

Global Development Goals *and* Linkages to Health *and* Sustainability

WORKSHOP SUMMARY

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Roundtable on Environmental Health Sciences, Research, and Medicine

Board on Population Health and Public Health Practice

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Willing is not enough; we must do.”*
—Goethe



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Although the reviewers listed above have provided many constructive comments and suggestions, they did not see the final draft of the workshop summary before its release. The review of this summary was overseen by **Susan J. Curry**, University of Iowa. Appointed by the Institute of Medicine, she was responsible for making certain that an independent examination of this workshop summary was carried out in accordance with institutional procedures and that all review comments were carefully considered. Responsibility for the final content of this summary rests entirely with the rapporteur and the institution.

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Introduction

The Roundtable on Environmental Health Sciences, Research, and Medicine was established in 1998 and provides a structured opportunity for regular and open communication among experts interested in environmental health topics from a variety of government, academic, industry, and consumer groups. Through meetings and workshops, the Roundtable has focused on the state of environmental health sciences and decision making, identification of populations vulnerable to environmental hazards, and translation of environmental health research into public health practice. The Roundtable defines the environment broadly—a definition that incorporates the natural, built, and social environments—and considers how changes in the environment can impact human health through direct and indirect pathways (IOM, 2006).

In September 2012, the Roundtable established the Global Environmental Health and Sustainable Development Innovation Collaborative as an ad hoc activity to provide an adaptable pathway for discussing issues related to sustainable development and for sharing scientific information across United Nations (UN) system entities, international and governmental organizations, academia, the private sector, and civil society. The Innovation Collaborative is composed of Roundtable members and other stakeholders with a shared interest in developing cooperative activities and strategies to advance global goals on sustainable development and human health. Through multidisciplinary collaboration, the Innovation Collaborative seeks to connect and leverage expertise across a variety of fields related to sustainable development, including economics, energy, environmental sciences, medicine, public health, and health communication.

The Innovation Collaborative held a series of webinars in October, November, and December 2012 to help inform the post-2015 development agenda process that was under way and being led by the UN. Provided below is a brief background of key events and reports that informed the planning of the webinar series, as well as details on the purpose of the webinar series and the overall structure of this summary.

OVERVIEW OF SUSTAINABILITY

The term *sustainability* comes from the concept of sustainable development defined in the 1987 report *Our Common Future* by the Brundtland Commission of the United Nations as “development which meets the needs of current generations without compromising the ability of future generations to meet their own needs” (WCED, 1987). Sustainable development is supported by three pillars—the economic, social, and environmental dimensions—where health is both an outcome of and a precondition for all three pillars (UN, 2012). Being built on multiple disciplines, sustainable development follows an integrated systems-based approach to encompass the aims of development, including human well-being, quality of life, freedom, and opportunity (NRC, 2011). Because of this approach, sustainability frameworks are increasingly utilized to address intractable problems throughout the world, particularly growing challenges around global environmental degradation and poverty (NRC, 2011).

In 1992, sustainable development was formally endorsed by the international community at the historic UN Earth Summit held in Rio de Janeiro, Brazil. Box 1-1 includes a list of the international sustainable development conferences and documents discussed in this chapter. The Earth Summit resulted in the creation of Agenda 21, an ambitious action plan for global sustainable development (UN, 1993), and the Rio Declaration, which outlined 27 principles for global sustainability (UN, 1992). For example, Principle 1 of the Rio Declaration states that “human beings are at the center of concerns for sustainable development . . . they are entitled to a healthy and productive life in harmony with nature” (UN, 1992), clearly articulating that protecting human health is the cornerstone of sustainable development. Principle 4 goes on to state that “in order to achieve sustainable development, environmental protection shall constitute an integral part of the development process and cannot be considered in isolation from it” (UN, 1992). This principle places environmental protection on an equal plane with development, a requirement to ensure that resources are available for present and future generations.

The Rio Declaration also highlights the need to eradicate poverty and decrease disparities in standards of living to achieve the objectives of sustainable development. Following these efforts, world leaders gathered in New York City in 2000 for the Millennium Summit and adopted the Millennium Declaration (UN General Assembly, 2000), which gave rise to the Millennium Development Goals (MDGs). The MDGs are a set of eight health-related development goals intended to reduce extreme poverty throughout the world, protect the environment, and improve conditions for vulnerable populations (see Box 1-2). Each goal includes a

BOX 1-1	
International Sustainable Development Conferences and Documents	
Conferences	
<ul style="list-style-type: none"> • 1992: Earth Summit (Rio de Janeiro, Brazil) • 2000: Millennium Summit (New York, United States) • 2002: World Summit on Sustainable Development (Johannesburg, South Africa) • 2005: World Summit (New York, United States) • 2012: United Nations (UN) Conference on Sustainable Development (Rio+20 Conference) (Rio de Janeiro, Brazil) 	
Documents	
<ul style="list-style-type: none"> • <i>Our Common Future</i> (WCED, 1987) • <i>Rio Declaration</i> (UN, 1992) • <i>Agenda 21</i> (UN, 1993) • <i>Millennium Declaration</i> (UN General Assembly, 2000) • <i>Report of the World Summit on Sustainable Development</i> (UN, 2002) • <i>2005 World Summit Outcome</i> (UN General Assembly, 2005) • <i>The Future We Want</i> (UN, 2012) 	

series of time-bound targets for achieving and tracking progress across countries through 2015. In 2002, the MDGs were reaffirmed at the World Summit on Sustainable Development in Johannesburg, South Africa (UN, 2002), and a plan of implementation was developed that reinforced the interdependent components of sustainable development (economic development, social development, and environmental protection) and overarching objectives, including poverty eradication, improved human health, and protection and management of the natural resources base. Following the 2005 UN World Summit, the MDG targets were updated to incorporate intergovernmental agreements from the event; Targets 5B, 6B, and 7B were added, and Target 1B was added as a revision of a previous target listed under MDG 8.

Despite these efforts, many of the MDGs have not been achieved, and adverse trends have been reported for several of the environmental targets (UN, 2013). For example, global carbon dioxide emissions have increased by more than 46 percent since 1990, nearly one-third of marine fish stocks are overexploited, and an estimated 863 million people continue to reside in slums in the developing world (UN, 2013). One possible explanation for this slow progress is lack of integration across the social, economic, and environmental priorities found in the MDGs (Haines et al., 2012). In addition, the drafting process primarily involved

BOX 1-2**Millennium Development Goals (MDGs) and Targets**

1. Eradicate extreme poverty and hunger
 - 1A. Halve, between 1990 and 2015, the proportion of people whose income is less than \$1 per day
 - 1B. Achieve full and productive employment and decent work for all, including women and young people
 - 1C. Halve, between 1990 and 2015, the proportion of people who suffer from hunger
2. Achieve universal primary education
 - 2A. Ensure that, by 2015, children everywhere, boys and girls alike, will be able to complete a full course of primary schooling
3. Promote gender equality and empower women
 - 3A. Eliminate gender disparity in primary and secondary education, preferably by 2005, and in all levels of education no later than 2015
4. Reduce child mortality
 - 4A. Reduce by two-thirds, between 1990 and 2015, the under-5 mortality rate
5. Improve maternal health
 - 5A. Reduce by three-quarters, between 1990 and 2015, the maternal mortality ratio
 - 5B. Achieve, by 2015, universal access to reproductive health
6. Combat HIV/AIDS, malaria, and other diseases
 - 6A. Have halted by 2015 and begun to reverse the spread of HIV/ AIDS
 - 6B. Achieve, by 2010, universal access to treatment for HIV/AIDS for all those who need it
 - 6C. Have halted by 2015 and begun to reverse the incidence of malaria and other major diseases
7. Ensure environmental sustainability
 - 7A. Integrate the principles of sustainable development into country policies and programs and reverse the loss of environmental resources
 - 7B. Reduce biodiversity loss, achieving, by 2020, a significant reduction in the rate of loss
 - 7C. Halve, by 2015, the proportion of the population without sustainable access to safe drinking water and basic sanitation
 - 7D. By 2020, to have achieved a significant improvement in the lives of at least 100 million slum dwellers

8. Global partnership for development
- 8A. Develop further an open, rule-based, predictable, nondiscriminatory trading and financial system
 - 8B. Address the special needs of the least developed countries
 - 8C. Address the special needs of landlocked developing countries and small-island developing states
 - 8D. Deal comprehensively with the debt problems of developing countries through national and international measures in order to make debt sustainable in the long term
 - 8E. In cooperation with pharmaceutical companies, provide access to affordable essential drugs in developing countries
 - 8F. In cooperation with the private sector, make available the benefits of new technologies, especially information and communications

NOTE: Please see *The Millennium Development Goals Report 2013* for a detailed assessment of global and regional progress made toward the MDGs and targets: <http://mdgs.un.org/unsd/mdg/Resources/Static/Products/Progress2013/English2013.pdf> (accessed August 14, 2013).

SOURCE: UN, 2008.

experts from the UN system (who took the targets from the text of the Millennium Declaration) and lacked direct participation from civil society and nongovernmental organizations (NGOs); as a result, implementation was slow in some countries and regions (UN System Task Team on the Post-2015 UN Development Agenda, 2012; Vandemoortele, 2011).

PURPOSE OF THE WEBINAR SERIES

In June 2012, world leaders and participants from government, NGOs, the private sector, and civil society gathered in Rio de Janeiro for the UN Conference on Sustainable Development to honor the 20th anniversary of the 1992 Earth Summit (commonly referred to as Rio+20). The official discussions of the Rio+20 Conference highlighted seven areas for priority attention (decent jobs, energy, sustainable cities, food security and sustainable agriculture, water, oceans, and disaster readiness), and focused on issues related to the green economy in the context of sustainable development and poverty eradication.

A formal outcome document was prepared at the conclusion of the conference that reaffirms

the need to achieve sustainable development by promoting sustained, inclusive and equitable economic growth, creating greater opportunities

for all, reducing inequalities, raising basic standards of living, fostering equitable social development and inclusion, and promoting the integrated and sustainable management of natural resources and ecosystems that supports, inter alia, economic, social, and human development while facilitating ecosystem conservation, regeneration and restoration, and resilience in the face of new and emerging challenges. (UN, 2012).

The document also highlights the need for a set of Sustainable Development Goals (SDGs) that address and incorporate all three dimensions of sustainable development and that can be integrated into the UN post-2015 development agenda (a global framework that is being developed to maintain the progress of the MDGs beyond 2015).

The follow-up to the Rio+20 Conference provides an opportunity for guidance on the post-2015 development agenda framework and the SDGs, which will likely converge and be adopted at the September 2015 UN General Assembly. The challenge is to achieve collective support for effective, meaningful, concise, and easy-to-communicate global development goals that will focus on the three areas of sustainable development and benefit the health of populations at the global, regional, and national levels. In an effort to provide varied perspectives that may benefit higher-level policy discussions, the Global Environmental Health and Sustainable Development Innovation Collaborative hosted a webinar series during October, November, and December 2012. The statement of task for the webinar series can be found in Box 1-3. The webinars covered lessons learned from the MDG process and insights on topics and goals that may be considered for inclusion in the development frameworks being debated and negotiated at the global level. An independent planning committee (whose role was limited to planning the webinar series in accordance with the procedures of the National Research Council [NRC]) invited experts within the fields of environmental and global health to present their experiences and thoughts on the topic areas and encouraged representatives from government, academia, and civil society to participate in the discussion sessions that followed the presentations.

STRUCTURE OF THE SUMMARY

This summary was prepared by the workshop rapporteur as a factual summary of what occurred during the webinars. All views presented in the summary are those of the webinar participants. The summary does not contain any findings or recommendations by the planning committee or the Roundtable.

BOX 1-3
Statement of Task

An ad hoc committee will plan and conduct a public three-part webinar series (workshop) on Sustainable Development Goals (SDGs) and human health. The webinars will feature invited presentations and discussions to look at possible health-related measures and metrics that can be utilized for creating new SDGs as the Millennium Development Goals sunset in 2015. The workshop will focus on fostering discussion across academic, government, business, and civil society sectors to make use of existing measurements that can be adapted to track progress of global sustainable development and human health. The committee will develop the webinar agendas, select invited speakers and discussants, and moderate the discussions. A workshop summary based on all three webinars will be prepared by a designated rapporteur in accordance with National Research Council policies and procedures.

The presentations and discussions that occurred during the webinars are summarized in the subsequent chapters. Chapter 2 considers lessons learned from the MDGs and opportunities for aligning environmental health objectives with the post-2015 development agenda. Chapter 3 includes provide perspectives on possible health goals and indicators for sustainable development while making connections to climate change. Chapter 4 provides insights on making linkages between sustainable development, health equity, and social justice. The webinar agendas can be found in Appendix A, and the speaker biosketches are included in Appendix B.

REFERENCES

- Haines, A., G. Alleyne, I. Kickbusch, and C. Dora. 2012. From the Earth Summit to Rio+20: Integration of health and sustainable development. *The Lancet* 379(9832):2189–2197.
- IOM (Institute of Medicine). 2006. *Rebuilding the unity of health and the environment in rural America*. Washington, DC: The National Academies Press.
- NRC (National Research Council). 2011. *Sustainability and the U.S. EPA*. Washington, DC: The National Academies Press.
- UN (United Nations). 1992. *Report of the United Nations conference on environment and development, Rio de Janeiro, Brazil, 3–14 June 1992*. A/CONF.151/26. New York: United Nations.
- UN. 1993. *Earth Summit: Agenda 21. The United Nations programme of action from Rio*. New York: United Nations.

- UN. 2002. *Report of the World Summit on Sustainable Development. Johannesburg, South Africa, 26 August–4 September 2002*. A/CONF.199.20. New York: United Nations.
- UN. 2008. Official list of MDG indicators. <http://mdgs.un.org/unsd/mdg/host.aspx?Content=indicators/officiallist.htm> (accessed August 14, 2013).
- UN. 2012. *The future we want*. A/CONF.216/L.1. New York: United Nations.
- UN. 2013. *The Millennium Development Goals report 2013*. New York: United Nations.
- UN General Assembly. 2000. *United Nations Millennium Declaration*. A/RES/55/2. New York: United Nations.
- UN General Assembly. 2005. *2005 World Summit Outcome*. A/60/L.1. New York: United Nations.
- UN System Task Team on the Post-2015 UN Development Agenda. 2012. Review of the contributions of the MDG agenda to foster development: Lessons for the post-2015 UN development agenda. Discussion note. http://www.un.org/millenniumgoals/pdf/mdg_assessment_Aug.pdf (accessed August 20, 2013).
- Vandemoortele, J. 2011. The MDG story: Intention denied. *Development and Change* 42(1):1–21.
- WCED (World Commission on Environment and Development). 1987. *Our common future*. Edited by G. H. Brundtland. Oxford: Oxford University Press.

Reflecting on the Millennium Development Goals and Post-2015 Development Agenda

John M. Balbus, senior advisor for public health at the National Institute of Environmental Health Sciences and co-chair of the Institute of Medicine Global Environmental Health and Sustainable Development Innovation Collaborative, opened the first webinar by highlighting the global burden of disease attributable to the modifiable environment. He noted that worldwide about 24 percent of all disability-adjusted life years (or years lost from both disability and death) is related to environmental factors (WHO, 2006), which range from the biological environment (such as water pollution) to the chemical environment (such as air pollution) to the built environment (including road traffic accidents). The burden of disease related to the environment is highest in the poorest countries of the world, and in these parts of the world sustainable development can provide the opportunity for a better economic life and improved health through sustainable development decisions informed by environmental health considerations.

Balbus emphasized that one of the key goals of sustainable development is to bring energy, transportation services, and other economic services to people who are lacking these resources in a way that does not compromise the needs of future generations. Substantial health benefits can be obtained from sustainable development policies around the world that focus on climate change mitigation, transportation, agriculture, food consumption, household energy, and large-scale energy production; and, in many cases, the economic benefits of these policies would significantly offset the associated costs.

However, to achieve health benefits from these policies, efforts need to take place throughout the world in ministries outside the Ministry of Health. Balbus said that in order to implement direct energy policies or change urban planning or transportation systems, the public health community needs to work in an intersectoral way to raise awareness about the health impacts from other sectors that have a strong hold on the health of future generations.

Although a siloed approach to policy development facilitates clarity in communication, it often can lead to missed opportunities to address the interrelationships among economic and social development, environmental protection, and human health (Balbus and Wasserheit, 2012). Balbus emphasized that many existing silos need to be removed, starting with the areas that have the greatest public health importance and greatest scientific rigor. In order to achieve wide acceptance across sectors and make progress, the cost of the policy or intervention needs to be reasonable, the benefits need to be measurable and sizable, the language needs to be understandable to all sectors, and all stakeholders need to strive for simplicity—simplicity in the articulation of goals, in the communication of interlinkages, and in the creation of targets and indicators.

POSITIONING HEALTH IN THE POST-2015 DEVELOPMENT AGENDA

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In thinking about the post-2015 development agenda, Maria Neira began by referencing a recent report to the United Nations (UN) Secretary-General, *Realizing the Future We Want for All*. The report outlines the importance of working with a “circle mentality” that includes environmental sustainability, inclusive social development, inclusive economic development, and peace and security—with a significant focus on sustainability, equality, and human rights—in creating the post-2015 development agenda (see Figure 2-1). This framework builds on the three pillars of sustainable development (economic, social, and environmental) and adds a fourth goal of peace and security; these four areas are all enablers of the three fundamental principles (human rights, equality, and sustainability) of the global vision (UN System Task Team on the Post-2015 UN Development Agenda, 2012a). In thinking about how to position health within the agenda, Neira noted that it is extremely important to understand the post-2015 development agenda process, particularly the architecture created under the Secretary-General.

Understanding the Post-2015 Development Agenda Process

The Secretary-General’s High-Level Panel of Eminent Persons on the Post-2015 Development Agenda was created to propose a framework for

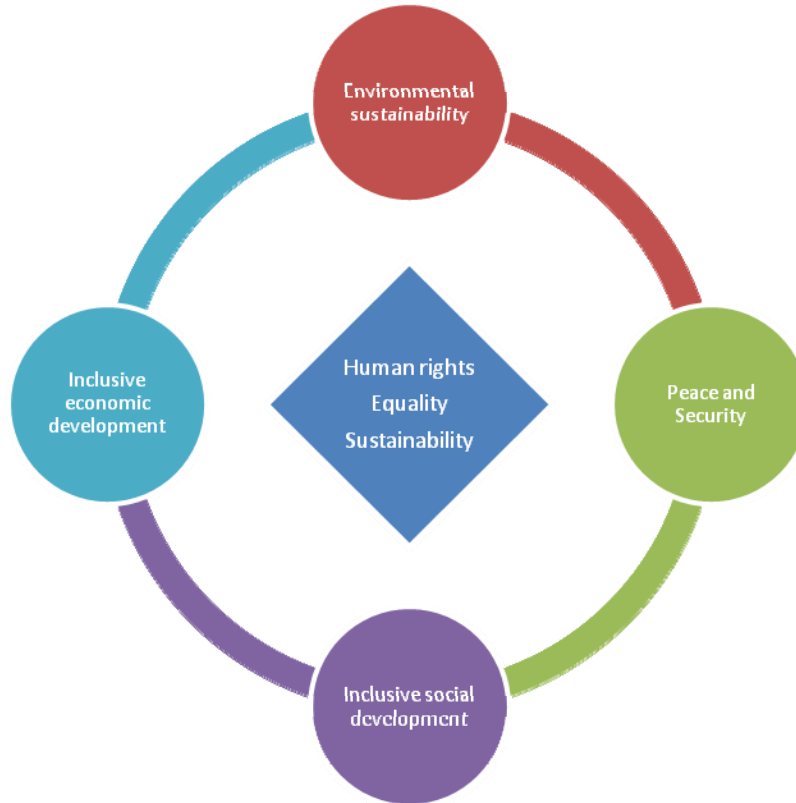


FIGURE 2-1 Proposed integrated framework for realizing the “future we want for all” in the post-2015 development agenda.

