Global Health Threats

- Moderator: **Barry R. Bloom**, *Joan L. and Julius H. Jacobson Professor of Public Health, Dean of the Faculty, Harvard School of Public Health*
- Panelists: **David E. Bloom**, *Chairman, Department of Global Health and Population, Clarence James Gamble Professor of Economics and Demography, Harvard School of Public Health*
  Marc Lipsitch, *Professor of Epidemiology, Department of Epidemiology and Department of Immunology and Infectious Diseases, Harvard School of Public Health*
  Walter C. Willett, *Frederick John Stare Professor of Epidemiology and Nutrition, Chair, Department of Nutrition, Harvard School of Public Health; Professor of Medicine, Harvard Medical School*

Overview

The world faces major health threats. The significant threats discussed in this session are the threat of lethal and rapidly spreading infectious diseases (a pandemic); the threat of prevalent and costly chronic diseases (particularly diabetes, which is greatly affected by obesity); and the aging of the world's population due to longer life expectancy and lower birth rates. Each of these threats looms large and will affect societies, governments, policies, and the economy. Efforts are underway to prevent and/or address each of these threats but much more work remains to be done.

Context

This panel addressed three of the world's most significant health threats: infectious disease, particularly the threat of a pandemic; chronic disease; and aging.

Key Takeaways

- **Understanding the world's most serious health threats requires understanding the context for global health.**

  Dean Bloom set the stage for the presentation by providing a general context on global health. Currently, only one of every six people in the world has an opportunity to live a healthy life. Significant public health threats exist in many countries, and large numbers of the world's population live in poverty (1.2 billion people live on less than $1 per day; and just less than half of the world's population lives on $2 per day). One out of six children goes to bed hungry or is malnourished.

  And, there are huge disparities in health among countries and even within countries. Today almost 50% of all health expenditures in the world are in the United States and the developing world accounts for just 13% of all health care spending. Many people believe that economic development leads to good health. But actually, the opposite is true; populations need good health in order to develop economically.

> *"In terms of health, the world is definitely not flat."*
> — Barry R. Bloom

- **Infectious diseases, particularly influenza, are a major global health threat.**

  Influenza is one of many types of diseases that are transmitted from animals, often wildlife, to humans. About five diseases per year begin in this way, often starting in Asia. Sometimes these diseases are catastrophic, resulting in global pandemics, and often they are costly even if they don't cause many deaths. For example, SARS caused fewer than one thousand deaths but cost about $30 billion.

  The scientific community is concerned about a potential pandemic because pandemics occur frequently, on average about three times per century, and they can be of great magnitude. The Spanish Influenza of 1918 may have killed 50 million people around the world, and other smaller pandemics have killed in the millions.

  There has been some concern about the H5N1 virus which has been transmitted from animals to humans and has caused some deaths in Asia. But to date, the virus has not evolved into a form that is able to be easily transmitted from human to human.

  To prepare for a potential pandemic, the following actions are being taken:

  — *Learning from history.* The 1918 pandemic as well as other pandemics have been studied extensively to learn what actions work best. The conclusion: nonbiologic strategies to decrease social contact, such as closing churches, schools, and businesses, can slow the spread of the disease. These lessons were applied in SARS where those diagnosed with the disease were isolated and quarantined. (However, with SARS, people first got sick and only after eight days did they infect another person, meaning that isolation worked well. But historically the influenza strains that have caused pandemics were spread from person to person before an individual even know he or she was sick.)

  — *Increasing worldwide vaccine manufacturing capacity.* Social distancing is simply a strategy of delay to buy time for a vaccine to be developed, manufactured, and distributed. A key problem is that until recently there has been a lack of adequate manufacturing capacity for vaccines. Even if a vaccine was developed, only enough units could be made to vaccinate a small percentage of the world's population. But this is changing as more capacity is being developed.

> *"The U.S. strategy focuses on nonbiologic interventions and use of anti-virals . . . to buy time for a vaccine."*
> — Marc Lipsitch

— *Detection systems.* A critical part of dealing with a pandemic is detecting it early so that social distancing can be initiated in addition to efforts to develop a vaccine. These surveillance and detection systems require sustained investments in public health systems to collect data, systems which are lacking in much of the developed world. For example, an official from China who spoke recently at the Kennedy School was asked why China failed to disclose cases of SARS. He claimed that China didn't fail to disclose cases it knew of, but the reality was that they didn't know of some cases because they lack the public health infrastructure to detect the disease.

