



Toward an Ecological View of Health: An Imperative for the Twenty-First Century

Ted Schettler, MD, MPH

Paper presented by The Center for Health Design® and Health Care Without Harm at a conference sponsored by the Robert Wood Johnson Foundation, September 2006.



**THE CENTER FOR
HEALTH DESIGN®**

www.healthdesign.org

The Center for Health Design is a nonprofit research and advocacy organization whose mission is to transform healthcare settings into healing environments that improve outcomes through the creative use of evidence-based design. We envision a future where healing environments are recognized as a vital part of therapeutic treatment and where the design of healthcare settings contributes to health and does not add to the burden of stress. For more information, visit www.healthdesign.org.

Health Care Without Harm is an international coalition of 440 groups in 55 countries working to transform the healthcare industry so that it is ecologically sustainable and no longer a source of harm to people and the environment. Since 1996, HCWH has been at the forefront of efforts to shift the healthcare sector toward safer, healthier products and practices. Major successes include: virtually eliminating the market for mercury fever thermometers in the United States; reducing the number of polluting medical waste incinerators in the United States from 5,000 in the mid-1990s to less than 100 today; shifting the medical-device market away from DEHP-containing PVC plastic; implementing the first green building system for hospitals, the *Green Guide for Health Care*; and working with hospitals to build markets for locally grown, sustainable healthy food. For more information, visit www.noharm.org.

The Robert Wood Johnson Foundation focuses on the pressing health and healthcare issues facing the United States. As the nation's largest philanthropy devoted exclusively to improving the health and healthcare of all Americans, the foundation works with a diverse group of organizations and individuals to identify solutions and achieve comprehensive, meaningful, and timely change. For more than thirty years, the foundation has brought experience, commitment, and a rigorous, balanced approach to the problems that affect the health and healthcare of those it serves. When it comes to helping Americans lead healthier lives and get the care they need, the foundation expects to make a difference in your lifetime. For more information, visit www.rwjf.org.



©2006 The Center for Health Design
1850 Gateway Boulevard
Suite 1083
Concord, CA 94520
925.521.9404 tel.
925.521.9405 fax
admin@healthdesign.org
www.healthdesign.org



Health Care Without Harm
1901 North Moore Street
Suite 509
Arlington, VA 22209 U.S.A.
703.243.0056 tel.
703.243.4008 fax
infor@hcwh.org
www.noharm.org



Robert Wood Johnson
Foundation

Robert Wood Johnson Foundation
Route 1 & College Road East
P.O. Box 2316
Princeton, NJ 0854302316
877.843.RWJF (7953)
www.rwjf.org

Graphic design: Glenn Ruga/Visual Communications
Copyediting: Lisa Richter, Richter Communications

Toward an Ecological View of Health: An Imperative for the Twenty-First Century

Ted Schettler, MD, MPH

Nature's goods and services are the ultimate foundations of life and health, even though in modern societies this fundamental dependency may be indirect, displaced in space and time, and therefore poorly recognized.

— **Lee Jong-wook, Director-General 2003-2006, World Health Organization, *Ecosystems and Human Well-Being: Health Synthesis, a report of the Ecosystem Millennium Assessment, United Nations Environment Program***

The growing prevalence of chronic conditions such as diabetes, heart disease, and obesity will overwhelm attempts to fine-tune the delivery system if there are not strong benefit plans and a focused approach to disease management and prevention and wellness.

— **Ronald M. Hollande, President and Chief Executive Officer, Massachusetts Hospital Association, *Boston Globe*, July 15, 2006**

At the beginning of the twentieth century, the quality of medical education and practice was haphazard and poorly regulated by professional or other institutions. The *Flexner Report*, commissioned by the Carnegie Foundation in 1910, concluded that medical practice was not sufficiently informed by science and that medical education should be designed so that physicians would be well-grounded in science and the pathophysiology of disease. The adoption of these recommendations, along with other social, cultural, economic, and political forces, helped to shape the trajectory of twentieth-century medicine. The medical profession acquired substantial power and authority, while scientific understanding of the origins of disease dramatically advanced (Starr 1982).

During this time, and not just coincidentally, the paths of medicine and public health diverged. Broadly speaking, medicine focused primarily on the pathophysiology and treatment of diseases, while public health emphasized disease prevention. To some extent, the two fields have competed for resources and authority ever since, and each has made important contributions. Improvements in sanitation, working conditions, housing, nutrition, care for poor people, and infectious-disease prevention dramatically improved the public's health. Technological achievements based on advances in biomedical understanding, translated into medical interventions, led to marked improvements in the outcomes of many diseases.

But technological achievements that emerged out of what is now a vast medical industrial complex have come at a steep price. In the United States, as a percentage of gross domestic product, medical expenditures grew from 5.1 percent in 1970 to 16 percent in 2005 (ASPE Issue Brief 2005, Kolata 2006).