SOURCE: UN System Task Team on the Post-2015 UN Development Agenda, 2012a.

the post-2015 development agenda and deliver a report to the UN General Assembly by the second quarter of 2013. Neira noted that the framework may include post-2015 Millennium Development Goals (MDGs) or Sustainable Development Goals (SDGs), along with data and work informed by the 2012 UN Conference on Sustainable Development (Rio+20 Conference) and ongoing country-level consultations of the UN Development Group (UNDG). The High-Level Panel is co-chaired by three individuals: Susilo Bambang Yudhoyono, President of Indonesia; Ellen Johnson Sirleaf, President of Liberia; and David Cameron, Prime Minister of the United Kingdom. In addition, 30 countries are assisting with the process. Neira emphasized the need to work within this structure

to ensure that health is included in the post-2015 development agenda process.

In addition to the High-Level Panel and UNDG country consultations, there are 11 thematic consultations planned, which will be led by appointed UN agencies (see Box 2-1). The architecture of all these groups can be complicated and will likely initiate competition among different topic areas and proposed goals. The health consultation will be led by the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF), with Sweden and Botswana playing a fundamental role in the planning process, and will conclude in January or February 2013 with a final event in Botswana. Neira highlighted the need to also use the other thematic areas, such as consultations for water or energy, to include health as an indicator and make progress in those sectors' policies. These additional efforts will be fundamental to including health goals in the post-2015 development agenda.

Achieving a Greater Focus on Health

In working on the health thematic consultation, Neira said that it is important to emphasize achievements and investments made in the health-related MDGs in order to sustain this work. She noted that there is a need for greater recognition and focus on the means as well as the ends.

BOX 2-1

11 Global Thematic Consultations for the Post-2015 Development Agenda Process

1. Inequalities (across all dimensions)
2. Health (including MDG 4, MDG 5, MDG 6, and noncommunicable diseases)
3. Education (primary to tertiary and vocational)
4. Growth and Employment (investment in productive capacities, decent work, and social protection)
5. Environmental Sustainability (including biodiversity and climate change)
6. Governance (accountability at all levels)
7. Conflict and Fragility (conflict and post-conflict countries, and those prone to natural disasters)
8. Population Dynamics (including aging, international and internal migration, and urbanization)
9. Hunger, Nutrition, and Food Security
10. Energy
11. Water

For example, we as a global community need to recognize health as a human right, need stronger and more resilient health systems, need more innovation and efficiency to respond to financial constraints, and need to address the economic, social, and environmental determinants of health. All of this calls for a multisectoral response. Instead of looking for what could be the new health goals, Neira noted, the public health community should build a case for why health is a concern for all people and is influenced by, as well as contributes to, policies across a wide range of sectors. The overarching goal being proposed by WHO in order to accommodate and maintain the visibility of all the internationally agreed upon health goals is universal health coverage. The vision of universal health coverage will ensure that all people have coverage and access to health services and have financial risk protection for paying for care.

Although universal health coverage is an important overarching goal, Neira again noted the importance of including health in many of the proposed thematic consultations. For the thematic consultation on water, health-related goals should be framed to use health as a way to measure progress in the water and sanitation sectors; in this way those goals will have a very clear and positive impact on the health of people. Similarly, for energy, using health as an indicator of achievements and progress made by good energy policies will likely serve as a better outcome, which will garner popular support for policies that have more diffuse outcomes, such as reducing carbon dioxide (CO₂) emissions.

Closing Remarks

Neira closed by stating that the post-2015 development agenda process is obviously a work in progress, and she hopes that at the end of the process the results will include a greater focus on health within what is sure to be a complicated post-2015 development agenda.

A PERSPECTIVE FROM UGANDA: MILLENNIUM DEVELOPMENT GOALS AND THE ENVIRONMENT

*David Serwadda, M.B.Ch.B., M.Sc., M.Med., M.P.H.
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Makerere University School of Public Health, Uganda*

David Serwadda began his presentation by pointing out that each of the eight MDGs lays out overarching goals and specific targets for the world to work toward by 2015 (see Box 1-2 in Chapter 1 for a complete list of goals and targets). MDG 7 focuses on ensuring environmental sustainability, but this goal is linked to many other MDG outcomes. He

stated that it is important to see the interconnections between MDG 7 and MDGs 1, 2, 3, 4, and 8 to understand how the management of the environment acts on the other goals. For example, Target 7C (to halve, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation) has connections to improved time saving for women and the promotion of gender equality (MDG 3), and reductions in waterborne diseases that can lead to reduced child mortality (MDG 4).

Coordinating Implementation of Global Development Goals

Taking a step back, Serwadda shared his experience with evaluating WHO's *Global Strategy for Health for All by the Year 2000*, noting that many of the goals set for this global strategy were not achieved by 2000. One of the reasons for falling short, which is still prevalent today, is focusing implementation efforts on independent outcomes, despite the fact that the process of achieving the goals is quite interrelated. Serwadda emphasized that the MDGs are implemented in silos, with a lack of good systematic coordinated platforms for implementation.

Taking a closer look at coordinating MDG efforts, Serwadda used the topic of water sanitation to exemplify the complexity of managing resources. In Uganda, as well as many countries in Africa, water and sanitation surveillance take place in the Ministry of Health. He noted that the Ministry of Health is able to identify huge growing health problems associated with poor-quality water and sanitation, most of which is indicated by diarrheal diseases and high morbidity and mortality rates in children less than 5 years of age. However, the Ministry of Water and Sanitation—a completely separate ministry—is responsible for the management of these resources. This makes it difficult to effectively achieve Target 7C, because the public health community that tracks progress in this area has very little input in the implementation of water and sanitation resources. Serwadda pointed out that this again highlights the issue of looking at the outcomes, rather than the process of how the outcomes are achieved. In looking at the MDG process, one will quickly realize that most of the direct and indirect impacts on health and education are actually found outside the directly relevant goals. Serwadda emphasized that this is a significant problem that should be addressed moving forward with the post-2015 development agenda process.

Impact of Population Growth in Africa

Serwadda then shifted to the challenges associated with African population growth. By 2050 Africa is projected to be the second most populous continent in the world, which is driven in large part by high fertility rates (UN, Department of Economic and Social Affairs,

Population Division, 1999, 2009). He explained that this population growth is increasing deforestation as the need for household energy sources expands. In addition, the increased need for housing is causing rapid development of land with poor provisions of water and sanitation. Serwadda noted that population growth is a large driver of health impacts and will require specific management to reduce its potentially significant impacts on the environment and other health outcomes. For example, efforts to reduce HIV by 50 percent are continually impacted by a denominator that is increasing all the time; this has difficult implications on the resources that are needed to move this cause forward. Looking at the MDGs, reproductive health is emphasized, but the MDGs do not specifically talk about child birth rates, and for post-2015, as far as Africa is concerned, this is going to be a huge issue that needs to be addressed moving forward.

Closing Remarks

In summary and considering the points made above, Serwadda noted the need to implement a country framework that builds, adds, and supplements each MDG goal in a coordinated manner, with a view that some MDGs, particularly those related to health, are significantly impacted by factors outside the health sector. He emphasized that population growth is an enormous driver that will have significant impacts in Africa that directly and indirectly affect the MDGs. Serwadda said this needs to be comprehensively addressed because population growth not only underpins many resource needs but also can create a vicious cycle in terms of being able to meet end targets for global development.

LESSONS TO APPLY TO THE POST-2015 DEVELOPMENT AGENDA PROCESS

*Zehra Aydin, M.A.
Senior Program Officer,
United Nations Environment Programme*

Zehra Aydin began by noting that the Millennium Declaration, adopted in 2000, led to the development of the MDGs (see Chapter 1 for more detail). She said it would be worth looking through this document again to inspire ideas on collective responsibilities for current and future generations. For example, the Millennium Declaration recognized that “in addition to our separate responsibilities to our individual societies, we have a collective responsibility to uphold the principles of human dignity, equality, and equity at the global level . . . especially the most

vulnerable and, in particular, the children of the world, to whom the future belongs” (UN General Assembly, 2000).

Lessons to Learn from the MDGs

Aydin noted that there are several positive lessons to learn from the MDG experience. The two that are the most important, she said, are to have few goals to focus everyone’s attention and to have goals that shift the attention of policy makers to thinking about sustainability. With respect to the former, she said, the Millennium Summit allowed the world community to present thousands of targets and goals from numerous intergovernmental meetings and conferences, and focusing the attention on a few goals was welcomed by many people. The MDGs also moved the attention of policy makers, from looking at economic growth and development to thinking about the economy, society, and environment together in a sustainable development manner.

But some of the positive lessons also contained some negative aspects, Aydin noted. For instance, the targets and goals were selectively chosen from the text of the Millennium Declaration, and the MDGs do not reflect all of the internationally agreed-upon goals included in that document (UN System Task Team on the Post-2015 UN Development Agenda, 2012b). Important issues, such as human rights, unemployment, and peace and security (a major issue that affects all of the goals) were left out of the MDGs. In the case of MDG 7, this goal was based on environmental protection, but the associated targets and indicators do not necessarily match the intention and content provided in the Millennium Declaration. For example, the emphasis on climate change, which is present in the Millennium Declaration through the agreed-upon need to reduce greenhouse gas emissions and the number and effects of natural disasters, does not appear anywhere in the MDG 7 framework (see Table 2-1). In addition, not all of the MDG targets were well defined or included well-selected indicators (e.g., to halve poverty or reduce child mortality by two-thirds does not take into account population dynamics from 1990 to 2015). These are lessons to learn from in the post-2015 development agenda process.

Elements of the Post-2015 Development Agenda Process

Aydin explained that the post-2015 development agenda process has three elements. First, the process is expected to build on the existing MDGs, because not all of the targets of these goals have been achieved. Second, the process provides the opportunity to improve the context of the existing MDGs, perhaps with better targets and indicators. Third, the process provides an opportunity to identify new goals as a global community

TABLE 2-1 MDG 7 (Ensure Environmental Sustainability): Targets and Indicators

Targets	Indicators
Target 7A: Integrate the principles of sustainable development into country policies and programs and reverse the loss of environmental resources	7.1 Proportion of land area covered by forest
	7.2 CO ₂ emissions, total, per capita and per \$1 gross domestic product
	7.3 Consumption of ozone-depleting substances
	7.4 Proportion of fish stocks within safe biological limits
	7.5 Proportion of total water resources used
Target 7B: Reduce biodiversity loss, achieving, by 2010, a significant reduction in the rate of loss	7.6 Proportion of terrestrial and marine areas protected
	7.7 Proportion of species threatened with extinction
Target 7C: Halve, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation	7.8 Proportion of population using an improved drinking water source
	7.9 Proportion of population using an improved sanitation facility
Target 7D: By 2020, to have achieved a significant improvement in the lives of at least 100 million slum dwellers	7.10 Proportion of urban population living in slums*

* The actual proportion of people living in slums is measured by a proxy, represented by the urban population living in households with at least one of four characteristics: (1) lack of access to improved water supply; (2) lack of access to improved sanitation; (3) overcrowding (three or more persons per room); and (4) dwellings made of non-durable material.

SOURCE: UN, 2008.

and confront emerging challenges (such as inequality) affecting both developed and developing countries.

Moving to the UN process, Aydin highlighted two key elements. The first element, also mentioned by Neira during her presentation, is the UN System Task Team report to the Secretary-General on the post-2015 development agenda. Aydin noted that the three fundamental principles—equality, sustainability, and human rights—proposed in *Realizing the Future We Want for All* should be the basic building blocks of the framework for the next development agenda (see Figure 2-1). The second element in the UN process includes national consultations that

will take place in up to 100 countries and global thematic consultations on 11 specific themes (see Box 2-1). The national consultations are supported by the UN Development Group and are being organized through collaboration with the UN Office of the Resident Coordinator and the national governments. These consultations could provide an entry point for colleagues and counterparts at other national science academies to contribute to the national discussion. Aydin suggested that mobilizing these groups could enhance the scientific basis of the process.

Although the global thematic consultations reference 11 separate themes, with crosscutting issues looking at human rights and gender equality, these consultations will not occur in silos. Aydin said there are efforts under way to encourage linkages among the themes (such as discussing environmental sustainability along with education, health, food security, or population dynamics) to assess relationships among these issues. All of the thematic consultations will start with a call for papers and virtual conversation, followed by an expert or leadership meeting, and then a final report that synthesizes all the findings. When these contributions are completed, the process goes into the inter-governmental stage from June 2013 through the end of 2015, and discussions will focus on producing a globally agreed-upon new development agenda that will take effect in 2016.

In closing, Aydin noted that she hopes that by working together, the national science academies can mobilize their networks and colleagues from all parts of the world to contribute to this process.

DISCUSSION

A brief discussion among the speakers and participants followed the presentations. Their remarks are summarized in this section.

An Intersectoral Approach to Achieving Global Development Goals

Balbus began the discussion session by noting the interesting process issues that were described in the presentation from Aydin, including the idea of points of entry into the process and the role of the national science academies at the country level. He also highlighted a point from Serwadda, the idea that breaking down silos should not come from the very top down to the country level, but that each country needs an intersectoral approach to achieving global development goals that can work within the context of each individual country's culture and government structure. Balbus then presented the first question to the group, asking for additional ideas on how to operationalize this proposed approach at the country level.

Serwadda began by noting that most of the MDGs were framed at the 10,000-foot level and that adoption of the MDGs were more or less agreed upon through the UN system, rather than having bottom-up input from the country level. He stated that the process lacked a rigorous country discussion to determine exactly how the MDGs should be implemented and whether the goals were realistic. Serwadda went on to say that the consultation process referenced in Aydin's presentation is probably trying to rectify this, because the discussions are starting from the country level and moving up. He thinks that this process facilitates more dialogue and more awareness of what is required to implement the global goals and the process to achieve the outcomes.

Aydin stated that she was also intrigued by the suggestion that there could be an approach to achieve the global development goals in every country and noted that there has been an effort in that direction that could perhaps be built upon in the post-2015 development agenda process. She explained that after the 1992 Rio Summit there was a decision that the countries would develop their sustainable development frameworks (for example, some called it National Agenda 21, and quite a few countries developed frameworks), but then attention was diverted to the Millennium Summit. However, she said, the existing country frameworks—whether called National Agenda 21, National Council for Sustainable Development, or something else—could survive, and include not only the three pillars of sustainable development but also other global concerns related to peace and security. Aydin noted that the additional dimension of peace and security presented in the integrated framework in *Realizing the Future We Want for All* (see Figure 2-1) completes the cycle of sustainable development because, as learned over time, when a conflict breaks out, all efforts to address sustainable development are lost. There is an opportunity for the country level to become better coordinated, she said, because part of the problem at the country level is lack of coordination across the different ministries. She emphasized that the four basic building blocks of the vision for the post-2015 development agenda—environmental sustainability, inclusive social development, inclusive economic development, and peace and security—will provide incentives for ministries to increase communication at the country level, which in turn will hopefully eliminate confusing mandates or mixed messages that often arise from not communicating across ministries.

Neira noted that there are multiple consultative and delegative processes occurring at the moment, each with complicated mechanisms, and suggested the need to propose very pragmatic solutions to address the difficult processes. She highlighted the importance of involving all stakeholders and relevant groups in the process, but in a pragmatic way to move toward consensus. She said the process at the country level has been extremely clear and straightforward and ensuring this multisectoral

approach is fundamental to the process, as well as facilitating country-level involvement with all the thematic consultations.

William Sontag, global environmental informatics specialist with the Office of International and Tribal Affairs at the U.S. Environmental Protection Agency, provided a few additional points. He said it seems that the successful MDGs around human health aspects (such as cardiopulmonary disease, clean drinking water, and chemical exposure) will likely continue in the next agenda, but the new or somewhat different types of measures and goals that are needed should be explored in the post-2015 context. These could include looking at population health in urban areas, the connection of ecosystem services provisioning to human health, or the connection between biodiversity and human health. Following a point made by Aydin during her presentation, Sontag noted that consultation efforts should focus on the development of appropriate indicators under MDG 7 or under the SDGs, in order to assess the major impacts that connect the environment with human health. In addition, current work to develop early-warning or assessment information systems could be helpful to this process, as well as the possibility of utilizing crowd source citizen participation to help identify information on population and public health.

Highest-Priority Goals for the Post-2015 Development Agenda or SDGs

Balbus presented the second question for the group. If one were writing these SDGs or post-2015 development goals, he asked, which one would be placed at the top of the list, or which goal is the most important?

Serwadda noted that it is very difficult to pick one important goal that overrides the others, because so many of the variables that produce the desired outcomes are interrelated. He said that it is important to work on multiple fronts in order to make an impact.

Neira also noted that this is an extremely difficult question, but WHO is exploring the potential for using universal health coverage as a way to accommodate a wide range of health concerns (such as polio, AIDS, tuberculosis, malaria, and mortality related to noncommunicable diseases (NCDs), which is becoming a major issue). WHO is proposing universal health coverage as an overarching goal and a way to utilize the benefit of health policies in other sectors, including transportation, energy, urban planning, water and sanitation, and many others, where health can be a good indicator of progress.

Aydin noted that she would like to see a goal on climate change with corresponding indicators that would make linkages to the four pillars that are emerging for the next development framework; there would be an indicator on how much the economy is greening, how much the society

is learning to be green, and how improved management of natural resources is preventing conflict. A second high priority for Aydin would be a goal on inequality, because research shows that when a society is more equal, many of the illnesses and problems are more manageable (from health to education to the environment); however, when inequality grows, a negative cycle that feeds into more problems and inequality is established.

Paulo Buss, former president of the Oswaldo Cruz Foundation (also known as FIOCRUZ), noted his agreement with the WHO choice of universal health coverage, but said it is important to ensure the definition is broad and goes beyond the provision of clinical health services to a more comprehensive idea of universal health systems, which would incorporate public health more broadly.

Sontag noted the need for a very strong connection between whatever indicators are chosen and urban sustainability, as the urban sustainability agenda is extremely important.

Making Intersectoral Linkages in the Post-2015 Development Agenda Process

Judy Wasserheit, vice chair of the Department of Global Health at the University of Washington School of Public Health, provided the third question for the group, asking how the call for papers and other components of the post-2015 development agenda process will be structured in order to build intersectoral linkages between health and nonhealth sectors from the foundation up.

Aydin said many lessons have been learned from the MDGs process that will help to improve the next development agenda. One of the lessons learned at the UN is the need for UN coherence at the country level to prevent working in silos. This approach is being piloted in 30 countries, where the focus is on working together as one at the country level rather than in separate agencies. She noted that this process has been beneficial; even though it requires more give-and-take, this ultimately leads to better results for everyone involved, making it a win-win approach. By applying the lessons from this “one-UN process” to the new development agenda at least at the country level, there will be more coherence and less possibility for a siloed approach. Aydin emphasized that during the past several decades, UN teams have learned that the more they connect and the more they collaborate, the better the results, which is perhaps the simplest answer.

Neira then said she is not sure if the call for papers will force stakeholders to work on intersectoral collaboration. She noted that if indicators are developed under each thematic category to measure how much intersectoral collaboration is taking place, this may create a

mechanism that will force these collaborations and prevent a siloed approach.

Balbus reminded people to reference the WHO website on health in the green economy (http://www.who.int/hia/green_economy/en [accessed October 18, 2012]) to review discussion papers on indicators for other sectors that emphasize health content to better understand how these indicators may facilitate intersectoral collaboration.

