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SUSTAINABLE Healthcare

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Preface

Should people working in the health sector be interested in sustainability? The answer, we think, is a resounding ‘yes’. We, an authorial team comprising a primary care clinician (KS), a medical teacher (TT), a public health specialist (DP) and a science educationalist (KF), have been exploring the interface between medicine and sustainability for many years. In that time, general public interest in this area has increased a lot, but within the health sector it has received relatively little attention. We have written this book as a synthesis of a growing, but disparate, body of expert knowledge, and also with the hope of bringing sustainability to its rightful place at the centre stage of healthcare policy and practice.

The earth system is a wonderful yet ultimately vulnerable thing. It provides us with endless benefits upon which we are entirely dependent and which we can easily come to take for granted. These ‘ecosystems services’ include fresh water, clean air, fertile soils, carbon-based and renewable energy sources and a stable and relatively predictable climate. Less tangibly, we draw spiritual sustenance from nature in all its beauty and diversity. The science is now unequivocal—this planetary system is under stress due to human activity. We unpack these stresses, such as climate change and the loss of biodiversity, and consider the various consequences for human health and the healthcare system—a system that itself struggles to contain costs, deal with the soaring prevalence of chronic illness and bring humanity to technological care.

This book describes a new paradigm to tackle these pressing predicaments—a collection of ideas and perspectives (mostly developed by others, but some of our

own) that fall, however untidily, under the banner of *sustainable healthcare*. This brings to the foreground the prevention of disease and the creation of individual and community resilience. It champions lean systems of clinical care that maximise efficiency and common humanity and minimise resource use and the creation of waste products (including greenhouse gases and toxic pollutants). A consistent and heartening observation is that many interventions that improve individual health (such as fresh, local and mainly plant-based food) are also good for the health of the planetary system—creating what are termed 'virtuous cycles'.

We have written for a readership busy with the myriad tasks of delivering care. We have tried to keep the book concise and balance 'need to know' with 'useful to know' information. We have read and appraised much of the science so you don't have to, and tried to draw balanced conclusions in a field where there is considerable uncertainty. At times we have applied the *precautionary principle*—advocating action where the price of inaction seems incalculable. We cut through some of the jargon and challenge the rhetoric of both fear and denial, which often pervades the topic. And we focus on the essential questions, offering a synopsis of the main issues which we support with key references and links to sources of further information. In short, this is a book of first resort.

We write with a wide readership in mind including health professionals, educationalists, health service managers and healthcare students for whom it might provide an outline curriculum in sustainable healthcare. We hope this is a positive book that inspires reflection, engagement and—crucially—action. We think that there are smarter, safer, fairer and more sustainable ways of doing things in the health sector, which are well worth the effort for the benefit of current and future generations. Who would have

thought even 10 years ago that in many countries smoking would be banned in public places? A similar shift in public policy and human behaviour, involving innovative technology and better models of care, needs to happen to develop health systems that can sustain us through the challenging decades ahead.

For feedback, comments and suggestions for improvements please email k.schroeder@bristol.ac.uk.

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About the Authors

Knut Schroeder works part-time as a Family Physician and is Honorary Senior Clinical Lecturer at the Centre for Academic Primary Care in the University of Bristol, UK. He had never really considered the link between climate change and health until he attended a conference on '*Climate Change and its Impact on Health*' in 2008, hosted by the Royal College of Physicians. This instilled a growing interest in the relationship between health and sustainability and prompted the idea for writing this book. Knut is a Board Member of the UK *Self Care Forum*, which aims to support people in making better (as well as more sustainable) choices about their health. He also works with the *NHS Institute for Innovation and Improvement* to help family practices work more efficiently and more sustainably. Knut enjoys spending time with his young family. Whenever work and family commitments allow, he is out and about running or cycling, or writes about topics that he feels passionate about.

Trevor Thompson is a Family Physician at the Wellspring Healthy Living Centre in Bristol, UK, which supports a diverse inner-city population with a range of community-based and medical services. He is also a senior teacher at the University of Bristol Medical School with responsibilities across the curriculum. Trevor has been reading on the theme of sustainability for many years and since 2006 has run an undergraduate course on the '*Global Environment and Human Health*'. Teaching is often the best way to learn and his writing here draws extensively on his educational practice which seeks to engage both hearts and minds. Trevor is clinical co-lead for the *Sustainable Healthcare Education Network*, supporting green

educational initiatives across the UK. He is an active cyclist, sailor and grower.

