Inheriting the World:
The Atlas of Children’s Health and the Environment

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A warming planet, page 46
Every child has the right to live in a healthy, supportive environment – an environment that encourages growth and development, and protects from disease. Many of the world’s children, however, are exposed to hazards in the very places that should be safest – the home, school and community. Considering that their growing bodies are particularly sensitive to environmental threats, the final burden of childhood disease is substantial. Every year, more than three million children die due to unhealthy environments.

The majority of these child deaths are caused by unsafe water, lack of sanitation, indoor air pollution, and mosquitoes bearing malaria. Other environmental hazards include passive smoking, lead and pesticides, road traffic accidents, and global environmental changes.

Persistent poverty aggravates these environmental threats. The children worst affected are those in the developing world, and the enormous burden of ill-health falling on their youngest citizens constrains the social and economic development of these countries.

Children are helpless in the face of environmental risks and, all too frequently, adults do not listen to the voices of children or act upon their most urgent needs. But we must listen. Children are our most precious resource. Together, now is the time to focus our efforts on combating environmental threats to children’s health and to work towards a sustainable and brighter future.
The World’s Forgotten Children

Aiko is safely delivered in Kumamoto, Japan, and can expect to live about 85 years. Yet these gains have not been enjoyed everywhere: in some countries of sub-Saharan Africa, child mortality is rising as wars and the ravage of the AIDS epidemic undermine the medical, social and economic structures of society.

Over 10 million children under five die every year—98 per cent of them in developing countries. Widespread malnutrition hampers children’s growth and development, opening the door to the biggest killers of children under five: perinatal diseases, pneumonia, diarrhoea, and malaria. This presents a sharp contrast to the situation in the industrialized world, where junk food and a sedentary lifestyle have triggered an unprecedented epidemic of obesity in children, leading to diabetes and heart disease in adult life.

The last three decades have witnessed an impressive decline in child mortality, from 17 million a year in the 1970s. Yet these gains have not been enjoyed everywhere: in some countries of sub-Saharan Africa, child mortality is rising as wars and the ravage of the AIDS epidemic undermine the medical, social and economic structures of society.

At the turn of the century, the world joined together in the fight against poverty, and committed itself to the Millennium Development Goals, adopted by the United Nations in 2000. “To reduce by two-thirds the under-five mortality rate between 1990 and 2015” may be the most ambitious of these goals.

Today, 25% of Africa’s children are at higher risk of death than they were ten years ago. "It is not enough to prepare our children for the world; we must also prepare the world for our children," Luis J. Rodriguez (1954–)

The biggest killers of children under five

Main causes of child mortality 2002

- Acute respiratory infection 18%
- Diarrhoea 15%
- Malaria 11%
- Other 24%
- Deaths associated with malnutrition 54%
- Measles 5%
- Human Immunodeficiency Virus (HIV) 4%
- Perinatal diseases (within 7 days of birth) 23%

The price of life

Annual expenditure on pet food in North America and Europe 1998

US$ 17 billion

Annual cost of scaling-up vaccination, malaria prevention and essential treatment to reach every child in the developing world 2001

US$ 7.5 billion

Under-five mortality rate per 1000 live births 2000

- over 175
- 101 – 175
- 10 and under
- 26 – 100
- no data

Beacons of hope

greatest improvement in child mortality rate 1970–2000

1970–2000

in child mortality rate

greatest improvement

98
Poverty is the single biggest threat to children’s health. Poor children are more likely to die as infants, and are sick more often and more seriously than better-off children.

The poor and the marginalized – especially children – often bear the brunt of environmental degradation. Yet, because of their vulnerability, children are the very group that can least afford to be exposed to environmental hazards. They are not “little adults” – they breathe more air, consume more food, and drink more water in proportion to their weight. Children’s behaviour further puts them at risk. Their life takes place closer to the ground and young children frequently put their fingers in their mouths.

Exposure to environmental risks is one of the reasons for poor children being worse off than their wealthier peers. In developing countries, environmental risks are compounded in the poorest settlements, where housing is inadequate, water and sanitation are lacking, garbage collection is non-existent, and smoke fouls indoor air. In rich countries, low-income or minority neighbourhoods are sometimes disproportionately located near hazardous waste sites or polluting industries.

A rising income gap between the rich and the poor within countries around the world means that millions of children may be excluded from the health benefits of emerging prosperity.
Children today live in an environment that is vastly different from that of a few generations ago. Global challenges include industrialization, rapid urban population growth, the unsustainable consumption of natural resources, the increasing production and use of chemicals, and the movement of hazardous wastes across national borders.

Homes, schools, streets and fields – the settings where children live, learn, play and work – all present environmental hazards. Yet, children born into different countries, cities or rural areas, and even different neighbourhoods, face risks that may be poles apart.

As countries develop, many of the most serious “basic risks” to child health gradually vanish with improvements in water and sanitation, hygiene and cleaner fuels for cooking. Their decline, however, is accompanied by an increase in “modern risks”. Industrialization brings with it an increase in road traffic, air pollution, and the use of chemicals that infiltrate the air children breathe and the food they eat.

It is too early to judge the exact impact of “emerging risks”, such as endocrine-disruptors and global warming. These add to the challenges we must confront to safeguard our children’s health and future.

Each year over three million children die from illnesses and other conditions caused by environmental hazards.

Summary of risks by income 2004

- Low-income populations in poverty
- Middle-income populations in transition
- High-income industrialized societies

- basic risks: lack of safe water, sanitation and hygiene, indoor air pollution, vector-borne diseases, hazards that cause accidents and injuries
- modern risks: unsafe use of chemicals, environmental degradation
- emerging risks: climate change, ozone depletion, persistent organic pollutants, endocrine disruptors
Halving the proportion of people without access to a safe water supply by 2015 requires connecting 125 000 people every day and sustaining existing connections.