REFERENCES

- Balbus, J. M., and J. Wasserheit. 2012. *Seeking synergy: New perspectives on addressing interrelated global health and development problems*. Commentary, Institute of Medicine, Washington, DC. <http://www.iom.edu/~media/Files/Perspectives-Files/2012/Commentaries/EHSRT-Seeking-Synergy.pdf> (accessed August 20, 2013).
- UN (United Nations). 2008. Official list of MDG indicators. <http://mdgs.un.org/unsd/mdg/host.aspx?Content=indicators/officiallist.htm> (accessed August 14, 2013).
- UN General Assembly. 2000. *United Nations Millennium Declaration*. A/RES/55/2. New York: United Nations.
- UN System Task Team on the Post-2015 UN Development Agenda. 2012a. *Realizing the future we want for all. Report to the Secretary General*. New York: United Nations.
- UN System Task Team on the Post-2015 UN Development Agenda. 2012b. Review of the contributions of the MDG agenda to foster development: Lessons for the post-2015 UN development agenda. Discussion note. http://www.un.org/millenniumgoals/pdf/mdg_assessment_Aug.pdf (accessed August 20, 2013).
- UN, Department of Economic and Social Affairs, Population Division. 1999. *The world at six billion*. New York: United Nations.
- UN, Department of Economic and Social Affairs, Population Division. 2009. *World population prospects: The 2008 revision, highlights*. New York: United Nations.
- WHO (World Health Organization). 1981. *Global strategy for health for all by the year 2000*. Geneva: World Health Organization.
- WHO. 2006. *Preventing disease through healthy environments. Towards an estimate of the environmental burden of disease*. Edited by A. Prüss-Ustün and C. Corvalán. Geneva: World Health Organization.

Health Goals and Indicators for Sustainable Development

John M. Balbus, senior advisor for public health at the National Institute of Environmental Health Sciences and co-chair of the Institute of Medicine Global Environmental Health and Sustainable Development Innovation Collaborative, opened the second webinar by highlighting the overarching goal of the webinar series, which is to illuminate the critical linkages between sustainable development and environmental health. As a short-term target, the webinar series is intended to inform the current United Nations (UN) development agenda process, which is setting the stage for new Sustainable Development Goals (SDGs) and post-2015 development goals. The webinars are designed to provide scientific information about how health and sustainability are linked and also offer some new ideas on how to integrate environmental health into the targets and metrics of relevant SDGs. During the first webinar (see Chapter 2), the discussion focused on how the Millennium Development Goals (MDGs) created silos that were helpful in simplifying messaging but made intersectoral coordination difficult at the country level. Balbus emphasized that this webinar will look at ways to achieve multi-disciplinary collaboration in international processes related to the post-2015 development agenda and SDGs, focusing on aspects that can create real synergies and benefits that can leverage financial investments and organizational support across different sectors.

**BRIDGING THE GAP BETWEEN THE MILLENNIUM
DEVELOPMENT GOALS AND PRINCIPLES OF SUSTAINABLE
DEVELOPMENT AND CLIMATE CHANGE**

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Independent Consultant,
ClimAdapt, LLC*

In thinking about how to move the MDGs into alignment with sustainable development, Kristie L. Ebi explained that in addition to identifying specific tasks, there is a need to think broadly about how to promote health within sustainable development. Achieving the SDGs will require more than an engineering approach to the world, where a problem is recognized and a technological solution identified. Top-down approaches to improving public health have worked effectively for a wide range of issues, which is why the MDGs and other inspirational goals mainly take this kind of approach. However, these approaches are unlikely to be sufficient to address the challenges presented by global environmental change and the need to achieve sustainable development goals; working with other sectors to address current and future challenges will be critical. Further, it is important to recognize that one size may not fit all with respect to global goals and targets to further sustainable development.

“Wicked Problems” and Managing Climate Change

Ebi noted that “wicked problems,” a term used in social planning, applies to this discussion. A wicked problem is one that is difficult or impossible to solve because of incomplete, contradictory, and changing requirements that are often difficult to recognize (Wikipedia, 2013). In addition, because of complex interdependencies, efforts to solve one aspect of a wicked problem may reveal or create other problems (Australia Public Service Commission, 2007). Ebi noted that those who work in climate change may immediately recognize how this term applies: there are high levels of uncertainty about how specific changes will occur in the atmosphere and what those changes will ultimately mean at a particular location at a particular time. Because of the complexities, efforts to solve one part of a wicked problem can cause problems somewhere else. This can be seen with climate change efforts undertaken in one sector, such as agriculture or water, which can then affect human health. She explained that actions to address health or other risks of climate change cannot be taken independently from what is being done in other sectors because they could affect other problems. It

is the responsibility of public health professionals to ensure that problems are reduced or resolved.

MDGs and Climate Change

Focusing on the MDGs, Ebi described how climate change is likely to interact with MDG 1 and why achieving Target 1C—which seeks to halve, between 1990 and 2015, the proportion of people who suffer from hunger—may be a challenge (all MDGs are listed in Box 1-2 in Chapter 1). Figure 3-1 is a map of the world scaled in terms of underweight children, rather than geographic size. China, Ethiopia, Indonesia, and Nigeria have the largest populations of underweight children, and almost 50 percent of the children less than 5 years of age living in Bangladesh, India, and Nepal are underweight (UNDP, 2004). Figure 3-2 shows the progress achieved to reach MDG 1 up to 2007. The red areas depict where there is no progress or a deterioration of progress since 1990.

Ebi noted that many challenges have made it difficult to alleviate extreme hunger and poverty throughout the world. One contributor may be climate change. Research looking at how climate change may affect current crop production, particularly the cereal crops, shows that observed increased temperature changes from 1980 to 2008 are associated with decreased crop yields in many of the places having difficulty achieving Target 1C (Lobell and Field, 2007). Some regions have seen increased production; warmer temperatures have been beneficial to wheat yields in Australia, Canada, and the United States and to maize yields in India. Rice yields have decreased in a number of areas throughout the world, showing (in part) the negative impacts of increased ambient temperatures. Research projecting yields of cereal crops in a changing climate indicates that increasing local temperatures in the mid- to high-latitudes will have benefits in coming decades, but any increase in temperature in low-latitude areas will result in reduced yields (Easterling et al., 2007). This reduction in cereal grains will likely impact the places that currently have the biggest problems with undernourished children and exacerbate existing struggles to feed those children.

Projections of how often the highest recorded temperatures from 1985 to 2005 will occur in future time periods indicate that within the next few decades in Africa, there could be a 40 percent increase in the recurrence of these very high temperatures (Diffenbaugh and Giorgi, 2012). The current 1-in-20-year extreme temperature will occur about once every 5–10 years within a couple of decades in many places throughout the world. Linking this back to the temperature sensitivity of crops, in many parts of the tropics, cereal crops are already growing at the edge of their temperature tolerance. Efforts are under way to develop drought- and

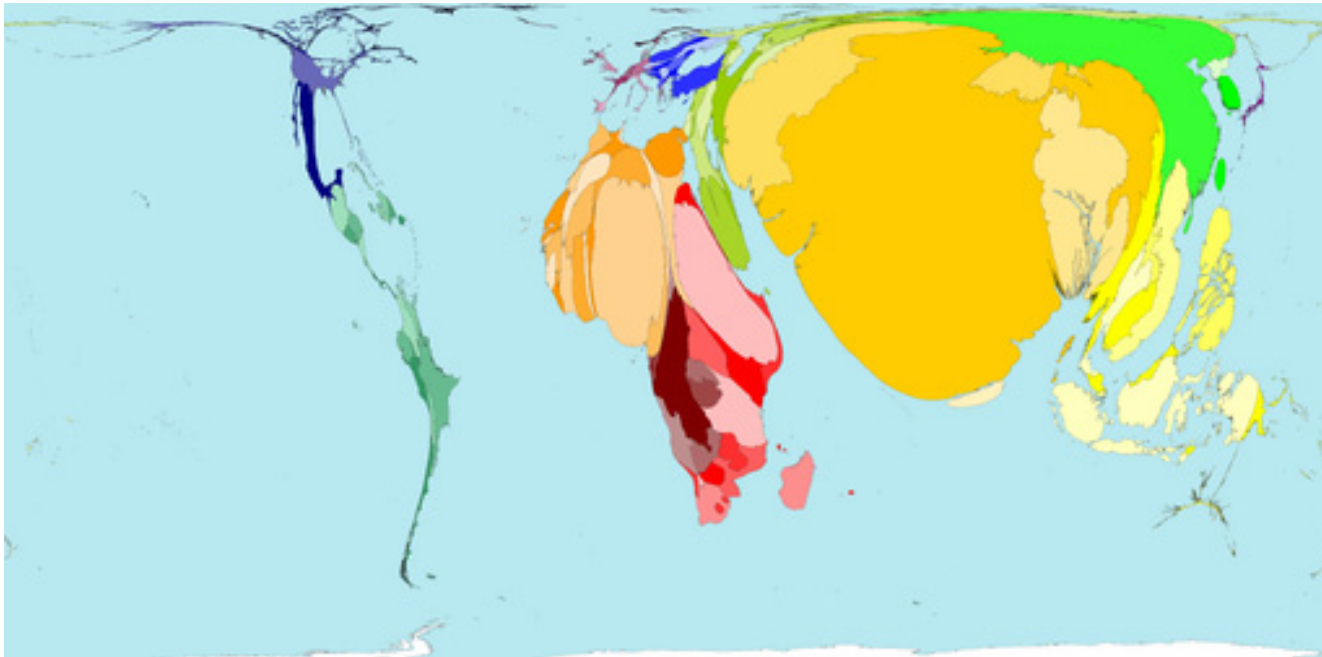


FIGURE 3-1 World Mapper view of the world scaled in terms of underweight children.
SOURCE: Worldmapper, 2006. © Copyright 2006 Sasi Group (University of Sheffield) and Mark Newman (University of Michigan).

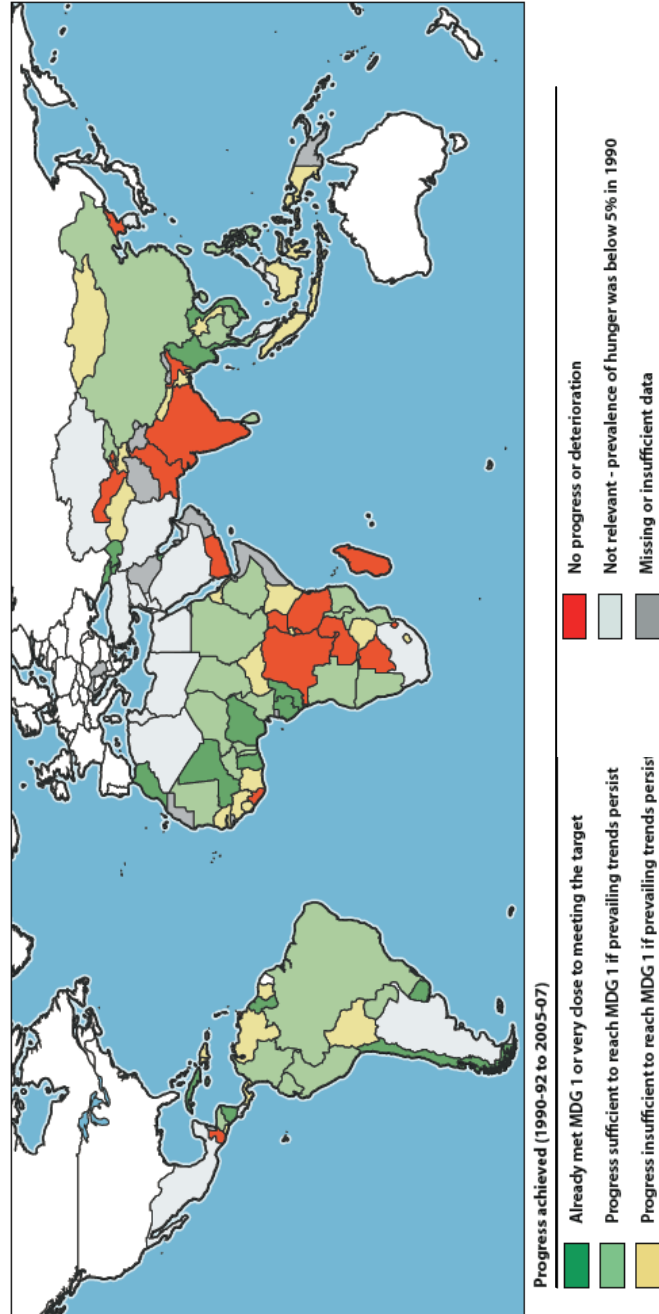


FIGURE 3-2 Progress toward MDG 1: Hunger target.

NOTE: The calculation of progress compares country-level information on the prevalence of undernourishment (2005–2007) with the rates that existed in 1990–1992 (the base period for the hunger target). The projection for reaching MDG 1 in 2015 assumes the trends between both periods continue. Developed countries are not considered.

SOURCE: FAO, 2010. Reprinted with permission from the Food and Agriculture Organization of the United Nations.

salt-resistant crops for these changing environmental conditions. The research to develop new cultivars can take many decades, she said, often with an equally long period of time needed to deploy new varieties to farmers.

Ebi stated that it is apparent that climate change is presenting a significant challenge to achieving the 1C Target. The MDG targets were developed thinking about how to solve the problem of undernourished children but not thinking broadly across all the systems, particularly those affected by climate change. The challenges of global environmental change are calling on public health professionals to take a much broader perspective on how systems are changing, what these changes are likely to mean for human health, how these kinds of changes can best be managed, and what options are available for improving the lives of children around the world.

Interactions Among Nutrition, Disease, and Climate Change

Ebi noted that the number of undernourished children is affected not only by how many cereal grains are available. It also is important to understand other causes of food insecurity. For example, undernutrition and malaria interact in that undernourished children are more likely to succumb to malaria, and children with malaria are more likely to be undernourished. Temperature and precipitation are among the important determinants of geographic shifts in the incidence of malaria because they affect mosquito and parasite life cycles and behaviors (Parham and Michael, 2010). Thus, she said, there is a strong system of interdependencies across undernutrition, malaria, and climate.

Additionally, Ebi explained, there is an interdependency between children who are malnourished, the incidence of diarrheal disease, and climate. Children with diarrheal disease have a reduced capacity to absorb nutrients, which means they become malnourished much more easily. A range of environmental factors is associated with diarrheal disease, including acute weather events such as flooding and heavy rainfall (Cann et al., 2012). As temperatures around the world have increased, heavy rain events have also increased because warmer air holds more water. This increases the number of flooding events, which are associated with more frequent outbreaks of waterborne diseases (including diarrheal disease), especially in low-income countries. As shown in Figure 3-3, climate change will greatly increase the risk of diarrheal disease based on temperature projections alone, with new regions becoming susceptible and currently susceptible regions seeing increased diarrheal disease rates (Kolstad and Johansson, 2011). This will challenge much of the excellent work of control programs completed to date that have focused on investments in sanitation and access to safe drinking water (WHO and UNICEF, 2009).

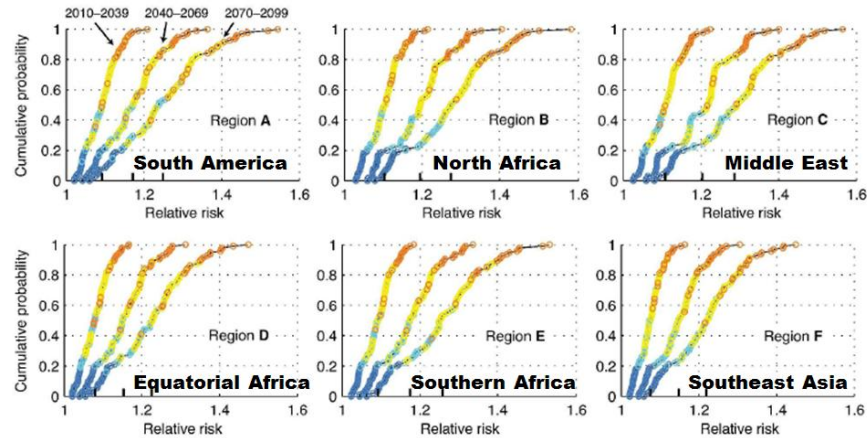


FIGURE 3-3 Projected changes in the risk of diarrheal disease with climate change.

NOTE: The values are shown with distinct colors according to the corresponding α -values (the empirically derived increases in the relative risk for each 1°C temperature increase). Blue corresponds to $\alpha = 0.03$, turquoise to $\alpha = 0.06$, yellow to $\alpha = 0.08$, and orange to $\alpha = 0.11$. In each plot, relative risk projections are shown for 2010–2039 (left), 2040–2069 (middle), and 2070–2099 (right).

SOURCE: Kolstad and Johansson, 2011. Reprinted with permission from *Environmental Health Perspectives*.

Ebi stated that the health risks of climate change arise from the interactions of three factors: (1) how climate change will alter weather patterns and what this means, for example, for ecosystems that support mosquito populations; (2) who or what is exposed to these changing weather patterns; and (3) the underlying vulnerability of the exposed populations. It often does not take an extreme event to cause an extreme impact, which was the case in Zimbabwe in 2008, where the largest cholera outbreak in Africa followed a heavy rain event (IPCC, 2012). The reason there was such a large outbreak was the very high susceptibility and poor public health among the population in Zimbabwe.

Principles for SDGs

Ebi emphasized that sustainable development can be considered a series of aspirational goals and a plan for how to achieve those goals. Usually, the plans are fairly straightforward and appear relatively easy, but the reality is often quite different. Surprises certainly will occur, particularly with climate change. Thresholds are likely to be crossed, although there is limited understanding of where and when they will be encountered, such as from interactions across food, water, and energy.

There may be setbacks from factors that are not taken into consideration. This calls for a flexible approach, not just to set goals for sustainable development, but also to create flexibility so the necessary information, tools, and policy instruments are available to address challenges as they arise.

JOINING HEALTH AND SUSTAINABLE DEVELOPMENT GOALS THROUGH LOW-CARBON POLICIES

*Sir Andrew Haines, M.D.
Professor of Public Health and Primary Care,
London School of Hygiene and Tropical Medicine*

Andrew Haines began by stating that his talk would focus on the importance of bringing together health and sustainable development using the example of strategies that both reduce greenhouse gas emissions and improve health. He noted that there is a new window of opportunity with the review of the MDGs and through the proposed SDGs to integrate health and broader development issues into new globally agreed-upon goals.

Health Cobenefits from Greenhouse Gas Reduction Strategies

Looking at the potential projections for carbon dioxide emissions over time, different scenarios are projected based on the Intergovernmental Panel on Climate Change (IPCC) report from 2007 (see Figure 3-4). The scenarios are shown in the colored lines on the graph, and the black dotted line shows what is actually being observed. It will likely be extremely difficult, Haines said, to keep within the 2°C that many climatologists perceive as the limit above which dangerous climate change occurs (for instance, increases in extreme events and wide-scale melting of ice caps). He emphasized that it is important to try to reduce greenhouse gas emission quite dramatically, and in order to achieve this, industrialized countries (like the United Kingdom and United States) need to cut their emissions by approximately 80 percent by 2050. This kind of challenge can be quite difficult politically, especially considering the cost, but there will be many benefits to decreasing carbon dioxide emissions in the future.