Before designing the twenty-first century hospital, we should ask whether the healthcare system should continue on its twentieth-century path. Where is that path going? Is this relentless growth sustainable and will it continue to deliver value? To whom? Are there new opportunities for the healthcare sector to make unique contributions to the well-being of individuals and their communities? What are the determinants of health? What is health? To the extent that they address disease prevention at all, most health-

care professionals and institutions concentrate on well-established, proximate causes of disease, rather than more distal or structural causes. Are there new opportunities and responsibilities for disease prevention? What are the relationships among medicine, public health, and environmental health? How are those relationships reflected in current institutional structures and practices?

Until these questions are addressed, it is impossible to know if the services provided by healthcare institutions are appropriate for delivering real value to their communities. And, without knowing what the mix of services and activities ought to be, discussion of building and infrastructure design is premature.

In the sections that follow, this paper addresses four basic themes.

First, as with all forms of life, humans are fundamentally dependent on environmental quality and ecosystem services for their well-being and quality of life. Locally, regionally, and globally, ecosystems and the services that they provide are under considerable stress and undergoing rapid change unique in human history with profound implications for human health.

Second, the healthcare sector not only treats people whose illnesses are in part or whole attributable to environmental conditions, but also contributes in multiple ways to environmental degradation that fosters ill health.

Third, the healthcare sector has both an opportunity and a responsibility to address these realities by modifying practices and modeling behavior in ways that demonstrate an understanding of ecological health. Ecological health embraces the deeply fundamental complex interrelationships that collectively influence human and environmental health.

Finally, as the costs of medical care continue to increase, we will increasingly come face to face with the uncomfortable question: How much are we really interested in disease prevention and health promotion and restoration?

Relationships between human and environmental health

Since life emerged on the planet 3.5 billion years ago, organisms have entered into a co-evolutionary, dialectic relationship with their environments in which each changes the other. Although modern humans evolved about 120,000 years ago, the qualities of ecological change created by population growth and technological achievements throughout the past several centuries, accelerating in the past fifty to one hundred years, are unique and deserve a closer look.

In 2005, the United Nations released the largest assessment of the health of the earth's ecosystems ever undertaken (UNEP 2005). More than one thousand experts from ninety-five countries prepared the report, which was then reviewed by a large independent board of editors and commented upon by hundreds of experts and governments before being released.

Among the findings

- In the past 50 years, humans have changed ecosystems more rapidly and extensively than in any comparable period of time in human history.
- Approximately 60 percent of the ecosystem services examined, from regulation of air quality to purification of water, are being degraded or used unsustainably.
- Between one-third and one-half of the land surface of the earth has been transformed by human activity.
- The changes have contributed to substantial net gains in human well-being and economic development for many people.

- These gains, however, have been achieved at growing costs in the form of the degradation of many ecosystem services, increased risks of nonlinear changes, exacerbation of poverty for some groups of people, and growing disparities and inequities.
- In the past 50 years, the world's human population has increased from 2.4 billion to 6.4 billion people. Much of this growth has occurred in increasingly large cities where mega-slums proliferate. Mega-slums are incubators of new and re-emergent diseases that can quickly travel across the world via air travel. Greed, inequity, poor planning, and disrespect for human rights create the slums and tend to intensify the earth's natural forces.
- Those forces, ecological and biological, do not always behave predictably. Changes in ecosystems increase the likelihood of nonlinear changes (including accelerating, abrupt, and potentially irreversible changes), with important consequences for human well-being. Growing pressures from over-harvesting, climate change, invasive species, and nutrient loading push ecosystems toward thresholds that they might otherwise not encounter.
- Economic globalization forges ahead without concomitant investment in a global public health infrastructure. This is a formula for catastrophe.
- Large numbers of plant and animal species have been driven to extinction, and most marine fisheries are severely depleted. More than half the world's coral reefs are threatened by human activities. Loss of species and genetic diversity decreases the resilience of ecosystems (the level of disturbance that an ecosystem can undergo without crossing a threshold to a different structure or functioning).
- Positive carbon balance (net increase of carbon released into the atmosphere and oceans) has resulted in global climate change, greenhouse gas effects, and increased acidification of oceans threatening the marine food web.
- Anthropogenic nitrogen fixation from fertilizer production and use and fossil-fuel combustion exceeds all natural terrestrial processes combined. Nitrous oxides are greenhouse gas and ozone precursors. Nitrates contaminate ground and surface water and, along with phosphorous, cause eutrophication of marine and fresh-water systems, algal blooms, attendant health risks, and fish depletion.
- Over the past 50 years, there has been an accelerated release of artificial chemicals into the environment, many of which are long-lived and transformed into byproducts whose behaviors, synergies, and impacts are not well-known. Humans are at risk from inorganic and organic pollutants present in food and water.

Ironically, most but not all of the ecosystem damages were the direct or indirect result of attempts to meet demands for ecosystem services such as food, water, timber, fiber, and fuel. While it may be easy to conclude from this that these are basic human necessities and ecological decline is inevitable, it is important to remember that (1) there are choices among ways to satisfy these needs and (2) wants and needs are not the same.

Relevance to the healthcare sector in the United States

These findings are relevant to the healthcare industry for at least two reasons. First, human health trends in the United States are strongly influenced by these ecological changes, either directly or indirectly. Second, the healthcare industry substantively contributes to ecosystem degradation domestically and globally.