**Health effects**

Intestinal diseases caused by unsafe drinking water:
- Diarrhoea
- Cholera
- Dysentery
- Typhoid
- Guinea worm

Hygiene- and sanitation-related diseases (map 5)

- Water is essential for hygiene, especially for hand-washing after defecation (map 8)
- Pools and marshes are breeding sites for malaria-carrying mosquitoes (map 7)
- Arsenic and high levels of fluoride in drinking water cause severe illness (map 8)
- Children and women often spend many hours collecting water (map 6)
- During daily water collection, children face the risk of drowning and injuries (map 12)

**Preventing diarrhoea**

Annual number of deaths of children under five years 2002 thousands

- from diarrhoea
- that would be averted by piped water supply and sanitation
- that would be averted by household water treatment

**Water supplies**

Percentage of households with access to an improved water supply 2000 or latest available data

An improved water supply is defined according to the type of technology (piped drinking water, protected well or spring, rainwater), the distance from the source (available within 1 km of the home) and water quantity (at least 20 litres per day).
I imagine a life without a clean, private place to defecate and urinate: the embarrassment of going to the toilet in an abandoned plot or on the open street, and for girls, the fear of assault at night.

This is the reality of life for a staggering 2.4 billion people, most of whom live in extreme poverty in Africa and Asia. Inadequate sanitation in the home and in public places erodes human dignity, undermines development, and causes disease.

Putting fingers into their mouth puts young children most at risk of catching diarrhoea. For families, preventing faecal-oral contamination depends on proper hygiene, and disposing of children’s faeces safely. The availability of sufficient water enables both children and adults to wash their hands before meals and after defecating. Simple hand-washing could save up to one million lives every year.

Realizing the Millennium Development Goal of halving the proportion of people without access to sanitation by 2015 would still leave almost a quarter of humanity without a basic latrine. Hopes of achieving even this modest goal are fading fast.

**Health effects**

Diseases caused by inadequate sanitation and hygiene:
- Intestinal worms (including ascariasis, trichuriasis and hookworm)
- Schistosomiasis
- Trachoma
- Intestinal diseases (map 4)

**Meagre sanitation**

Percentage of households without access to improved sanitation 2000 or latest available data

- over 75%
- 61% - 25%
- 51% - 75%
- 5% and under
- 26% - 50%
- no data

**Sewerage services**

2000
- percentage of population with a flush toilet
- percentage of urban wastewater that is not treated

A sewerage connection is an effective system for removing human faeces from a household. However, sewage is frequently discharged, untreated, into rivers, lakes and oceans, where it contaminates food and water supplies, causing illness, in particular among the poor. Even in industrialized countries not all sewage is treated. This dilemma will continue to plague the sewerage debate.

**Highly Neglected Field**

“Aren’t we to decide the importance of issues by asking how fashionable or glamorous they are? Or by asking how seriously they affect how many?”

*Nelson Mandela (1918-)*
To Fetch a Pail of Water

Fetch water prevents mothers from looking after their children and generating household income. The time children spend carrying heavy buckets, queuing at the water source or being sick with diarrhoea could be spent in school and not in fetching water. An estimated 100 million working days a month are lost in this way. With its large population, Asia loses more time than any other continent.

Pakistan India Nepal Philippines Indonesia

Time spent on water collection represents time lost to household and national economies. Every month, the Indian economy misses out on over 100 million working days in this way. With its large population, Asia loses more time than any other continent.

A mother and her children take turns trekking 14 km to the nearest water source each day to fetch a pail of water. They carry a bucket weighing up to 20 kg, causing backache and, over the years, spinal injury. Some women have been ganged up on by men; others have been attacked by dogs or bitten by snakes. Water is so hard to come by that there is barely sufficient for drinking.

Halving the proportion of Africans without access to an improved water supply and improved sanitation would save US$ 1.2 billion in health treatment costs. Universal access for Africans to a piped water supply and sewerage connection in their homes would save US$ 6.4 billion.
Malaria

The name "malaria" was coined in Italy, as people believed that "bad air" brought about the disease. In truth, the cause of malaria is a parasite transmitted from person to person through the bite of the female Anopheles mosquito.

The environment is a key determinant of the spread of malaria -- the deadliest of all the vector-borne diseases. Malaria flourishes within a certain temperature range and altitude, where favourable rainfall patterns and humidity prevail, and where animal or human blood is available. Any clean standing water provides a potential breeding site for mosquitoes.

Ninety per cent of the at least one million deaths a year from malaria occur in Africa, mostly among young children. Malaria also hampers children's education: because they miss school when ill, and because severe episodes of the disease may cause permanent neurological damage. Malaria has been estimated to cost Africa more than US$ 12 billion every year in lost GDP. The disease could be controlled for a fraction of that sum.

Preventive measures, such as insecticide-treated bed nets, stop mosquitoes biting children. Drugs, such as chloroquine, are available, but drug resistance means that new remedies are urgently being sought. Malaria is one of the major public health challenges undermining development. Long-term solutions are needed to stop an African child dying every 30 seconds.

Other vector-borne diseases

- **Schistosomiasis**: Flat worms, whose life cycle partly takes place in freshwater snails, burrow through the skin. 200 million people, many of them children, are currently infected with schistosomiasis.
- **Japanese encephalitis**: This is a virus transmitted by mosquitoes in Asia. 90% of the cases occur in children under five years.
- **Leishmaniasis**: Transmitted by sand flies, this parasite causes skin lesions and damage to internal organs. It killed 59,000 people in 2001.
- **Dengue fever**: Mosquitoes transmit the virus, which kills more than 10,000 children every year.
- **Lymphatic filariasis**: Worms lodging in the lymphatic system can cause deformations in children as young as 12 years.

Africa bears the overwhelming burden of malaria. It is home to the deadliest form of the malaria parasite and to climatic conditions where mosquitoes flourish. Local environmental conditions, such as wetlands and drainage patterns, also influence the abundance of mosquitoes. Consequently, dams and irrigation schemes must be carefully planned and managed in order to reduce opportunities for mosquitoes to breed.
Fluoride and Arsenic in Drinking Water

Millions of children are exposed to excessive amounts of fluoride through drinking water contaminated from natural geological sources. In China, the burning of fluoride-rich coal adds to the problem. Small amounts of fluoride are good for teeth; it is added to toothpaste and, in some countries, to drinking water. At higher doses, it destroys teeth and accumulates in bones, leading to crippling skeletal damage. With their bodies still growing, children are most at risk.

Like fluoride, arsenic is widely distributed throughout the earth’s crust, and is present in almost all waters in very small amounts. In certain areas, however, there are dangerous levels of this toxin in children’s drinking water. The most tragic example is Bangladesh, where thousands of wells are causing a mass poisoning of the population. Unsafe wells are marked with red paint, warning people that this water is not for drinking.

