Inheriting the World:

The Atlas of Children's Health and the Environment

Bruce Gordon, Richard Mackay and Eva Rehfuess

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Malaria in Africa, page 21
Africa malaria distribution map, theoretical model. Mapping Malaria Risk in Africa, 2003.

The sun's rays, page 44
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A warming planet, page 46
Livermore M (University of East Anglia), Campbell-Lendrum D (WHO). Generated in 2004 based on data from the Hadley Centre. Climate change observations and predictions. Exeter, UK Meteorological Office, 2003.

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Bruce Gordon is a member of the Healthy Environments for Children Alliance Secretariat of WHO, and a researcher in the area of health and sustainable development. Prior to joining WHO in 2002, he participated in environmental management and development studies in Thailand, Vietnam, and Peru. He was the recipient of a Canadian International Development Agency Innovative Research Award for his work in Peru on capacity-building and environmental management. He has a degree in Biochemistry from the University of British Columbia, and a Master's degree in Environmental Design from the University of Calgary. His fascination with the links between poverty, health and the environment continues to grow.

Richard Mackay is an environmental consultant. He has a science degree from the University of Cambridge, UK and a Master's degree in Environmental Management. He has implemented environmental and safety programmes for the University of Cambridge and for the business and government sectors. He is a member of the British Institute of Environmental Management and Assessment. He is the author of *The Atlas of Endangered Species* (Penguin USA/Earthscan UK, 2002), also produced by Myriad Editions. He takes a keen interest in environmental protection and ecology, including work on the Aride Island Nature Reserve, Seychelles and nature reserves in Britain.

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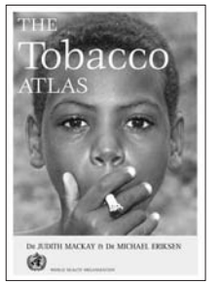
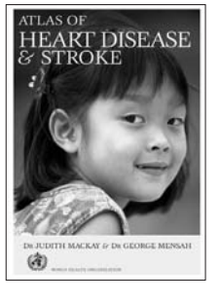




Foreword

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.

Dr LEE Jong-wook
Director-General
World Health Organization
Geneva
March 2004

1 The World's Forgotten Children

Aiko is safely delivered in Kumamoto, Japan, and can expect to live about 85 years. At the same time, Mariam comes into this world in one of the poorest areas of Freetown, Sierra Leone. She is underweight and vitamin-deficient, and has a 30% chance of dying before her fifth birthday.

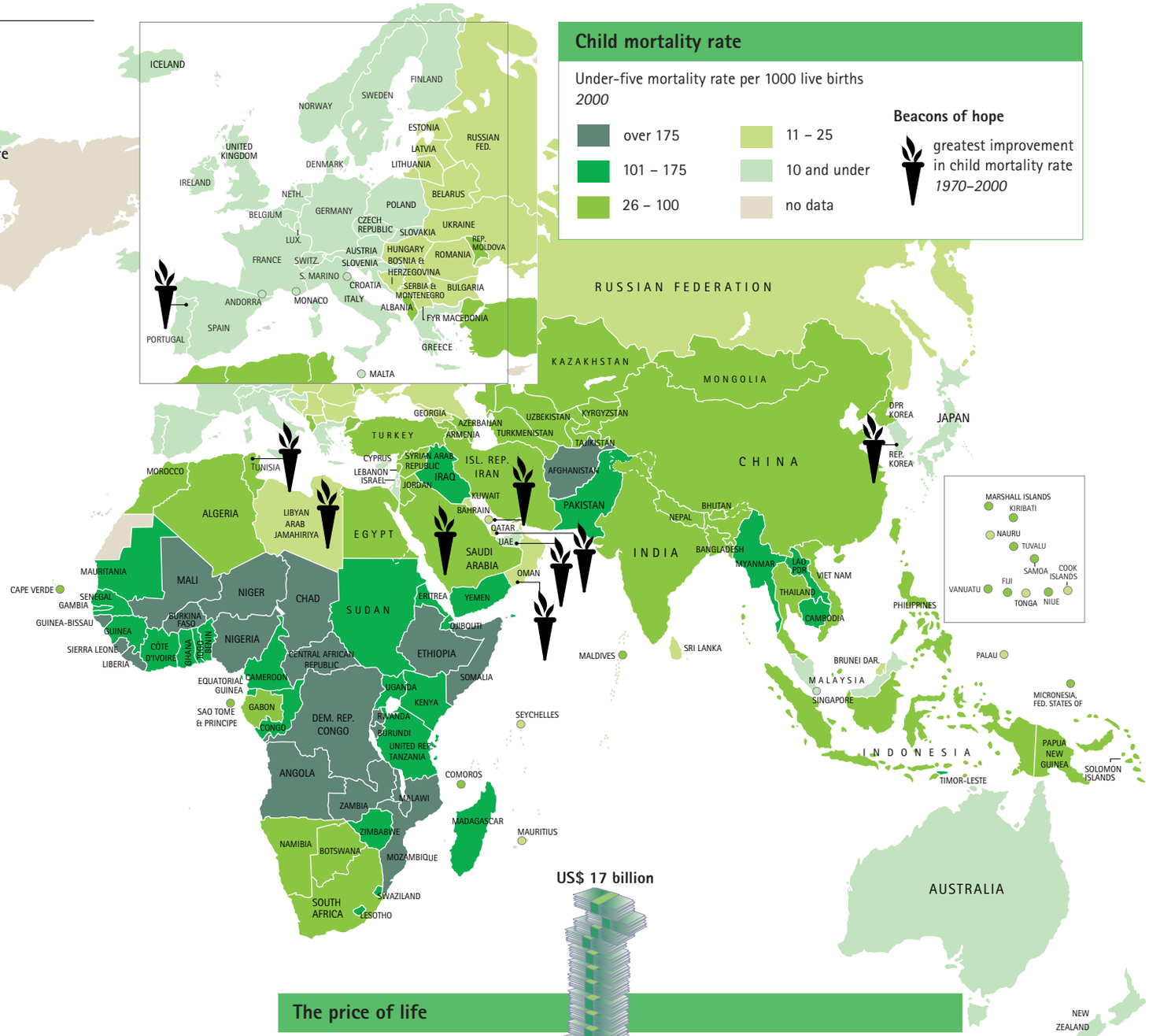
Over 10 million children under five die every year – 98 per cent of them in developing countries. Widespread malnutrition hampers children's growth and development, opening the door to the biggest killers of children under five: perinatal diseases, pneumonia, diarrhoea, and malaria. This presents a sharp 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.

