site physician and nurse teams at the PIH district hospitals administer chemotherapy to a select number of patients with curable cancers, with DFCI oncologists providing clinical advice. This program has proven complementary to national, MOH-defined initiatives such as the formulation of a national cancer plan, a country-wide cervical cancer prevention program, a new national palliative care project, and the development of a population-based national cancer registry.

Several key lessons that could be applied to other institutional collaborations and different resource-constrained settings have emerged from the PIH-DFCI-BWH partnership:

- Task shifting for cancer care, utilizing training, and back-up from specialists can be implemented safely and effectively;
- Implementation requires flexibility and creativity– the models for prevention, screening, diagnosis, and treatment vary across countries and socio-economic environments;
- Cancer care is easier to sustain when incorporated into existing chronic care programs, including programs applied to infectious disease;
- Resources should be used for palliation to reduce human suffering as well as for prevention and treatment;
- Adapting new techniques to local circumstances provides a research opportunity to identify new or viable pathologic methods for all settings.

This example shows how inputs and training from high income countries can build capacity through international collaborations in training and sharing of technical expertise. It also illustrates how international collaborations can be used to spur national CCC programs, and how these can be layered onto existing disease-specific and horizontal initiatives by applying the diagonal approach to build more sustainable health systems. However, these programs require evaluation, adaptation, and support for scale-up and sustainability. National governments will need to adapt programs like PIH's to promote a good fit with national cancer plans and eventually guarantee sustainable funding.

Case 2: Uganda Program on Cancer and Infectious Diseases. A collaboration between FHCRC and Uganda Cancer Institute[71]

To conduct the most efficient and impactful cancer service interventions and research in infection-related cancers, scientists from the Fred Hutchinson Cancer Research Center (FHCRC) in the US, partnered with the Uganda Cancer Institute in Kampala, in 2004, to form the Uganda Program in Cancer and Infectious Diseases (UPCID). The focus of the work is infection-associated cancers.

The program has three core components: research, capacity-building, and care delivery. This combination was considered necessary to make meaningful and sustained differences, and over the first five years, substantial progress has been made in each area.

Research projects are aimed at elucidating the fundamental questions that need to be answered to provide comprehensive cancer prevention and treatment for infection-related malignancies. For example, researchers are studying novel therapies and care delivery methods specific to infection-associated cancers. These new therapeutics would target the etiololgic infectious agent, leading to reduced toxicity, increased efficacy, and lower cost. Each of the methods under evaluation would lead to prevention and treatment strategies that could be used in both resource-rich and resource-poor settings. More than a dozen research projects are under way at the research clinic, with work to date clarifying the pathogenesis, diagnosis, and treatment of two common cancers in sub-Saharan Africa– Kaposi's sarcoma and lymphoma.

A central mission of this program is to provide training activities to build the human capacity for cancer care and research in resource-limited regions. The training program has expanded the capacity to treat cancer in Uganda several fold. To date, five Ugandan physicians have been trained in cancer care through a 13-month fellowship at FHCRC, in a program that provides the foundations of cancer care tailored to settings with few resources. An additional 53 Ugandans and Americans in a variety of disciplines– including pharmacy, nursing care, infectious disease medicine, epidemiology, laboratory sciences, research coordination, regulatory management, and program administration– have trained with the program.

A unique aspect of this program is the development of a cancer treatment facility model for low-resource regions, which would allow for the efficient and impactful delivery of care. Working with an international team of architects, the program is building a cancer clinic, training center, and laboratories in Kampala as a collaboration between a clinical and research cancer center in the US, the FHCRC, and a local cancer institute in Uganda, the UCI.

Case 3: Expanding access to gynecological CCC in Peru through an MOH-PATH collaboration

Peru has had a National Plan for the Prevention of Gynecological Cancer since 1998. The plan includes cervical and breast cancer screening, but numerous problems in implementing screening services led the Ministry of Health to partner with the Pan American Health Organization (PAHO) and PATH through the TATI (acronym for the Spanish term, *tamizaje y tratamiento inmediato*) demonstration project. Limited screening services are centered primarily in Lima, the capital, which has hampered access in rural areas. Recent government prioritization of five high-burden cancers, including breast cancer, has resulted in a significant increase in the availability of funds to expand early detection, treatment, and care services, aided by the introduction of the Community-based Program for Breast Health.

The program focused on three aspects of delivery: 1) community information and education; 2) screening services; and 3) diagnostic and/or treatment services, with the goal of screening 80% of women between the ages of 25 and 49 years in the region of San Martin, over three years.[72] Intervention teams with trained midwives and a primary care physician were placed in 30 primary health centers to screen using Visual Inspection with Acetic Acid, triage via Visual Inspection with Acetic Acid Magnified, and treat using cryotherapy.[73] A total of 35 primary care physicians and 48 midwives received training for screening and treatment.[74] Although the project did not meet the 80% coverage target, it demonstrated that successful cervical cancer screening programs are feasible where resources are limited.

In partnership with PATH, the Breast Health Global Initiative, the Union for International Cancer Control, and the Norwegian Cancer Society, the National Cancer Institute of Peru (IREN) initiated a Community-based Program for Breast Health, in 2011. By developing a regional cancer center in the northern part of the country, (IREN Norte) in Trujillo –an example of infrastructure shifting– the program is piloting screening and initial diagnostic evaluation of breast cancer closer to the community and evaluating the potential for national scale-up with the prospective development of other regional centers. Trujillo has had a cancer registry that predates these new efforts, providing an opportunity to analyze impact through down staging. The work on breast cancer is being integrated with previous efforts on cervical cancer.

Essential to the project is the training of nurses and midwives who deliver most of the care at health centers and health posts. This group of health professional is also being trained to conduct clinical breast exams. Suspected masses are referred to the local hospital for evaluation by physicians trained to use ultrasound, where ultrasound is available, and fine needle aspiration (FNA) biopsy. Oncologists at IREN Norte are being trained as master trainers for FNA so they can train and supervise physicians at community hospitals. Women with a diagnosis of cancer are referred to IREN Norte for treatment. The project plans to train district-level physicians to administer follow-up management after treatment. This approach ensures that a woman stays within the community for as much of the process as possible. At the same time, she has access to quality specialty care.

Community outreach and modification of the health information system are other parts of this collaborative pilot project. New tracking variables are being added to the health information system to determine the number of women in the target age

group who receive CBE, how many are referred, how many FNAs are conducted and their results, and the number of women referred to IREN that comply. A comparison of screening rates and diagnostic follow-up in the pilot area with neighboring districts where training has not yet been provided, will be conducted. The lessons learned will provide evidence to help INEN shape its strategy on early detection services and diagnostic follow-up and treatment.

Case 4: Twinning in pediatric oncology
Models for the innovative use of ICT to bridge distance

St. Jude International Outreach Program (IOP) seeks to improve the survival rate of children with cancer globally, but particularly in developing regions where outcomes are extremely poor. The IOP was established with the belief that pediatric oncology care is both appropriate and feasible in developing countries.[75] The program is primarily funded by an allocation of approximately one percent of the hospital's annual budget.

IOP currently collaborates with 19 partner medical institutions in 14 developing countries to help develop local pediatric cancer centers.[76] In 2010, more than 17,000 patients in developing countries were treated.[77] The IOP strategy involves assessing local needs, identifying an appropriate model for action, implementing services accordingly, and monitoring outcomes.[78] The cornerstone of the IOP approach is twinning. The IOP promotes a mentorship model between centers of excellence in pediatric oncology in developed countries with centers in developing countries. The St. Jude IOP employs targeted education and training of key personnel at mentee institutions to transfer the knowledge needed to lead the twinning program.[79] Ongoing distance learning and continuing medical education is offered through teleconference and web technology. Bi-weekly tele-consultations on complex cases between the mentor and mentee centers ensure real time and continuous access to specialist and expert care. There is also an opportunity for intensive training at St. Jude through the International Visitors Program, a fellowship for health care professionals from LMICs.[80] Twinning activities have been shown to reduce abandonment of treatment, relapse, and mortality from the toxic effects of treatment.[81] Further, this model has important and potentially replicable, built-in elements that guarantee programmatic and financial sustainability.

While St. Jude's is the most evaluated and extensive of the existing programs in pediatric cancer, other hospitals are becoming active. In Rwanda, for example, there is a system of teleconsult between the Clinical Director of PIH Rwanda, a pediatrician, and a pediatric onocologist at Dartmouth Medical School. The specialist provides advice on both the diagnosis and treatment plan, including chemotherapy, radiation, and supportive care. Counterparts communicate by email, sharing pathology reports and photographs of the radiological images, which are then reviewed by a pathologist and radiologist at Dartmouth.

One particularly innovative project unique to St. Jude is Cure4Kids. This is a free, open source e-library with educational materials (e-textbooks, journals, and a repository of cases and related content presented thorough its Oncopedia, which is reviewed by an international editorial board), training resources (online seminars and courses), and opportunities for interactive knowledge exchange (discussion boards) between pediatric oncologists and health professionals worldwide through a secure information-sharing interface. Informatics infrastructure support for development of secure hospital-based databases and data sharing, as well as web communication tools for ongoing exchange, are offered by the web collaboration. More than 200 regional and international groups gather regularly through web-based meetings to discuss complex cases. Cure4Kids reaches 17,000 health care professionals across 169 countries. The website provides both a public and private interface for interaction and has earned numerous awards including Best Medical Website from the Web Marketing Association and the

Strategic e-HealthCare Leadership Award. Cure4Kids provides an exemplary model of a global public good with broad access and far-reaching effects, and one that could, and should, be replicated for all cancers.

Case 5: International training and exchanges
American Society of Clinical Oncology

To begin to address the gap between need and human resources, existing specialists in LMICs need support, but, at the same time, and in the short-term, capacity needs to be increased by extending oncology training to other members of the medical team, when appropriate. Over the longer-term, specialist training needs to be expanded in LMICs. To be successful, these efforts need to be made in a systematic, sustained way, and in the context of local clinical settings where needs are understood and training can be put into practice.

With these challenges and goals in mind, in 2008, the American Society of Clinical Oncology (ASCO) partnered with Health Volunteers Overseas (HVO), an international medical education organization, to create a program to pair ASCO's member oncologists with colleagues from medical centers in LMICs that serve as national cancer referral hospitals. The aims of this "International Cancer Corps" are to exchange medical expertise, develop training programs, and build long-term, supportive relationships between ASCO, these essential medical institutions, and the clinicians who practice there.

The program is a fortuitous marriage of expertise. For the past two decades, HVO has worked to increase health care access in LMICs through clinical training and education programs in child health, primary care, trauma and rehabilitation, essential surgical care, oral health, infectious disease, nursing education, and burn management. Active in more than 40 hospitals in 25 countries, HVO-affiliated medical volunteers train, mentor, and provide crucial professional support to health care providers. With more than 28,000 members in more than 100 countries, ASCO is able to draw on extensive oncologic and regional expertise to implement cancer programs in LMICs.

The first International Cancer Corps (ICC) sites are Honduras, Vietnam, and Ethiopia, selected from among those hospitals where HVO has experience implementing programs in other specialties, the size of the cancer patient population, and the nature of the overall need and potential for ASCO impact.

Once a site is selected, ASCO and HVO appoint an ASCO member volunteer with prior experience in the country or region to conduct a two-week site assessment at the hospital. On the basis of this assessment, and working closely with these partners, the International Cancer Corps establishes a set of program objectives. Care is taken to set objectives that fall within the scope of clinical training, are achievable within several years, and lead to sustainable change.

The first ICC site is located at three hospitals in the Honduran capital city of Tegucigalpa: the Hospital Escuela ("Teaching Hospital"), Hospital San Felipe, and Cancer Center Emma Callejas. Objectives for Honduras were defined in the areas of pathology, palliative care, gynecological cancers, pediatric hematology-oncology, and oncology training curricula. The program began accepting volunteers in January 2010, and in the first year, nine volunteers conducted twelve visits. Each volunteer had specific expertise that matched the goals of the program.

Though it is too early to assess the clinical impact of the program, it is clear that the engagement of both the volunteers and the local clinicians is strong. A critical factor for the program will be to ensure effective volunteer-to-volunteer communication so that each volunteer builds on the work of other volunteers. Another factor will be the creation of volunteer-partner project teams to focus on specific objectives, such as developing curriculum materials, so that progress is not solely dependent on volunteer site visits. These are project management issues that ICC partner Health Volunteers

Overseas is familiar with, based on twenty years of experience administering similar programs in other medical specialties, and their expertise will be crucial. The ICC program also provides opportunities for collaboration with other international organizations and agencies in the cancer field such as the Oncology Nursing Society and the Society for Gynecological Oncologists.

Case 6: Satellite cancer care in high income countries for peri-urban and rural communities

Applying the concept of infrastructure shifting –making changes to infrastructural resources to optimize care options– various tertiary hospitals in high -income countries have adopted a satellite model to bring high quality care closer to the community. Satellites link tertiary hospitals (usually in large cities) with local facilities in suburban or rural areas. The main advantage of this model is that it reduces the travel time and costs for patients. This type of innovation also has the advantage of utilizing social networks embedded within the community to provide more comfort and support to patients and their families during the treatment process, and through follow-up and survivorship care. Satellite operations, given their grounding within the community, provide a range of ongoing services (24-hours a day, similar to tertiary facilities) and may be more trusted by some patients, increasing the likelihood of seeking and/or adhering to treatment. They also reduce the patient load at tertiary centers.

Two examples of satellite networks in North America are detailed below: 1) the Dana-Farber/Brigham and Women's Cancer Center at Milford Regional Medical Center (US) and 2) the Pediatric Oncology Group of Ontario (Canada).[82,83] Each network serves as an example of close collaboration and institutional partnership between facilities at various levels of care within the delivery system. The success of both networks is based on clear guidelines and agreements on roles and responsibilities between institutions in a way that eases the patient's process of navigating through the health system, and with a common objective of improving the patient's long-term care experience.

The Dana-Farber/Brigham and Women's Cancer Center at Milford Regional Medical Center is a partnership between the Dana-Farber Cancer Institute (DFCI), a leader in patient care and research on cancer within the United States and internationally, and the Brigham and Women's Hospital (BWH) with the Milford Regional Medical Center (MRMC). The partnership began in 2008 in response to high patient demand for quality alternatives for cancer treatment and care within central Massachusetts, and specifically in the town of Milford. MRMC was an existing and successful independent community hospital that observed a growing patient base traveling to the state capital (Boston) from the Milford service area, for cancer treatment. This led to discussions between DFCI and BWH to help make the DFCI specialty services available within the com-munity and to eventually include a cancer center at MRMC in a broader satellite network consisting of three other community hospitals, each with independent agreements with DFCI/BWH. The partnership allows for a range of services to be provided at MRMC, from diagnostic imaging, chemotherapy and infusion treatments, radiation therapies, and specific surgical services to survivorship support. Patients only travel to Boston for more complex services and surgeries. Through close linkages with DFCI, including ongoing education and training of MRMC physicians at DFCI/BWH and tracking of performance indicators as well as direct employment of key technical staff from the specialty hospital (DFCI) for service at MRMC, a high level of care is maintained. Further, infrastructure upgrades through the building of a state-of-the-art facility specifically for comprehensive cancer care linked with MRMC, have contributed to ensuring quality care. The larger hospital serves as a key resource for the cancer center. The use of a satellite network has also had a reciprocal benefit by helping overcome space constraints to meet clinical volume within the main DFCI campus.

The Pediatric Oncology Group of Ontario (POGO), a non-governmental organization, was established in 1983 by a team of pediatric oncology specialists to "continually drive improvements across the continuum of children's cancer care," within Ontario, Canada, and beyond, through the development of an integrated pediatric cancer system.[84,85] The POGO membership consists of a range of teaching and community hospitals, as well as private sponsors and volunteers to advance and deliver appropriate care, at the right time, and at accessible locations for children with cancer and their families.[86] POGO officially advises the Ontario Ministry of Health and Long-Term Care on childhood CCC with evidence-based action policy recommendations on pediatric oncology programming and on broader national health policy development. POGO's efforts have earned Priority Program status for pediatric cancer programs, guaranteeing the disease separate funding and planning processes to address the spectrum of care from treatment through survivorship.[87] The group developed a Provincial Pediatric Oncology Satellite Program in 1998, to safely transfer various aspects of care and treatment to facilities within, and closer to, the patient's community.[88,89] The program consists of three tertiary hospitals, two satellite partners, and seven satellite hospitals, with each satellite primarily partnered with one tertiary hospital for referral purposes. Catchment areas are defined both geographically and by patient load. When children are diagnosed with cancer, the children and their families are provided with the option of either undergoing treatment at the tertiary hospital or relocating to a satellite center closer to home. Similar to the Dana-Farber/Brigham and Women's Cancer Center, the fact that the same treatment protocols used at the tertiary hospital are followed at the satellites, provides assurance to patients and their families that they are receiving the same level of care at a satellite while having the advantage of being closer to their home environment and social support networks.

6.iv. Conclusions and recommendations

The results from existing initiatives and the available literature suggest that harnessing platforms, optimal tasking, and infrastructure shifting using ICT and telemedicine can facilitate access to CCC in LMICs. The most obvious areas are prevention of risk factors, early detection and screening, some aspects of treatment including chemotherapy, adherence to treatment, and some aspects of long-term survivorship care including community reintegration, pain relief, and palliation.

While each of the specific projects described in the report offer encouraging examples, a major concern is scale-up. Existing programs and projects are small-scale and often depend on individuals or specific institutions, and budgets are precarious. These programs require evaluation, and actual scale-up combined with implementation research will be the only means of identifying the lessons needed to be able to provide increased access on a global scale.

While innovations in delivery can expand access for many patients, they are not a panacea, and more is needed in order to respond to the challenge of expanding access to CCC in LMICs. Availability of diagnostic services, drugs, surgery, and radiotherapy are often essential, but missing. In the absence of some services and specialists, certain cancers can only be palliated, and patients receive only survivorship support. Other innovations to begin to address these needs are addressed later in this report.

Recommendations

1. Efforts to reduce the risks for cancer and other NCDs posed by tobacco use, inactivity, and unhealthy eating should be incorporated into anti-poverty and social welfare programs.
2. Many existing health system platforms and programs could incorporate elements of CCC. Programs for reproductive, maternal and child health, social welfare, and anti-poverty are examples. Specific opportunities need to be identified, and then interventions developed, and evaluated.
3. Non-specialized health care workers should be trained to diagnose and provide core treatment, where appropriate and especially for the candidate cancers identified in Section 5, and in areas and communities where no specialized cancer care is available. This does not substitute for trained oncologists and specialists, but can make their services more accessible to many.
4. The use of communications technology and telemedicine should be expanded to provide access to diagnosis and specialized care in remote areas through partnerships and linkages with distant oncology specialists. This technology also should be used to share diagnostic information, data and knowledge, and for training and continuing education.
5. Tertiary treatment centers, cancer institutes, and bilateral donors should consider establishing dedicated funds to support the expansion and solidification of existing pilot programs and to establish new initiatives.
6. Alternative innovative and complimentary delivery mechanisms should also be identified, evaluated, and scaled up to close the gap between need and available resource capacity.
7. Lessons learned from innovative CCC programs and experiences should be adapted and incorporated into large-scale programs to increase access, improve quality, and bring care closer to home and community.
8. A data base of existing CCC programs, technologies, and lessons learned needs to be developed, financed, and institutionalized to make the evidence easily accessible for translation into policy and programming. Results should be shared globally through a clearinghouse of information that could be based at WHO or IARC.

References

1. Frenk J, Chen L, Bhutta ZA, et al. Health professionals for a new century: transforming education to strengthen health systems in an interdependent world. *Lancet*. 2010; 76(9756):1923-58.
2. Chen L, Evans T, Anand S, et al. Human resources for health: overcoming the crisis. *Lancet*. 2004; 364(9449):1984-90.
3. World Health Organization. The world health report 2006: working together for health. Geneva, Switzerland: World Health Organization; 2006.
4. Ferlay J, Shin H, Bray F, Forman D, Mathers C, Parkin D. GLOBOCAN 2008: cancer incidence and mortality worldwide. *International Journal of Cancer*. 2010;127(12):2893-917.
5. Joint Learning Initiative, Global Equity Initiative. Human resources for health: overcoming the crisis. The President and Fellows of Harvard College 2004. http://www.who.int/hrh/documents/JLi_hrh_report.pdf (accessed October 4, 2011).
6. American Society of Clinical Oncology/Health Volunteers Overseas International Cancer Corps Needs Assessment Reports on Honduras. 2008.
7. American Society of Clinical Oncology/Health Volunteers Overseas International Cancer Corps Needs Assessment Reports on Ethiopia. 2010.
8. Knaul F, Bustreo F, Ha E, Langer A. Breast cancer: why link early detection to reproductive health interventions in developing countries? *Salud Pública de México*. 2009; 51(2):220-7.
9. Forouzanfar MH, Forman KJ, Delossantos AM, et al. Breast and cervical cancer in 187 countries between 1980 and 2010: a systematic analysis. *Lancet*. 2011: Epub ahead of print. http://www.thelancet.com/journals/lancet/article/PIIS0140-6736(11)61351-2/fulltext (accessed October 1, 2011)
10. Knaul F, Bustreo F, Ha E, Langer A. Breast cancer: why link early detection to reproductive health interventions in developing countries? *Salud Pública de México*. 2009; 51(2):220-7.
11. Hongoro C, McPake B. How to bridge the gap in human resources for health. *Lancet*. 2004; 64(9443):1451-6.
12. World Health Organization. Task shifting: rational redistribution of tasks among health workforce teams: global recommendations and guidelines: World Health Organization PEPFAR UNAIDS; 2008.
13. Janse van Rensburg-Bonthuyzen E, Engelbrecht M, Steyn F, Jacobs N, Schneider H, van Rensburg D. Resources and infrastructure for the delivery of antiretroviral therapy at primary health care facilities in the Free State Province, South Africa. *Sahara Journal*. 2008; 5(3):106-12.
14. Shumbusho F, van Griensven J, Lowrance D, et al. Task shifting for scale-up of HIV care: Evaluation of nurse-centered antiretroviral treatment at rural health centers in Rwanda. PLoS Med. 2009; 6: 1-12.
15. Love MB, Gardner K, Legion V. Community health workers: who they are and what they do. *Health Education & Behavior*. 1997; 24(4): 510-21.
16. Koenig S, Leandre F, Farmer P. Scaling-up HIV treatment programmes in resource-limited settings: the rural Haiti experience. *AIDS*. 2004; 18(3): 21-25.
17. Mukherjee JS, Ivers L, Leandre F, Farmer P, Behforouz H. Antiretroviral therapy in resource-poor settings. Decreasing barriers to access and promoting adherence. *Journal of Acquired Immune Deficiency Syndromes*. 2006; 43 (1): 123-6.
18. Callaghan M, Ford N, Schenider H. A systematic review of task-shifting for HIV treatment and care in Africa. *Human Resources for Health*. 2010; 8: 1-9.
19. Lehmann U, Van Damme W, Barten F, Sanders D. Task shifting: the answer to the human resources crisis in Africa? *Human Resources for Health*. 2009; 7(1):12-4.
20. Koenig S, Leandre F, Farmer P. Scaling-up HIV treatment programmes in resource-limited settings: the rural Haiti experience. AIDS 2004; 18(3): 21-25.
21. Chowdhury AMR, Chowdhury S, Islam MN, Islam A, Vaughan JP. Control of tuberculosis by community health workers in Bangladesh. *Lancet*. 1997; 350(9072):169-72.
22. Islam MA, Wakai S, Ishikawa N, Chowdhury AM, Vaughan JP. Cost-effectiveness of community health workers in tuberculosis control in Bangladesh. *Bulletin of the World Health Organization*. 2002;80:445–50.
23. Brownstein JN, Bone LR, Dennison CR, Hill MN, Kim MT, Levine DM. Community health workers as interventionists in the prevention and control of heart disease and stroke. *American Journal of Preventive Medicine*. 2005; 29: 128-133.
24. Kim S, Koniak-Griffin D, Flaskerud JH, Guarnero PA. The impact of lay health advisors on cardiovascular health promotion: using a community-based participatory approach. *Journal of Cardiovascular Nursing*. 2004; 19(3):192-9.
25. Jafar TH, Levey A, Jafary F, et al. Ethnic subgroup differences in hypertension in Pakistan. *Journal of Hypertension*. 2003;21: 905-12.
26. Hunter JB, de Zapien JG, Papenfuss M, Fernandez ML, Meister J, Giuliano AR. The impact of a promotora on increasing routine chronic disease prevention among women aged 40 and older at the US-Mexico border. *Health Education & Behavior*. 2004; 31:18 -28.
27. Earp JAL, Viadro CI, Vincus AA, et al. Lay health advisors: a strategy for getting the word out about breast cancer. *Health Education & Behavior*. 1997; 24(4):432-49.
28. Lehmann U, Van Damme W, Barten F, Sanders D. Task shifting: the answer to the human resources crisis in Africa? *Human Resources for Health*. 2009;7(1):49.
29. World Health Organization. Treat, Train, Retain The AIDS and health workforce plan. Report on the Consultation on AIDS and Human Resources for Health Geneva, Switzerland: World Health Organization. 2006:1-80.
30. Samb B, Desai N, Nishtar S, et al. Prevention and management of chronic disease: a litmus test for health-systems strengthening in low -income and middle -income countries. *Lancet*. 2010; 376(9754):1785-97.
31. Mullan F, Frehywot S. Non-physician clinicians in 47 sub-Saharan African countries. *Lancet*. 2008;370(9605):2158-63.
32. Hongoro C, McPake B. How to bridge the gap in human resources for health. *Lancet*. 2004; 364 (9443):1451-6.
33. Humphreys C, Wright J, Walley J, et al. Nurse led, primary care based antiretroviral treatment versus hospital care: a controlled prospective study in Swaziland. *BMC Health Services Research*. 2010; 10(1):229.
34. Cumbi A, Pereira C, Malalane R, et al. Major surgery delegation to mid-level health practitioners in Mozambique: health professionals' perceptions. *Human Resources for Health*. 2007; 5(1):1-9.
35. Chilopora G, Pereira C, Kamwendo F, Chimbiri A, Malunga E, Bergstrom S. Postoperative outcome of caesarean sections and other major emergency obstetric surgery by clinical officers and medical officers in Malawi. *Human Resources for Health*. 2007; 5(17):1478-4491.
36. Richard F, Witter S, De Brouwere V. Innovative approaches to reducing financial barriers to obstetric care in low -income countries. *American Journal of Public Health*. 2010; 100(10):1845-52.
37. Dovlo D. Using mid-level cadres as substitutes for internationally mobile health professionals in Africa. A desk review. *Human Resources for Health*. 2004; 2(1):1-12.
38. Samb B, Desai N, Nishtar S, et al. Prevention and management of chronic disease: a litmus test for health-systems strengthening in low -income and middle -income countries. *Lancet*. 2010; 376(9754):1785-97.
39. Brennan TA, Gawande A, Thomas E, Studdert D. Accidental deaths, saved lives, and improved quality. *New England Journal of Medicine*. 2005; 353(13):1405-09.
40. Conley DM, Singer SJ, Edmondson L, Berry WR, Gawande A. Effective Surgical Safety Checklist Implementation. *Journal of the American College of Surgeons*. 2011;212(5):873-9.
41. Haynes AB, Weiser TG, Berry WR, et al. A surgical safety checklist to reduce morbidity and mortality in a global population. *New England Journal of Medicine*. 2009;360(5):491-9.
42. Weiser TG, Haynes AB, Lashoher A, et al. Perspectives in quality: designing the WHO Surgical Safety Checklist. *International Journal for Quality in Health Care*. 2010;22(5):365-70.
43. Cartilla Nacional de Salud. Mujer de 20 a 59 años. Gobierno Federal. México, 2008.
44. Definition if needed: Witmer, in Hunter et al: community members who work almost exclusively in community settings and who serve as connectors between health care consumers and providers to promote health among groups that have traditionally lacked access to adequate care.
45. Lewin S, Munabi-Babigumira S, Glenton C, et al. Lay health workers in primary and community health care for maternal and child health and the management of infectious diseases. *The Cochrane Collaboration*. 2010; 3:1-209.
46. Laurant M, Reeves D, Hermens R, Braspenning J, Grol R, Sibbald B. Substitution of doctors by nurses in primary care (Review). *Cochrane Database of Systematic Reviews*. 2009; 1-39.
47. World Health Organization, UNICEF. Management of sick children by community health workers: intervention models and programme examples. World Health Organization. 2006. http://whqlibdoc.who.int/publications/2006/9789280639858_eng.pdf (accessed October 4, 2011).
48. Haines A, Sanders D, Lehmann U, et al. Achieving child survival goals: potential contribution of community health workers. *Lancet*. 2007; 369(9579): 2121-31.
49. World Health Organization, Global Health Workforce Alliance. Scaling up, Saving Lives. World Health Organization. 2008. http://www.who.int/workforcealliance/knowledge/resources/scalingup/en/index.html (accessed October 4, 2011).
50. Callaghan M, Ford N, Schenider H. A systematic review of task-shifting for HIV treatment and care in Africa. *Human Resources for Health*. 2010; 8:1-9.
51. Doherty TM, Coetzee M. Community health workers and professional nurses: defining the roles and understanding the relationships. *Public Health Nursing*. 2005; 22: 360-365.
52. Berman P, Gwatkin D, Burger S. Community -based health workers: Head start of false start towards health for all? *Social Science and Medicine*. 1987; 25(5):443-459.
53. Bhutta Z, Lassi Z, Pariyo G, Huicho L. Global experience of community health workers for delivery of health related Millennium Development Goals: a systematic review, country case studies, and recommendations for integration into national health systems. Geneva, Switzerland: Global Health Workforce Alliance, 2010.
54. Ahmed SM. Taking healthcare where the community is: the story of the Shasthya Sebikas of BRAC in Bangladesh. *BRAC University Journal*. 2008; V: 29-45.

55. Frenk J, Chen L, Bhutta ZA, et al. Health professionals for a new century: transforming education to strengthen health systems in an interdependent world. ***Lancet***. 2010; 76(9756):1923-58.
56. World Health Organization, Global Health Workforce Alliance. Scaling up, Saving Lives. World Health Organization. 2008. http://www.who.int/workforcealliance/knowledge/resources/scalingup/en/index.html (accessed October 4, 2011).
57. Lewin S, Munabi-Babigumira S, Glenton C, et al. Lay health workers in primary and community health care for maternal and child health and the management of infectious diseases. ***The Cochrane Collaboration***. 2010;3:1-209
58. World Health Organization, UNICEF. Management of sick children by community health workers: intervention models and programme examples. World Health Organization. 2006. http://whqlibdoc.who.int/publications/2006/9789280639858_eng.pdf (accessed October 4, 2011)
59. Calculations based on cost of each segment of public transportation from the home town to the hospital in Mexico City.
60. Cancer de Mama: Tomatelo a Pecho. Proyectos Especificos: Innovaciones en la prestación de servicios de detección temprana y tratamiento del cáncer de mama en México. 2011. http://www.tomateloapecho.org.mx/proyectos.html (accessed October 4, 2011).
61. Bashshur RL, Shannon GW. National Telemedicine Initiatives: Essential to Healthcare Reform. ***Telemedicine and e-Health***. 2009;15(6):600-10.
62. Bashshur R, Shannon G, Krupinski E, Grigsby J. The Taxonomy of Telemedicine. ***Telemedicine and e-Health***. 2011;17(6):484-94.
63. Harold Varmus. The art and politics of science. New York, NY: WW Norton & Company. 2009.
64. Bashshur RL, Shannon GW. National Telemedicine Initiatives: Essential to Healthcare Reform. ***Telemedicine and e-Health***. 2009;15(6):600-10.
65. Maserat E. Information communication technology: new approach for rural cancer improvement. ***Asian Pacific Journal of Cancer Prevention***. 2008; 9:811-814.
66. Qaddoumi I, Mansour A, Musharbash A, Drake J, Swaidan M, Tihan T, et al. Impact of telemedicine on pediatric neuro-oncology in a developing country: the Jordanian-Canadian experience. ***Pediatric Blood and Cancer***. 2007 Jan;48(1):39-43**.**
67. Hazin R, Qaddoumi I. Teleoncology: current and future applications for improving cancer care globally. ***Lancet Oncology***. 2010;11(2):204-10.
68. Ibid.
69. Kvedar J., Heinzelmann P.J., Jacques G. Cancer diagnosis and telemedicine: a case study from Cambodia. ***Annals of Oncology***. 2006; 17 (18 Suppl): viii37-viii42
70. Carlson J, Lyon E, Walton D, et al. Partners in Pathology: A Collaborative Model to Bring Pathology to Resource Poor Settings. ***American Journal of Surgical Pathology***. 2010; 34(1):118-23.
71. Casper C, Sessle E, Phipps W, Yager J, Corey L, Orem J. Uganda Program on Cancer and Infectious Diseases. GTF.CCC Working Paper Series, Paper No. 2, Harvard Global Equity Initiative, 2011.
72. Luciani S, Winkler J. Cervical cancer prevention in Peru: lessons learned from the TATI demonstration project. Pan American Health Organization, 2006. http://www.paho.org/english/ad/dpc/nc/pcc-cc-tati-rpt.pdf (accessed October 4, 2011).
73. Luciani S, Winkler J. Cervical cancer prevention in Peru: lessons learned from the TATI demonstration project. Pan American Health Organization, 2006. http://www.paho.org/english/ad/dpc/nc/pcc-cc-tati-rpt.pdf (accessed October 4, 2011).
74. Ibid.
75. Ribiero RC, Marina N, Crist WD. St Jude Children's Research Hospital's International Outreach Program. ***Leukemia***. 1996;10(3):570-574.
76. St. Jude Children's Research Hospital. About International Outreach. 2011. http://www.stjude.org/stjude/v/index.jsp?vgnextoid=2f166f9523e70110VgnVCM1000001e0215acRCRD&vgnextchannel=e41e6fa0a9118010VgnVCM1000000e2015acRCRD (accessed October 4, 2011).
77. St. Jude Children's Research Hospital International Outreach Program: Report of Activities 2010. 2011. http://www.stjude.org/SJFile/IOP-Report-of-Activities-2010.pdf (accessed October 4, 2011).
78. St. Jude Children's Research Hospital. International Outreach Program: Guide to Establishing a Pediatric Oncology Twinning Program. http://www.stjude.org/SJFile/IOP_Twinning_Manual_082908.pdf (accessed October 4, 2011).
79. Ibid.
80. Ibid.
81. Ribeiro RC, Pui CH. Saving the children – improving childhood cancer treatment in developing countries. ***New England Journal of Medicine***. 2005; 352(21):2158-2160.
82. Homepage: Dana-Farber/Brigham and Women's Cancer Center at Milford Regional Medical Center. 2011. http://www.dana-farber.org/About-Us/Satellite-Locations/Dana-FarberBrigham-and-Women-s-Cancer-Center-at-Milford-Regional-Medical-Center.aspx (accessed October 4, 2011)
83. Pediatric Oncology Group of Ontario. Homepage: Pediatric Oncology Group of Ontario. 2011. http://www.pogo.ca/ (accessed October 4, 2011)
84. Pediatric Oncology Group of Ontario. About POGO. 2011. http://www.pogo.ca/about/ (accessed October 4, 2011).
85. Pediatric Oncology Group of Ontario. POGO's Mission. 2011. http://www.pogo.ca/about/mission/ (accessed October 4, 2011).
86. Pediatric Oncology Group of Ontario. Childhood Cancer Care and Support. 2011. http://www.pogo.ca/care/ (accessed October 4, 2011).
87. Pediatric Oncology Group of Ontario. About POGO. 2011. http://www.pogo.ca/about/ (accessed October 4, 2011).
88. Pediatric Oncology Group of Ontario. History and Milestones. 2011. http://www.pogo.ca/about/history/ (accessed October 4, 2011).
89. Tsimicalis A, De Courcy MJ, Di Monte B, et al. Tele-practice guidelines for the symptom management of children undergoing cancer treatment. ***Pediatric Blood and Cancer***. 2011;57(4):541-8.

Access to Affordable Medicines, Vaccines & Technologies: Overcoming Price and Non-Price Barriers to Access

Section 7

Section 7

Access to Affordable Medicines, Vaccines & Technologies

Key messages

- Expanding access to cancer medicines, vaccines, and health technologies requires three vital levers: financial resources, political will, and a health-systems approach. Within this approach, pharmaceutical management must link wise selection, vigorous price optimization, reliable procurement, assured quality, engagement of key stakeholders, action to address barriers to palliation and pain control, and innovation.

- The cost of increasing global access to cancer treatment may be less than many fear. The annual estimated global cost of unmet needs for medicines for four selected cancers varies from roughly $26 million for cervical cancer to $4.3 billion for breast cancer. For breast cancer, the unmet need is estimated at $340 million for Latin America and the Caribbean, $550 million for Africa, and just over $1.7 billion for Asia.

- The cost of curative or life-extending cancer medicines varies from less than $500 per patient for cervical cancer, Kaposi's sarcoma and Burkitt's lymphoma to an average of nearly $9,000 for breast cancer, and over $35,000 per year for lifelong treatment of chronic myelogenous leukemia. The most costly chemotherapy regimens include new on-patent agents.

- Most cancer medicines needed for LMICs are off-patent generics, many of which are available for under $100 per course of treatment, and nearly all are available for under $1,000. Yet world market prices for the same product vary four-fold or more between low and high prices.

- A wide range of screening, diagnostic, surgical, and radiotherapy capabilities are necessary for effective detection, care, and treatment of cancer. National and international efforts must be accelerated to develop resource-appropriate strategies, technologies, capacity-building, information-exchange, standardization, procurement and other support in these areas.

- Quality assurance and safety monitoring must go hand-in-hand with efforts to optimize the price of novel and generic medicines. Strategies to eliminate or minimize policy, regulatory, and administrative barriers for palliative care are exigent to reduce unnecessary pain and suffering.

- Multilateral agencies, the international community, and the private sector should expand current efforts to increase access to cancer vaccines, reduce non-price barriers to palliation and pain control, develop new bioavailable oral chemotherapy, and create "frugal innovations" such as low-cost radiation therapy and other technologies for resource-poor settings.

7.i. Introduction: Challenges in affordable access to cancer medicines, vaccines, and technologies

High cost and poor availability of cancer treatment are significant barriers to access in many low and middle income countries (LMICs). In the Philippines, the expenditure for cervical cancer treatment is more than double the average annual income.[1] In Pakistan, which has a per capita income of $2,860*, the cost of treating leukemia with chemotherapy and associated transfusion requirements is $20,000.[2] In Rwanda, with over 75% of the population living on $1.25 a day, the average cost of treating AIDS-related Kaposi's sarcoma is $278.[3] Meeting this need would constitute a significant addition to a Ministry of Health's budget.In most LMICs, patients' out of pocket payments cover from 50% to 90% of the cost of medicines,[4] including those for chronic conditions.[5] Control of pain and suffering is hampered less by the medicine cost of oral liquid morphine, which can be less than $3 per week, and more by legal and administrative barriers. Seventeen of the 24 essential medicines on the World Health Organization's (WHO) essential medicine list (EML) for the treatment of the 10 most common cancers are not widely available in developing countries and, if available, are unaffordable for all but the richest patients.[6]

High cost and poor availability of cancer treatment are significant barriers to access in many LMICs.

Cancer medicines remain unaffordable in sub-Saharan Africa,[7,8] India,[9] Latin America,[10] and middle income countries such as Egypt[11] and Morocco.[12] Poor availability of chronic disease medications is pervasive in the public sector.[13] The final cost to the patient can be higher if the medicine is subject to import duties and taxes, and as a result of procurement inefficiencies. Too often, patients are reduced to receiving substandard or interrupted treatment regimens, or abandoning treatment altogether, because of unaffordability and unavailability, thereby decreasing their odds of survival.[8,14] Given that 5% of cancer patients in Africa receive chemotherapy,[15] even after late diagnosis, there are complementary health system related components that need to be addressed to ensure availability, accessibility, quality, and their rational use, including efforts to provide low cost cancer medicines.