Fluorosis
- Tooth discoloration and decay
- Crippling skeletal damage

Arsenicosis
- Skin pigmentation changes and skin thickening (hyperkeratosis)
- Cancer of the skin, lungs, bladder and kidney

Some estimates suggest arsenic in drinking water will cause 200,000 to 270,000 deaths from cancer in Bangladesh alone.

The dose makes the poison.
Paracelsus, physician (1493-1541)
Cooking is central to our lives, yet the very act of cooking is a threat to children’s health and well-being.

Half of the world’s population rely on solid fuels, such as dung, wood, crop waste or coal to meet their most basic energy needs. In most developing countries, these fuels are burned in open fires or rudimentary stoves that give off black smoke. Children, often carried on their mother’s back during cooking, are most exposed. The indoor smoke inhaled gives rise to pneumonia and other respiratory infections – the biggest killer of children under five years of age. Indoor air pollution is responsible for nearly half of the more than 2 million deaths each year that are caused by acute respiratory infections.

Good ventilation and improved cooking stoves can dramatically reduce children’s exposure to smoke. Ultimately, making the transition to gas and electricity will save lives and reduce the physical toll on women and children from gathering wood, freeing time for education and development.

This problem has been largely ignored by policy-makers.

### Health effects

**Established effects:**
- Pneumonia and other respiratory infections
- Chronic obstructive pulmonary disease (including bronchitis, emphysema)

**Suspected effects:**
- Tuberculosis
- Cataracts
- Asthma
- Low birth weight
- Middle ear infection (otitis media)

### Map: Indoor Smoke: Breaking Down Respiratory Defences

**The Energy Ladder**

- **Increasing cleanliness, efficiency, convenience:**
  - Electricity
  - Liquefied petroleum gas, natural gas
  - Kerosene
  - Charcoal, coal
  - Wood
  - Crop waste, dung

**Smoky homes**

- Typical 24-hour mean concentration of particulate matter of less than 10 micrometres in diameter (PM$_{10}$) early 2000s micrograms per cubic metre ($\mu g/m^3$)

**European Union standard 50**

- 250

**Hut with an open fire**

- 10

**Bangkok roadside**

- 240

**Berlin city centre**

- 1000
Passive Smoking: Children Protest

“Child abuse doesn’t have to mean broken bones and black and blue marks. Young growing tissues are far more vulnerable to carcinogens than those of adults. Knowingly subjecting children to respiratory tract disease is child abuse.”

Dr. William Cahan, Memorial Sloan Kettering Cancer Center, USA, 1993

The burning of tobacco produces a cocktail of dangerous chemicals. Almost half the world’s children (about 700 million) are exposed to smoke from burning tobacco and exhaled smoke at home. Environmental tobacco smoke has particularly harmful effects on foetuses and young children, causing respiratory infections and other illness.

Children do not choose to inhale a mix of over 4000 chemicals, including carcinogens. In fact, the majority of children worldwide urge people to stop smoking in public places. At home, it is the responsibility of parents to protect their children and stop smoking. Media campaigns, combined with smoking restrictions in public places and the workplace, can help make homes tobacco-free.

Other tobacco control measures include taxation, bans on tobacco advertising and health warnings on cigarette packs. The Framework Convention on Tobacco Control, an international treaty instigated by WHO, is currently in the process of signature and ratification.

Children whose parents and friends smoke are more likely to become addicted themselves; 250 million children alive today will be killed by tobacco if current consumption trends continue.

Children’s voices

Percentage of students aged 13–15 years who want bans on smoking in public places 1999–2003

- over 75%
- 51% – 75%
- 26% – 50%
- no data

Framework Convention on Tobacco Control

First five countries to ratify convention

Health effects on children

- Increased risk of sudden infant death syndrome
- Adverse effect on oxygen uptake and arteries
- Possible association with brain tumours and long-term mental effects
- Middle ear infections (chronic otitis media)
- Respiratory diseases (including bronchitis and pneumonia)
- Asthma induction and exacerbation
- Chronic respiratory symptoms (wheezing, coughing, breathlessness)
- Decreased lung function
- From fires caused by tobacco

Exposure in the home

Percentage of children exposed to tobacco smoke in the home 1999–2003 by WHO region

- Africa
- Eastern Mediterranean
- Europe
- South-East Asia
- Western Pacific
- The Americas

Over 75%
51%–75%
26%–50%
No data

Children's voices

Children do not choose to inhale a mix of over 4000 chemicals, including carcinogens. In fact, the majority of children worldwide urge people to stop smoking in public places. At home, it is the responsibility of parents to protect their children and stop smoking. Media campaigns, combined with smoking restrictions in public places and the workplace, can help make homes tobacco-free. Other tobacco control measures include taxation, bans on tobacco advertising and health warnings on cigarette packs. The Framework Convention on Tobacco Control, an international treaty instigated by WHO, is currently in the process of signature and ratification.
Polluted Cities: The Air Children Breathe

Power plants, factories and vehicles spew out harmful gases and small particles that can penetrate deep into children’s lungs. In strong sunlight, oxides of nitrogen from vehicle exhaust fumes form ozone at ground level, which can trigger asthma attacks. Air pollution does not respect national borders. Heavy metals and persistent organic pollutants are carried by winds, contaminating water and soil far from their origin. In the late 1990s, forest fires, mainly in Indonesia, caused a haze of smoke to hang for months over neighbouring South-East Asian countries. Schools and kindergartens were forced to close, while local hospitals reported large numbers of haze-related illnesses in young children.

The Great London Smog of 1952 focused the world’s attention on the problem of air pollution, and since then there has been a marked improvement in air quality in developed countries. Nevertheless, every year outdoor air pollution is responsible for the death of hundreds of children in Europe, and of more than 24 000 globally.

Industrial growth and rapid urbanization aggravate the problem, with the pressure felt most acutely in the megacities of the developing world. Use of cleaner fuels and technologies, refined motor engines, and public transport are crucial in ensuring that children breathe clean air.