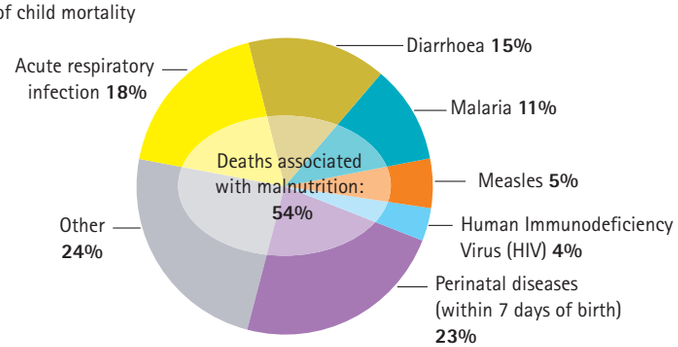
Today, 35% of Africa's children are at higher risk of death than they were ten years ago.

"It is not enough to prepare our children for the world; we must also prepare the world for our children."
Luis J. Rodriguez (1954–)

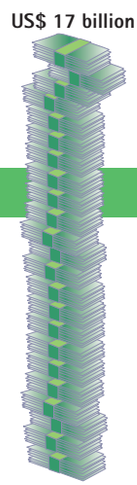


The biggest killers of children under five

Main causes of child mortality
2002

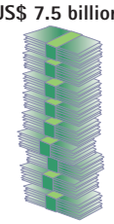


The price of life



US$ 17 billion

Annual expenditure on pet food in North America and Europe
1998



US$ 7.5 billion

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

2 Two Worlds: Rich and Poor

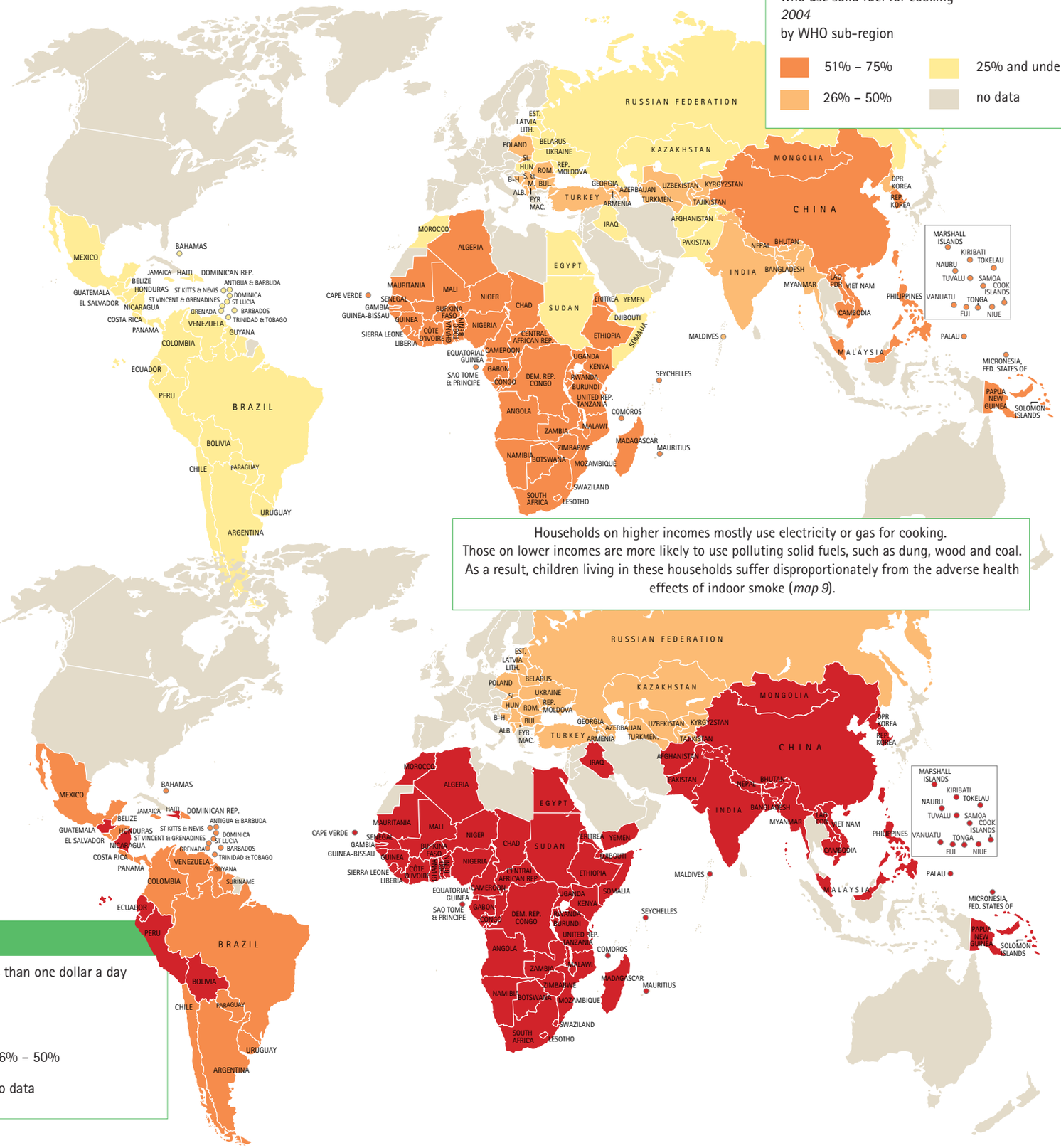
"We are all responsible for all."
Fyodor Dostoevsky (1821–1881)

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.



The rich...

Percentage of people living on more than two dollars a day who use solid fuel for cooking
2004
by WHO sub-region

- 51% – 75%
- 26% – 50%
- 25% and under
- no data

Households on higher incomes mostly use electricity or gas for cooking. Those on lower incomes are more likely to use polluting solid fuels, such as dung, wood and coal. As a result, children living in these households suffer disproportionately from the adverse health effects of indoor smoke (*map 9*).

Every year smoke from burning solid fuels in the home kills one million children under five years.