Kathleen Frith is a creative, visionary leader working for a smarter, more sustainable world and President of Glynwood, one of the United States' leading sustainable agriculture and food organisations. With a deep passion for the natural world, Kathleen studied marine biology and received a Master's degree in Science Journalism from Boston University. In 2001, she was recruited to Harvard by the *Center for Health and the Global Environment* at Harvard Medical School, where she helped shape the Center's programmes to educate and inform people about the links between human health, the ocean, food systems and the environment, serving as the organisation's Managing Director during the last two years of her tenure. In 2009, Kathleen produced the award-winning film *Once Upon a Tide*, a live action and animated educational short that screens around the world. In 2010, Kathleen started the *Harvard Community Garden*, Harvard University's first garden dedicated solely to the production of food. Other initiatives while at the Center included the creation of the Center's *Healthy Oceans, Healthy HumansProgram*, the launch of Center's *Healthy and Sustainable Food Program* and work with National Geographic to help restore a healthy, sustainable seafood resource. Kathleen has produced a number of award-winning reports and publications and serves as an advisor for a number of environmental and community organisations.

David Pencheon is a UK-trained public health doctor and is currently Director of the National Health Service's *Sustainable Development Unit* for England. David was previously Director of a Public Health Observatory in Cambridge, England. He has worked as a clinical doctor in the NHS, a joint Director of Public Health, a Public Health Training Programme Director in the East of England, with

the NHS R&D programme, and lived in China in the early 1990s contributing to the work of Save the Children Fund (UK). His main interests and areas of research and publication are: sustainable development, large scale transformational change, health and climate change, underpinning action and policy with good information and evidence, training and professional development, organisational development, medical informatics and decision support for health professionals, carers and the public. He blogs mainly via the BMJ website. He was awarded an OBE in the New Year's Honours List 2012 for services to public health and the NHS.

Chapter 1
Greening the gaze

Health professionals have a lot on their minds: caring for patients, managing teams, keeping up to date with clinical developments and responding to broader agendas of quality and cost containment. This book offers up a quietly revolutionary invitation to rethink this enterprise by considering medicine in its rightful place within a much bigger planetary system. Here, we call this new way of thinking *sustainable healthcare* and believe it can help us deliver services of better quality, at lower costs and with less impact on the systems that sustain us. To this point in time the health sector has taken planetary health for granted, but now a body of evidence shows an earth system under stress. Half the rainforest is gone, extinction rates are soaring, the oceans are increasingly acidic and the planet is running a fever one degree above pre-industrial levels. We are just starting to realise how these planetary ailments impact on human health, with climate change famously described in the *Lancet* as ‘the biggest global health threat of the 21st century’ [1]. Though many health professionals are alive to these global issues, in the health professions, as in society at large, sustainability competes with many other pressing and more proximate concerns. Thus, there is a danger that we are collectively sleepwalking into a public health catastrophe. This book offers a new synthesis of sustainability and health, leading in later chapters to many ideas for practical action. Firstly, though, we want to explain why we need a revolution in our health systems, why nothing short of a revolution is going to be enough and what sort of a revolution we are talking

about. Luckily it is a revolution from which we all stand to benefit.

The revolutionary road

Nineteenth century medicine witnessed the emergence of *germ theory*, which revolutionised our understanding of infectious disease. This new theory dispatched the then prevalent *miasmatic* paradigm, which held that disease arose from bad air. In the twentieth century, classical mechanics was revolutionised by quantum theory, in which, for instance, matter could be both particulate and wave-like. Such paradigmatic revolution requires two conditions. Firstly, there needs to be a build-up of *anomalies*, difficulties that cannot be solved by the dominant paradigm and which call its completeness into question. Secondly, a new paradigm must be waiting in the wings that accounts for the problems of the day and offers some hope of resolving them. We argue that the time for such a paradigmatic revolution in medicine is upon us. Biomedicine, despite its huge successes, cannot, of itself, provide solutions to the long term health needs of humanity. So, what are these anomalies and predicaments that are great enough to signal the need for a revolutionary new approach?

The verge of collapse

Readers in New York or Glasgow or Sydney may be forgiven for thinking that it is business as usual in healthcare. People value medical care and hold healthcare professionals in high esteem, with the enterprise enjoying enduring governmental support. There are plenty of patients, plenty of things to do to help them and a reasonable amount of money available to pay for it all. In

