

The global burden of disease

The Global Burden of Disease (GBD) represents the sum of life-limiting disease on the human population. The original assessments were made by Chris Murray and Alan Lopez, in 1996. In the original assessment of the GBD, the environmental contribution to the global burden of disease was deduced by attributing mortality and morbidity data to environmental causes, mainly on the basis of expert opinion, and by extrapolation from research studies. Since then, a more detailed analysis of the global burden of disease is being undertaken, which is attempting to assess the environmental contribution to the GBD from estimates of population exposures and exposure-response relationships (Ezzati et al. 2002).

Because the overall effect of illness and disability cannot realistically be assessed only in terms of the death rate, and because comparisons cannot easily be made between crude rates of morbidity (which may differ greatly in severity), the GBD is estimated in terms of disability-adjusted life years (DALYs). These are a measure of the years lost to either premature death or life-limiting disease.

2. DEFINING WHAT MATTERS

No indicator tells us all we need to know: the world and what we need to know are both too complex for that. Nor can we develop indicators for everything. If we were to do so, the huge volume of information — much of it often contradictory and confused — would simply weaken rather than strengthen the message, and overwhelm those concerned. Or the indicators themselves would be so wide-ranging and general that any meaningful interpretation would be impossible. To be effective, information must always be selective: we must target the key issues and communicate concisely.

Selection is not easy. Children are subject to many different threats, and these vary depending on local circumstance and the vulnerability of those concerned. The range of potential issues of interest is therefore extremely large. In defining these issues, we also need to take account of both cause and effect. Not all health outcomes derive from the environment, but those that do can only be effectively addressed if we understand their environmental roots. Indeed, in terms of action and response, the focus should perhaps be on the environment rather than the health outcome: for while we can often reduce suffering by treating health outcomes, only by removing the exposures responsible for the disease can we avoid it entirely. This needs action far upstream of the health effect — for example, by intervening in the environmental processes, or the social and economic systems, that generate the hazard in the first place. By the same token, the fruits of intervention are often seen first in the environment, and only later — too late to ensure prevention — in the health of the population.

2.1 The burden of disease

By selecting, of course we also prioritize. The issues we select as the focus for our indicators, therefore, become the focus for our policy. How then should we select?

The most obvious way is in terms of the burden of disease. In this context, what matters most for children is incontrovertible. Global estimates of the burden of disease, derived from an analysis of national statistics and research studies (Figure 1), are already available. Both the data and the science behind these estimates are admittedly approximate, but such is the scale of illness in the world that approximations matter little. The major causes of death and illness — and thus the major focus of concern — are all too evident. They dominate the statistics. Though they can be categorized in different ways, five main groups demand attention:

- Perinatal diseases — including low birthweight, stillbirths and congenital malformations.
- Respiratory diseases — including pneumonia, tuberculosis and asthma.
- Diarrhoeal diseases — including rotavirus infections, E. coli infections, and cholera.
- Insect-borne diseases — especially malaria.
- Physical injuries — including traffic accidents, poisonings, drowning, falls and burns.

Together, these kill some 10 million children below the age of fifteen every year, of whom probably at least three-quarters are under the age of five (WHO 1996).