...and the poor

Percentage of people living on less than one dollar a day who use solid fuel for cooking
2004
by WHO sub-region

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

3 Traditional Hazards, New Risks

"The problems we have today cannot be solved by thinking the way we thought when we created them."
Albert Einstein (1879–1955)

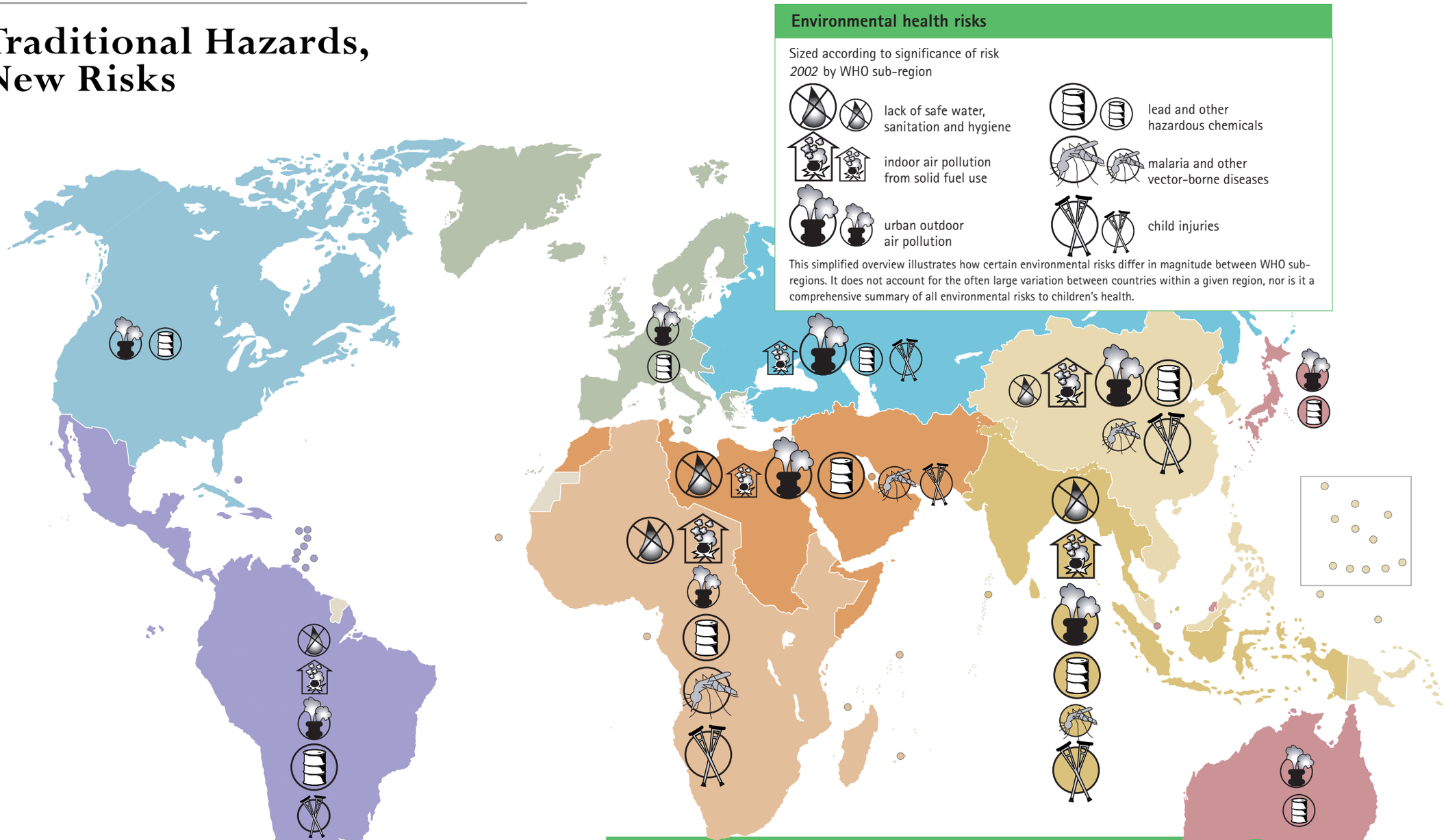
Children today live in an environment that is vastly different from that of a few generations ago. Global challenges include industrialization, rapid urban population growth, the unsustainable consumption of natural resources, the increasing production and use of chemicals, and the movement of hazardous wastes across national borders.

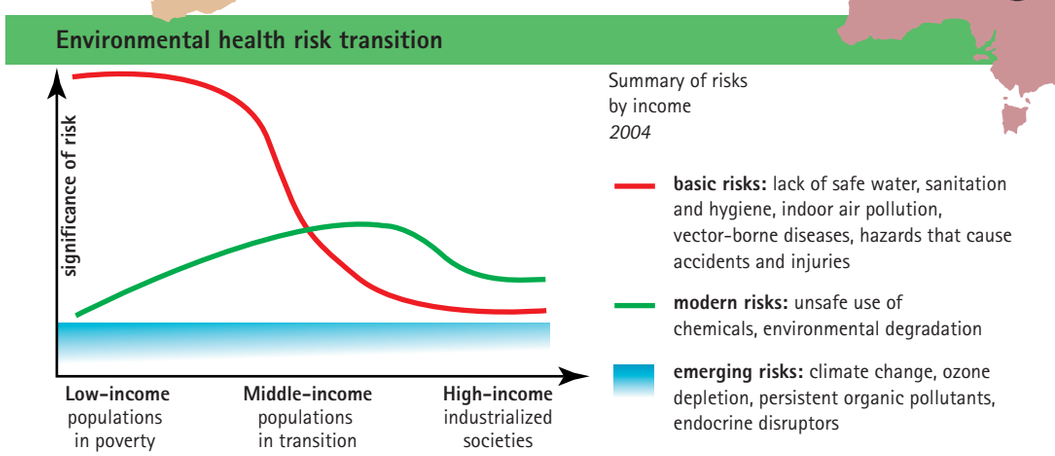
Homes, schools, streets and fields – the settings where children live, learn, play and work – all present environmental hazards. Yet, children born into different countries, cities or rural areas, and even different neighbourhoods, face risks that may be poles apart.

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.





4 Water for All: Making it Happen

"By means of water we give life to everything."
Koran

Water is the essence of life and human dignity. As a fundamental human right "sufficient, safe, acceptable, physically accessible and affordable water for personal and domestic uses" is vital for all. Governments are responsible for ensuring that this human right is progressively fulfilled. As a result of their action, in collaboration with partners, 900 million more people gained access to an improved water supply during the 1990s.

Yet 1.1 billion people in rural areas and urban slums still rely on unsafe drinking water from rivers, lakes and open wells. Children, in particular, suffer from water-related illnesses. Each episode of diarrhoea sets back a child's growth by lowering their appetite and reducing their calorie and nutrient uptake. Persistent diarrhoea and severe diseases, such as typhoid and dysentery, jeopardize children's healthy development. Every year, nearly 2 million children do not survive this struggle.

Continued progress towards providing everyone with access to protected wells and, ultimately, piped water supplies will radically reduce childhood illness. In the meantime, disinfection and filtration at home are simple and cheap measures that make an immediate difference to the lives of the worst affected.

The United Nations proclaimed the years 2005 to 2015 as the Decade of Water for Life.

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 5*)
- 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*)

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).

