



Transitions in human health: surviving this millennium by learning from the past one hundred millennia

We have been living through several decades of great and rapid changes in the human condition. Life expectancies increased markedly during the twentieth century; populations are becoming 'older'; disease profiles are changing. The world is connecting up economically and electronically, market forces have become increasingly dominant, the post-Cold War political landscape has been transformed, cities are expanding rapidly, and material wealth is accruing – albeit unevenly. Meanwhile, however, a range of large-scale environmental changes is occurring, of which the most apparent is global climate change. This reflects a more fundamental process: the biosphere and its life-support systems are straining under the weight of human numbers, intensified food production, escalating carbon-based energy use and the spread of mass consumption behaviours.

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The long history of the human species shows that the succession of great changes in human ecology, along with dispersal into diverse environments, has repeatedly reshaped the profile of human survival, disease and societal sustainability. Today is therefore a time to examine the prospects for humankind as the two million-year-old career of *Homo sapiens* accelerates into a new millennium. In particular, we will need to gain insights into the fundamental dependence of human populations on the goods and service of nature – that is, into the ecological framework within which human biology has evolved and human society operates – if we are to make wise, sustainable decisions about how to manage, and survive in, our future world.

That 'ecological perspective' on human wellbeing, health and survival is now being illuminated by a surge of new research into our species' long and colourful past. The fossil trail has yielded new insights into human origins. The advent of molecular biology has revealed our forebears' genetic tracks across and between continents and the complex intermixing of human populations. We are gaining new insights into the sources of variations in both human biology and culture in response to environmental pressures. Meanwhile, we can

see more clearly the basic oneness of humankind as we elucidate the recent origins of our species and the shared ancestry and genetic closeness of the world's human populations. (There is around five times more genetic variation within the chimpanzee species as within the human species.) Today, we may be apprehensive about globalisation – but there was a time, a short 100,000 years ago when all members of our species cohabited in eastern Africa. In the intervening period, human groups diverged hugely, occupied all non-polar continents, developed locally-attuned cultures, acquired local infectious agents, and (until the last several millennia) were generally unaware of the many other branches of their family that lived beyond distant horizons.

Over the past several decades, we have been learning fast, in response to environmental signals of systemic overload, about the workings of Earth and its ecosystems. Scientists and policy-makers are using, albeit still rather tentatively, the somewhat novel language of 'sustainability'. This is because we sense that, for our generation and its successors, there are really big things at stake. The optimists among us also see new 'post-genome' possibilities – at least in the ideal situation

where technologies are directed at social benefit – for better management of the natural environment and for less environmentally damaging methods of food production. We are giving greater weight to consideration of the potential impacts of environmental changes on human population health within the policy-making discourse. This reflects an emerging awareness that human health and wellbeing are, in the longer term, underwritten by environmental sustainability.

That awareness derives in part from new insights into our ancestors' experiences. During the restless life-course of the human species, changes in patterns of disease and survival have reflected the interface between human populations and their ever-changing environment. Those environmental changes arose, first, because of the dispersal of human populations around the world from precarious origins in the wooded savannas of Africa; then change occurred because of escalating human interventions in the environment via farming, animal husbandry, urbanisation, imperialism, trading and industrialisation. Reflecting these great changes in human ecology, disease patterns have changed over the millennia: various infectious diseases have come and gone; and nutritional deficiencies have varied in type and intensity. Throughout much of this time, the profiles of disease, especially infectious disease, have differed between regions, populations and subgroups. Within the past century, a gradual convergence of ways of living and, consequently, of profiles of disease has emerged. Life expectancies have increased around the world, and the survival gaps between rich and poor have lessened – although they still remain substantial.

The great historical scourges of population health have been infectious disease, malnutrition and starvation, warfare, and natural disasters – well characterised by the Bible's apochryphal Four Horsemen of the Apocalypse. Malnutrition stunted the peasant classes in neolithic villages; the ancient Egyptians died from tuberculosis; rat-borne plague decimated the late Roman Empire; and the Spaniards conquered the Aztecs and Incas by inadvertently introducing fatal infections. In the twentieth century, heart attacks rose and then decline in western societies, while the frightful pandemic of HIV/AIDS engulfed much of the world, but especially high-vulnerability populations in sub-Saharan Africa.

These fluctuations in types and rates of disease signify more than historical anecdote. After all, good health is more than a personal attribute, attainable by prudent behaviour, visits to the doctor, and avoidance of environmental hazards. The health profile

of a population is a fundamental index of how well matched the environmental circumstances are to the population's biological and psychological needs. In the longer term, then, the maintenance of good health is an index of the sustainability of the natural and social environments.

In modern large cities, we live at several removes from the interface with the natural world and we may therefore have a misplaced faith in the capacity of our wealth and technology to maintain health by preventing and treating disease. Yet, as the 'ecological footprints' of modern populations grow larger, around the world, and as evidence mounts that we are now causing unprecedented changes in the global environment – the lower and middle atmosphere, the fertility of soils, the supplies of freshwater, the productivity of the oceans, the spread of invasive species, the stocks of biodiversity and the vitality of ecosystems – so we cast lengthening shadows over the health prospects of future human populations everywhere.

We are thus beginning to see that if 'sustainability' is important as a general social goal, it is especially important because we cannot survive as healthy and happy human populations unless we maintain the underpinnings of life on earth. Successful economies, access to natural amenities, the ethic of conservation, and the aesthetics of the wondrously varied world around us are important. But none of those can remain important, to humans, if we cannot first be sure of sustaining our population health and viability. In that very basic sense, then, population health is a prime index of how well we are managing our natural and social environments. It is an *ecological* index.

These ideas are a condensation of the material and arguments contained in Tony McMichael's newly-published book: "Human Frontiers, Environments and Disease: Past Patterns, Uncertain Futures." Cambridge University Press, 2001, 424 pp. (paperback and hardback).

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