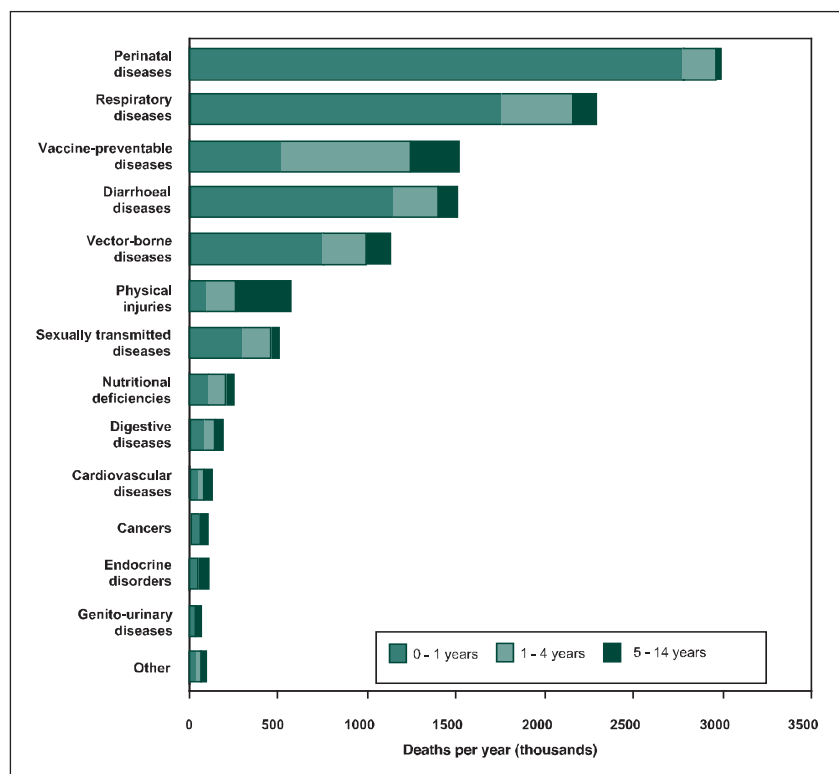


Figure 1. Global mortality rates by age for major categories of disease

The data show that, for most causes, the large majority of deaths occur to children during the first year of life. They also show that five main causes — perinatal conditions (together with congenital anomalies), respiratory infections, diarrhoeal diseases, malaria and physical injuries (including drowning and motor-vehicle accidents) are the major killers of young children.

Source: WHO 2002

Traditional, modern and emerging risks

Children's health risks tend to change as a consequence of development. In less developed countries, 'traditional' environmental health risks tend to be associated with problems such as poor sanitation, unsafe food, malnutrition and vector-borne diseases. With economic development, many of these risks are eliminated or at least greatly reduced. In their place, new risks tend to emerge, such as exposures to pollution from industry and transport, and problems such as obesity. Most of these 'modern' risks can, however, be effectively controlled by implementing policies of sustainable development, in which environmental protection is linked to deliberate strategies to reduce inequalities and enhance education and empowerment. In addition, there are 'emerging' risks such as environmental allergens, endocrine disruptors and autoimmune diseases; potential health-and-environment linkages require further research to identify causative factors or a combination of such factors.

These diseases are not the product of the environment alone. Genetics, lifestyle, and chance play a large role, but the exposures to environmental hazards certainly make a major contribution. Thus, their prevalence depends to a large extent on conditions such as the magnitude of natural hazards, the extent and severity of pollution, and the quality of the living environment. Together, these five disease groups account for about one-third of the total global burden of environmental disease in children (as much as 40% of those aged less than five). By the same token, they are susceptible to environmental policy.

They are also, almost overwhelmingly, diseases of the developing rather than the developed world. With development they are all, more or less, avoidable. In selecting these issues as the focus for attention, therefore, we are inevitably skewing our efforts to the developing world. From a global perspective that is surely just, for it is in developing countries, overwhelmingly, that the largest burden of children's disease is found. Nonetheless the point must be made. The way we define the issues will inevitably limit the indicators we choose. And, if we use the indicators effectively to guide our actions, then these in turn will skew the way we act. The old adage is true: we manage what we measure and we measure what we manage.

We need, therefore, to be clear about how we select the issues for which our indicators are designed, and why we have selected them. We also need to recognize that, in another area, with different problems, or from the perspective of another observer with different interests, this selection may differ, and, with it, the choice of indicators also. Indicators are thus servants of need. They are rarely, if ever, universal. As the need changes, so must the indicators change. Any set of indicators, however 'core' they might be, is limited in its relevance and can easily be made redundant by changes in conditions or concern. For other purposes, and especially in the developed world, other issues might therefore need to be defined, and with them other indicators. As priorities for global concern, however, this 'big five' amongst the killers of children stands unchallenged. If we do not understand and do not better address these killers, then we will have failed indeed. As a basis for global action, they are surely priorities.