many ways, then, these readers are right. It takes a lot of imagination to think beyond our immediate circumstances, to think globally and think in terms of our common and distant future. Because while, as we shall see, there are challenges facing us right now, there are more and greater challenges ahead. The greatest would be the collapse of civil society through some sort of man-made environmental calamity, as in science fiction movies like *The Day After Tomorrow*. This possibility feels remote. It probably also felt remote to the many societies which have experienced such collapses in recorded history [2]. Take for instance the fate of the Easter Islands communities. These remote islands were first spotted on Easter Day 1722 by the Dutch explorer Jacob Roggeveen. He encountered a small population, with small and leaky canoes, living on an island devoid of trees, but sporting 300 stone platforms and 887 giant, long-eared, and intently gazing, stone statues. How, thought Roggeveen, did these Polynesians voyage in such vessels from their nearest neighbour, Pitcairn, 1300 miles away, and erect such monuments without rope and wood? Paleobotanical research has demonstrated that the islands were originally thickly wooded with a huge and now extinct species of palm. So what happened? We know that from around AD 900 settlers arrived and used trees for firewood, cremation, sea-worthy canoes and timber for shifting statues. They also cleared woodland to create fields to feed their workforce and a population of around 15 000. We know that by AD 1600 this complex tribal society had all but collapsed. All native land birds and mammals were extinct, all the trees gone and the stone quarries abandoned. The priestly caste was replaced by militia and the islanders turned to cannibalism. Of course, some people *survived* but by most reckonings in a much impoverished culture. Captain Cook visited the islands in 1774 and described the inhabitants as ‘small, lean, timid and miserable’. The Easter Island story concerns a tiny

geographical locale. But today we face the collapse of a planetary system that will affect us all.

Living within boundaries

When we look back on the Easter Islanders cutting down their trees and subverting their culture, we feel incredulous that people could be so short-sighted. But how will future generations look back on us? Will ours be branded the *Age of Stupid* [3]? Collapsing cultures consistently fail to play by the rules—rules that contemporary science is starting to name and understand. In 2009, the journal *Nature* published a feature based on the work of the *Stockholm Environment Institute* on *planetary boundaries* [4]. In a number of distinct domains, these boundaries define the estimated limits of what we can do without causing serious adverse changes to the planetary system (Table 1.1). The Institute proposes, for instance, a boundary for the loss of biodiversity of 'ten species lost to life per million species per year' and a boundary of 15% of global land cover converted to cropland (the current figure is 11.7%).

Table 1.1 Domains of actions to avoid serious adverse changes to the planet. (Reprinted by permission from Macmillan Publishers Ltd: Rockstrom J., Steffen W., Noone K., Persson A., Chapin F.S., Lambin E.F., *et al*. A safe operating space for humanity. Nature. 2009;461(7263):472–5. Copyright © 2009).

Planetary Boundaries

Earth system process	Parameters	Proposed boundary	Current value	Pre-industrial value
Climate change	Atmospheric carbon dioxide concentration (parts per million by volume)	350	387	280
Rate of biodiversity loss	Extinction rate (number of species per million species a year)	10	>100	0.1–1
Nitrogen cycle	Amount of N_2 removed from the atmosphere for human use (millions of tons per year)	35	121	0
Phosphorus cycle	Quantity of P flowing into oceans (millions of tons per year)	11	8.5–9.5	–1
Stratospheric ozone depletion	Concentration of ozone (Dobson unit)	276	283	290
Ocean acidification	Global mean saturation of aragonite in surface sea water	2.75	2.90	3.44
Global freshwater use	Consumption of freshwater by humans (km^3 per year)	4000	2600	415
Change in land use	Percentage of global land cover converted into cropland	15	11.7	Low
Atmospheric aerosol loading	Overall particulate concentration in the atmosphere on a regional basis		To be determined	
Chemical pollution	For example, amount emitted to or concentrations of persistent organic pollutants, plastics, endocrine disrupters, heavy metals and nuclear waste in the global environment, or the effects on ecosystem and functioning of Earth system thereof.		To be determined	

If we can keep within these boundaries, say the authors, we have a chance of maintaining the favourable earthly conditions of the *Holocene*. The Holocene is a geological epoch, beginning about 12 000 years ago, characterised by a stable interglacial climate. Geologists now speak informally of the *Anthropocene*, a new period which marks the time from which we can observe the impact of humanity on the global system: its oceans, soils, atmosphere, climate and biosphere (Chapter 2). The bottom line is not comforting. We are, through our activities, already approaching or surpassing all of the planetary boundaries cited by the Stockholm Institute. For instance, the authors of the article in *Nature* give a threshold of 350 parts per million (ppm) of atmospheric carbon dioxide to contain global warming at less than two degrees above pre-industrial levels. Yet, in February 2012, the official figure from Hawaii's Mauna Loa observatory put the figure at 394 ppm [5]. So even though it may seem business as usual in healthcare in the richer world, the system as a whole faces a number of serious challenges that fundamentally threaten its operation.

Five contemporary predicaments

In this section we take a wider look at the general human situation through the lens of five contemporary predicaments. These are predicaments we are unlikely to sort out with the same style of thinking that helped to create them, but which are explicable and potentially solvable from a sustainability perspective (Figure 1.1).