Asthma, neurodevelopmental disorders, some kinds of cancer, some birth defects, mental illness, obesity, diabetes, premature births, and newly emerging and some recurrent infectious diseases are all increasing in the United States and throughout much of the world (US Dept. of HHS 2005, NCI 2006). These trends result from direct and indirect impacts of multiple interacting factors acting within a broad conceptualization of a changing ecosocial environment. Alone or in various combinations, dietary inadequacies or excesses (e.g., micronutrient deficiency, excessive fat or carbohydrate intake, etc.); exposure to toxic chemicals and pollutants in air, water, or food; inadequate exercise; exposure to infectious agents; and social and economic deprivation contribute to these trends. People with these environmentally related disorders live, work, play, and go to school in our communities.

The United States spends far more per capita than any other country in the world on healthcare (Bureau of Labor Education 2001). Capital equipment, buildings, operations, material throughput, transportation, water and electricity demands, and pharmaceuticals contribute significantly to these growing expenses. A large and growing environmental footprint (Rees, Wackernagel, and Testemale 1996) of this medical industrial complex has direct and indirect impacts on human health domestically and globally. According to the US Department of Energy and US EPA Energy Star program, in 1999, medical facilities spent more than \$6.5 billion on energy (converted to 2004 dollars) (US EPA and US DOE 2006). The healthcare sector generates thousands of tons of waste each day—including toxic materials and chemicals—and still relies heavily on incineration to “treat” portions of the waste stream including pathological and chemotherapy waste. Tons of ordinary solid waste from healthcare facilities are also burned, resulting in toxic air emissions related to incineration (O’Brien 2005). Pharmaceutical products or byproducts are discarded or excreted into sewerage systems, contaminating surface waters throughout the United States (Kolpin et al. 2002).

Healthcare food-procurement practices support an industrial agricultural system heavily reliant on fossil fuels in food production and transport and petrochemical pesticide use. These practices directly contribute to air and water pollution, climate change, biodiversity loss, top-soil loss, eutrophication of surface waters, and adversely impact the social and economic fabric of rural communities (Tegtmeier and Duffy 2004). Moreover, this dominant agricultural system from which most healthcare systems obtain their food makes readily available a diet rich in calories but relatively poor in some nutrients, contributing to obesity, diabetes, and other adverse health outcomes treated in those same healthcare facilities (Nestle 2006; Davis, Epp, and Riordan 2004).

Despite ever-increasing expenditures, the health status of Americans is inferior to that of people in many other countries in the developed world. For example, a recent study concluded that, based on self-reported illnesses and biological markers of disease, late middle-aged US residents are much less healthy than their counterparts in Great Britain for diabetes, hypertension, heart disease, myocardial infarction, stroke, lung disease, and cancer (Banks et al. 2006). These differences exist at all points of socioeconomic status, despite the United States spending more than twice that of Great Britain per capita on medical care.

Today’s healthcare institutions: What is their mission? What do they do?

Most healthcare institutions in the United States say that their mission is to provide high-quality care and service to diagnose and treat human illness. Some mission statements also mention disease prevention. In practice, disease-prevention activities usually entail individual behavior modification (smoking cessation, weight control, exercise, etc.).

Disease prevention sometimes merges with early diagnosis through screening programs (hypertension detection, mammography, colonoscopy, etc). Early diagnosis and intervention can help to prevent complications of certain conditions, but secondary prevention differs from primary prevention of disease before it occurs. Prevention efforts in the healthcare sector focus largely on proximal contributors to dis-

ease that are closely connected to the specific pathophysiology in question and about which there is little uncertainty. Causal factors that are more distantly related to the biological manifestations of disease, factors whose mechanistic contributions to disease processes are not well-understood, or factors for which data are limited tend to be ignored or given limited attention in clinical medicine.

Here are some examples.

- In clinical medicine, asthma prevention usually focuses on avoiding exposures to well-established asthma triggers subject to individual control such as cigarette smoke or dust mites in the home. The healthcare sector, however, is often silent about more socially determined factors such as outdoor air pollution, engine or incinerator emission standards, housing quality, city planning and traffic flow, stress, or labor standards that influence occupational exposures to asthmagens over which individual employees may have little control. Even within healthcare institutions, efforts to remove asthma triggers or causal agents from indoor air are often initiated only after aggrieved staff or outside activists complain loudly rather than avoiding the culprits altogether by intentional upstream design (Massachusetts Nurse 2005).
- Some kinds of cancer (e.g., prostate, brain, pancreatic, lymphoma, leukemia) are repeatedly positively associated with pesticide exposure in epidemiologic studies, although details of individual susceptibility and mechanistic understanding are limited (Ontario College of Family Physicians 2004). Not only is this information largely unknown within the healthcare sector and rarely taught in medical or nursing schools, but also, even when known, uncommonly leads to policy recommendations without considerable pressure, usually applied by advocacy groups. A few healthcare facilities, sometimes prodded by activist nurses, have begun to adopt policies that reduce the need for pesticides and restrict their use. Beyond the facility, however, in the United States, it is highly unusual for healthcare professionals or institutions to weigh in on community-based initiatives intended to reduce local or regional pesticide use.
- Despite overwhelming evidence of the importance of diet and nutrition for human health, many healthcare facilities ignore obvious opportunities for modeling disease prevention by serving food to patients, staff, and visitors that is appealing, optimally nutritious, and produced in ecologically sustainable ways. Some hospitals even lease space to fast food restaurants selling food that contributes to diseases treated in that same institution. Moreover, the agricultural system supplying much hospital food employs practices that profoundly degrade ecosystems domestically and in other parts of the world (Tegtmeier and Duffy 2004).
- The importance of social class and economic status as determinants of health is undeniable. Disparities in health outcomes across social class are not fully explained by individual risk factors such as diet, smoking, and exercise. Rather, lower social class is independently related to poorer health (Marmot 2005). Similarly, stress is independently causally related to a variety of adverse health outcomes. Yet, the ways in which these variables impact the pathophysiology of disease are often insufficiently understood to attract the intentional intervention of clinicians or healthcare facilities on a community or societal level. The healthcare sector traditionally sees its role in preventing the social determinants of disease as limited or the responsibility of others.