- over 95%
- 81% – 95%
- 61% – 80%
- 41% – 60%
- 40% and under
- no data

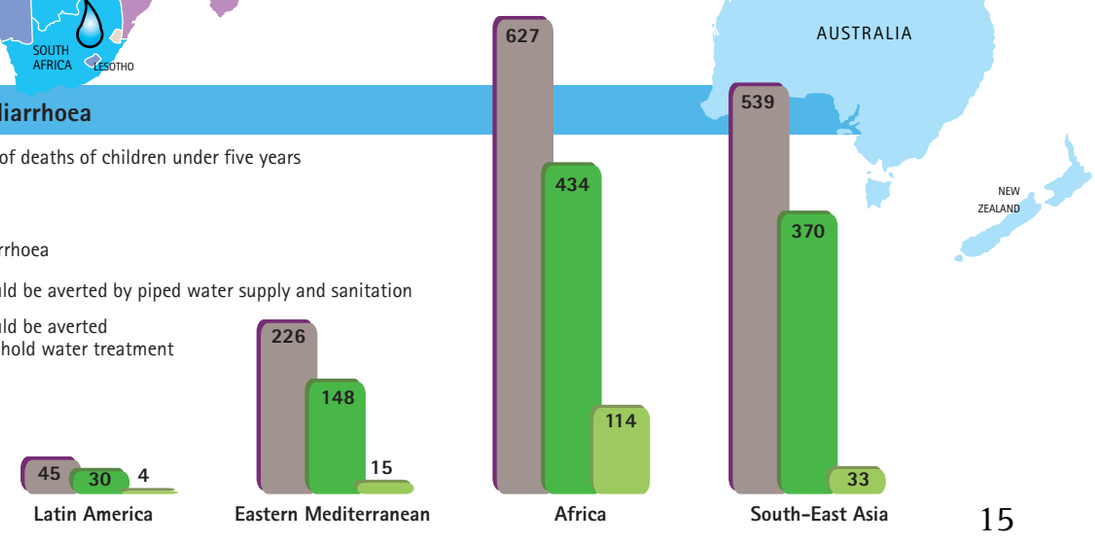
Striving ahead

multiple projects on household water management are underway
2004

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



5

Hurry Up in the Toilet: 2.4 Billion are Waiting

"Are 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–)

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.

One gram of faeces may contain 10 million viruses, 1 million bacteria, a thousand parasite cysts and a hundred worm eggs.

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

Improved sanitation facilities include flush toilets and pit latrines, if they are not shared between households and provide privacy.

- over 75%
- 51% – 75%
- 26% – 50%
- 6% – 25%
- 5% and under
- no data

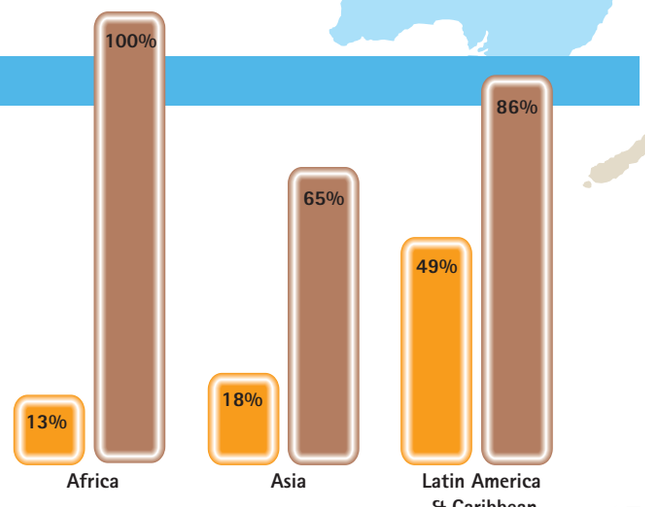
Every minute 1.1 million litres of raw sewage are dumped into the Ganges river. The same story is repeated in rivers, lakes and oceans around the world.

Sewerage services

2000

- percentage of population with a flush toilet connected to a sewer
- 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.



6 To Fetch a Pail of Water

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

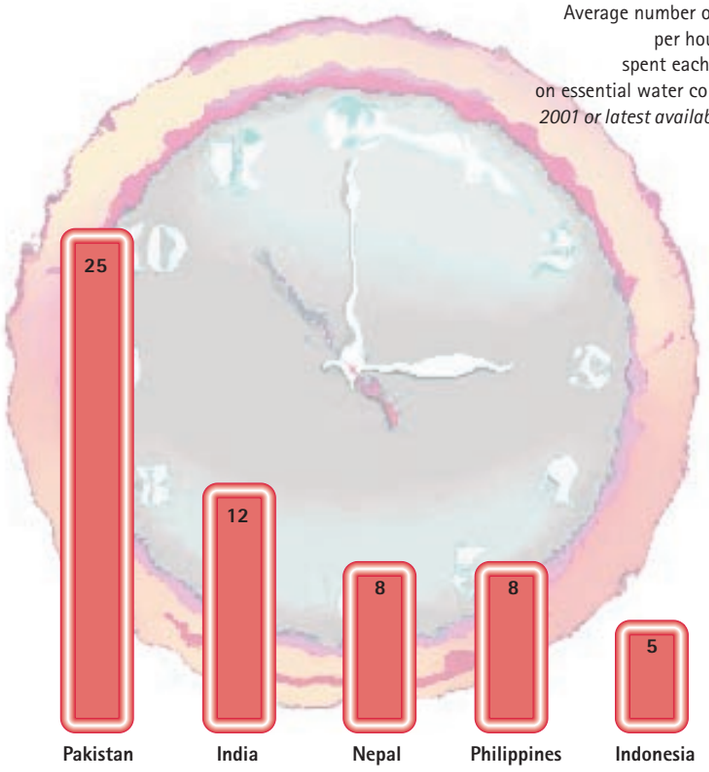
Fetching water prevents mothers from looking after their children and generating household income. The time children spend carrying heavy buckets, queuing at the water source or being sick with diarrhoea could be spent in school or on other productive tasks. In urban slums, paying hefty sums of money to a water vendor may be the only way to obtain drinking water at all.

With scarcely enough water to quench children's thirst, even less remains for hand-washing. Dirty, insufficient water causes diarrhoea and other intestinal diseases in children: the worst hit families often have no access to medical care and are least able to pay for the cost of treatment, such as oral rehydration salts.

Difficulty in obtaining water causes disease, and denies families opportunities for education and income generation, perpetuating poverty.

Time ticking away

Average number of hours per household spent each month on essential water collection
2001 or latest available data



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 heavy burden

Percentage of people who must travel more than half an hour to fetch water and return home
2001 or latest available data

- over 50%
- 26% – 50%
- 25% and over
- no data

MOROCCO
EGYPT
SENEGAL
MALI
NIGER
CHAD
GUINEA
BURKINA FASO
CÔTE D'IVOIRE
GHANA
BENIN
NIGERIA
CENTRAL AFRICAN REPUBLIC
CAMEROON
ETHIOPIA
UGANDA
KENYA
RWANDA
UNITED REP. TANZANIA
ZAMBIA
MALAWI
ZIMBABWE
MADAGASCAR
NAMIBIA
MOZAMBIQUE
SOUTH AFRICA

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.