Too often, patients are reduced to receiving substandard or interrupted treatment regimens, or abandoning treatment altogether, because of unaffordability and unavailability, thereby decreasing the odds of survival.

If we are to meet the 2008 World Cancer Declaration's seventh target: "Improve access to diagnosis, treatment, rehabilitation and palliative care" and reduce the global cancer burden by 2020, a number of global initiatives must be swiftly put into place. This section of the report of the Task Force discusses several feasible options and addresses key challenges that need to be overcome in order to ensure widespread access to cancer medicines, vaccines, and health technologies in LMICs.

As demonstrated throughout this section of the report, the processes that guarantee accessibility to cancer medicines, vaccines and technologies for cancer care and control (CCC) can be understood within the framework of the diagonal approach. Improving access to cancer medicines, vaccines and technologies can help strengthen health systems to support other disease priorities and populations. Medicines can be allocated to support specific, vertical programs and interventions but in many cases are used to treat or manage the symptoms of more than one disease. Palliative care is a prime example. In the case of cancer, many chemotherapy agents are highly specific to a single disease and radiation therapy is primarily for cancer. Still, the process of establishing access that includes, for example guaranteeing a site meets the norms of hygiene and safety to manage both delivery and waste disposal, is part of strengthening health systems overall. Efforts to consolidate purchasing of medicines strengthens markets and is a potentially effective way to obtain improved conditions for both purchasers and suppliers for many drugs and other inputs.[16] Finally, applying frugal innovations and searching for options for public-private mixes in provision can reverberate throughout a health system and improve access to many drugs and services.[17]

Strengthening the core functions of health systems will facilitate better access to medicines, vaccines and technologies for improved CCC. Improving access to medicines is an important challenge in LMICs that involves all health system functions, including stewardship.[18] Further, medicines constitute a major source of health expenditure for national governments and are often a cause of impoverishment for families that lack financial protection in health and seek to pay out of pocket for drugs (see Section 8).[19]

* All monetary values in this Section are in $US.

7.ii. Systems approach to affordable access to quality pharmaceuticals and health technologies

Widespread availability and use of medicines, vaccines and health technologies for cancer requires three vital levers: financial resources, political will, and a health-systems approach to address the pressing priority of cancer in LMICs. Only with these three levers in place is it possible to achieve steady increases in the availability of essential, affordable, quality cancer care and treatment.

Cancer is the most variable and arguably the most complex non-communicable disease with respect to prevention, early detection, diagnosis, treatment, and palliation. In addition, the cost per patient treated and capital investment along the continuum from early detection to palliation are highly variable. Expanding access to affordable medicines, vaccines, and health technologies for cancer will require a pharmaceutical systems approach. Such an approach includes international standard treatment guidelines (STGs); a list of essential medicines, vaccines, and health technologies for cancer; medicine price information and price reduction strategies; reliable national, regional, and global procurement mechanisms; effective quality assurance; engagement with manufacturers; and action to address non-price barriers to palliation and pain control.

An integrated systems approach for affordable access to pharmaceuticals and health technologies considers all critical success factors from the current situation of cancer care and control in LMICs to large scale availability of affordable medicines, vaccines, and health technologies.

An integrated systems approach for affordable access to pharmaceuticals and health technologies considers all critical success factors from the current situation of CCC in LMICs to large-scale availability of affordable medicines, vaccines, and health technologies. Several elements are described elsewhere in this report, including the core elements of cancer care and control (see Section 5) and innovative financing mechanisms (see Section 8), which have an important influence on procurement options.

7.iii. Medicines, vaccines, and health technologies for cancer care and control

Prevention, early detection, diagnosis, treatment, and palliation depend on a wide variety of pharmaceutical products and health technologies. Pharmaceutical products for cancer include chemotherapeutic agents, hormones, a wide range of ancillary and palliative care medicines, and, currently, two vaccines. Health technologies for CCC range from simple diagnostics such as pathology services to sophisticated radiation therapy facilities. Informed and sometimes difficult choices must be made concerning what to include and what not to include in emerging national cancer programs. Proceeding with one element when the other crucial components are not in place may result in expensive treatment failures.

Treatment guidelines and essential medicines lists for cancer

Several decades of global health experience have demonstrated the value of WHO and other recognized international bodies developing evidence-based prevention, care, and treatment guidelines from which national and local guidelines can be adapted. Such standard treatment guidelines (STGs) and essential medicines lists (EMLs) have become a cornerstone for increasing access, improving use, reducing cost, and increasing quality for medicines and vaccines in public health programs.[20] Especially in low income countries, national stakeholders depend on WHO recommendations to develop treatment strategies or change existing approaches.[21,22] At the same time, developing such guidelines is often an interactive national-to-global, then global-to-national process in which, as in the case of HIV/AIDS treatment, pioneering national or local programs work out individual standard approaches that then inform an international process.[23]

There is growing consensus on the need to develop resource-appropriate treatment strategies for major cancers.[24,25,26] The Union for International Cancer Control (UICC) called on the international community to "develop a comprehensive global strategy to facilitate cancer drug access worldwide," beginning with WHO's essential medicines list (EML) for cancer.[27] A number of institutions are actively involved in developing such strategies. A prime example is the Breast Health Global Initiative's (BHGI) comprehensive treatment protocols for settings with various levels of resources,[28] which recently served as a template for cancers other than breast cancer.[29] Additionally, the National Comprehensive Cancer Network (NCCN) is another example of an institution that has developed a number of de facto clinical practice guidelines for use by health care providers and patients.[30]

There is growing consensus on the need to develop resource-appropriate treatment strategies for major cancers.

If essential medicines for cancer are listed in a country's National Essential Medicines List (NEML) and linked to STGs, selection and procurement become easier and can contribute to lower prices. Due to the varying burden and types of cancers, resource-poor countries need to be able to make decisions based on a cost-benefit analysis to distinguish between essential cancer medicines for their programs and high-cost medicines for limited use.[31] In addition, chemotherapeutic agents included in WHO's 2007 EML for childhood cancer are not unique to children and are commonly used in the treatment of adult cancer. Therefore national programs must implement the same policies and procedures used in the procurement of medicines for adult cancer to procure medicines for childhood cancer.[32]

If essential medicines for cancer are listed in a country's National Essential Medicines List and linked to STGs, selection and procurement become easier and can contribute to lower prices.

Some countries have used STGs to help decrease costs. For example, STGs in Mexico recommended generic antineoplastic medicines whose quality conforms to international standards at a cost savings of 60%.[33] For acute lymphoblastic leukemia, India's STG lists the most cost-effective medicines in their generic form and institutes low-dose protocols for lung cancer; this has reduced the cost of gemcitabine by 66%.[34,35] However, in most resource-poor settings, evidence-based treatment guidelines are needed for a wide range of cancers. WHO's standardized public health approach for antiretroviral therapy (ART) facilitated rational selection and procurement of antiretrovirals (ARVs) through well-known and diverse global, regional, and central mechanisms. Likewise, national STGs and EMLs for tuberculosis and malaria have compelled national authorities to standardize treatment and link it with their NEMLs, resulting in progressively lower prices of medicines and health commodities in the last decade. WHO treatment guidelines help shape demand and create incentives for manufacturers to respond to changing market needs –as notably seen for HIV/AIDS– related medicines when funding dramatically increased.[36]

WHO treatment guidelines help shape demand and create incentives for manufacturers to respond to changing market needs as notably seen for HIV/AIDS-related medicines when funding dramatically increased.

Vaccines for cancer prevention

As prices continue to fall and the number of prequalified manufacturers increases, vaccines such as the human papillomavirus (HPV) vaccine for cervical cancer and the hepatitis B vaccine for liver cancer will be an increasingly important element in comprehensive cancer programs. Currently, these are the only cancer prevention vaccines available (Table 1). Funding support from the Global Alliance for Vaccines and Immunizations (GAVI) provided impetus for low income countries to include hepatitis B as part of their immunization programs, which in turn led five manufacturers to attain WHO prequalification in the last decade (Table 1). This, in addition to the dramatic price reduction of hepatitis B vaccine from a 1982 launch price of over $100 to $0.20 a dose has enabled developing countries to dramatically increase vaccination rates (Figure 1).

Table 1

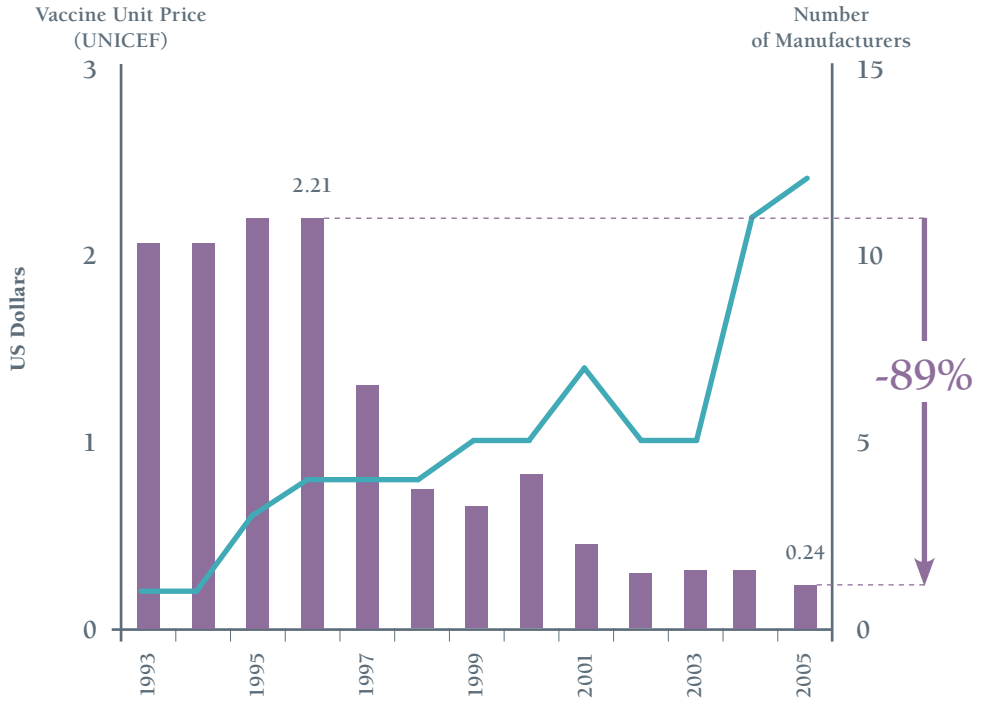
Vaccines for Cancer Prevention – Potential Impact, Current Coverage, Financing, Pricing, and WHO Prequalification

	Hepatitis B	Human Papillomavirus (HPV)
Cancer prevented	Liver cancer – 749,744 new cases[37] every year, of which roughly 80%[38] are preventable with immunization.	Cervical cancer – 530,232 new cases[39] every year, of which roughly 70% are preventable with immunization.[40]
Coverage	68 % coverage in developing countries[41]	33 countries – national programs[42] 20 countries – pilot programs
Financing	National governments; Bilateral donors; GAVI; UN Agencies	National governments; Ongoing manufacturer-led donation programs
Price reduction	• Reduction since launch: 98% • Launch price (1982): > $ 100/3 doses • Price when introduced in national immunization programs (1993): $ 2.00 • Current price (2011): $ 0.20/dose	• Reduction since launch: 86% • Launch price (2006): > $ 120/single-dose • Price when first introduced into US national immunization program (2007): $ 97/dose • Current price (2011): $ 5.00/dose (GAVI differential pricing – see text)
WHO prequalification[43]	9 manufacturers from 6 countries for 30 different dosages in vials/ampoules	2 manufacturers from 2 countries for 3 dosages in vials
Year of prequalification	1987, 1996, 2001, 2002, 2004, 2006, 2008	2009

The recent differential pricing of $5 per dose of HPV vaccine offered by the originator company to GAVI could avert hundreds of thousands of unnecessary deaths due to cervical cancer that occur mostly in low income countries.[44] Further price reduction of the HPV vaccine to under $2 could avert hundreds of thousands of unnecessary deaths due to cervical cancer that occur mostly in these countries. For public health programs in middle income countries that are not eligible for GAVI support, attractive tiered pricing should be offered by manufacturers. The history of immunization over the last half century, and especially the last two decades is encouraging. It suggests that price reductions of 80% to more than 90% from initial vaccine launch prices can be expected over time. Current academic partnerships with developing country manufacturers show promise in the provision of quality-assured HPV vaccines at lower cost.[45] HPV vaccines have demonstrated to be highly efficacious, safe and well-tolerated, but there is continuing discussion in the public health and cancer control communities regarding the place of HPV in routine vaccination.[46]

Figure 1

Global Price Changes in Monovalent Hepatitis B Vaccine (1993-2005)



Source: Cunningham G. Public markets for vaccines. Presentation at the International Vaccine Technology Workshop hosted by the World Health Organization (WHO) and the U.S. Department of Health, and Human Services (HHS). Hyderabad, India; September 18, 2010. http://www.globalhealth.gov/topics/vaccineWorkshops/20100917pae.pdf (accessed Aug 17, 2011) based on UNICEF Supply Division; GAVI Annual Report 2008; team analysis.

Health technologies for cancer detection, diagnostics and treatment

The core elements for provision of cancer care and control in LMICs outlined in Section 5 include a wide range of essential health technologies, from biopsy devices, to radiotherapy machines, to surgical equipment. Previous research suggests that histopathology, conventional radiology, ultrasonography, and basic endoscopy are the minimum health technologies for cancer management programs.[47] Histopathology is a key barrier in much the same way that culturing multidrug-resistant tuberculosis has been. International cooperation in providing access, perhaps through telemedicine techniques, is likely to be imperative. Despite low income countries having poor diagnostic capacity for cancer, initiatives by international cancer community members demonstrates that it is possible to build capacity for diagnosis in low resource settings. The BHGI identified several components that, at a minimum, require investments for pathology services to be effectively used for correct diagnosis and staging of cancer.[48] Partners in Health demonstrated a collaborative model for implementing pathology services in challenging situations and building local capacity where possible.[49] In Central America, a regional flow cytometry for diagnosis of acute leukemia was established by connecting the equipment to the laboratory at St. Jude Children's Research Hospital in the United States, where all the cases were reviewed. This provided quality control while increasing capacity and improving training.[50]

Recent advances in low-cost HPV testing methods (visual inspection with acetic acid) as an alternative to conventional screening methods demonstrate that developing feasible interventions for resource-limited settings is possible with the right partnerships.

The history of immunization over the last half century, and especially the last two decades is encouraging; particularly price reductions of 80% to more than 90% from initial vaccine launch prices can be expected over time.

Despite low income countries having poor diagnostic capacity for cancer, initiatives by international cancer community members demonstrates that it is possible to build capacity for diagnosis in low resource settings.

Ongoing efforts by WHO's Global Initiative for Emergency and Essential Surgical Care must address needs for cancer care and control programs.

Because of the late stage of presentation of cancer in many low income countries, there is an urgent need to expand access to affordable radiotherapy machines and services. The International Atomic Energy Agency (IAEA) has taken the lead to expand access to radiotherapy services, resulting in a 30% increase in the number of machines in the last ten years.[51] However, such machines are rarely available in many LMICs, in addition to the scarcity of qualified personnel to operate them.[52] Thus strategies to encourage manufacturers to simplify the design of machines along with a guaranteed market leading to competitive prices must be promoted. In the case of HIV/AIDS, CD4 count and viral load machines for monitoring HIV/AIDS treatment, once unavailable in resource-poor settings, are now accessible despite numerous obstacles, such as weak infrastructure and limited human capacity. With the availability of unprecedented international funding sources, systems and procedures are gradually being built to support clinical decision-making and to improve patient care for HIV/AIDS.[53,54] Even so, development of appropriate infrastructure and human resources to provide radiotherapy is costly and will take time in many low income countries.

Strategies to encourage manufacturers to simplify the design of machines along with a guaranteed market leading to competitive prices must be promoted.

Given the challenges that limit the scale-up of laboratory services in the clinical management of HIV/AIDS, tuberculosis, and malaria, the Maputo Declaration (2008) called for a comprehensive strategy to strengthen laboratory systems with the vision of a unified system to support diseases of public health importance.[55] This mandate presents an excellent opportunity to develop appropriate strategies to strengthen laboratory support systems for cancer detection, diagnosis, and treatment. The recent establishment of the African Society for Laboratory Medicine (ASLM) and launch of the *African Journal of Laboratory Medicine* are encouraging developments.[56,57] The international cancer community must build on the momentum established by key stakeholder groups to strengthen laboratory systems across a spectrum of cancers.[58]

7.iv. Pricing, procurement, quality, and regulation

Ensuring affordable access to quality cancer medicines, vaccines, and health technologies depends not only on wise selection, but also on price reduction and procurement strategies appropriate to each type of product. As noted in Section 8, innovative approaches to reliable financing are especially important for achieving the best long-term availability and medicine prices. This includes optimizing the use of both push and pull mechanisms.[59]

Price reduction strategies for cancer medicines and vaccines

The final price of medicines and vaccines is influenced by a number of factors. Therefore, achieving the best prices requires a multi-strategy approach.[60] Transparent information on prices and sources of essential cancer medicines is vital for price reduction, program planning, forecasting, procurement management, and supply system performance monitoring. Transparency in price information for ARVs through initiatives by Médecins Sans Frontières and WHO's Global Price Reporting Mechanism contributed to informed purchasing decisions for HIV/AIDS programs. Likewise, the Global Fund to Fight AIDS, Tuberculosis and Malaria (Global Fund) requires that principal recipients submit prices paid for a range of procured medicines for HIV/AIDS, tuberculosis and malaria which are then publicly posted through its Price and Quality Reporting System with country and region specific analyses.

Using available world market prices and illustrative treatment regimens described in Section 5 for treatable cancers common in low and middle income countries, indicative chemotherapy and hormone therapy costs were estimated for fifteen selected essential medicines (Table 2). This analysis shows over a four-fold difference between the lowest

and highest prices for 10 of the 15 products, and over 10-fold differences for some products. It also shows tremendous variation in the per treatment cost for medicines alone, ranging from less than $100 cyclophosphamide for Burkitt's lymphoma to over $45,000 for some sources of imatinib for chronic myelogenous leukemia. Such variations are associated with differences in price information, supply source, purchase volume, patent status, timing of patent expiration, and other factors. Unfortunately, such wide variations in the price of medicines for chronic diseases, including palliative cancer care, are not uncommon.[61-63]

The actual final cost to the patient will be great when higher distribution margins, dispensing fees, import duties and taxes, common supply system inefficiencies are considered. Therefore national governments must do their utmost to reduce or eliminate substantial taxes, tariffs, and customs duties on imported cancer medicines.[64]

Transparent information on prices and sources of essential cancer medicines is vital for price reduction, program planning, forecasting, procurement management, and supply system performance monitoring.

Table 2

Indicative Chemotherapy and Hormone Therapy Costs for Selected Essential Medecines for Cancer in Low and Middle Income Countries[a]

Agent[b]	Patent Status	WHO	EML	Indicative cost per treatment[c]			High/ Low ratio
		Adult	Children	Low	Median	High	
Anastrozole	X			$ 172	$ 432	$ 2,086	12
Asparaginase	X	√	√	$ 233	$ 455	$ 729	3
Carboplatin	X	√		$ 380	$ 480	$ 2,333	6
Cisplatin	X			$ 38	$ 60	$ 480	13
Cyclophosphamide	X	√	√	$ 44	$ 111	$ 240	5
Dacarbazine	X	√		$ 382	$ 772	$ 1,159	3
Doxorubicin	X	√	√	$ 199	$ 238	$ 1,140	6
Imatinib[d]	On			$ 28,295	$ 37,259	$ 46,224	2
Mercaptopurine	X	√	√	$ 613	$ 1,596	$ 2,877	5
Methotrexate	X	√	√	$ 99	$ 117	$ 135	1
Paclitaxel	X	√		$ 658	$ 1,609	$ 12,250	19
Rituximab[e]	On			$ 16,031	$ 19,125	$ 21,186	1
Tamoxifen	X	√		$ 16	$ 206	$ 548	33
Vinblastine	X	√		$ 114	$ 218	$ 461	4
Vincristine	X	√	√	$ 26	$ 57	$ 71	3

[a] Based on Essential Package of Cancer Services and Drugs for Low and Middle Income Countries (Section 5).

[b] Estimated costs for anastrozole, imatinib and tamoxifen are per year; costs can vary depending on length of treatment course; each chemotherapeutic agent is part of a multi-regimen treatment protocol used for the specific kind of malignancy - so total treatment costs for specific cancers will vary.

[c] Based on 2009-2010 world market institutional purchase prices from MSH-WHO International Drug Price Indicator Guide, 2010 and Partners in Health. Treatment costs use these prices and treatment regimen calculations by Gene Bukhman, Partners in Health with inputs from Dana-Farber Cancer Institute. Medicines listed in the MSH-WHO International Drug Price Indicator Guide are from reputable suppliers using international quality assurance standards (see http://erc.msh.org/mainpage.cfm?file=2.4.cfm&id=5541&temptitle=Quality%20standards&module=DMP&language=English).

[d] Sold by Novartis as Gleevec or Glivec.

[e] Monoclonal antibody sold under trade names including Rituxan and MabThera. Currently co-marketed by Biogen Idec and Genentech in the US; by Roche in Canada (under the trade name Rituximab) and the European Union; by Chugai Pharmaceuticals and Zenyaku Kogyo in Japan; and by Dr. Reddy's Laboratories from India.

Strategies for generic/multisource products

Competition among qualified suppliers is the single most effective mechanism to achieve the lowest price for generic/multisource medicines and vaccines.[65] For the public sector, nongovernmental organizations, and private institutions, the most effective way to tap the full power of generic competition is through one of the procurement mechanisms described below, with careful attention to selection of generic medicine suppliers whose products meet national and international quality standards and who also have an established record of reliable, timely delivery.

The power of generic competition and price negotiation was seen in the remarkable decrease in the price of medicines for HIV/AIDS in the early 2000s resulting from a "leap-frog" of negotiation and competition.

In Brazil, there has been an almost 90% reduction for certain cancer medicines due to generic competition alone.[66] The power of generic competition and price negotiation was seen in the remarkable decrease in the price of medicines for HIV/AIDS in the early 2000s resulting from a "leap-frog" of negotiation and competition. Beginning with a $12,000 per year market price, the annual per person cost of ART was reduced over a four-year period to roughly $7,200 (UNAIDS negotiation), then $4,500 (generic competition in Brazil), then $1,200 [voluntary reduction/negotiation through the Accelerated Access Initiative (AAI)], then $350 (generic competition, initially from India), and finally to $200 (negotiation by the Clinton HIV/AIDS Initiative).[67]

Strategies for on-patent/single-source products

Among the on-patent medicines used in the treatments outlined in Section 5 are imatinib (Gleevec or Glivec) used in treating chronic myelogenous leukemia and certain other cancers, and two monoclonal antibodies, trastuzumab (Herceptin) for breast cancer and rituximab (Rituxan, MabThera) for lymphomas and leukemias. The cost of such products typically runs in the tens of thousands of dollars per treatment or per year when chronic treatment is required – which is prohibitively expensive for LMICs.

Price reduction for on-patent/single-source products requires active engagement with the research-based pharmaceutical industry.

Price reduction for on-patent/single-source products requires active engagement with the research-based pharmaceutical industry. Effective price reduction strategies include price negotiation/differential pricing by producers, sustained donation programs ("zero price," e.g., ivermectin for river blindness; imatinib for chronic myeloid leukemia),[68] and voluntary and compulsory licensing in line with the flexibilities afforded by the Trade-Related Aspects of Intellectual Property Rights (TRIPS) Agreement. Price reduction strategies must be implemented in appropriate territories where feasible, and taking into account impacts elsewhere.

Differential pricing was most notably used in the 2001 Accelerating Access Initiative (AAI) created by five research-based pharmaceutical companies. The AAI had an impact on decreasing the price of triple therapy at a time when it was still unaffordable for LMICs. However, generic competition, a massive increase in financing, and expanding market volume also played important roles in the eventual 99% reduction in prices.[69] A clearly-defined market for cancer medicines with robust demand will be needed for successful implementation of differential pricing, which happens on a case-by-case basis. Donation programs should follow established guidelines and respond to local needs, and even then may benefit only a limited number of patients.[70,71]

Voluntary licensing, whose terms and conditions are specified by originator companies, can significantly increase access to life-saving treatments, but it does not necessarily result in affordable prices.[72] One reason is that voluntary licenses are commonly issued on an exclusive basis for individual markets – essentially a licensed monopoly. Compulsory licensing may be a useful negotiating tool under very specific circumstances, but is likely to achieve substantial price reductions only with a high volume market and multiple licenses to stimulate competition. To date, attempts by manufacturers seeking voluntary licensing arrangements for cancer medicines have yet to emerge.[73]

Text Box 7.1
Working towards affordable pricing for HPV vaccines for developing countries: the role of GAVI

In April 2009, WHO recommended that national immunization programs include routine HPV vaccination, with the specific provision that cervical cancer or other HPV-related disease prevention measures should be a public health priority.[74] WHO advised that the vaccine should be part of a comprehensive approach to cervical cancer prevention and control including education, screening, diagnosis and treatment. Yet, price has remained a major barrier. Merck licensed its HPV vaccine in the US in 2006. The vaccine requires three doses and the private market price was $120 per dose. In 2007, the price available to the US public market was $97 per dose,[75] making it the most expensive vaccine publicly funded at the time. GSK's first license for its three-dose HPV vaccine was obtained in 2007 and prices, initially in line with Merck's, then rapidly decreased. For example, GSK announced in late 2008 a 60% price reduction in the Philippines to approximately $48 per dose.[76] In South Africa, a 36% price decrease brought the price to $44 per dose.[77]

Overall, the reported prices of HPV vaccine varied widely from 2007 to 2011. In industrialized countries prices ranged from $100 to $233 per dose, and from $30 to $100 per dose in developing countries, and were mainly available to the private sector.[78] Both Merck and GSK obtained WHO pre-qualification in 2009, which opened the door for purchase by UN organizations. The price offered to the Pan American Health Organization Revolving Fund decreased from $32 per dose in January 2010 to $14 per dose in April 2011 for the GSK vaccine.[79] The Merck vaccine was offered to PAHO within the same price range.

Another milestone was achieved the week before the June 2011 GAVI Alliance conference when Merck offered to provide its HPV vaccine at $5 per dose to GAVI.[80,81] The Merck price offer was made in response to GAVI's call for action and marks the first-ever public offer of a price for HPV vaccines for low income countries.

The work to achieve these results began in October 2008 when the GAVI Board gave priority support to the HPV vaccine. However, due to financial constraints at the time, the GAVI Alliance was not able to provide immediate support without first shaping the market. GAVI then worked with manufacturers to lower the price of vaccines, encouraging them to announce an indicative price for HPV vaccine for GAVI-eligible countries. Such information is needed to help countries decide if the vaccine will be a cost-effective and appropriate public health intervention.

In the short term, GAVI is working with the two existing manufacturers to further increase the affordability of the vaccines. GAVI also has begun meeting with new suppliers and will explore the possibilities of push-funding mechanisms and procurement strategies, such as advanced purchase agreements and longer term awards for reducing prices. Such strategies would leverage GAVI's ability to pool procurement for volumes over longer time periods, allowing manufacturers to forego some level of margin in exchange for certainty of demand.[82]

The breakthroughs in June of 2011 –a combination of full funding for GAVI and a lowering of HPV vaccine prices– constitute major steps towards helping to prevent the deaths of hundreds of thousands of women in LMICs every year and meeting the expressed demand of developing countries for the vaccine as part of their immunization programmes.

Procurement options

Successful global, regional, and national procurement organizations –whose establishment requires substantial investments of time, expertise, and money– provide viable options for procurement of cancer medicines, vaccines, and health technologies. The Interagency Pharmaceutical Coordination Group (made up of representatives from WHO, the World Bank, UNICEF, and the United Nations Population Fund) in 1999 issued their "Operational Guidelines for Good Pharmaceutical Procurement," which outlined several strategic objectives: procure the most cost-effective drugs in the right quantities, select reliable suppliers of high-quality products, ensure timely delivery, and achieve the lowest possible total cost.[83] Countries able to procure essential medicines on their own have had substantial success resulting in strengthened national and regional procurement systems. Pooled procurement achieves the best prices and availability when it concentrates purchase volumes, is linked to reliable and prompt payment, provides reasonably accurate forecasting, and maintains a procurement schedule that reduces shipping and storage costs (Text Box 7.1). National, regional, or global pooled procurement influences market dynamics, makes procurement more efficient, and pushes market power towards purchasers rather than suppliers (Text Box 7.2).

National, regional, or global pooled procurement influences market dynamics, makes procurement more efficient, and pushes market power towards purchasers rather than suppliers.

At the local level a pooled procurement system in Delhi, India provided a 30% savings to the local government associated with more than 80% availability of essential medicines at health facilities.[84] Using ocean and land transport instead of air transportation to deliver ARVs contributes to price reductions by saving up to 85% of freight costs.[85] Successful global and regional pooled procurement is invariably linked to reliable financing. For national supply systems, reliable financing and good governance are arguably the two pivotal determinants of national pharmaceutical system performance.

Although the regional and global-level pooled procurement systems (such as IDA Foundation and IMRES) are not currently focused on procurement of cancer-related commodities, it is possible that at least some of these mechanisms could be expanded to address cancer requirements (several nonprofit international procurement agents already offer selected, generically available cancer medications). Building a new procurement and supply organization exclusively for cancer agents should be avoided, given the time, expertise and money required to build reliable, efficient, and high turnover procurement organization.

Text Box 7.2
Partnership and pooled procurement for a life-saving health technology[86]

Surgery is an essential element of treatment for certain cancers such as breast cancer, cervical cancer, and head and neck cancer. In sub-Saharan Africa, nearly 70% of operating theatres do not have oxygen monitors (pulse oximeters), which could save thousands of lives through safer surgery and anaesthesia. Depending on the type of oximeter and supply source, the typical cost of a model designed for the operating theatre is about $2,000-$3,000 in developing countries whereas it may cost $1,000 in the USA partnership of the World Federation of Societies of Anaesthesiologists, Association of Anaesthetists of Great Britain and Ireland and Harvard School of Public Health established the LifeBox project ***(www.lifebox.org)*** *as a pooled procurement mechanism for pulse oximeters. They also provided educational materials and helped launch the concept with health professionals. Manufacturers were engaged early on about the potential market in resource-poor settings and the desired characteristics for such devices, which included battery operation, affordability, reliability, durability*

and minimal or no maintenance. Subsequently, WHO hosted a consultative meeting with a wide-range of stakeholders including manufacturers to discuss procurement and distribution options as well as training models for widespread introduction of pulse oximetry. After a competitive tender, one manufacturer was selected to provide oximeters for a low cost of $250, including delivery charges. Hospitals in Ethiopia, Ghana, India, Kenya, Liberia, Uganda and the Philippines have ordered pulse oximeters and Smile Train has ordered 2,000 devices. The LifeBox experience demonstrates that professional advocacy and early engagement with manufacturers can create a solid market with robust demand for essential health technologies.

Quality, safety, and regulation

Measures to assure medicine and vaccine quality and monitor safety must go hand-in-hand with efforts to reduce price. Medicine quality cannot be sacrificed for the sake of lower prices, given the implications of substandard products for treatment efficacy. The long-term aim would be for all countries to have national regulatory authorities with the capacity to ensure the quality of all medicines coming into or manufactured within the country. Unfortunately, evidence on antibiotics, antiretrovirals, anti-malarials and other essential medicines demonstrates considerable variation in the quality of producers and products in many low income markets.[87]

Measures to assure medicine and vaccine quality and monitor safety must go hand-in-hand with efforts to reduce price.

As one response to this situation, WHO has established a prequalification program for a growing number of products for high burden diseases, including HIV/AIDS, malaria, and tuberculosis. As seen earlier in Table 1, prequalified manufacturers for hepatitis B and HPV vaccines paved the way for a global market place with concomitant support from GAVI for implementation. The Global Fund has helped to strengthen quality assurance for HIV/AIDS, tuberculosis and malaria products, and public posting of results from quality tests have helped countries make decisions on the sources of medicines of assured-quality.[88]

While global efforts are being made for the provision of low-cost cancer medicines, persistent weaknesses in pharmaceutical management at the country level must be simultaneously addressed with appropriate mechanisms to ensure their safe handling, rational use, and medicines safety monitoring. Research in high income countries documented substantial contamination in drug preparation areas (75%) and drug administration areas (65%) of cancer hospitals.[89] Poor handling of chemotherapeutic agents can be hazardous, especially in low income countries with inadequate infrastructure, policies, and procedures to minimize occupational exposure.[90] In addition, policies and procedures must be in place for safe disposal of expired chemotherapeutic agents and radioactive waste to ensure that they are appropriately managed and eliminated and to minimize risks of environmental contamination.[91]

The Global Fund has helped to strengthen quality assurance for AIDS, tuberculosis and malaria products, and public posting of results from quality tests have helped countries make decisions on the sources of medicines of assured-quality.

Non-price barriers to palliation and pain control

No one with cancer should die in pain simply because of where they live. Yet, there is a stunning access gap in morphine consumption – and high income countries with much smaller populations are consuming 90% of the morphine. Strategies to eliminate or minimize policy and administrative barriers for palliative care are exigent to eliminate unnecessary pain and suffering. If we are to eliminate this gap, governments must take the lead with national laws and policies that draw on existing international guidelines and best practices to first ensure seamless access to opioid analgesics for those in need.

Each country's formulary list must be revised to contain at minimum the various morphine formulations and codeine that are part of WHO's EML.

The access gap can only be closed through a well documented, multipronged approach.[92] Each country's formulary list must be revised to contain at minimum the various morphine formulations and codeine that are part of WHO's EML.[93] Administrative barriers such as weak forecasting due to poor demand, supply management, insecure storage, and lengthy authorization processes must be addressed to ensure consistent availability and accessibility of opioid analgesics, including mechanisms for decentralization. Efficient forecasting is crucial as international conventions regulated by the International Narcotics Control Board require annual forecasts before these controlled substances can be shipped. Evidence from resource-poor settings shows that this is possible if strong government support is combined with balanced measures to effectively regulate the opioid supply chain.[94]

Innovative financing strategies through existing programs, such as PEPFAR and the Global Fund, and additional funding subsidies will be required. Also, more work must be done to ensure that currently allocated donor funds are fully utilized for increased access to pain relief.[95] Health workers need to be adequately trained in pain management and in the administration of correct and safe dosages. Through increased availability of oral morphine, home-based care can be effectively delivered thus reducing costs to the family and health system.

The high cost of fentanyl patches (costing 30 times that of modified release forms)[96] needs to be reduced to make this alternative available and reduce barriers in administration. Local production of morphine, where feasible, can substantially increase access to pain relief as seen in Jordan and Uganda.[97,98] Indeed, effective pain treatment is arguably a human right, and national governments and international organizations must work together to meet their obligation of breaking barriers.[99]

Indeed, effective pain treatment is arguably a human right, and national governments and international organizations must work together to meet their obligation of breaking barriers.

7.v. Treatment affordability and unmet need for cancer medicines

Estimating the total cost of the unmet need for cancer medicines is a key factor in developing a global plan of action for closing the cancer divide. It enables cancer alliances such as the GTF.CCC, UICC, INCTR, and others to work with pharmaceutical companies, price information services, current and possible supply organizations, and other stakeholders to develop strategies for increasing access through reduced prices, efficient procurement and other strategies outlined earlier in this Section.

A recent analysis of the global economic burden of non-communicable diseases suggests wide variation among cancers in the average cost of treatment, ranging from over $30,000 for some leukemias to less than $1,500 for cervical cancer.[100] The major drivers of treatment cost are chemotherapy, radiation therapy, surgery-related hospitalization, and in some cancers: high-cost diagnostic procedures. An analysis of breast cancer treatment in Mexico found that the average cost breakdown across all stages was 52% for chemotherapy (86% of which was for medicines), 16% for surgery, and 11% for radiation. For treatment in Nigeria for a very different cancer, Burkitt's lymphoma, the cost breakdown was 63% for medicines, 19% for hospitalization, and 12% for laboratory testing.[101] Where radiation is required and available, the reported cost per patient for breast cancer (if available) varies widely, from $6,465 in North America to $323 in Africa and $173 in Asia, as do hospitalization and other costs association with surgical treatment.[102]

Table 3

Estimated Chemotherapy Costs for Selected Cancers in LMICs*

Disease	Patient type assumed[a]	medicines per patient (average)[b]	HIV/ AIDS-Related[c]	Epidemiological Context and Role of Chemotherapy in Treatment (see Section 5 for detailed discussion)
Cervical (average across several stages)	Adult woman	$130	Yes	Most common cancer in women worldwide, particularly in developing countries. Cryosurgery for lesions with no visible evidence of cancer. Areas visible with cancer should be treated with excision either by loop, cone biopsy or hysterectomy.
Kaposi's Sarcoma (bleomycin+ vincristine)	Adult	$245	Yes	Most common HIV/AIDS-related cancer, endemic in Africa. Chemotherapy offers substantial palliation. Effective chemotherapy depends on concomitant control of HIV/AIDS infection. This regimen provides effective low-cost treatment for patients with less advanced disease. Retreatment required for recurrences.
Burkitt's Lymphoma	Child ~ 8 y.o.	$280		Primarily a childhood cancer, endemic in Africa. Treated with systemic chemotherapy, which can be highly curative with early and complete treatment.
Childhood Sarcomas	Child ~ 12 y.o.	$1,065		Inexpensive chemotherapeutic regimen is available, but without surgery it is not curable.
Hodgkin's Lymphoma	Adult	$2,030		Mostly occurs in young adults aged 17 to 35 years. Highly curable disease based on systemic therapy. Radiation, if available, is used as adjunct therapy to decrease usage of chemotherapy.
Acute Lymphocytic Leukemia (all)	Child ~ 12 y.o.	$2,290		Most common in children. Highly curable with chemotherapy alone.
Kaposi's Sarcoma (paclitaxel)	Adult	$4,560	Yes	Most common HIV/AIDS related cancer, endemic in Africa. If HIV/AIDS is not under control then treatment may not be effective. This regimen reserved for patients with more extensive and life-threatening disease.
Breast Cancer (average across several stages)	Adult woman	$8,900		In many countries, the most common women's cancer and worldwide accounts for 1/4 of all cancers in women. Surgical removal of tumor is key. With systemic chemo-therapy and hormones, treatment can be curative in early stage and often life-prolonging in later stages. Radiotherapy can be important, depending on clinical setting.
Diffuse Large B-Cell Lymphoma	Adult	$19,570		Diffuse large B-cell lymphoma (DLBCL) is the most common form of non-Hodgkin's lymphoma in high income countries and one of several common HIV/AIDS-related cancers. DLBCL can advance very quickly and usually requires immediate treatment. A combination of chemotherapies and the monoclonal antibody rituximab can lead to a cure in a large number of cases.
Chronic Myelogenous Leukemia (CML)	Adult	$37,270		Once an incurable disease, CML can now be controlled with imatinib for a longer time. Also affects older people. With oral, continuous life-long therapy, lifespan is extended.

NOTES:

[a] See Body Surface Area Calculations, www.halls.md/body-surface-area/bsa.htm.

