

Ecological Health, Public Health, and Societal Well-Being

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The history of medicine is punctuated by changing health risks driven by radical shifts in human ecology. Threats to health changed, for example, as humans developed agriculture and established permanent settlements. Contagious diseases jumped from domesticated pets and livestock to humans. Cities were both birthplaces of modern civilization and incubators of pestilence and disease. Inadequate sanitation, combined with crowded conditions in towns and cities, spread diseases more rapidly while expanding trade spread diseases over longer distances (Table 1).

Industrialization, especially rapid in the twentieth century, added new threats even as it reduced others. Most technologies were two-edged swords. Wonder drugs controlled common pathogens while natural selection strengthened the ability of those pathogens to resist the drugs. Reservoirs in the tropics made water supplies more reliable for humans, but also created ideal environments for human parasites. Industrialization exposed human society to a remarkable array of chemicals — natural (e.g., heavy metals) and synthetic (e.g., chlorinated hydrocarbons) — with diverse

health consequences (acute or chronic toxicity; carcinogens and teratogens; and immune suppressants and endocrine disruptors).

As each new challenge arises, medical practice must adapt, typically in a five-step process: (1) awareness that the problem exists; (2) understanding of its cause; (3) capability to control the cause; (4) sense of values that the problem matters; and (5) political will to conquer the threat. John Snow's meticulous study of the spread of cholera from wells in London in the 1840s is a classic example that eventually included all five steps. It provided the theoretical and empirical foundation for modern epidemiology and was instrumental in the eventual control of "filth diseases."

But past medical and public health advances should not make us overconfident. The activities of modern society continually present new dilemmas. New variants of old diseases continue to plague us (tuberculosis), as do newly emerged pathogens such as HIV, and the causes of Ebola fever, and mad-cow disease. From antibiotic resistance to rising exposure to endemic diseases at home (Lyme disease) and abroad (Lassa fever), classic diseases persist and even expand their range.

Furthermore, threats to public health are not constrained to bodily diseases. An increasingly important class of risks to individual health and societal well-being derives from declining ecological health, that is, the disruption of Earth's living systems. Depletion and degradation of the biosphere introduce health problems to human society that range from rising asthma rates to limited (or variable-quality) food supplies, global climate change, and stress diseases caused by overcrowding or the pace of modern life. Living systems are critical to maintain mental health and social stability. Failure to maintain ecological health increases human susceptibility to many diseases and increases the likelihood of crime and civil unrest, from burglary to murder, terrorism, and war.

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Table 1: Shifting array of health challenges faced by human society in the past 200,000 years

Years Before Present	Major Events	New Challenges
200,000	Modern humans appear	Combat and accidents Vector-borne infection Periodic famine
10,000	Towns and cities Agriculture	Nutritional deficiencies Contagious diseases Local ecological disruption
150	Industrial revolution	Chemical toxins
30	Modern affluence	Overnutrition Global ecological disruption

Modified from McMichael (1993).

The foundation of these health challenges is alteration of the supply of goods and services that human society draws from living systems. One recent study of so-called ecological services (e.g., soil formation, amelioration of climate, pollination) estimated the total annual economic benefits of biodiversity for the United States at \$319 billion. Another study estimated the current global economic value of 17 ecosystem services for 16 biomes at \$33,000 billion per year.

This new scourge — collectively declining ecological health — requires a new vision, one that no longer restricts health practices to treating symptoms. It also requires a changing view of what a “patient” is. Individuals and populations will always be patients, but the living systems of Earth, or the biosphere, must also be considered patients. Societal neglect or misunderstanding of this fact must be overcome. Until modern society and especially health practitioners become aware of the problem (step 1), we are unlikely to take the additional steps necessary to protect societal well-being.

Narrowly applying the methods of curative medicine to protect ecological health carries certain dangers. Instead of the typical emphasis on curing acute infections and traumatic conditions, it would be more appropriate to adopt a public health preventive approach — to protect and promote health. Too often modern medicine deals with problems after they arrive rather than preventing them. Snow’s lesson from the London cholera outbreak shows the merit of a preventive approach.

Another important lesson from medicine’s past is the need to anticipate unintended consequences, thereby averting iatrogenic, or doctor-caused, disease. Such diseases, inadvertently provoked by physicians or, more broadly, by modern medicine, may be clinical, social, or cultural. Anyone familiar with natural resource or environmental management is well aware of this sort of unintended consequence. Miracle “cures,” such as pesticides to control crop pests or hatchery fish to supplement overharvested wild salmon populations, have led to unexpected “illnesses” ranging from stronger pests to extinct fish.

Efforts to bridge the gap between human and ecological health require new cooperation and collaboration among members of the human health community (medicine, epidemi-

ology, public health) and the ecological health community (protection of life-support systems, pollution control). Improved communication with all citizens must be a central goal of that collaboration.

The success of public health in the twenty-first century depends on a movement that strengthens public health systems and understands that human health is a subset of a broader ecological health. Absence of disease in individuals is good, but overall public health is better. Both depend on ecological health. In short, a healthy biosphere is a prerequisite for healthy humans and for societal well-being.

Recommended Reading

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