Health effects on children
- Pneumonia and other lower respiratory infections
- Asthma
- Low birth weight

Dirty air: the silent killer

Average concentration of small particles (PM$_{10}$) in outdoor urban air by WHO sub-region 2000 micrograms per cubic metre ($\mu$g/m$^3$)
- over 50
- 21 – 30
- 11 – 15
- 16 – 20
- no data

Average concentration of small particles (PM$_{10}$) in selected European cities 2001 micrograms per cubic metre ($\mu$g/m$^3$)
- over 30
- 21 – 30
- 20 and under

PM$_{10}$ refers to particles less than 10 micrometres in diameter, which can penetrate deep into the lungs and cause adverse health effects. The European Union standard for 24-hour mean PM$_{10}$ levels is set at 50 $\mu$g/m$^3$, not to be exceeded more than 35 days per year.
Drowning is the most common cause of injuries for infants, killing approximately 60 000 children under five every year and leaving roughly the same number permanently disabled. Children also suffer burns from open fires and kerosene stoves, and are injured in falls at home, at school and at playgrounds.

In older children, however, the overriding cause of injuries is road traffic accidents, killing approximately 180 000 children under 15 each year. Children are rarely the cause of road traffic accidents but suffer as pedestrians, cyclists and passengers. Boys, often given greater freedom to roam, are more likely to be injured than girls.

Injuries are unnecessary and avoidable. The use of seatbelts and child car seats, and the wearing of helmets are essential to prevent the death of child passengers or cyclists. Traffic measures such as checking vehicle roadworthiness, enforcing speed limits and prosecuting drunk drivers are particularly important in developing countries, where roads tend to be poorly maintained and the number of vehicles is growing rapidly.

Injuries from road traffic accidents already cost developing countries US$ 65 billion a year—more than the annual amount of development assistance they receive.

Deaths from road accidents are projected to rise by 65% by 2020, mostly in developing countries.
The need to support themselves and their families forces over 200 million children aged 5 to 14 years to work. More than half of these child workers toil in hazardous occupations, such as agriculture, mining and construction.

Agriculture exposes children to pesticides, extreme temperatures, disease-carrying insects and dangerous machinery. Mining and construction involve long hours of strenuous physical labour, often in environments rife with dust, noise and toxic chemicals such as mercury, which is used for gold extraction.

Children are powerless in the face of such hazardous working conditions: they lack the experience to recognize risks and they lack the physical and emotional strength to protect themselves. Every year, more than 35 000 child workers under 17 years die as a result of occupational injuries.

Children also lack the choice to shape their own lives: many child workers cannot attend school – a precious right that will equip them to build a better future for themselves.

The International Labour Organization’s Convention 182 calls for the immediate elimination of the worst forms of child labour, including hazardous child labour. Nearly 150 countries have already committed themselves to the fight against hazardous child labour by ratifying the Convention. There is, however, a long road ahead in developing alternative livelihoods for children and their families.

Child scavengers search through waste with their bare hands.
The toxic effects of lead have been known for centuries: severe anaemia was common among aristocratic women who relied on lead-based powder to meet their desire for a fair complexion. Workers in lead mines, constantly exposed to high doses of lead, frequently suffered convulsions and even death.

Lead continues to be present in our surroundings as an additive to gasoline, an ingredient of paint and pottery glaze, or the main material of old water pipes. Children are at the greatest risk because lead is more easily absorbed by their growing bodies, and because their tissues are especially sensitive to damage. They may swallow lead in dust from decaying lead-based paint or suck the ceramic beads of necklaces. Even blood lead levels as low as 5 micrograms per decilitre can irreversibly impair the development of children’s brains, reducing their IQ.

This threshold level is still exceeded around the world, particularly in children in the cities of developing countries. Industrialized countries have made progress by phasing lead out of gasoline, banning lead in many consumer goods and replacing lead pipes with copper pipes. Lead-based paint, however, continues to be a considerable problem in North America.

A potential link between elevated lead levels and antisocial behaviour and delinquency makes tackling this problem even more urgent.

### Blood and lead

<table>
<thead>
<tr>
<th>Region</th>
<th>Percentage of children with blood lead levels above 10 micrograms per decilitre (µg/dl)</th>
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<tbody>
<tr>
<td>The Americas</td>
<td>Amr-A: 7% Amr-B: 6% Amr-C: 5% Amr-D: 4%</td>
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<tr>
<td>Europe</td>
<td>Eur-A: 23% Eur-B: 23% Eur-C: 24%</td>
</tr>
<tr>
<td>Eastern Mediterranean</td>
<td>Eur-A: 23% Eur-B: 24% Eur-C: 26%</td>
</tr>
<tr>
<td>Africa</td>
<td>Afri-D: 24% Afri-E: 18% Sear-B: 18% Sear-D: 17%</td>
</tr>
<tr>
<td>South-East Asia</td>
<td>Wpr-A: 17% Wpr-B: 17%</td>
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<tr>
<td>Western Pacific</td>
<td>Wpr-A: 17% Wpr-B: 17%</td>
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Blood lead levels above 10 µg/dl are a serious cause for concern.

**Lead in children’s blood**

Mean blood lead level in urban children by WHO sub-region 2002 or latest available data

<table>
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<tr>
<th>Micrograms per decilitre (µg/dl)</th>
<th>Lead level</th>
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<tbody>
<tr>
<td>5.0 and under</td>
<td>no data</td>
</tr>
<tr>
<td>5.1 – 10.0</td>
<td>10.1 – 15.0</td>
</tr>
<tr>
<td>over 15.0</td>
<td>20.0 – 24.9</td>
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21.9% of African-American children in older housing are poisoned by lead compared with 2.2% of all American children.
Safe Food: Crucial for Child Development

The proper development of the human brain is one of the biggest mysteries of biology. This complex, rapid process – at times 250 000 neurons are added per minute – is uniquely vulnerable to environmental influences in air, water and, in particular, food.

Babies with toxoplasmosis, contracted by the mother from a parasite in undercooked meat, suffer brain damage and blindness. This disorder affects up to 1 in every 1000 live births. Methylmercury, which also harms brain development, is a particular threat to children living in coastal areas where they eat predatory fish such as swordfish and shark.

Children come into contact with microbes and hazardous chemicals through many pathways: through the placenta to the developing fetus, through breast milk to the nursing infant, or directly through contaminated food. The young are more susceptible to foodborne diseases because they eat more in proportion to their body weight than adults, have rapidly growing organ systems, and have fewer defences against toxins.