[b] Treatment costs use these prices and treatment regimen calculations by Gene Bukhman, Partners in Health with inputs from Dana-Farber Cancer Institute (available at http://www.msh.org/expertise/pharmaceutical-management/index.cfm). Pharmaceutical costs are median world market institutional purchase prices from MSH-WHO International Drug Price Indicator Guide, 2010 and Partners in Health, 2009-2010. Medicines listed in the MSH-WHO International Drug Price Indicator Guide are from reputable suppliers using international quality assurance standards (see http://erc.msh.org/mainpage.cfm?file=2.4.cfm&id=5541&temptitle=Quality%20standards&module=DMP&language=English).

[c] AIDS-related cancers listed based on www.cancer.gov/cancertopics/types/AIDS.

* Figures rounded to the nearest $5.

For the many cancers for which chemotherapy plays the sole or a major role in treatment, it will generally account for the largest share of total treatment costs.

For the many cancers for which chemotherapy plays the sole or a major role in treatment, it will generally account for the largest share of total treatment costs. A full curative course of chemotherapy may require a period of weeks to months to complete. Only for a few cancers such as chronic myelogenous leukemia (CML) is continuous life-long treatment required. However, average chemotherapy costs vary widely (Table 3), from less than $500 for cervical cancer, Kaposi's sarcoma (the most common HIV/AIDS-related cancer) and Burkitt's lymphoma (a primarily childhood cancer endemic in Africa) to an average across all stages of nearly $9,000 for breast cancer, to an annual cost of over $35,000 for CML. As indicated by individual drug prices (Table 2), the most costly chemotherapy involves the newest on-patent agents such as trastuzumab (Herceptin) for HER2+ cases, imatinib (Gleevec/Glivec) for CLM, and rituximab (Rituxan/MabThera) for diffuse large B-cell lymphoma.

As noted earlier, there is a substantial gap in access to cancer treatment in most low and middle income countries. Text Box 7.3 presents an estimate of the annual cost of unmet needs for chemotherapy medicines for four common cancers, which suggests that the cost of increasing access to chemotherapy may be more affordable than many have suggested. Among these cancers, the annual global cost of cancer medicines varies from roughly $26 million for cervical cancer to $4.3 billion for a breast cancer scenario that assumes 20% HER2+ and 60% early detection. For breast cancer, the unmet need with this scenario is estimated at $340 million for Latin America and the Caribbean, $550 million for Africa, and just over $1.7 billion for Asia.

The high cost of unmet need for medicines for breast cancer is primarily a reflection of the high incidence of breast cancer worldwide and the high cost of current trastuzumab (Herceptin) treatment HER+ breast cancer. The impact of HER2+ breast cancer treatment is reflected in the alternative scenarios presented in Text Box 7.3.

Text Box 7.3
Estimating the global unmet need for cancer medicines: Hodgkin's lymphoma, cervical cancer, childhood acute lymphoblastic leukemia, and breast cancer

Robust estimation of the potential demand and global unmet need for drugs is a necessary first step to plan the financing and overcome the obstacles to the development of successful schemes for the pooled procurement and negotiation of prices for cancer drugs and to shape market dynamics. It is also essential for developing national cancer plans and programs and developing annual health sector budgets especially for CCC.

Estimates of potential demand and unmet need are highly dependent on good quality, national estimates of current and future needs. In practice, this implies knowing the number of prevalent cases to identify unmet current needs. In addition, it is necessary to estimate the number of incident cases and projections of how these numbers may evolve over time. For most cancers the preferred drug regimen depends on having a precise diagnosis and in some cases staging. The latter is particularly important, as the stage at diagnosis can determine the type and quantity of recommended medications as well as other treatments and therapies. Early detection usually implies a lesser quantity of drugs, and especially in terms of potential years of life that can be saved, is always the better option.[103]

Estimation of potential volumes of demand and unmet need for services and drugs is not a onetime exercise. Rather it should be continuously and regularly updated as new and better sources of information become available, coverage of services expands, and new options for treatment are developed. A background document for this report "Estimation of global potential demand of cancer drugs" proposes basic methods for these estimations.[104]

As a first approximation, the total annual cost of covering chemo- and adjuvant therapy is estimated by multiplying the cost of drug regimens for specific cancers (Table 3) by the number of incident cases based on data from Globocan (2008),[105] for a select group of cancers (Table 4A). This provides an estimate of the total cost of treatment for all cases identified in a given year for a specific cancer.

A key quantity for the purposes of improving prices and procurement is the unmet need for cancer services and drugs. Unmet need can be conceived as the incident cases in a given period that are not being treated multiplied by the quantities of services and drugs that are required to treat these cases. For this report, untreated cases are estimated by subtracting estimates of current coverage from the incidence figures for each country. Current coverage is inferred based on the ratio of mortality to incidence (an approximation of case fatality), as well as taking into account information from medical sources on the survival ratios with and without treatment. Applying a specific level of prices or costs of inputs yields the monetary value of the services that would be required for expanding coverage (Table 4B).[106]

The incidence data have several limitations as they are based on projections for many countries where cancer registries are lacking, especially in LMICs (see Section 9). Further, it is not possible to differentiate certain types of cancers. In the case of childhood leukemia, for example, it is not possible to separately identify the cases that are acute lymphoblastic leukemia from other types of leukemia. Hence, for the calculations used to estimate costs, 75% of leukemia in children is assumed to be acute lymphoblastic leukemia. This is a rough assumption and there is likely to be variance by region and by country.

It is particularly noteworthy that for several cancers the total cost of covering the drug treatment regimes for all unmet need, and even for all incident cases is relatively low. This is largely because most of the drugs are off patent.

It is, however, important to note that these estimates refer only to drug therapies and do not include diagnostics or other aspects of treatment such as surgery and radiation therapy. One estimate for the National Institute of Social Security of Mexico shows that in the case of breast cancer, drugs account for about 50% of the overall cost of CCC.[107]

For acute lymphoblastic leukemia for all children 0-14, the total cost of unmet need for chemotherapy drugs for one year of incident cases is $6 million for Africa, $8 million for Latin America and the Caribbean, and $38 million for the LMICs of Asia. The total cost of meeting unmet need in LMICs is $52 million. Further, even the cost of treating all incident cases is just under $150 million for all LMICs.

For cervical cancer, the costs of unmet need for medicines are $6 million, $3 million, and $15 million, respectively for Africa, Latin America and the Caribbean and the LMICs of Asia, respectively. For all LMICs, the figure is $25 million and for all incident cases is $60 million. For Hodgkin's Lymphomas, the total unmet need for LMICS is $38 million, compared to $70 million for all incident cases.

The cost of drugs for treating breast cancer is much higher: largely driven by the extremely effective yet costly drug traztuzumab that is used in a subset of cases (20% of breast cancer cases are assumed to be HER2+ and can benefit from traztuzumab). Further, the doses of drugs used and hence the costs are also highly sensitive to the stage of diagnosis. Thus, these calculations also take into account two scenarios: 1) only 10% of cases are detected in early stages; and, 2) 60% of cases are detected in early stages. These scenarios are based on existing data from LMICs and high income countries.[108-110] Without HER2+ treatment and with only 10% of cases detected in early stages, the cost of drugs required to satisfy unmet need for all LMICs is just over $700 million. For incident cases, it is estimated to be more than $2 billion. If 60% of cases are detected early, the figures go down by approximately 40%. With HER2+ treatment at current prices, the costs increase more than six fold to $4.5 billion for unmet need and more than $13 billion for all incident cases. Again, early detection saves lives and implies a lower volume of drugs needed and hence a reduction of approximately 30% in costs. Thus, in the case of breast cancer, securing better prices for HER2+ treatment is very important, but promoting early detection is equally important for reducing costs, as well as for improving outcomes.

Cost of Covering Chemotherapy for One Year of Incident Cases for Hodgkin's Lymphoma, Childhood Acute Lymphoblastic Leukemia, and Cervical and Breast Cancer, 2010 Prices ($millions)

Table 4a

Region	Hodgkin's lymphoma	Acute Lymphoblastic* Leukemia (Children 0-14)	Cervix	Breast (females)			
				With HER2+ treatment for 20% of cases		Without HER2+ treatment	
				10% early detection	60% early detection	10% early detection	60% early detection
World	104	232	66	23,379	16,764	3,606	2,195
High Income Countries	34	83	6	10,310	7,393	1,590	968
Low and Middle Income Countries	70	149	60	13,069	9,371	2,016	1,227
Africa	13	17	10	1,570	1,126	242	147
Latin-American and the Caribbean	9	29	8	1,933	1,386	298	181
Asia (excluding high income countries)	38	63	37	7,568	5,427	1,167	710

Cost of Covering Chemotherapy for Unmet Needs for Hodgkin's Lymphoma, Childhood Acute Lymphoblastic Leukemia, and Cervical and Breast Cancer, 2010 Prices ($millions)

Table 4b

Region	Hodgkin's lymphoma	Acute Lymphoblastic* Leukemia (Children 0-14)	Cervix	Breast (females)			
				With HER2+ treatment for 20% of cases		Without HER2+ treatment	
				10% early detection	60% early detection	10% early detection	60% early detection
World	43	58	26	6,005	4,306	926	564
High Income Countries	5	5	2	1,460	1,047	225	137
Low and Middle Income Countries	38	52	25	4,544	3,259	701	427
Africa	10	6	6	768	550	118	72
Latin-American and the Caribbean	3	8	3	476	341	73	45
Asia (excluding high income countries)	21	38	15	2,424	1,738	374	228

*These figures assume that 75% of all leukemias in 0-14 year olds are acute lymphoblastic leukemia. Globocan 2008 incidence data do not specify type of leukemia.

Source: Author calculations based on Table 3, Globocan 2008 and Guerrero et al., (2011). Estimation of global potential demand of cancer drugs.

7.vi. Engaging the private sector

Access to existing medicines, vaccines and technologies

The international cancer community, WHO, and other partners must strategically engage with the pharmaceutical manufacturers –brand and generic, north and south– for widespread access to cancer medicines, vaccines, and health technologies. The beginning of the decline in prices seen for ARVs in the early 2000s would not have happened without the engagement of the pharmaceutical manufacturers with UNAIDS, WHO, and the European Commission along with pressure from activists.[111] The HIV/AIDS experience demonstrated a paradigm shift for the research-based pharmaceutical industry to modify their business model in a high-volume market. The international cancer community can provide stewardship by engaging both patent-holding multinational pharmaceutical firms and generic manufacturers from the developing world.

Though "South-South" collaboration is encouraged by donor governments and international organizations, such organizations initiated only 17 of 279 reported South-South collaborations among research institutes and manufacturing firms in Africa, Asia, and Latin America actively working together to produce pharmaceutical products for shared health priorities. For example, Cuba's Center of Molecular Immunology is spearheading clinical trials for nimotuzumab (already approved for head and neck cancers) to treat other cancers of epithelial origin in partnership with 20 developing countries and 7 developed countries, thus by-passing large pharmaceutical companies.[112,113] This suggests that through such arrangements, the international cancer community can promote the development and supply of health technologies that are appropriate for resource-limited settings. For instance, manufacturers and regulatory agencies in Brazil and Cuba, with encouragement from WHO, quickly responded to the need for a large-scale supply of meningitis A vaccine to combat the outbreak in Africa. Similarly, PEPFAR engaged a private medical diagnostic company to strengthen laboratory capacity for managing TB and HIV/AIDS diagnosis in eight African countries.[114] Transfer of technology has been an important element in increasing production of medicines for multidrug resistant tuberculosis in the South.[115] Through engagement with manufacturers built on the advance market commitment model, the pneumococcal vaccine was recently introduced for $3.50 a dose.[116] Given their strong manufacturing capacity and ability to commercialize affordable health products, countries like Brazil, China, India and Mexico have the opportunity to serve the world as they prepare to manufacture generic products for cancer.[117]

The HIV/AIDS experience demonstrated a paradigm shift for the research-based pharmaceutical industry to modify their business model in a high-volume market.

Product innovation

Targeted innovations in cancer medicines, vaccines, and related health technologies for resource-poor settings are urgently needed. With ultrasound and mammography machines running in the tens of thousands of dollars and radiotherapy equipment running in the millions, lower cost, appropriate technology for radiotherapy that can function effectively with unstable electricity is urgently needed, as are other cancer-related health technologies that can function in resource-limited settings. Recently, the IAEA challenged manufacturers not only to reduce the cost of radiotherapy machines from $3 million to $1 million but also to provide simpler designs that are feasible in resource-limited settings. Termed "frugal innovation," such efforts are essential for scaling up cancer detection, diagnosis, and treatment.[118]

In response to WHO's call for innovative health technologies for 19 global health concerns, cancer received the second-highest number of applications (26) by interested manufacturers wanting to commercialize resource-appropriate, lower cost health technologies.[119] Further, the First Global Forum on Medical Devices concluded with optimism that manufacturers expressed their willingness to develop or adapt health

technologies for global health purposes.[120] Costs for mammography, radiotherapy and ultrasound machines do not have to be insurmountable. Using the frugal innovation approach, there are opportunities to design machines suitable for resource-poor settings. However, there is an absolute need to ensure appropriate quality and patient safety of these lower cost devices combined with the requisite regulatory approvals, quality-assurance mechanisms, post-market vigilance, innovations in healthcare delivery models and options for health system capacity building.[121]

Targeted innovations in cancer medicines, vaccines, and related health technologies for resource-poor settings are urgently needed.

Turning to medicines, a wider range of oral chemotherapy would reduce the need for patients to travel hundreds of miles to the metropolitan area to receive prolonged infusions, thus saving both time and transportation costs. The design of effective treatment regimens utilizing oral therapies, where feasible, eliminates costs for in-patient care with the potential to alleviate staffing shortages and ensure that a greater number of patients are treated.[122] Using existing off-patent products for the treatment of AIDS-related lymphoma, oral chemotherapy demonstrated reasonable efficacy and safety.[123] Analysis of current oral products under development shows that some of them overcome the concerns of efficacy and bioavailability relative to infusions.[124] Targeted chemotherapeutic agents that specifically attack malignant cells and minimize toxicity are greatly needed for improved quality of care. Evidence from South Africa highlights the need for cheaper liposomal drugs which have a comparative advantage in efficacy and tolerability for the management of AIDS-associated Kaposi's sarcoma.[125]

Analysis of available data indicates that promising cancer products receive the highest research investment, compared to other non-communicable diseases, by nonprofit agencies and the research-based pharmaceutical industry.[126] For these new products that are expected to be commercialized, prior engagement with product developers is necessary for rapid availability of products for predominant cancers in low and middle income countries. Fast-track approval of expanded indications for existing oral therapies that minimize toxicity must be given priority. Product development partnerships (PDPs) have been fairly successful in licensing 12 products to combat major infectious diseases, with funding leveraged from various streams.[127] In the context of health technologies for cancer, developing, manufacturing, and commercializing resource-appropriate technologies will require a paradigm shift to speed up access in low and middle income countries. At the 2010 Berlin World Health Summit, PDPs called on governments for increased funding, building on Germany's announcement to deliver more global health aid through such mechanisms.[128]

Costs for mammography, radiotherapy and ultrasound machines do not have to be insurmountable. Using the frugal innovation approach, there are opportunities to design machines suitable for resource-poor settings.

7.vii. Conclusions and recommendations

1. **National cancer control programs in low and middle income countries must work systematically to:** adapt global guidelines for national cancer prevention, treatment, and palliation programs; strengthen procurement and distribution systems; ensure regulation of quality and safety; and pursue other critical actions such as controlling distribution mark-ups and eliminating tariffs on cancer medicines.
2. **International guidelines for cancer prevention, detection, treatment, and palliative care in LMICs** should be developed and the range of cancer agents in the **WHO model list of essential medicines and vaccines** should be expanded. This effort should be spear-headed by the Union for International Cancer Control (UICC), International Network for Cancer Treatment and Research (INCTR), American Society of Clinical Oncology (ASCO), European Society of Medical Oncology (ESMO), Sociedad Latinoamericana y del Caribe de Oncología (SLACOM) and others working closely with the World Health Organization.
3. **Transparent web-based exchange of information on prices and sources of cancer medicines and vaccines,** such as that provided by the MSH-WHO International Drug Price Indicator, should be expanded to include demand information, widely disseminated and actively used by cancer program planners and procurement agencies. Such information can achieve dramatic price reductions –especially on off-patent products– when used in competitive pooled procurement by reliable global, regional, or national procurement and supply organizations. Observed reductions of over 90% for HPV and hepatitis B vaccines and 99% for antiretrovirals should be possible for some chemotherapy agents.
4. **For off-patent chemotherapeutic agents,** producers of both finished products and active pharmaceutical ingredients (APIs) in LMICs, such as in China and India, should engage in developing innovative models for using real-time consumption and demand forecast information to ease the shortages of critical off-patent chemotherapeutic agents in the developed world and reduce prices in LMICs.
5. **For on-patent cancer agents,** for which world market prices can be prohibitively expensive at $40,000 per patient or more, increased access should be pursued through differential pricing by companies, negotiation with companies, sustained targeted donations and work with global, regional and national procurement agencies to expand their range of cancer agents as need and demand grow. Compulsory and voluntary licensing can be useful tools under very specific circumstances, but alone rarely achieve large-scale price reduction.
6. **Cancer detection, treatment, and palliation** should be made more accessible and affordable through diagnostic tests and medications that are more easily delivered in remote settings, reducing the cost of key components, especially through strategies described in this section and Section 6 on innovative delivery.

References

1. Domingo EJ, Dy Echo AV. Epidemiology, prevention and treatment of cervical cancer in the Philippines. *J Gynecol Oncol* 2009; 20:11-16.
2. Aziz Z. Across generations: cancer treatment in developing countries. *J Clin Oncol* 2008;26:4990-91.
3. Shulman D, Bukhman G. Partners In Health, Rwanda. Personal Communication. March 9, 2011.
4. Quick JD. Essential medicines twenty-five years on: closing the access gap. *Health Policy Plan* 2003;18:1-3.
5. Kanavos P, Das P, Durairaj V, Laing R, Abegunde DO. Options for financing and optimizing medicines in resource-poor countries. Background Paper 34: World Health Report 2010. Geneva: World Health Organization, 2010.
6. Boyle P, Levin B. *World Cancer Report 2008*. Lyon: International Agency for Research on Cancer, 2008.
7. Orem J, Wabinga H. The roles of national cancer research institutions in evolving a comprehensive cancer control program in a developing country: experience from Uganda. *Oncology* 2009;77:272-80.
8. Meremikwu MM, Ehiri JE, Nkanga DG, Udoh EE, Ikpatt OF, Alaje EO. Socioeconomic constraints to effective management of Burkitt's lymphoma in south-eastern Nigeria. *Trop Med Int Health* 2005;10:92-98.
9. Cancer Patients Aid Association India. Cancer drugs-Pricing and Patents. September 2010. India: Department of Industrial Policy and Promotion, Ministry of Commerce and Industry, Government of India, 2010. http://dipp.nic.in/ipr-feedback/Feedback_01_CL_10September2010.pdf (accessed March 25, 2011).
10. Howard SC, Marinoni M, Castillo L, et al. MISPHO Consortium Writing Committee. Improving outcomes for children with cancer in low -income countries in Latin America: a report on the recent meetings of the Monza International School of Pediatric Hematology/Oncology (MISPHO) – Part I. *Pediatr Blood Cancer* 2007;48:364-69.
11. El-Zawahry HM, Zeeneldin AA, Samra MA, et al. Cost and outcome of treatment of adults with acute myeloid leukemia at the National Cancer Institute-Egypt. *J Egypt Natl Canc Inst* 2007;19:106-13.
12. Boutayeb S, Boutayeb A, Ahbeddou N, et al. Estimation of the cost of treatment by chemotherapy for early breast cancer in Morocco. *Cost Eff Resour Alloc* 2010;8:16.
13. Mendis S, Fukino K, Cameron A, et al. The availability and affordability of selected essential medicines for chronic diseases in six low- and middle -income countries. *Bull World Health Organ* 2007;85:279–88.
14. Ekenze SO, Ekwunife H, Eze BI, Ikefuna A, Amah CC, Emodi IJ. The burden of pediatric malignant solid tumors in a developing country. *J Trop Pediatr* 2010;56:111-14.
15. Wairagala W. Working to improve access to palliative care in Africa. *Lancet Oncol* 2010;11:227-28.
16. HAI Global. Universal Access to Medicines for Non-Communicable Diseases: Within our Grasp but Out-of-Reach. Briefing note for delegates to the NCD High Level Meeting, September 2011. http://www.haiweb.org/12092011/NCDSummitpaper13Sept2011.pdf (accessed October 10, 2011).
17. Cameron A, Roubos I, Ewen M, et al. Differences in the availability of medicines for chronic and acute conditions in the public and private sectors of developing countries. *Bulletin of the World Health Organization* 2011;89(6):279-287.
18. Carrin G, Mathauer I, Xu K, Evans DB. Universal coverage of health services: tailoring its implementation. *Bulletin of the World Health Organization* 2008;86(11):857-863.
19. Knaul FM, Arreola-Ornelas H, Mendez-Carniado O, et al. Evidence is good for your health system: policy reform to remedy catastrophic and impoverishing health spending in Mexico. *Lancet* 2006;368(9549):1828-41.
20. Management Sciences for Health. *MDS-3: Managing Access to Medicines and other Health Technologies*. Arlington, VA: Management Sciences for Health, 2011.
21. Wells WA, Konduri N, Chen C, et al. Tuberculosis regimen change in high-burden countries. *Int J Tuberc Lung Dis* 2010;14:1538-47.
22. Beck EJ, Vitoria M, Mandalia S, Crowley S, Gilks CF, Souteyrand Y. National adult antiretroviral therapy guidelines in resource-limited countries: concordance with 2003 WHO guidelines? *AIDS* 2006;20:1497-502.
23. World Health Organiztion. *Scaling up antiretroviral therapy in resource-limited settings: guidelines for a public health approach*. Geneva: World Health Organization, 2002.
24. Sloan FA, Gelband H (Eds.). *Cancer control opportunities in low- and middle -income countries*. Washington, DC: Institute of Medicine of the National Academies, National Academies Press, 2007.
25. International Union Against Cancer (UICC). World Cancer Declaration, 2008. http://www.uicc.org/sites/uicc.agenceinovae.com/files/wcden09low.pdf (accessed June 10, 2011).
26. Kerr DJ, Midgley R. Can we treat cancer for a dollar a day? Guidelines for low -income countries. *N Engl J Med* 2010;363:801-03.
27. International Union Against Cancer (UICC). Access to Cancer Drugs: A UICC Position Paper (Revision 2008/2009). Geneva: UICC, 2009. http://www.uicc.org/sites/clonesource.agenceinovae.com/files/private/access_to_cancer_drugs_uicc.pdf (accessed June 10, 2011).
28. Eniu A, Carlson RW, El Saghir NS, et al. Breast Health Global Initiative Treatment Panel. Guideline implementation for breast healthcare in low- and middle -income countries: treatment resource allocation. *Cancer* 2008;113(Suppl 8):2269-81.
29. Collingridge D. Delivering consensus from the Asian Oncology Summit 2009. *Lancet Oncol* 2009;10:1029-30.
30. The National Comprehensive Cancer Network. About Us. http://www.nccn.org/about/default.asp . (accessed September 17, 2011).
31. Network (The Newsletter of the International Network for Cancer Treatment and Research [INCTR]). Annual meeting special issue (Replaces Winter and Spring Issues 2007). Annual meeting panel A: WHO Drug Essential Drug List. INCTR 2007; 7: 10. http://www.inctr.org/fileadmin/user_upload/inctr-admin/Network%20Magazine/Vol%207%20No%202%20Winter%20Spring%202007LR2.pdf (accessed March 23, 2011).
32. WHO. *Model List of Essential Medicines for Children*. Geneva: World Health Organization 2007.
33. Network (The Newsletter of the International Network for Cancer Treatment and Research [INCTR]). Winter 2007-2008. REPORT: Childhood Cancer in a Developing Nation: The Impact of a National Program. INCTR 2007; 7: 9-10. http://www.inctr.org/fileadmin/user_upload/inctr-admin/Network%20Magazine/Vol%207%20No%204%20Winter%202007%202008LLR.pdf (accessed March 25, 2011).
34. Network (The Newsletter of the International Network for Cancer Treatment and Research [INCTR]). Winter 2002-2003. Profiles in Cancer Medicine: Standardizing Cancer Treatment. INCTR 2003;3:20. http://www.inctr.org/fileadmin/user_upload/inctr-admin/Network%20Magazine/Vol%203%20No%203%20-%20Winter%202002-2003LLR.pdf (accessed March 25, 2011).
35. Sharma DC. Boost to cancer care in India. *Lancet Oncol* 2005;6:835-37.
36. Gilks CF, Crowley S, Ekpini R, et al. The WHO public-health approach to antiretroviral treatment against HIV/AIDS in resource-limited settings. *Lancet* 2006;368:505-10.
37. Ferlay J, Shin HR, Bray F, Forman D, Mathers C, Parkin DM. *GLOBOCAN 2008:Cancer incidence and mortality worldwide*. Lyon: International Agency for Research on Cancer, 2010.
38. Hepatitis B Foundation http://www.hepb.org/professionals/hepb_and_liver_cancer.htm. (access October 11,2010).
39. Ferlay J, Shin HR, Bray F, Forman D, Mathers C, Parkin DM, 2010.
40. PATH. Progress in preventing cervical cancer: Updated evidence on vaccination and screening. *Outlook* 2010;27(2). http://www.path.org/files/RH_outlook_27_2.pdf (accessed March 31, 2011).
41. Global Alliance for Vaccines and Immunization. Press Release: Increasing access to vaccines will reduce the global burden of cancer. http://www.gavialliance.org/media_centre/statements/2010_02_04_uicc.php (accessed March 31, 2011).
42. Scott Wittet, Senior Communications Officer, PATH Cervical Cancer Project. Personal Communication, March 4, 2011.
43. World Health Organization. Filterable search for prequalified vaccines with product details. http://www.who.int/immunization_standards/vaccine_quality/PQ_vaccine_list_en/en/index.html (accessed March 31, 2011).
44. Global Alliance for Vaccines and Immunization. GAVI welcomes lower prices for life-saving vaccines. Press Release; 6 June, 2011. http://www.gavialliance.org/media_centre/press_releases/vaccine_prices.php (accessed June 10, 2011).
45. Crager SE, Guillen E, Price M. University contributions to the HPV vaccine and implications for access to vaccines in developing countries: addressing materials and know-how in university technology transfer policy. *Am J Law Med* 2009;35:253-79.
46. Lu B, Kumar A, Castellsagué X, Giuliano AR. Efficacy and safety of prophylactic vaccines against cervical HPV infection and diseases among women: a systematic review & meta-analysis. *BMC Infect Dis* 2011;11:13.
47. Sankaranarayanan R, Boffetta P. Research on cancer prevention, detection and management in low- and medium-income countries. *Ann Oncol* 2010;21:1935-43.
48. Masood S, Vass L, Ibarra JA Jr, et al. Breast Health Global Initiative Pathology Focus Group. Breast pathology guideline implementation in low- and middle -income countries. *Cancer* 2008;113(Suppl 8):2297-304.
49. Carlson JW, Lyon E, Walton D, et al. Partners in pathology: a collaborative model to bring pathology to resource poor settings. *Am J Surg Pathol* 2010;34:118-23.
50. Howard SC, Campana D, Coustan-Smith E, et al. Development of a regional flow cytometry center for diagnosis of childhood leukemia in Central America. *Leukemia* 2005;19:323-25.
51. Sitas F, Parkin DM, Chirenje M, Stein L, Abratt R, Wabinga H. Part II: Cancer in Indigenous Africans – causes and control. *Lancet Oncol* 2008;9:786-95.
52. Barton MB, Frommer M, Shafiq J. Role of radiotherapy in cancer control in low -income and middle -income countries. *Lancet Oncol* 2006;7:584-95.
53. Abimiku AG. Building laboratory infrastructure to support scale-up of HIV/AIDS treatment, care, and prevention: in-country experience. *Am J Clin Pathol* 2009;131:875-86.
54. Spira T, Lindegren ML, Ferris R, Habiyambere V, Ellerbrock T. The WHO/PEPFAR collaboration to prepare an operations manual for HIV/AIDS prevention, care, and treatment at primary health centers in high-prevalence, resource-constrained settings: defining laboratory services. *Am J Clin Pathol* 2009;131:887-94.

55. World Health organization. ***The Maputo Declaration on Strengthening of Laboratory Systems***. Maputo, Mozambique: World Health Organization, 2008. http://www.who.int/diagnostics_laboratory/Maputo-Declaration_2008.pdf (accessed March 24, 2011).
56. African Society for Laboratory Medicine (ASLM) http://www.afslm.org/ (accessed October 11, 2011).
57. African Journal of Laboratory Medicine http://www.afslm.org/journal/ (accessed October 11,2011).
58. Nkengasong JN, Nsubuga P, Nwanyanwu O, et al. Laboratory systems and services are critical in global health: time to end the neglect? ***Am J Clin Pathol*** 2010;134:368-73.
59. Fisk NM, Atun R. Market Failure and the Poverty of New Drugs in Maternal Health. PLoS Med 2008;5(1):e22.
60. Management Sciences for Health. "Pharmaceutical Pricing: Theory and Practices." In ***MDS-3: Managing Access to Medicines and other Health Technologies***. Arlington, VA: Management Sciences for Health, 2011.
61. Gelders S, Ewen M, Noguchi N, Laing R. Price availability and affordability: An international comparison of chronic disease medicines. Background report prepared for the WHO Planning Meeting on the Global Initiative for Treatment of Chronic Diseases held in Cairo in December 2005. Cairo: World Health Organization Regional Office for the Eastern Mediterranean, 2006. http://www.haiweb.org/medicineprices/08092008/EDB068final.pdf (accessed June 10, 2011).
62. Cameron A, Ewen M, Ross-Degnan D, Ball D, Laing R. Medicine prices, availability, and affordability in 36 developing and middle -income countries: a secondary analysis. ***Lancet*** 2009;373:240-49.
63. Cameron A, Roubos I, Ewen M, et al., 2011.
64. Olcay M, Laing R. Pharmaceutical Tariffs: What Is Their Effect on Prices, Protection of Local Industry and Revenue Generation? Study prepared for The Commission on Intellectual Property Rights, Innovation and Public Health. Geneva: World Health Organization, 2005. http://www.who.int/intellectualproperty/studies/TariffsOnEssentialMedicines.pdf (accessed June 10, 2011).
65. Waning B, Diedrichsen E, Moon S. A lifeline to treatment: the role of Indian generic manufacturers in supplying antiretroviral medicines to developing countries. ***Int AIDS Soc*** 2010;13:35.
66. Schwartsmann G, Picon PD. When drugs are worth more than gold! ***Lancet Oncol*** 2007;8:1049-50.
67. Holmes CB, Coggin W, Jamieson D, et al. Use of generic antiretroviral agents and cost savings in PEPFAR treatment programs. ***JAMA*** 2010;304:313-20.
68. Kanavos P, Vandoros S, Garcia-Gonzalez P. Benefits of global partnerships to facilitate access to medicines in developing countries: a multi-country analysis of patients and patient outcomes in GIPAP. ***Global Health*** 2009;5:19.
69. The Global Fund. ***Making a Difference: Global Fund Results Report 2011. Geneva: The Global Fund to Fight AIDS, Tuberculosis, and Malaria, 2011.***
70. Bero L, Carson B, Moller H, Hill S. To give is better than to receive: compliance with WHO guidelines for drug donations during 2000-2008. ***Bull World Health Organ*** 2010;88:922-29.
71. Brower V. Drugs are scarce as mix of programs aims to ease access. ***J Natl Cancer Inst*** 2009;101:1304-06.
72. Amin T. Voluntary licensing practices in the pharmaceutical sector: An acceptable solution to improving access to affordable medicines? Oxfam GB, 2007. http://www.i-mak.org/storage/Oxfam%20-%20Voluntary%20Licensing%20Research%20IMAK%20Website.pdf (accessed March 24, 2011).
73. Singh K. Natco may seek compulsory license for Bayer's cancer drug. ***The Economic Times***. January 24, 2011. http://economictimes.indiatimes.com/news/news-by-industry/healthcare/biotech/pharmaceuticals/natco-may-seek-compulsory-licence-for-bayers-cancer-drug/articleshow/7350869.cms (accessed March 24, 2011).
74. World Health Organization. Human papillomavirus vaccines. WHO Position Paper. WHO Weekly epidemiological record 10 April 2009: No .15, 2009, 84 117-132. http://www.who.int/wer/2009/wer8415.pdf (accessed August 9, 2011).
75. International AIDS Vaccine Initiative, PATH. HPV Vaccine adoption in developing countries: Cost and financing issues. December 2007. http://screening.iarc.fr/doc/IAVI_PATH_HPV_financing.pdf (accessed August 9, 2011).
76. GlaxoSmithKline press release. GlaxoSmithKline cervical cancer vaccine now accessible to more Filipinas. 28 November 2008. http://www.gsk.com.ph/CervarixAccessible.html (accessed August 9, 2011).
77. Cervical Cancer Action. GSK announces South African price for HPV vaccine. 2 December 2008. http://www.cervicalcanceraction.org/news/news-detail.php?id=30 (accessed August 9, 2011).
78. Politi C and Kaddar M. Briefing Note: HPV Vaccine: Supply, demand, price and financing for low and middle income countries - Preliminary analysis. Geneva: World Health organization, 2009.
79. Pan American Health Organization. ***Financing for HPV vaccines: America's experience with new vaccines***. Washington, DC: PAHO, 2011. http://www.technet21.org/index.php/documents/view-document/1098-financing-for-hpv-vaccines-americas-experience-with-new-vaccines.html (accessed August 9, 2011).
80. Merck. Press release: Merck commends GAVI Alliance on continued efforts to improve access. 5 June 2011. http://www.merck.com/newsroom/news-release-archive/corporate-responsibility/2011_0605.html (accessed August 8, 2011).
81. GAVI. Press release: GAVI welcomes lower prices for life-saving vaccines. 6 June 2011. http://www.gavialliance.org/library/news/press-releases/2011/gavi-welcomes-lower-prices-for-life-saving-vaccines/ (accessed August 8, 2011).
82. Nguyen A, Furrer E, Schwalbe N and GAVI Alliance. Market shaping: strategic considerations for a healthy vaccine marketplace. GAVI Alliance Paper 6b. Washington, DC: GAVI Alliance, June 2011.
83. World Health Organization. ***Operational principles for good pharmaceutical procurement. Essential Drugs and Medicines Policy***. Interagency Pharmaceutical Coordination Group. Geneva: World Health Organization, 1999.
84. Chaudhury RR, Parameswar R, Gupta U, Sharma S, Tekur U, Bapna JS. Quality medicines for the poor: experience of the Delhi programme on rational use of drugs. ***Health Policy Plan*** 2005;20:124-36.
85. Partnership for Supply Chain Management. Supply Lines. http://scmsweb.pfscm.org/scms/resources/newsletter (accessed March 24, 2011).
86. Atul Gawande; Iain Wilson personal communication 11 March, 2011.
87. Caudron JM, Ford N, Henkens M, Macé C, Kiddle-Monroe R, Pinel J. Substandard medicines in resource-poor settings: a problem that can no longer be ignored. ***J Tropical Medicine & International Health*** 2008;13(8):1062-1072.
88. The Global Fund. List of products and corresponding batch numbers tested on behalf of the Global Fund (updated 10 Feb 2011). Geneva, The Global Fund to Fight AIDS, Tuberculosis and Malaria http://www.theglobalfund.org/documents/psm/PSM_CoAs_List_en.htm (accessed March 31, 2011).
89. Connor TH, Anderson RW, Sessink PJ, Broadfield L, Power LA. Surface contamination with antineoplastic agents in six cancer treatment centers in Canada and the United States. ***Am J Health Syst Pharm*** 1999;56:1427-32.
90. Elshamy K, El-Hadidi M, El-Roby M, Fouda M. Health hazards among oncology nurses exposed to chemotherapy drugs. ***African Journal of Haematology and Oncology*** 2010;1:70.
91. World Health Organization. Wastes from health care activities. Fact sheet number 253 (November 2007). http://www.who.int/mediacentre/factsheets/fs253/en/ (accessed March 31, 2011).
92. World Health Organization. ***Ensuring balance in national policies on controlled substances: Guidance for availability and accessibility of controlled medicines***. Geneva: World Health Organization, 2011.
93. Cherny NI, Baselga J, de Conno F, Radbruch L. Formulary availability and regulatory barriers to accessibility of opioids for cancer pain in Europe: a report from the ESMO/EAPC Opioid Policy Initiative. ***Ann Oncol*** 2010;21:615-26.
94. Logie DE, Harding R. An evaluation of a morphine public health programme for cancer and AIDS pain relief in Sub-Saharan Africa. ***BMC Public Health*** 2005;5:82.
95. Human Rights Watch. "Chapter 6: International donors' lack of attention to palliative care" in ***Needless pain: Government failure to provide palliative care for children in Kenya***. United States: Human Rights Watch, 2010.
96. Dehghan R, Ramakrishnan J, Ahmed N, Harding R. The use of morphine to control pain in advanced cancer: an investigation of clinical usage in Bangladesh. ***Palliat Med*** 2010;24:707-14.
97. Crane K. Cancer in the developing world: Palliative care gains ground in developing countries. ***J Natl Cancer Inst*** 2010;102:1613-35.
98. O'Brien M. Director, Global Access to Pain Relief Initiative, Union for International Cancer Control (UICC). Personal Communication. March 22, 2011.
99. Lohman D, Schleifer R, Amon JJ. Access to pain treatment as a human right. ***BMC Med*** 2010;8:8.
100. Author calculations from data presented in: Bloom DE, Cafiero ET, Jané-Llopis E, et al. ***The Global Economic Burden of Non-communicable Diseases***. Geneva: World Economic Forum, 2011.
101. Meremikwu MM, Ehiri JE, Nkanga DG, et al. Socioeconomic constraints to effective management of Burkitt's lymphoma in south-eastern Nigeria. ***Trop Med Int Health*** 2005;10(1):92-8.
102. Groot MT, Baltussen R, Uyl-de Groot CA, Anderson BO, Hortobágyi GN. Costs and health effects of breast cancer interventions in epidemiologically different regions of Africa, North America, and Asia. ***Breast Journal***. 2006;12(1):81.
103. Knaul FM, Arreola-Ornelas H, Velázquez E, Dorantes J, Méndez O, Ávila-Burgos L. El costo de la atención médica del cáncer mamario: el caso del Instituto Mexicano del Seguro Social. ***Salud Pública de México*** 2009;51(Suppl 2):S286-S295.
104. Guerrero R, Amaris AM, Giraldo JA, Arreola-Ornelas H, Knaul FM. Estimation of global potential demand of cancer drugs. Background paper. Boston: Harvard Global Equity Initiative and Global Task Force on Expanded Access to Cancer Care and Control in Developing Countries, 2011. http://gtfccc.harvard.edu/icb/icb.do?keyword=k69586&pageid=icb.page420088 (accessed on October 11, 2011).
105. International Agency for Research on Cancer. ***Cancer incidence and Mortality Worldwide. Globocan 2008***. http://globocan.iarc.fr/ (accessed October 11, 2011).
106. Guerrero R, Amaris AM, Giraldo JA, Arreola-Ornelas H, Knaul FM. Estimation of global potential demand of cancer drugs. Background paper. Boston: Harvard Global Equity Initiative and Global Task Force on Expanded Access to Cancer Care and Control in Developing Countries, 2011. http://gtfccc.harvard.edu/icb/icb.do?keyword=k69586&pageid=icb.page420088 (accessed on October 11, 2011).
107. Knaul FM, Arreola-Ornelas H, Velázquez E, Dorantes J, Méndez O, Ávila-Burgos L. El costo de la atención médica del cáncer mamario: el caso del Instituto Mexicano del Seguro Social. ***Salud Pública de México*** 2009;51(Suppl 2):S286-S295.
108. Shulman LN, Willett W, Sievers A, Knaul FM. Breast cancer in developing countries: Opportunities for improved survival. ***Journal of Oncology*** 2010; 595167.