7 Malaria

The name "*mal aria*" 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.

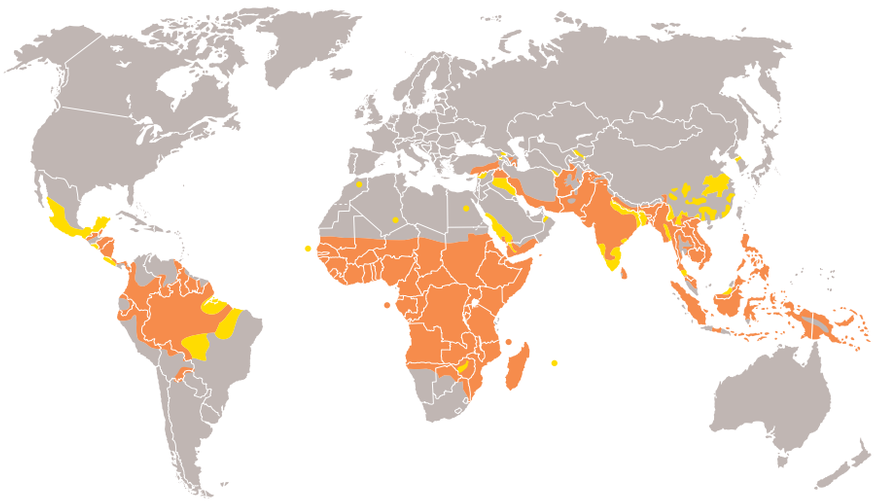
Ninety per cent of the at least one million deaths a year from malaria occur in Africa, mostly among young children. Malaria also hampers children's education: because they miss school when ill, and because severe episodes of the disease may cause permanent neurological damage. Malaria has been estimated 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.

Malaria around the world

2004

- malaria transmission occurs
- limited risk
- no malaria



Other vector-borne diseases

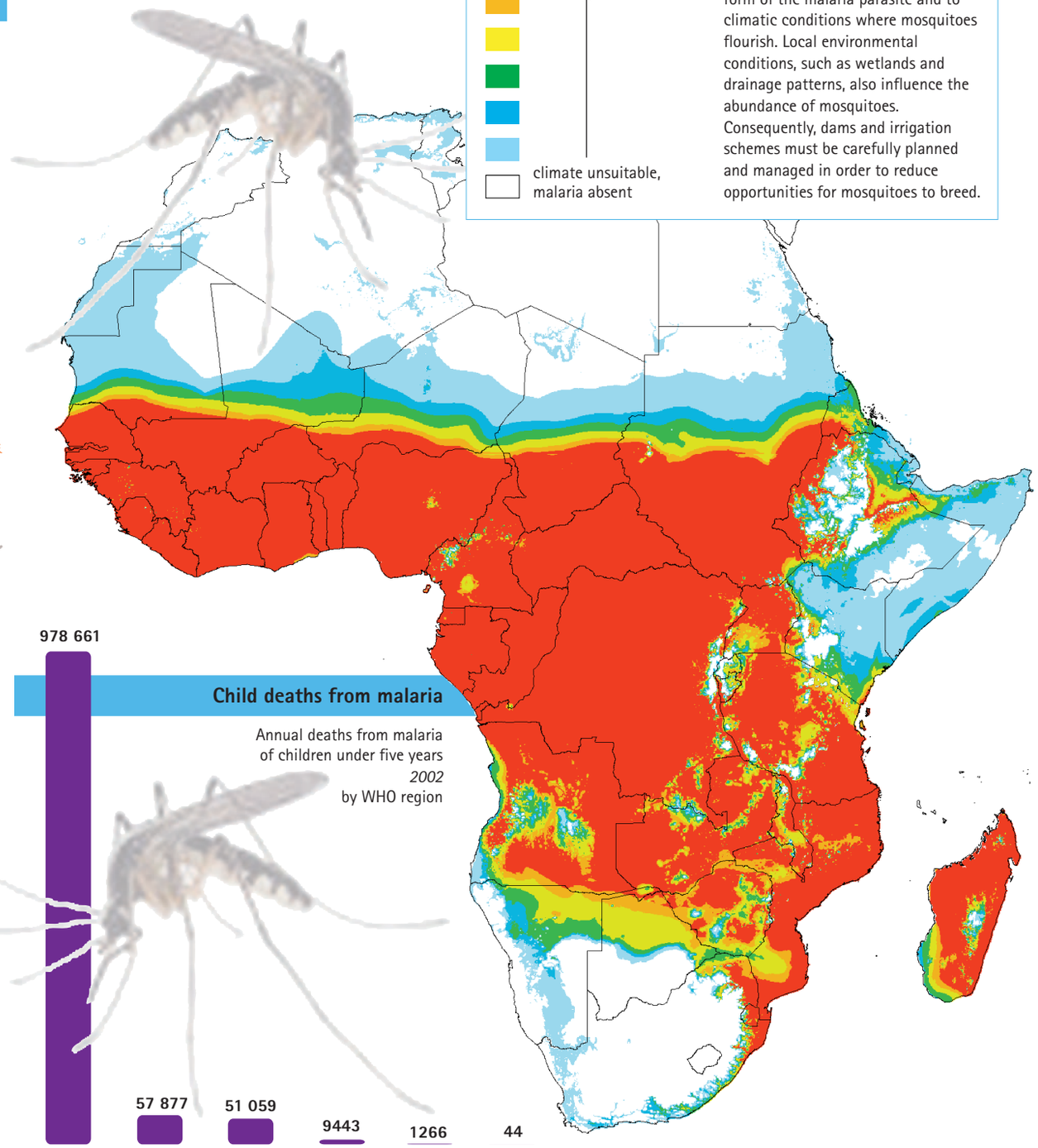
Schistosomiasis	Flat worms, whose life cycle partly takes place in freshwater snails, burrow through the skin. 200 million people, many of them children, are currently infected with schistomiasis.
Japanese encephalitis	This is a virus transmitted by mosquitoes in Asia. 90% of the cases occur in children 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.