Some institutional mission statements mention an obligation to contribute to the health of the surrounding community. This may be accomplished in various ways—perhaps by providing free care to indigent community members, free disease-screening opportunities from time to time, or supporting various community activities. By doing this, institutions acknowledge responsibilities beyond institutional walls and, in some ways, address traditional public health concerns. But most healthcare institutions do not intentionally focus significant resources on favorably influencing community determinants of health.

In short, to the extent that the healthcare sector addresses disease prevention at all, it tends to focus on prevention of well-established proximal causes, while largely ignoring what epidemiologist Geoffrey Rose (1992) called the “causes of causes” (see also Krieger 1999).

First and foremost, healthcare institutions are really disease-care institutions. They provide care for people who are ill or injured. Programs aimed at primary-disease prevention are limited. To a large extent, healthcare institutions ignore or give limited attention to the range of environmental factors that directly or indirectly influence the health of their clients. They may justify this based on a restricted notion of their role, believing that many of these issues are in the domain of public health or environmental protection and not medicine.

Recent attempts to re-examine the distribution of roles and responsibilities related to human health call for closer collaboration between medicine and public health and re-thinking professional and institutional boundaries (Lasker 1997, IOM 2003). The realities of the early twenty-first century suggest that ecological health should be explicitly added to this collaboration. What is the potential role and responsibility of healthcare systems to address a fuller range of causes of morbidity and mortality in the communities that they serve? Given the steady growth of already oversized health (disease) care expenditures, this question becomes increasingly relevant as healthcare institutions consider their missions and plans for the future.

What Is Health?

Some people think of health as the absence of disease. The World Health Organization says that health is a state of complete physical, mental, and social well-being and not merely the absence of disease. The Institute of Medicine (1988) says that public health is “what we as a society do collectively to assure *the conditions* in which people can be healthy” [emphasis added].

An ecologist might define health differently. Aldo Leopold (1949) concluded from his field work that health is the capacity for self-renewal. Essayist, farmer, and ecologist Wendell Berry (1995) says that health is membership. The word *health*, he said, comes from the same Indo-European root as *heal*, *whole*, and *holy*. To be healthy is to be whole. To heal is to make whole.

Berry went on to ask, “Can our present medical industry produce an adequate definition of health? My own guess is that it cannot do so. Like industrial agriculture, industrial medicine has depended increasingly on specialist methodology, mechanical technology, and chemicals; thus, its point of reference has become more and more its own technical prowess and less and less the health of creatures and habitats. I don't expect this problem to be solved in the universities, which have never addressed, much less solved, the problem of health in agriculture. And I don't expect it to be solved by the government.”

Given the steady growth of already oversized health (disease) care expenditures, this question becomes increasingly relevant as healthcare institutions consider their missions and plans for the future.

Ecological health: A new and necessary responsibility for medicine and public health

When viewed as separate domains, many relationships among individual, public, and environmental health are either unapparent or ignored. Viewed as nested spheres, however, one contained within the other, vivid patterns and relationships become clearer and demand attention. Individual health cannot truly be realized independent of public and environmental health. Similarly, public and environmental health depend to a large degree on the health of individuals. Artificial boundaries drawn among these concepts for professional, social, political, and economic reasons tend to obscure their intimate inter-relationships.

As we enter the twenty-first century, the healthcare sector would do well to ask once again: What is health? How is health dependent on the status of the community and ecological systems? What are our impacts, roles, and responsibilities in each of these domains? What would a *Flexner Report* for the twenty-first century say about the quality of medical education and the science that should inform medical practice? Without seriously considering these questions, we are unlikely to serve human communities and the planet well in the future.

Disciplinary isolation and specialization, along with sociopolitical and economic choices, have encouraged the

sprawling medical-industrial complex to focus narrowly within complex causal webs of disease. Public health practitioners emphasize the health of communities with a stronger emphasis on primary prevention through more systemic interventions. Medicine, nursing, and public health, however, do not give consistently coherent attention to the status of larger ecological systems in which people live. This needs to change. Instead of ignoring and, in many cases, actually facilitating the degradation of ecological systems on which human health depends, medical and public health practitioners have unrealized opportunities to transform their practices and embrace responsible, restorative membership in a larger planetary community.