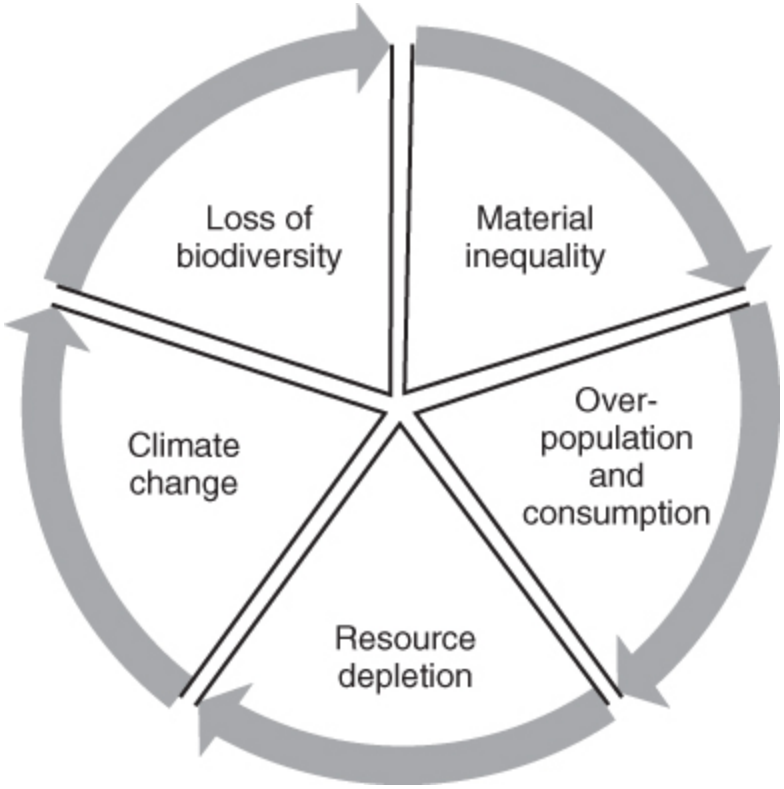

Figure 1.1 Five contemporary predicaments.

Material inequality

Although the diversity of the human situation means that inequalities in material wealth are inevitable, the *degree* of inequality within humanity is anomalous. More than a billion people currently live in what the World Bank defines as *extreme* poverty with an income of less than US$ 1.25 (£0.79) per day. Nearly half of the world's population lives on less than US$ 2 (£1.30) per day [6]. These income levels

are not sufficient to meet basic human needs and are not remotely enough to support any advanced medical interventions in settings where people have to pay for services. For instance, a child developing insulin-dependent diabetes in an impoverished rural area may not receive insulin therapy because the cost would be beyond the means of the child's family (Case study 1.1).

Case study 1.1 The fate of a child with diabetes in rural India

An eight-year-old girl called Sudha was admitted with DKA (diabetic ketoacidosis) soon after her diagnosis with Type 1 diabetes. On discharge, I explained to her parents the importance of insulin for survival. Sudha's poor and illiterate parents were very attentive. Finally her father asked:

‘Doctor, if I understand you correctly, does Sudha have to take insulin injections every day for rest of life?’

‘Yes.’

‘What would happen if she stopped taking insulin?’

‘Well, she would slip into coma and if left unattended, would die.’

Three months later Sudha had died. Her father had quite intentionally stopped giving her insulin. To the outsider he appears inhuman, cruel and criminal. But for him, the choice was between the starvation of his other children *versus* treatment of a diabetic child.

The average annual family income in India is Rs 50 000(£750/US$ 1185). The cost per annum for insulin and syringes alone is Rs 15 000 (£200/US$ 316). If blood glucose monitoring is included the cost is doubled.

With no health insurance cover, poor families find it difficult to commit over a quarter of their monthly income to the treatment of a diabetic child. The logic of poverty overpowers the logic of life.

Quoted, with permission, from a letter to one of the authors from Dr Sharad Pendsey, Consultant Diabetologist, Director, Diabetes Clinic and

Research Centre, Nagpur, India and Managing Trustee, Dream Trust (www.dreamtrust.org).

In contrast, the world's wealthy are getting wealthier (as admittedly are the world's poor). The *United Nations University's* survey of the *World Distribution of Household Wealth* documents the divide with stark statistics [7]. In 2000, the richest 1% of the world adult population owned 40% of global assets, while the poorest half owned only 1%. Income correlates with success in all of the *United Nations' Millennium Development Goals*, including child health, universal education and putting an end to hunger [8]. The reasons for these differences in material wealth are complex and go far beyond the scope of this book. But although differences are material, the solutions may not be. This degree of material inequality indicates a profoundly dysfunctional global system. The United Nations, for instance, estimated in 1998 that the millennium goal of basic education for all could be attained by an additional global investment of US$ 6 billion (£3.8 billion). In that same year people living in the USA spent US$ 8 billion (£5 billion) on cosmetics, the people of Europe US$ 11 billion (£6.9 billion) on ice cream and the world community US$ 780 billion (£492 billion) on the military [9].