Dioxins, dibenzofurans, and polychlorinated biphenyls are persistent organic pollutants (POPs) that work their way up the food chain by dissolving and remaining stored in the body fat of animals. These so-called “endocrine disruptors” may upset a child’s hormone balance.

Food safety is one of the most important preventive measures to protect infants and children. The solution lies in good hygiene and, ultimately, in reducing emissions of hazardous substances into our environment.

Foodborne pathogens are responsible for up to 70% of diarrhoea in infants and children worldwide.

**Foodborne pathogens**
- Toxoplasmosis: Women infected during pregnancy can transmit the infection to the fetus, leading to stillbirths, birth defects and mental retardation.
- Listeriosis: Women infected during pregnancy can transmit the infection to the fetus, leading to spontaneous abortion or infants born with visual and mental problems.
- Heavy metals: Lead and methylmercury can cross the placenta. These neurotoxic substances result in IQ depression and behavioural problems.
- POPs: POPs (persistent organic pollutants) can cross the placenta and lead to behavioural problems, hormone disturbances, and cancer.
- Alcohol: Maternal prenatal alcohol use causes severe birth defects and developmental disabilities, ranging from growth retardation and subtle changes in I.Q. to fetal alcohol syndrome characterized by brain disorders and facial malformations.

**Pollutants lurking in vegetation**
- Mean concentration of dioxins and furans (TEQ units) in vegetation 2000 picograms per gram of vegetation (pg/g)

**Safer breast milk**

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<td>20</td>
<td>14</td>
</tr>
<tr>
<td>Germany</td>
<td>24</td>
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<td>Finland</td>
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<td>12</td>
<td>9</td>
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<tr>
<td>Czech Republic</td>
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<td>13</td>
<td>9</td>
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<tr>
<td>Slovak Republic</td>
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<td>Ukraine</td>
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<tr>
<td>Norway</td>
<td>14</td>
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<td>Croatia</td>
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<td>11</td>
<td>7</td>
</tr>
<tr>
<td>Hungary</td>
<td>13</td>
<td>11</td>
<td>8</td>
</tr>
</tbody>
</table>

In Europe, this downward trend will be sustained, with many countries having implemented the Stockholm Convention (2001) to reduce or eliminate the emission of 12 persistent organic pollutants (POPs) into the environment.

The advantages of breastfeeding far outweigh the potential risks from environmental pollutants. Failing to Account Breastfeeding’s Short-and Long-term Health Benefits for Children and Mothers, WHO recommends breastfeeding in all but extreme circumstances.

Breastfeeding is essential to the health of babies, as well as to the health of mothers. The advantages of breastfeeding far outweigh the potential risks from environmental pollutants. Therefore, WHO recommends breastfeeding in all but extreme circumstances.
Poisoning: Hidden Peril for Children

Young children are naturally inquisitive – opening, eating, and drinking what adults would recognize as poisonous. Drinking kerosene, which is often stored in soft-drinks bottles, is a common problem in developing countries. In industrialized countries, children may swallow medicines such as pain killers, iron supplements and antidepressants, which often look like sweets. Snakebites, scorpion stings, poisonous plants and fungi can also cause acute health effects in children. Concern is growing about the impact of chronic exposure to pesticide residues and heavy metals in food.

Poisons centres around the world advise on treatment, record incidents, raise awareness and promote prevention campaigns. Despite their efforts, more than 35 000 children aged 0 to 14 years die every year as a result of unintentional poisoning. Educating both adults and children, and encouraging the safe storage, use and disposal of toxic substances such as kerosene, bleaches and pesticides, can reduce this toll. Moreover, the use of child-resistant packaging for medicines and household products limits children’s access to toxic substances.
Lead has been added to gasoline (petrol) since the 1920s as an anti-knocking agent, to improve fuel performance and reduce wear on vehicle engines. In developed countries, concern about the health impacts of lead (see map 14) emitted by vehicles grew during the 1970s. This, together with the fact that lead interferes with the pollution control devices in automobiles, spurred the introduction of lead-free gasoline.

Blood lead levels of children have been falling dramatically in countries that phased out leaded gasoline, with an average 7.8 percent reduction per year. Using unleaded gasoline makes economic sense: countries can save five to 10 times the conversion cost in health and economic benefits between US$ 110 and US$ 319 billion every year. Many poorer countries, however, have yet to make the switch because of the costs involved in modernizing refineries.

Eliminating lead from gasoline is the single most important action to reduce children’s exposure to lead and is a prerequisite for additional air-pollution control measures: unleaded gasoline is needed for using catalytic converters, which reduce emissions of nitrogen oxides and other harmful air pollutants.
Education and health form a virtuous circle. Healthy, attentive and secure children can fully participate in classroom activities to achieve their full potential. And better education leads to improved health: the educated child will grow to live an informed, healthy lifestyle and, through better earnings, will be able to afford health services.

Implementing this vision constitutes the philosophy of a Health-Promoting School: a school where children are taught to understand their bodies and how to treat them well, a school that provides an environment free of physical hazards such as unsafe food or mosquito-breeding sites, and free of violence and harassment. It is a place where medical services, such as immunisation, can be delivered safely, and where teachers and children are encouraged to be ambassadors for health in their families and communities.

The concept of environmental health – a healthy environment for learning, coupled with a curriculum that reinforces the importance of safe environments in general – is one of the pillars of Health-Promoting Schools.

As yet, this concept has not been widely translated into day-to-day practice. However, the global movement Education for All recently called for the provision of clean water and decent sanitation facilities – separate for boys and girls – as a first step in creating a safe school environment. This opens up the potential for improving children's health and environment overall.