— *Investments in basic science.* When a pandemic outbreak occurs, it will be a race to identify the specific cause and develop a vaccine. The ability to do so as quickly as possible requires a solid foundation of basic science. Waiting for the pandemic to occur is too late; the basic science has to be in place in advance.

- **Chronic diseases, particularly diabetes, which is largely driven by obesity, are another growing global health issue.**

The rate of obesity in the United States has grown tremendously over the past two decades. In 1985, there were 8 U.S. states where 10% to 14% of the population was obese, and no states where the rate of obesity was higher. As of 2006, 2 states had obesity rates of more than 30% of the population; in 20 states, 25% to 29% of the population was obese; 24 states have obesity rates of 20% to 25%; and just 4 states have obesity rates of 15% to 19%.

This problem is not just limited to the United States—it is a global issue, affecting both developed countries and poor countries. And of particular concern is the significant increase in the rates of childhood obesity in the United States and around the world. One researcher estimates that by 2030, 38% of the world's population will be overweight and almost 20% will be obese, representing more than 1 billion obese people in the world.

One of the consequences of the increase in obesity is a significant increase in the number of people in the world with diabetes. People who are slightly overweight are about 10 times more likely to develop diabetes; people who are obese (with BMI of 35 or more) are 60 times more likely to develop diabetes. Also, some ethnic groups, such as Asians, are more genetically predisposed to develop diabetes.

This is a huge problem for the entire world as those with diabetes are far more likely to develop cardiovascular diseases, kidney disease, and blindness, and to have other medical issues.

The good news: Type 2 diabetes is largely preventable and the actions that can be taken to prevent it are known. The simultaneous actions needed to be "low risk" are: not smoking; having a BMI of less than 25; engaging in moderate to vigorous exercise; having a good diet, which includes low trans fats, high cereal fiber, a low glycemic load, and a high ratio of polyunsaturated to saturated fat; and consuming a bit of alcohol. If everyone were low risk, 92% of diabetes could be eliminated.

The bad news: only 4% of the U.S. population is low risk. Lowering risk is a complex combination of individual responsibility; a person's social environment (peers, family, friends); the physical environment (neighborhoods, schools, exercise facilities, restaurants, etc.); and the societal macro system (media, government, culture, food production and distribution, etc.).

> *"This is an almost completely preventable disease and yet we are having an epidemic."*
> — Walter C. Willet

Professor Willet observed, "An unregulated market is doing to human health what it has done to the U.S. economy." He recommended the following actions:

— *Limit aggressive advertising to children.* Most of this advertising is for junk food.

— *Set high standards for foods/beverages in schools.* This is where and when children learn and develop their eating habits.

— *Use taxes/subsidies to promote healthy choices.*

— *Establish better standards for labeling and nutrition information*.

- **The world's aging population is both a health issue and an economic one.**

The world's population is aging significantly and rapidly. Today there are 670 million people in the world over the age of 60, representing 10% of the world's population. By 2050 that is projected to grow to 2 billion people and 22% of the population. From 1950 to 2050 the total global population is projected to grow by 3.5 times; during this period, the number of people older than 60 is projected to grow by 10 times and the number of people older than 80 is projected to grow by 30 times. There are significant regional differences as today just 5% of Africans are older than 60 while 21% of Europeans are more than 60 years old. But, going forward, the populations of all geographies will age.

> *"The world is heading into uncharted waters [in terms of the aging of the world's population]."*
> — David E. Bloom

This aging of the world is occurring for three main reasons:

— *Age dynamics.* This is the aging of the generations in the population, particularly the Baby Boomers, born from 1946 to 1964.

— *Declining fertility.* In nearly every country fertility rates have plummeted. In 1950 the global fertility rate was 5 children per woman; today it is 2.6 and is projected to

be 2.0 in 2050. The "replacement rate" is 2.1, which is currently the fertility rate in the United States. In Spain the fertility rate is 1.3 children per woman, foreshadowing a declining population.