Population and consumption

In October 2011, the world population reached seven billion from a pre-industrial baseline of one billion, and the US Census Bureau estimates that the population will rise to nine billion by 2040 [10]. This growth equates to creating a new city of a million people every five days from now to 2050 [11]. One reason for this growth has been the *Green Revolution* (Chapter 6), which has been fuelled by new, energy-intensive ways of making nitrogenous fertilisers and the development of new disease and drought-resistant strains of grain [12]. An estimated 50% of people today

depend for their calories on food grown using such artificial fertilisers. More people require more food, space, water and energy. Because some people consume much more than others, there is a good argument that the chief metric should be not population numbers *per se* but the *per capita* impact of each person on the earth's resources. The richest billion people on the planet consume, on average, 32 times as much as the remaining six billion [13]. The signs are that people in poorer countries now aspire to the sorts of lifestyles adopted in richer countries. Hence, any global transition to the western lifestyle will have a much greater impact than would be implied by population growth alone. Take, for example, an increasing appetite for meat in China and India (Chapter 6 gives an exposition of the environmental impact of animal protein). Rising consumption is, therefore, a greater threat than rising population. Fuelling such consumption is the rising tide of economic migration from poorer to richer economies, a tide that will certainly run stronger as climate change has its differential effects on the poorer world. This predicament lies in uneasy paradox with our first problem of inequality. We need the rich to consume less and the earth's poorer citizens to draw more on resources than they do already (these twin concepts of *contraction* and *convergence* are explored further in Chapter 3). An advantage of convergence is that family size tends to reduce as communities emerge from the extremes of poverty, easing population pressures [14].

Resource depletion

The resources of the earth, such as fossil fuels, are limited and even the energy we can extract each year from the sun is finite. In 2005, analysts reported that we had consumed half of all the earth's extractable reserves of conventional oil and gas [15]. They warned that remaining reserves

would be more costly and more risky to exploit, as we saw for instance with the Deepwater Horizon disaster of 2010, in which an explosion led to oil gushing unchecked from the seabed and the biggest spill in United States' history [16]. This *peak oil* narrative holds true for conventional oils and gases, though the picture has become complicated because of the recent emergence of alternative hydrocarbon sources and extraction methods, such as shale oil and hydraulic fracturing. At current levels of consumption, supplies of conventional fuels are likely to be depleted by the end of the century, with much uncertainty over how alternative fuels, nuclear power and renewables will fill this energy void [15]. Experts predict substantive changes in the world economy as a result, including in the health sector [17]. If the supply of fossil fuels diminishes and prices rise, this will have severe implications for the delivery of healthcare, yet there is scant evidence that we are prepared for this transition. Imagine, for instance, running hospitals using 50% less energy than at present. Although such a situation might be desirable from a sustainability perspective, it would herald some fundamental changes in the way we realise our hospitals—changes that we need to start planning for now. The picture is set to be clarified in the next decade as the potential of alternative sources of hydrocarbons is established, though these will only worsen the problem of carbon emissions.

Water scarcity may turn out to be a bigger threat to global security than diminishing fossil fuels. Rivers such as the Rio Grande, the Nile, the Indus and China's Yellow River struggle to reach the sea throughout the year. We are taking water from rivers, lakes and aquifers faster than it can be replaced by the hydrological cycle [18]. Hydraulic ‘fracking’ for shale oil, our best hope for obtaining fossil fuels as conventional oil supplies decline, is an intensely thirsty process, pumping millions of gallons of water deep

underground. Since fracking also forces chemicals underground, it has the potential not only to deplete but also contaminate supplies. The *UN Food and Agriculture Organisation (FAO)* estimates that 1.8 billion people will experience water scarcity by 2025. City communities such as La Paz in Bolivia, which draw their summer supplies from glacial melt water, are particularly vulnerable as glaciers recede due to global warming. Other resources in danger of depletion include rare earth metals such as neodymium (which makes the powerful magnets used in wind turbines), phosphates used in fertiliser production and uranium for nuclear fission. Like the Easter Islanders we are set to run short of the raw materials that underpin the processes of our civilisation.