Haines explained that there are many cobenefits that arise from greenhouse gas reduction strategies, in addition to any benefits that occur from reducing climate change itself. The studies he and his colleagues have done look predominately at four sectors—housing, transport, food

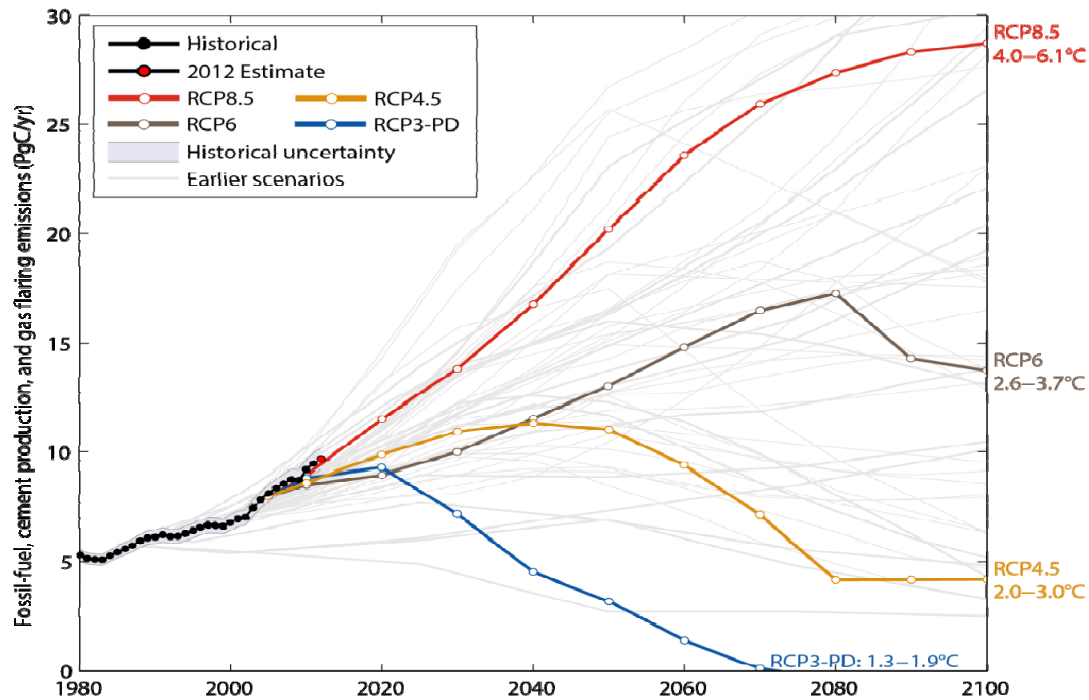


FIGURE 3-4 Fossil fuel carbon dioxide emissions compared to the Intergovernmental Panel on Climate Change (IPCC) marker scenarios used for climate projections.

NOTES: RCP = Representative Concentration Pathway. The four RCP trajectories displayed in the figure come from the IPCC and represent a possible range of radiative forcing values in the year 2100.

SOURCE: Peters et al., 2013. Reprinted with permission from Glen P. Peters and Corinne Le Quéré.

and agriculture, and electricity generation—in both low- and high-income settings. In each of those, there are strategies that can result in substantial reductions in greenhouse gas emissions and can also improve human health, in some cases in a relatively short time period. The studies consider different strategies in the four sectors and look at both greenhouse gas emissions and human health implications of the strategy in question compared with a business-as-usual strategy without specific policies to reduce greenhouse gas emissions. In the case of the United Kingdom, the Climate Change Act set a target for at least an 80 percent reduction of 1990 levels of greenhouse gas emissions by 2050. The emission reductions studied were intended to put the country on a trajectory to meet these emission reductions.

Household Energy Sector

The first sector Haines outlined was household energy. In a country like the United Kingdom, there are many inefficient houses that allow a lot of heat to escape through the walls and windows. A research team conducted a study that modeled the effects of improved household energy efficiency and ventilation control to achieve the desired greenhouse gas emission reductions (Wilkinson et al., 2009). He noted that in designing energy-efficient housing, it is important to consider ventilation control improvements in addition to insulation control to avoid increased indoor air pollution that may result from sealing the houses to reduce heat loss. The results of the study showed that approximately 90 deaths per million in the UK population could be avoided annually from energy-efficient upgrading, not including the benefits from addressing cold exposure. This would also result in saving roughly 41 million tons of carbon dioxide compared with 2010 baseline values (Wilkinson et al., 2009).

Haines noted that in low-income countries—where the MDGs are particularly relevant as they are currently configured—household air pollution is a major risk factor for acute respiratory infections in children and chronic obstructive pulmonary disease in women (Wilkinson et al., 2009). A study investigated the health and climate benefits of installing approximately 150 million improved-efficiency cookstoves in India over a 10-year period (Wilkinson et al., 2009). Although the numbers may seem ambitious, said Haines, China implemented a similar program in the 1980s in which 100 million improved cookstoves were installed over the same period. These cookstoves are relatively cheap to install and maintain, costing less than \$50 per household every 5 years or so. In comparison to traditional open-fire or very inefficient cookstoves, a modern cookstove can greatly reduce household air pollution and greenhouse gas pollutants (such as black carbon and ozone precursors, including methane and carbon monoxide) by up to 1 billion tons of carbon dioxide equivalent over 10 years. An improved cookstove program of this magnitude could avert 2 million premature deaths, mainly in

women and children, over a decade (Wilkinson et al., 2009). Haines emphasized that this initiative directly impacts some of the MDGs, particularly those related to child mortality, and is particularly relevant for the countries where much of the poorest part of the population uses either open fires or inefficient cookstoves.

Urban Transport Sector

The second sector Haines outlined was urban transport. He noted that this sector is responsible for a large and growing amount of greenhouse gas emissions in many countries and impacts air pollution, road traffic injuries, and, very importantly, sedentary lifestyles. Obesity and diabetes rates are going up in many parts of the world, conditions that are partly related to sedentary lifestyles. Haines noted that one of the most important ways of increasing people's physical activity is changing their habitual activities of daily living, particularly walking (or cycling) to school, work, shops, and so on. This type of activity is increasingly difficult in many urban environments. Haines mentioned a study that modeled the effect of different travel scenarios—investigating the differences in increased active travel (cycling and walking for short distances), low-carbon driving (more efficient cars), and business-as-usual policies (without specific policies to reduce greenhouse gas emissions)—in the cities of London and Delhi (Woodcock et al., 2009). This study looked at how introducing these new strategies could reduce greenhouse gas emissions and also impact human health. Active travel had the largest effect on health because sedentarism is such an important risk factor for seven major conditions (ischaemic heart disease, cerebrovascular disease, dementia, breast cancer, diabetes, depression, and bowel cancer). According to the scenario developed in the study, heart disease, stroke, dementia, and breast cancer could be reduced by up to 19 percent, 18 percent, 8 percent, and 13 percent, respectively, in London (Woodcock et al., 2009). Haines noted that there may be increased deaths and injuries due to road traffic crashes as more people cycle and walk (a 19 to 39 percent increase), even if road vehicle use is reduced; however, this drawback is vastly outweighed by all the benefits that would occur (Woodcock et al., 2009).

Haines discussed another study that assessed the possibility of averting health services expenditures as a result of these same transport strategies (Jarrett et al., 2012). National Health Service expenditures that could be averted by the increased active travel scenario in the United Kingdom were broken down by year and by health outcome. Over a 20-year period, the savings could total UK £17 billion (in 2010 prices) with additional savings accumulating after this period. Reducing the prevalence of diabetes had the largest impact because diabetes is so costly to the whole system (Jarrett et al., 2012). Haines noted that people often live with diabetes for many years and that over that time they accrue extensive costs to the health system (perhaps higher than the

study projections, which do not include the effects of reducing obesity to avoid double counting). By preventing some cases of diabetes, in addition to the potentially large savings for the health system, there will be potential improvements in labor productivity and other social benefits.

Food and Agriculture Sector

The third sector Haines outlined was food and agriculture. He noted that on a global level the food supply system is somewhat dysfunctional—roughly 1 billion people are suffering from hunger and at the same time obesity is growing around the world. Approximately 40 percent of all the grain harvested in the world is fed to animals (Smil, 2000), and livestock are major contributors to greenhouse gas emissions (particularly through methane from ruminants). Haines summarized results from a modeling study that investigated the health impact of reducing animal-source saturated fat by 30 percent and replacing it with polyunsaturated fat of plant origin. In a country similar to the United Kingdom and a city similar to São Paulo, Brazil,¹ the burden of ischemic heart disease could be reduced by approximately 15 percent (this is equivalent to 2,850 and 2,180 disability-adjusted life years [DALYs] per million population in 1 year in the United Kingdom and São Paulo, respectively) (Friel et al., 2009). Haines noted that although it is important to improve the efficiency of energy use in the agriculture and food sector, this alone will not be sufficient to achieve the kind of targets needed to adequately reduce greenhouse gas emissions in order to stabilize the climate. In high-consumption countries like the United States and the United Kingdom, it is difficult to avoid the conclusion that reducing animal product consumption is needed and will provide additional health benefits from increasing fruit and vegetable consumption, as outlined in the study from Friel and colleagues.

Electricity Generation Sector

The fourth sector Haines outlined was electricity generation. He summarized a study that examined the health burden associated with equivalent carbon dioxide emissions from different sources of electricity generation (Markandya and Wilkinson, 2007). The results indicated that lignite, coal, and, to a somewhat lesser extent, oil produce a large amount of greenhouse gas emissions and also produce large health impacts from air pollution and accidents (see Figure 3-5). Nuclear energy produced the

¹ The authors of the study chose the United Kingdom and São Paulo, Brazil, because both populations consume similar amounts of saturated fat; however, the United Kingdom is a high-income country and emits large quantities of greenhouse gases, whereas Brazil is an emerging economy with increasing greenhouse gas emissions. São Paulo is the largest city in Brazil, with a population of approximately 10.4 million in 2010 (Friel et al., 2009).

lowest health impacts according to this analysis, but is controversial for reasons such as waste and potential accidents. Haines stated that renewable energy sources (for example, solar or wind) are not shown in the figure, but they would clearly be at the bottom-left corner, below gas and close to nuclear, because many renewable technologies do not produce fine-particulate air pollution, which is the major risk factor from the combustion of coal and lignite. Haines highlighted that there is a range of new technologies coming to the market (including renewable technologies for clean energy) that offer great promise for reducing not only carbon dioxide emissions, but also fine-particulate air pollution and thus the health burden from outdoor air pollution. For example, one new technology involves placing solar-concentrating power panels on a vertical tower containing molten sodium, which then drives turbines to generate electricity. Haines suggested that the whole electricity supply of North America and Europe could be supplied by solar-concentrating power established in the North American desert, if appropriate investments were made.

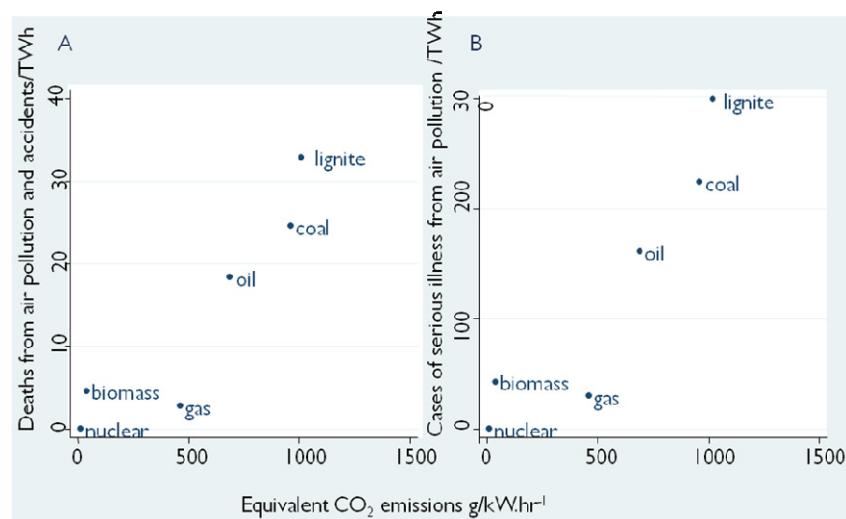


FIGURE 3-5 Electricity generation and air pollution impacts from equivalent carbon dioxide (CO₂) emissions.

NOTE: (a) deaths from air pollution and accidents and (b) cases of serious illness from air pollution.

SOURCE: Markandya and Wilkinson, 2007. Reprinted from *The Lancet*, © Copyright 2007, with permission from Elsevier.

Closing Remarks

Haines concluded by saying that there is a range of policies in at least these four sectors, and possibly in others, that can both help address public health priorities and promote sustainable development, particularly by mitigating climate change. Considering the impacts of these policies on both environmental goals and health goals simultaneously will make them much more attractive to policy makers than focusing on either in isolation. Haines stated that his presentation had outlined the potential for some metrics and goals, which would be the topic of the next presentation. For example, both sustainable development and public health targets could focus on household air pollution, active travel, and low-carbon generation of electricity. Haines emphasized that the health gains associated with these mitigation policies are in addition to the benefits from reducing climate change, and these health gains can likely help avert health service costs and also offset the cost of implementing low-carbon policies.

METRICS FOR HEALTH, DEVELOPMENT, AND THE ENVIRONMENT

*Christopher J. L. Murray, M.D., D.Phil.
Director, Institute for Health Metrics and Evaluation
University of Washington*

Christopher J. L. Murray noted that he would present current evidence from the Global Burden of Disease Study 2010² to support some of the linkages between health and the environment highlighted by previous speakers. Then he would provide a brief outline of desirable attributes for proposed metrics for the post-2015 development agenda.

Global Burden of Disease Study 2010

The Global Burden of Disease Study 2010 is the latest version of a 20-year effort to systematize the evidence on the state of health around the world by disease, injury, and risk factor. In the current study, 291 diseases and injuries and 67 risk factors are evaluated at the country level over time. Murray noted that looking at change in health over time will likely be essential when thinking about some of the issues that will be

² The Global Burden of Disease Study 2010 was published as seven separate articles in *The Lancet* in December 2012. Further information on the study and links to the articles can be found at <http://www.thelancet.com/themed/global-burden-of-disease> (accessed August 20, 2013).

important as the post-2015 development agenda is established (further detail on this process is provided in Chapter 2).

In looking at the health changes from 1990 through 2010, Murray said, three large drivers have been identified and studied in detail. The first is a demographic transition, namely, larger population size and an older population, which can have profound effects on the leading health problems. The second is a cause-of-death transition, where there is a marked shift away from the burden associated with communicable diseases (such as diarrhea and pneumonia) to the burden from noncommunicable diseases (NCDs) (such as cardiovascular disease and diabetes). The third is a disability transition, where there is a progressive shift to disabling conditions that do not necessarily cause death, but cause a substantial fraction of the burden of disease (such as mental health, substance abuse, and musculoskeletal disorders).

The impact of these transitions can be seen in changes in population measures over this 20-year period. Murray explained that measures of DALYs—a measure of healthy years of life lost that captures both premature mortality and illness—have shifted away from burden in children (although many children are still affected) toward burden in young and middle-aged adults. He noted that this shift is moving at a steady pace, so decade by decade the burden will likely progressively shift from children to adults. In addition, the disability transition has impacted the distribution of the burden of disease between years of life lost and years lost to disability. When looking at 21 regions around the world, years lost to disability in 1990 accounted for roughly 10 percent of the burden of disease in the least developed regions and almost 40 percent in the most developed regions (Murray et al., 2012). In 2010, years lost to disability substantially increased in comparison to years of life lost in all regions, and generally increased with the demographic and epidemiological transition—with the most profound shifts occurring in transitional regions (e.g., East Asia, tropical Latin America, the Middle East, and North Africa). The years lost to disability in regions with an advanced demographic and epidemiologic transition accounted for approximately 50 percent of the burden of disease (including Western Europe and high-income areas of the Asian Pacific and North America) (Murray et al., 2012).

Murray explained that shifts in the burden of disease have changed the ranking of the leading health problems from 1990 to 2010 (Murray et al., 2012). In Figure 3-6, the red boxes indicate communicable, maternal, neonatal, and nutritional disorders, which have become less prevalent between 1990 and 2010. For example, over the two decades, diarrhea has decreased by about 50 percent in terms of the burden of disease, despite increases in population over this time frame. The blue boxes indicate NCDs, which have increased between 1990 and 2100.

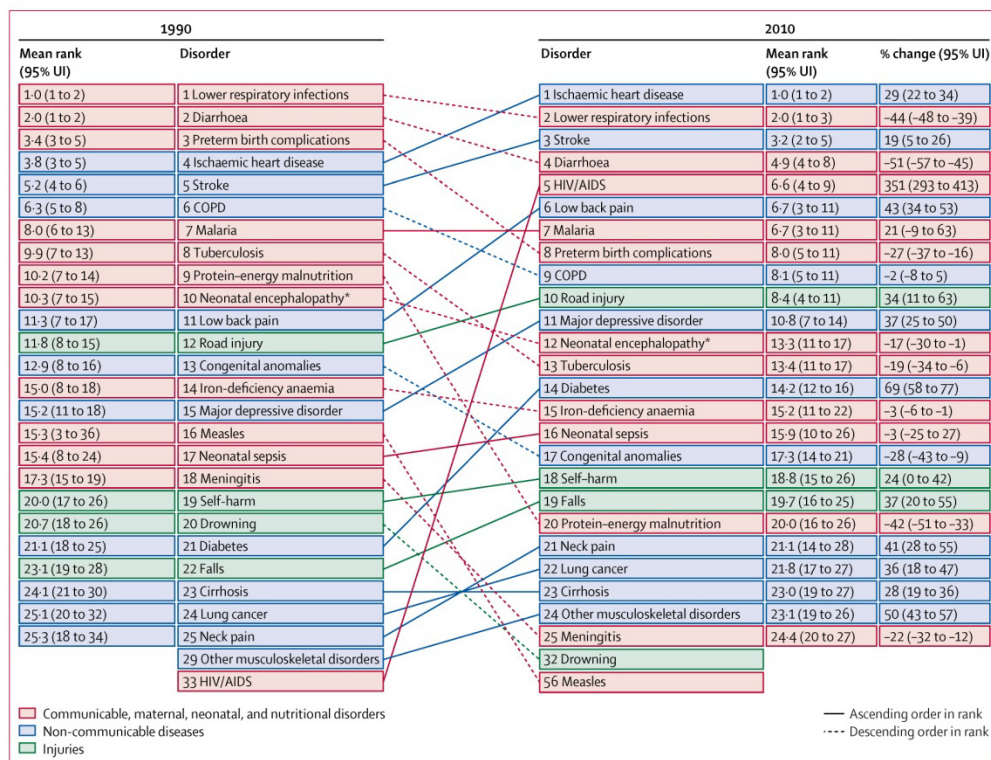


FIGURE 3-6 Ranks with 95 percent uncertainty intervals for the top 25 causes of global disability-adjusted life years in 1990 and 2010, and the percent change with 95 percent uncertainty intervals between 1990 and 2010.

SOURCE: Murray et al., 2012. Reprinted from *The Lancet*, © Copyright 2012, with permission from Elsevier.

The leading cause of global DALYs is now ischemic heart disease (up by about 29 percent), and, moving down the list, there is a progressive transition from communicable diseases to NCDs over the past two decades. However, HIV is up from much lower levels in 1990 and malaria has remained relatively constant from 1990 to 2010. The green boxes in the figure indicate injury. Murray highlighted that road injuries have seen about a 34 percent increase in the burden of disease over this period of time, and this may be important for transport agendas.

When looking at the global burden of disease attributable to different risk factors, high blood pressure is at the top of the list in terms of contributing to the percent of DALYs, followed by tobacco smoking and alcohol use (Lim et al., 2012). Murray noted that household air pollution from burning solid fuels is number 4 on the list, which is an important finding for thinking about connections to the environment. Ambient particulate matter pollution is number 9 on the list, accounting for 3 percent of the global burden of disease (Lim et al., 2012). Murray pointed out that both ambient air pollution and household air pollution are important risk factors because of the distribution and concentration found in dense high-population areas.

New Metrics for the Post-2015 Development Agenda

Murray outlined the five key attributes he believes are important in designing new metrics for the post-2015 development agenda. First, although there is an incredible array of indicators that can be utilized for development, health, the environment, and the intersection of these areas, it is important to have indicators for the post-2015 development agenda that are large and have true population impacts on environmental, health, or economic outcomes. Second, there is a tendency in the discussion of indicators to confuse the essential indicator with the measurement strategy, which sometimes leads people to propose distal proxies instead of measuring the thing they actually care about. Murray noted that it is necessary, particularly for a long-running agenda, to measure the true quantity of interest rather than some distant proxy. Third, some indicators are problematic if they are not clearly interpretable by a broad audience, and monotonicity is desirable. For example, sometimes people propose indicators where there is a somewhat U-shaped curve, where more could be bad or good; these indicators do not work very well because the outcomes are harder to communicate. Fourth, before the proposal of a new indicator, a practical measurement strategy should be developed as a route for good measurement; the strategy does not necessarily need to be operational immediately, because this can take several years to implement, but should be achievable in a reasonable time frame. Fifth, it is particularly important for the post-2015 development agenda to propose indicators that are relevant to a broad set of countries rather than a small group

(even if it is very important for that small group of countries) because of the political buy-in and consensus required to achieve improved outcomes globally.