— *Longer life expectancy.* People are living much longer. From 1950 to 2000 the average life expectancy increased by almost 20 years. In the next 50 years life expectancy can be expected to improve by perhaps another 10 years. Going forward, all researchers believe that life expectancy will continue to grow, but differences exist in the magnitude. Some believe that between 2060 and 2100 the average life expectancy will become 100; others believe it will peak around 85.

Important to the discussion around length of life is whether people are enjoying a good quality of life for a longer period, or are they just "adding years of misery." Professor Bloom says that research appears to indicate a postponement of chronic disease and a "compression of morbidity," meaning that as people are living longer lives, they appear to be enjoying a high quality of life for a longer period.

The aging of the population will have economic and policy implications. It will affect:

- Mandatory retirement ages and Social Security. These haven't changed much despite the fact that people are living much longer.
- Savings rates. These will need to increase as people live longer. Increased savings should provide an economic benefit.
- Population migration/immigration. Developed countries will need workers for many jobs and will have to turn to immigration as a source. This provides a benefit to poorer countries, which will have younger citizens who need jobs.

Speaker Biographies

Barry R. Bloom (Moderator)
Joan L. and Julius H. Jacobson Professor of Public Health, Dean of the Faculty, Harvard School of Public Health

Barry Bloom is dean of the faculty at the Harvard School of Public Health and the Joan L. and Julius H. Jacobson Professor of Public Health. A leading scientist in infectious diseases, vaccines, and global health, he continues to pursue an interest in bench science as the main investigator of a laboratory researching the immune response to tuberculosis, which claims more than 2 million lives each year.

Bloom has been extensively involved with the World Health Organization (WHO) for more than 40 years. He is chair of WHO's Technical and Research Advisory Committee to the Global Malaria Programme, has been a member of the WHO Advisory Committee on Health Research, and chaired the WHO committees on Leprosy Research and Tuberculosis Research and the Scientific and Technical Advisory Committee of the UNDP/World Bank/WHO Special Programme for Research and Training in Tropical Diseases. He is on the editorial board of the *Bulletin of the World Health Organization*.

Bloom serves on the Ellison Medical Foundation scientific advisory board and the Wellcome Trust Pathogens, Immunology, and Population Health Strategy Committee. He is on the scientific advisory board of Columbia University's Earth Institute and the advisory council of the Paul G. Rogers Society for Global Health Research.

Bloom came to the School of Public Health to serve as dean of the faculty in 1998. In his capacity as dean, he served as secretary-treasurer for the Association of Schools of Public Health. Before Harvard he was chairman of the Department of Microbiology and Immunology at the Albert Einstein College of Medicine from 1978 to 1990, when he became an investigator of the Howard Hughes Medical Institute. Earlier he was a consultant to the White House on international health policy (1978).

Bloom holds a bachelor's degree in biology and an honorary doctorate from Amherst College and a Ph.D. in immunology from Rockefeller University. He is a member of the National Academy of Sciences, the Institute of Medicine, the American Association for the Advancement of Science, and the American Philosophical Society.

David E. Bloom
Chairman, Department of Global Health and Population, Clarence James Gamble Professor of Economics and Demography, Harvard School of Public Health

David Bloom is chairman of the Department of Global Health and Population and the Clarence James Gamble Professor of Economics and Demography at the Harvard School of Public Health. He has published over 200 articles and books in the fields of economics and demography. Bloom has been honored with a number of distinctions, including fellow of the American Academy of Arts and Sciences, an Alfred P. Sloan Research Fellowship, and the Galbraith Award for quality teaching in economics. He was also a Fulbright Scholar in India and a scholar in residence at the Russell Sage Foundation during the academic year 1989–1990.

Bloom's current research interests include labor economics, health, demography, and the environment. He has written extensively on the links between health status and economic growth; the effects of population change on economic development; the determinants of wages, fringe benefits, and total family income; the adjudication of labor disputes; the measurement of discrimination; the emerging world labor market; the effects of rapid population growth; the economics of municipal solid waste; the sociology and economics of marriage and fertility; and the global spread and economic impacts of HIV and AIDS.

Bloom has served as a consultant to the United Nations Development Programme, the World Bank, the World Health Organization, the International Labour Organization, the National Academy of Sciences, and the Asian Development Bank. He is a member of the American Arbitration Association's Labor Arbitration Panel and the board of trustees of the American Foundation for AIDS Research and a faculty research associate at the National Bureau of Economic Research, where he participates in the programs on labor studies, health economics, and aging.