Climate change

In October 2011, an independent and previously sceptical team of climatologists from Berkeley, California, confirmed findings from other centres that the average surface temperature of the earth has risen by one degree since 1950s [19]. This observation persists after adjusting for the possible confounding effects of *urban heat islands*, which are metropolitan areas that are considerably warmer than their surrounding rural areas. We know that the cause of this warming is mainly carbon dioxide from the burning of fossil fuels and that no other mechanism could account for the rapidity of the change (Chapter 2). The earth's poles are particularly sensitive. According to data from the *US National Centre for Atmospheric Research*, the extent of arctic sea ice has declined by 30% since 1979 [20]. With the melting of continental ice in Antarctica and Greenland comes the possibility of rising sea levels and the inundation of coastal communities. If evidence of current global warming is incontrovertible, it is much less certain how global warming will proceed as the century unfolds. We

also do not know whether change will remain gradual or hit a tipping point as the earth system flips into a new and hotter state. The potential impacts of climate change on human health are huge and mediated particularly by loss of food security, through flood and drought, direct effects of extreme weather, expanding habitat for disease vectors such as malaria and the inevitable health consequences of mass migration from stricken areas [1]. Because of these pressing effects on health the whole of Chapter 2 is devoted to understanding the science of climate change and its impacts.

Loss of biodiversity

Perhaps we can rescue the climate, but once a species is extinct there is no going back. The current rate of extinction is thought to be between 100 and 1000 times the estimated background extinction rate (there are difficulties knowing for certain of the extinction of creatures such as ants at large in the Amazon basin). Many organisms are already ‘functionally extinct’ because they exist in numbers too small to have noticeable presence within their local ecosystems. Iconic examples include the Yangtze River Dolphin and the Iberian Lynx. The sociobiologist E.O. Wilson estimated in 2002 that, at current rates, one-half of all species on earth would be extinct in 100 years [21]. People seem remarkably unaware of the scale of what is happening—the greatest extinction event since the one 65 million years ago, when the dinosaurs and half of life on earth were wiped out by a meteorite or volcanic upheaval, or both. In our times a quarter of mammals, a third of those vulnerable amphibians, a quarter of corals and a quarter of freshwater fish are threatened [22]. Humanity has a long history of causing extinction of large mammals through direct predation; this still accounts for why so many species of fish and other cetaceans (marine mammals) are

endangered. On land the mechanism of contemporary extinction has more to do with the depletion of habitats, as marshes are drained and forests cleared. Around half of the original six million square miles of tropical forest present in 1947 has now been destroyed. Current projections suggest that by 2030 we will be left with just 10% of the original coverage [23]. In specific pockets, such as Haiti, the tropical canopy is almost completely gone.

The impacts of such losses are incalculable and it takes particular imagination to grasp the impact of all this on human health. There is, for instance, the loss of plants and animals which might have turned out to have been of direct medicinal use. In his book *The Future of Life*, E.O. Wilson relates an anecdote in which a Bornean tree is discovered to yield a medicine active against HIV [21]. On returning to the remote swamp from where they gathered their sample, collectors found the tree had been felled and no more could be found. Luckily a specimen showed up in the Singapore Botanic Garden. What is harder to appreciate is how by removing species we 'damage ecosystems, collapse food webs and ultimately undermine the planetary life-support system on which our species depends' [24]. This is why we study systems in more depth in Chapter 3.

Crises in healthcare

So far we have defined five predicaments that confront us: inequalities, over-population with rising consumption, resource depletion, climate change and loss of biodiversity. We could add more, such as soil erosion, oceanic acidification and armed conflict. These predicaments are, of course, intimately interwoven. For example, fossil fuels have fuelled the development that stimulates population growth, which impacts on land use and, hence, biodiversity. We cannot solve these predicaments by simply doing more

of what we are doing already. The threat to our lifestyle is our lifestyle. For instance, we will not be able to address the issues of material inequality by striving to bring the consumption levels of everyone up to the level of those in the wealthiest countries, as we are already exceeding the carrying capacity of the planet. These big picture predicaments are often removed from the daily work of healthcare professionals in the world's richer countries, though certainly not for those working in poorer ones.

Healthcare is a part of the global system like any other ‘industry’ and faces its own related suite of pressing predicaments [25]. Here we cite five *crises* in health, drawing on the *Oxford English Dictionary* definition of crisis as a ‘time of difficulty, insecurity, and suspense’ (Figure 1.2). Having defined these crises we go on to show, in this chapter and in the book as a whole, how sustainable healthcare offers at least the hope of solutions to the troubles of our times—solutions that the healthcare community will have a central role in bringing to life.