As the healthcare sector plans for the twenty-first century, current circumstances, briefly summarized above, establish additional context for designing appropriate services, facilities, operations, and community involvement. In an ecosocial model of health and disease, based on the best available science, medicine and public health inescapably share membership with the planet's ecosystems upon which peoples' health depends. Much of clinical medicine in the United States is based on technologies that are unsustainable over time and cannot be transferred to other parts of the world because of economic and other resource constraints (Pierce and Jameton 2003). Although quality of care and financial considerations will always be important influences on healthcare policy, a strong case can also be made for including an expanded view of bioethics in decision-making.

Bioethics is often confused with medical ethics, but the two are really quite different, although overlapping. Medical ethics predominately address autonomy, beneficence, nonmaleficence, and distributive justice. The emphasis is on the individual rather than community, connection, and inter-relationships. Bioethics has a more expansive perspective. Humans are situated within larger complex ecological systems that also deserve moral consideration (Jameton 2005). Oncologist Van Rensselaer Potter from the University of Wisconsin introduced the term *bioethics* in 1970. He saw the concept as biology, combined with diverse humanistic knowledge, forging a science that sets a *system of medical and environmental priorities for acceptable survival* [emphasis added] (Potter 1988).

Potter was strongly influenced by ecologist Aldo Leopold and geneticist C.H. Waddington. For Leopold, land was a collective organism—not merely soil, but “a fountain of energy flowing through a circuit of soils, plants, and animals.” People, he said, are “plain members of the biotic community” (Leopold 1949). Leopold argued that a thing was right when it tends to preserve the integrity, stability, and beauty of the biotic community. It was wrong when it did otherwise. He said that ethics and beauty should play an important role in deciding how to live on the earth, and he developed a “land ethic.” In this ethic, health is maintenance of the capacity for self-renewal. Leopold thought that three things were necessary to protect and preserve the ecological systems on which all species depend. One is the formulation of mechanisms for protecting the public interest in private land. Another is the revival of land esthetics. The third is refinement of restorative practices. Out of these three forces, he thought, “may eventually emerge a land ethic more potent than the sum of the three, but *the breeding of ethics* is as yet beyond our powers. All science can do is to safeguard the environment in which *ethical mutations* might take place” [emphasis added] [Leopold 1949].

Geneticist C.H. Waddington thought that “what is demanded of each generation is a theory of ethics which is neither mere rationalization of existing prejudices, nor a philosophical discourse so abstract as to be irrelevant to *the practical problems with which mankind is faced at that time* [emphasis added] . . . We can, with perfect logical consistency, conceive of an aim or principle of policy which, while not in itself in its essence an ethical rule, would enable us to judge between different ethical rules. It is for such a principle that I am searching, and which I claim to be discoverable in the notion which I have referred to as ‘biological wisdom’” (Potter 1988).

Leopold, Potter, and Waddington were keenly aware that modern humans had existed on the earth for mere moments in the deep time of billions of years of other life forms. Biological wisdom, they knew, would be necessary to prolong our stay with meaningful quality. Potter said that any ethic for the human

Hippocratic Lessons

Contemporary physicians and healthcare institutions pay little attention to more general ecosystem health, even though in his famous treatise, “On Airs, Waters, and Places,” Hippocrates (400 BCE) saw the connections to medicine when he wrote

“Whoever wishes to investigate medicine properly, should proceed thus: in the first place to consider the seasons of the year, and what effects each of them produces for they are not at all alike, but differ much from themselves in regard to their changes. Then the winds, the hot and the cold, especially such as are common to all countries, and then such as are peculiar to each locality. We must also consider the qualities of the waters, for as they differ from one another in taste and weight, so also do they differ much in their qualities. In the same manner, when one comes into a city to which he is a stranger, he ought to consider its situation, how it lies as to the winds and the rising of the sun; for its influence is not the same whether it lies to the north or the south, to the rising or to the setting sun. These things one ought to consider most attentively, and concerning the waters which the inhabitants use, whether they be marshy and soft, or hard, and running from elevated and rocky situations, and then if saltish and unfit for cooking; and the ground, whether it be naked and deficient in water, or wooded and well watered, and whether it lies in a hollow, confined situation, or is elevated and cold; and the mode in which the inhabitants live, and what are their pursuits, whether they are fond of drinking and eating to excess, and given to indolence, or are fond of exercise and labor, and not given to excess in eating and drinking.

From these things he must proceed to investigate everything else. For if one knows all these things well, or at least the greater part of them, he cannot miss knowing, when he comes into a strange city, either the diseases peculiar to the place, or the particular nature of common diseases, so that he will not be in doubt as to the treatment of the diseases, or commit mistakes, as is likely to be the case provided one had not previously considered these matters.

species has to be based on the possibility of severely degraded quality of life—even human extinction—and that each of us has the capacity to figure out how we “ought” to live, to avoid the fate of most other species (Potter 1988).