Murray then proposed four indicators at the intersection between the environment and health that warrant attention for the post-2015 development agenda. He noted that this list is not terribly evidence-based but is based on the global burden of disease work and knowledge of what may be tractable indicators.

Particulate Exposure

Murray noted that one of the things that is quite new in the Global Burden of Disease Study 2010 is the much larger magnitude of harm related to PM_{2.5}, which is fine particulate matter smaller than 2.5 micrometers in size. In terms of the global burden of disease, ambient and household air pollution combined account for 6–7 percent of the total burden, which is quite a large percentage and much greater than, for example, the entire HIV epidemic (Lim et al., 2012). Murray emphasized that this is an area where the solutions are in the environmental arena and the outcomes can improve health. In addition, some of the strategies to reduce ambient and household PM_{2.5} may also reduce carbon emissions (as Haines mentioned in his presentation). It is feasible going forward, although somewhat complicated, he said, to achieve real measurements of human exposure to PM_{2.5}, rather than proxy measures that are commonly used (such as cooking with biomass fuels). Murray stated that human exposure to PM_{2.5} would be a tremendously useful indicator on which various environmental policies would have an impact and one that would allow the harm to humans to be tracked rather easily.

Clean and Safe Transport

The second indicator at the intersection between health and the environment that Murray proposed is clean and safe transport. The combined burden of disease related to road traffic injuries, ambient air pollution from vehicle use, and lead from vehicle use is quite substantial in all regions of the world. Some of investments required to improve or achieve clean and safe transport come from the transport sector and from institutions investing in road infrastructure or mass transit systems. Changes in this sector can be carried out in a way that will realize both transport needs and clean and safe transport outcomes. In addition, changes can achieve both greenhouse gas reduction goals and health goals. Murray explained that a likely indicator could be the fraction of miles traveled using clean and safe transport, which is complicated to calculate but not impossible. And the measurement could go one step further to capture the extent to which some transport alternatives

encourage physical activity as well. Including all of this in one indicator may be complex but is certainly worth exploring.

Burden Due to Poor Diet

The third indicator that Murray proposed relates to the new science around diet components and how “healthy diets” relate to the way foods are produced, distributed, and sold. In the past, he said, the message on diet was about salt, sugar, and saturated fat. Interestingly, the latest systematic reviews do not show that saturated fat is harmful when compared to other sources of calories, in that if you substitute carbohydrates for saturated fat, there actually is no health gain. All components of diet combined account for more than 10 percent of the burden of disease (Lim et al., 2012). Murray noted that current evidence shows that certain components can promote healthy diets, such as fruits, nuts and seeds, whole grains, fiber, and vegetables (in that particular order). One could imagine both agricultural policy and tax and subsidy policies that could encourage the consumption of those resources and also result in environmental benefits if agricultural systems were developed in the right way. Lost years of healthy life from poor diet, an indicator tracking just burden, is now available at the country level and could be used to track many environmental or agricultural concerns over time.

Healthy Life Expectancy

The fourth indicator that Murray proposed sounds entirely like a health measure, but would entail more connections between the environment, social development, and health. He explained that healthy life expectancy—which summarizes mortality and nonfatal outcomes in a single measure—is a good health indicator for the post-2015 development agenda because it is an excellent summary of overall health, it is measurable, it is currently measured, it is available now for all countries from 1990 to 2010, and it reflects not just public health and medical care, but also many key determinants such as educational attainment, environmental concerns, and economic development. Healthy life expectancy would provide a way to frame health more broadly as an intersectoral concern, and in so doing could encourage greater consideration and focus on the overlapping areas between sectors.

At the same time, there is some resistance in the health sector to such a measure because it is perceived to not focus enough on medical care and public health and because other sectors have so much impact on healthy life expectancy. The Global Burden of Disease Study 2010 measures healthy life expectancy by country from 1990 to 2010. Of course, Murray said, there is a huge range seen globally, which reflects varying levels of both disease and mortality, but the good news is that healthy life expectancy has increased in most regions of the world in the

past decade. Healthy life expectancy is a measurable outcome that could provide a broad indicative strategy for a number of sectors and their connections to health.

DISCUSSION

A brief discussion among the speakers and participants followed the presentations. Their remarks are summarized in this section.

Economic Argument for Health Cobenefits

Bernard Goldstein, professor emeritus in the Department of Environmental and Occupational Health at the University of Pittsburgh, began the discussion by commenting on the economic benefits from averting disease. He noted that many economists argue that basically there is no real economic benefit from preventing cardiovascular disease due to ambient or household air particulates because a person is going to experience disease and death from something else, which will lead to the same end-of-year life cost on average. Goldstein asked Haines to comment on this and explain how he would argue that the economic cobenefits from health are real. Haines noted that the argument depends on the disease being averted and the assumptions that are included. Haines stated that you need to consider not just impacts on the health system, but also impacts on things like labor productivity in order to look more broadly at the impacts of health cobenefits on the economy. For some cobenefit strategies, the economic benefits can more or less offset the costs, but for other strategies this is not true. For example, in the food and agricultural sector, if you were to move human consumption away from animal products and toward greater intake of plant-based products, it would have negative economic impacts at least in the short term. Haines noted that this raises the question of to what extent policy decisions should focus on gross domestic product (GDP) growth, highlighting that in his opinion GDP is a flawed indicator of the economic success of different human societies. Haines stated that there is a need to look more broadly at other metrics of human development, whether well-being or healthy life expectancy, as Murray suggested. Haines explained that it is somewhat dangerous to consider only GDP growth as an indicator of societal success, but noted that it may take time for the public to catch up with this debate and consider other ways of measuring the success of societies in order to develop an alternative that is politically acceptable.

Particulate Exposure Indicator

Balbus commented on the presentation from Murray and asked whether the PM_{2.5} indicator that was proposed could indeed become part of the post-2015 development agenda or the SDGs. Balbus noted that the MDGs tend to include indicators that relate to just one goal, and wondered if the next round of global goals will allow for a crosscutting indicator like PM_{2.5}, which has its own intrinsic value as a health indicator but is also connected to everything from agriculture to transport to energy production. Murray explained that during the process leading to the creation of the MDGs, an indicator of household air pollution, namely, the fraction of households using solid fuels for cooking, was included in the preliminary environmental goals. However, he said, that indicator was never really adopted by a group and was dropped in a later revision of the indicators. Murray noted that a crosscutting indicator for the next round of global goals needs to appeal to enough groups to champion it throughout the process. Developing a crosscutting indicator may present a challenge, because it may not be the number-one indicator for any given sector, but because it does apply to many sectors, one would hope there is a way to use those connections to gain support this time around.

Water and Sanitation Indicator

Ana Treasure, environmental health advisor at the Pan American Health Organization representation in Jamaica, directed a question to Murray about his thoughts on possible indicators for water and sanitation given the updated information from the Global Burden of Disease Study 2010. Murray noted that water and sanitation remains an important agenda item, particularly for parts of West Africa and other places where waterborne diseases remain prevalent. However, because of the powerful trends in the data for diarrheal disease, it is likely that diarrhea will decrease another 30 or 40 percent over the next 10 years. From a health point of view, he said, one would likely not argue for indicators around water and sanitation for the post-2015 development agenda because the trend is so favorable with respect to diarrheal disease. It may be counter to many people's natural instincts, but it seems that in looking forward, water and sanitation will not meet the first principle he outlined in choosing indicators for the post-2015 development agenda, which was to focus on the really large issues. Murray stated that one may argue for water and sanitation indicators for nonhealth reasons, such as household well-being, access to clean water, and use of household time, but framing in this way does not create significant links to health. Murray pointed out that it is important to continue to monitor water and sanitation programs appropriately, but that is a little different than choosing new indicators to replace the MDGs.

Ebi provided a differing opinion, noting that while there are positive trends in diarrheal disease, there are counter trends coming with changes in temperature and precipitation that will likely affect how people use water in ways that tend to increase diarrheal disease. One of the questions becomes whether you want indicators that are only backward-looking, measuring how well something was done, or whether you also want indicators that are more forward-looking. She explained that these forward-looking indicators may provide projections of how water availability is going to change in a number of regions, which would allow for the establishment of preventive programs, and progress in these programs could then be measured with the backward-looking indicators. Ebi noted that it is important to think about how these interactions with environmental variables could affect health and to use these environmental variables to design health programs and monitor progress.

Healthy Life Expectancy Indicator

Balbus asked Murray to elaborate on the healthy life expectancy indicator and provide further information on the metrics available at the country and subnational levels. Murray noted that there are two fundamental strategies for measuring healthy life expectancy, in which a mortality measurement and life table is combined with a measure of the prevalence of ill health and disability. One strategy is to conduct a household survey, using one of the health-related quality of life or health status instruments that are available. A second strategy, which was utilized in the Global Burden of Disease Study 2010, is to construct the prevalence of disabling conditions and ill health from prevalence numbers by disease and sequela, using rich data from around the world, and to construct that prevalence country by country. Murray stated that the latter strategy is more analytically complicated, but said that in his view it is more robust, because the strategy is grounded in the same case definitions by disease and sequela and is intrinsically more comparable than household surveys. Murray noted that this strategy could be done at the subnational level, but it would require sophisticated data systems within the country.

Clean and Safe Transport Indicator

Referencing the clean and safe transport indicator that was presented, Balbus asked Murray to comment on the robustness and comparability of this indicator across countries, since it appears to be dependent on household surveys. Murray pointed out that household surveys are likely being conducted with relatively high frequency in every country around the world. For instance, the latest library at the World Bank shows that most countries average more than one nationally represented household

survey per year and often more than one per year if you look across sectors. However, the issue of good comparability and measurement management remains. Because the clean and safe transport indicator is a new idea, it would require mapping out a new measurement strategy that combines the cleanliness and safety with consumer choice or behavior data. Murray noted that this could be managed by enhancing data about personal behaviors and transport use with measures of how clean and safe those choices are at the local level.

Murray explained that an indicator on diet is a little more straightforward because the measure could be constructed from data on household consumption, which come from food balance sheets and reported diet consumption data that are collected in nutritional surveys. Overall, Murray said, mapping this indicator would require planning, thinking, and persuasive argument that it is worth carrying out and important to measure.

REFERENCES

- Australian Public Service Commission. 2007. Tackling wicked problems: A public policy perspective. <http://www.apsc.gov.au/publications-and-media/archive/publications-archive/tackling-wicked-problems> (accessed August 20, 2013).
- Cann, K. F., D. R. Thomas, R. L. Salmon, A. P. Wyn-Jones, and D. Kay. 2013. Extreme water-related weather events and waterborne disease. *Epidemiology and Infection* 141(4):671–686.
- Diffenbaugh, N. S., and F. Giorgi. 2012. *Climate change hotspots in the CMIP5 global climate model ensemble*. *Climatic Change* 114(3-4):813–822.
- Easterling, W. E., P. K. Aggarwal, P. Batima, K. M. Brander, L. Erda, S. M. Howden, A. Kirilenko, J. Morton, J. F. Soussana, J. Schmidhuber, and F. N. Tubiello. 2007. Food, fibre and forest products. In *Climate change 2007: Impacts, adaptation and vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. Edited by M. L. Parry, O. F. Canziani, J. P. Palutikof, P. J. van der Linden, and C. E. Hanson. Cambridge, UK: Cambridge University Press.
- FAO (Food and Agriculture Organization of the United Nations). 2010. Progress towards Millennium Development Goal 1: Hunger target. http://www.fao.org/fileadmin/templates/es/Hunger_Portal/MDG_Progress_Map.pdf (accessed September 3, 2013).
- Friel, S., A. D. Dangour, T. Garnett, K. Lock, Z. Chalabi, I. Roberts, A. Butler, C. D. Butler, J. Waage, A. J. McMichael, and A. Haines. 2009. Public health benefits of strategies to reduce greenhouse-gas emissions: Food and agriculture. *The Lancet* 374(9706):2016–2025.

- IPCC (Intergovernmental Panel on Climate Change). 2012. *Managing the risks of extreme events and disasters to advance climate change adaptation. A special report of Working Groups I and II of the Intergovernmental Panel on Climate Change*. New York: Cambridge University Press.
- Jarrett, J., J. Woodcock, U. K. Griffiths, Z. Chalabi, P. Edwards, I. Roberts, and A. Haines. 2012. Effect of increasing active travel in urban England and Wales on costs to the National Health Service. *The Lancet* 379(9832):2198–2205.
- Kolstad, E. W., and K. A. Johansson. 2011. Uncertainties associated with quantifying climate change impacts on human health: A case study for diarrhea. *Environmental Health Perspectives* 119(3):299–305.
- Le Quéré, C., M. R. Raupach, J. G. Canadell, G. Marland, L. Bopp, P. Ciais, T. J. Conway, S. C. Doney, R. A. Feely, P. Foster, P. Friedlingstein, K. Gurney, R. A. Houghton, J. I. House, C. Huntingford, P. E. Levy, M. R. Lomas, J. Majkut, N. Metzl, J. P. Ometto, G. P. Peters, I. C. Prentice, J. T. Randerson, S. W. Running, J. L. Sarmiento, U. Schuster, S. Sitch, T. Takahashi, N. Viovy, G. R. van der Werf, and F. I. Woodward. 2009. Trends in the sources and sinks of carbon dioxide. *Nature Geoscience* 2(12):831–836.
- Lim, S. S., T. Vos, A. D. Flaxman, G. Danaei, K. Shibuya, H. Adair-Rohani, M. A. AlMazroa, M. Amann, H. R. Anderson, K. G. Andrews, M. Aryee, C. Atkinson, L. J. Bacchus, A. N. Bahalim, K. Balakrishnan, J. Balmes, S. Barker-Collo, A. Baxter, M. L. Bell, J. D. Blore, F. Blyth, C. Bonner, G. Borges, R. Bourne, M. Boussinesq, M. Brauer, P. Brooks, N. G. Bruce, B. Brunekreef, C. Bryan-Hancock, C. Bucello, R. Buchbinder, F. Bull, R. T. Burnett, T. E. Byers, B. Calabria, J. Carapetis, E. Carnahan, Z. Chafe, F. Charlson, H. Chen, J. S. Chen, A. T. A. Cheng, J. C. Child, A. Cohen, K. E. Colson, B. C. Cowie, S. Darby, S. Darling, A. Davis, L. Degenhardt, F. Dentener, D. C. Des Jarlais, K. Devries, M. Dherani, E. L. Ding, E. R. Dorsey, T. Driscoll, K. Edmond, S. E. Ali, R. E. Engell, P. J. Erwin, S. Fahimi, G. Falder, F. Farzadfar, A. Ferrari, M. M. Finucane, S. Flaxman, F. G. R. Fowkes, G. Freedman, M. K. Freeman, E. Gakidou, S. Ghosh, E. Giovannucci, G. Gmel, K. Graham, R. Grainger, B. Grant, D. Gunnell, H. R. Gutierrez, W. Hall, H. W. Hoek, A. Hogan, H. D. Hosgood, D. Hoy, H. Hu, B. J. Hubbell, S. J. Hutchings, S. E. Ibeanusi, G. L. Jacklyn, R. Jasrasaria, J. B. Jonas, H. Kan, J. A. Kanis, N. Kassebaum, N. Kawakami, Y. H. Khang, S. Khatibzadeh, J. P. Khoo, C. Kok, F. Laden, R. Lalloo, Q. Lan, T. Lathlean, J. L. Leasher, J. Leigh, Y. Li, J. K. Lin, S. E. Lipshultz, S. London, R. Lozano, Y. Lu, J. Mak, R. Malekzadeh, L. Mallinger, W. Marcenes, L. March, R. Marks, R. Martin, P. McGale, J. McGrath, S. Mehta, Z. A. Memish, G. A. Mensah, T. R. Merriman, R. Micha, C. Michaud, V. Mishra, K. M. Hanafiah, A. A. Mokdad, L. Morawska, D. Mozaffarian, T. Murphy, M. Naghavi, B. Neal, P. K. Nelson, J. M. Nolla, R. Norman, C. Olives, S. B. Omer, J. Orchard, R. Osborne, B. Ostro, A. Page, K. D. Pandey, C. D. H. Parry, E. Passmore, J. Patra, N. Pearce, P. M. Pelizzari, M. Petzold, M. R. Phillips, D. Pope, C. A. Pope, J. Powles, M. Rao, H. Razavi, E. A. Rehfuss, J. T. Rehm, B. Ritz, F. P. Rivara, T. Roberts, C. Robinson, J. A. Rodriguez-Portales, I. Romieu, R. Room, L. C. Rosenfeld, A. Roy, L. Rushton, J. A. Salomon, U. Sampson, L. Sanchez-Riera, E. Sanman, A. Sapkota, S. Seedat,

- P. Shi, K. Shield, R. Shivakoti, G. M. Singh, D. A. Sleet, E. Smith, K. R. Smith, N. J. C. Stapelberg, K. Steenland, H. Stöckl, L. J. Stovner, K. Straif, L. Straney, G. D. Thurston, J. H. Tran, R. Van Dingenen, A. van Donkelaar, J. L. Veerman, L. Vijayakumar, R. Weintraub, M. M. Weissman, R. A. White, H. Whiteford, S. T. Wiersma, J. D. Wilkinson, H. C. Williams, W. Williams, N. Wilson, A. D. Woolf, P. Yip, J. M. Zielinski, A. D. Lopez, C. J. L. Murray, and M. Ezzati. 2012. A comparative risk assessment of burden of disease and injury attributable to 67 risk factors and risk factor clusters in 21 regions, 1990–2010: A systematic analysis for the Global Burden of Disease Study 2010. *The Lancet* 380(9859):2224–2260.
- Lobell, D. B., and C. B. Field. 2007. Global scale climate—crop yield relationships and the impacts of recent warming. *Environmental Research Letters* 2(1): doi:10.1088/1748-9326/2/1/014002.
- Markandya, A., and P. Wilkinson. 2007. Electricity generation and health. *The Lancet* 370(9591):979–990.
- Murray, C. J. L., T. Vos, R. Lozano, M. Naghavi, A. D. Flaxman, C. Michaud, M. Ezzati, K. Shibuya, J. A. Salomon, S. Abdalla, V. Aboyans, J. Abraham, I. Ackerman, R. Aggarwal, S. Y. Ahn, M. K. Ali, M. A. AlMazroa, M. Alvarado, H. R. Anderson, L. M. Anderson, K. G. Andrews, C. Atkinson, L. M. Baddour, A. N. Bahalim, S. Barker-Collo, L. H. Barrero, D. H. Bartels, M. G. Basáñez, A. Baxter, M. L. Bell, E. J. Benjamin, D. Bennett, E. Bernabé, K. Bhalla, B. Bhandari, B. Bikbov, A. B. Abdulhak, G. Birbeck, J. A. Black, H. Blencowe, J. D. Blore, F. Blyth, I. Bolliger, A. Bonaventure, S. Boufous, R. Bourne, M. Boussinesq, T. Braithwaite, C. Brayne, L. Bridgett, S. Brooker, P. Brooks, T. S. Brugha, C. Bryan-Hancock, C. Bucello, R. Buchbinder, G. Buckle, C. M. Budke, M. Burch, P. Burney, R. Burstein, B. Calabria, B. Campbell, C. E. Canter, H. Carabin, J. Carapetis, L. Carmona, C. Cella, F. Charlson, H. Chen, A. T.-A. Cheng, D. Chou, S. S. Chugh, L. E. Coffeng, S. D. Colan, S. Colquhoun, K. E. Colson, J. Condon, M. D. Connor, L. T. Cooper, M. Corriere, M. Cortinovis, K. C. de Vaccaro, W. Couser, B. C. Cowie, M. H. Criqui, M. Cross, K. C. Dabhadkar, M. Dahiya, N. Dahodwala, J. Damsere-Derry, G. Danaei, A. Davis, D. D. Leo, L. Degenhardt, R. Dellavalle, A. Delossantos, J. Denenberg, S. Derrett, D. C. Des Jarlais, S. D. Dharmaratne, M. Dherani, C. Diaz-Torne, H. Dolk, E. R. Dorsey, T. Driscoll, H. Duber, B. Ebel, K. Edmond, A. Elbaz, S. E. Ali, H. Erskine, P. J. Erwin, P. Espindola, S. E. Ewoigbokhan, F. Farzadfar, V. Feigin, D. T. Felson, A. Ferrari, C. P. Ferri, E. M. Fèvre, M. M. Finucane, S. Flaxman, L. Flood, K. Foreman, M. H. Forouzanfar, F. G. R. Fowkes, M. Fransen, M. K. Freeman, B. J. Gabbe, S. E. Gabriel, E. Gakidou, H. A. Ganatra, B. Garcia, F. Gaspari, R. F. Gillum, G. Gmel, D. Gonzalez-Medina, R. Gosselin, R. Grainger, B. Grant, J. Groeger, F. Guillemin, D. Gunnell, R. Gupta, J. Haagsma, H. Hagan, Y. A. Halasa, W. Hall, D. Haring, J. M. Haro, J. E. Harrison, R. Havmoeller, R. J. Hay, H. Higashi, C. Hill, B. Hoen, H. Hoffman, P. J. Hotez, D. Hoy, J. J. Huang, S. E. Ibeanusi, K. H. Jacobsen, S. L. James, D. Jarvis, R. Jasararia, S. Jayaraman, N. Johns, J. B. Jonas, G. Karthikeyan, N. Kassebaum, N. Kawakami, A. Keren, J.-P. Khoo, C. H. King, L. M. Knowlton, O. Kobusingye, A. Koranteng, R. Krishnamurthi, F. Laden, R. Lalloo, L. L. Laslett, T. Lathlean, J. L. Leasher, Y. Y. Lee, J. Leigh, D. Levinson, S. S. Lim, E. Limb, J. K. Lin, M. Lipnick, S. E.