109. Knaul FM, Nigenda G, Lozano R, Arreola-Ornelas H, Langer A, Frenk F. Breast Cancer in Mexico: a pressing priority. ***Reproductive Health Matters***. 2008; 16(32)113-123.
110. American Cancer Society. Breast cancer facts and figures. 2009-2010. http://www.cancer.org/Research/CancerFactsFigures/BreastCancerFactsFigures/index (accessed Octoboer 11, 2011)
111. Schwartländer B, Grubb I, Perriēns J. The 10-year struggle to provide antiretroviral treatment to people with HIV/AIDS in the developing world. ***Lancet*** 2006;368:541-46.
112. Thorsteinsdóttir H, Melon CC, Ray M, et al. South-South entrepreneurial collaboration in health biotech. ***Nat Biotechnol*** 2010;28:407-16.
113. Sáenz TW, Thorsteinsdóttir H, de Souza MC. Cuba and Brazil: an important example of South-South collaboration in health biotechnology. ***MEDICC Rev*** 2010;12:32-35.
114. The United States President's Emergency Plan for AIDS Relief. BD and PEPFAR collaborate to strengthen laboratory systems in fight against HIV/AIDS and TB. http://2006-2009.pepfar.gov/press/94440.htm (accessed March 24, 2011).
115. International Federation of Pharmaceutical Manufacturers and Associations (IFPMA). ***Technology transfer: a collaborative approach to improve global health. The research-based pharmaceutical industry experience***. International Federation of Pharmaceutical Manufacturers and Associations (IFPMA) 2011. http://www.ifpma.org/fileadmin/content/Events/Pharma_Forums/9_March_2011/IFPMA_Forum_Highlights_Tech_Transfer_09March2011.pdf (accessed March 24, 2011).
116. Kmietowicz Z. Developing countries roll out pneumococcal vaccine thanks to novel funding scheme. ***BMJ*** 2010;341:c7230.
117. Jayaraman K. India's Cipla sets sights on Avastin, Herceptin and Enbrel. ***Nat Biotechnol*** 2010;28:883-84.
118. Wood J. Old problems fresh solutions: Indonesia's new health regime. A report from the Economist Intelligence Unit, 2010. http://graphics.eiu.com/upload/GE_Indonesia_main_Sep21_WEB_FINAL.pdf (accessed April 1, 2011).
119. World Health Organization. ***Innovative technologies that address global health concerns. Outcome of the call for global initiative on health technologies***. Geneva: World Health Organization, 2010.
120. World Health Organization. ***Landscape analysis of barriers to developing or adapting technologies for global health purposes***. Global Initiative on Health Technologies. Department of Essential Health Technologies. Geneva: World Health Organization, 2010.
121. Riband H. Vice-President, Legal and External Affairs, Medtronic International. Personal communication, Mar 14, 2011.
122. Lingwood RJ, Boyle P, Milburn A, et al. The challenge of cancer control in Africa. ***Nat Rev Cancer*** 2008;8:398-403.
123. Mwanda WO, Orem J, Fu P, et al. Dose-modified oral chemotherapy in the treatment of AIDS-related non-Hodgkin's lymphoma in East Africa. ***J Clin Oncol*** 2009;27:3480-88.
124. Findlay M, von Minckwitz G, Wardley A. Effective oral chemotherapy for breast cancer: pillars of strength. ***Ann Oncol*** 2008;19:212-22.
125. Chu KM, Mahlangeni G, Swannet S, Ford NP, Boulle A, Van Cutsem G. AIDS-associated Kaposi's sarcoma is linked to advanced disease and high mortality in a primary care HIV/AIDS programme in South Africa. ***J Int AIDS Soc*** 2010;13:23.
126. World Health Organization. ***Research and Development Coordination and Financing Report of the Expert Working Group***. Geneva: World Health Organization, 2010. http://www.who.int/phi/documents/ewg_report/en/index.html (accessed March 24, 2011).
127. International AIDS Vaccine Initiative. ***Innovative Product Development Partnerships: Advancing Global Health and Economic Development Goals***, Policy Brief 26. New York: International AIDS Vaccine Initiative, 2010. http://www.iavi.org/Lists/IAVIPublications/attachments/eb7b4247-6816-4094-9f54-9f2f2b99e95a/IAVI_Innovative_Product_Development_Partnerships_2010_ENG.pdf (accessed March 24, 2011).
128. Kondro W. "The best or the worst" end up in product development partnerships. ***CMAJ*** 2010;182:E761-62.

Innovative Financing: Local and Global Opportunities

Section 8

Section 8

Innovative Financing: Local and Global Opportunities

Key messages

Global

- To date, international donor support for cancer and non-communicable diseases (NCDs) has been far too limited compared to funding for communicable disease and compared to the rapidly increasing health burden posed by cancer and NCDs in low and middle income countries.

- Innovative global financing and domestic health system funding are two potential sources of new revenue that need to be explored to meet the growing burden of cancer and other NCDs and chronic illness, especially in the face of declining global development financing.

- Innovative financing focuses on non-traditional approaches to external donor financing for health. GAVI, the Global Fund, and the President's Emergency Plan for AIDS Relief demonstrate the success of innovative funding for addressing malaria, tuberculosis, HIV/AIDS, and vaccine preventable diseases in children. These experiences provide platforms and lessons for financing cancer care and control (CCC).

- New initiatives can provide models and platforms for strengthening international partnerships and catalyzing innovative financing for cancer and other NCDs. The UN Secretary General's Every Woman Every Child strategy provides a commitment-based model that could be adopted for increasing funding for cancer control. It also provides opportunities for incorporating cancer into programs for women and children. The Pink Ribbon Red Ribbon is another new and promising initiative that links cancer to HIV/AIDS platforms.

- By contrast, recently developed international financing initiatives have yielded very limited additional funding for cancer control and hence, are unlikely to be options for expanding resources for CCC or other NCDs in the near future.

Domestic

- Domestic sources fund almost all of total health expenditure in middle income countries and more than half in most of the world's poorest countries.

- Out of pocket spending by families, which accounts for more than half of total health expenditure in many low and middle income countries (LMICs) is associated with catastrophic spending that drives families into poverty. This is especially true for chronic illness such as cancer.

- Many middle income, and even some low income countries are undertaking health financing reforms to offer population-wide financial protection to reduce the reliance on out of pocket spending. Several of the reforms include cancer and this constitutes a significant investment of resources that provides an opportunity to offer more effective CCC.

- Countries that have adopted guaranteed health benefits packages as part of universal entitlement programs are addressing the challenge of financing catastrophic chronic diseases, such as cancer, that can impoverish patients and their families.

- Domestic financing of CCC needs to balance prevention, early detection and treatment to ensure financial protection is most effectively targeted to reduce mortality and morbidity. Investing in treatment is made much less effective if prevention and early detection are underfunded.

8.i. Introduction

Since 2000, development assistance for health (DAH) for low and middle income countries has effectively targeted HIV/AIDS, tuberculosis, and malaria, with notable increases also since 2008 for maternal, newborn, and child health programs. [1,2] NCDs, including cancer, received the least amount of funding, accounting for only 0.5% of total DAH in 2008.[3]

Globally, funding for cancer is heavily skewed to high income countries. Though cancer in low and middle income countries accounts for 80% of the global cancer burden, only 5% or less of global health spending on cancer is in LMICs.[4]

Globally, funding for cancer from all sources is heavily skewed to investments in high income countries. Though cancer in low and middle income countries accounts for 80% of the global cancer burden, only 5% or less of global health spending on cancer is in LMICs.

The dearth of funding for NCDs and cancer is inexcusable, given the increasing illness and rising number of deaths from NCDs and cancer in LMICs, both in absolute and relative terms, compared to communicable diseases. Projections show that by 2030, NCDs will cause 74% of mortality and 64% of morbidity in LMICs.[5]

The dearth of funding for NCD and cancer is inexcusable, given the increasing illness and rising number of deaths from NCD and cancer in LMICs.

Following the large increases seen between 2002 and 2009, overall DAH flattened in 2010 and 2011. This decrease was largely due to the economic problems faced by donor countries. Considerable increases in external financing for global health from traditional bilateral donors, the European Commission, and emerging economies, is unlikely to materialize until 2015.

Text Box 8.1
Current ODA for NCDs and cancer

The Millennium Declaration at the United Nations General Assembly Special Session in 2000 galvanized donors to increase their financial investments to support efforts aimed at controlling HIV/AIDS, tuberculosis, malaria, vaccine preventable diseases in children, and, much less convincingly, conditions affecting the health of pregnant women and neonates.[6-9]

Official development assistance (ODA) recorded for population and reproductive health increased from $6.5 billion in 2002 to between $17 and $26 billion in 2009 (both in constant 2008 $US).[10] *Private citizens, corporations, and foundations have funded an increasingly large share of DAH, rising to 27% in 2007.*[11]

The Global Fund to fights AIDS, Tuberculosis, and Malaria (the Global Fund) and GAVI, new institutions that apply innovative financing mechanisms, have driven the significant increase in development assistance for health. The focus of these institutions includes vaccine preventable childhood diseases and maternal health in the case of GAVI and tuberculosis, malaria, maternal and child health, and, most importantly, HIV/AIDS in the case of the Global Fund. HIV/AIDS also benefits significantly from the US President's Emergency Program for AIDS Relief (PEPFAR).[12]

By contrast, the total contribution from innovative revenue-raising sources to global ODA is low. Excluding local currency bonds issued by the multilateral development banks and aid extended by emerging donors, the total is a relatively modest amount of $US 6.3 billion from 2000 through 2008. Global solidarity levies, such as those placed on airline tickets, accounted for only about $US 1 billion. Further, the total raised through other innovative efforts and pooling with private donors was only $3.7 billion.

Financing for non-communicable diseases[13] and cancer in LMICs –despite an increase in real terms from $238 million in 2004 to $686 million in 2008– pales in significance when compared to the funding for communicable diseases. In 2004, NCD and cancer funding in LMICs was a mere 1.3% of total communicable disease funding. In 2007, this share was 2.3%. From 2004 to 2008, the estimated donor funding for cancer was a paltry $US 60 million. Bilateral and multilateral agencies provided one half of the total $2 billion in accumulated donor funding for NCDs and cancer between 2004 and 2008, with the remaining amount funded by private for-profit and private non-profit organizations – especially the Wellcome Trust UK, which provided $458 million.[14]

Given the continuously increasing burden caused by NCDs and chronic illness, and the declining DAH, new and innovative domestic and global sources of funding need to be explored. While several middle income countries have effectively mobilized domestic resources, no innovative global financing mechanisms specifically target NCDs and cancer.

While several middle income countries have effectively mobilized domestic resources, no innovative global financing mechanisms specifically target NCD and cancer.

This section maps the global landscape to identify innovative financing mechanisms for health. This analysis is based on the value chain approach that conceptualizes innovative financing holistically as resource mobilization, pooling financial resources, and channeling new funds to countries.[15] Case studies of approaches that have reached a global scale are used to explore how lessons learned can be applied to financing the burden of NCDs and cancer in LMICs.

The section of the report also includes an analysis of several innovative domestic approaches to financing. Case studies on China, Colombia, the Dominican Republic, India, Mexico, Peru, Rwanda, and Taiwan are synthesized in the second part of this section to arrive at overall recommendations for improving domestic financing to better meet the challenge of cancer and other chronic illness.

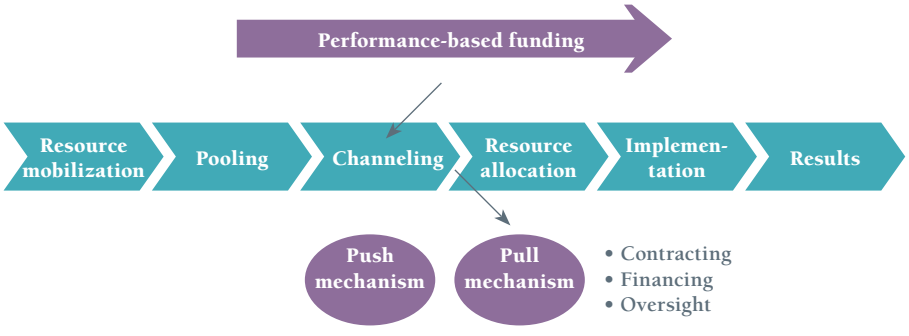
8.ii. Innovative global financing: harnessing the most effective platforms[16]

The term "innovative financing" gained prominence in 2002 following the International Conference on Financing for Development.[17] Innovative financing focuses on non-traditional, catalytic approaches to external donor financing for health. It encompasses many aspects of financing from identifying additional funding to more effective use of funds.[18]

The Task Force expanded on earlier definitions of innovative financing by considering it along the financing value chain. This financing value chain includes: non-traditional approaches to resource mobilization to supplement official contributions; innovative ways of pooling resources; channeling resources to other countries; new incentives for delivery and allocation at the country and program levels; and implementation of programs through contracting, financing, and oversight (Figure 1 and Text Box 8.2). The expanded definition encompasses funding from both private not-for-profit foundations and the for-profit private sector.

Figure 1

Value Chain Framework for Innovative Financing



Text Box 8.2
Innovative financing along the financing value chain

Resource mobilization in our framework involves gathering funds for health from various sources. The search for innovative financing has emphasized the need to identify new sources of funding, in addition to ODA, for specific initiatives such as the MDGs. This can be done either through sectoral funding for health systems strengthening or through more targeted disease funding. Innovative approaches to pooling involve combining funds at the global level through financing mechanisms from traditional and "novel" sources, such as the private sector, philanthropic agencies, innovative financing instruments, and funding from countries that are not part of the Development Assistance Committee of the OECD. This approach to channeling funds differs from traditional approaches because it emphasizes country ownership, in line with the Paris Principles of Aid Effectiveness.[19] This new approach involves an inclusive process for developing proposals or national plans with participation of a wide range of stakeholders. It also favors channeling finances through mechanisms that use performance-based funding principles. Innovations in resource allocation encourage recipient countries to develop their own programs. Further, they promote aligning programs with national and strategic health plans, and involving civil society and the private sector in establishing health priorities.

Innovative resource allocation can be used to create incentives to promote funding for areas that private markets will not serve, or to scale-up successful interventions. Financial guarantees and recognition of corporate social responsibility are examples of these incentives, which can be categorized as push mechanisms that offer supply-side incentives, or pull mechanisms that rely on demand creation or signaling for new health products and uptake of implementation.[20] The Global Fund, GAVI, and the President's Emergency Plan for AIDS Relief (PEPFAR) have helped to create pull mechanisms for HIV/AIDS, tuberculosis, and malaria medicines, diagnostics, and for vaccine development.

The results of innovative global financing efforts have been highly uneven. In spite of the many possible approaches to innovative development financing, only three major health-related innovative mechanisms have reached global scale: GAVI, the Global Fund, and UNITAID. These mechanisms have mostly addressed vaccine-preventable childhood diseases (GAVI), HIV/AIDS, tuberculosis, and malaria (the Global Fund and UNITAID) by investing in medicines, vaccines, diagnostics, preventative interventions, and health systems strengthening.[21-23]

The results of innovative global financing efforts have been highly uneven. In spite of the many possible approaches to innovative development financing, only three major health-related innovative mechanisms have reached global scale: GAVI, the Global Fund, and UNITAID.

OECD singles out GAVI and the Global Fund as two important innovative financing mechanisms, and distinguishes them from new resource generation schemes such as air-ticket levy, International Finance Facility for Immunisation (IFFIm), and (PRODUCT)RED. Unlike initiatives that focus mainly on raising funds for health, the Global Fund and GAVI are innovative integrated financing mechanisms because they span the essential functions of resource mobilization, pooling, channeling, and allocation.[24]

GAVI, the Global Fund, and UNITAID have introduced innovations in their resource mobilization and resource allocation mechanisms. For example, GAVI is largely funded through IFFIm, which raises funds by issuing bonds in the capital markets and converts the long-term government pledges into immediate available cash resources, effectively front-loading the financing. The Advance Market Commitment (AMC) for pneumococcal disease also supports GAVI financing through a long-term pledge that provides new incentives to pharmaceutical companies to develop products. The Global Fund receives contributions from private companies, such as Chevron and Takeda, and private philanthropic foundations, such as the Bill and Melinda Gates Foundation. It also receives funds from innovative resource mobilization approaches such as (PRODUCT)RED, a brand licensed to partner companies such as Nike, American Express, GAP, Starbucks, and Apple Inc. which give a percentage of the profits associated with their products that carry the (PRODUCT)RED logo to raise awareness and funds to address HIV/AIDS in Africa.[25] The Global Fund has also used debt swaps to make domestic resources available for the approved Global Fund programs through the Debt2Health initiative. The latter requires participating creditor and debtor countries, which are also grant recipients from the Global Fund, to agree to a three-party accord. Through this accord, creditors forgo repayment of a portion of their claims on the condition that the beneficiary country invests an agreed-upon counterpart amount in health through Global Fund-supported programs.

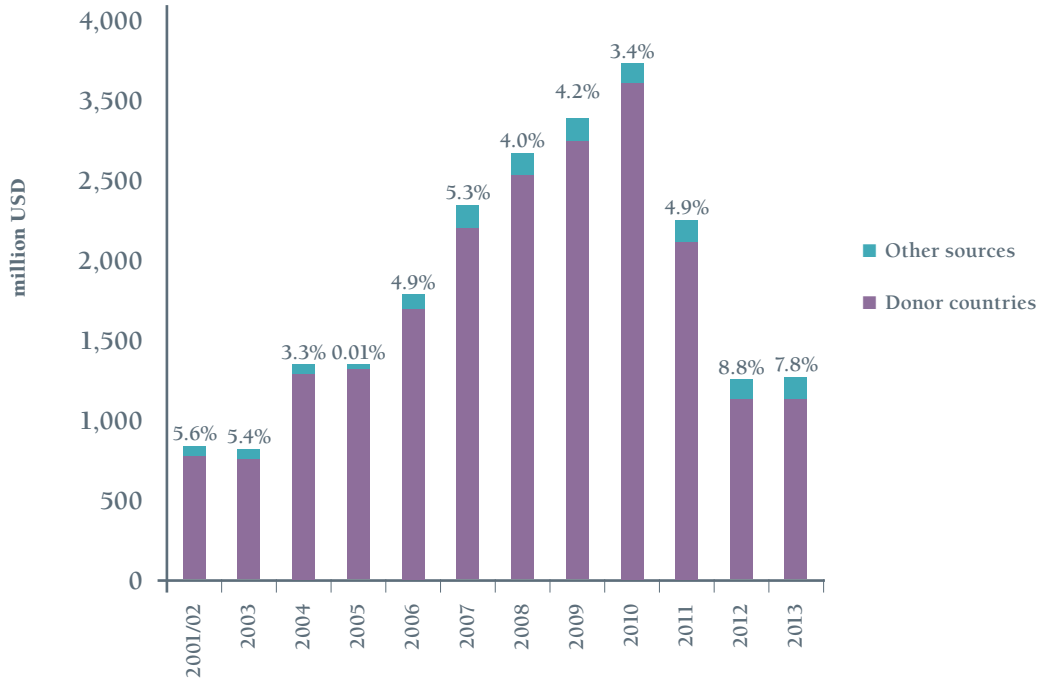
GAVI, the Global Fund, and UNITAID have introduced innovations in their resource mobilization and resource allocation mechanisms.

The two major innovative resource mobilization mechanisms, the Global Fund and GAVI, have been predominantly supported by donor governments. As of February 2011, the $17.9 billion in pledges from the public sector represented 95% of total pledges to the Global Fund, with the $950 million from the private sector contributing the remaining 5% (Figure 2). The Bill & Melinda Gates Foundation accounted for most of the remaining $950 million. Since its launch in 2006, (PRODUCT)RED has generated $160 million. Financing from Debt2Health has amounted to around $120 million.

Total funds received by GAVI between 2000-2010 summed to $US 5.2 billion. Of this, 39% came from donor governments and the European Commission, 24% from private contributions, 36% from IFFIm to GAVI Fund Affiliate transfers, and 1% from AMC funds (Figure 3).

Figure 2

Global Fund Pledges by Year due and Source (million USD)



Source: The Global Fund external website:
http://www.theglobalfund.org/en/resources/?lang=en (accessed 16/02/2011)

Figure 3

GAVI Cash Received

Source: GAVI http://www.gavialliance.org/about/donors/index.php (accessed 23/03/2011)
http://www.gavialliance.org/resources/Cash_Received_1999_2009_16mar2010.pdf

UNITAID has committed more than $500 million in 80 primarily low income recipient countries. In partnership with the Clinton Foundation, UNITAID has successfully achieved a reduction in the price of second-line AIDS treatments, ranging from 25% to 50%, depending on the country's income level, and a 40% reduction in the price of pediatric antiretroviral drug treatments.

The independent, not-for-profit Millennium Foundation was established to forge a partnership with the travel industry in countries that have not adopted the UNITAID airline levy. The foundation created the MASSIVEGOOD donation program to enable voluntary contributions by ordinary citizens at the point-of-sale. To establish the Millennium Foundation, UNITAID provided an initial grant of $22.3 million. As of summer 2011, MASSIVEGOOD has raised about $200,000 in micro-contributions from their leisure program, matching funds, and donations from their corporate program.

More recently, efforts to mobilize new funds for reproductive, maternal, newborn, and child health (RMNCH) have been promising.[26] In the UN General Assembly's 66th Session (UNGAS) in 2011, at the special first anniversary High-Level Meeting of Every Woman Every Child, the UN Secretary-General announced more than 100 new commitments to the UN's Global Strategy for Women's and Children's Health from domestic sources, private foundations, multilateral organizations, the UN, the private sector, and professional associations. The pledges by these institutions total an unpre-cedented amount of more than $40 billion, including "game-changing" multi-stakeholder endeavors that involve private sector partners.

The momentum created by recent financial commitments to new funds for reproductive, maternal, newborn, and child health offers an important opportunity for applying a diagonal approach in global financing innovations and provides a model for resource mobilization for cancer.

The momentum created by these pledges offers an important opportunity for applying a diagonal approach in global financing innovations. Linking interventions for cancer and NCDs to those for RMNCH will enable greater synergies from investments made and better protect women and children against health risks, not just at childbirth and during the early years of life (see Section 6), but also throughout their life cycles.

Linking interventions for cancer and NCDs to those for RMNCH will enable greater synergies from investments made and better protect women and children against health risks throughout their life cycles.

This apparent success of efforts to secure large pledges from diverse sources to finance the implementation of the RMNCH strategy, Every Women Every Child, offers a model for cancer.[27] By utilizing the considerable investments countries have already made for CCC as a platform (see domestic financing section below), the cancer movement could encourage key stakeholders to co-invest and help leverage these investments, not by establishing a new global fund, but by better engaging the cancer movement and mobilizing additional domestic and international resources for CCC in LMICs. Actions to expand funding should draw on a broad range of stakeholders, especially those groups involved in resource mobilization and investment for other NCDs.

Another promising innovative resource mobilization and service delivery initiative is the Pink Ribbon Red Ribbon partnership, designed to leverage public and private investments to combat cervical and breast cancer in sub-Saharan Africa and Latin America.[28] The initiative, led by the George W. Bush Institute, PEPFAR, Susan G. Komen for the Cure, and UNAIDS, with an initial commitment of $75 million across five years, aims to improve the linkage between CCC and HIV/AIDS through a diagonal investment and service delivery approach. The initiative is designed to expand the availability of cervical cancer screening and treatment –especially for high-risk HIV-positive women– and to promote breast cancer education by leveraging existing HIV/AIDS platforms and PEPFAR investments, and by drawing on the lessons learned in the recent, significant scale-up of HIV/AIDS services.

Conclusions

The Task Force analysis of investment patterns for global health suggests that to date, international sources have provided limited additional funds for innovative financing, especially for cancer and NCDs. While funding from new sources has played an increasingly important role in development assistance for health, official contributions from bilateral sources have continued to be the major source of international financing. The contributions from the private sector and innovative financing appear to be relatively small and uneven, yet play an important role in reducing country dependence on official contributions.

Instead, what has worked in innovative financing in global health is the emergence of viable innovative, integrated financing mechanisms, such as the Global Fund and GAVI, which have effectively pooled, channeled, and managed (based on performance) investment of donor funds at a global scale, to achieve results. These innovative, integrated financing mechanisms can provide effective platforms for expanding access to CCC, especially by linking and leveraging investments from new initiatives, such as the Pink Ribbon Red Ribbon initiative and new RMNCH platforms, which offer opportunities to expand programs for cancer and other NCDs.

Other promising innovative resource mobilization and service delivery initiatives are mobilizing HIV/ AIDS platforms and investments to expand CCC, especially for women's cancers.

To date, international sources have provided limited additional funds for innovative financing for cancer and NCD.

What has worked in innovative financing in global health, is the emergence of viable innovative, integrated financing mechanisms, such as the Global Fund and GAVI, which have effectively pooled, channeled, and managed investment of donor funds at global scale to achieve results based on performance.

Recommendations and lessons learned: Applying global innovative financing to CCC

Several important lessons emerge from innovative global health financing efforts to mobilize and channel external resources for cancer care and control:

1. It appears unlikely in the near term that significant amounts of new monies will be available from innovative revenue-raising sources. Traditional donor and domestic funding will likely continue to predominate.
2. Innovative integrated financing mechanisms that have worked at the global scale for disease- and population-specific initiatives, such as the Global Fund and GAVI, could be utilized to create synergies for CCC, especially because the Global Fund will have to continue to invest in health systems to manage HIV/ AIDS as a chronic illness.[29-32] RMNCH is an example where such synergies have been achieved. Significant growth in financing since 2006 has come not from targeted investments, but through cross-investments largely driven by GAVI and the Global Fund.[33] Thus, investments in HIV/AIDS are providing clear benefits for the health of women and children.[34] These two innovative integrated financing mechanisms have been able to channel large amounts of funding to low and middle income countries to strengthen health systems.[35] The newly established Health Systems Funding Platform, which includes the Global Fund, GAVI, the World Bank, and WHO, provides an opportunity to invest in health systems in a coordinated manner. This platform improves health outcomes beyond HIV/ AIDS, tuberculosis, malaria, and vaccine preventable diseases, and includes RMNCH- and NCD-related health outcomes.

3. Initial start-up costs for new innovative financing mechanisms can be very high, far outweighing investments or returns achieved (for example, MASSIVEGOOD spent more than $11 million to start up the initiative, with only $200,000 raised). Rather than creating new agencies to fund CCC, the existing innovative financing mechanisms should be used to pool and invest new monies.
4. New financing commitments for RMNCH announced at the 66th UN General Assembly and the Pink Ribbon Red Ribbon initiative on cancer and HIV/AIDS, provide additional opportunities for engagement and for channeling new funds.
5. New RMNCH platforms which have succeeded in mobilizing additional resources, as well as global support and coordination, provide good models for broad-based international partnerships for cancer and NCDs. A similar platform should be developed to bring together stakeholders and highlight existing investments in CCC.

Further, mobilization and investment of any new international funding for CCC in LMICs should be guided by the following principles:

i. **Additionality:** New funding should be in addition to existing international and domestic investments for CCC.
ii. **Subsidiarity:** Resources from the international donor community should be subsidiary in the sense that they are supplementary to local alternatives when these have been exhausted, and used in a way that does not diminish local efforts.
iii. **Non-duplicative:** New funding should be channeled through existing innovative global financing mechanisms to reduce transaction costs, minimize start-up costs, and create synergies by leveraging investments for both disease control and health system strengthening.
iv. **Stability:** Funding should be predictable and stable over time.
v. **System-wide synergy:** Targeted investments should create synergies across diseases or population groups. They should also make the best possible use of existing mechanisms and institutions in ways that serve multiple health needs, increase coordination, and avoid duplication of efforts. The allocation of resources should avoid crowding out other important priorities. This means investments should crowd in and favor programs and projects that benefit other health problems, following the diagonal approach.
vi. **Continuity:** Investments should focus not only on scaling-up interventions, but also on protecting gains and providing sustainability.
vii. **Relevance:** Local relevance should be guaranteed through comprehensive cancer plans.

8.iii. Innovative domestic financing: Effective and equitable options

Innovation in CCC financing will involve reorganizing domestic finance, focusing on equity and efficiency.

Much of the financing for CCC is and will continue to be domestically sourced. Thus, a great deal of innovation in CCC financing will involve reorganizing domestic finance to focus on equity and efficiency. Still, even in countries where global financing is relatively small, these additional external investments can play an important catalytic role in driving policy change and innovation in care delivery.

Domestic sources of financing account for a substantial share of total health expenditure (THE), especially in middle income countries where external financing is 1% of THE, or less. Even in low income countries, WHO estimates that in 2008, external sources covered, on average, 16.4% of total health expenditure in LMICs. With the important exception of the poorest and most aid-dependent countries –Malawi, Tanzania, and Mozambique– even countries as poor as Ethiopia, Niger, or Haiti rely on domestic funding for more than half of total health expenditure.[36]

Even countries as poor as Ethiopia, Niger, and Haiti rely on domestic funding for more than half of health expenditure.

Domestic finance of health and disease management is primarily of two types: (1) private, out-of-pocket and at point of service by families; and (2) public spending, social protection, or insurance schemes. The first type is regressive, a source of inefficiency and can cause impoverishment. The second, is an effective and equitable way of organizing health system financing. Out-of-pocket spending by families, which accounts for more than 50% of total health expenditure in many LMICs, is the least equitable and most inefficient means of financing a health system.[37-40]

While acute care costs even for simple ailments can push an already poor family much deeper into poverty, the repeating and ongoing costs of a chronic illness are even more devastating. Recent research in India demonstrates the substantial financial vulnerability of households to NCDs, especially to cancer. The share of out-of-pocket health expenditure devoted to NCDs increased from one-third to almost 50% in a decade. Further, the cost of a single hospital stay for cancer or heart disease in a public hospital is the equivalent of 40-50% of annual per capita income.[41] In South Asia, the probability of incurring catastrophic health expenditure from hospitalization is 160% higher for cancer, and 30% higher for cardiovascular disease, than hospitalization for a communicable disease.[42,43]

One of the most insidious aspects of this vicious illness-impoverishment cycle is that for many cancer patients the out-of-pocket spending is wasted as it does nothing to improve health. First, the cancer is often detected late, and so the best and only useful investment is for pain control and palliation. Second, a substantial proportion of what is spent by patients is not effective because they receive low-quality, poor, or inappropriate care. Third, it is often coupled with prohibitive transportation costs and investments of time. These difficulties are more likely to occur with a disease like cancer, where primary-level physicians are ill-prepared for early detection and diagnosis, and care often requires travel and on-going treatment (see Text Box 2.3).

One of the most insidious aspects of this vicious illness-impoverishment cycle is that for many cancer patients much of the out-of-pocket spending is wasted as it does nothing to improve health.

Universal health coverage is at the center of many health system reforms. For a health system to achieve universal health coverage, inclusion of both beneficiaries (population) and benefits (interventions or diseases) must be taken into account.[44] The composition and depth of the package of covered services is a key determinant, and a shallow package, even if it covers a large proportion of the population, is unlikely to offer protection from financial catastrophe and financial barriers to accessing care. The inclusion of interventions for cancer and many NCDs in the package poses a specific set of challenges due to the chronic nature of illness and the importance of considering all facets of the CCC continuum (see Section 4).

A number of countries have achieved, or are near to achieving, universal financial coverage through public insurance and pre-payment using domestic funding sources. Some countries have established universal entitlements to key services as guaranteed benefits packages. These innovations directly address the challenge of financially catastrophic and chronic illnesses, such as cancer. This coverage can include prevention and early detection of some cancers as well as partial support for tertiary-level care.

A number of countries are near to achieving universal financial coverage through public insurance and pre-payment, using domestic funding sources and including CCC in the package of covered services.

The experiences of several LMICs that have implemented universal health insurance and other innovations to provide financial protection for cancer are described below. The recommendations synthesize the lessons learned about the financing of cancer care through those experiences.

In the case of the Latin American and Caribbean region (LAC), social insurance and health reform have been ongoing for more than a decade. The analysis below includes a set of countries and provides some basis for comparison. Some reforms have been relatively well documented, both in initial and in later phases (Colombia,

Chile, Mexico), while others are very recent or have not yet been evaluated (Peru, Dominican Republic). These health financing reform efforts have built on each other and have much in common, such as the separation of funds for public and catastrophic expenditures, the development of contributory and subsidized plans for different population groups, the challenges of incorporating and financing the informal sector, and building on basic services associated with social welfare programs. Each of these reforms is facing the challenge of including chronic, catastrophic illness such as cancer in the package for both rich and poor population groups. In each of the LAC countries, cancer is a tracer disease that marks the depth of the package.

Innovative financing case 1: Mexico

The Mexican health system employed innovative financing mechanisms to respond to the health challenges posed by epidemiological transition and poverty. These innovations concentrated first on the poorest segments of the population, taking into account the complex health backlog of poverty and the impact of chronic and non-communicable disease.[45-49]

Until 2003, the Mexican health system was based on a segmented model. Formal sector workers and their families had been able to access pooled, prepayment options through public social security programs. The social security packages had few limitations in terms of covered services, yet their use was limited by scarcity and lack of quality.

The other half of the population –approximately 50 million people, who are mostly poor, non-salaried workers, and rural residents– relied on coverage through the Ministry of Health, based on a residual budget, with a restricted package of covered services, low per capita investment in health, and limited access. Approximately half of total health expenditure was out-of-pocket and concentrated among the uninsured. An estimated 2 to 4 million families faced catastrophic and impoverishing health expenditures each year, and this was more common among the rich than the poor.[50,51]

The health reform of 2003 and the Seguro Popular de Salud (SPS) initiative, which began in 2004, responded to the challenge of securing fair funding by offering universal financial protection in health through public insurance coverage, and by expanding supplies and improving the quality of services. Today, all Mexicans who do not have access to social security are eligible for SPS. Federal funding, contributions from states, and a sliding scale pre-payment by households (which is zero for all families living in poverty) finance SPS.[52]

Seguro Popular coverage began with the poorest segments of the population and has steadily expanded with the goal of attaining universal coverage by 2012. By the end of 2010, SPS covered more than 43 million Mexicans, the vast majority without access to social security.[53]

The SPS applies a diagonal approach to health insurance.[54] Horizontal, population-based coverage is provided for all public and community health services. A package of essential health services is managed at the state-level for all those enrolled with SPS. Catastrophic illnesses are aggregated into the national Fund for Protection against Catastrophic Expenses, which offers accelerated vertical coverage– anyone diagnosed with a covered disease is eligible for SPS, and a complete range of treatment services is included. In the case of breast cancer, for example, the Fund covers trastuzumab and partial breast reconstruction. As of 2006, all children under five are covered for a wide range of health needs, supplementing both the package of basic services and the Fund for Protection against Catastrophic Expenses (FPCE) through a horizontal approach entitled Insurance for a New Generation.

Parallel to the extension of population coverage, the package of interventions and covered diseases has expanded to include a wider range of personal health services at the primary, secondary, and tertiary levels of care. Similarly, the Fund for Protection against Catastrophic Expenses has expanded to cover additional diseases. By the

end of 2010, the package of personal health services covered 275 interventions, and the FPCE covered 49 interventions for 8 disease groups.[55,56] The first diseases to be covered in the FPCE were cervical cancer in 2004, and HIV/AIDS and ALL in children, in 2005.[57,58] Breast cancer was added in 2007, as were all childhood cancers, and in 2011, the SPS announced coverage for testicular cancer and NHL. Although the fund and number of covered diseases have increased continually, there are still a host of diseases that are not covered including several cancers and this represents a significant challenge.

Rigorous evaluation processes have been underway since the SPS was established, and the results are encouraging for the diseases that have been included in the package. The incidence of catastrophic spending has decreased by more than 20% among those enrolled in Seguro Popular, as has overall out-of-pocket spending, especially among the poorest households.[59] Since the incorporation of childhood cancers into the program, 30-month survival has increased from approximately 30% to almost 70%, and adherence to treatment from 70% to 95%.[60] A study of breast cancer started in 2007, reported an 80% survival rate of 30-months after initiation of treatment, and an increase in adherence to treatment from 79% to 98%.[61] Although these results are preliminary and not based on registry data, they suggest an important impact on access to care and on improving the financial situations of families. A separate study showed that hypertensive adults insured through Seguro Popular had a significantly higher probability of obtaining effective treatment, and that this was associated with a greater supply of health professionals.[62]

The combination of horizontal coverage of personal health services with a catastrophic fund makes it possible to offer financial protection for chronic-catastrophic illness such as cancer, as well as investing in prevention, early detection, and survivorship care. Still, barriers remain particularly around early detection in the case of breast cancer. Further, survivorship is a new concept that has not been fully integrated into the health system. The six stages of the CCC continuum can and should be fully integrated into the health insurance system to maximize the benefits to patients and the value of the significant investments in treatment.

Innovative financing case 2: Colombia[63]

In the early nineties, Colombia adopted a universal social health insurance system and introduced a mandatory benefits package.[64-69] Implementation has been gradual, and universal coverage is expected in 2011.[70] Overall, enrollment has protected households against catastrophic expenditures, and improvements in access and utilization of health services, particularly among the poor, have been documented.[71]

Colombia has a contributory plan for workers and employers in the formal sector, and a subsidized one for the informal sector, the unemployed and the poor. The average per capita rate is $US 182 per year in the contributory plan, and $US 105 in the subsidized plan.[72] Multiple competing insurers, who receive established per capita payments, deliver the legally approved package of services. The subsidized plan has a smaller benefits package, but the Colombian government is committed to equalizing the two plans by 2014.

This financing reform has been implemented in the context of a growing NCD and cancer epidemic. Prior to the financing reform, most services for catastrophic illnesses were paid out-of-pocket in both public and private facilities. When the content of the insurance package was first defined in 1994, coverage was mandated for a series of basic interventions. Cancer was classified as a catastrophic disease along with HIV/AIDS, chronic renal failure, transplants, genetic disorders, and severe trauma. In 1995, some coverage for high-cost catastrophic diseases like cancer was also included in the basic plan for the subsidized system.

Coverage of catastrophic illness has expanded gradually. For cancer, surgery, chemotherapy, radiotherapy, and some drugs (such as tamoxifen and paclitaxel) have

been included in the insurance package. In 2000, screening interventions were included for breast, cervical, prostate, and colorectal cancers. Radiotherapy treatment with linear accelerators was included in the package for both plans in 2002.[73]

Still, important exclusions remain, which make coverage of treatment less effective: mammography is available only to women over 50 years of age who belong to contributory plans,[74] and certain higher-cost drugs, such as trastuzumab, are excluded from both packages. Geographical disparities and barriers in access to prevention and care also persist.[75] More than 77.8% of breast cancer patients are diagnosed when breast cancer has reached advanced stages.[76]

In the courts, patients often successfully challenge the denial of services and drugs, even those that are not included in the package. The number of such legal claims has grown explosively, as have costs fueled by the resulting inefficient, ad hoc procurement and payment methods.[77] In this context, substantial amounts of resources are devoted to very expensive drugs that are given to patients who sue, often after late diagnosis, when treatment is not very effective. Meanwhile, prevention and detection remain underfunded.

In 2007, the government mandated the creation of a high-cost sub-account to pool and redistribute risk for catastrophic conditions across the entire population. This was a response to a fiscal crisis in the system generated by the concentration of catastrophic patients in the main public insurer. Based on a successful pilot of the sub-account for chronic renal failure, several cancers are to be added. These would include cervical, breast, stomach, colorectal, prostate, acute lymphoid leukemia, acute myeloid leukemia, Hodgkin's and non-Hodgkin's lymphomas, along with epilepsy, rheumatoid arthritis, and HIV/AIDS.