What is the environment?

Definitions can sometimes be the death of understanding. Rather than clarifying, they can simply confuse. So it is with 'environment' – a concept that means many different things to different people. In reality, the environment has no clear bounds. It simply means the context within which things happen: 'the conditions or influences under which any person or thing lives or is developed' in the words of the *Oxford English Dictionary*

In terms of environmental health, the environment thus includes not only the natural world, but also the anthropogenic world of the home, school, workplace and neighbourhood. It includes not only physical and chemical influences, but also the social and other factors that affect our health.

This is an expansive definition. If applied in full it throws open the whole world to our consideration. For practical reasons, we have to be more pragmatic. While we do not draw strict boundaries around the concept of environment, we do therefore define a focus for our attention. This focus is provided by the physical contexts within which children interact with their world: the ambient environment (the wider world of air, water, land and living creatures); the community (the social environment or neighbourhood within which they live); and the home environment.

Even in the developing world, these diseases do not affect everyone equally. Socio-economic disadvantage is in many ways the great divider. But age — and in many cases gender — are also powerful discriminators of risk. Usually, it is the youngest who are most under threat. Across the world, death rates are greatest in the first year (and often the first hours) of life.

Later in life, the balance of risks tends to change, and other risk factors emerge. In particular, injuries, and some infections such as measles, begin to take a greater toll. By age five, however, those who survive already have a greatly increased life expectancy. Even when they do not kill, many of the diseases of the very young also leave a lasting and, in some cases, lifelong imprint. These early years therefore hold the key.

2.2 The environment as hazard

Of course, all these deaths and diseases cannot be attributed, either directly or indirectly, to the environment within which children are born and live. Environmental agents nevertheless lie behind many of these diseases and disabilities, and in some cases — such as diarrhoeal diseases or vector-borne diseases — they clearly account for the major share of both mortality and morbidity.

In part this is because the environment is itself a hazardous place. Natural processes such as earthquakes, volcanoes, landslides, floods and droughts all pose threats. In many areas these threats are increasing, not because the hazards themselves are necessarily becoming more severe, but because human populations are moving into hazard-prone areas.

More generally, however, it is the way that humans use the environment that makes it a hazardous place to live. Pollution often provides the most obvious evidence for this. But damage to soils, abstraction of groundwaters and destruction of habitats all have equally far-reaching implications for health. We thus create new environments and vectors for insects and other carriers of disease, we change the hydrology and climate and increase the likelihood of droughts or floods, and we shift closer to the limits that the Earth can sustain.

The environment, therefore, is often not the villain, but merely the medium through which threats to health operate. Indeed, strictly speaking, many of the environmental health risks facing children derive not from the environment per se, but from the things humans do in, and to, their environment.

Human impacts on the environment are far-reaching, and are increasingly felt on a global scale. The threats they pose to children's health, however, are far more local. Children, even more than adults, spend most of their lives at home — 80% or more when very young (Tso and Yeung 1996, Farrow et al. 1997). It is in the home, therefore, that by far the largest majority of exposures and infections that afflict children occur. The home, however, nests within a neighbourhood, and is dependent on the services and support systems which the community provides (Figure 2). Inadequacies in these services (e.g. in water supply, food supply or waste collection) thus also threaten the child. By comparison, exposures in the ambient environment are often of relatively less importance for children, though on some occasions — as with major natural disasters or war — they can certainly intrude. Nevertheless, the wider environment remains vital, for it is here that many of the actions aimed at protecting children need to take place — for example, through national or international policy aimed at tackling the root causes of environmental health problems.