In 1978, philosopher Hans Jonas noted that modern technology has introduced actions of such novel scale, objects, and consequences that the framework of former ethics can no longer contain them (Jonas 1984). Jonas argued that, since future generations will exist, the power of our technologies and our actions to reach far into time and space is sufficient to establish a moral responsibility to future generations. This is not, he pointed out, an assertion about the rights of future generations but rather a claim about our responsibilities to them.

Much human behavior suggests that we do not recognize responsibilities to future generations or even to current generations, particularly when they live some distance from us. We continue to draw down the earth’s natural capital, squander resources into scarcity, and contaminate ecosystems with untested chemicals and other industrial waste. We seem unable to recognize natural planetary limits and the need for restoration and regeneration of human life-support systems. The healthcare sector has both an opportunity and responsibility to address the ecological and bioethical dimensions of its own contributions to this trajectory as well as to influence the behavior of others.

Ecological health and disease prevention: Designing for the twenty-first century

Lee Jong-wook, who served as acting director-general of the World Health Organization from 2003 until his death in 2006, said in *Ecosystems and Human Well-Being: Health Synthesis. A Report of the Ecosystem Millennium Assessment*:

These more distant and complex links mean that we now need to look at environmental health through a broader lens. Health risks are no longer merely a result of localized exposures to "traditional" forms of pollution—although these still certainly exist. They are also a result of broader pressures on ecosystems, from depletion and degradation of freshwater resources, to the impacts of global climate change on natural disasters and agricultural production.

Like more traditional risks, the harmful effects of the degradation of ecosystem services are being borne disproportionately by the poor. However, unlike these more traditional hazards, the potential for unpleasant surprises, such as emergence and spread of new infectious diseases, is much greater. This report represents a call to the health sector, not only to cure the diseases that result from environmental degradation, but also to ensure that the benefits that the natural environment provides to human health and well-being are preserved for future generations [WHO 2005].

In its 2003 report on the future of the public's health in the twenty-first century, the Institute of Medicine argued for a more integrated public health system and said

The emphasis on an intersectoral public health system does not supercede the special duty of the governmental public health agencies but, rather, complements it with a call for the contributions of other sectors of society that have enormous power to influence health. A public health system would include the governmental public health agencies, *the healthcare delivery system*, and the public health and health sciences academia, sectors that are heavily engaged and more clearly identified with health activities. The committee has also identified communities and their many entities (e.g., schools, organizations, and religious congregations), *businesses*, employers, and the media as potential actors in the public health system. Businesses play important, often dual, roles in shaping population health. In the occupational setting, through environmental impacts, as members of communities, and as purveyors of products available for mass consumption, businesses may undermine health by polluting, spreading environmental toxicants, and producing or marketing products detrimental to health. However, businesses can and often do take steps to contribute to population health through efforts such as facilitating economic development and regional employment and workplace-specific contributions such as health promotion and the provision of healthcare benefits. The media is also featured because of its deeply influential role as a conduit for information and as a shaper of public opinion about health and related matters [emphasis added].

In planning for the twenty-first century, the healthcare sector—as institutions for healthcare delivery and as businesses—has opportunities to design their roles, services, buildings, and infrastructure intentionally within this integrated approach. The healthcare sector can be drivers of change, not only by modifying their own practices and activities, but also by helping other sectors to identify and ameliorate their contributions to impaired public environmental health and discover opportunities for positive change.

The design of the menu of services provided by healthcare institutions must logically precede the design of buildings to house them. Revisiting the nature of those services and how they are financed are certain to be at times controversial and subject to debate. Nevertheless, those services should be reviewed with full consideration of their appropriateness, the ecological context in which they are provided, their environmental impacts, and the demonstrable reality that health status in the United States is inferior to that in countries that spend far less on healthcare. Those services should also be reviewed through an expanded lens of bioethics that embraces the fundamental interconnections among individual, public, and environmental health.

Each institution, professional association, and healthcare-related business will need to address what it believes its roles and responsibilities are in disease prevention, preserving and restoring ecological services on which all life depends, and engaging with other sectors in a more integrated approach to improve public health. This will be an opportunity to decide whether to embrace the status quo or to begin to develop a new path into the twenty-first century based on current science and circumstances.

Examples of questions to consider

- What is health? What are the boundaries of the framework in which that question is considered? Why?
- How can we incorporate an expanded view of bioethics into all institutional activities?
- Some notable economists have argued that large increases in medical expenditures will serve as the engine to drive the economy and are not alarming since Americans are wealthy and need to spend their money on something (Kolata, 2006). What are the implications of this point of view for disease prevention and the environmental impacts of the healthcare sector?
- To what extent do we truly care about disease prevention? Do our activities aid or hinder disease prevention? For example, in hospitals offering weight-reduction surgery, are any steps also undertaken to address the underlying causes of obesity in the community?
- How do we encourage (or discourage) health promotion and disease prevention in individuals and in communities that we serve? In homes, schools, businesses? Are there new opportunities that we should explore? What can we do to promote community health restoration and resilience?
- Given their importance, how are we addressing the social determinants of health? How can we help to alleviate poverty and stress in our communities? What institutional services could we design into our programs to help do that?
- How are we supporting our local economy and doing what we can to keep money flowing through the local economy as long as possible?¹
- What is the size of our environmental footprint? How can it be reduced?
- How can we reduce our use of toxic chemicals and encourage improved chemical and materials production policies in the manufacturing sector?²
- How can we support and promote an agricultural system that provides nutritious food with reduced ecological impacts?³
- How can adverse public environmental health impacts of diagnostics and therapeutics be minimized (including pharmaceutical prescribing practices)?⁴
- As a way of integrating many of the environmental factors known to influence reproductive health and childhood development, how can we help to ensure that all babies born in this community are full term, of normal weight, and receive appropriate newborn, infant, and child services?