**A safe school**

**Features of a healthy school environment**

Provision of basic necessities:  
- Shelter  
- Warmth, light and ventilation  
- Water  
- Food  
- Toilets  
- Emergency medical care

Protection from biological threats:  
- Moulds  
- Dirty water  
- Unsafe food  
- Vector-borne diseases  
- Animal bites and stings

Protection from physical threats:  
- Traffic accidents  
- Violence and crime  
- Injuries  
- Radiation

Protection from chemical threats:  
- Air pollution and tobacco smoke  
- Water pollution  
- Pesticides  
- Hazardous waste  
- Asbestos, paint and cleaning agents

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**The global network in one continent**

Number of Health-Promoting Schools in Latin America 2001–2003

- **World Health Day**
- Latin American countries that introduced activities in schools as part of World Health Day 2003 on Healthy Environments for Children

In 2001, the Caribbean forged ahead and created its own network of Health-Promoting Schools.
The discovery of a hole in the ozone layer over the Antarctic in 1985 sounded the alarm. Chlorofluorocarbons (CFCs), and other industrial chemicals released into the atmosphere, were destroying the stratospheric ozone, which shields the Earth from harmful ultraviolet (UV) radiation from the sun. Concern about the link between a thinning ozone layer and an increase in skin cancer prompted countries to sign the Montreal Protocol (1987) to phase out ozone-depleting substances.

While small doses of sunlight help the body produce vitamin D, excessive UV radiation damages the skin and eyes. Every year, more than 130 000 malignant melanomas, and between 2 million and 3 million non-melanoma skin cancers arise, particularly among fair-skinned people. Children are most at risk, as exposure to the sun during childhood appears to set the stage for the development of skin cancer later in life.

The Global Solar UV Index, reported on many weather forecasts, is a daily reminder to stay alert in the sun. Encouraging individuals to protect themselves — by seeking shade and wearing suitable clothes — remains the key to preventing 66 000 people from dying from skin cancer every year.

The Montreal Protocol has proved that the world can work together to solve global environmental problems. Hopefully, the lessons learned can help us meet even greater challenges to preserve our planet’s and our children’s health.
Climate Change

The world is getting hotter. Industry, vehicles and homes burn fossil fuels, releasing gases that trap the sun’s energy. These gases also change the weather: storms, floods and droughts are becoming more common. With the oceans warming and expanding, the sea level will rise, threatening coasts and small islands with flooding.

Children’s health will suffer as a result of heat waves, increased air pollution and floods. Higher temperatures will speed up the development of the malaria parasite, leading to higher malaria transmission rates. As rains fall, crops wither and livestock die. Children will face starvation and diminishing water supplies for drinking and hygiene.

Climate change represents one of the greatest environmental and health equity challenges of our times: wealthy, energy-consuming nations are most responsible for global warming, yet vulnerable, low-income populations, least prepared for the impacts of climate change, are most at risk.

The extent of climate change is uncertain, but this irreversible global experiment represents a gamble with our children’s future. The failure of the global community to come together and implement a meaningful strategy to reduce greenhouse gas emissions does not breed optimism.
Highs and Lows of Environmental Health

30 million bc Fossils of mosquitoes, found in Africa, illustrate that the vector for malaria was present well before Homo sapiens.

3000–1500 bc Stone water closets are built in the Palace of Knossos, Crete—the oldest example of flushing technology.

2000 bc Ancient Hindu source advises people to heat foul water by boiling and exposing it to sunlight.

476 AD Lead acetate is added as a sweetener to wine and food. This, along with lead leaching into drinking water from leaded pipes and vessels, hastens the decline of the Roman Empire.

11th century The Persian physician Ibn Sina (Avicenna) advises travelers to boil or strain drinking water.

13th century Holy Roman Emperor Frederick II (1194–1250) installs pour-flush toilets in his Castel del Monte, inspired by Arab technology.

1589 In England, Sir John Harrington invents the water closet, but the invention is ignored until 1778, when Joseph Bramah begins marketing a patented closet.

1690s Joseph Bramah begins marketing a flush toilets in his Castel del Monte, identifying dirty water supplies as the cause of cholera outbreaks in London.

1775 In England, Sir John Harrington invents the water closet, but the invention is ignored until 1778, when Joseph Bramah begins marketing a patented closet.

1842 The British Royal Commission on Employment of Children in Mines reports “outrageous revolting to humanity,” finding children chained to carts and working 15-hour days.

1859 Percival Pott notes an elevated incidence of scrotal cancer in small boys assisting chimney sweeps.

1860s Paris is the first European city to build an extensive sewerage system.

1875 Perception Pott notes an elevated incidence of scrotal cancer in small boys assisting chimney sweeps.

1900s In Europe, mercury used in the felting process poisons hat workers, giving rise to the expression “mad as a hatter.”

1908 The Swedish chemist Svante Arrhenius argues that the greenhouse effect from coal and petroleum use is warming the globe.

1940s Shortly after the Second World War, chloroquine is introduced as an effective prophylaxis and treatment against all forms of malaria.

1950 Puza Rika killer smog, caused by gas fumes from an oil refinery, leaves 8000 people and maiming many more. Most of the victims lived in squatter settlements near the plant.

1986 The Chernobyl nuclear reactor explodes. Radioactive materials severely contaminate large areas of Belarus and Ukraine and are spread by wind and rain all over Europe.


1990s The installation of wells helps reduce child mortality in Bangladesh but exposes children to high levels of arsenic.


1997 The Kyoto Protocol sets targets for developed countries to reduce their emissions of greenhouse gases to combat global warming.

1999s In the USA, Dr. Wendell Holmes proclaims the importance of hand washing to control the spread of disease.

1983 Louis Pasteur discovers that heat removes undesirable organisms. Today, pasteurization is used to prevent the spoilage of milk and milk products.

1985 John Snow publishes On the Mode of Communication of Cholera, identifying dirty water supplies as the cause of cholera outbreaks in London.

1997 Singapore bans smoking in buses, cinemas, theatres and other public places.

1978 Rice oil contaminated with polychlorinated biphenyls (PCBs) causes Yucheng (“oil-disease”) in Taiwan, China. Children of affected women suffer developmental delays and behaviour problems.

1988–98 China’s National Improved Stoves Programme provides more than half of rural households with more efficient, cleaner cooking technologies. 185 million improved stoves help prevent pneumonia and other respiratory infections—the biggest killer of Chinese children.

1984 Methyl isonitrate gas leaks from a Union Carbide pesticide plant in Bhopal, India, killing 38000 people and maiming many more. Most of the victims lived in squatter settlements near the plant.

1986 The Chernobyl nuclear reactor explodes. Radioactive materials severely contaminate large areas of Belarus and Ukraine and are spread by wind and rain all over Europe.


1996 The installation of wells helps reduce child mortality in Bangladesh but exposes children to high levels of arsenic.