- Lipshultz, W. Liu, M. Loane, S. L. Ohno, R. Lyons, J. Mabweijano, M. F. MacIntyre, R. Malekzadeh, L. Mallinger, S. Manivannan, W. Marcenes, L. March, D. J. Margolis, G. B. Marks, R. Marks, A. Matsumori, R. Matzopoulos, B. M. Mayosi, J. H. McAnulty, M. M. McDermott, N. McGill, J. McGrath, M. E. Medina-Mora, M. Meltzer, Z. A. Memish, G. A. Mensah, T. R. Merriman, A. C. Meyer, V. Miglioli, M. Miller, T. R. Miller, P. B. Mitchell, C. Mock, A. O. Mocumbi, T. E. Moffitt, A. A. Mokdad, L. Monasta, M. Montico, M. Moradi-Lakeh, A. Moran, L. Morawska, R. Mori, M. E. Murdoch, M. K. Mwaniki, K. Naidoo, M. N. Nair, L. Naldi, K. M. V. Narayan, P. K. Nelson, R. G. Nelson, M. C. Nevitt, C. R. Newton, S. Nolte, P. Norman, R. Norman, M. O'Donnell, S. O'Hanlon, C. Olives, S. B. Omer, K. Ortblad, R. Osborne, D. Ozgediz, A. Page, B. Pahari, J. D. Pandian, A. P. Rivero, S. B. Patten, N. Pearce, R. P. Padilla, F. Perez-Ruiz, N. Perico, K. Pesudovs, D. Phillips, M. R. Phillips, K. Pierce, S. Pion, G. V. Polanczyk, S. Polinder, C. A. Pope, S. Popova, E. Porrini, F. Pourmalek, M. Prince, R. L. Pullan, K. D. Ramaiah, D. Ranganathan, H. Razavi, M. Regan, J. T. Rehm, D. B. Rein, G. Remuzzi, K. Richardson, F. P. Rivara, T. Roberts, C. Robinson, F. R. De León, L. Ronfani, R. Room, L. C. Rosenfeld, L. Rushton, R. L. Sacco, S. Saha, U. Sampson, L. Sanchez-Riera, E. Sanman, D. C. Schwebel, J. G. Scott, M. Segui-Gomez, S. Shahrzad, D. S. Shepard, H. Shin, R. Shivakoti, D. Singh, G. M. Singh, J. A. Singh, J. Singleton, D. A. Sleet, K. Sliwa, E. Smith, J. L. Smith, N. J. C. Stapelberg, A. Steer, T. Steiner, W. A. Stolk, L. J. Stovner, C. Sudfeld, S. Syed, G. Tamburlini, M. Tavakkoli, H. R. Taylor, J. A. Taylor, W. J. Taylor, B. Thomas, W. M. Thomson, G. D. Thurston, I. M. Tleyjeh, M. Tonelli, J. A. Towbin, T. Truelsen, M. K. Tsilimbaris, C. Ubeda, E. A. Undurraga, M. J. van der Werf, J. van Os, M. S. Vavilala, N. Venketasubramanian, M. Wang, W. Wang, K. Watt, D. J. Weatherall, M. A. Weinstock, R. Weintraub, M. G. Weisskopf, M. M. Weissman, R. A. White, H. Whiteford, N. Wiebe, S. T. Wiersma, J. D. Wilkinson, H. C. Williams, S. R. M. Williams, E. Witt, F. Wolfe, A. D. Woolf, S. Wulf, P.-H. Yeh, A. K. M. Zaidi, Z.-J. Zheng, D. Zonies, and A. D. Lopez. 2012. Disability-adjusted life years (DALYs) for 291 diseases and injuries in 21 regions, 1990–2010: A systematic analysis for the Global Burden of Disease Study 2010. *The Lancet* 380(9859):2197–2223.
- Parham, P. E., and E. Michael. 2010. Modeling the effects of weather and climate change on malaria transmission. *Environmental Health Perspectives* 118(5):620–626.
- Peters, G. P., R. M. Andrew, T. Boden, J. G. Canadell, P. Ciais, C. Le Quéré, G. Marland, M. R. Raupach, and C. Wilson. 2013 The challenge to keep global warming below 2°C. *Nature Climate Change* 3:4–6.
- Raupach, M. R., G. Marland, P. Ciais, C. Le Quéré, J. G. Canadell, G. Klepper, and C. B. Field. 2007. Global and regional drivers of accelerating CO₂ emissions. *Proceedings of the National Academy of Sciences of the United States of America* 104(24):10288–10293.
- Smil, V. 2000. *Feeding the world: A challenge for the twenty-first century*. Cambridge, MA: The MIT Press.
- UNDP (United Nations Development Programme). 2004. *Human Development Report 2004: Cultural liberty in today's world*. New York: United Nations Development Programme.

- WHO (World Health Organization) and UNICEF (United Nations Children's Fund). 2009. *Diarrhoea: Why children are still dying and what can be done*. Geneva, Switzerland: World Health Organization.
- Wikipedia. 2013. Wicked problem. http://en.wikipedia.org/wiki/Wicked_problem (accessed August 20, 2013).
- Wilkinson, P., K. R. Smith, M. Davies, H. Adair, B. G. Armstrong, M. Barrett, N. Bruce, A. Haines, I. Hamilton, T. Oreszczyn, I. Ridley, C. Tonne, and Z. Chalabi. 2009. Public health benefits of strategies to reduce greenhouse-gas emissions: Household energy. *The Lancet* 374(9705):5–11.
- Woodcock, J., P. Edwards, C. Tonne, B. G. Armstrong, O. Ashiru, D. Banister, S. Beevers, Z. Chalabi, Z. Chowdhury, A. Cohen, O. H. Franco, A. Haines, R. Hickman, G. Lindsay, I. Mittal, D. Mohan, G. Tiwari, A. Woodward, and I. Roberts. 2009. Public health benefits of strategies to reduce greenhouse-gas emissions: Urban land transport. *The Lancet* 374(9705):1930–1943.
- Worldmapper. 2006. Underweight children. Map No. 182. <http://www.worldmapper.org/display.php?selected=182#> (accessed August 20, 2013).

Links Among Sustainable Development, Health Equity, and Social Justice

John M. Balbus, senior advisor for public health at the National Institute of Environmental Health Sciences and co-chair of the Institute of Medicine (IOM) Global Environmental Health and Sustainable Development Innovation Collaborative, opened the third webinar by highlighting the focus on making linkages among sustainable development, equity, and social justice. He noted that this relates to the overarching goal of the webinar series, which is to discuss how environmental health is integrated with issues of sustainable development. He explained that the second webinar addressed new approaches to connecting sustainable development across sectors (including the agricultural, energy, health, and transport sectors) and ideas about how to create crosscutting indicators to support the post-2015 development agenda process and the Sustainable Development Goals (SDGs). Balbus stated that achieving sustainable development not only requires creating bridges among the traditional pillars (economic development, social development, and environmental protection), but also reducing harmful exposures for those who are most vulnerable around the world. He noted that this leads us to confront issues of poverty, inequity, and social justice as they relate to sustainable development.

GLOBAL ENVIRONMENTAL CHANGE AND IMPACTS ON HUMAN HEALTH AND SOCIAL JUSTICE

*Úrsula Oswald Spring, Ph.D.
Professor and Researcher, Regional Centre of
Multidisciplinary Research
National Autonomous University of Mexico*

Úrsula Oswald Spring began her presentation by describing issues related to global environmental change that are affecting human health. She explained that we have witnessed a constellation of changes during

the past few centuries in different spheres—involving both natural and human components—that have contributed to global environmental change. The human population has tripled during the past century, greenhouse gas emissions have escalated, and the global temperature has risen, bringing greater nitrogen fixation and flux to coastal zones. In turn, these changes have created an enormous loss of biodiversity and species extinction in land and sea.

Oswald Spring noted that natural ecosystems produce an abundance of services on which humans depend. For instance, populations rely on provisioning services, or products obtained from ecosystems (such as food, water, and air); supporting services, or processes needed for the production of all other ecosystem services (such as the nutrient, sulfur, and carbon dioxide [CO₂] cycles); and regulating services, or benefits that are obtained from ecosystem regulation (such climate regulation and water purification, which are crucial for discussions on global environmental change). One other area that often gets lost in the discussion is the cultural component, or the immaterial benefits obtained from ecosystems related to cultural heritage. She noted that human health is at the center of all these services, because human well-being is impacted by changes in ecosystems that directly or indirectly affect good social relations, material minimums, security, freedom, and choice.

Ecosystem Changes

Oswald Spring stated that experts are seeing unprecedented changes in the world's ecosystems. During the past 30 years, increasing fresh water stress and water pollution have occurred throughout the world. In the past several decades, 20 percent of the world's coral reefs were lost and another 20 percent were degraded. In addition, 35 percent of the mangrove forests, which are considered the most biodiverse areas on earth, were lost during this same period. The amount of water in reservoirs has quadrupled since 1960,¹ withdrawals from rivers and lakes have doubled in the same time period, and today most surface water (70 percent worldwide) is used for agriculture (Millennium Ecosystem Assessment, 2005a). All of these processes have changed the world's ecosystems and the services they provide.

These changes have related costs, Oswald Spring noted. Extinction rates among mammals, birds, and amphibians are 1,000 times higher than what was seen in the fossil record (Millennium Ecosystem Assessment, 2005b). Soil degradation is also increasing worldwide, which has implications for food production and water availability given that healthy

¹ More reservoirs have been built since 1960. Water in reservoirs may be used to supply drinking water, generate hydroelectric power, provide irrigation, support recreational activities, and other uses.

soils are crucial to sustaining many ecosystem services. Speaking directly to the links with health, in 1990 about 30 percent of the world population, or 1.5 billion people, were exposed to dengue vectors, one of the most important viral vectorborne diseases sensitive to global warming and climate change. By 2085 it is estimated, based on climate change and population projections, that 50 to 60 percent of the world population, or 5 to 6 billion people, will be at risk for dengue transmission (Hales et al., 2002).

Distribution of the Health Impacts Related to Climate Change

Because the webinar focuses on inequality, Oswald Spring stated, we should examine how health impacts related to climate change are distributed throughout the world. Figure 4-1 provides a visual representation of countries (a) scaled by their total CO₂ emissions from 1950 to 2000 in the top graphic and (b) scaled by estimates of per capita mortality from climate change in 2000 in the bottom graphic (Patz et al., 2007; WHO, 2008). One can see that Africa, which has almost no CO₂ emissions, is the continent most affected by the health burden of climate change, followed by India. In effect, climate change is threatening to widen the health inequalities the already exist between rich and poor populations, exposing those in regions with the greatest disease burden to additional and disproportionate health risks (WHO, 2008). In order to reduce the burden of disease from climate change within these vulnerable populations, Oswald Spring said, regions need both mitigation and adaptation processes.

During natural disasters, Oswald Spring noted, large populations can be vulnerable to droughts, floods, extreme temperatures, windstorms, wildfires, earthquakes, landslides, volcanic eruptions, and wave surges. From 1974 to 2003, disasters caused an estimated 2 million deaths and affected more than 5 billion people worldwide. Drought was the largest contributor, accounting for 44 percent of the deaths and 36 percent of other impacts (injuries, homelessness, etc.) (Guha-Sapir et al., 2004). Oswald Spring stated that about 1 billion people are now living in arid or semi-arid regions worldwide, which makes them vulnerable to climate change and highly exposed to drought that can threaten their lives.

Role of Gender in Health Impacts Related to Natural Disasters

Oswald Spring pointed out that gender also affects vulnerability to the impact of natural disasters. Gender is not only understood as masculinity and femininity, but also includes an understanding of the roles, norms, values, behavior, social representation, responsibilities, necessities, and expectations in society, as well as sexuality and sexual behavior. Gender factors can create a division of labor, power, and responsibilities and impact

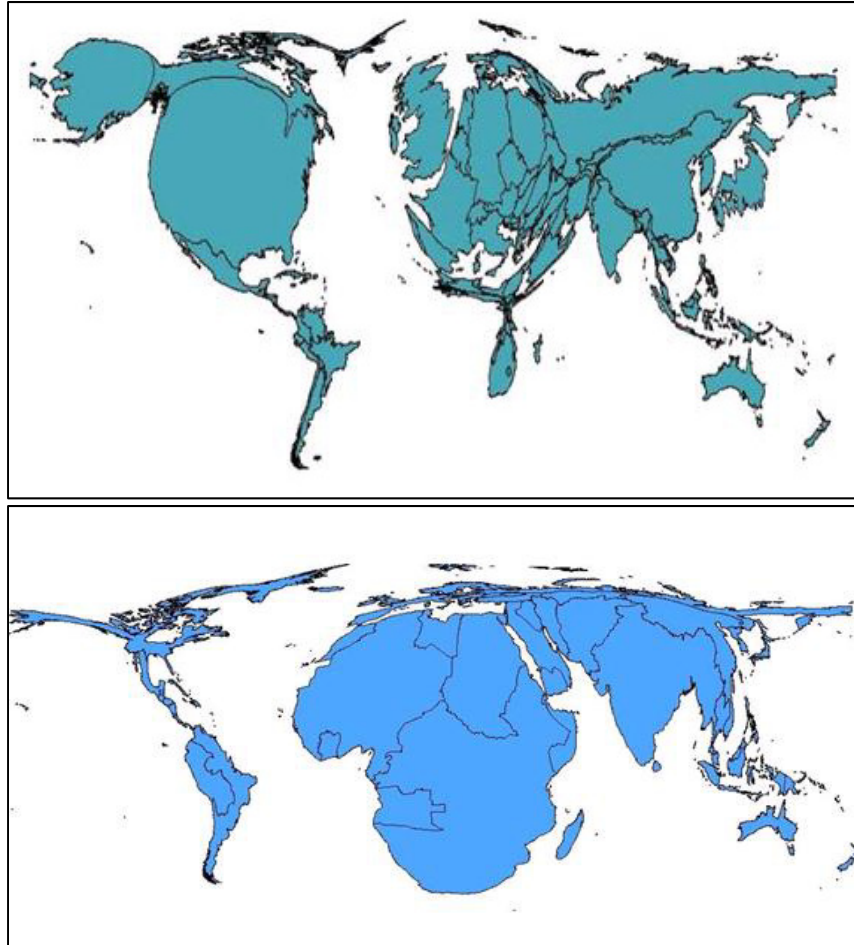


FIGURE 4-1 Inequalities related to greenhouse gas emissions (top) and health impacts related to climate change (bottom).

NOTES: Maps are density-equalizing cartograms in which the sizes of the 14 World Health Organization regions are proportional to estimated greenhouse gas emissions and mortality related to climate change. The bottom map shows estimated mortality (per million people) for four climate-sensitive health effects (malaria, malnutrition, diarrhea, and inland flood-related fatalities) by the year 2000.

SOURCE: Oswald Spring, 2012. Adapted from Patz et al., 2007.

the distribution of resources and benefits within society. Oswald Spring noted that the socially most vulnerable include girls and women in southern regions of the world where the socioeconomic status of women is low. It appears that natural disasters exacerbate existing inequalities in societies, in that increased female disaster mortality rates are linked with poor economic and social rights for women (Neumayer and Plümper, 2007). These rates may also be due to women's trained and self-assumed social responsibilities to care for others, often at the cost of their own lives (Oswald Spring, 2008). Natural disasters can lead to dramatic gender gaps in mortality, where women often account for 70 to 80 percent of those who die during these events (as seen with the 2004 Asian tsunami, the 2005 Pakistan earthquake, or Hurricane Stan in 2005 in Guatemala and Mexico).

A New Adaptation System for Sustainable Development

Oswald Spring stated that we need a new adaptation system that makes links among human capital (including gender issues, human adaptation, and human capabilities), environmental capital (including ecosystem processes, energy and ecological resources, and natural recycling), income and commodities, and science and medicine to create a human population with sustainable economic systems and energy processes to meet growing challenges (see Figure 4-2). She noted that energy processes should attempt to reduce fossil fuel usage and increase use of alternative fuels (e.g., small hydropower, solar, wind, and waves) in order to meet future energy demands in a sustainable manner that maintains human health and the environment. She also pointed out that the new adaptation system needs a different economic model for life that includes a distributive way to advance the health and wealth of populations. Oswald Spring explained that this transition to sustainable development will be a much better approach if it also focuses on overcoming poverty and addressing disaster risk management. These interconnections were included in a recent Intergovernmental Panel on Climate Change (IPCC) special report (*Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation*) in which the issues of sustainability, poverty, adaptation to climate change, and disaster risk management were considered together to identify systems transformations to address vulnerable populations at high risk. This includes integrating adaptation and disaster risk management approaches into the social, economic, and environmental policy domains to tackle inequalities that sustain poverty and limit access to resources (IPCC, 2012). She noted that in order for this integrated approach to be successful, decision makers need to change their worldview and mindset related to how they approach, react to, and value these interlinkages. By working together, she said, stakeholders can influence and create policies locally, nationally, and internationally to achieve this sustainable transition.