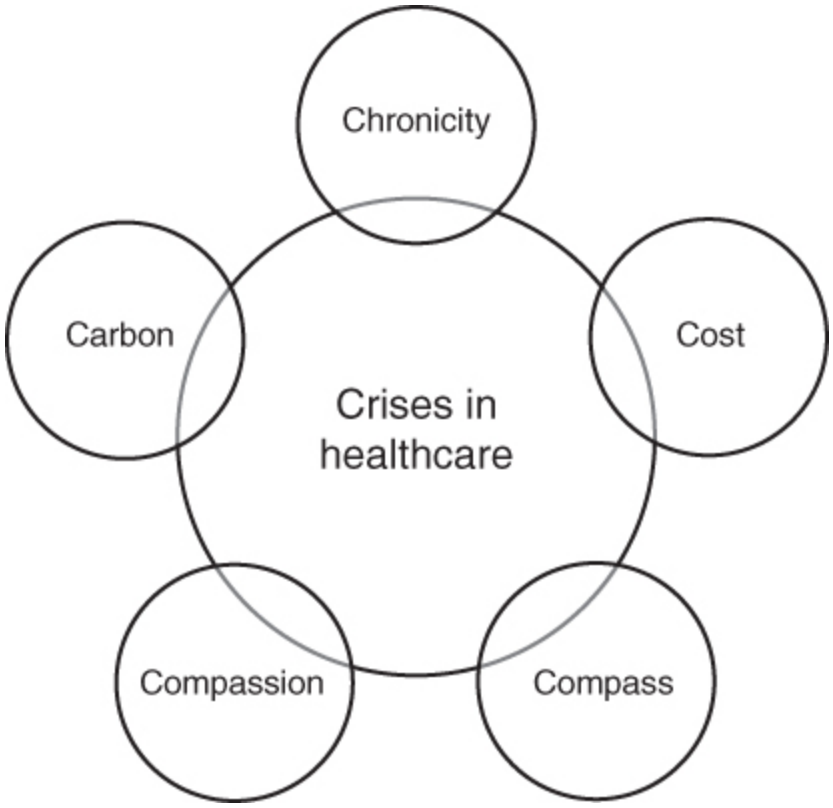

Figure 1.2 Crises in healthcare.

Crisis of chronicity

We know that the global population is growing. It is also aging. Japan, for instance, is estimated to be the ‘oldest’ nation that has ever existed, with one in ten of its citizens being over 75 years of age [13]. This demographic explains, in part, the shift in healthcare's orientation from the treatment of acute illness to the management of chronic disease. Chronic disease has always been with us but is emerging as the primary preoccupation of many healthcare systems, especially in higher-income countries. Take diabetes as a sentinel diagnosis, the prevalence of which is rising rapidly across the world. The number of people diagnosed with Type 2 diabetes in the United States rose by 33% between 1990 and 1998 [26]. Projections suggest that 29 million people will live with this condition in the United States by 2050 [27]. Diabetes is significant because

it underpins trends in many other chronic health problems, such as heart disease and stroke. But why is diabetes becoming such a big a problem? The answer lies in a complex mix of demography, keener diagnosis and the worldwide emergence of another global health crisis—obesity. According to the World Health Organization (WHO), more people die from being overweight than from malnutrition [28]. The 500 million world citizens who are obese are at greater risk of diabetes, cancer, heart disease and a prodigious number of other ailments [29]. A particularly worrying trend is the emergence of obesity in children (Chapter 6). Healthcare systems across the world also face high burdens of cancer, autoimmune disease, respiratory disease and chronic infectious diseases such as HIV/AIDS and tuberculosis. Though we do not understand all the causes of these diseases, science has shown strong associations with modern sedentary lifestyles and the western diet. Being still is dangerous for our health. Never have we moved our bodies around the world so much without actually *moving* our bodies. In later chapters we will see how lifestyles and diet also contribute to our global environmental ills.

Crisis of cost

Richer nations invest vast and increasing sums of money in healthcare, most of it in the treatment of the chronic conditions referred to earlier. This expenditure continues at a time when most governments are seeking ways of spending and borrowing less. These two trends seem impossible to reconcile. European nations spend around 9% of their Gross Domestic Product (GDP) on healthcare; the United States spends an exceptional 17.4% [30]. The *US Congressional Budget Office* estimates that if the United States health budget continues to grow at current rates, the nation will be spending an unthinkable 31% of its GDP

on healthcare by 2035 [31]. The high cost of healthcare is down to another complex mixture of factors as people live longer and accrue diagnoses. In the United States, for instance, one in two adults live with a chronic condition [32]. As medical science progresses, we find more things to do at higher cost. For instance, MRI scanning is now almost a routine procedure. And new drugs, especially for life-threatening disease, are often inordinately expensive: for example, 21 tablets (5 mg) of the myeloma treatment lenalidomide (*Revlimid*®), the subject of Adam Wishart's mordant documentary *The Price of Life* [33], cost the United Kingdom taxpayer an improbable £3570 (US$ 5643) [34]. In systems that are based on reimbursing physicians through private insurance companies, there are strong reverse incentives to cost containment. The more things health professionals do, the more they get paid. And the more insurance companies pay out to providers, the more they pass on in premiums. Predictably, these premiums can soon become unaffordable, so that in 2009 an estimated 50.7 million persons in the United States had no health insurance whatsoever [35]. In 2007, 625 of personal bankruptcies in the United States were due to medical fees that could not be paid [36].