Malaria in Africa

Suitability of climate conditions for the transmission of malaria
2004

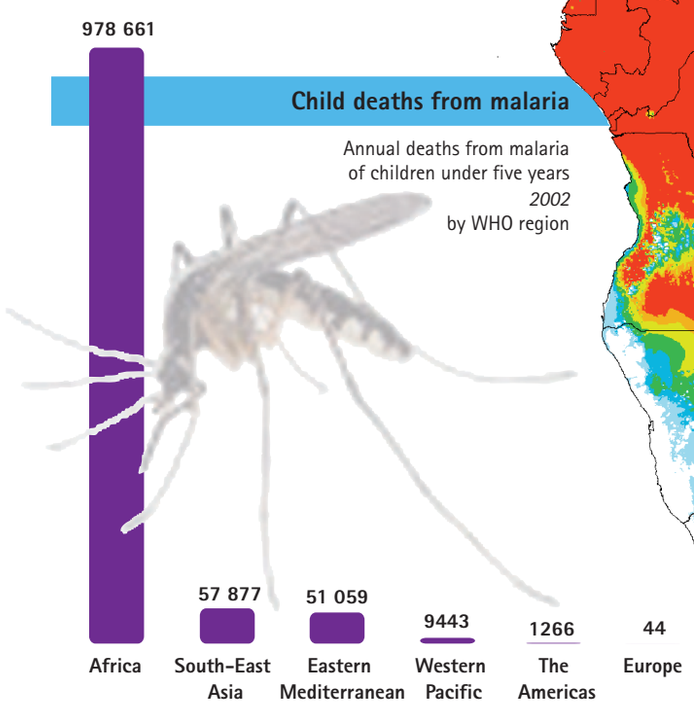
- climate suitable, malaria endemic
- climate unsuitable, malaria absent

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.



Child deaths from malaria

Annual deaths from malaria of children under five years
2002
by WHO region



8 Fluoride and Arsenic in Drinking Water

In Kachariadih village, India, a group of children with limbs twisted out of shape hobble forward with the help of walking sticks. They grin with embarrassment because they cannot run like other children their age — fluoride poisoning has crippled their limbs.

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.

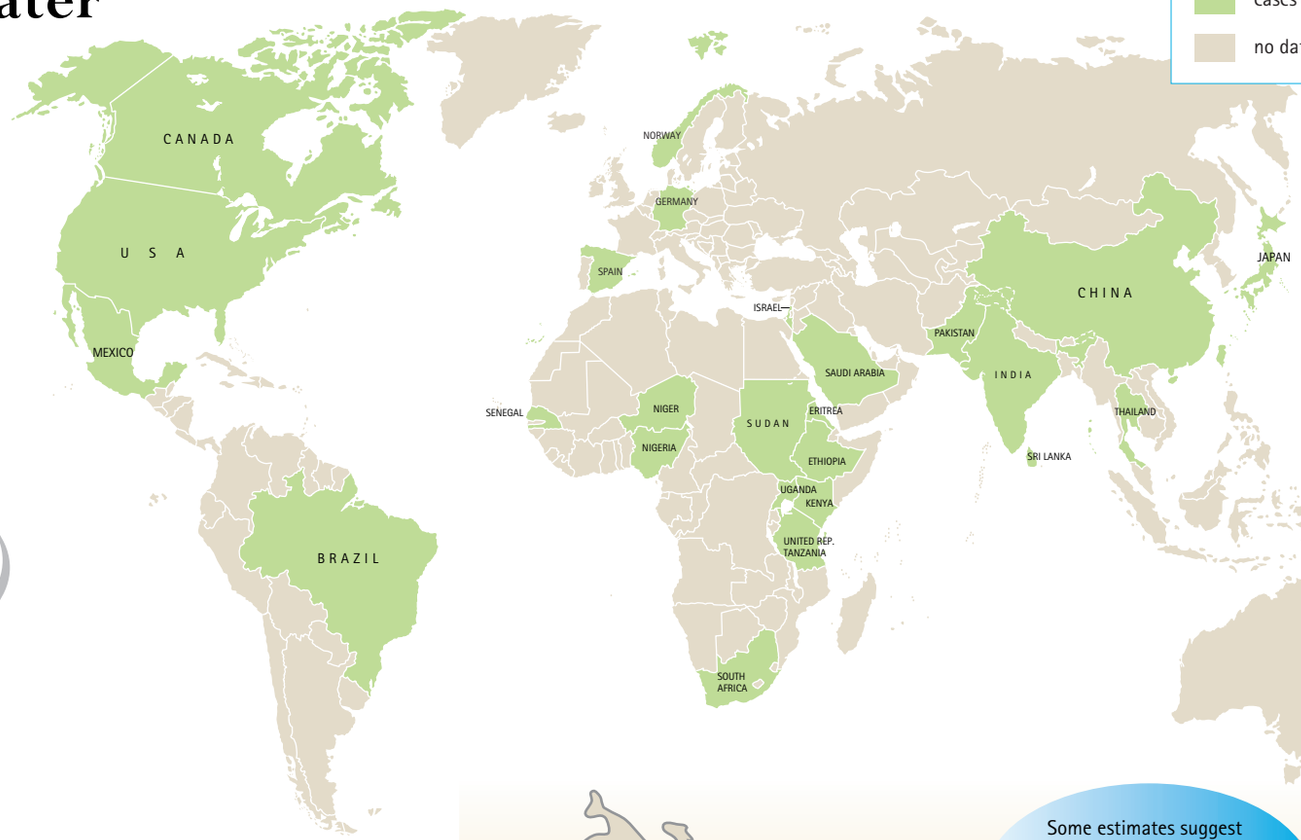
Like fluoride, arsenic is widely distributed throughout the earth's crust, and is present in almost all waters in very small amounts. In certain areas, however, there are dangerous levels of this toxin in children's drinking water. The most tragic example is Bangladesh, where thousands of wells are causing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

Health effects

Fluorosis
- Tooth discoloration and decay
- Crippling skeletal damage

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

"The dose makes the poison."
Paracelsus, physician
(1493–1541)



Fluorosis

2004 or latest available data

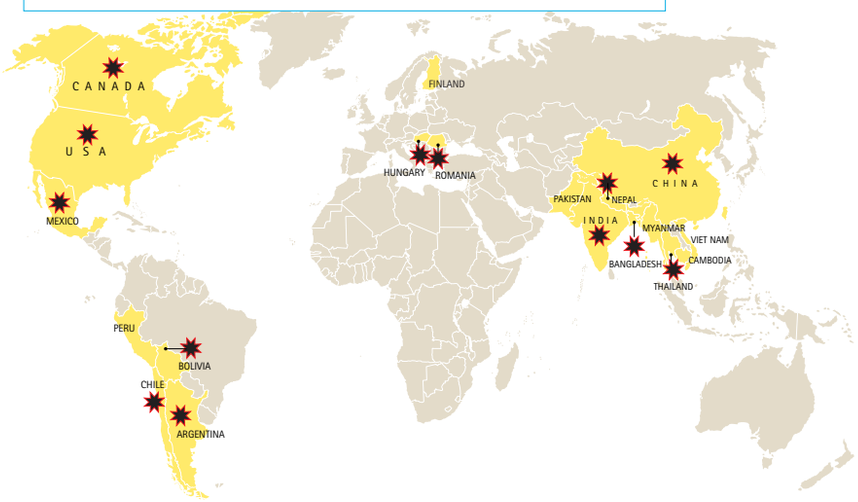
- cases of dental or skeletal fluorosis reported
- no data

There are 2 million cases of skeletal fluorosis in China.