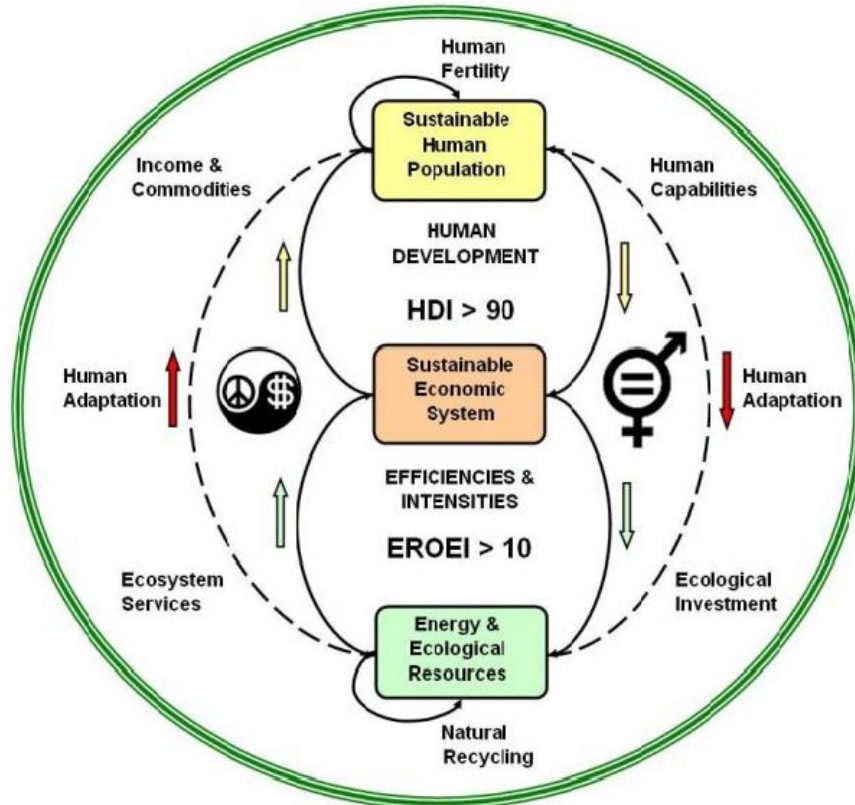


FIGURE 4-2 New adaptation system for sustainable development.

NOTE: EROEI = energy returned on energy invested, HDI = Human Development Index.

SOURCE: The Pelican Web (2011). Reprinted with permission from The Pelican Web.

POLICIES TO ADDRESS HEALTH EQUITY, SOCIAL JUSTICE, AND SUSTAINABLE DEVELOPMENT

*Sir Michael G. Marmot, M.D., Ph.D.
Professor of Epidemiology and Public Health,
Director of the International Centre for Health and Society,
University College London*

Building off the previous presentation, Michael G. Marmot noted that equity and poverty are important topics to discuss for two reasons: (1) the degree of poverty and social disadvantage can render people more susceptible to environmental challenges, and (2) these issues can be addressed by aligning policies on the physical and biological environments with those on the social environment. He pointed out that three major reviews support this approach: (1) *Closing the Gap in a Generation* (2008) from the Commission on Social Determinants of Health, (2) *Fair Society, Healthy Lives: The Marmot Review* (2010) from the Strategic Review of Health Inequalities in England, and (3) *Review of Social Determinants of Health and the Health Divide in the WHO European Region: Final Report* (2013). He stated that the European Review utilized a model based on the accumulation of positive and negative effects on health and well-being during the life course stages (prenatal, early years, working ages [16 to 64 years], and older ages) from the wider society, the broader macrolevel (which includes topics that Oswald Spring presented), and systems of governance. Marmot explained that all societies have social hierarchies, but the magnitude of health and equity that follows from social and economic inequity is not the same in different countries. When comparing the absolute inequality in male death rates by level of education across European countries, the magnitude varies enormously, with countries in Eastern Europe experiencing much greater inequalities than countries in the west, north, and south (Mackenbach et al., 2008).

Assessing Health Inequalities During the Life Course Stages

Prenatal and Early Years

Beginning with the prenatal and early years of the life course, Marmot stated, possible causes of inequalities can be assessed. For instance, a comparison of child poverty rates² before and after social

² Child poverty rate is defined as the percentage of children in families with less than 60 percent of needed median income.

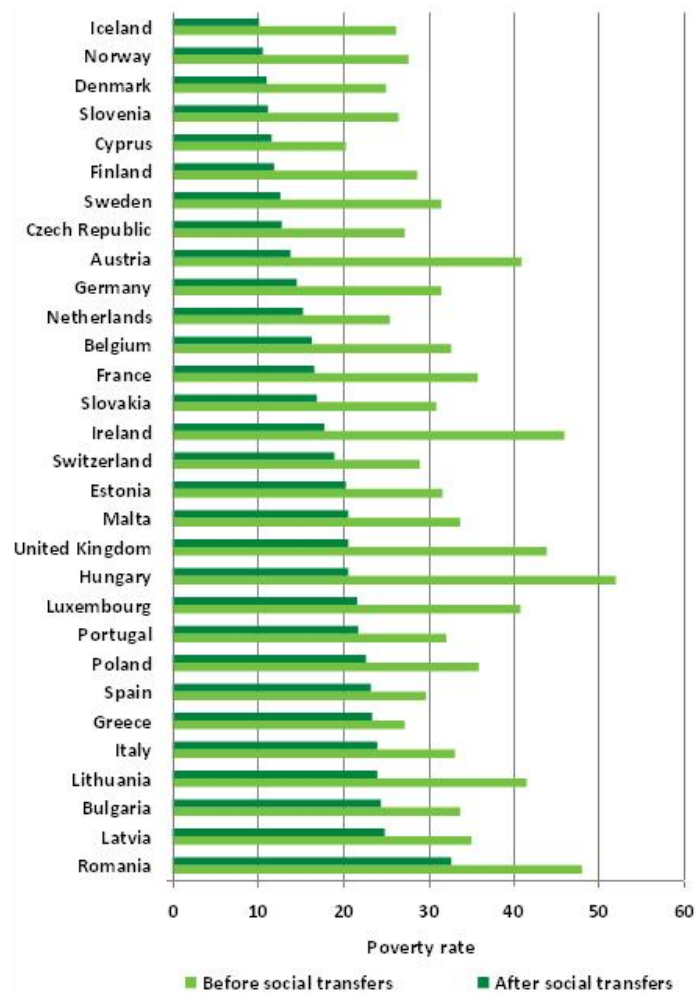


FIGURE 4-3 Child poverty rates before and after social transfers for 2009.
SOURCE: Marmot, 2012. Data from European Union Statistics on Income and Living Conditions.

transfers³ shows that child poverty rates decreased by approximately 10–30 percent after making social transfers within various European countries (see Figure 4-3). He noted that poverty, a key determinant of

³ Social transfers are defined as cash and in-kind transfers to provide a minimum income and livelihood security for poor and vulnerable populations.

health, is affected by the fiscal policy of governments, and that social transfers and social policy can do an enormous amount to decrease child poverty rates within countries. As a second example, Marmot pointed out that access to preschool is impacted by wealth in different countries of Central and Eastern Europe and the Commonwealth of Independent States of the former Soviet Union. In all of these countries, access varies significantly by wealth quintile, with approximately 0–10 percent of those in the poorest quintile having access to preschool compared to 15–75 percent of those in the richest quintile in each country (Marmot, 2012). He explained that access to preschool, which is a key determinant of early childhood development and children's readiness for school, is an important predictor of the outcome of education, which in turn influences adult socioeconomic conditions and inequities in adult health.

Working Ages

Marmot noted that early childhood development and education are drivers of unemployment in the working ages. Again, comparing the countries of Central and Eastern Europe and the Commonwealth of Independent States, unemployment among 15- to 24-year-olds is considerably greater than unemployment among the total population (see Figure 4-4). He explained that government policy and macro-level changes affect unemployment rates, which in turn impact health. During the recent economic downturn across Europe, a 1 percent rise in the unemployment rate was associated with a 0.8 percent rise in suicide and a 0.8 percent rise in homicide (Stuckler et al., 2009). Marmot pointed out the policies of austerity will predictably increase unemployment and result in similar negative outcomes. Government policies that decrease unemployment (or increase employment) are crucial to protect the health and well-being of the population.

Older Ages

Looking at the situation among older people, Marmot said, the English Longitudinal Study of Ageing (ELSA) shows that inequalities persist across income quintiles. He noted that for people aged 50 years and older, spending on basic resources (fuel, domestic food, and clothing) as a percent of income rises steeply among the poorer groups (see Table 4-1). For instance, people in the richest quintile spent 16 percent of their income on basics compared to 48 percent of the people in the poorest quintile. He pointed out that the economic downturn made things much harder for the people at the bottom, whose spending on the basics increased by 12.5 percent during 2008–2009 compared to 2004–2005.

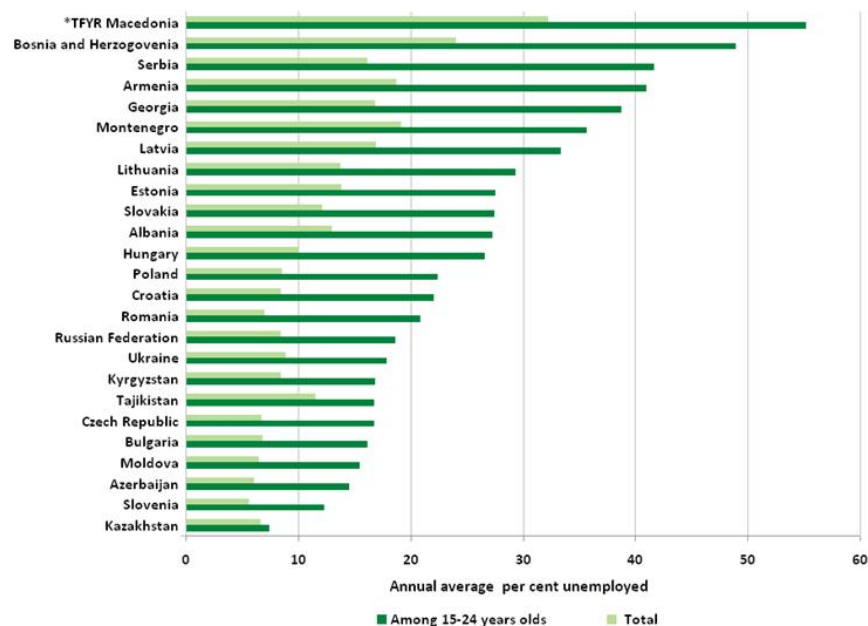


FIGURE 4-4 Unemployment rates in the countries of Central and Eastern Europe and the Commonwealth of Independent States for 2009.
SOURCE: Marmot, 2012. Data from UNICEF TransMONEE Database.

TABLE 4-1 Spending on Basics as Percent of Income

Quintile	Spending on Basics as Percent of Income 2008/2009	Percentage Point Change in Spending as Percent of Income from 2004/2005–2008/2009
Poorest	48.3	12.5
2nd	34.4	2.2
3rd	27.6	-1.5
4th	22.6	-4.1
Richest	16.4	-7.1
All	29.7	0.7

SOURCE: Marmot, 2012. Data from English Longitudinal Study of Ageing (see <http://www.ifs.org.uk/ELSA/about> [accessed August 14, 2013]).

Policies to Promote Health Equity and Sustainable Development

Marmot stated that he believes government spending really makes a difference in the health of people. Evidence from Stuckler and colleagues (2010) supports the idea that the higher the social welfare spending per capita, the lower the all-cause mortality (see Figure 4-5). Additional analyses from the ELSA study showed that each additional \$100 increase in social welfare spending was associated with a 1.19 percent decrease in all-cause mortality. Marmot emphasized that pursuing policies of austerity in the face of economic problems will likely harm people lower in the social hierarchy and result in adverse impacts on health. Overall, issues of health equity and sustainable development need to be addressed together because they are both part of social justice. He noted that evidence shows that policy at the local level, the national level, and the international level can have huge impacts on the lives people are able to lead, and hence impact health and health equity.

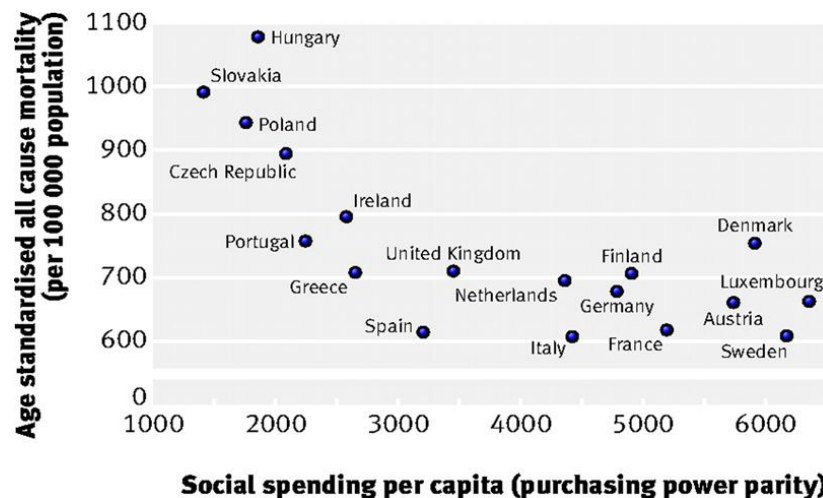


FIGURE 4-5 Relationship between social welfare spending and all-cause mortality in 18 European Union countries for 2000.

NOTE: Social spending per capita has been adjusted by purchasing power parity, which is the number of units of a country's currency required to buy the same amounts of goods and services in the domestic market as the U.S. dollar would buy in the United States.

SOURCE: Stuckler et al., 2010. Reprinted with permission from the BMJ Publishing Group Ltd.

ON-THE-GROUND PERSPECTIVE ON ADDRESSING HEALTH EQUITY AND SUSTAINABLE DEVELOPMENT

*Katherine Rogers, D.Phil.
Executive Manager, Office of the Executive Director
United Nations Children's Fund (UNICEF)*

Katherine Rogers presented information on A Promise Renewed, a UNICEF program and global movement to decrease preventable maternal, newborn, and child deaths. She noted that the program aligns with Millennium Development Goal (MDG) 4—to reduce child mortality—and is intended to sustain the progress of MDG 4 well beyond 2015 (the target end year for the MDGs). She stated that A Promise Renewed brings together public, private, and civil society actors committed to advocacy and action supporting maternal, newborn, and child survival at the national, subnational, and local levels.

Despite seeing tremendous progress to tackle preventable death worldwide, the global decline in preventable child death remains uneven with variable progress across regions, populations, and specific causes of mortality (UN, 2013). National averages often mask deep disparities that exist within and between countries, and evidence shows that by applying an equity focus to child survival, to address disparities with targeted interventions, significant declines in the global under-5 mortality rate can be achieved. For example, in low-income, high-mortality countries, each additional million dollars invested in reaching the most vulnerable children can avert up to 60 percent more child deaths than current approaches (UNICEF, 2010). She explained that a modeling exercise presented at the Childhood Survival Call to Action event—convened by the governments of Ethiopia, India, and the United States in collaboration with UNICEF—demonstrates that all countries can lower child mortality rates to 20 or fewer deaths per 1,000 live births by 2035 and save approximately 45 million lives (UNICEF, 2012). This is an important milestone toward the ultimate goal of ending preventable child deaths.

Rogers stated that these results can be achieved by utilizing four broad global strategies: (1) sharpening and scaling up high-impact country plans addressing child mortality, (2) building and mobilizing a global child survival movement to strengthen accountability, (3) communicating and celebrating national progress, and (4) mobilizing resources to foster innovative partnerships. Implementing high-impact strategies goes well beyond the field of health and requires coordinated cross-sectoral support from a full spectrum of public and private groups and coalitions that can influence health outcomes for women and children. She noted that focusing on the socioeconomic determinants of mortality is critical to achieving sustainable results. By incorporating conventional work on maternal, newborn, and child survival with an emphasis on issues like

women's empowerment, it is possible to equip women and families with the skills and confidence to make healthy decisions on their own and invest in the sustainable development of communities as a whole.

Thinking about the post-2015 development agenda, Rogers said, it is important not to lose sight of the fact that the health and well-being of children is one of the most compelling indicators of society's progress as a whole. She noted that since June 2012, 164 governments, 185 civil society organizations, 220 faith-based organizations, and more than 1,000 individuals have signed a pledge of their commitment to maternal, newborn, and child survival. Each signature represents renewed commitment to work across sectors, issues, and specific interventions to end preventable child deaths.

DISCUSSION

A brief discussion among the speakers and participants followed the presentations. Their remarks are summarized in this section.

How to Achieve the Right Balance in Investments

Balbus began the discussion by commenting on how framework diagrams depicting the interactions among social equity, justice, environmental exposures, and health often appear complicated and somewhat circular. He noted that intervening on the social level will likely improve the health of people and often reduce their environmental exposures. By reducing people's environmental exposures, it is possible to also improve their health and alleviate some factors that perpetuate poverty. Balbus then asked the speakers to share their thoughts on how to achieve the right balance between investing in environmental sectors, or in upstream sectors on the environmental side of the framework, and investing in education, poverty alleviation, social welfare payments, and other options that address the root issues of poverty.

Marmot noted that he has two types of responses to the question. First, the answer to the question is clearly going to depend on the level of income or level of development of a country. For instance, in a slum in Nairobi where it may cost more to buy a liter of water than in London, for example, the lack of availability of clean water that people can afford is going to be key. In contrast, in the countries of Central and Eastern Europe, people do have clean water, enough food, and shelter, so simply focusing on water and shelter would be ineffective in Central and Eastern Europe. So, Marmot noted, the mix will depend on the general background of low-, middle-, and high-income countries. Marmot's second response focused on the inequity in early childhood development or in child health across high-, middle-, and low-income countries. He

explained that one possible approach to this is to reduce the level of social and economic inequality in society, because that is driving the inequities in early childhood development and child health. While working toward that goal, which could take a while, it is important to break the link between people's social and economic position and the quality of childhood development and health. Marmot noted that this may require access to high-quality services for early childhood development or improved education of women. Having first stated that the mix will depend on country factors, one should not disregard the need for education and early childhood development in low-income countries that may also need water and shelter. As stated by previous speakers, education and empowerment of women are even more important in low-income countries. Marmot noted that, overall, decision makers need to pay attention to both material conditions and to social and economic drivers of health and development.

Oswald Spring stated that with regard to the circular approach to social and environmental impacts, the poorest countries or transition countries clearly have a more complex approach to deal with, as Marmot described. Moving through the circular social impact, education is on one side and public services on the other side. In Mexico, a program to provide larger scholarships to girls than boys resulted in more girls attending school and improved the education of girls as well as their reproductive health. The World Bank found educating girls and young women could lead to improvements in the gross domestic product of a country. Moving through the environmental impact, natural disasters and management of extreme events are crucial issues in poverty alleviation. So, Oswald Spring said, it is important to work simultaneously on the social, educational, and health parts when considering the environment in order to give the next generation the potential to live better. She highlighted that this will require much more involvement from civil society to ensure that the most vulnerable and in-need people are reached.

Relationship Between Social Welfare Spending and All-Cause Mortality

Bernard Goldstein, professor emeritus in the Department of Environmental and Occupational Health at the University of Pittsburgh, then shifted the discussion to the data presented by Marmot on the relationship between social welfare spending and all-cause mortality among European countries (see Figure 4-5). He pointed out that although the countries of Central and Eastern Europe have not caught up with the rest of Europe in terms of improved social programs, there still appears to be a wide range of social welfare spending among the other European countries but very little difference in mortality. In addition, Goldstein

stated, it is unclear if the social welfare spending captured includes government spending as well as spending by civil society or charitable groups who are involved in alleviating poverty and dealing with gender equality.