Building design, construction, and operations can be much more meaningfully addressed after questions like these and others are discussed in an open, transparent, and inclusive process. Twentieth-century answers will result in twentieth-century buildings. They may be more energy efficient, use less water, recycle more waste, and foster greater patient satisfaction than earlier versions but still not address fundamental ethical, economic, and ecological concerns.

These basic, underlying concerns will not go away by being ignored. Jane Lubchenco (1998), president of the American Association of the Advancement of Sciences, said, "As the magnitude of human impacts on the ecological systems of the planet becomes apparent, there is increased realization of the intimate connections between these systems and human health, the economy, social justice, and national security." She called for a new social contract for science that would more adequately address the problems of the coming century than does our current scientific enterprise. The contract, she said, "should be predicated upon the assumptions that scientists will (i) address the most urgent needs of society, in proportion to their importance; (ii) communicate their knowledge and understanding widely in order to inform decisions of individuals and institutions; and (iii) exercise good judgment, wisdom, and humility."

Eight years later, the need for a new social contract for science is even more apparent. The healthcare sector could make an important contribution to this effort by re-examining its social contract with society and asking whether twentieth-century assumptions, programs, and services are adequate and appropriate for the twenty-first century. Each healthcare institution, along with the community that it serves, would do well to engage in this kind of exercise early in the process of designing for the twenty-first century—informed by what we have learned and our best predictions of what lies ahead. Otherwise, we are at risk of designing for a past that no longer exists, and institutions and buildings designed for the twentieth century are unlikely to serve us or future generations well.

Author Biography

Ted Schettler, MD, MPH, is science director of the Science and Environmental Health Network. Schettler is co-author of *Generations at Risk: Reproductive Health and the Environment* and *In Harm's Way: Toxic Threats to Child Development*. He has published a number of articles in peer-reviewed journals and served on advisory committees of the US Environmental Protection Agency and National Academy of Sciences. He earned a medical degree from Case Western Reserve University and a master's in public health from Harvard University.

Notes

- ¹ See, for example, Business Alliance for Local Living Economies. [Web site; retrieved 7/31/06.] <http://livingeconomies.org/>.
- ² For example, Kaiser Permanente's Environmental Stewardship Council has approved a general policy seeking to identify and reduce or eliminate chemical hazards in products that the organization purchases for any purposes within the institution.
- ³ For example, Kaiser Permanente has made a systemwide commitment to improving the quality of food served to patients, staff, and visitors in its institutions, serving food produced with reduced use of pesticides, hormones, and antibiotics and supporting local agriculture through preferential purchasing and supplying space for farmers markets.
- ⁴ See, for example, http://www.janusinfo.se/imcms/servlet/GetDoc?meta_id=7236 [Online document; retrieved 7/31/06.] describing Swedish efforts to reduce the discharge of pharmaceuticals into the environment. At its 2006 annual meeting, the American Medical Association agreed to work with the US Environmental Protection Agency and pharmaceutical companies to develop guidelines for physicians and the public regarding the proper disposal of pharmaceuticals. It is also worth considering the extent to which disease prevention efforts would obviate some of the need for pharmaceuticals.