Arsenicosis

2004 or latest available data

- elevated levels of arsenic (over 50 µg/l) reported in water
- ill-health has been reported due to arsenic-contaminated water



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

Arsenic poisoning in Bangladesh

Percentage of boreholes tested where arsenic levels are above 50 micrograms per litre (µg/l)
1999

The provisional WHO guideline value for arsenic in drinking water is set at 10 µg/l

- 75% and over
- 50% – 74%
- 25% – 49%
- under 25%
- no data

9

Indoor Smoke: Breaking Down Respiratory Defences

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.

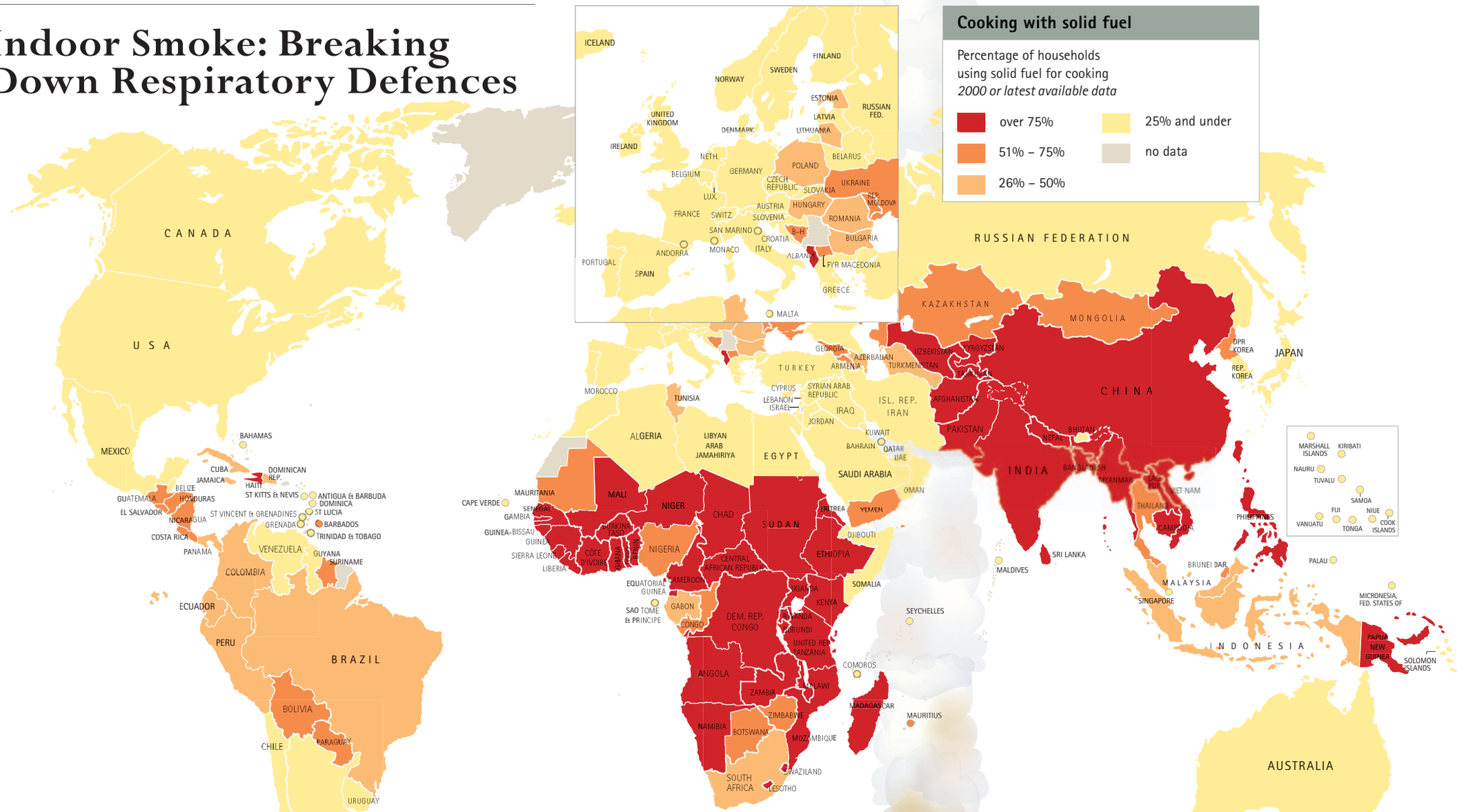
Health effects

Established effects:

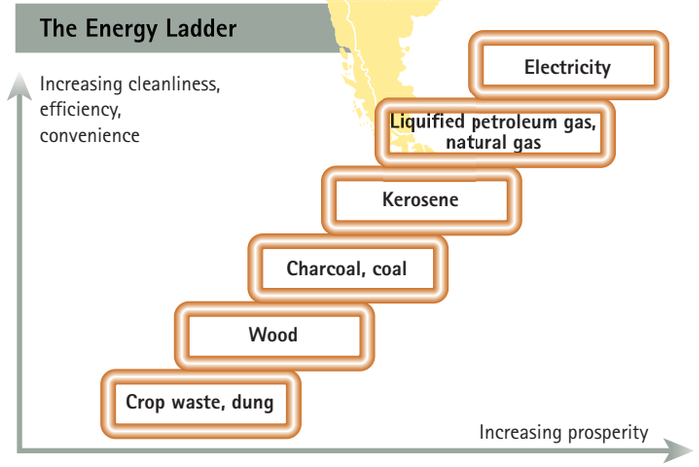
- Pneumonia and other respiratory infections
- Chronic obstructive pulmonary disease (including bronchitis, emphysema)

Suspected effects:

- Tuberculosis
- Cataracts
- Asthma
- Low birth weight
- Middle ear infection (otitis media)

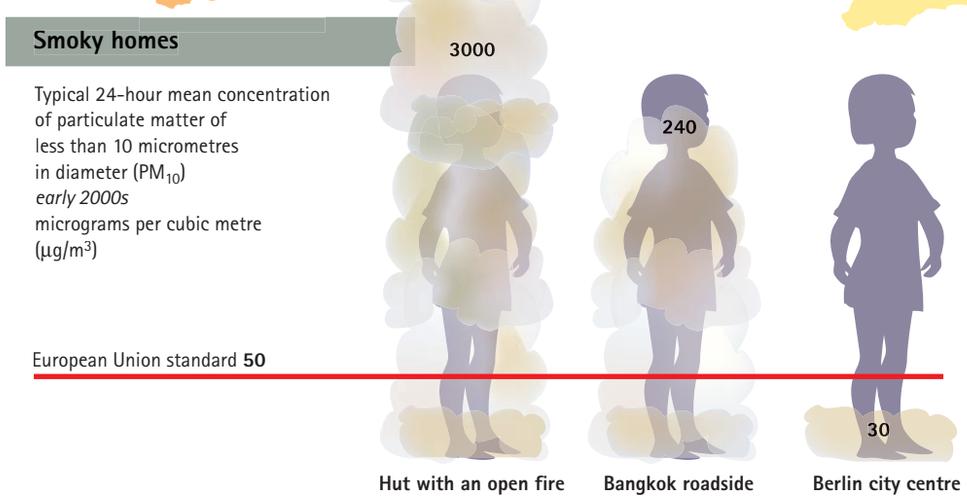


The Energy Ladder



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 ($\mu g/m^3$)



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.