Innovative financing case 3: The Dominican Republic[78-81]

The Dominican Republic began to implement an extensive financial reform of its health system in 2007. Prior to the reform, cancer patients – and many others who required complex and specialized services for NCDs – had almost no financial protection. Most specialized services were (and still are) provided by two not-for-profit oncological hospitals (with the most comprehensive cancer care that exists in the country) as well as the private facilities serving mainly high income groups. The public hospitals offered only basic services to low income patients in early stages of the disease. Most insurance plans had little coverage for cancer and patients had to rely on out-of-pocket expenditures, minor support from civil society organizations and subsidized care from not-for-profit hospitals.

Reform created a compulsory, publicly financed health insurance, the Seguro Familiar de Salud (SFS), designed to cover the entire population over a ten-year period. Similar in design to the Colombian reform, the SFS has both a contributory and subsidized components. The contributory portion is financed with employer and employee contributions and the subsidized portion by the Government. As of early 2011, 45% of the population was in the system, 25% in the contributory regime and 20% in the subsidized. A third regime, aimed at covering the informal workers, has not yet begun implementation.

The SFS covers an explicit and comprehensive package of community and personal health goods and services. There is only one single benefit package, although cost and quality differ because the subsidized population may only access services at the public facilities with low quality, as they lack adequate resources and frequently confront governance issues. Rationing in the traditional public sector facilities is, therefore, implicit. The difference of prices among the subsidized and contributory package is due to the still widely used supply side financing mechanism of the public facilities.

Cancer and other NCDs were not a priority in public health plans until recently, although their burden is very high and growing. However, with the reform, cancer is included in the benefit's package. When services do not exist in the public sector, the SFS pays for them in private institutions for the subsidized regime, such as the not-for-profit private oncological hospitals. Most of their patients are now insured by the subsidized and even the contributory regime.

The health system now offers comprehensive financial protection for treatment of all cancers and has a fund to cover catastrophic illnesses with some similarities in design to the Mexican Seguro Popular, although the funds are not separated from the basic package. The fund covers one million Dominican pesos per person ($28,000 at 2010 exchange rates) per year, with a 20% co-payment, for diagnosis, treatment, and palliative care for a set of diseases. In addition to adult and pediatric cancers, the fund lists several other conditions including heart disease, dialysis and joint replacement. Cancer coverage includes diagnostic procedures, surgery, hospitalization, chemotherapy, radiotherapy and other procedures, up to the limit of catastrophic coverage. An additional $US 2,500 (with 30% co-payment) per year is available for cancer drugs on a specified list, in addition to other outpatient prescription drugs, including new drugs such as trastuzumab for positive HER2 breast cancer. Screening for several cancers is financed, such as Pap smear and mammography, within regular women health preventive consultations.

The implementation of the reform represented a major breakthrough in financial protection for Dominicans living with cancer. Yet, the reform is new and not well documented, lacking studies on its long term sustainability.

Innovative financing case 4: Peru[82]

In 2009, the Peruvian government passed the Universal Health Insurance Law, which established mandatory membership in a health insurance plan for the entire population. This law offers opportunities to incorporate cancer into the new universal health insurance system.

Drawing on reforms in Colombia and Mexico, and similar in some ways to the Dominican Republic, the new plan established three programs: the contributory, the semi-contributory, and the subsidized which is for the population that lives in poverty. The law sets out a package of conditions, interventions, and services that will be covered in all institutions administering health insurance funds. In relation to cancer, the law covers the diagnosis of cancer of the cervix, breast, colon, stomach, and prostate, but covers treatment only for cervical cancer. The package does not cover prevention or health promotion, which severely limits the possibilities of applying cost-effective health insurance strategies.

Because high-cost treatments are not included in the Essential Health Insurance Plan (Plan Esencial de Aseguramiento en Salud), additional coverage of $3200 for a list of specific conditions has been provided for those affiliated with the subsidized plan.

In addition to the issue of funding for cancer, there are problems of capacity and limited information. Supply is fragmented and provided through a combination of public and private sectors. Cancer drugs are expensive and typically marketed by monopolistic suppliers. Few medical oncologists and health personnel for prevention and early detection are available. In 2010, training was initiated through a special budget line with the National Institute of Neoplastic Diseases, aiming to increase capacity in the public sector. With the implementation of the law, additional mechanisms for strengthening supply will be developed. Strengthening MOH capacity for stewardship in CCC is a key element. Such stewardship is needed to counterbalance and work with leading oncology groups in a multi-stakeholder effort.

Innovative financing case 5: Taiwan[83]

For over a quarter century, cancer has been the leading cause of death in Taiwan. In response to this challenge, Taiwan's government has redoubled efforts for both cancer prevention and treatment. Specific targets are breast, cervical, colon, lung, and oral cancers, which account for more than 50% of cancer mortality.[84,85] Taiwan's National Health Insurance offers universal access to health and medical services, and financial protection for both prevention and treatment, which has made it possible to put this policy into action.

In March of 1995, Taiwan implemented the single-payer National Health Insurance program with comprehensive benefits. Overnight, 41% (8.6 million) of Taiwan's previously uninsured population, most of them women and children, became eligible for health insurance coverage. Since the mid-2000s, the National Health Insurance (NHI) has covered 99% of Taiwan's population of 23 million.

For several years, Taiwan's total annual national health spending has remained in the 6.2% of GDP range. The NHI accounts for roughly 56% of total national health spending. The package of covered benefits is comprehensive and uniform across beneficiaries. Benefits include outpatient and inpatient care, drugs, dental care, and traditional Chinese medicine. Kidney dialysis was added in 2003.

As a single payer, the government sets the fees for all services and drugs covered by the NHI. The NHI is a pay-as-you-go premium-based social insurance program. The NHI's premium rate has increased from 4.55% of wage and salary in 2010, to the current 5.17%. Even this new premium rate is low compared to the contributions required in most of the OECD countries. For certain population groups, such as low income families, the government subsidizes 100% of the NHI premium.

In 2003, Taiwan's parliament passed a bill on cancer prevention and treatment. The five-year plan (2005-2009) that developed following the passing of this bill provides comprehensive guidelines and programs for cancer education for the public, cost-effective cancer screening for the four major cancers mentioned above, and improved quality of cancer care to reduce incidence and mortality.

Despite the five-year plan on cancer prevention and treatment, no comprehensive cancer-screening programs existed in Taiwan before 2009 (except for screening programs for cervical cancer). The screening rate for breast cancer was a low 5-10% of women, and screening rates for oral and lung cancers were inadequate.[86] By contrast, between 1995 and 2005, Taiwan successfully reduced cervical cancer mortality by half, largely as a result of the government's cervical cancer screening program.[87]

A lack of designated funding for a broader screening program caused delays in implementing screening programs with consequent missed opportunities for early diagnosis and treatment.[88] In 2009, recognizing that the significant lag in cancer survival was largely due to inadequate preventive measures, Taiwan's Minister of Health at the time, Dr. Yeh Ching-Chuan, announced "a special sum from tobacco tax revenue, solely for screening three major cancers in Taiwan: colon, oral, and breast."[89] As Taiwan has a high prevalence of liver cancer, the government made liver cancer screening available for carriers of Hepatitis B and C viruses beginning in 2010.

Funding for cancer screening programs comes from the cigarette tax revenue, aptly called "Tobacco Products Health and Welfare Contribution." In January of 2009, Taiwan's parliament passed a bill that doubled the cigarette tax from NT$ 10 per pack to NT$ 20 per pack, raising the cost per package from NT$ 55 to NT$ 70.[90]

Revenue from the Tobacco Products Health and Welfare Contribution (tax) is put into the Tobacco Prevention and Health Promotion Fund and spent on tobacco cessation and health promotion programs. According to government statistics, 6% of the total 2011 budget of the Tobacco Prevention and Health Promotion Fund is designated for cancer screening and management, and 3% is for the prevention of tobacco use.[91]

Taiwanese government's policy response to the cancer epidemic –earmarking funding for specific cancer prevention measures– is noteworthy. This earmarked funding strategy avoids risking further underinvestment in prevention and early detection

by relying on a general health insurance fund to cover cancer care. The case of Taiwan is exceptional considering that general health insurance often provides coverage for cancer treatment, but neglects cancer prevention.

Taiwan's residents can access screening services at any hospital or clinic that has contracted with the government to provide screening services. Providers are then paid by the government for the screening services delivered.

While payment for NHI covered benefits, including cancer treatment, is predominantly fee-for-service for outpatients, and both fee-for-service and diagnosis-related group (DRG) payments for inpatients, Taiwan's NHI has a pay-for-performance plan for five diseases, including breast cancer.[92] Breast cancer pay-for-performance is based on input, process, and outcome measures, and participation is voluntary.

Innovative financing case 6: China
Covering acute lymphocytic leukemia in children

Childhood leukemia is a catastrophic diseases that threatens both patients and their families. Annually, an estimated 16,000-20,000 cases are diagnosed in China. About 75-80% are acute lymphocytic leukemia (ALL) or acute promyelocytic leukemia (APL).

The 5-year survival rate of ALL is 75-80%, and the 5-year survival rate for APL has reached 90% with accurate diagnosis and proper treatment in major hospitals. Yet, only about 8% of patients –about 1,200-1,500 children– receive formal diagnosis and systematic treatment. The rest of the children and their families abandon treatment because of financial difficulties or because they lack access to major hospitals and can only seek treatment in local hospitals that have limited capacity for proper diagnosis and treatment. Some children and their families do not seek treatment at all because they are unaware that these cancers could be curable.

To address this devastating situation, especially for families living in the rural areas, Premiere Wen Jiabao, in his 2010 government report, proposed pilot programs to provide healthcare coverage for certain types of childhood leukemia and congenital heart defects, and to increase the health care coverage of catastrophic diseases for rural areas. In response, the Ministry of Health and Ministry of Civil Affairs, together, issued "Suggestions for experiments on healthcare coverage for major childhood diseases in rural areas of China."

Beginning in 2010, China's Ministry of Health started a series of programs across the country to expand medical coverage for childhood ALL, APL, and congenital heart defects. Programs on healthcare coverage for major childhood diseases have been implemented in several rural areas in Sichuan, China. Led by the provincial health department and in collaboration with the Department of Civil Affairs, two counties (Zhongjiang and Fushun) have been linked to several major hospitals in Sichuan for treatment of ALL/APL and four types of congenital heart defects, when the young patients are identified. Local village doctors will be trained to recognize early symptoms of ALL/APL, patient medical records will be established, and the social health insurance and medical costs will be closely monitored.

Supported by the "xin nong he" (rural health insurance) and the medical aid systems, 90% of the total cost of treatment is covered for children 0-14 years old. The estimated medical cost is 80,000 RMB for low-risk ALL, 120,000 RMB for intermediate-risk ALL, and 25,000 RMB for congenital heart defects. An effective treatment guideline for ALL with relatively low cost has been established at the Shanghai Xinhua Children's Medical Center through an expert committee of the Ministry of Health.

These programs offering financial protection for these two major childhood diseases, especially with their focus on rural areas, have the potential to catalyze and guide broader national programs, and pave the path for future medical insurance in China.

Innovative financing case 7: India Arogyasri Community Health Insurance Scheme and Rashtriya Swasthya Bima Yojana

Recognizing that poor families were borrowing money and selling assets in order to pay for health services, the Indian state of Andhra Pradesh launched the Arogyasri Community Health Insurance Scheme in 2007.[93,94] The scheme is a public-private partnership between the State of Andhra Pradesh, the insurer Arogyasri Health Care Trust, and public and private hospitals. Arogyasri aims to improve access to health services for the poor by providing financial protection against high medical expenses for families below the poverty line.[95] It covers the full costs of 330 health services/conditions related to a list of diseases considered "catastrophic," including cancers (such as head and neck, gastrointestinal, gynecological, breast, skin, and lung, among others) and several other NCDs. Arogyasri also covers screening and outpatient consultations at the primary-level. The state government pays the premiums while the insurer pays the healthcare provider directly so that beneficiaries have an entirely cashless experience at the point of service. While the scheme covers a broad range of major diseases and a large segment of the population (nearly 80% of the population of Andhra Pradesh, 20 million households living below the poverty line), families with conditions that are not covered still lack financial protection.[96]

The Rashtriya Swasthya Bima Yojana (RSBY) is a national health insurance program launched in 2008, with the aim of providing, by 2012, financial protection in health for all households below the poverty line, across India.[97] The program, a public-private partnership that involves central and state governments, and public and private insurance companies and hospitals, covers health services for any disease or ailment that requires hospitalization, with a cap of Rs 30 000 ($650) per year, per family. Also included in the package is basic support for transportation costs. While there is an annual registration fee of Rs 30 ($0.65), which is paid by families, the premium is paid by central and state governments through general taxes.[98] Registered beneficiaries can access hospitals across the country with a smartcard so that they pay nothing at the point of service.

Both of these insurance programs are publicly funded via general taxes, with either no contributions or minimal registration fees paid by the beneficiaries. Further analysis is needed to determine whether the poorest families, particularly in rural areas, are being reached, and whether they are financially sustainable in the long run.

Innovating financing case 8: Rwanda

Several countries in Africa have introduced community-based health insurance. Rwanda provides a model of rapid scale-up and near-universal coverage.[99] The country-wide plan has been made more effective by strong government stewardship, which includes the coordination of external and donor aid, and the introduction of a performance-based pay program.[100-102]

Over the last decade, based on a strong commitment to providing universal health coverage, the Government of Rwanda (GoR) has undertaken extensive health care reforms and adopted innovative health care financing mechanisms. The share of GDP spent on health went from 4% in 2000 and 2002, to 6.6% in 2003,[103] and from 1998 to 2007, the annual budget share allocated to health increased from 2.5 % to 10%.[104,105]

The Mutual Health Insurance (MHI or mutuelles de santé) is the largest insurance plan and is dedicated to serving poorer households. In 1996, after the genocide, MHI was reintroduced to mitigate out-of-pocket catastrophic health expenditure and to increase health service utilization. A national policy to scale-up the mutuelles was initiated in 2004.[106] In 2008, a law on MHI was put in place to make health insurance compulsory

with a goal of reaching universal coverage by 2012. Current enrollment is near 85% of the population.[107,108] Increased utilization of modern healthcare services and reduced catastrophic expenditure on health is further evidence of the success of the insurance plan.[109-111]

Sources of funding include annual household user fees or premiums of 1000 Rwandan francs ($2) per person, per year (as of January 2007), combined with government and donor subsidies. Payments are collected by community health workers and transferred to the district level.[112] A flat rate co-payment of $0.40 per visit at the health center level, and 10% of costs at the hospital level, also apply.[113]

Even that financial contribution is onerous for many households. Premium subsidies are provided for vulnerable groups, and membership fees are waived for certain groups, including genocide survivors and people living with HIV/AIDS.[114] Through a five-year grant provided by the Global Fund, Mutuelle membership fees for almost one million poor and orphans, as well as people living with HIV/AIDS (PLWHAs), has been covered. A national solidarity fund for Mutuelle at the central level, channels subsidies to district Mutuelle solidarity funds. The social insurance program for the formal sector, the Military Medical Insurance, the central government, and international partners, including the Global Fund, contribute to the national solidarity fund.[115,116]

There are three complimentary packages: primary health services at the health center, services at the district level, and tertiary-level services at national referral teaching hospitals and the psychiatric hospital. Health care centers serve as the key point for managing referrals.[117]

The expansion of the insurance plan is limited by availability of human resources, medical diagnostics, and treatment facilities. Although the MHI system seeks to provide a baseline financial infrastructure for more comprehensive care for chronic diseases, its depth is limited by insufficient specialized services.

Reviews of the Mutuelle program highlight several lessons learned: the importance of broad dialogue and stakeholder inclusion; subsidies for the poorest are required even though they increase the pressure on the public budget, with external and NGO funding as the stopgap; monitoring and evaluation with feedback to policy makers, is essential; and, the political and economic spillovers have stimulated household and community empowerment, providing a base for other programs for poverty reduction and lending.[118]

The Government of Rwanda considers cancer, along with other NCDs, a priority. CCC is being expanded and incorporated into the Mutuelle benefits package, starting with cervical cancer vaccination through the National Strategic Plan for the Prevention, Control, and Management of Cervical Cancer. Further, the government of Rwanda is seeking to integrate CCC into existing service systems using a diagonal approach, beginning with women's cancer, which can be integrated into existing MCH and SRH programs, as well as cancers associated with HIV/AIDS.

Recommendations and lessons learned: Harnessing equitable and effective domestic CCC financing

The cases of innovative financial reform that enable inclusion of cancer in essential health services or in insurance packages offer several important lessons for LMICs.

1. The financial barriers faced by families can lead to impoverishment, and many families will spend out-of-pocket, utilizing all family assets and jeopardizing future stability, often for ineffective treatments. Social protection in health based on pre-payment and pooling helps to resolve this problem.
2. CCC can be integrated into broader health insurance initiatives. Experience from the several low and middle income countries analyzed in this report suggests a suitable set of prevention, early detection, treatment, and care interventions that can be effectively integrated into basic service packages covered by insurance. These interventions can be financed from general revenues that cover the overall insurance program or through specific levies.
3. Establishing entitlements around a guaranteed benefits package that includes cancer leads to improved access. People become aware of their rights and make them effective.
4. The benefits package has to be guaranteed with permanent revenue sources and capacity-building to ensure effective coverage. Low effective coverage –particularly of early detection– is common even in countries with relatively complete treatment coverage in the benefits package. This compromises final outcomes.[119]
5. Improvements in the delivery model are not achieved automatically by the mere existence of the package. Resources need to be increased with expanded training and incentives for providers in order to emphasize preventive activities and achieve better outcomes.
6. Not being able to set limits to the list of services and drugs that are publicly funded compromises both financial sustainability and equity. Resources that could save more lives if allocated to early detection can be diverted to costly treatments that offer fewer health benefits. Although the package of covered services and treatments can and should grow over time, new benefits need to be underpinned by strong evidence of their comparative effectiveness, and with sufficient funding to treat all the persons that need them. If funding for a given service or drug is only sufficient to cover part of the population, equity is compromised.
7. Separate funds for personal versus catastrophic health services should be established.
8. Although insurance covers treatment costs, families face many other financial and non-financial barriers that need to be overcome including transportation costs, care-giving for the patient and other family members, and stigma.
9. Effective financing considers the entire CCC continuum to avoid overspending on very costly, difficult, complex and painful treatments that often do not significantly extend healthy life and could have been avoided with effective prevention or early detection.
10. A strong evidence base, including the results of rigorous evaluation, is key to developing innovative financing mechanisms overall and to implementing, and continually upgrading, CCC financing and programs.

References

1. Institute for Health Metrics and Evaluation. *Financing Global Health 2010: Development assistance and country spending in economic uncertainty*. Seattle, WA: Institute for Health Metrics and Evaluation, 2010. http://www.healthmetricsandevaluation.org/publications/policy-report/financing-global-health-2010-development-assistance-and-country-spending-economic-uncertaint (accessed October 3, 2011).
2. Pitt C, Greco G, Powell-Jackson T, Mills A. Countdown to 2015: assessment of official development assistance to maternal, newborn, and child health, 2003–08. *Lancet*. 2010;376:1485-1496.
3. Institute for Health Metrics and Evaluation, 2010. http://www.healthmetricsandevaluation.org/publications/policy-report/financing-global-health-2010-development-assistance-and-country-spending-economic-uncertaint (accessed October 3, 2011).
4. Farmer P, Frenk J, Knaul FM, et al. Expansion of cancer care and control in countries of low and middle income: a call to action. *Lancet*. 2010;376:1186-93.
5. World Health Organization. The global burden of disease: 2004 update. Geneva, Switzerland: World Health Organization, 2008. http://www.who.int/healthinfo/global_burden_disease/2004_report_update/en/index.html (accessed October 3, 2011).
6. United Nations General Assembly. Resolution adopted by the General Assembly. 55/2 United Nations Millennium Declaration. 18 September 2000.
7. Fisk NM, Atun R. Systematic analysis of research underfunding in maternal and perinatal health. *British Journal of Obstetrics & Gynaecology*. 2009;116:347–35.
8. Fisk NM, Atun R. Market failure and the poverty of new drugs in maternal health. *PLoS Med*. 2008;5(1).
9. Fisk NM, McKee M, Atun R. Relative and absolute addressability of global disease burden in maternal and perinatal health by investment in R&D. *Tropical Medicine and International Health*. 2011. April 7. Epub ahead of print].
10. Kates J, Wexler A, Lief E, Seegobin V. *Donor funding for health in low and middle income countries, 2001-2008*. Washington, DC: Kaiser Family Foundation, 2010. 2010.
11. Institute for Health Metrics and Evaluation, 2010.
12. Ibid.
13. Nugent RA, Feigl AB. Where have all the donors gone? Scarce donor funding for non-communicable diseases. Centre for Global Development. Working Paper 2008. 2010. Washington D.C., U.S.A.
14. Ibid.
15. Porter ME. *Competitive advantage: creating and sustaining superior performance*. New York, NY: The Free Press. 1985.
16. For a more detailed analysis on innovative financing that draws on the above framework see Atun R, Akachi Y, Knaul F. Innovative financing for health in 2002 to 2010. Forthcoming.
17. United Nations. Monterrey Consensus of the International Conference on Financing for Development. 2002. http://www.un.org/esa/ffd/monterrey/MonterreyConsensus.pdf (accessed October 3, 2011).
18. Girishankar N. Innovating Development Finance: From Financing Sources to Financial Solutions. The World Bank. Policy Research Working Paper 5111. 2009. http://wwwwds.worldbank.org/servlet/WDSContentServer/WDSP/IB/2009/11/03/000158349_20091103112908/Rendered/PDF/WPS5111.pdf (accessed October 3, 2011).
19. Organisation for Economic Co-operation and Development. The Paris Declaration on Aid Effectiveness and the Accra Agenda for Action: 2005/2008. http://www.oecd.org/dataoecd/11/41/34428351.pdf (accessed October 3, 2011).
20. Fisk NM, Atun R., 2008.
21. Brookings Institution Global Health Financing Initiative. Debt2Health: Debt conversion for the Global Fund to Fight AIDS, Tuberculosis, and Malaria. Snapshot Series. Washington, D.C.; 2008.
22. Ketkar S, Ratha D, eds. *Innovative financing for development. The World Bank*. Washington, D.C.; 2009.
23. Hecht R, Palriwala A, Rao A. *Innovative Financing for Global Health. A Moment for Expanded U.S. Engagement?* A Report of the CSIS Global Health Policy Center. Washington, DC, 2010.
24. Sandor E, Scott S, Benn J. Innovative Financing to Fund Development: Progress and Prospects. DCD Issues Brief. Organisation for Economic Co-operation and Development. 2009. http://www.oecd.org/dataoecd/56/47/44087344.pdf (accessed October 3, 2011).
25. Product Red 2006. Global fund private sector partnerships: resource mobilization overview. The Global Fund, June 2006. http://www.google.com/url?sa=t&source=web&cd=3&ved=0CCMQFjAC&url=http%3A%2F%2Fwww.theglobalfund.org%2Fdocuments%2Fpartnership_forum%2FPartnershipForum_2006Day1ResourceMobilisation_Presentation_en%2F&rct=j&q=product%20red%20%2B%20global%20fund%20%2B%202006&ei=TZAUToT6HIbu0gGbrfSWDg&usg=AFQjCNHuOLaLSF7h_NgT81ye_w_pWrtlUQ&sig2=i-_P0_B90PZfyOXvYjd0g&cad=rja (accessed October 3, 2011).
26. Partnership for Maternal, Newborn and Child Health. *The PMNCH 2011 Report*. World Health Organization. 2011. http://www.who.int/pmnch/en/
27. Partnership for Maternal, Newborn and Child Health. Press Release: The next frontier in women's health. World Health Organization. 2011. http://www.who.int/pmnch/media/membernews/2011/20110919_integrating_ncds_pr/en/index.html (accessed October 3, 2011).
28. U.S. Department of State. Pink Ribbon Red Ribbon. 2011. http://www.state.gov/r/pa/prs/ps/2011/09/172244.htm (accessed October 3, 2011).
29. Atun RA, McKee M, Coker R, Gurol-Urganci I. Health systems' responses to 25 years of HIV in Europe: Inequities persist and challenges remain. *Health Policy*. 2008;86(2-3):181-94.
30. Ullrich A, Ott JJ, Vitoria M, Martin-Moreno JM, Atun R. Long-term care of AIDS and non-communicable diseases. *Lancet*. 2011; 377: 639-640.
31. Atun R, Bataringaya J. Building a Durable Response to HIV/AIDS: Implications for Health Systems. *Journal of Acquired Immune Deficiency Syndromes*. 2011: 57 (Supplement 2); S91-S95.
32. Stover J, Korenromp EL, Blakley M, et al. Long-Term Costs and Health Impact of Continued Global Fund Support for Antiretroviral Therapy. *PLoS ONE*. 2011;6(6).
33. Institute for Health Metrics and Evaluation, 2010.
34. Rasschaert F, Pirard M, Philips MP, et al. Positive spill-over effects of ART scale up on wider health systems development: evidence from Ethiopia and Malawi. *Journal of the International AIDS Society*. 2011; 14(Suppl 1):S3 (pp1-10).
35. Shakarishvili G, Lansang MA, Mitta V, et al. Health systems strengthening: a common classification and framework for investment analysis. *Health Policy and Planning*. 2011; 26(4): 316-326.
36. World Health Organization. World Health Statistics, 2011. Geneva, Switzerland; World Health Organization. 2011. www.who.int/whosis/whostat/EN_WHS2011_Full.pdf (accessed October 3, 2011).
37. World Health Organization. *The World Health Report 2010. Health systems financing: The path to universal coverage*. Geneva, Switzerland; World Health Organization. 2010.
38. World Health Organization. *The World Health Report 2000. Health Systems: Improving Performance 2000*. Geneva, Switzerland; World Health Organization. 2000.
39. Knaul F, Arreola-Ornelas H, Mendez-Carniado O, et al. Evidence is good for your health system: policy reform to remedy catastrophic and impoverishing health spending in Mexico. *Lancet*. 2006;368(9549):1828-41.
40. World Health Organization. World Health Statistics, 2011.
41. Mahal A, Karan A, Engelgau M. The economic implications of non-communicable disease for India. Health, Nutrition and Population Discussion Paper: World Bank. 2010. http://siteresources.worldbank.org/HEALTHNUTRITIONANDPOPULATION/Resources/281627-1095698140167/EconomicImplicationsofNCDforIndia.pdf (accessed October 3, 2011).
42. Engelgau M, K Okamoto, K Navaratne, Gopalan S. Prevention and Control of Selected Chronic NCDs in Sri Lanka: Policy Options and Action Plan. Health, Nutrition and Population Discussion Paper: World Bank. 2010. http://siteresources.worldbank.org/HEALTHNUTRITIONANDPOPULATION/Resources/281627-1095698140167/NCDsSriLanka.pdf (accessed October 3, 2011).
43. Nikolic I, Stanciole A, Zaydman M. Chronic Emergency: Why NCDs Matter. Health, Nutrition and Population Discussion Paper: World Bank. 2011. http://siteresources.worldbank.org/HEALTHNUTRITIONANDPOPULATION/Resources/281627-1095698140167/ChronicEmergencyWhyNCDsMatter.pdf (accessed October 3, 2011).
44. World Health Organization. *The World Health Report 2010*.
45. Gwatkin D, Ergo A. Universal health coverage: friend or foe of health equity? *Lancet*. 2010;377(9784):2160-1.
46. Farmer P, Frenk J, Knaul FM et al., 2010.
47. Frenk J, Gómez-Dantés O, Knaul FM. The democratization of health in Mexico: financial innovations for universal coverage. *World Health Organization*. 2009;87:542-48.
48. Frenk J, González-Pier E, Gómez-Dantés O, Lezana MA, Knaul FM. Comprehensive reform to improve health system performance in Mexico. *Lancet*. 2006; 368: 1524-34.
49. Knaul FM, Frenk J. Health Insurance In Mexico: Achieving Universal Coverage Through Structural Reform. *Health Affairs*, 2005; 24(6): 1467-1476.
50. Frenk J, González-Pier E, Gómez-Dantés O, et al., 2006.
51. Knaul F, Arreola-Ornelas H, Mendez-Carniado O, et al, 2006.
52. Frenk J, González-Pier E, Gómez-Dantés O, Lezana MA, Knaul FM. Comprehensive reform to improve health system performance in Mexico. *Lancet*. 2006; 368: 1524-34.
53. Comisión Nacional de Protección Social en Salud. Informe de resultados. 2º. Semestre 2010. www.seguro-popular.gob.mx/images/contenidos/Informes_Resultados/Informe_Resultados_SPSS_2010.pdf (accessed October 3, 2011).

54. Sepúlveda J, Bustreo F, Tapia R, et al. Improvement of child survival in Mexico: the diagonal approach. ***Lancet***. 2006; 368: 2017–27.
55. Comisión Nacional de Protección Social en Salud. Catalogo Universal de Servicios de Salud, 2010. CNPSS. México, D.F. http://www.seguropopular.gob.mx/images/contenidos/Causes/catalogo_2010.pdf (accessed October 3, 2011).
56. Comisión Nacional de Protección Social en Salud. Informe de resultados. 2º. Semestre 2010. www.seguro-popular.gob.mx/images/contenidos/Informes_Resultados/Informe_Resultados_SPSS_2010.pdf (accessed October 3, 2011).
57. Diario Oficial de la Federación. Norma Oficial Mexicana NOM-010-SSA2-1993, Para la prevención y control de la infección por virus de la inmunodeficiencia humana. DOF 21-06-2000. http://www.salud.gob.mx/unidades/cdi/nom/010ssa23.html (accessed October 3, 2011).
58. Diario Oficial de la Federación. Norma Oficial Mexicana NOM-041-SSA2-2002, Para la prevención, diagnóstico, tratamiento, control y vigilancia epidemiológica del cáncer de mama. DOF 17-09-2003. http://www.salud.gob.mx/unidades/cdi/nom/041ssa202.html (accessed October 3, 2011).
59. King G, Gakidou E, Imai K, et al. Public policy for the poor? A randomised assessment of the Mexican universal health insurance programme. ***Lancet***. 2009: 373(9673), 1447-1454.
60. Pérez-Cuevas R, Zapata Tarrés MM, Salinas Escudero G, et al. Evaluación de los resultados en salud y sobrevida de pacientes menores de 18 años con cáncer, financiados a través del Fondo de Protección contra Gastos Catastróficos del Sistema de Protección Social en Salud. Informe final. Centro de Estudios Económicos y Sociales en Salud, Hospital Infantil de México Federico Gómez, 2010. México, D.F.
61. Lara-Medina FU, Arce C, Alvarado-Miranda A, et al. Evaluación del tratamiento del cáncer de mama en una institución del tercer nivel con Seguro Popular. Documento de trabajo, Instituto Nacional de Cancerología, México, D.F., 2010.
62. Bleich SN, Cutler DM, Adams AS, Lozano R, Murray CJL.Impact of insurance and supply of health professionals on coverage of treatment for hypertension in Mexico: population based study. ***British Medical Journal***. 2007;335: 875-8.
63. Guerrero R and Amarís AM. Financing cancer care and control: Lessons from Colombia. GTF.CCC Working Paper Series, Paper No. 1, Harvard Global Equity Initiative, 2011.
64. Piñeros M, Sánchez R, Cendales R, Perry F, Ocampo R. Patient delay among Colombian women with breast cancer. ***Salud Publica Mexico***. 2009;51:372-380.
65. Rivera DE, Cristancho A, González JC. Movilización Social para el Control del Cáncer en Colombia. Technical Document, Instituto Nacional de Cancerología. 2007. Bogotá.
66. República de Colombia, Ministerio de Protección Social, Instituto Nacional de Cancerología. Plan Nacional para el Control de Cáncer en Colombia 2010-2019. 2010. from http://cancer.gov.co (accessed October 3, 2011).
67. República de Colombia, Ministerio de Protección Social. Actualizaciones y aclaraciones al POS-C y POS-S 1994- 2010. 2010. http://pos.gov.co (accessed October 3, 2011).
68. República de Colombia, Ministerio de Protección Social, Instituto Nacional de Cancerología. Atlas de Mortalidad por Cáncer en Colombia. 2010. http://cancer.gov.co (accessed October 3, 2011).
69. República de Colombia, Ministerio de Protección Social, Profamilia, Instituto Colombiano de Bienestar familiar. Encuesta Nacional de Demografía y Salud, 2010. 2011. Bogotá.
70. Guerrero, R. Financing Universal Enrollment to Social Health Insurance: Lessons Learned from Colombia. ***Well-being and Social Policy***. 2008; 4(2): 75-98.
71. Giedion U, Villar M. Colombia's Universal Health Insurance System. ***Health Affairs***. 2009;28(3): 853-863.
72. Giedion U, Panopolou G, Gomez-Fraga S. ***Financiamiento del desarrollo: Diseno y ajust de los planes explicitos de beneficios: el caso de Colombia y Mexico***. Naciones Unidas, 2009.
73. República de Colombia, Ministerio de Protección Social. Actualizaciones y aclaraciones al POS-C y POS-S 1994- 2010. 2011. http://pos.gov.co (accessed October 3, 2011).
74. Piñeros, M., Sánchez, R., Cendales, R, Perry F., Ocampo R. Patient delay among Colombian women with breast cancer. ***Salud Publica de Mexico***. 2009;51:372-380.
75. República de Colombia, Ministerio de Protección Social, Instituto Nacional de Cancerología. Plan Nacional para el Control de Cáncer en Colombia 2010-2019. 2010. http://cancer.gov.co (accessed October 3, 2011).
76. Velásquez-De Charry, L., G. Carrasquilla, et al. Equidad en el acceso al tratamiento para cáncer de mama en Colombia. ***Salud Publica de Mexico***. 2009 ; 51(Suplememento 2): 246-253.
77. Defensoría del Pueblo. La tutela y el Derecho a la Salud 2006-2008. 2008. http://defensoria.org.co (accessed October 3, 2011).
78. Consejo Nacional de la Seguridad Social (CNSS), Ley 87-01, que crea el Sistema Dominicano de Seguridad Social y sus modificaciones, Santo Domingo, Rep. Dominicana, 2010.
79. Rathe M, Knaul F. Financing for AIDS and cancer in the context of the health system reform of the Dominican Republic, HIV/AIDS Survivorship in LMICS: Opportunity and challenge for health systems. Global Fund / Harvard Global Equity Initiative. 2010.
80. Rathe M. Arquitectura del Sistema de Salud dhe la Rep. Dominicana: A 10 años de su creación, Boletín mayo – junio, Fundación Plenitud, Santo Domingo, Rep. Dominicana, 2011.
81. Peña E, Muñoz L, González Pons C, Gil G. Situación y tendencia de las Neoplasias en República Dominicana al 2007. ***Epidemiología***. 2009;17(2).
82. Seinfeld J. Case study: Peru. Challenges to incorporating cancer in the new universal health insurance system. GTF.CCC Working Paper and Background Note Series No.4. Boston: Harvard Global Equity Initiative, 2011.
83. Cheng TM. Cancer prevention policy in Taiwan: Policy implications for global health. GTF.CCC Working Paper and Background Note Series No.5. Boston: Harvard Global Equity Initiative, 2011.
84. Bureau of Health Promotion, Department of Health, Taiwan. Cancer Screening (Colon Cancer, Oral Cancer, Cervical Cancer, Breast Cancer) (in Chinese). http://www.bhp.doh.gov.tw/BHPnet/Portal/Them.aspx?No=201007080002 (accessed October 3 2011).
85. Bureau of Health Promotion, Department of Health, Taiwan. Cancer Incidents and Ranking Published by the Department of Health 2008, April 13, 2011 (in Chinese).
86. Cheng, Tsung-Mei. Lessons From Taiwan's Universal National Health Insurance: A Conversation With Taiwan's Health Minister Ching-Chuang Yeh. ***Health Affairs***. 2009;28(4):1040-1.
87. Ibid.
88. Ibid.
89. Ibid.
90. NT$70 roughly is US$2.42 (as of August 5 2011 US$1 = NT$29.75).
91. Bureau of Health Promotion, Department of Health, Taiwan. 2011 Budget for Tobacco Prevention and Health Promotion Fund of the Bureau of Health Promotion, Department of Health (in Chinese).
92. Porter ME, Baron JF. Koo Foundation Sun Yat-Sen Cancer Center: Breast Cancer Care in Taiwan (TN). Harvard Business School Teaching Note 710-465.
93. Arogya Sri Community Health Insurance Scheme for Below Poverty Line Families in Mahaboobnagar, Anantapur, and Srikakulam Districts. Health, Medical and Family Welfare Department. Government of Adhra Pradesh, 2007. http://dme.ap.nic.in/insurance/Bid.pdf (accessed September 11, 2011).
94. Aarogysari Health Care Trust: Quality Medicare for the Unreached. 2011. https://www.aarogyasri.org/ASRI/index.jsp (accessed October 3, 2011)
95. Mahal A, Karan A, Engelgau M. The Economic Implications of Non-Communicable Dosease for India. Health, Nutrition and Population Discussion Paper. Washington: World Bank, 2009.
96. Mehta A, Bhatia A, and A. Chatterjee (Eds.) ***Improving Health and Education Service Delivery in India through Public-Private Partnerships***. Public-Private Partnerships Knowledge Series. Phillipines: Asian Development Bank, 2010.
97. Swarup A, Jain N. Rashtriya Swasthya Bima Yojana - A case study from India. RSBY Working Paper. http://www.rsby.gov.in/Documents.aspx?ID=14 (accessed October 3, 2011).
98. Swarup A, Jain N. India: Rashtriya Swasthya Bima Yojana. In Special Unit for South-South Cooperation. Sharing Innovative Experience. Volume 18. Successful Social Protection Floor Experiences. United Nations Development Program, Special Unit for South-South Cooperation, International Labour Organization, 2011.
99. Shimeles A. Community based health insurance schemes in Africa: The case of Rwanda. Working Papers in Economics, No. 463. University of Gothenburg, 2010. http://130.241.16.4/bitstream/2077/23064/1/gupea_2077_23064_1.pdf (accessed May 24, 2011).
100. Innovations in Health Systems. USAID Rwanda newsletter, March 2010. http://www.usaid.gov/rw/our_work/newsroom/newsletters/docs/healthsystemsstrengtheningissue.pdf (accessed October 3, 2011).
101. Logie DE, Rowson M, Ndagiji F. Innovations in Rwanda's health system: looking to the future. ***Lancet***. 2008; 372: 256-261.
102. Basinga P, Gertler PJ, Binagwaho A, Soucat ALB, Sturdy J, Vermeersch CM. Effect on maternal and child health services in Rwanda of payment to primary health-care providers for performance: an impact evaluation. ***Lancet***. 2011; 377: 1421-28.
103. National health accounts Rwanda 2006 with HIV/AIDS, malaria, and reproductive health subaccounts. Kigali, Rwanda: Republic of Rwanda Ministry of Health; 2008.
104. Republic of Rwanda, Ministry of Finance and Economic Planning. Ministry of Health. 2006. Scaling up to achieve the health MDGs in Rwanda. A background study for the high-level forum meeting.
105. Logie DE, Rowson M, Ndagiji F., 2008.
106. Ministry of Health. Health sector strategic plan: July 2009-June 2012. Government of Rwanda: Ministry of Health, 2009.
107. Twahirwa A. Sharing the burden of sickness: mutual health insurance in Rwanda. ***Bulletin of World Health Organization***. 2008; 86: 823-834.
108. Saksena P, Antunes AF, Xu K, Musango L, Carrin G. Mutual health insurance in Rwanda: evidence on access to care and financial risk protection. ***Health Policy***. 2011; 99: 203-209.
109. Ibid.
110. Shimeles A. Community based health insurance schemes in Africa: The case of Rwanda. Working Papers in Economics, No. 463. University of Gothenburg, 2010. http://130.241.16.4/bitstream/2077/23064/1/gupea_2077_23064_1.pdf (accessed May 24, 2011).
111. Logie DE, Rowson M, Ndagiji F. Innovations in Rwanda's health system: looking to the future. ***Lancet***. 2008; 372: 256-261.