References

- ASPE Issue Brief. 2005. *Long Term Growth of Medical Expenditures—Public and Private*. Dept of Health and Human Services. [Online document; retrieved 9/6/06.] <http://aspe.hhs.gov/health/MedicalExpenditures/index.shtml>.
- Banks, J., M. Marmot, Z. Oldfield, and J. Smith. 2006. "Disease and Disadvantage in the United States and in England." *Journal of the American Medical Association* 295(17): 2037–45.
- Berry, W. 1995. "Health Is Membership." In: *Another Turn of the Crank*. 86-109, Washington, DC: Counterpoint.
- Bureau of Labor Education. 2001. *US Health Care System: Best in the World, or Just the Most Expensive?* University of Maine. [Online document; retrieved 9/6/06.] <http://dll.umaine.edu/ble/U.S.%20HCweb.pdf#search=%22health%20care%20expenses%20per%20capita%20comparison%20country%22>.
- Davis, D., M. Epp, H. Riordan. 2004. "Changes in USDA Food Composition Data for 43 Garden Crops, 1950 to 1999." *Journal of the American College of Nutrition* 23(6):669-82.
- Hippocrates. 400 BCE. "On Airs, Waters, and Places." [Online document; retrieved 7/27/06.] <http://classics.mit.edu/Hippocrates/airwatpl.2.2.html>.
- Institute of Medicine (IOM) National Academy of Sciences. 1988. "The Future of Public Health." [Online document; retrieved 9/6/06.] http://darwin.nap.edu/openbook.php?record_id=1091&page=R1.
- Institute of Medicine (IOM). National Academy of Sciences. 2003. "The Future of the Public's Health in the 21st Century." [Online document; retrieved 7/16/06.] http://darwin.nap.edu/openbook.php?record_id=10548&page=R1.
- Jameton, A. 2005. "Environmental Health Ethics." In *Environmental Health: From Global to Local*. Ed: Frumkin, H. San Francisco: Jossey-Bass.
- Jonas, H. 1984. *The Imperative of Responsibility: In Search of an Ethics for the Technological Age*. Chicago, IL: University of Chicago Press.
- Kolata, G. 2006. "Making Healthcare the Engine that Drives the Economy." *New York Times*, August 22.
- Kolpin, D., E. Furlong, M. Meyer, E. Thurman, S. Zaugg, L. Barber, and H. Buxton. 2002. "Pharmaceuticals, Hormones, and Other Organic Wastewater Contaminants in U.S. Streams. 1999-2000. A National Reconnaissance." *Environmental Science and Technology* 36(6): 1202–11.
- Krieger, N. 1999. "Sticky Webs, Hungry Spiders, Buzzing Flies, and Fractal Metaphors: On the Misleading Juxtaposition of 'Risk Factor' Versus 'Social' Epidemiology." *Journal of Epidemiology and Community Health* 53: 678-80.
- Lasker, R. 1997. "Medicine and Public Health: The Power of Collaboration." New York Academy of Medicine. [Online document; retrieved 7/15/06.] <http://www.cacsh.org/pdf/MPH.pdf>.
- Leopold, A. 1949. *A Sand County Almanac*. New York: Oxford University Press.
- Lubchenco, J. 1998. "Entering the Century of the Environment: A New Social Contract for Science." *Science* 279(5350): 491-7.
- Marmot, M. 2005. "Social Determinants of Health Inequalities." *Lancet* 365(9464): 1099-1104.
- Massachusetts Nurse. 2005. *New Study of Brigham RNs Shows Lasting Effects of Poor Indoor Air Quality*. [Online publication, retrieved 9/6/06.] http://www.massnurses.org/mass_nurse/PDFs/JanFeb05.pdf.
- National Cancer Institute (NCI). 2006. "Surveillance Epidemiology and End Results." National Institutes of Health. [Online document; retrieved 7/15/06.] <http://seer.cancer.gov/statistics/>.

- Nestle, M. 2006. "Food Marketing and Childhood Obesity—A Matter of Policy." *New England Journal of Medicine* 354(24): 2527-9.
- O'Brien, S. 2005. "Improving Health Care Waste Management." [Online document; accessed 7/13/06.] <http://www.h2e-online.org/docs/h2ewastemanagement11505.pdf>.
- Ontario College of Family Physicians. 2004. "Systematic Review of Pesticide Human Health Effects." [Online document; retrieved 7/13/06.] <http://www.ocfp.on.ca/local/files/Communications/Current%20Issues/Pesticides/Final%20Paper%2023APR2004.pdf>.
- Pierce, J., and A. Jameton. 2003. *The Ethics of Environmentally Responsible Health Care*. New York: Oxford University Press.
- Potter, V. R. 1988. *Global Bioethics*. East Lansing, MI: Michigan State University Press.
- Rees, W., M. Wackernagel, and P. Testemale. 1996. *Our Ecological Footprint: Reducing Human Impact on the Earth*. Gabriola Island, BC: New Society Publishers.
- Rose, G. 1992. *The Strategy of Preventive Medicine*. Oxford: Oxford University Press.
- Starr, P. 1982. *The Social Transformation of American Medicine*. New York: Basic Books.
- Tegtmeier, E., and M. Duffy. 2004. "External Costs of Agricultural Production in the United States." *International Journal of Agricultural Sustainability* 2(1): 1-20. [Online document, retrieved 9/6/06.] http://www.leopold.ias-tate.edu/pubs/staff/files/externalcosts_IJAS2004.pdf.
- United Nations Environment Program (UNEP). 2005. "Millennium Ecosystem Assessment." [Online document; retrieved 7/16/06.] <http://millenniumassessment.org/en/products.aspx>.
- US Department of Energy and US Environmental Protection Agency (US DOE and US EPA). 2006. "Energy Star for Healthcare." [Online document; retrieved 9/15/06.] http://www.energystar.gov/index.cfm?c=healthcare.bus_healthcare.
- US Department of Health and Human Services (US Dept. of HHS). 2005. "Health, United States, 2005. With Chartbook on Trends in the Health of Americans." [Online document; retrieved 7/15/06.] <http://www.cdc.gov/nchs/hs.htm>.
- World Health Organization (WHO). 2005. Ecosystems and Human Well-Being: Health Synthesis. [Online document; retrieved 9/6/06.] <http://www.millenniumassessment.org/en/Article.aspx?id=72>.