Bloom has been a contributing editor of *American Demographics* and an associate editor of the *Review of Economics and Statistics*. He has served as a referee for over 60 journals and publishing houses and has been a member of the book review board of *Science* magazine since January 2000.

From 1990 to 1993, Bloom served as the chairman of the Department of Economics at Columbia University, and from 1996 to 1999, he served as deputy director of the Harvard Institute for International Development. He is now the director of Harvard's Program on the Global Demography of Aging.

Bloom received a BS from Cornell University and an MA in economics and a Ph.D. in economics and demography from Princeton University.

Marc Lipsitch
Professor of Epidemiology, Department of Epidemiology and Department of Immunology and Infectious Diseases, Harvard School of Public Health

Marc Lipsitch is professor of epidemiology in the Department of Epidemiology and the Department of Immunology and Infectious Diseases at the Harvard School of Public Health. His research focuses on the transmission dynamics and within-host population biology of infectious disease. It combines in vivo experimental studies with statistical and mathematical modeling (population-dynamical) approaches

to address questions in these areas. His research interests include population dynamics of pneumococcal carriage and transmission. He uses mathematical models to study the transmission dynamics of multiple serotypes of *Streptococcus pneumoniae* and the interactions among these serotypes. In the lab, Lipsitch is doing experiments on the population dynamics of intranasal carriage of pneumococci in mice to measure parameters and test assumptions and predictions of the mathematical models. A central question of interest in this experimental and mathematical work is whether widespread human use of conjugate vaccines against a subset of serotypes will result in the increased carriage of nonvaccine serotypes ("serotype replacement") and, if so, what the public-health consequences will be.

Lipsitch is also developing statistical models to test for evidence of serotype replacement in clinical trials. To study antimicrobial resistance in hospital- and community-acquired pathogens, he uses mathematical models and epidemiological data to evaluate the relationships between antimicrobial use and antimicrobial resistance in a number of bacterial and viral pathogens.

Lipsitch is also interested in the within-host population dynamics of antimicrobial resistance, the development of improved treatment protocols to reduce the selection for resistant bacteria, and the design of studies to measure the selective effect of treatment on antimicrobial resistance.

With Carl Bergstrom and Bruce Levin (Emory University), Lipsitch is working on mathematical models of plasmid persistence in bacterial populations. They are particularly interested in the roles of interspecific plasmid transfer and environmental heterogeneity in preserving plasmids when the plasmids impose a selective disadvantage on their bacterial hosts.

Lipsitch received a D.Phil. from the University of Oxford in 1995.

Walter C. Willett

Frederick John Stare Professor of Epidemiology and Nutrition, Chair, Department of Nutrition, Harvard School of Public Health; Professor of Medicine, Harvard Medical School

Walter Willett is the Fredrick John Stare Professor of Epidemiology and Nutrition and chair of the Department of Nutrition at the Harvard School of Public Health and professor of medicine at Harvard Medical School.

Willett grew up in Madison, Wisconsin, attended Michigan State University, and graduated from the University of Michigan Medical School before obtaining a master's and a doctorate in public health from the Harvard School of Public Health. He is a coinvestigator of the Nurses' Health Study I, a cohort of over 121,000 female registered nurses 30–55 years of age who completed a mailed questionnaire that included items about known or suspected risk for cancer and cardiovascular disease. He is also principal investigator of the Nurses' Health Study II, a prospective cohort investigation established in 1989 with over 116,000 female registered nurses. This study is designed to examine the association between lifestyle and nutritional factors and the occurrence of breast cancer and other major illnesses.

Besides his work with the Nurses' Health Studies I and II, in 1986 Willett began a parallel prospective study of diet in relation to cancer and cardiovascular disease among 52,000 men, the Health Professionals Follow-Up Study. He has published over 700 articles, mainly on lifestyle risk factors for heart disease and cancer, and has written the textbook *Nutritional Epidemiology*, 2nd edition. His recent book for the general public, *Eat, Drink, and Be Healthy: The Harvard Medical School Guide to Healthy Eating*, has appeared on most major bestseller lists.