2012 Agenda 21: the United Nations introduces a world programme of action on sustainable development, linking the environment, economy and society.

2017 The Kyoto Protocol sets targets for developed countries to reduce their emissions of greenhouse gases to combat global warming.

WHO Sub-Regions

The 192 Member States of the World Health Organization have been classified into five mortality strata according to their level of mortality in children under five years, and in males aged 15–50 years.

<table>
<thead>
<tr>
<th>Mortality strata</th>
<th>Child mortality</th>
<th>Adult male mortality</th>
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<tbody>
<tr>
<td>A</td>
<td>very low</td>
<td>very low</td>
</tr>
<tr>
<td>B</td>
<td>low</td>
<td>high</td>
</tr>
<tr>
<td>C</td>
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<td>high</td>
</tr>
<tr>
<td>D</td>
<td>high</td>
<td>high</td>
</tr>
<tr>
<td>E</td>
<td>very high</td>
<td>very high</td>
</tr>
</tbody>
</table>

These strata have been applied to countries within the six WHO regions, producing 14 sub-regions.

Africa

Afr-D
Africa with high child and high adult mortality

Afr-E
Africa with high child and very high adult mortality

The Americas

Amr-A
Americas with very low child and very low adult mortality

Amr-B
Americas with low child and low adult mortality

Amr-D
Americas with high child and high adult mortality

South-East Asia

Sear-B
South-East Asia with low child and low adult mortality

Scar-D
South-East Asia with high child and high adult mortality

Europe

Eur-A
Europe with very low child and very low adult mortality

Eur-B
Europe with low child and low adult mortality

Eur-C
Europe with high child and low adult mortality

Eastern Mediterranean

Emr-B
Eastern Mediterranean with low child and low adult mortality

Emr-D
Eastern Mediterranean with high child and high adult mortality

Western Pacific

Wpr-B
Western Pacific with very low child and very low adult mortality

Wpr-D
Western Pacific with low child and low adult mortality

* Following improvements in child mortality over recent years, Egypt meets criteria for inclusion in sub-region Emr-B with low child and low adult mortality. Egypt has been included in Eur-B for the presentation of sub-regional trends for mortality and burden to ensure comparability with previous editions of The World Health Report and other WHO publications.