112. Musango L, Doetinchem O. De la mutualisation du risque maladie à l'assurance maladie universelle: Expérience du Rwanda. Geneva, Switzerland: 2009; 2010. http://www.who.int/health financing/documents/covdpf 09 01-mutualisation rwa/en/index.html. (accessed July 31, 2011).
113. Antunes Fernandes A, Saksena P, Elovainio R, et al. Health financing systems review of Rwanda: options for universal coverage. World Health Organization and Ministry of Health, Republic of Rwanda. 2009.
114. Ibid.
115. Logie DE, Rowson M, Ndagiji F. Innovations in Rwanda's health system: looking to the future. ***Lancet***. 2008; 372: 256-261.
116. Diop F, Leighton C, Butera D. Health financing task force discussion paper: Policy crossroads for mutuelles and health financing in Rwanda. Washington DC: Health Financing Task Force: 2007. http://www.asivamosensalud.org/descargas/Paper_Dra_Amanda_Glassman.pdf (accessed May 24, 2011).
117. Chankova S, Sulzbach S, Diop F. Impact of mutual health organizations: evidence from West Africa. ***Health Policy and Planning***. 2008; 23: 264-276.
118. Diop F, Leighton C, Butera D., 2007.
119. Regional de cobertura efectiva. México D.F. 2010.

Evidence for Decision-Making: Strengthening Health Information Systems and the Research Base

Section 9

Section 9

Evidence for Decision-Making: Strengthening Health Information Systems and the Research Systems and the Research Base

Key messages

- Both health information systems and research are essential inputs for effective decision-making about cancer care and control (CCC), yet both are lacking in low and middle income countries (LMICs).
- Although population-based cancer registries (regional or national) are essential for monitoring cancer incidence and control, few LMICs have been able to establish them. High quality regional registries can be very effective if designed to be representative, and are more reasonable for LMICs than national registries.
- Data for generating evidence on cancer causes, treatment, and outcomes can be drawn from several sources, yet all tend to have limitations. These sources of data need to be strengthened and can serve not only for CCC but also for many other areas of health and health care, as part of a diagonal approach to building health information systems (HIS).
- Program evaluation, health systems, and implementation research are important, yet largely unexplored areas of research for understanding options for improving CCC in LMICs.
- Local policy and academic institutions can and have played important roles in capacity-building for health information systems (HIS), and research in cancer and CCC in LMICs.
- Converting information into decision-making requires uptake by national and global policy makers, and this requires making evidence on CCC more easily adaptable and linking this to health system performance.
- Both global and national frameworks for monitoring need to be developed. These frameworks can be effective in strengthening CCC, especially as part of broader efforts around NCD and chronic illness.

9.i. Introduction

High quality evidence that is relevant to decision-making is essential to closing the cancer divide and to improving CCC. Both global and local evidence is needed to help decision-makers allocate resources among competing needs and priorities. Evidence also provides the core of accountability.[1,2]

Yet, most LMICs lack both the health information systems (HIS) and the research to generate the kind of evidence needed for decision-making on cancer.[3,4] In most developing countries, less than 1% of national budgets are devoted to health research, and similarly, a small amount is spent on HIS. This impedes LMICs from generating the type of comprehensive evidence that is necessary to guide decision-making.[5]

This section first reviews the core data inputs for developing an HIS for CCC, then outlines the most important areas to expand what is currently available in LMICs. The next part identifies opportunities to build research capacity for expanding CCC, and highlights the areas that are especially weak in LMICs, including implementation research and evaluation.

Most LMICs lack both the health information systems and the research to generate the kind of evidence needed for decision-making on cancer.

9.ii. Towards stronger HIS

Incidence and mortality Cancer registries

Better quality cancer registries and mortality data should be considered a high-priority global public good. Cancer registry data is a primary source of information regarding cancer incidence and mortality. High quality cancer registries ascertain all newly diagnosed cancers and maintain information about the population at risk, which helps to characterize cancer incidence. Population-based cancer registries may have either regional or national coverage. Some high-quality cancer registries also collect information on stage at diagnosis and treatments received.

Improving the quality of cancer registries and mortality data should be considered a high-priority global public good.

For the last 30 years, the International Agency for Research on Cancer (IARC) has published regular estimates of the global cancer burden in broad areas of the world and more recently at the country level through its GLOBOCAN series.[6] These estimates are based on cancer registry data when available. A serious challenge is that, as of 2006, almost 80% of the world population was not covered by population-based cancer registries. Registration is particularly sparse in Asia (8% of the total population) and in Africa (11%).[7] For the 75 countries where no incidence data are available, GLOBOCAN estimates are based on modeling of mortality data (41 countries), or on neighboring populations.

IARC also publishes the *Cancer Incidence in 5 Continents (CI5)* series,[8] restricted to regional and national incidence data that are considered to meet high standards of completeness and validity. Only 8% of the world population is represented in the latest volume IX of CI5[9] (Figure 1), which presents data from 300 populations, most from high and middle income regions.[10]

As of 2006, almost 80% of the world population was not covered by population-based cancer registries, most living in LMICs.

The Figure identifies countries with a national (purple), or at least one regional (teal), population-based cancer registry with data of sufficient quality for inclusion in Cancer Incidence in Five Continents, volume IX.

The wide variation in availability and quality of cancer data highlights the need to help countries without cancer registries to develop and implement cancer surveillance systems. Establishing and strengthening these registries requires not only financial resources but also recognition of the importance of these data, ongoing commitment to data collection, and trained personnel. Any or all of these components may be lacking in LMICs. Thus, support for establishing and strengthening registries should take into account the needs for capacity-building in all areas, including data management programs, privacy issues, and analytic capability and metrics.

Registries must identify reliable sources of data, achieve centralized data capture, establish data validation procedures, and quality control measures.[11] The quality of cancer registry data depends on the completeness of case documentation, the validity or accuracy of the recorded data, and its timeliness.[12-14]

For most LMICs, a collection of data on all cancers in the country is unattainable. In these cases, comprehensive coverage with regional registries (covering a specific part of a country) may be preferable to limited national registries. In the United States, for example, the Surveillance, Epidemiology, End Results (SEER) registries traditionally covered areas representing only 9-14% of the population, and, even with recent expansions, still only cover 28% of the population.

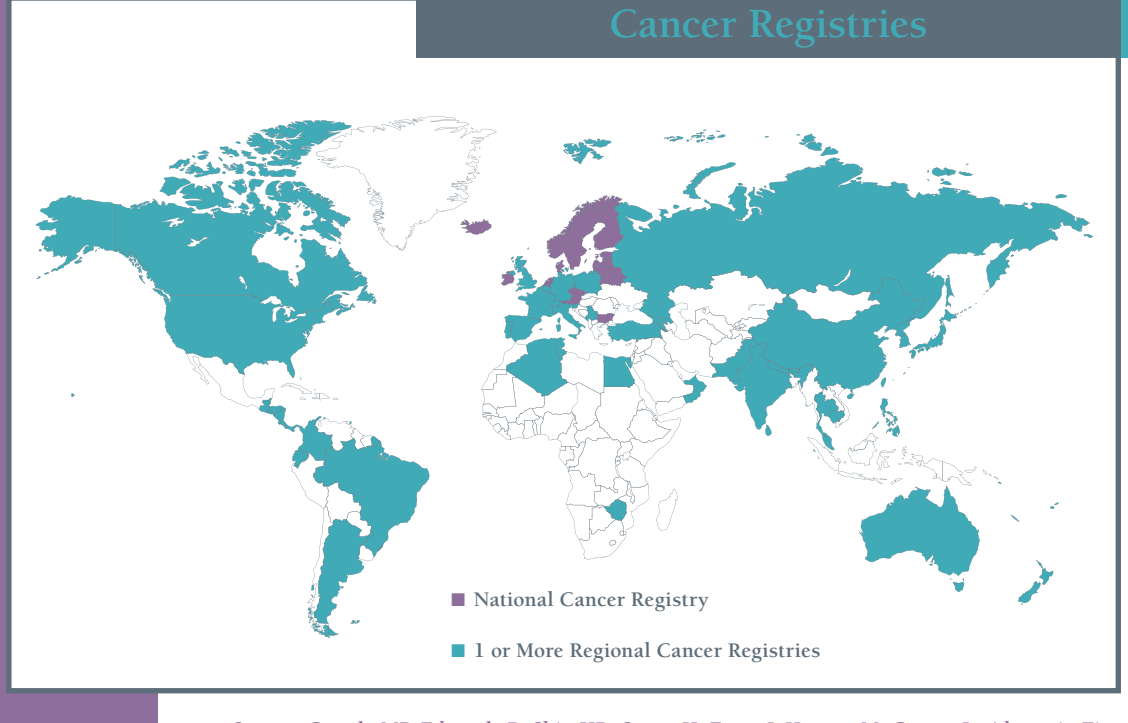
Yet, if used for national decision-making, regional registries must be population-based with a defined residential capture area, and-, ideally, the population at risk should roughly approximate the country's population, which is the case with SEER.[15] Identifying appropriate geographic capture areas in LMICs can be challenging, particularly in countries that do not collect census data. Covering rural areas is often particularly challenging.

Improving cancer registries should be a high priority for expanding LMIC capacity in CCC. It is relatively low-cost, results can be obtained quickly, and international sources of funding may be available.

Improving cancer registries should be a high priority tool for expanding LMIC capacity in CCC. It is relatively low-cost, results can be obtained quickly, and international sources of funding may be available. The renewed interest in global health and cancer from agencies such as the US National Cancer Institute should be channeled in this area, working with IARC and others.

Countries with Population-Based Cancer Registries

Figure 1



Source: Curado MP, Edwards B, Shin HR, Strom H, Feray J, Heanue M. Cancer Incidence in Five Continents, Vol. IX. Lyon, France: International Agency for Research on Cancer: IARC Scientific Publications No. 160; 2007.

International agencies promoting or supporting cancer registries

- ***International Agency for Research on Cancer***
  IARC provides many resources for cancer registries, including training programs for establishing and improving cancer registration, particularly in LMICs. In addition, IARC has developed and maintains the CANREG4 Software, a configurable computer program for cancer registration in population-based registries used by 140 registries in 75 countries. Version 5 of this free software was released in 2010, and is available in English, Spanish, French, Chinese, Russian and Portuguese. IARC compiles information from these registries and develops a global database of cancer incidence and mortality –Globocan– that has been widely used for both research and policy making.[16]

- ***International Association of Cancer Registries***
  IARC was founded in 1966, as a professional society dedicated to fostering the aims and activities of cancer registries worldwide. The Secretariat is housed at IARC.[17]

- ***International Network for Cancer Treatment and Research***
  INCTR has been operating globally for more than two decades with a focus on research and an extensive network of professionals in both high- and lower-income regions. INCTR has opened a program on cancer registration, starting with building a network of cancer registries in East Africa.[18]

Through academic institutions in both high and low income countries, the know-how and capacity exist to expand the number and quality of registries in LMICs if resources become available. Several international agencies and associations, and, most notably, IARC, have worked in this area for decades. There are a number of examples of countries that have collaborated with academic and governmental organizations to establish successful cancer registries (Text Box 9.1).

Through academic institutions in both high and low income countries, the know-how and capacity exist to expand the number and quality of registries in LMICs if resources become available.

Text Box 9.1
Leveraging collaborations to establish cancer registries in LMICs: Examples from Colombia and Uganda

Some countries have successfully established cancer registries by collaborating directly with academic institutions. One such registry is the Cancer Registry in Cali, Colombia, the first and longest-running population-based cancer registry in Latin America, which covers a population of 1.8 million people. Dr. P. Correa started the registry in 1962, in the Department of Pathology of Del Valle University, and it has continued uninterrupted operations ever since.

The National Cancer Institute in the US provided training and guidance, and assisted with securing the initial funding for the registry– a $3,000 grant for "high risk projects" from the Fuller Foundation, and a small US surplus grant for scientific purposes in other countries.[19] *Since its inception, the registry has been financed and maintained by an academic institution, the Del Valle University, with a small budgetary allocation.*[20] *Supplemental funding for the registry is provided by government health agencies, although the university provides most of the funding and support.*

Data from the Cali Cancer Registry have been published in seven volumes of CI5, a tribute to the data's quality and completeness.[21] Data from the Cali Cancer Registry have guided targeted interventions that have led to improved outcomes. For example, high incidence rates of cervical cancer prompted national screening programs. Screening successfully resulted in a shift in stage at diagnosis, with lower rates of invasive cervical cancers and more identification of in situ cancers.[22] In 1998, the Cali Cancer Registry participated in the creation of a new population-based cancer registry, in the southern city of Pasto. The Pasto Cancer Registry covers a population of 350,000 and is the second population-based registry in Colombia.

Another model for developing a cancer registry utilizes existing cancer institutions as the starting point. The Kampala Cancer Registry in Uganda is an example of such a program, having obtained substantial initial support from the Uganda Cancer Institute. Similar to the Cali Cancer Registry, the Kampala Cancer Registry also receives assistance from a university. The Kampala Cancer Registry was established in the Department of Pathology of Makerere University in 1951, and is the oldest population-based cancer registry in Africa.[23] The registry stopped capturing cases in 1978 because of political instability, but resumed registration in 1989, and has been in operation consistently since then. The registry's catchment area is Kyadondo County (population 1.2 million, in 1998), which includes the capital city of Kampala as well as neighboring urban and semi-urban areas.[24,25]

Cancer cases are reported by a university hospital with an oncology program and a radiation facility, and by four other hospitals and three private pathology laboratories. Data collection is supported by CANREG software from IARC. In the mid 1990s, cancer registration was approximately 90% complete.[26] Kampala Cancer Registry data have been published in volumes I, VII, VIII, and IX of CI5.[27] Efforts to expand cancer registration in Uganda to the national level have been impeded by a lack of financing. Population-based cancer registries were started in the West Nile district of Kuluva and at Ishaka Hospital, but both closed due to the lack of funds.[28]

Data on cancer causes, treatment, and outcomes

Health information systems (HIS) provide the necessary data to better understand cancer etiology, epidemiology, and response to treatments, outcomes, and access to screening, diagnostic, and treatment services. This enables policy makers to develop and better maintain CCC programs. Data can come from many sources, including cancer registries, tumor specimens, clinical records, registration and licensing of drug use, infrastructure surveys, and administrative records. These sources, as well as examples of their uses, are summarized in Table 1.

Table 1

Data on Cancer Causes, Epidemiology, Treatment, and Outcomes

Data Source	Uses	Limitations
Cancer registry data	Crucial for understanding cancer burden (descriptive epidemiology) A foundation for epidemiological studies of the causes and prevention of cancer Stage distribution can reflect success of screening programs Treatment data, when available, can reflect access to various treatments Evaluation of public health interventions (e.g. screening or vaccination)	Most registries do not have data on stage at diagnosis and treatments; when available, often missing data
Tumor specimens	Understand biological differences in cancers among different populations, including germ line and somatic mutations Can be linked to cancer registries and other data bases	Depending on storage requirements, may be time-consuming and costly to collect and study
Clinical data from medical records, pathology reports	Understand treatments received and if disparities exist in treatments Understand relative effectiveness of treatments in different populations or patients with specific tumor characteristics	Time consuming and costly to collect data Data from a single institution cannot be generalized Data from medical records requires good documentation and record storage
Equipment licensing and registration data	Availability of services that are registered or licensed, such as radiation equipment, controlled substances,[29,30] and mammography facilities	Can measure availability, but not access to these services
Surveys	National health surveys to understand population risk factors and specific cancer risk factors Patient surveys to learn about their understanding of disease, values and preferences, treatments, experiences with care, quality of life, and symptom control Hospital surveys about availability of services, including specialists Physician surveys about knowledge, beliefs, and practice patterns	Can be challenging to identify generalizable populations Low response rates can introduce bias Respondents' reports are subject to measurement error
Administrative data from insurance claims or other encounters data	Understand patterns of care for certain populations	Not available in most LMICs When available, may be only for a particular group covered by insurance (e.g., Medicare population, in the United States)

9.iii. Priority areas for strengthening the research base

Cancer biology

Cancer biology is a particularly important area for basic research in LMICs as there are likely to be fundamental differences in cancer etiology, both between and within countries. Most cancer research is conducted in high income countries and so global knowledge is skewed towards these populations and their specific cancers.[31] Consequently, much remains to be learned about etiologies of the cancers that are more common in LMICs, including cancers associated with infection.

Further, the study of the heterogeneous populations of LMICs is likely to expand knowledge about cancer in ways that will help both rich and poor countries and populations alike. One example, recently featured in the US NCI Bulletin, is the Costa Rica HPV vaccine trial.[32]

Health systems research

Understanding how health systems perform and convert investments in CCC into service delivery and health outcomes is especially important in LMICs where resources are constrained. Although little work has been done in this area to date, there is new and potentially catalytic interest from the recently established National Cancer Institute (NCI) Center for Global Health.[33] This area of research involves qualitative and quantitative methods and should include both demand and supply-side analysis. Further, analysis of access should consider equity and distributional issues, as well as quality of services and responsiveness.[34]

This area of research covers all health system functions and how to integrate CCC into each. Thus, this information is essential to applying a diagonal approach to health system strengthening and CCC (see Section 4).[35,36] Metrics and methods such as National Health Accounts can be extended to promote better understanding of the interactions between CCC and health system performance.

Mapping interventions to resource availability and health system capacity is very useful for determining the most appropriate mix of CCC for each country. This resource stratification exercise has been undertaken for breast cancer and should be expanded to other cancers and NCDs.[37]

Costs and cost-effectiveness

The World Health Organization Choosing Interventions that are Cost-Effective (WHO-CHOICE) program uses standardized tools to assemble regional databases on the cost, impact on population health, and cost-effectiveness of key health interventions. It also provides tools to adapt regional results to the country level.[38] Unfortunately, insufficient data are available about both the costs of cancer control and treatment services, and the cost-effectiveness of such services in LMICs, although some progress is being made. For instance, estimates exist for indoor air pollution and tobacco use, and for treatment and detection of breast, cervical, and colorectal cancer.[39-41]

Relying on static cost-effectiveness estimates could initiate a vicious cycle that would be particularly harmful for LMICs because potentially affordable interventions would appear to be out of reach. This emphasizes the need to use a wide-ranging variety of inputs (sensitivity analysis), including expected future prices that reflect the opportunities to expand demand, reduce delivery costs, and incorporate new discoveries. Indeed, recent analyses on cervical cancer considered a substantial drop in the price of the vaccine, which is, in fact, occurring.[42,43]

Program evaluation and implementation research

Research on the implementation and impact of programs for CCC provides evidence that can be used for decision-making. This genre of research spans many areas of the CCC continuum: education and intervention programs around risk factors and early detection; interventions such as expanding access to breast clinical exams or mobile mammography; and strategies to improve the use of recommended treatments. Survivorship care in LMICs is an area where particularly little is known, and where program evaluation research would be particularly beneficial.

Research about barriers to improving care can be especially useful at the project-design phase. This should cover both supply-side (e.g., access to care) and demand-side (e.g., the impact of stigma, gender discrimination, and lack of knowledge) issues. Identifying barriers to care can help to ensure that limited resources are invested in appropriate and well-designed interventions for maximum impact (Text Box 9.2).

Research about barriers to improving care can be especially useful at the project-design phase.

The most rigorous evaluation research includes a quantitative component and a control group. Methodologies to ethically identify appropriate control groups are now available to aid this research.[44] Qualitative research is also useful.[45]

Text Box 9.2

Evidence-based approaches to identifying barriers and designing multifaceted education and intervention projects: Increasing awareness and enhancing early detection of breast cancer in Gaza strip[46]

Breast cancer is the most common cancer and the leading cause of death among women living in Gaza, one of the most densely populated cities in the world, with a population of 1.4 million living on a total area of 360 square kilometers (139 sq mi). Five-year survival rates are as low as 30-40% and are attributable to factors such as late-stage presentation, aggressive forms of breast cancer in Arab women, and young age at diagnosis.

The lack of resources for screening, diagnosis, and treatment pose severe challenges, which are exacerbated by ignorance about the disease and a lack of financial protection for women with cancer. Further, women residing in Gaza face the added barrier of fearing for one's safety while reaching medical facilities.

The very low breast cancer screening rate is likely the result of economic and institutional barriers, as well as societal and cultural barriers. A recent program was designed to assess women's understanding of breast cancer, use of screening mammography, and barriers to screening, in hopes of guiding the development of a comprehensive educational effort to target health care providers and their patients. This program has four stages: 1) a survey to identify barriers and opportunities; 2) development of education materials; 3) implementation of interventions; and 4) measurement of the impact of education and intervention.

In 2009, women living in Gaza or from Gaza and living in other countries, were surveyed. These women expressed interest in obtaining appropriate care, including mammography. The key barriers to breast cancer screening included lack of information, education, and access to good quality, affordable services in locations that could be safely reached. Religion and culture were not barriers to breast cancer screening.

In phase two, the study team developed educational materials for physicians and patients about barriers to screening, breast cancer risk factors, and methods to increase compliance with screening. These materials served to facilitate training for local Palestinian health care providers in multidisciplinary aspects of breast cancer including exposure to breast imaging, medical and surgical oncology, and breast pathology.

In April 2010, a booklet on breast cancer screening and a kit were published in Gaza with support for printing from CARE International. The third stage of the project, which involves training local health care providers, is currently underway. Recognizing the importance of evaluation research for refinement and scale-up, the fourth phase will include research to measure the impact of educational intervention on the attitudes of local physicians and their patients.

Precedents exist for evaluation research in LMICs, and these offer opportunities to expand work on CCC. One large-scale impact evaluation is *Oportunidades*, in Mexico, an anti-poverty, cash-transfer program that includes health, education, nutrition, and community development components.[47] *Oportunidades* has led to, and continues to lead to, better quality prenatal care for low -income women,[48] measurable improvements in birth weight outcomes,[49] and improvements in child growth and cognitive development.[50,51] Analyses of barriers to CCC have been undertaken using these data.[52]

Overall, relatively little program evaluation research focused on chronic illness or cancer has been done in LMICs. Most studies have focused on screening.[53,54]

Again, this area of research has been largely neglected and the commitment from the NCI Center for Global Health could be transformative.[55] More collaboration between high income and LMICs would help catalyze this research. Collaboration across academic, governmental, and private institutions is also crucial.[56] Text Box 9.3 highlights two successful collaborative programs.

More collaboration between high income and LMICs would help catalyze evaluation and implementation research.

Finally, because of the challenges and costs of evaluation research, it cannot be undertaken for all interventions or in all settings. Thus, available research should be generalized whenever possible, and results should be shared widely and disseminated globally.

A forum or network for collecting, vetting, sharing, and projecting results and lessons learned would be a valuable complement to research efforts and could be undertaken by institutions such as IARC or UICC. This could also be a major area of work for the new US National Cancer Institute's Center for Global Health.[57] (see Section 10). Such a network could take the form of a research core to help with training local research staff, provide input into study design, and recommend data collection tools and instruments for research projects. Additionally, it could help to pair advocates and researchers from LMICs with established researchers in projects that mimic what is being done in clinical oncology (see Text Box 6, Section 10).

A forum or network for collecting, vetting, sharing, and projecting results and lessons learned would be a valuable complement to research efforts.

Text Box 9.3
Strengthening collaboration for implementation and evaluation research

The St. Jude International Outreach Twinning Program in Pediatric Oncology *is an impressive example of a program that has dedicated substantial resources to implementation research in LMICs and to sharing lessons learned. This program "twins" hospitals in LMICs with St. Jude to provide more comprehensive and informed pediatric oncology care. To date, the program has more than twenty participating countries and hospitals. The St. Jude's team has published a series of research articles in leading professional journals, along with more open-access reports describing improvements in pediatric cancer care at the "twin" hospitals.*[58-63] *Resources have been dedicated to making this information available in several languages, including Spanish and Portuguese. Perhaps of greatest importance-, is that as part of the dedication to sharing information with the worldwide medical community, in 2002, St. Jude launched Cure4Kids, a comprehensive online resource dedicated to supporting the care of children with cancer and other catastrophic diseases. Today, Cure4Kids (www.Cure4Kids.org) has more than 24,000 registered users, in more than 175 countries.*[64] *One of the many important lessons learned and shared is that dedicated funding from the host hospital was essential to developing a sustainable and expansive program. St. Jude dedicates 1-2% of its annual income to the IOP program.*

Breast Cancer Program at Tikur Anbessa Hospital, in Addis Ababa: *The pilot Breast Cancer Program at Tikur Anbessa Hospital in Addis Ababa, Ethiopia, offers another example of a collaborative cancer initiative, in a developing country. This program, too, has a strong implementation research component, and an emphasis on reporting and sharing results and lessons learned. In 2005, AstraZeneca began sponsoring a com-prehensive program at the hospital to help build local capacity in the management of breast cancer, the second most common cancer among young women in the country. The objectives of the program were to strengthen human resource capacity, technical competency and advocacy, and to improve access to breast cancer treatment.*[65] *When the Ethiopia Breast Cancer Program started, the entire country had only one cancer specialist, with no mammography, no easy access to chemotherapy or hormonal agents, and no national treatment protocols.*[66]

The program focused on strengthening diagnosis and treatment capabilities at Tikur Anbessa Hospital by developing treatment guidelines, improving the patient referral system, raising awareness of services available among healthcare workers, providing training for other physicians in Ethiopia, and setting up an institution-based cancer registry. This model, which started as a small, targeted pilot, has evolved into an effective collaboration with the Ministry of Health and the Ethiopian Cancer Association.[67] *One direct measurable patient outcome of this program is reduced time between diagnosis and surgery, from 12-18 months in 2006 to 3-6 months in 2009.*[68]

Despite its modest size, the impact of this innovative, single-site initiative has had a broad, systemic reach. All of the guidelines and reporting forms developed under this program have been distributed to all university and regional hospitals in Ethiopia. Anastrazole and tamoxifen can now be dispensed at other hospitals to lighten the travel burden for some patients, and oncologists from Tikur Anbessa now travel to other hospitals to train local doctors in breast cancer treatment and care. This group has also been quite effective at disseminating their findings in the literature.[69-71]

9.iv. Capacity-building

In the case of CCC, as in many other areas of health, local academic, and policy-oriented institutions may be in the best position to measure health system performance by adopting globally applicable methods and tools. Improving capacity in HIS and research in LMICs is essential to CCC. Decision-makers at all levels should be included to ensure not only the production of evidence but also its uptake. Improved access to knowledge by free, online publication is an important contribution to local uptake.[72]

Local academic, and policy-oriented institutions may be in the best position to measure health system performance by adopting globally applicable methods and tools. Thus, improving capacity in HIS and research in LMICs is essential to CCC, and decision-makers at all levels should be included to ensure not only the production of evidence but also its uptake.

Academic institutions should encourage exchanges and steer faculty and trainees to global health research opportunities. Partnerships between local and global institutions can be very effective, but must balance global research agendas with local needs.[73,74]

Bilateral research funding, including agencies and professional associations, could be especially effective in building local capacity.

Bilateral research funding, including agencies and professional associations, could be especially effective in building local capacity. The Fogarty International Center, part of the US National Institutes of Health, supports research and capacity-building in global health with a focus on LMICs. Research training programs address priority areas including NCD and cancer. Two-thirds of grants support research training with a focus on providing grants directly to institutions in LMICs. The new NCI Center for Global Health and Cancer will also undertake and support training to build research capacity. This will generate opportunities for synergies and collaboration within NIH and with institutions based in LMICs.[75]

In the global arena, IARC is a major contributor to research and HIS capacity-building, and this role could be expanded if additional resources were made available.

In the global arena, IARC is a major contributor to research and HIS capacity-building, and this role could be expanded if additional resources were made available. Cognizant that many LMICs lack graduate training in chronic disease epidemiology, many fellowships support training in this area. These fellowships also serve as a resource for IARC's work on registries and population-based research. Of the five hundred fellowships awarded to junior scientists since 1966, approximately 85% returned to their home country upon completion of their training, and today, more than 80% remain active in cancer research.[76] In addition to fellowships, IARC hosts courses and several other exchanges and awards for scientists. These programs are important to building research capacity in cancer in LMICs, but funding limitations hinder scale-up. An increase in the participation of LMICs in IARC could help bridge this gap.

A diagonal approach to capacity-building is needed. The experience in building HIS for HIV/AIDS and other infectious diseases in LMICs provides valuable lessons about capacity-building for cancer. Further, existing HIS provide bases that can be expanded to include cancer and other NCDs on which to build research and generate knowledge, thereby maximizing limited resources and using infrastructure that is already in place.[77]

Experience with HIV/AIDS suggests that national public health institutes and other teaching and research institutions within LMICs, should be targeted for investment and capacity-building for cancer.

Experience with HIV/AIDS suggests that national public health institutes and other teaching and research institutions within LMICs should be targeted for investment and capacity-building for cancer (Text Box 9.4). They can provide structure for cancer information and research, and also for the development of national cancer plans, health promotion campaigns, delivery of screening and prevention programs, training, and dissemination of evidence to other stakeholders such as civil society.[78] Further, the International Association of National Public Health Institutes, which is dedicated to improving public health capacity through developing partnerships with members from around the world, could prove to be an important facilitator.

Text Box 9.4
International, multi-institutional partnerships for capacity-building in cancer research: Uganda Program on Cancer and Infectious Disease[79]

To conduct the most efficient and meaningful research on infection-related cancers, and to increase the potential for impact on these diseases, scientists from the Fred Hutchinson Cancer Research Center (FHCRC) in the US partnered with the Uganda Cancer Institute in Kampala, in 2004, to form the UPCID. The program has three core components: research, capacity-building, and care delivery.

Uganda Program on Cancer and Infectious Disease (UPCID) research projects aim to clarify and answer the fundamental questions that could lead to comprehensive prevention and treatment for infection-related malignancies. One of the research areas currently being pursued is the characterization of the natural history of progression, from primary acquisition of viral oncogenes to the establishment of chronic infection and the eventual development of malignancies. A striking feature of infection-related cancers is that more than 70% of persons throughout the world are infected with at least one pathogen that can cause cancer, but less than 0.1% will ever develop cancer. Collaborative research between scientists at the UCI and FHCRC is investigating the pathophysiology of tumorigenesis, and simultaneously discovering and validating blood- and saliva-based biomarkers to identify individuals at highest risk for developing cancer. Another example is research on novel therapies and care delivery methods specific to infection-associated cancers. These new therapeutics, in particular, will target the etiologic infectious agent, leading to reduced toxicity, increased efficacy, and lower cost. Each of the methods under evaluation could result in new prevention, and treatment strategies that could be used in both resource-rich and resource-poor settings.

The lack of personnel trained in cancer research, care delivery, and education is among the greatest challenges faced by UPCID, as the few with expertise must simultaneously conduct cutting-edge research and provide patient care, and also provide administrative leadership. Still, and thanks in great part to strong training initiatives, substantial progress has been made over the first five years of UPCID (see Section 6). More than a dozen research projects are currently under way at the research clinic, with work to date elucidating the pathogenesis, diagnosis, and treatment of Kaposi sarcoma and lymphoma, the two most common cancers in sub-Saharan Africa.[80-83]

9.v. Conclusions and recommendations

Opportunities for global and national uptake

Measurable health system performance targets directly related to cancer are needed to develop global and national frameworks for monitoring progress.

The Declaration of the High-Level Meeting of the UN General Assembly on the Prevention and Control of NCDs, highlights the importance of research on all aspects of prevention and control, as well as innovation and science technology. It also reflects the gap that must be filled by translating this research into knowledge and evidence so that it can be used for action. This emphasizes the need for greater investment in this area, which could and should be heeded by national and international players.

The Declaration does not actually establish a set of specific targets or a formula to measure, monitor, or evaluate progress. By the end of 2012, however, WHO is charged with developing a comprehensive global monitoring framework and recommendations for a set of voluntary, global targets for the prevention and control of NCDs. In less specific language, national governments are encouraged, and guided by, WHO, to establish targets and indicators.

By the end of 2012, WHO is charged, as part of the Declaration of the High-Level Meeting of the UN General Assembly on the Prevention and Control of NCDs, with developing a comprehensive global monitoring framework and recommendations for a set of voluntary, global targets for the prevention and control of NCDs.

Measurable health system performance targets directly related to cancer are needed to develop these global and national frameworks for monitoring progress. This will require developing and applying metrics designed to measure performance.[84] These must be disease-specific, yet also integrated into health information systems and linked to horizontal health system goals– another application of the diagonal approach.

Academic, research, donor, and national and international agencies should work together to ensure that these targets and measures are developed. Global monitoring and surveillance promotes accountability, which helps ensure that targets are achieved. Prior experiences, such as global efforts to monitor fulfillment by countries of the terms set out in the Convention on the Rights of the Child, provide lessons.[85] Recent work related to the MDGs has analyzed commitments to advance the global strategy on women's and children's health, and a special Commission on Information and Accountability produced a series of concrete recommendations.[86] One of the aims is to ensure global oversight and so from 2012-2015, an Expert Review Group of external advisors will report regularly to the UN Secretary General on results and resources.[87] This framework for accountability on investment in women's and children's health can, and should, be applied to work on cancer and NCDs.[88]

Global monitoring and surveillance promotes accountability, which will help ensure that targets around NCDs are achieved.

Converting information into decision-making on CCC requires both the generation of evidence and its uptake by policy makers in LMICs. This implies linking evidence to health system strengthening, and closing the relevance-excellence gap[89] to make information more accessible and easily converted into policy. To improve translation of evidence into policy, frameworks for monitoring and surveillance that are linked to overall health system performance must be considered in national cancer plans.

Specific recommendations to improve evidence for decision-making by strengthening health information systems and the research base

1. Increase the availability of global and domestic funding for HIS and for research on cancer in LMICs, that can be applied directly to initiatives in-country through international collaborations, and for global comparative projects such as Globocan.
2. Expand training opportunities for researchers and evidence-builders based in LMICs, as well as for decision-makers, to enable them to make more effective use of data on cancer.
3. As a tool for promoting better research and decision-making, establish free access to journals and to public digital libraries of evidence on CCC for researchers and decision-makers in LMICs. Establish a clearinghouse for CCC research that could be based at IARC.
4. Strengthen the set of cancer registries in LMICs and the global HIS on cancer by identifying existing registries that can be improved and countries wherein registries can be established. This will require additional investment by IARC participating states and/or bi-lateral agencies.
5. Apply novel methodologies and metrics to research on cancer, and institutionalize these analyses in LMICs to support better decision-making.
6. Expand the capacity and funding for evaluation of projects and programs to implement more effective delivery of the full spectrum of CCC services.
7. Expand the capacity and funding for health services and implementation research concerning cancer in LMICs with special attention to human and physical resource needs as well as opportunities for better use of information and communication technology (ICT) and telemedicine.
8. To disseminate the results of implementation research, establish a clearing-house of programs, policies, and projects that acknowledges the multiple stake-holders and providers (governmental, civil society, and private sector), and the opportunity to promote global learning from both failed and successful interventions.
9. Develop and apply measures that demonstrate the importance and effectiveness of pain relief, recognizing it as a human right that is not adequately reflected in existing indicators.
10. Link research on CCC to research on health system strengthening.