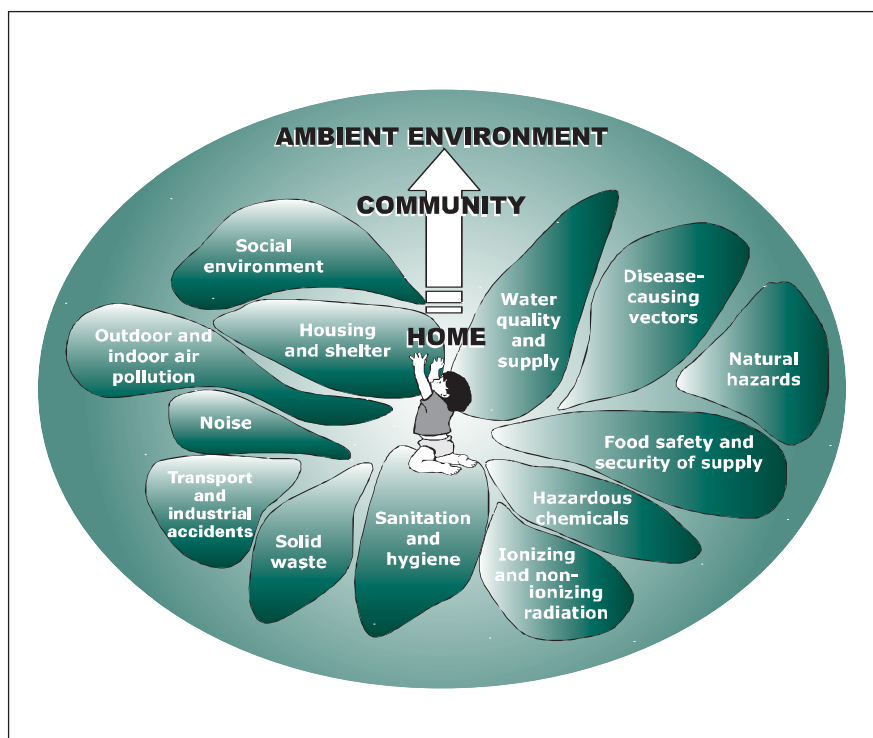


Figure 2. Children's hazard spaces

Children's exposures to environmental health hazards occur in many different settings – in the home, in the neighbourhood or community and in the wider environment. Most hazards operate at a range of spatial scales, and thus straddle the three settings of ambient environment, community and home. Because children spend most of their time indoors at home, however, it is in this setting that most exposures occur.

Source: WHO 2002

Against this background, we can argue that what matters to children is not the same as what matters to adults. One reason for this is that children occupy very different types of hazard spaces (i.e. the places where they spend their time and are most at risk). For adults, these spaces are typically diverse, though occupational environments are often especially important since they account for a large part of adults' activity time and are relatively hazardous. In contrast, children — and especially young children (who are inherently the most vulnerable) — occupy far more restricted hazard spaces.

Nor is it only the physical environment on which we should concentrate. The social world is also important. All children are not born equal, either in terms of wealth or opportunity. For almost all hazards and health outcomes, the gradient of risk per unit of exposure is greater for already impoverished children than it is for children from better-provided backgrounds or more affluent homes. The reasons are complex and many. Poorer households may be subject to a wider range of environmental hazards, both in the home and outside, which act, often together, to increase health risks. Parents and children from poorer homes are likely to be inherently more vulnerable because of problems of poor diet and lifestyle. They are likely to be less aware of how to cope with risks and less able to take avoiding or mitigating action; they have less access to education and health care. The physical and social environments thus act in consort not only to threaten the health and lives of children, but also to determine their vulnerability to these threats. Children are also inherently more vulnerable, not only because of their smaller stature, and their limited bodily defences, but also because of their lack of familiarity with many of the environmental hazards they face, their lack of command over any of these risks and their limited scope to avoid them.