Marmot noted that the graph he presented included only government expenditure on social welfare, but agreed that the contributions from civil society are also important. Addressing the question about the range of social welfare spending and all-cause mortality, Marmot stated that Figure 4-5 looks somewhat curvilinear and is exaggerated by the Czech Republic, Hungary, Poland, and Slovakia data points. However, there are substantial differences in the mortality of the older members of the European Union that are not trivial (e.g., mortality differences between Ireland and Sweden). As presented earlier, government can reduce child poverty through taxes and transfers (see Figure 4-3), but the quality of early childhood development is not influenced by government expenditure alone. For instance, attendance at formal early childhood development centers makes a difference, particularly for children from deprived families, but less so for children from well-off families. Although the evidence supports childhood development centers, he said, it may be provided by civil society or families rather than by government, highlighting the importance that civil society plays in these issues.

Addressing Health Equity, Social Justice, and Sustainable Development

Commenting on the concepts of health equity and social justice, Balbus noted that it appears that two levels of approach are required: (1) the more operational approach through concrete actions that address specific indicators, and (2) the more philosophical approach related to a humanistic concept of policy. He asked the speakers to address how governments may incorporate both the operational approach and the philosophical approach to achieve change.

Marmot stated that many of the systematic inequalities in health that exist between social groups are judged to be avoidable by reasonable means and hence are unfair or inequitable. As such, any policies that lead to these avoidable health inequities are unfair. Marmot pointed out that what he sees in many European countries (which likely is occurring elsewhere) is governments stating that they used to be concerned about green issues and reductions in carbon emissions, but given the economic problems the country must drop the green goals and focus on economic growth. The idea that abandoning environmental protection will promote economic growth is questionable at best and contradicted by the evidence at worst. Marmot stated that he believes decision makers cannot pursue environmental goals without pursuing poverty reduction and cannot

pursue economic development without also pursuing fairness, justice, and environmental goals at the same time.

Rogers noted that to change the traditional concept of politics, the onus cannot necessarily be placed on governments alone. She explained that over the next few years, especially with regard to the post-2015 development agenda and other global processes, the responsibility rests increasingly with civil society networks and community-based constituencies that are involved in advocating for increased government responsiveness when it comes to equitable outcomes. She added that the best way to achieve this is to make sure community-based groups and civil society networks have the data and analysis they need to hold governments accountable.

Oswald Spring stated that on the philosophical side, it is important to change the business-as-usual mindset into a transitional process. For this reason, it may be more strategic to speak about the transition to sustainability instead of sustainable development. In the past 20 years following the 1992 United Nations Earth Summit, the environmental community has not been able to alleviate the destructive development processes that occur worldwide. Oswald Spring pointed out that in order to achieve equity and justice, mindsets need to change at both the macrolevel and microlevel. She noted that it is necessary to overcome destructive consumerism and create policies that link business with environmental protection, social justice and poverty alleviation, and social equity to confront the new uncertainty people throughout the world are experiencing. Oswald Spring added that it is important to carefully choose the indicators that are utilized to link the social and environmental domains in order to stop the process of destruction and reveal the types of development processes (e.g., mining, oil exploitation, natural gas extraction, etc.) that continue to destroy the wide range of resources we have on earth and bring new threats to health and survival.

Closing Remarks

Balbus noted that this is the final webinar in the 2012 series from the IOM Global Environmental Health and Sustainable Development Innovation Collaborative. He hopes that the summaries of all three webinars will serve as a valuable resource for the post-2015 development agenda process and other global processes related to sustainable development and creation of new SDGs.

REFERENCES

- Commission on Social Determinants of Health. 2008. *Closing the gap in a generation: Health equity through action on the social determinants of health*. Geneva, Switzerland: World Health Organization.
- Guha-Sapir, D., D. Hargitt, and P. Hoyois. 2004. *Thirty years of natural disasters 1974–2003: The numbers*. Louvain-la-Neuve, Belgium: Centre for Research on the Epidemiology of Disasters.
- Hales, S., N. de Wet, J. Maindonald, and A. Woodward. 2002. Potential effect of population and climate changes on global distribution of dengue fever: An empirical model. *The Lancet* 360(9336):830–834.
- IPCC (Intergovernmental Panel on Climate Change). 2012. *Managing the risks of extreme events and disasters to advance climate change adaptation. A special report of Working Groups I and II of the Intergovernmental Panel on Climate Change*. New York: Cambridge University Press.
- Mackenbach, J. P., I. Stirbu, A. J. Roskam, M. M. Schaap, G. Menvielle, M. Leinsalu, and A. E. Kunst. 2008. Socioeconomic inequalities in health in 22 European countries. *New England Journal of Medicine* 358(23):2468–2481.
- Marmot, M. 2012. *Social/economic inequalities, sustainable development, and health inequalities*. PowerPoint presentation at the Institute of Medicine Webinar on Making Linkages Between Sustainable Development, Equity, and Social Justice, Washington, DC.
- Marmot, M., J. Allen, P. Goldblatt, T. Boyce, D. McNeish, M. Grady, I. Geddes, and The Marmot Review Team. 2010. *Fair society, healthy lives: The Marmot Review*. London, UK: Strategic Review of Health Inequalities in England.
- Millennium Ecosystem Assessment. 2005a. *Ecosystems and human well-being: Health synthesis*. Geneva, Switzerland: World Health Organization.
- Millennium Ecosystem Assessment. 2005b. *Ecosystems and human well-being: Synthesis*. Washington, DC: Island Press.
- Neumayer, E., and T. Plümper. 2007. The gendered nature of natural disasters: The impact of catastrophic events on the gender gap in life expectancy, 1981–2002. *Annals of the Association of American Geographers* 97(3):551–566.
- Oswald Spring, Ú. 2008. *Gender and disasters. Human, gender, and environmental security: A HUGE challenge*. Bonn, Germany: United Nations University Institute for Environment and Human Security.
- Oswald Spring, Ú. 2012. *Perspectives on the intersection of sustainable development, equity, and social justice: Environmental perspective*. PowerPoint presentation at the Institute of Medicine Webinar on Making Linkages Between Sustainable Development, Equity, and Social Justice, Washington, DC.
- Patz, J. A., H. K. Gibbs, J. A. Foley, J. V. Rogers, and K. R. Smith. 2007. Climate change and global health: Quantifying a growing ethical crisis. *EcoHealth* 4:397–405.

- The Pelican Web. 2011. Strategies for the transition to clean energy. *Mother Pelican: A Journal of Sustainable Human Development* 7(10). <http://www.pelicanweb.org/solisustv07n10supp3.html> (accessed September 17, 2013).
- Stuckler, D., S. Basu, M. Suhrcke, A. Coutts, and M. McKee. 2009. The public health effect of economic crises and alternative policy responses in Europe: An empirical analysis. *The Lancet* 374(9686):315–323.
- Stuckler, D., Basu, S., and M. McKee. 2010. Budget crises, health, and social welfare programmes. *British Medical Journal* 340:c3311.
- UN (United Nations). 2013. *The Millennium Development Goals report*. New York: United Nations.
- UNICEF (United Nations Children’s Fund). 2010. Narrowing the gaps to meet the goals. Available at: http://www.unicef.org/publications/files/Narrowing_the_Gaps_to_Meet_the_Goals_090310_2a.pdf (accessed August 20, 2013).
- UNICEF. 2012. *Committing to child survival: A Promise Renewed. Progress report 2012*. New York: United Nations Children’s Fund.
- WHO (World Health Organization). 2008. *Protecting health from climate change: World Health Day 2008*. Geneva, Switzerland: World Health Organization.
- WHO. 2013. *Review of social determinants of health divide in the WHO European Region: Final report*. Copenhagen, Denmark: World Health Organization.

A

Webinar Agendas

WEBINAR #1 AGENDA

Understanding the United Nations Post-2015 Development Agenda Process and Opportunities and Challenges for Health

October 18, 2012
11:00 am–12:30 pm EDT

Webinar series is organized with support from
National Institute of Environmental Health Sciences
Pan American Health Organization

Webinar Goals and Objectives

- Provide an overview of ongoing UN teams and panels focusing on the post-2015 development agenda process.
- Discuss lessons learned from the Millennium Development Goal (MDG) agenda process, highlighting perspectives of developing countries.
- Identify opportunities and challenges that lie ahead with the post-2015 development agenda.

11:00 am

Opening

John M. Balbus, M.D., M.P.H. (moderator)
Senior Advisor for Public Health, National Institute of
Environmental Health Sciences (NIEHS)

11:10 am **Overview of the UN Post-2015 Development Agenda Process and Description of Health-Focused Initiatives**
Maria Neira, M.D.
Director, Public Health and Environment, World Health Organization (WHO)

Panel Discussion: Lessons Learned from the MDG Agenda and Insights on Opportunities and Challenges with the Post-2015 Development Agenda Process

11:20 am David Serwadda, M.B.Ch.B., M.Sc., M.Med., M.P.H.
Professor of Disease Control and Environmental Health,
Makerere School of Public Health, Uganda

11:30 am Paulo Buss¹ M.D., M.P.H.
Former President, Oswaldo Cruz Foundation, Brazil

11:40 am Zehra Aydin, M.A.
Senior Program Officer, United Nations Environment Programme

11:50 am **Discussion**

12:25 pm **Closing**
John M. Balbus, M.D., M.P.H.

12:30 pm **ADJOURN**

¹ Unfortunately, this speaker was not able to present because of technical difficulties.

WEBINAR #2 AGENDA**Integrating the MDGs with the Pillars and Principles of Sustainable Development**

November 15, 2012
11:00 am–12:30 pm EDT

Webinar series is organized with support from
National Institute of Environmental Health Sciences
Pan American Health Organization

Webinar Goals and Objectives

- Discuss how the global development framework may evolve to include environmental, economic, and social goals of sustainable development.
- Provide a vision for integrating health and achieving intersectoral collaboration with the post-2015 development agenda process.
- Identify metrics for assessing trends and tracking progress on shared goals of global environmental health and sustainable development.

11:00 am	<p>Opening John M. Balbus, M.D., M.P.H. (moderator) Senior Advisor for Public Health, NIEHS</p>
11:10 am	<p>Transitioning to an Integrated View of Health in the Post-2015 Development Agenda Process Sir Andrew Haines, M.D., MBBS Professor of Public Health and Primary Care, London School of Hygiene and Tropical Medicine</p>
11:25 am	<p>Bridging the Gap Between the MDGs and Principles of Sustainable Development Kristie L. Ebi, Ph.D., M.P.H. Consulting Professor, Department of Medicine, Stanford University</p>

- 11:40 am **Describing Mutual Metrics Among Economic and Social Development, Environmental Protection, and Human Health**
Christopher J. L. Murray, M.D., D.Phil.
Director, Institute for Health Metrics and Evaluation,
University of Washington
- 11:55 am **Discussion**
- 12:25 pm **Closing**
John M. Balbus, M.D., M.P.H.
- 12:30 pm **ADJOURN**

WEBINAR #3 AGENDA**Making Linkages Among Sustainable Development,
Equity, and Social Justice**

December 20, 2012
11:00 am–12:30 pm EDT

Webinar series is organized with support from
National Institute of Environmental Health Sciences
Pan American Health Organization

Webinar Goals and Objectives

- Discuss drivers and consequences of gender and income inequity, highlighting associations with sustainable development and human health.
- Identify how models or approaches could be utilized to reduce income disparities across or within global regions to promote sustainable development.
- Provide insights on how sustainable development, equity, and social justice may converge in developing a post-2015 development agenda or Sustainable Development Goals (SDGs).

11:00 am **Opening**
John M. Balbus, M.D., M.P.H. (moderator)
Senior Advisor for Public Health, NIEHS

**Panel Discussion: Perspectives on the Intersection of Sustainable
Development, Equity, and Social Justice**

11:10 am **Environmental Perspective**
Úrsula Oswald Spring, Ph.D.
Professor and Researcher, Regional Centre of
Multidisciplinary Research, National University of
Mexico

- 11:20 am **Health Perspective**
Sir Michael G. Marmot, M.D., Ph.D.
Professor of Epidemiology and Public Health, Director
of the International Centre for Health and Society,
University College London
- 11:30 am **On-the-Ground Perspective**
Katherine Rogers, D.Phil.
Executive Manager, Office of the Executive Director,
United Nations Children’s Fund
- 11:40 am **Discussion**
- 12:25 pm **Closing**
John M. Balbus, M.D., M.P.H.
- 12:30 pm **ADJOURN**

B

Webinar Speaker Biosketches

Zehra Aydin, M.A., joined the United Nations (UN) Environment Programme (UNEP) in September 2006 as the UNEP Liaison to the UN Development Group—a system-wide mechanism to coordinate operational activities in the field and to support UN country teams. Prior to UNEP she was with the UN Department for Economic and Social Affairs (DESA), where she worked in the Division for Sustainable Development, managing the relationship of the Commission on Sustainable Development with civil society and the private sector (1993–2006). Before DESA, she was with the former UN Centre on Transnational Corporations, where she worked on environment and business issues (1990–1992). During her assignment in DESA, she was seconded twice: first to the executive office of the Secretary-General for 18 months and next to the UN Non-Governmental Liaison Service (NGLS) for 12 months. Ms. Aydin’s UN career has largely focused on environment and development, partnerships with civil society and the private sector, and inter-agency relations. Her work with civil society and the private sector has generated new participatory practices in the UN Commission on Sustainable Development, such as the multi-stakeholder dialogues, and shaped the World Summit on Sustainable Development (Johannesburg, 2002) as an unusually participatory event. She also assisted the Cardoso Panel to develop proposals on improving how the UN collaborates with civil society, and in NGLS she managed the first-ever Hearings of the General Assembly with civil society and the private sector in 2005.

John M. Balbus, M.D., M.P.H., serves as senior advisor for public health at the National Institute of Environmental Health Sciences (NIEHS). He also leads NIEHS efforts on climate change and human health. In this capacity he serves as Department of Health and Human Services principal to the U.S. Global Change Research Program, for which he also co-chairs the Interagency Cross-Cutting Group on Climate Change and Human Health. Dr. Balbus has authored studies and lectures on global climate change and health, transportation-related air pollution, the toxic effects of chemicals, and regulatory approaches to protecting susceptible subpopulations. Before joining the NIEHS, Dr. Balbus was chief health scientist for the nongovernmental organization the Environmental Defense Fund. He served on the faculty of the George

Washington University, where he was founding director of the Center for Risk Science and Public Health, founding co-director of the Mid-Atlantic Center for Children's Health and the Environment, and acting chairman of the Department of Environmental and Occupational Health. He maintains an adjunct faculty appointment at the Johns Hopkins Bloomberg School of Public Health. Dr. Balbus received his A.B. degree in biochemistry from Harvard University, his M.D. from the University of Pennsylvania, and his M.P.H. from the Johns Hopkins Bloomberg School of Public Health.

Kristie L. Ebi, Ph.D., M.P.H., has been conducting research on the impacts of and adaptation to climate change for more than 15 years, primarily on extreme events, thermal stress, foodborne diseases, and vectorborne diseases. She has worked with the World Health Organization (WHO), United Nations Development Programme, International Development Research Centre, United States Agency for International Development, and others on designing and implementing adaptation measures in low-income countries, and has worked with the Center for Climate Strategies on identifying adaptation options for U.S. states conducting vulnerability and adaptation assessments. She was a lead author for the Human Health chapter of the Intergovernmental Panel on Climate Change Fourth Assessment Report, and was lead author for Human Health for the U.S. Synthesis and Assessment Product *Analyses of the Effects of Global Change on Human Health and Welfare and Human Systems*. She has edited four books on climate change and health, and has more than 80 publications. Dr. Ebi's scientific training includes an M.S. in toxicology and a Ph.D. and an M.P.H. in epidemiology, and 2 years of postgraduate research at the London School of Hygiene and Tropical Medicine.

Sir Andrew Haines, M.D., MBBS, is a professor of public health and primary care with joint appointments in the Department of Social and Environmental Health Research and Department of Nutrition and Public Health Intervention Research at the London School of Hygiene and Tropical Medicine. He was previously director (originally dean) of the London School of Hygiene and Tropical Medicine for almost 10 years, having previously been professor of primary health care at University College London between 1987 and 2000. He also worked part-time as a general practitioner in North London for many years. Dr. Haines' research interests are in epidemiology and health services research, focusing particularly on research in primary care and the study of environmental influences on health, including the potential effects of climate change and the health cobenefits of the low-carbon economy. He has been a member of a number of major international and national committees, including the Medical Research Council (MRC) Global

Health Group (chair), the MRC Strategy Group, the UK Health and Social Care Policy Committee (chair), and the WHO Advisory Committee on Health Research (chair). He was a member of the UN Intergovernmental Panel on Climate Change for the second and third assessment reports and is currently a review editor for the fifth report.

Sir Michael G. Marmot, M.D., Ph.D., is professor of epidemiology and public health and director of the International Centre for Health and Society at University College London, as well as adjunct professor of health and social behavior at the Harvard School of Public Health. Sir Marmot's lifetime work has focused on social inequalities and health. He conducted the well-known Whitehall Studies in Britain, which documented important effects of class on health over a 20- to 40-year span, and he has been involved with translating these issues into policy. He has coordinated two European Research networks and is now co-coordinator of the European Science Foundation network on inequalities in healthy life expectancy; he has also been a member of two research networks of the Chicago-based MacArthur Foundation and a member of the Canadian Institute for Advanced Research population research program. He is a fellow of the Faculty of Public Health Medicine, a Fellow of the Royal College of Physicians, and was elected as a founding fellow of the Academy of Medical Science. Sir Marmot holds a medical degree from the University of Sydney and a Ph.D. in epidemiology from the University of California, Berkeley.

Christopher J. L. Murray, M.D., D.Phil., is a professor of global health at the University of Washington and director of the Institute for Health Metrics and Evaluation. A physician and health economist, his work has led to the development of a range of new methods and empirical studies to strengthen the basis for population health measurement, measure the performance of public health and medical care systems, and assess the cost effectiveness of health technologies. Dr. Murray worked at WHO from 1998 to 2003, where he served as the executive director of the Evidence and Information for Policy Cluster. From 2003 until 2007, Dr. Murray was the director of the Harvard University Initiative for Global Health and the Harvard Center for Population and Development Studies, as well as the Richard Saltonstall Professor of Public Policy at the Harvard School of Public Health. Dr. Murray has authored or edited 14 books, many book chapters, and more than 130 journal articles in internationally peer-reviewed publications. He holds bachelor of arts and science degrees from Harvard University, a D.Phil. in international health economics from Oxford University, and an M.D. from Harvard Medical School.

Maria Neira, M.D., is the director of the Department of Public Health and Environment at WHO. Previously, between September 2002 and August 2005, she was president of the Spanish Food Safety Agency and Vice Minister of Health and Consumer Affairs in Spain. Dr. Neira was appointed in 1999 as director of the Department of Control, Prevention and Eradication at WHO. Prior to that, she had been working for WHO in Geneva since 1993, as coordinator of the Global Task Force on Cholera Control. Before joining WHO, Dr. Neira worked as the public health adviser in the Ministry of Health in Mozambique from 1991 to 1993. Earlier, in Kigali, Rwanda, she was a UN public health advisor/physician on assignment from the United Nations Development Programme. From 1987 to 1989, she was in El Salvador and Honduras as medical coordinator for Médecins sans Frontières. Dr. Neira is a Spanish national who holds a degree in medicine and surgery from the University of Oviedo, Spain, and a master's degree in public health from the Université Pierre et Marie Curie, in Paris, France. She specialized in endocrinology and metabolic diseases at the Université René Descartes, then in nutrition at the Conservatoire National d'Arts et Métiers, both in Paris, and she obtained an international diploma in emergency preparedness and crisis management from the University of Geneva, Switzerland.

Katherine Rogers, D.Phil., is an executive manager in the Office of the Executive Director at the United Nations Children's Fund (UNICEF). Prior to joining UNICEF, Dr. Rogers worked for the World Bank in Sierra Leone, where she led a research project that focused on the relationship between mining companies and host communities. Upon joining UNICEF, she worked in the Division of Policy and Strategy, as well as the Division of Programmes, focusing on the agency's engagement with civil society. Dr. Rogers has an M.Phil. in international relations and a D.Phil. in international development from the University of Oxford.

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