Crisis of compass

If healthcare is unsustainably expensive in the rich world, we could at least hope that we are benefitting from the very latest scientific medicine and that this colossal expenditure is resulting in our better health. However, existing data do not uniformly support this optimistic hypothesis. On the contrary, evidence suggests that spending on healthcare is being invested in interventions that do not improve health. For instance, the *Dartmouth Atlas Project* has shown that patients who live in regions of the United States with a higher intensity pattern of care

where they receive more visits, undergo more imaging examinations and are more frequently admitted to hospital, show no better survival rates than those living in regions with lower-intensity healthcare [37]. Billions are spend each year on coronary angioplasties and stents, yet a randomised controlled trial, published in April 2007 in the *New England Journal of Medicine*, found that these two procedures do not prolong life or prevent heart attacks in patients with stable coronary disease when compared to pharmaceutical approaches [38]. We also know from comparing data between nations that there is a poor correlation between expenditure on healthcare and longevity. For example, although Chileans and Americans enjoy similar average longevity (78.6 versus 78.3 years), healthcare spending per capita is, according to the Organisation for Economic Co-operation and Development (OECD), six times greater in the United States—and 25 times greater than in the famously low-cost Cuban system [39]. These data suggest that a high proportion of healthcare funds is being misspent, however well meaning and culturally reasonable the reasons behind this spending may be. This is, in part, due to the conflation of healthcare as part of a system of *care*, with healthcare as profit-driven *industry*. An independent review calculated that US pharmaceutical companies spent US$ 57.5 billion (£35.6 billion) in 2004 on promoting their products, giving them weighty influence over the delivery of care which is, inevitably, dominated by medication, even in less overtly commercialised systems [40]. And medication use is on the up in many clinical fields. For instance, the health service in England issued 39 million prescriptions for antidepressants in 2009, compared with 20.1 million in 1999, with no evidence that England is a happier country as a result [41].

Developments like these herald what we call the ‘crisis of compass’—a crisis in the purpose and direction of the healthcare enterprise. And what if ‘care’ is not only ineffective but actually harmful [42]? In 2009, there were 1.2 million visits to US emergency rooms due to the misuse of prescribed medications [43]. Even when used correctly, medicines can cause grave harms which are often not initially apparent. According to research published in *The Lancet*, between 88 000 and 140 000 excess cases of serious coronary heart disease occurred in the United States over the market-life of the anti-inflammatory *rofecoxib (Vioxx®)* before it was withdrawn in 2004 [44]. Even health promotion may have unforeseen problems. For instance, the United Kingdom's £96 million per annum *National Breast Screening Programme* is mired in controversy as epidemiologists debate whether it causes more harm than good [45]. So judicious use of investigations, medications and surgery will remain at the heart of good medicine. But, as we argue in Chapter 10, just because some treatment is possible does not mean that it is desirable. The direction we advocate is toward better health with, paradoxically, *less healthcare*, putting a firmer emphasis on broad, holistic and mainly preventative interventions. A welcome and convenient truth is that such interventions, be they preventative or therapeutic, are also, typically, much kinder on the planetary system.

Crisis of compassion

One of the effects of delivering so much in healthcare is that health professionals have become very busy, with more patients having more ‘done’ during shorter hospital stays and clinic visits. Whilst our therapeutic systems have advanced, there has not been a corresponding advance in our ability to meet the human needs of those in our care. In fact, by some indicators, the clinical frontline of medicine is

uncomfortably short of humanity. The UK's *Care Quality Commission* found in 2011 that almost half of hospitals did not meet basic standards for nutrition and dignity in the care of elderly patients (Box 1.1 shows some extreme examples) [46].

Box 1.1 Quotations from ‘We have been listening, have you been learning?’ A report by the UK's Patients Association, 2011 [47].

‘As you can imagine, my mother was horrified when she then turned up in hospital to discover dad sat beside his bed, quite literally sitting in his own faeces… In general during dad's time in hospital the nursing staff treated him as an object that they had to treat rather than a human being who should be included in his care and given the dignity that he deserves.’

‘Even despite the often poor care he was receiving, my father had nothing but praise and gratitude for the people caring for him, and thanked them every time. However, to us he said that nobody cares in here what happens to you.’

‘The horrible thing is that my mum was not alone in this situation. I witnessed the old lady in the bed opposite being left with a bowl of steaming hot soup which she pulled towards her before I could stop her, and poured it all over her upper legs. When the nurse was called she said she was busy and would be along in a minute! The lady suffered scalding to her legs and the doctor had to be called.’

‘Mum has always been very particular about her appearance and personal hygiene. We found it hugely distressing to find her with dirty fingernails and dirty teeth. She also had food all over her clothes. We took an apron in with us for mum to wear when she ate, but it was barely used, unless a member of family was present.’