** Although Cambodia, the Lao People’s Democratic Republic, and Papua New Guinea meet criteria for high child mortality, they have been included in the Wpr-B sub-region with other developing countries of the Western Pacific Region for reporting purposes.
<table>
<thead>
<tr>
<th>Country</th>
<th>Population 2002</th>
<th>Gross National Income (US$ per capita 2001)</th>
<th>Child mortality % of households with access to improved water supply under-five mortality (per 1000 live births 2000)</th>
<th>Water % of households with access to improved sanitation 2000 or latest available data</th>
<th>Sanitation % of households without access to improved sanitation 2000 or latest available data</th>
<th>Child labour % of children aged 5–14 years who are working 2001 or latest available data</th>
<th>Poisons centres modelled data in italics</th>
<th>Dioxins and furans mean concentration of TEQ units in vegetation (pg/g) 2004</th>
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<td>50%</td>
<td>250</td>
<td>257</td>
<td>13%</td>
<td>88%</td>
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<td>&gt; 95%</td>
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<td>9%</td>
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<td>32%</td>
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<td>8%</td>
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<td>4%</td>
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<td>51%</td>
<td>–</td>
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<td>&lt; 5%</td>
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<td>Congo, Dem. Rep.</td>
<td>51 201</td>
<td>54%</td>
<td>90</td>
<td>212</td>
<td>45%</td>
<td>79%</td>
<td>–</td>
<td>&lt; 5%</td>
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<td>Cook Islands</td>
<td>18</td>
<td>44%</td>
<td>23</td>
<td>23</td>
<td>100%</td>
<td>0%</td>
<td>–</td>
<td>&lt; 5%</td>
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<td>4 094</td>
<td>37%</td>
<td>4 100</td>
<td>11</td>
<td>95%</td>
<td>7%</td>
<td>–</td>
<td>&lt; 5%</td>
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<td>Côte d’Ivoire</td>
<td>16 265</td>
<td>49%</td>
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<td>167</td>
<td>81%</td>
<td>48%</td>
<td>–</td>
<td>&gt; 95%</td>
<td>–</td>
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<tr>
<td>Croatia</td>
<td>4 439</td>
<td>21%</td>
<td>4 640</td>
<td>8</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>&gt; 95%</td>
<td>–</td>
</tr>
<tr>
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<td>11 271</td>
<td>25%</td>
<td>1 170</td>
<td>9</td>
<td>91%</td>
<td>2%</td>
<td>–</td>
<td>&lt; 5%</td>
<td>–</td>
</tr>
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<td>796</td>
<td>27%</td>
<td>12 320</td>
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<td>19%</td>
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<td>–</td>
<td>–</td>
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<td>–</td>
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<td>22%</td>
<td>30 290</td>
<td>6</td>
<td>100%</td>
<td>0%</td>
<td>–</td>
<td>&lt; 5%</td>
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<td>Country</td>
<td>Population 2002</td>
<td>Gross National Income (GNI) per capita</td>
<td>Child mortality under-five mortality per 1000 live births 2000</td>
<td>Water collection % of population who must travel more than half an hour to fetch water 2003 or latest available date</td>
<td>Indoor smoke % of households using solid fuel for cooking 2000 or latest available data</td>
<td>Child labour % of children aged 5–14 years who are working 2001 or latest available data</td>
<td>Poisons centres number 2004</td>
<td>Dioxins and furans mean concentration of TEQ units in vegetation (pg/g) 2000</td>
<td>Country</td>
</tr>
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<td>693 50%</td>
<td>900 150</td>
<td>100%</td>
<td>9%</td>
<td>–</td>
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<td>78 34%</td>
<td>3 180 14</td>
<td>97%</td>
<td>17%</td>
<td>–</td>
<td>–</td>
<td>–</td>
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</tr>
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<td>8 616 39%</td>
<td>2 320 37</td>
<td>86%</td>
<td>33%</td>
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<td>1 450 36</td>
<td>85%</td>
<td>14%</td>
<td>–</td>
<td>–</td>
<td>–</td>
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<td>70 507 42%</td>
<td>1 470 45</td>
<td>97%</td>
<td>2%</td>
<td>–</td>
<td>–</td>
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<td>77%</td>
<td>18%</td>
<td>–</td>
<td>–</td>
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<td>3 991 52%</td>
<td>160 112</td>
<td>46%</td>
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<td>–</td>
<td>–</td>
<td>–</td>
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<td>1 338 22%</td>
<td>4 130 11</td>
<td>93%</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
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<tr>
<td>Ethiopia</td>
<td>68 961 52%</td>
<td>100 179</td>
<td>24%</td>
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<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
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<tr>
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<td>831 39%</td>
<td>2 160 28</td>
<td>47%</td>
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<td>1 306 48%</td>
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<td>1 388 47%</td>
<td>280 128</td>
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<td>650 23</td>
<td>79%</td>
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<td>–</td>
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<tr>
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<td>270 105</td>
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<td>10 970 18%</td>
<td>11 660 7</td>
<td>–</td>
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<tr>
<td>Grenada</td>
<td>80 35%</td>
<td>3 500 23</td>
<td>95%</td>
<td>3%</td>
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<td>Guatemala</td>
<td>12 036 50%</td>
<td>1 750 56</td>
<td>92%</td>
<td>19%</td>
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<td>–</td>
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<td>–</td>
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<td>8 359 51%</td>
<td>410 163</td>
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<td>42%</td>
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<td>–</td>
<td>Guinea</td>
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<tr>
<td>Guinea-Bissau</td>
<td>1 449 53%</td>
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<td>56%</td>
<td>44%</td>
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<tr>
<td>Guyana</td>
<td>764 36%</td>
<td>840 58</td>
<td>94%</td>
<td>13%</td>
<td>–</td>
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<td>–</td>
<td>Guyana</td>
</tr>
<tr>
<td>Haiti</td>
<td>8 218 47%</td>
<td>440 136</td>
<td>46%</td>
<td>72%</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
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<tr>
<td>Honduras</td>
<td>6 781 48%</td>
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<td>88%</td>
<td>25%</td>
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<tr>
<td>Hungary</td>
<td>9 933 20%</td>
<td>5 290 11</td>
<td>–</td>
<td>1%</td>
<td>–</td>
<td>–</td>
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<td>–</td>
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<tr>
<td>Iceland</td>
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<td>27 070 3</td>
<td>–</td>
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<td>–</td>
<td>–</td>
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<tr>
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<td>1 049 549</td>
<td>480 96</td>
<td>84%</td>
<td>72%</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>India</td>
</tr>
<tr>
<td>Indonesia</td>
<td>217 131 36%</td>
<td>710 50</td>
<td>78%</td>
<td>45%</td>
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<td>92%</td>
<td>17%</td>
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<td>85%</td>
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<tr>
<td>Ireland</td>
<td>3 911 26%</td>
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<td>–</td>
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<td>–</td>
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<td>6 304 33%</td>
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<td>–</td>
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<td>–</td>
<td>–</td>
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<tr>
<td>Italy</td>
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<td>–</td>
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<td>2 627 37%</td>
<td>1 820 16</td>
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<td>127 478 18%</td>
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<td>–</td>
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<td>Japan</td>
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<tr>
<td>Jordan</td>
<td>5 329 45%</td>
<td>1 760 28</td>
<td>96%</td>
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<td>–</td>
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<td>15 469 32%</td>
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<td>91%</td>
<td>1%</td>
<td>–</td>
<td>–</td>
<td>–</td>
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</tr>
<tr>
<td>Kenya</td>
<td>31 540 50%</td>
<td>360 113</td>
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<td>13%</td>
<td>–</td>
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<td>–</td>
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<td>Kiribati</td>
<td>87 42%</td>
<td>810 77</td>
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<td>22 541 33% 65%</td>
<td>1 560 55</td>
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<td>92%</td>
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<td>–</td>
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<td>–</td>
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<td>5 067 39%</td>
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<td>70%</td>
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<td>Lebanon</td>
<td>3 596 36%</td>
<td>3 990 34</td>
<td>100%</td>
<td>1%</td>
<td>–</td>
<td>–</td>
<td>–</td>
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<td>Country</td>
<td>Population 2002</td>
<td>Gross National Income (GNI) 2002 per capita</td>
<td>Child mortality under-five mortality per 1000 live births 2000</td>
<td>Water % of households with access to improved water supply 2000 or latest available data</td>
<td>Indoor smoke % of households using solid fuel for cooking 2000 or latest available date</td>
<td>Child labour % of children aged 5-14 years who are working 2000 or latest available date</td>
<td>Poisons centres number 2004</td>
<td>Dioxins and furans mean concentration of TEQ units in vegetation (pg/g) 2000</td>
<td>Country</td>
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<tr>
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<td>Lesotho</td>
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<td>470</td>
<td>149</td>
<td>78%</td>
<td>85%</td>
<td>0</td>
<td>0</td>
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<td>3 239</td>
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<td>83%</td>
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<td>5 445</td>
<td>5 540</td>
<td>20</td>
<td>73%</td>
<td>3%</td>
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<td>6 660</td>
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<td>0.3</td>
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<td>&lt; 5%</td>
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<th>Sanitation % of households without access to improved sanitation 2000 or later available data</th>
<th>Water collection % of population who must travel more than half an hour to fetch water 2001 or latest available data</th>
<th>Indoor smoke % of households using solid fuel for cooking 2000 or latest available data</th>
<th>Child labour % of children aged 5-14 years who are working 2001 or latest available data</th>
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<td>–</td>
<td>Turkmenistan</td>
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<tr>
<td>Tuvalu</td>
<td>10</td>
<td>38%</td>
<td>–</td>
<td>65</td>
<td>100%</td>
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<td>250</td>
<td>147</td>
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<td>48 902</td>
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<td>2 937</td>
<td>31%</td>
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<td>10</td>
<td>–</td>
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<td>23%</td>
<td>25 250</td>
<td>7</td>
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<td>3 391</td>
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<td>25 226</td>
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<td>32%</td>
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<td>80 278</td>
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<td>–</td>
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<td>10 698</td>
<td>54%</td>
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<td>12 835</td>
<td>50%</td>
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<td>–</td>
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