References

1. Hanna T, Kangolle A. Cancer control in developing countries: using health data and health services research to measure and improve access, quality and efficiency. *BMC International Health and Human Rights*. 2010;10(1):24.
2. Mellstedt H. Cancer initiatives in developing countries. *Annals of Oncology*. 2006;17(suppl 8):viii24-viii31.
3. Global Forum for Health Research. About: 10/90 gap. Global Forum for Health Research. 2011. http://www.globalforumhealth.org/about/1090-gap/ (accessed October 5, 2011).
4. Annan KA. Challenge to the world's scientists. *Science*. 2003;299:1485.
5. Wagner CS, Grahmakulam I, Jackson B et al. *Science and Technology Collaboration: Building Capacity in Developing Countries*. Arlington, VA: RAND Corporation, 2001.
6. Ferlay J, Shin HR, Bray F, Forman D, Mathers C, Parkin DM. GLOBOCAN 2008, Cancer Incidence and Mortality Worldwide: IARC CancerBase No.10. Lyon, France: International Agency for Research on Cancer; 2010. http://globocan.iarc.fr (accessed October 5, 2011).
7. Ferlay J, Shin HR, Bray F, Forman D, Mathers C, Parkin DM. Estimates of worldwide burden of cancer in 2008: GLOBOCAN 2008. *International Journal of Cancer*. 2010;127:2893-917.
8. Parkin DM, Ferlay J, Curado MP, Bray F, Edwards B, Shin HR, Forman D. Fifty years of cancer incidence: CI5 I-IX. International Journal of Cancer. 2010; 127: 2918–2927.
9. Curado MP, Edwards B, Shin HR, Strom H, Feray J, Heanue M. *Cancer Incidence in Five Continents, Vol. IX*. Lyon, France: International Agency for Research on Cancer: IARC Scientific Publications No. 160; 2007.
10. Parkin DM. The evolution of the population-based cancer registry. *Nature Reviews Cancer*. 2006;6:603-612.
11. Akhtar F, Pheby DFH. Cancer Research and Registration: Presenting a case for population-based cancer registries in Pakistan. *Pakistan Journal of Medical Research*. 2004;43(1).
12. Parkin DM, Chen VW, Ferlay J, Galceran J, Storm HH, Whelan SL. *Comparability and quality control in cancer registration*. IARC Technical Report No. 19. Lyon, France: International Agency for Research on Cancer, 1994.
13. Bray F, Parkin DM. Evaluation of data quality in the cancer registry: Principles and methods. Part I: Comparability, validity, and timeliness. *European Journal of Cancer*. 2009;45:747-755.
14. Parkin DM, Bray F. Evaluation of data quality in the cancer registry: Principles and methods. Part II. Completeness. *European Journal of Cancer*. 2009;45:756-64.
15. Surveillance, Epidemiology, and End Results (SEER) Program of the National Cancer Institute. Overview of the SEER program. National Cancer Institute. 2011. http://seer.cancer.gov/about/overview.html (accessed October 6, 2011).
16. International Agency for Research on Cancer. GLOBOCAN 2008: Cancer incidence and mortality worldwide in 2008. International Agency for Research on Cancer. 2011. http://globocan.iarc.fr/ (accessed October 5, 2011).
17. International Association of Cancer Registries. About IACR: History and aims of the association. International Association of Cancer Registries. 2011. http://www.iacr.com.fr/ (accessed October 5, 2011).
18. International Network for Cancer Treatment and Research. Cancer Registration. International Network for Cancer Treatment and Research. 2011. http://www.inctr.org/programs/cancer-registration/ (accessed October 5, 2011).
19. Fontham ETH. A conversation with Pelayo Correa. *Epidemiology*. 2010;21(1):154-157.
20. Universidad del Valle, School of Medicine, Department of Pathology. Cali Cancer Registry. Universidad del Valle. 2011. http://rpcc.univalle.edu.co/es/index.php (accessed October 6, 2011).
21. Curado MP, Edwards B, Shin HR, et al, 2007.
22. Fontham ETH. A conversation with Pelayo Correa. *Epidemiology*. 2010;21(1):154-157.
23. Davies JN. The pattern of African cancer in Uganda. *East African Medical Journal*. 1961;38:486-491.
24. Parkin DM, Wabinga H, Nambooze S. Completeness in an African cancer registry. *Cancer Causes Control*. 2001;12:147-52.
25. Gondos A, Brenner H, Wabinga H, Parkin DM. Cancer survival in Kampala, Uganda. *British Journal of Cancer*. 2005; 95:1808-12.
26. Parkin DM, Wabinga H, Nambooze S. Completeness in an African cancer registry. *Cancer Causes Control*. 2001;12:147-52.
27. Ibid.
28. Orem J, Wabinga H. The Roles of National Cancer Research Institutions in Evolving a Comprehensive Cancer Control Program in a Developing Country: Experience from Uganda. *Oncology*. 2009;77:272-80.
29. Pain and Policy Studies Group. Opioid consumption data overview. Pain and Policy Studies, University of Wisconsin. 2011. http://www.painpolicy.wisc.edu/internat/opioid_data.html#source (accessed October 6, 2011).
30. International Narcotics Control Board. Narcotic drugs – technical reports. International Narcotics Control Board. . 2011. http://www.incb.org/incb/narcotic_drugs_reports.html (accessed April 30, 2011).
31. Mellstedt H. Cancer initiatives in developing countries. *Annals of Oncology*. 2006;17(suppl 8):viii24-viii31.
32. Winstead ER. HPV Vaccine Study in Costa Rica Yields Insights on Cancer Prevention. *National Cancer Institute Bulletin*. 2011;8(18). http://www.cancer.gov/ncicancerbulletin/092011/page2 (accessed October 6, 2011).
33. Varmus H, Trimble EL. Integrating cancer control into global health. *Science Translational Medicine* 2011; 3(101):28.
34. World Health Organization. *The World Health Report 2000 - Health systems: improving performance*. Geneva, Switzerland:World Health Organization, 2000.
35. Sepúlveda J, Bustreo F, Tapia R, et al. Improvement of child survival in Mexico: the diagonal approach. *Lancet* 2006; 368(9551): 2017-27.
36. Frenk J. Bridging the divide: global lessons from evidence-based health policy in Mexico. *Lancet*. 2006;369(9539):954-61.
37. Anderson BO, Yip CH, Ramsey SD, Bengoa R, Braun S, Fitch M, et al. Breast cancer in limited-resource countries: health care systems and public policy. *The Breast Journal*. 2006;12(s1):S54-S69.
38. World Health Organization. Choosing interventions that are cost effective (WHO-CHOICE). World Health Organization. 2005. http://www.who.int/choice/en/ (accessed October 6, 2011).
39. Ibid.
40. Valencia-Mendoza A, Sánchez-González G, Bautista-Arredondo S, Torres-Mejía G, Bertozzi SM. Costo-efectividad de políticas para el tamizaje de cáncer de mama en México/Cost-effectiveness of breast cancer screening policies in Mexico. *Salud Pública de México*. 2009;51(Supl.2).
41. Groot MT, Baltussen R, Uyl-de Groot CA, Anderson BO, Hortobágyi GN. Costs and health effects of breast cancer interventions in epidemiologically different regions of Africa, North America, and Asia. *Breast Journal*. 2006;12(1):81.
42. Ginsberg G, Edejer T, Lauer J, Sepulveda C. Screening, prevention and treatment of cervical cancer – A global and regional generalized cost-effectiveness analysis. *Vaccine*. 2009;27(43):6060-79.
43. Global Alliance for Vaccines and Immunization. Press Release GAVI welcomes lower prices for life-saving vaccines. 6 June, 2011. http://www.gavialliance.org/library/news/press-releases/2011/gavi-welcomes-lower-prices-for-life-saving-vaccines/ (accessed October 4, 2011).
44. Fernald LC, Gertler PH, Neufeld LM. 10-year effect of Oportunidades, Mexico's conditional cash transfer programme, on child growth, cognition, language, and behavior: a longitudinal follow-up study. *Lancet*. 2009;374:1997-2005.
45. Nigenda G, Caballero M, Gonzalez-Robledo LM. Access barriers in early diagnosis of breast cancer in the Federal District and Oaxaca. *Salud Publica de Mexico*. 2009;51(Suppl 2):s254-62.
46. Shaheen R, Slanetz P, Raza S, Rosen M. Barriers and opportunities for early detection of breast cancer in Gaza women. *Breast*. 2011;20(2):s30-s4
47. Programa de Desarrollo Humano Oportunidades. Homepage: Opportunidades. Gobierno de Mexico. 2011. www.oportunidades.gob.mx/portal (accessed October 6, 2011).
48. Barber SL, Gertler PJ. Empowering women to obtain high quality care: evidence from an evaluation of Mexico's conditional cash transfer programme. *Health Policy and Planning*. 2009;24:18-25.
49. Barver SL, Gertler PJ. The impact of Mexico's conditional cash transfer programme, Oportunidades, on birthweight. *Tropical Medicine and International Health*. 2008;13:1405-14.
50. Fernald LC, Gertler PH, Neufeld LM. 10-year effect of Oportunidades, Mexico's conditional cash transfer programme, on child growth, cognition, language, and behavior: a longitudinal follow-up study. *Lancet*. 2009;374:1997-2005.
51. Fernald LC, Gertler PJ, Neufeld LM. Role of cash in conditional cash transfer programmes for child health, growth and development: an analysis of Mexico's Oportunidades. *Lancet*. 2008;371:828-37.
52. Sosa-Rubí SG, Walker D, Serván E. Práctica de mastografías y pruebas de Papanicolaou entre mujeres de áreas rurales de México. *Salud Pública de México*. 2009;51(suppl.2):s236-45.
53. Sepúlveda C, Prado R. Effective cervical cytology screening programmes in middle -income countries: the Chilean experience. *Cancer Detection and Prevention*. 2005;29(5):405-11.
54. Deerasamee S, Srivatanakul P, Sriplung H, et al. Monitoring and evaluation of a model demonstration project for the control of cervical cancer in Nakhon Phanom province, Thailand. *Asian Pacific Journal of Cancer Prevention*. 2007;8(4): 547-56.
55. Varmus H, Trimble EL, 2011.
56. Mellstedt H. Cancer initiatives in developing countries. *Annals of Oncology*. 2006;17:viii24-viii31.
57. Varmus H, Trimble EL, 2011.
58. Wilimas JA, Wilson MW, Haik BG, et al. Development of retinoblastoma programs in Central America. *Pediatric Blood & Cancer*. 2009;53(1):42-6.
59. Ribeiro R, Pui CH. Treatment of acute lymphoblastic leukemia in low-and middle -income countries: Challenges and opportunities. *Leukemia & Lymphoma*. 2008;49(3):373-6.

60. Rivera GK, Quintana J, Villarroel M, et al. Transfer of complex frontline anticancer therapy to a developing country: The St. Jude osteosarcoma experience in Chile. ***Pediatric Blood & Cancer***. 2008;50(6):1143-6.
61. Rodriguez-Galindo C, Wilson MW, Chantada G, et al. Retinoblastoma: one world, one vision. ***Pediatrics***. 2008;122(3):e763-e71.
62. Leander C, Fu LC, Peña A, et al. Impact of an education program on late diagnosis of retinoblastoma in Honduras. ***Pediatric Blood & Cancer***. 2007;49(6):817-9.
63. Howard SC, Pui CH, Ribeiro RC. Components of cure: treatment of acute lymphoblastic leukemia in Indonesia and other low -income countries. ***Pediatric Blood & Cancer***. 2008;51(6):719-21.
64. St. Jude Children's Research Hospital. About International Outreach. St. Jude Children's Research Hospital. 2011. http://www.stjude.org/stjude/v/index.jsp?vgnextoid=2f166f9523e70110VgnVCM1000001e0215acRCRD&vgnextchannel=e41e6fa0a9118010VgnVCM1000000e2015acRCRD (accessed October 6, 2011).
65. Dye TD, Bogale S, Hobden C, et al. Complex care systems in developing countries: breast cancer patient navigation in Ethiopia. ***Cancer***. 2010;116(3):577-85.
66. International Federation of Pharmaceutical Manufacturers and Associations. Resources: Partnerships Directory. International Federation of Pharmaceutical Manufacturers and Associations. 2010. http://www.ifpma.org/resources/partnerships-directory.html (accessed October 6, 2011).
67. Reeler A, Sikora K, Solomon B. Overcoming challenges of cancer treatment programmes in developing countries: a sustainable breast cancer initiative in Ethiopia. ***Clinical Oncology***. 2008;20(2):191-8.
68. Ibid.
69. Ibid.
70. Reeler A, Qiao Y, Dare L, Li J, Zhang AL, Saba J. Women's cancers in developing countries: from research to an integrated health systems approach. ***Asian Pacific Journal of Cancer Prevention***. 2009;10:519-26.
71. CanTreat International. Access to cancer treatment in low- and middle -income countries: An essential part of global cancer control. Shenzhen, China: 2010. p. 1-23.
72. Harold Varmus. The art and politics of science. New York, NY: WW Norton & Company, 2009.
73. Council on Health Research for Development. Health research: getting the priorities right. Policy Brief No 2004.1. Geneva.Switzerland: Council on Health Research for Development, 2004. http://www.cohred.org/publications/library-and-archive/health_research_gett_1_211/ (accessed October 6, 2011).
74. Mellstedt H. Cancer initiatives in developing countries. ***Annals of Oncology***. 2006;17(8):viii24-viii31.
75. Varmus H, Trimble EL, 2011.
76. International Agency for Research on Cancer. Education and Training: IARC Fellowships for Cancer Research. International Agency for Research on Cancer. 2011. http://www.iarc.fr/en/education-training/index.php (accessed October 6, 2011).
77. World Health Organization Maximizing Positive Synergies Collaborative Group. An assessment of interactions between global health initiatives and country health systems. ***Lancet***. 2009;373(9681):2137-69.
78. Frieden T, Koplan J. Stronger national public health institutes for global health. ***Lancet***. 2010;376(9754):1721-2.
79. Casper C, Sessle E, Phipps W, Yager J, Corey L, Orem J. Uganda Program on Cancer and Infectious Diseases. GTF.CCC Working Paper Series, Paper No. 2, Harvard Global Equity Initiative, 2011.
80. Bateganya MH, Stanaway J, Brentlinger PE, et al. Predictors of survival after a diagnosis of non-Hodgkin lymphoma in a resource-limited setting: A retrospective study on the impact of HIV infection and its treatment. ***Journal of Acquired Immune Deficiency Syndromes***. 2011;56(4):312-9.
81. Nguyen H, Okuku F, Ssewankambo F, et al. AIDS-associated Kaposi sarcoma in Uganda: response to treatment with highly active antiretroviral therapy and chemotherapy. ***Infectious Agents and Cancer***. 2009;4(Suppl 2):O5.
82. Casper C. The increasing burden of HIV-associated malignancies in resource-limited regions. ***Annual Review of Medicine***. 2010;62:157-70.
83. Phipps W, Sewankambo F, Nguyen H, et al. Gender Differences in clinical presentation and outcomes of epidemic Kaposi sarcoma in Uganda. ***PLoS ONE***. 2010;5(11):e13936.
84. Samb B, Desai N, Nishtar S, et al. Prevention and management of chronic disease: a litmus test for health-systems strengthening in low -income and middle -income countries. ***Lancet***. 2010;376(9754):1785-97.
85. UNICEF. Convention on the Rights of the Child: Monitoring the fulfilment of States obligations. World Health Organization. 2011. http://www.unicef.org/crc/index_30210.html (accessed October 6, 2011).
86. Partnership for Maternal, Newborn and Child Health. The PMNCH 2011 Report: Analyzing Commitments to Advance the Global Strategy for Women's and Children's Health. World Health Organization. 2011. http://www.who.int/pmnch/topics/part_publications/PMNCH_Report_2011_-_29_09_2011_full.pdf (accessed October 4, 2011).
87. Every Woman Every Child. Expert Review Group Members. World Health Organization. 2011. http://everywomaneverychild.org/resources/independent-expert-review-group/expert-review-group-members. (accessed October 6, 2011)
88. Time for action in New York on non-communicable diseases. ***Lancet***. 2011;378(9795):961.
89. Frenk J, Knaul F, Gómez-Dantés O. Closing the relevance-excellence gap in health research: the use of evidence in Mexican health reform. In Matlin S (Ed.). Global Forum Update on Research for Health, p. 48-53. London: Pro-Brook Publishing, 2005. Pro-book London.

Strengthening Stewardship and Leadership to Expand Access to Cancer Care and Control

Section 10

Section 10

Strengthening Stewardship and Leadership to Expand Access to Cancer Care and Control

Key messages

- As highlighted in the Political Declaration of the 2011 High-level Meeting of the UN General Assembly on the Prevention and Control of Non-communicable Diseases (UN HLM NCDs), existing national and global institutions, and especially the World Health Organization (WHO), must be strengthened to provide more effective stewardship and to produce essential global and national public goods.

- Time -bound goals need to be developed, built into country and global strategies, and matched with strong monitoring and accountability frameworks. The Declaration of the UN HLM requests that WHO establish a framework by 2012 and encourages national governments to do the same by 2013.

- WHO and IARC are the lead UN institutions on cancer care and control (CCC) and they require a renewed and strengthened agenda that focuses on producing global public goods. Resources must be made available to enable both institutions to implement this agenda.

- Multilateral agencies, such as the World Bank, as well as bilateral agencies have been largely absent from cancer care and control (CCC) and need to be engaged.

- Private sector engagement has been limited and should be stepped up in order to successfully expand access to CCC.

- An independent multi-agency, multi-stakeholder, multisectoral partnership of experts and leaders should be established.

- National mulitsectoral, multi-stakeholder commissions should be established to help move forward expanded CCC activities at country level.

- The global cancer arena has expanded significantly over the past decades. The world is poised to launch all-inclusive, multisectoral and multi-stakeholder global and national cancer movements.

- Activities around CCC can spur global and national responses to the challenge of NCD and chronic illness.

10.i. Introduction

Lack of stewardship and political leadership in global health and within the global cancer community has limited awareness, financing, and access to CCC in LMICs. As a result, many of the global and national public goods needed to increase access to CCC are absent. Strong stewardship and leadership are essential to mobilize global and country-level stakeholders to achieve the recommendations outlined in this Report and to implement the strategies set forth in the Declaration of the UN HLM on NCDs.

10.ii. Stewardship in health

Ministries of Health are the ultimate stewards, not only of national health systems but also of global health. They play a key role in global health stewardship by representing their countries in the governing bodies of international agencies and ensuring that the Paris and Accra Principles of country ownership are consistently upheld to achieve effective aid.[1]

Stewardship –the leadership of global, national and sub-national health systems– is considered the most important health system function, as it influences all other health system functions. Further, stewardship and leadership in the cancer arena encompasses players from outside the health sector, and in many areas of public policy. Yet in LMICs, stewardship and leadership of health systems and the capacity of ministries of health to interact with other sectors is often weak.[2]

Text Box 10.1
Stewardship

National stewardship of health involves the provision of strategic direction for all players in the health system as well as those that work outside of the system and that can influence the health sector (e.g. finance, agriculture, environment). Stewardship activities include: generating and disseminating information and evidence; promoting and implementing the results of research; budgeting and allocating resources across health priorities; and, consensus-building and agenda-setting in order to define and implement national health policy. Establishing norms, regulation and eliciting compliance are especially important and have particular applications to certain aspects of cancer treatment as controlled inputs and substances are used (e.g. opioids, radiation therapy).[3]

Globally, stewardship involves the production and dissemination of public goods that are important to health systems, but usually are not produced by individual countries.[4-7] *Global stewardship includes: production of knowledge that benefits all countries; production and monitoring of global frameworks for action (e.g. Millennium Development Goals, WHO Framework Convention on Tobacco Control); development of harmonized norms and standards for use by countries; regulation of international transactions including service provision and global risks; global solidarity for health financing [e.g. UNITAID); consensus-building and agenda-setting for global health actions (such as the UN HLM on the Prevention and Control of NCDs); and actions to determine, implement, and monitor global policies to enhance access to effective medicines (e.g. DOHA Declaration on Trade-related Aspects of Intellectual Property Rights (TRIPS)].*[8,9]

Another global public good is controlling the cross-border spread of disease. Although traditionally limited to communicable diseases, with globalization the spread of behavioral risk factors and environmental hazards also falls under this rubric. One of the most effective and important tools for controlling cancer –the WHO Framework Convention on Tobacco Control (FCTC)– is a global public good.

Public goods have an important impact on global health and CCC. Thus, the stewardship function of ministries of health and governments must be strengthened to achieve effective policies for expanded CCC. This will require increasing awareness among policy makers at all levels and capacity building to ensure timely uptake and application of knowledge and evidence (see Section 9).

National cancer, health, and development plans are stewardship roadmaps that target national and global priorities. Aligning and perfecting national plans for specific diseases, health, and development produces an integrated mapping of stewardship. A national cancer plan provides strategic direction for all activities and actors specific to cancer. Thus, CCC should be mainstreamed into national health and development plans. The same is true for other NCDs and chronic illness.

Text Box 10.2
National cancer plans

A critical step in improving stewardship capacity is to produce a national cancer plan that incorporates and engages all constituencies and established measureable goals and methods of accountability. The process for creating national plans should be derived from multisectoral commissions that are led by ministries of health but include representation of all stakeholders involved with CCC in-country.

Still, many LMICs have yet to include cancer in their national health plans, few have plans specific to cancer, and even fewer have established comprehensive cancer plans that identify candidate cancers and compelling opportunities to set priorities. Countries that do have plans tend to cover only cervical and breast cancer, or tobacco. A survey by WHO in 2001 covering 167 countries showed that only half of all countries had national cancer plans, and in Africa the figure was only 15%.[10]

Based on a review of 20 LMICs undertaken for this Report and covering all regions, only a third had national cancer control strategies and/or programs in place. More than half had policies or programs specifically on cervical and/or breast cancer, but only about a quarter had national tobacco control programs. Only four countries had in existence or were in the process of drafting overall NCD policies, plans or programs.

WHO and global agencies can provide useful guidance and support for developing and integrating national cancer plans. The WHO framework for National Cancer Plan Development is one example.[11] *A very useful contribution by WHO, IARC or even the civil society institutions discussed below, would be to track the number of countries with plans and use this as a simple, measureable indicator of progress that can be monitored on an annual basis.*

10.iii. Stewardship and leadership for CCC: building global and local stakeholder networks

The increasing complexity of cancer, and health systems over all, has generated a new set of challenges on the local and global stage as well as opportunities for stewardship and leadership. The number and types of players, and their ability to voice opinions, affect policy and provide core financing has expanded significantly over the past few decades.[12] Indeed, internationally agreed upon principles of aid effectiveness, as well as strategy documents from international organizations, stress the need to foster broad dialogue as part of country ownership.[13,14]

Development of effective global and local CCC depends on mobilizing multiple stakeholders spanning all levels of government, including legislators, patient groups and communities affected by the disease, multilateral development and financing institutions, normative and technical agencies, bilateral agencies, civil society organizations, research institutions, philanthropic institutions, and the private sector.[15] Effective stewardship and leadership for CCC must draw on the energies of all global and local players to establish networks for effective dialogue and to foster country ownership.[16,17]

Many of the global and local actors (international financial institutions, related UN agencies, bilateral donors) who can and should be more involved in guaranteeing the provision of CCC have stayed out of this arena. In some cases, this is because cancer has been neglected or at least under-recognized in priority setting in global health – an error of ignorance. In others, it is because of the minimalist philosophy that insists on investing only in communicable disease.

The barriers that have been erected around the false dichotomy of horizontal versus vertical programs also pose impediments to effective action. Few examples exist of horizontal institutions working together with cancer-specific agencies, either in the realm of global health or national health systems. Even the organizations working on sexual, reproductive and women's health have tended to neglect women's cancers as a priority, despite the burden of cervical and other women's cancers in LMICs.[18,19] Similarly, childhood cancer, and in fact all childhood NCDs, are missing from the agenda of international agencies devoted to child health such as UNICEF.

Finally, stakeholders involved in CCC have tended in the past to act in a fragmented manner, often focusing only on specific cancers, with few linkages to other cancers, diseases, or health system actors or goals. This means many of the strongest civil society institutions working on cancer are highly specific and lack broadly-based networks to catalyze health system approaches to expanding access to CCC.

This underscores the importance of establishing multi-sectoral, multi-stakeholder forums to support, pressure, and guide governments and global organizations. As discussed below, several global forums exist and these need to be strengthened, made more inclusive and better linked to work with global, multilateral and bilateral agencies. In LMICs, multi-stakeholder task forces need to be created and linked to national and sub-national forums on health.

In summary, exploring avenues for collaboration can greatly strengthen both work on cancer and on achieving broader health system goals. Further, national and global leaders and stewards should interact and be mutually reinforcing. This will promote a healthy feedback of knowledge, consensus-building, development of public goods, and policy making.[20]

10.iv. The myriad of players in global and national CCC

This Report recommends leveraging global institutions and national systems (health and others that influence CCC) as well as mobilizing key stakeholders in the health arena. To contribute to this work, the Report includes a mapping of a selection of the leading global and national institutions working in the cancer arena.

The results build on earlier analysis.[21] They demonstrate the depth and breadth of potential global participants, including cancer-specific, other disease focused, broader health, and development oriented institutions, that should and could be more effectively and comprehensively mobilized.[22]

In most LMICs, there is a similar richness of organizations working nationally and often sub-nationally (see Text Box 10.3 on Jordan for an example). Even in countries where there may be only a few actors, a careful mapping exercise is useful as it aids in identifying opportunities to promote the creation of new institutions.

Text Box 10.3

Mapping national actors: the Jordan case

A complete mapping of both the global and national players in CCC would be useful to guide stewards and leaders and strengthen their capacity to move forward.[23] To illustrate the potential of these data, Jordan is included as an example, focusing solely on those institutions directly involved in CCC. A list is provided below with a summary of the stewardship role played by each organization and identifying some future opportunities.

Table 1

Mapping of the CCC Arena in Jordan

Actor	Role
Key National Actors	
Ministry of Health (MoH)	**Current** • Provide regulatory mechanisms around healthcare overall • Allocate government resources to cancer within the health care budget • Manage the cancer registry • Provide primary, secondary and tertiary healthcare services through: 57 comprehensive healthcare centers, 368 primary healthcare centers and 29 hospitals • Provide variable cancer care across facilities; chemotherapy administered only in Al-Basheer Hospital **Prospective** • Intends to develop national CCC plan or strategy and enhance registry • Intends to establish National Cancer Institute (NCI) to strengthen and standardize care across the country, conduct cancer surveillance, manage research and training; KHCC has potential to be designated responsibility of an NCI
King Hussein Foundation and Center (KHCF/C)	**Current** • Largest cancer care provider (not-for-profit) and cancer specific non-governmental organization in Jordan • Treats majority of new and on-going cancer patients in the country annually • Only comprehensive cancer care provider in Jordan and the Middle East with accreditation from the Joint Commission as a disease-specific cancer center • Regional hub for training and complex treatments, including bone marrow transplants • Only facility aside from the military with authority to import essential drugs for cancer treatment that are otherwise not available in Jordan • Largest insurer providing affordable cancer treatment coverage to residents of Jordan • Through various endowments and charitable funds, provides funding for treatment of indigent patients who do not have insurance and are not able to obtain any other coverage • Strong projects and technology (P&T) committee that examines pharmacoeconomics of cancer medications and has authority to conduct formulary management/approvals • KHCC is a WHO regional collaborative center **Prospective** • Model facility for high quality cancer care within in the country to help upgrade standards for both government and non-governmental providers • Expand the number of patients covered by KHCF's insurance program (known as Health Care Program). • Expand the pharmacoeconomics unit to include other health economic decision-making and advocate for MOH to adopt KHCC recommendations on national formulary

Table 1

Mapping of the CCC Arena in Jordan (continued)

Actor	Role
Key National Actors	
Jordan Breast Cancer Program	• Established under the leadership and support of the KHCF/C With the directive of MOH • Coordinates and conducts national screening program for breast cancer, particularly advocacy and capacity building efforts for provision of related services[24]
King Abdullah University Hospital	• One of two main teaching hospitals with range of cancer care capacity and primary coverage of patients in the Irbid region
Jordan University Hospital	• One of two main teaching hospitals with range of cancer care capacity
Royal Medical Services	• 11 hospitals for active and retired military and security personnel, and their families • Independent budget and insurance scheme • Cancer care provided in varying and limited degrees across facilities; and one facility where chemotherapy is administered
Other private providers	• 59 hospitals, majority are affiliated to the Private Hospitals Association of Jordan • Limited cancer care provided in varying degrees across facilities, including primary care clinics
NGOs and charities	• Serve specific catchment areas and under-privileged populations
United Nations Relief and Works Agency	• Operates 23 health centers providing primary and preventive healthcare services • Serve as point of referral for cancer care at governmental and private facilities
Joint Procurement Directorate	• Negotiates and conducts national drug procurement, including oncology drugs • Procurement based on WHO List of Essential Medicines
Other Stakeholders	
Middle East Cancer Consortium	• Partnership between United States and MOHs in Cyprus, Egypt, Israel, Jordan, and the Palestinian Authority to reduce the incidence and impact of cancer in the Middle East through the solicitation and support of collaborative research; limited activity in Jordan currently[25]
US-Middle East Partnership for Breast Cancer Awareness and Research	• Public-private partnership between the US State Department, Susan G. Komen for the Cure and countries in the Middle East region, including Jordan, to raise awareness • Transitioning into an independent, regional entity

WHO

WHO is the international health agency responsible for providing global public goods in health, including those for CCC. The Declaration of the UN HLM emphasizes the role of WHO as the lead institution in promoting global action on cancer and other NCDs.

The WHO Framework Convention for Tobacco Control (FCTC) has 168 signatories and is widely used for policy change in many countries exemplifying the global reach and influence of the institution.[26] The FCTC is, in fact, the world's most important legal instrument against cancer.

Should strengthen its, WHO has not assumed an effective leadership role in CCC. The few resources allocated to this area are largely focused on country-level work and too little emphasis is placed on core global public goods. One example is approving essential drugs, which creates bottlenecks in all areas of CCC, as well as for other disease-specific work.

There is potential for WHO to forge internal links among disease-specific programs by applying a diagonal approach.[27] One example is in metrics and evidence building. An area of promising work is being undertaken by CHOICE with cost-effectiveness analysis for breast, cervical and colorectal cancer interventions, and there are other pending projects, such as developing disease-specific National Health Accounts, that merit funding and technical support from WHO.[28]

Links to the communicable diseases departments continue to be weak and represent an untapped area for action. This is a concern that is virtually ubiquitous in the CCC and NCD communities and thus an area where WHO could provide catalytic leadership. The first step is to begin dialogue with HIV/AIDS and NCD groups to identify areas of common linkages in prevention, treatment and care. The Pink Ribbon Red Ribbon initiative is a good first example. [29]

Obvious, and to date underexploited, links also exist with: sexual and reproductive health; women's health; maternal, newborn, and child health; children's health; and, community health. The Family and Community Health Cluster of WHO is becoming increasingly active to change this. Encouraging steps have been taken to facilitate interaction between groups working on gender and health, and particularly those committed to reproductive, maternal, newborn, and child health (RMNCH), to incorporate and integrate reproductive cancers.[30,31]

At the same time, several platforms for global advocacy are being underutilized. For example, the role of the Goodwill Ambassador for Global Cancer Control could be developed into a more effective instrument for consensus-building. If better applied, this could serve as a model for other NCDs.[32]

The WHO regional offices can and should play an expanded role in future work on NCDs. Several existing programs, such as the PAHO Revolving Fund, may provide useful platforms.

Looking internally for solutions is not sufficient. To strengthen its work on NCD and chronic illness, WHO must enlist the many potential partners that populate the global health and cancer arena. As discussed below, the UNHLM provides opportunities for this to happen and the Declaration mandates that it should continue and be intensified.

IARC

UNAIDS and the International Agency for Research on Cancer (IARC) are the only disease-specific agencies in the UN system. Cancer is the only NCD represented by an institution within the multilateral system. Yet, the potential of IARC to produce global public goods for CCC is underutilized.

Given the tremendous amount of research undertaken in governmental and academic institutions around the globe, IARC is in a position to re-evaluate its role in research, training, monitoring and evaluation. The institution could be expanded and re-aligned to generate and disseminate more effectively a range of global public goods for CCC.

Text Box 10.4
IARC

IARC, founded in 1965 through a resolution of the World Health Assembly as the result of a French initiative, is located in Lyon, France. IARC is considered a part of WHO and follows the general governing rules of the UN family but is led by its own governing bodies. IARC's Governing Council is composed of representatives of 22 participating states and the Director-General of WHO, and its research program is reviewed by a Scientific Council. IARC's member countries, primarily high income, provide most of the financing for the work of the institution.

IARC's mission and objective are focused on to coordinating and conducting research on the causes of human cancer and carcinogenesis, developing scientific strategies for cancer prevention and control, promoting international collaboration in cancer research, and producing evidence-based science for global cancer control policies.

Within this mandate, IARC has been able to contribute significantly to the global public goods in evidence and information, both within and across countries. In particular, the agency is the repository of the GLOBOCAN cancer registry database and the producer of global, harmonized, comparative data from these registries (see Section 2).

IARC could play a stronger role in strengthening the stewardship of national governments and promote uptake of evidence. This would mean focusing and expanding IARC's activities around development and support to countries for cancer registries, supporting governments in strengthening and developing registries and core evidence, becoming a global repository and clearinghouse of knowledge, and developing in-house and in-country program evaluation capacity. New areas of opportunity for IARC, in support of WHO include: evidence for guideline development, identifying and disseminating lessons on implementing CCC, integrating data on cost-effectiveness of interventions, dissemination of latest research results and program implementation and evaluation in LMICs.

IARC can be pivotal in developing the cancer components of the monitoring and accountability framework of the Declaration of the UNHLM. Further, the institution is ideally positioned to produce a global cancer observatory that, on an annual basis, could monitor progress of countries and follow-up against the global and national targets that will be established as a result of the UNHLM.

Other international actors

United Nations

The UN, by calling the high-level meeting effectively generated tremendous activity around cancer and other NCDs. The leadership role of the UN will be crucial over the coming years for promoting follow-through on the Declaration.

It will also be important that each UN agency take part in implementing the provisions of the Declaration under the guidance and leadership of WHO. The mandates of many UN agencies such as the ILO, UN Women, UPFPA, UNICEF, UNEP and UNAIDS include programs that could be used for expanding CCC and meeting the challenge of NCD. Yet, these linkages remain underexploited. To guarantee commitment and ownership, each of these UN agencies should explicitly the areas in which they can impact on controlling the NCD epidemic.

IAEA deserves special mention as its work in the cancer arena stands out among the UN institutions working outside of health.[33] Through the Programme of Action for Cancer Therapy (PACT), IAEA has focused considerable financial, advocacy, and technical resources on expanding access to radiation therapy and nuclear medicine. Further, the agency has adopted a broad, development-oriented approach and undertakes research and publication on the inequities in access to overall CCC.[34] IAEA has been highly active in developing innovative solutions to close the cancer divide.[35] Dating back to 1980, IAEA's work in cancer can serve as an example for other international agencies.

Mobilizing donors is an area that requires more stewardship from the UN. There is little evidence of success in mobilizing global financing to meet the challenge of cancer beyond the basic risk-factors and especially tobacco control. Donor support did not emerge with the UNHLM on NCDs. This implies an important role for the UN to promote increased support from bi-lateral and multi-lateral donors, as well as through foundations and other private donor agencies. The successful strategies applied around Every Woman Every Child provide a useful framework (see Section 8).[36]

The Global Fund to Fight AIDS, Tuberculosis and Malaria

The Global Fund offers significant potential for expanded CCC because the organization has been so effective in channeling large amounts of disease-specific resources to LMICs. Through its investments in health systems, The Global Fund strengthens stewardship capacity at the country level in support of AIDS, tuberculosis and malaria. These efforts also benefit CCC and work on other NCDs. Further, the Global Fund Strategy for 2011-15 proposes maximizing the impact of its investments beyond AIDS, tuberculosis and malaria, particularly for women and children (see Section 8).[37]

World Bank and regional development banks

The multilateral financial institutions have not been very active in NCDs to date, although recent reports have begun to highlight the importance of expanding the existing health portfolios to include chronic disease.[38] The World Bank, in particular, can play an important role in financing the development of global public goods that will serve to expand CCC in LMICs. It is ideally placed to finance and evaluate large-scale demonstration initiatives. Existing work on health systems strengthening can also be reformulated to support a more coherent response to NCDs, including cancer.

The regional development banks could also be very effective in financing programs that include strong evaluation components. Further, these institutions are well situated to facilitate regional cooperation and public goods.

With the exception of tobacco control, ***bi-lateral agencies*** have mostly shied away from supporting work on cancer, and more generally on NCDs. A few have even expressed their concern that undue focus on NCDs or chronic illness would detract from efforts towards achieving MDGs. National and global stewards and leaders must continue to work with the bi-laterals to demonstrate the positive interactions between MDGs and the NCDs, and to promote increased investment in programs, particularly in low income countries. One path will likely be through existing investments in health systems strengthening and specific programs for the health of women and children.

The Organization for Economic Co-operation and Development (OECD)

The OECD could play an enhanced role in global CCC. Their work to date on NCDs and strengthening health systems, particularly in identifying the most cost-effective strategies, could be of use not only for the middle income countries that are now members, but also to provide lessons for LMICs overall.

Civil society

History demonstrates that civil society is instrumental in galvanizing action in health and other social sectors. In addition, the independence from government places civil society in the appropriate position to undertake advocacy. The global AIDS response provides an example. Advocacy from civil society, often driven by patients, was instrumental in catalyzing a special session of the UN General Assembly in 2000 and the creation of several global institutions. Another example surrounding a patient-driven advocacy movement is tobacco control.[39]

In the United States, advocacy from civil society on cancer has provided a generation of work, started by leaders like Mary Lasker who built strong momentum around cancer and more recently around breast cancer.[40-43] Indeed, the cancer civil society network in high income countries is among the strongest of all the NCD networks and is empowered by the voices of patients, survivors, and their families. There is now an opportunity and a responsibility to learn from the experiences in high income countries and to support the development of similar civil society action around cancer and other NCDs in LMICs.

Today, a range of well-established national and international civil society organizations are active in advocacy, research, capacity building, community mobilization and action in relation to cancer in LMICs. An analysis and mapping of this vast network remains to be undertaken.

Several civil society organizations based in the US and Europe now reach beyond the domestic arena. For example the American Cancer Society, founded in 1913 as the American Society for the Control of Cancer, now works globally.[44,45] It has established regional civil society organizations such as Latina Mama and developed scorecards for influencing health system stewards.

More recently, two of the strongest civil society agencies working in cancer in the US have expanded their work to the global arena. Livestrong began to work globally in 2008 and has developed an important focus on global advocacy. Their work in a series of countries around the world addresses stigma and lack of awareness.[46] Susan G. Komen for the Cure, a strong US voice and force in breast cancer, began global work in 2007 with races and training in 16 countries. In 2010, global work expanded with the launch of the Komen Global Health Alliance in support of women's cancers and as part of the larger women's health agenda.[47] Their Pink Ribbon Red Ribbon initiative, launched in September of 2011 is an innovative example of applying the diagonal approach by linking women's cancers and HIV/AIDS.[48]

Civil society organizations working on cancer in LMICs are increasingly active and politically involved. Many countries have at least one civil society organization dedicated to cancer issues, and several have institutions that focus specifically on childhood or breast cancer. However, these organizations, often established by those affected by cancer, tend to lack technical or health policy expertise to influence policy, and struggle for financial stability and a niche from which to influence policy.[49] These organizations would benefit from stronger links to those working on research and policy, as well as the private sector.

Text Box 10.5
Femama: Promoting policy change in Brazil through civil society[50]

Femama brings together civil society organizations, and focuses on dissemination of information, as well as ensuring access to quality care (access to mammograms, reducing the time between diagnosis and the initiation of appropriate treatment), and advocacy for policy change in Brazil. The organization has successfully promoted multi-sectoral strategies to develop a national policy to address breast cancer, involving government, medical professionals, and the population in general.

Femama led a successful movement to pass national legislation that resulted, in 2008 in Brazil's Federal Law 11.664. This law addresses the health of women in a comprehensive manner, encompassing the prevention, detection, and treatment of breast and cervical cancer. It ensures the availability of mammography to all women over 40 years of age.

In March of 2011, Brazil released a National Program for Control of Breast and Cervical Cancer. In relation to breast cancer, the objectives include guaranteeing increased access to examinations for early detection of breast cancer, improving quality of care for all Brazilian women, and creating a working group to implement the National Program of Quality in Mammography. The policies of Femama were incorporated into this national program.

Femama recognizes that much of its work must involve engaging society in the formulation of public policy and encouraging political participation. Promoting altruistic and volunteer work has helped to generate a sense of civic responsibility, and a powerful grassroots movement.

The Union for International Cancer Control (UICC) is a global, umbrella, civil society organization that dates back to 1933 and has a unique and important role to play in global stewardship and as a leader of the civil society movement.[51] The civil society organizations that are members of UICC offer a glimpse into the range, depth, and complexity of these institutions that span the globe (Text Box 10.5).

Further, UICC is a founding member of the NCD Alliance and led civil society in cancer in the work around the UNHLM on NCDs.[52] This effective leadership by UICC in an important global setting demonstrates the potential of the organization to represent civil society cancer organizations in the future.

Text Box 10.6
The Union for International Cancer Control (UICC)

Founded in 1933 and based in Geneva, UICC unites more than 300 member organizations engaged in cancer control, representing more than 100 countries. It has a broad mandate that extends to all facets of the CCC continuum.[53]

Thus, UICC provides the entire cancer community with a platform from which to coordinate and mobilize civil society globally and in-country. For this platform to reach its full potential it must be strengthened, expanded, and aligned to be able to respond to the current opportunities.

The World Cancer Declaration –a live, sign-on document, developed and managed by UICC– has proven an effective advocacy tool and offers a good stage for global CCC efforts. If expanded, it could also be converted into a base upon which to build a set of measurable goals for global CCC. The Declaration could be a point of departure for undertaking a global observatory led by the civil society or "watch" by, for and from civil society for monitoring global and national CCC efforts.

Through an annual progress report based on measurable goals, UICC could turn existing efforts around the Declaration into powerful tools for civil society to exert change. A Global Cancer Watch with a scorecard could include reflections and indicators of progress on civil society itself, as well as others. An observatory could be generated to serve as a clearinghouse of information on organizations investing in or implementing programs on cancer in LMICs.

The recent global momentum and interest in non-communicable disease and the UN High-level meeting has offered UICC the opportunity to reinvent itself and strengthen its niche and role in the global health community. One of the challenges for the future will be to balance participation in issues that affect cancer with those that affect population health more generally, and accomplishing this in ways that do not detract from the UICC's ability to serve and lead the international cancer community. In addition to working within the non-communicable diseases community, as UICC has been effectively accomplishing through the NCD Alliance, this requires developing skills and influence among other groups and should include those working at the level of health systems, as well as building bridges to groups that can provide joint platforms including the MCH, SRH, HIV/AIDS and other communicable disease communities.

Professional associations and research institutions

Associations of professionals, especially in the health field, can be a strong force for change, especially when they join forces with civil society and academics. The associations typically bring together extensive global, regional, and local networks, and can exert significant influence on policy in their home country.

Many operate at the margins of the cancer field, yet are poised to participate. Good examples are associations that focus on cancer in women. One example is the International Federation of Gynecology and Obstetrics (FIGO), which brings together professional societies of obstetricians and gynecologists from around the world with member societies in 124 countries.[54] The many associations of clinicians who work on AIDS is another set of important groups to target for work on cancer care.

Further, local physician associations operate in most LMICs along with associations of nurses, social workers and other health professionals, and even sub-specialty associations including oncologists. In Mexico, for example, an active association of oncologists (Sociedad Mexicana de Oncología) dates back to 1951 and there are a number of sub-specialty groups, such as the Asociación Mexicana de Mastología.[55,56]

Some professional association networks were created around global CCC, including several based in LMICs. These include, for example the African Organization for Research and Training in Cancer (AORTIC) founded in 1983, the Sociedad Latinoamericana y del Caribe de Oncología Médica founded in 2003,[57] and more recently the Federación de Sociedades Latinoamericanas de Cáncer.[58]

Professional associations in high income countries have also expanded their participation in global cancer. For example, the International Network for Cancer Treatment and Research, established in 1988, now has membership in 50 countries.[59,60] The International Society of Peadiatric Oncology, founded in the late 1960s, now has more than 1150 members.[61]

Over the past decade, international professional associations such as the American Society of Clinical Oncology (ASCO) and the European Society of Clinical Oncology (ESCO) have significantly increased the scope and scale of their international work in response to requests from their members, though much needs to be done to utilize the expertise of ASCO to strengthen global advocacy by working with other stakeholders, such as UICC.

Text Box 10.7
ASCO's evolving engagement in global cancer control

Since its first meeting in November 1964, ASCO –today with approximately 30,000 members around the world– has been committed to working globally.[62] Unlike most American medical societies at the time, ASCO chose from the start to make membership in the society equally available to clinicians around the world.[63]

In the mid- to late-1990s, as the international membership of ASCO grew exponentially and the ASCO Annual Meeting became a global conference, an International Affairs Task Force, comprised of members from around the world, was installed and ASCO started sponsoring and endorsing international oncology conferences.[64,65]

By 2000, one out of every four ASCO members was based outside of the US, and international members became increasingly active in governance.[66] Today, a third of ASCO's members, nearly 9,000 oncologists from 120 countries, practice outside the United States, as do a majority of the attendees to the ASCO Annual Meeting.

ASCO has accelerated the development of programs to address oncology workforce issues in less developed countries. In 2002, ASCO offered its first International Development and Education Awards (IDEAs) that today support the mentoring and professional development of young oncologists in 42 LMICs. This was followed in 2004 by the launch of the Multidisciplinary Cancer Management Course, which has to date delivered training on cancer management principles to more than 2,000 clinicians in low and middle income countries. ASCO and the European Society of Medical Oncology also jointly developed recommendations for the training of medical oncologists globally.[67]

Since 2009, ASCO has launched several new programs in critical areas, including: the International Clinical Trials Workshop to train clinicians in economically emerging countries in international research skills and standards; the Long-term International Fellowship to support research collaborations between ASCO members; the IDEA for Palliative Care Award for oncologists from LMICs; the partnership with the UICC on the Global Access to Pain Initiative to advocate for the access to pain medications in sub-Saharan countries; and the International Cancer Corps program to pair ASCO members with cancer centers in LMICs.[68] These programs have generated strong support and interest from the ASCO membership –both international and domestic– and several ASCO members recently published ambitious proposals for the society to further expand its contributions to cancer control in LMICs.[69]

Also, there has been a proliferation in published academic literature and research on global health and cancer, as well as a tendency for researchers based in high income countries to form groups and strengthen their international work in cancer. One of the pivotal studies was done by the Institute of Medicine of the National Academies of Medicine of the US.[70] Since then, several important studies have been financed and produced by civil society groups working with academia.[71-73] The UN HLM on NCDs provided impetus to this work and catalyzed a host of additional publications, particularly in academic and policy journals.[74]

Text Box 10.8
Research and publications on cancer in LMICs

An analysis of academic journal articles published on cancer in LMICs between 1990 and 2010 demonstrates that the number of publications has increased substantially. Between 2005 and 2010, 458 articles were published in journals. This is more than the total number of publications produced between 1990-2005. Further, there has been a surge over the past two years. Lancet and Lancet Oncology, for example, published 66 pieces over the past two decades, 12 between 1990 and 2000, 24 between 2001-2005, and 35 between 2006-10.

These results are based on a systematic literature review covering 1990-2010 in Medline, Embase, EBSCO, Web of Science and Google Scholar using a combination of synonyms for cancer and developing countries in the title, abstract or keywords, and including journals (ISBN) and official reports. Only articles written in English or with an abstract in English were included. Papers were included only if the title made reference to "developing countries," "less developed country," low-resources, poor-resources, etc. The main results are based on cancer literature related to developing countries as a group, specific regions, or country case studies used as examples for a developing country. These include global studies/ statistics, reports, international literature reviews and comparisons, country case studies, and cross-sectional studies. A total of 877 publications were identified.

Academic institutions from high income countries have also expanded their activities in global health and cancer. For example, the Africa Oxford Cancer Foundation was established in 2007 by leading researchers, politicians and individuals from the private sector to encourage international collaboration to support improved cancer care in Africa.[75] The Breast Health Global Initiative, founded and led by the Fred Hutchinson Cancer Research Center and largely funded by Susan G. Komen for the Cure, develops and endeavors to implement best practices and guidelines in countries with limited resources.[76] The Fred Hutchinson Cancer Research Center is also actively working with partners in Uganda in the production of research.[77]

A particularly promising new initiative is the Center on Global Health that has just been launched by the National Cancer Institute of the US. This new center will offer both fresh perspective and resources to CCC in LMICs. It plans to include a broad research agenda that encompasses health systems strengthening and monitoring program effectiveness.[78] The Center can also play a key role in broadening work in global health to look beyond traditional targets around communicable disease, and basic nutrition and reproductive health.

New inter-disciplinary and inter-institutional networks of civil society organizations, academics, health care providers and leaders from the private sector are emerging and engaging in advocacy, knowledge generation and dissemination activities to expand CCC in LMICs. CanTreat, for example, is an informal network dedicated to identifying treatment solutions.[79]

The GTF.CCC, the entity behind this report, is an informal group of leaders from the cancer care and global health communities based at public and private institutions around the globe and with expertise that spans advocacy, research, clinical care, population health services, and governments. Four Harvard University institutions – the Harvard School of Public Health, the Harvard Medical School, the Harvard Global Equity Initiative and the Dana Farber Cancer Institute, initially convened the group. GTF.CCC links a substantial group of leaders, many of whom had not previously engaged in work related to cancer.[80] The academic base of this network engages a wide range of participants, including national governments, international agencies, civil society, and the private sector.

Recent work bodes well for taking up the final recommendations of the Institute of Medicine (IOM) of the National Academies 2007 study.[81] The IOM recommends that the academic community active in global health extend their work beyond the traditional areas of focus to include CCC.

Private sector engagement

Effective mobilization of the private sector and full involvement in developing solutions for CCC in LMICs requires appropriate global and national stewardship. This includes establishing meaningful dialogue and interaction with industries directly involved in health care, such as pharmaceutical, diagnostics and medical device companies.

Yet, a host of other industries can influence CCC and these must be involved. The most important industries include food and beverage companies, the telecommunications sector, and marketing and media, all of which could contribute innovative ideas for expanding access to CCC in LMICs.

Another area for increased involvement of the private sector is promoting workplace health and expanding insurance coverage to cover cancer. The formal private sector is one of the most important employers and purchasers of health insurance, and workplace health is one of their main concerns. Associations of small businesses and informal sector trades and professions could also participate as consumers of organized health care and insurance through health care reform.

The private sector can also play a proactive and active role in shaping the global strategy to expand access by creating new business models and proposing innovative, affordable, and scalable solutions to cancer care and treatment in LMICs. This includes, yet goes far beyond developing and supplying inputs or achieving better prices for drugs. Frugal innovations in packaging treatments, innovations in delivery, training health professionals, appropriate marketing of products, and supporting demonstration products are a subset of areas for increased activity for the private sector. Further, public-private partnerships have proved especially useful in implementing innovative solutions.

Yet, there are few venues for the private sector to collectively address the challenge of scaling up access to CCC. The World Economic Forum offers a unique platform for these interactions, and other neutral spaces should be identified that can support ongoing multi-stakeholder, inter-industry and result-driven dialogue. Universities, especially departments working on global health and schools of business administration, can offer important opportunities to promote effective dialogue between the private sector and the diversity of stakeholders that operate in CCC in LMICs.

Text Box 10.9

An integrated partnership in Rwanda: Comprehensive National Cervical Cancer Prevention Program and the Rwanda Task Force on Expanded Access to CCC

On April 26, 2011, the Government of Rwanda (GOR), through a public-private partnership with Merck and Qiagen, launched a Comprehensive National Cervical Cancer Prevention Program – the first in Africa and therefore an incredible feat.[82-84] *This is also the first such collaboration of its kind and was initially announced as one of thirteen commitments to empower girls and women at the 2009 Annual Meeting of the Clinton Global Initiative.*[85] *This public-private partnership could serve as a model and pave the way for other countries in Africa where the HPV vaccine is direly needed to close the cancer divide – 93% of cervical cancer deaths are in LMICs and especially low income countries.*

Over the next three years, Merck is donating 2 million doses of the HPV vaccine GARDASIL to vaccinate girls between the ages of 12 and 15. Qiagen is supplying 250,000 HPV DNA tests to screen women aged 35 through 45 at no cost along with equipment and training to administer the test.[86] *Both companies have committed to making these latest technologies available to Rwandan women during the donation period. In addition, through partnership and negotiation with the GOR, the companies have also committed to developing a sustainable strategy for on-going vaccination and screening. This will contribute to a larger initiative by the GOR for developing and implementing a National Strategic Plan for the Prevention, Control and Management of Cervical Cancer incorporating strategies for prevention, early detection, diagnosis and treatment, palliative care, and policy and advocacy.*

Factors that have been critical to advancing action on cervical cancer in Rwanda include champions within each of the partner entities, and particularly the GOR,[87-89] *good governance and political support to form the public-private partnership, local ownership, and willingness of industry partners to back commitments with donations and a pledge to reduced and tiered pricing over the long-term. Additionally, transparency in negotiations and accountability has helped foster an environment of mutual interest. This lays a foundation and provides incentives for a sustainable public-private partnership. However, even with the reduced prices of the vaccine and screening test after the initial 3 years, there are financial barriers to maintaining a national program.*[90]

One of most interesting aspects of this program is the way the GOR has used it as a catalytic platform for broader activities in CCC, as well as integrating the initiative into health system strengthening and the primary sector through women and health programs in a truly diagonal approach. Also, the GOR is moving forward with much broader programs on early detection and treatment of cancer. With guidance from IARC, the GOR is developing a population-based cancer registry.[91] *Further, the launch of the cervical cancer program has been a mechanism for integrating awareness and early detection of breast cancer into the primary health care system with a focus on MCH, SRH and HIV/AIDS programs. Innovative treatment programs working with civil society (PIH) and hospitals based in high income countries (DFCI and BWH) are being extended (see Section 6). Further, the momentum around the public-private partnership on cervical cancer and an on-going recognition of the growing overall cancer burden by the GOR led to the simultaneous announcement of the Rwanda Task Force on Expanded Access to Cancer Care and Control. This multi-stakeholder group is working in collaboration with the GTF.CCC, and is lead by the Rwanda Medical Professional Associations working with GOR. Among other activities, these associations will help develop the Rwanda national cancer plan and serve as an external group for monitoring progress.*

10.v. Carpe diem: Seize the Day

After long periods of little attention or change around a specific issue or disease, global health is characterized by sudden, unpredictable and often fleeting bursts of policy attention.[92] These are opportune moments – a time to forge global movements through advocacy and activism and to establish longer term priorities and programs.[93]

The UN HLM on NCDs successfully catalyzed and then harnessed this moment. The impressive participation by heads of state and governments and the active involvement of civil society, academia, and the private sector are indicative of this success. The Declaration positions NCDs as an economic as well as a health priority and thus places this enormous challenge on the development agenda, and better positioned to play into the MDGs.[94]

Although much was accomplished with the Declaration and the meeting, UICC and others have identified areas where commitments achieved for the UN HLM on NCDs fall short of expectation and where future efforts must be focused.[95,96] The Declaration lacks specific, time-bound targets and has no overall goal of reducing preventable deaths. Advocacy and research are now needed to help convince governments to commit to measurable goals – including the WHO overall recommendation to reduce avoidable deaths from NCDs by 25% by 2025. In addition, the Declaration acknowledges that the resources devoted to NCDs are not commensurate with the magnitude of the problem, yet there are no commitments to increase these resources.

The Declaration of the UN HLM requests the Secretary General of the UN, through WHO, to work in consultation with Member States, all relevant UN bodies, and international organizations to produce and submit by the end of 2012 proposals for multisectoral action on NCDs through partnerships. This will require leveraging global institutions and national health systems and mobilizing all spheres of public policy and the many stakeholders that today occupy the global CCC arena through new and existing global and national forums and networks. This must include institutions that tend to operate from outside the health arena yet enact policy that affects CCC and other NCDs such as trade, environment, labor, fiscal policy, agriculture, and education.[97] Partnerships should also engage and harness the private sector to contribute to identifying and implementing solutions. As the UN HLM Declaration terms it, this must be 'a whole-of-government and a whole-of-society' effort.[98]

The Declaration also calls for a report by 2014 on progress achieved globally and by countries in realizing the commitments of the Declaration. This makes it especially important to put in place a strong system for global monitoring and accountability, as requested of WHO by 2012. While the Declaration mentions voluntary targets, there should be explicit, time-bound global and national targets on specific diseases and on NCDs overall that promote accountability. Based on lessons from the MDGs and other global health initiatives, a monitoring framework needs to be part of a broad accountability framework with global and national targets, independent reviews of progress by countries and global institutions, and mechanisms to support countries and facilitate progress. Experts are proposing that these efforts be aligned with the Accountability Commission on Women's and Children's Health and that there ideally be a single framework that takes into account all global health priorities including NCDs.[99] This would promote a diagonal approach to global stewardship.

The UN HLM on NCDs has generated new groupings for stewardship and governance in cancer and other chronic and NCDs.[100-102] The NCD Alliance is a much welcome example of more than 900 disease-specific organizations in 170 countries coordinating their expertise to speak with a unified voice.[103] The promotion and decision to hold the UN HLM helped to inspire the formation of the NCD Alliance and the organization proved to be a key force in driving forward the Declaration. Indeed, the formation of the NCD Alliance may itself be considered one of the important outcomes of having called a UN HLM.

Civil society, led by the NCD Alliance has an important role to play in moving forward after the UN HLM.[104] It is important to note that sustainability of the NCD Alliance collaboration after the UN meeting will depend on identifying additional opportunities for mutually beneficial collective action across the NCD community. This provides an opportunity for WHO to strengthen its stewardship role by supporting civil society.

An inclusive forum of interested parties –state and non-state, public and private, for-profit and civil society– is required and recent activities by global agencies are paving the way for this to occur. Meetings leading up to the UN HLM event provided new and exciting opportunities for establishing an inclusive forum of interest. For example, the First Global Ministerial Conference on Healthy Lifestyles and Non-communicable Diseases (Moscow, April 2011) was preceded by a multi-stakeholder forum.[105]

As a step towards the formation of partnerships to carry forward multisectoral actions, the GTF.CCC and this Report, endorse the call to establish an independent multi-agency, multi-stakeholder, inter-sectoral task force of experts and leaders following the UN HLM on NCD.[106] This task force should work across diseases and take a health systems, diagonal approach that includes other key sectors. It should also draw in groups and health priorities that did not have sufficient opportunities to participate in recent activities on NCDs –including mental illness– and work to build bridges with the communicable disease communities. In the case of cancer, UICC and IARC can make a tremendous contribution to this group or its secretariat.

The UN HLM also focused on the need to strengthen stewardship capacity in countries. The Declaration recommends that multisectoral national plans and policies for the prevention and control of NCDs be established or strengthened by 2013.

Global multi-stakeholder platforms should reinforce and be sustained by similar groupings in countries. The inter-disciplinary, inter-sectoral model of the GTF.CCC, and the focus on health systems and public health offers a framework for establishing these multi-stakeholder groupings in individual countries to expand advocacy, produce evidence and strengthen governmental programs around cancer. Further, commissions or task forces around CCC can be a starting point for developing national commissions on NCDs.

The UN HLM on NCDs, and the new partnerships that are being formed across institutions and in global health and cancer, coupled with the empowerment of cancer survivors, suggests that the cancer arena is poised for rapid expansion if new and renewed constellations of institutions emerge to provide better and more appropriate leadership and stewardship. This will require closer collaboration among the many players that populate the cancer arena and engagement with governments and the private sector to alter the modus operandi that has led to a series of fragmented disease-specific actions, rather than a cohesive global response.

The cancer community if it works as a unified force and because of the leadership that can be played in advocacy, can be catalytic in moving forward the agenda after the UN HLM on NCDs. The global cancer movement can galvanize awareness, interest, and action to establish multisectoral, multi-stakeholder, national and global, platforms and partnerships. The community is well-positioned to take advantage of emerging opportunities to expand access to all aspects of CCC, while at the same time benefiting other diseases by addressing the challenges of chronicity using a health systems approach.[107]

Cancer is a disease that commands attention. The fear of cancer and the aura around survival provides a platform from which much can be said and to which many will listen.[108]

Cancer is in fact a "communicable" disease - it is one of the few diseases that can be effectively ***communicated*** to catalyze a global movement.[109] Advocacy and activism around cancer, if positioned with an agenda for health system strengthening, can provide a human face to NCDs and help convert cancer and other chronic illness into a priority for global and national health agendas.

Recommendations for leadership and stewardship

The following actions will strengthen the cancer community and enable it to play a leadership role in implementing the proposals set out in the Declaration of the UN HLM on NCDs:

- Strengthen the capacity of WHO to work as the steward of the global cancer agenda.
- Redefine and strengthen IARC, including expand the base of participating countries, to work alongside WHO and provide evidence for decision making through research, evaluation and monitoring, training and increased support and technical assistance for cancer registries in LMICs.
- Strengthen the capacity and recognition of UICC as a global umbrella and stewardship organization.
- Engage the multilateral agencies using IAEA as an example, as well as the Global Fund and GAVI in CCC, and promote better coordination among international agencies and the UN system.
- Support cancer policies and funding at the country level through the World Bank and the regional development banks.
- Engage actors related to specific cancers such as UNICEF and the children's rights community for childhood cancers; and women and health, empowerment, sexual and reproductive health and maternal and child health actors for cancers of women.
- Encourage and support governments to integrate cancer into national health plans and formulate national cancer plans.
- Actively engage the private sector in the production of solutions, knowledge and in opportunities to implement results.
- Encourage and support multi-stakeholder commissions in-country on CCC that can be linked to other disease groups and system-wide initiatives, and can contribute to monitoring performance in achieving specific goals.
- Global cancer civil society organizations should support the development of country-led civil society groups and UICC is ideally placed to undertake this role.
- Identify agencies, working with IARC and WHO, to develop a system of measurable and implementable targets and goals specific to cancer that can be integrated into global targets for NCDs as required by the Declaration of the UN HLM on NCDs.
- Establish a multi-stakeholder partnership within the cancer community to promote the results of the UN HLM and monitor the goals and targets on cancer.
- The global cancer community should fully support the application of the proposals set out in the Declaration of the UN HLM on NCDs.

References

1. OECD. The Paris Declaration on Aid Effectiveness and the Accra Agenda for Action. 2010. http://www.oecd.org/dataoecd/11/41/34428351.pdf (accessed August 8, 2011).
2. Balabanova D, McKee M, Mills A, Walt G, Haines A. What can global health institutions do to help strengthen health systems in low income countries? Health Research Policy and Systems. 2010;8(1):1-11.
3. World Health Organization. Everybody's business: Strengthening health systems to improve health outcomes. Geneva: World Health Organization; 2007.
4. Atun R, Weil DEC, Eang MT, Mwakyusa D. Health-system strengthening and tuberculosis control. The Lancet. 2010;375(9732):2169-78.
5. World Health Organization. World Health Report 2010: Health systems financing: the path to universal coverage. World Health Organization. 2010.
6. World Health Organization. Everybody's business: Strengthening health systems to improve health outcomes. Geneva: World Health Organization; 2007.
7. WHO Commission on Macroeconomics and Health. Working Group 2. Global public goods for health: the report of Working Group 2 of the Commission on Macroeconomics and Health. World Health Organization. 2002.
8. Jamison D, Frenk J, Knaul F. International collective action in health: objectives, functions, and rationale. Lancet. 1998;351(9101):514-7.
9. Moon S, Szlezák NA, Michaud CM, Jamison DT, Keusch GT, Clark WC, et al. The global health system: lessons for a stronger institutional framework. PLoS Med. 2010;7(1):1-6.
10. World Health Organization. Assessment of national capacity for noncommunicable disease prevention and control. The report of a global survey. 2001. Geneva, WHO. http://whqlibdoc.who.int/hq/2001/WHO_MNC_01.2.pdf (accessed August 9, 2011).
11. World Health Organization. Cancer control: knowledge into action: WHO guide for effective programmes; Module 1. Planning. Switzerland: World Health Organization; 2006.
12. WHO Commission on Macroeconomics and Health. Working Group 2. Global public goods for health: the report of Working Group 2 of the Commission on Macroeconomics and Health. WHO. 2002.
13. OECD. The Paris Declaration on Aid Effectiveness and the Accra Agenda for Action. 2010. http://www.oecd.org/dataoecd/11/41/34428351.pdf (accessed August 8, 2011).
14. World Health Organization. Everybody's business: Strengthening health systems to improve health outcomes. Geneva: World Health Organization. 2007.
15. WHO Commission on Macroeconomics and Health. Working Group 2. Global public goods for health: the report of Working Group 2 of the Commission on Macroeconomics and Health. WHO. 2002.
16. Organisation for Economic Co-operation and Development (OECD). The Paris Declaration on Aid Effectiveness and the Accra Agenda for Action. 2010. http://www.oecd.org/dataoecd/11/41/34428351.pdf (accessed August 8, 2011).
17. World Health Organization. Everybody's business: Strengthening health systems to improve health outcomes. Geneva: World Health Organization; 2007.
18. Berer M. Integration of sexual and reproductive health services: a health sector priority. Reproductive Health Matters. 2003;11(21):6-15.
19. Integrating Cancer Care and Control with Women and Health: Identifying Platforms, Synergies and Opportunities for Action 2011 March 10-11, 2011; Harvard University, Boston, MA; 2011.
20. Frenk J, Knaul F, Gómez-Dantés O. Global Forum update on research for health. 2004: Pro-Brook Publishing; 2004.
21. Sloan FA, Gelband H. (Eds) Cancer control opportunities in low-and middle-income countries. Washington DC: National Academy of Press; 2007.
22. Knaul F, Cahill K, Bhadelia A. Institutions with direct and indirect involvement in CCC. GTF.CCC Working Paper and Background Note Series, Harvard Global Equity Initiative, Forthcoming, 2011.
23. Reich M. Political mapping of health policy: a guide for managing the political dimensions of health policy. Boston: Harvard School of Public Health. 1994.
24. Jordan Breast Cancer Program. About us. 2011. http://www.jbcp.jo/node/11 (accessed August 8, 2011).
25. Middle East Cancer Consortium (MECC). About. 2010. http://mecc.cancer.gov/about.html (accessed August 8, 2011).
26. World Health Organization. WHO Framework Convention on Tobacco Control. Informal working group on the draft protocol to eliminate illicit trade in tobacco products. World Health Organization. 2011. http://www.who.int/fctc/en/ (accessed August 8, 2011).
27. World Health Organization. Everybody's business: Strengthening health systems to improve health outcomes. P.35. Geneva: World Health Organization; 2007.
28. World Health Organization. CHOosing Interventions that are Cost Effective (WHO-CHOICE). WHO-CHOICE Interventions. World Health Organization. 2011. http://www.who.int/choice/interventions/en/ (accessed October 22, 2011).
29. Integrating Cancer Care and Control with Women and Health: Identifying Platforms, Synergies and Opportunities for Action 2011 March 10-11, 2011; Harvard University, Boston, MA; 2011.
30. Knaul F, Bustreo F, Ha E, Langer A. Breast cancer: why link early detection to reproductive health interventions in developing countries? Salud Pública de México. 2009;51(2):220-7.
31. US Department of State. Pink Ribbon Red Ribbon Overview. Office of Electronic Information US State Department. 2011. http://www.state.gov/r/pa/prs/ps/2011/09/172244.htm (accessed October 22, 2011).
32. World Health Organization. Programmes and Projects: Nancy Goodman Brinker, Goodwill Ambassador for Cancer Control. World Health Organization . 2011. http://www.who.int/goodwill_ambassadors/nancy_brinker/en/index.html (accessed August 8, 2011).
33. Sloan FA, Gelband H. (Eds) Cancer control opportunities in low-and middle-income countries. Washington DC: National Academy of Press; 2007.
34. IAEA. Inequity in cancer care: a global perspective. Vienna, Switzerland; IAEA. 2011.
35. IAEA. Supporting comprehensive cancer control programmes: IAEA and cancer control. IAEA. 2010. http://cancer.iaea.org/whoarewe.asp#content (accessed August 8, 2011).
36. Jamison D, Frenk J, Knaul F. International collective action in health: objectives, functions, and rationale. Lancet. 1998;351(9101):514-7.
37. Global Fund to Fight AIDS, Tuberculosis, and Malaria. Twenty-third board meeting. Geneva, Switzerland, 11-12 May, 2011.
38. Nikolic IA, Stanciole AE, Zaydman M. Health, Nutrition and Population (HNP) Discussion Paper: Chronic Emergency: Why NCDs Matter. The International Bank for Reconstruction and Development. World Bank. 2011.
39. Sloan FA, Gelband H. (Eds) Cancer control opportunities in low-and middle-income countries. Washington DC: National Academy of Press; 2007.
40. Enserink M. A Push to Fight Cancer in the Developing World. Science. 2011;331(6024):1548-50.
41. Mukherjee S. The emperor of all maladies: a biography of cancer. New York: Scribner; 2010.
42. Brinker NG. Promise Me: How a Sister's Love Launched the Global Movement to End Breast Cancer. Crown Archetype: New York. 2010.
43. Lasker Foundation. Home. 2011. http://www.laskerfoundation.org/ (accessed August 8, 2011).
44. American Cancer Society. Our History. American Cancer Society. 2011. http://www.cancer.org/AboutUs/WhoWeAre/our-history (accessed October 22, 2011).
45. American Cancer Society. Global Programs: Advancing the Global Fight Against Cancer. American Cancer Society. 2011. http://www.cancer.org/aboutus/globalhealth/ (accessed August 8 2011).
46. Neal, C., Beckjord, E., Rechis, R., & Schaeffer, J. (2010). Cancer stigma and silence around the world: A LIVESTRONG report. Austin, TX: LIVESTRONG. Available at http://livestrong.org/pdfs/3-0/LSGlobalResearchReport. (accessed October 23, 2011).
47. Susan G. Komen for the Cure. Press Release: Susan G. Komen for the Cure and World Health Leaders Launch Global Women's Health Initiative. June 8, 2010. http://ww5.komen.org/KomenNewsArticle.aspx?id=6442452157 (accessed August 8, 2011).
48. US Department of State. Pink Ribbon Red Ribbon Overview. Office of Electronic Information US State Department. 2011. http://www.state.gov/r/pa/prs/ps/2011/09/172244.htm (accessed October 22, 2011).
49. Durstine A, Leitman E. Building a Latin American cancer patient advocacy movement: Latin American cancer NGO regional overview. Salud Publica de Mexico. 2009; 52(Supplement 2).
50. Femama. Homepage. Femama. 2011. http://www.femama.org.br/novo/ (accessed October 23, 2011).
51. Sloan FA, Gelband H. (Eds) Cancer control opportunities in low-and middle-income countries. Washington DC: National Academy of Press; 2007.
52. Union for International Cancer Control. UN Summit on NCDs – Political Declaration. Union for International Cancer Control. 2011. http://www.uicc.org/node/9103 (accessed October 23, 2011).
53. Union for International Cancer Control. Union for International Cancer Control: Home. Union for International Cancer Control. 2011. http://www.laskerfoundation.org/ (accessed August 8, 2011).
54. International Federation of Gynecology and Obstetrics. (FIGO). International Federation of Gynecology and Obstetrics. Home. FIGO. 2011. http://www.figo.org/ (accessed August 8 2011).
55. Sociedad Mexicana de Oncologia A.C.. Sociedad Mexicana de Oncologia A.C. Quienes Somos: Historia. SMeO. 2011. http://www.smeo.org.mx/quienessomos/historia.php (accessed October 22, 2011).
56. Asociacion Mexicana de Mastologia A.C. Inicio. Asociacion Mexicana de Mastologia A.C. 2011. http://www.mastologia.org.mx/ (accessed October 22, 2011).
57. Sociedad Latinoamericanan y del Caribe de Oncología Médica (SLACOM). Acerca de SLACOM. SLACOM. 2011. http://www.slacom.org/acerca_historia.php (accessed October 22, 2011).
58. Federación Latinoamerica de Sociedades de Cancerlogía (FLASCA). Bienvenido a FLASCA. FLASCA. 2011. http://www.flasca.com/ (accessed October 22, 2011).
59. Personal communication, email with Ian McGrath and Elisabeth Dupont, INCTR (March 8, 2011).
60. Sloan FA, Gelband H. (Eds) Cancer control opportunities in low-and middle-income countries. Washington DC: National Academy of Press; 2007.

61. International Society of Pediatric Oncology (SIOP). About SIOP. SIOP. 2011. http://www.siop.nl/about-siop/ (accessed October 22, 2011).
62. American Society of Clinical Oncologists. Exploring ASCO's Roots: American Society of Clinical Oncology. 2003. American Society of Clinical Oncologists. http://www.asco.org/ascov2/About+ASCO/ASCO+Information/ASCO+History/History+Article+Series/Exploring+ASCO's+Roots (accessed October 22, 2011).
63. Ibid.
64. Ibid.
65. American Society of Clinical Oncologists. The ASCO Annual Meeting. 2004. American Society of Clinical Oncologists. http://www.asco.org/ASCOv2/About+ASCO/ASCO+Information/ASCO+History/History+Article+Series/The+ASCO+Annual+Meeting (accessed October 22, 2011).
66. American Society of Clinical Oncologists. ASCO's Founders Shared Vision for Future of Cancer Treatment. 2004. American Society of Clinical Oncologists. http://www.asco.org/ASCOv2/About+ASCO/ASCO+Information/ASCO+History/History+Article+Series/ASCO%27s+Founders+Shared+Vision+for+Future+of+Cancer+Treatment (accessed October 22, 2011).
67. Hansen H, Bajorin DF, Muss HB, Purkalne G, Schrijvers D, Stahel R. Recommendations for a global core curriculum in medical oncology. Annals of Oncology. 2004;15(11);1603-1612.
68. American Society of Clinical Oncologists. International Affairs. 2011. American Society of Clinical Oncologists. http://www.asco.org/ASCOv2/About+ASCO/International+Affairs (accessed October 22, 2011).
69. Patel JD, Galsky MD, Chagpar AB, Pyle D, Loehrer Sr PJ. Role of American Society of Clinical Oncology in low- and middle- income countries. Journal of Clinical Oncology. 2011;29(30).
70. Sloan FA, Gelband H. (Eds) Cancer control opportunities in low-and middle-income countries. Washington DC: National Academy of Press; 2007.
71. Beaulieu N, Bloom D, Bloom R, Stein R. Breakaway: the global burden of cancer–challenges and opportunities. Economist Intelligence Unit. 2009.
72. John R, Ross H. Global Economic Cost of Cancer Report. American Cancer Society. 2010.
73. Bloom DE, Cafiero ET, Jané-Llopis E, et al. The Global Economic Burden of Non-communicable Diseases. Geneva, Switzerland: World Economic Forum. 2011. http://www3.weforum.org/docs/WEF_Harvard_HE_GlobalEconomicBurdenNonCommunicableDiseases_2011.pdf (accessed October 23, 2011).
74. Alleyne G, Basu S, Stuckler D. Who's Afraid of Noncommunicable Diseases? Raising Awareness of the Effects of Noncommunicable Diseases on Global Health. Journal of Health Communication. 2011; 16(suppl 2):82-93.
75. Afrox. Improving cancer care in Africa: Our history. AfrOx. 2011. http://www.afrox.org/9/our-history (accessed October 22, 2011)
76. Breast Health Global Initiative. Background. Breast Health Global Initiative. 2011. http://portal.bhgi.org/Pages/Background.aspx (accessed October 22, 2011).
77. Casper C, Sessle E, Phipps W, Yager J, Corey L, and Orem J. Uganda Program on Cancer and Infectious Diseases. GTF.CCC Working Paper Series, Paper No. 2, Harvard Global Equity Initiative, 2011.
78. Varmus T, Trimble EL. Integrating Cancer Control into Global Health. Science Translational Medicine. 2011;3(101):101.
79. CanTreat International. Access to cancer treatment in low- and middle-income countries. An essential part of global cancer control; 2010.
80. Global Task Force on Expanded Access to Cancer Care and Control in Developing Countries. About Us. 2011. (accessed August 8 2011).
81. Sloan FA, Gelband H. (Eds) Cancer control opportunities in low-and middle-income countries. Washington DC: National Academy of Press; 2007.
82. CSR Press Release. Rwanda, Merck and QIAGEN Launch Africa's First Comprehensive Cervical Cancer Prevention Program Incorporating Both HPV Vaccination and HPV Testing. CSR Wires. April 25, 2011. http://www.csrwire.com/press_releases/32078-Rwanda-Merck-and-QIAGEN-Launch-Africa-s-First-Comprehensive-Cervical-Cancer-Prevention-Program-Incorporating-Both-HPV-Vaccination-and-HPV-Testing. (accessed October 22, 2011).
83. Lancet. Financing HPV vaccination in developing countries. Lancet 2011; 377:1544.
84. QIAGEN. First-of-its kind collaboration between QIAGEN and Merck will address cervical cancer in developing countries. QIAGEN. 2011. http://www.qiagen.com/jump/090923.aspx (accessed October 22, 2011).
85. Clinton Global Initiative. Corporations, NGOs, and Foundations Announce 13 New Commitments to Empower Girls and Women at the Fifth Annual Meeting of the Clinton Global Initiative. 2009. http://press.clintonglobalinitiative.org/press_releases/corporations-ngos-and-foundations-announce-13-new-commitments-to-empower-girls-and-women-at-the-fifth-annual-meeting-of-the-clinton-global-initiative/ (accessed October 22, 2011).
86. CSR Press Release. Rwanda, Merck and QIAGEN Launch Africa's First Comprehensive Cervical Cancer Prevention Program Incorporating Both HPV Vaccination and HPV Testing. CSR Wires. April 25, 2011. http://www.csrwire.com/press_releases/32078-Rwanda-Merck-and-QIAGEN-Launch-Africa-s-First-Comprehensive-Cervical-Cancer-Prevention-Program-Incorporating-Both-HPV-Vaccination-and-HPV-Testing. (accessed October 22, 2011).
87. Kabeera E. PM Makuza opens Cancer Summit. The New Times. April 29, 2011. http://www.newtimes.co.rw/index.php?issue=14609&article=40642. (accessed October 22, 2011).
88. Kagire E. First Lady to launch anti-Cervical Cancer campaign. The New Times. April 26, 2011. http://www.newtimes.co.rw/index.php?issue=14607&article=40573. (accessed October 22, 2011).
89. Muson E. First Lady leads campaign against Cervical Cancer. The New Times. April 27, 2011. http://www.newtimes.co.rw/index.php?issue=14608&article=40601. (accessed October 22, 2011).
90. Lancet. Financing HPV vaccination in developing countries. 2011;377(9777):1544.
91. Anastos, K. Rwanda's Population-Based Cancer Registry. Presentation at Women's Cancer Summit in Rwanda, April 28, 2011.
92. Moon S, Szlezák NA, Michaud CM, et al. The global health system: lessons for a stronger institutional framework. PLoS Medicine. 2010;7(1):1-6.
93. Fidler D. Architecture amidst anarchy: global health's quest for governance. Global Health. 2007;1(1):1-17.
94. Beaglehole R, Bonita R, Horton R, et al. Priority actions for the non-communicable disease crisis. Lancet. 2011;377(9775):1438 - 47.
95. Ibid.
96. Union for International Cancer Control. UN Summit on NCDs – Political Declaration. Union for International Cancer Control. 2011. http://www.uicc.org/node/9103 (accessed October 23, 2011).
97. Nishtar S, Jané-Llopis E. A global coordinating platform for noncommunicable diseases. Journal of Health Communication. 2011;16(suppl 2).
98. United Nations General Assembly. Draft political declaration of the high-level meeting on the prevention and control of non-communicable diseases. September 9, 2011. http://www.un.org/en/ga/ncdmeeting2011/pdf/NCD_draft_political_declaration.pdf (accessed October 22, 2011).
99. Beaglehole R, Bonita R, Horton R, et al. Priority actions for the non-communicable disease crisis. The Lancet. 2011;377(9775):1438 - 47.
100. Alleyne G, Stuckler D, Alwan A. The hope and the promise of the UN Resolution on non-communicable diseases. Globalization and Health. 2010;6(15).
101. WHA. A61.8 Prevention and control of noncommunicable diseases: implementation of the global strategy. Sixty-first World Health Assembly: World Health Organization; 2008.
102. World Health Organization. Towards implementation of UN General Assembly resolution A/RES/64/265 "Prevention and control of non-communicable diseases". Geneva, Switzerland; 2010 July 23 2010.
103. Beaglehole R, Bonita R, Horton R, et al. Priority actions for the non-communicable disease crisis. Lancet. 2011;377(9775):1438 - 47.
104. Beaglehole R, Bonita R, Horton R, et al. Priority actions for the non-communicable disease crisis. Lancet. 2011;377(9775):1438 - 47.
105. World Health Organization. First global ministerial conference on healthy lifestyles and noncommunicable disease control. 2011. http://www.who.int/nmh/events/moscow_ncds_2011/en/ (accessed October 11, 2011).
106. Beaglehole R, Bonita R, Horton R, et al. Priority actions for the non-communicable disease crisis. The Lancet. 2011;377(9775):1438 - 47.
107. Institute of Medicine. The U.S. Commitment to Global Health: Recommendations for the New Administration. Washington, DC: National Academies of Press. 2009.
108. Sontag S. Illness as Metaphor and AIDS and Its Metaphors. Picador USA. 1989. New York: NY.
109. Judt T. Letters: Night. The New York Review of Books; 2010.

The mandate of The Global Task Force on Expanded Access to Cancer Care and Control in Developing Countries (GTF.CCC) is to design, promote, and evaluate innovative strategies involving multiple stakeholders. The GTF.CCC supports the work of partners in low and middle income countries to test and scale-up new approaches to service delivery that can increase access to cancer care and control and, at the same time, strengthen health systems.

This Report provides a blueprint for expanding acess in low and middle income countries to reduce the immense disparities in outcomes that constitute the cancer divide. In three sections, the Report outlines what should, what could, and what can be done to close this divide. The proposed strategies can strengthen health systems in ways that will benefit all countries.

The GTF.CCC logo is a multicolor ribbon-of-ribbons that represents both all cancers, and the links between cancer and other diseases. It symbolizes the importance of building strong health systems to meet the challenge of cancer and, at the same time, of the potential contributions of expanding cancer care and control to strengthen health systems in ways that benefit all patients. The ribbon is transparently laid out over a map of the world to visually demonstrate that cancer is a global problem, affecting countries at all levels of development.

Global Task Force on Expanded Access to Cancer Care and Control
in Developing Countries (GTF.CCC)
Harvard Global Equity Initiative, Secretariat
651 Huntington Avenue
FXB Building, Room 632
Boston, MA 02115

gtfccc.harvard.edu **gtfccc@harvard.edu**

HARVARD GLOBAL EQUITY INITIATIVE HGEI SECRETARIAT

HARVARD School of Public Health

HARVARD Medical School

DANA-FARBER CANCER INSTITUTE