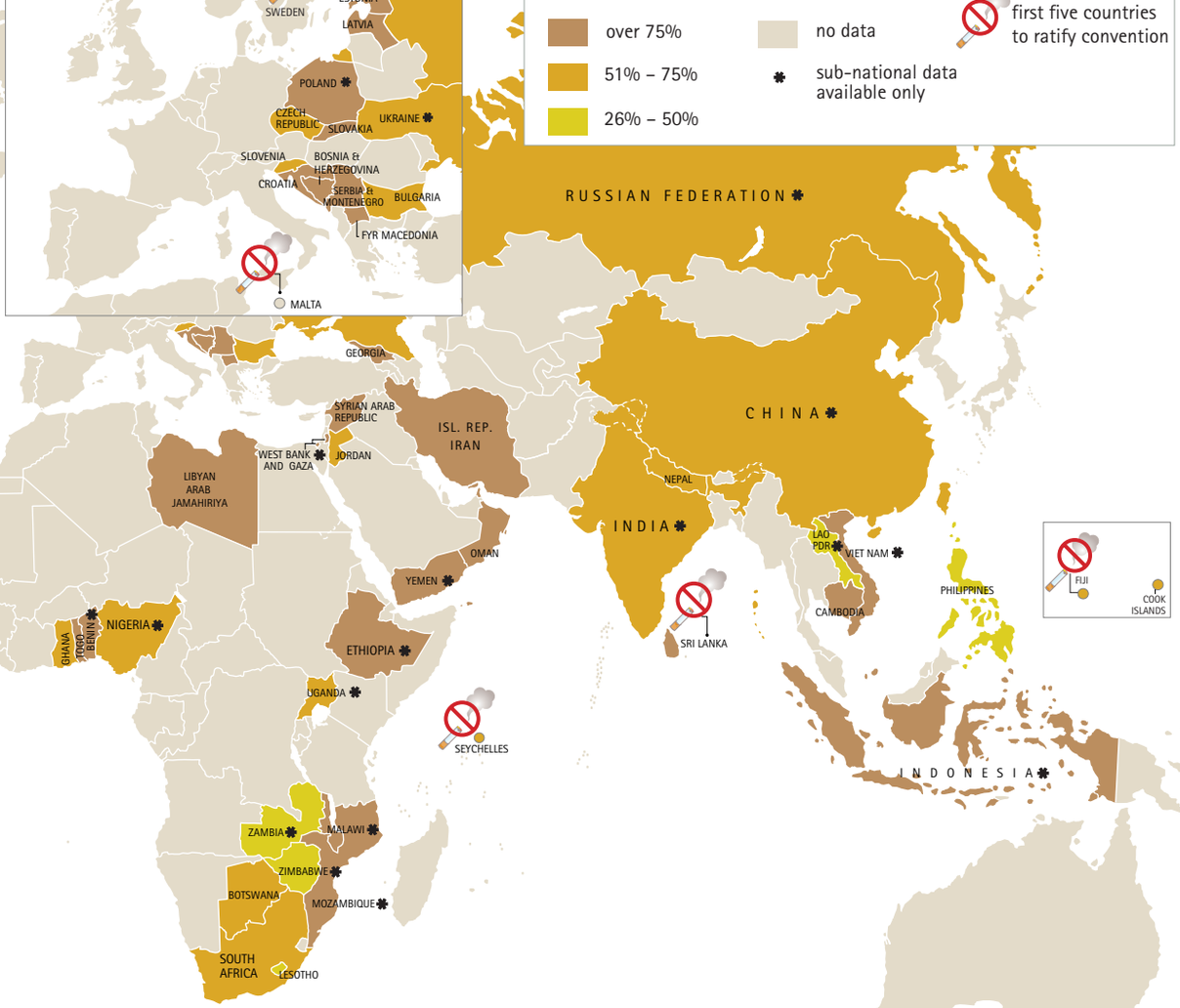
Children whose parents and friends smoke are more likely to become addicted themselves; 250 million children alive today will be killed by tobacco if current consumption trends continue.

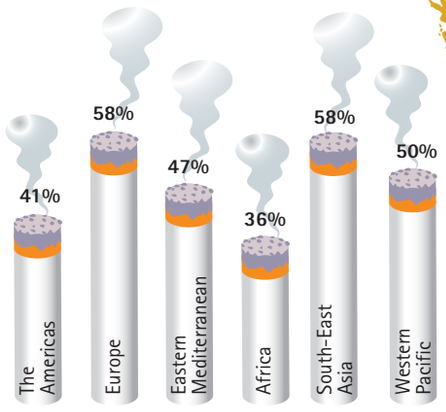
Children's voices

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
- sub-national data available only

Framework Convention on Tobacco Control
- first five countries to ratify convention

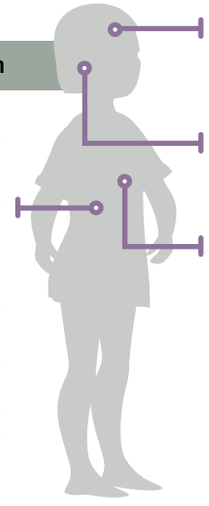




Exposure in the home

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

Health effects on children



BRAIN
- Possible association with brain tumours and long-term mental effects

EARS
- Middle ear infections (chronic otitis media)

LUNGS
- Respiratory diseases (including bronchitis and pneumonia)
- Asthma induction and exacerbation
- Chronic respiratory symptoms (wheezing, coughing, breathlessness)
- Decreased lung function

HEART
- Adverse effect on oxygen uptake and arteries

BLOOD
- Possible association with lymphoma

BURNS
- From fires caused by tobacco

- Increased risk of sudden infant death syndrome

11 Polluted Cities: The Air Children Breathe

"The widespread exposure of large numbers of children to heavily polluted air in developing countries has skyrocketed."
World Resources Institute 1999

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

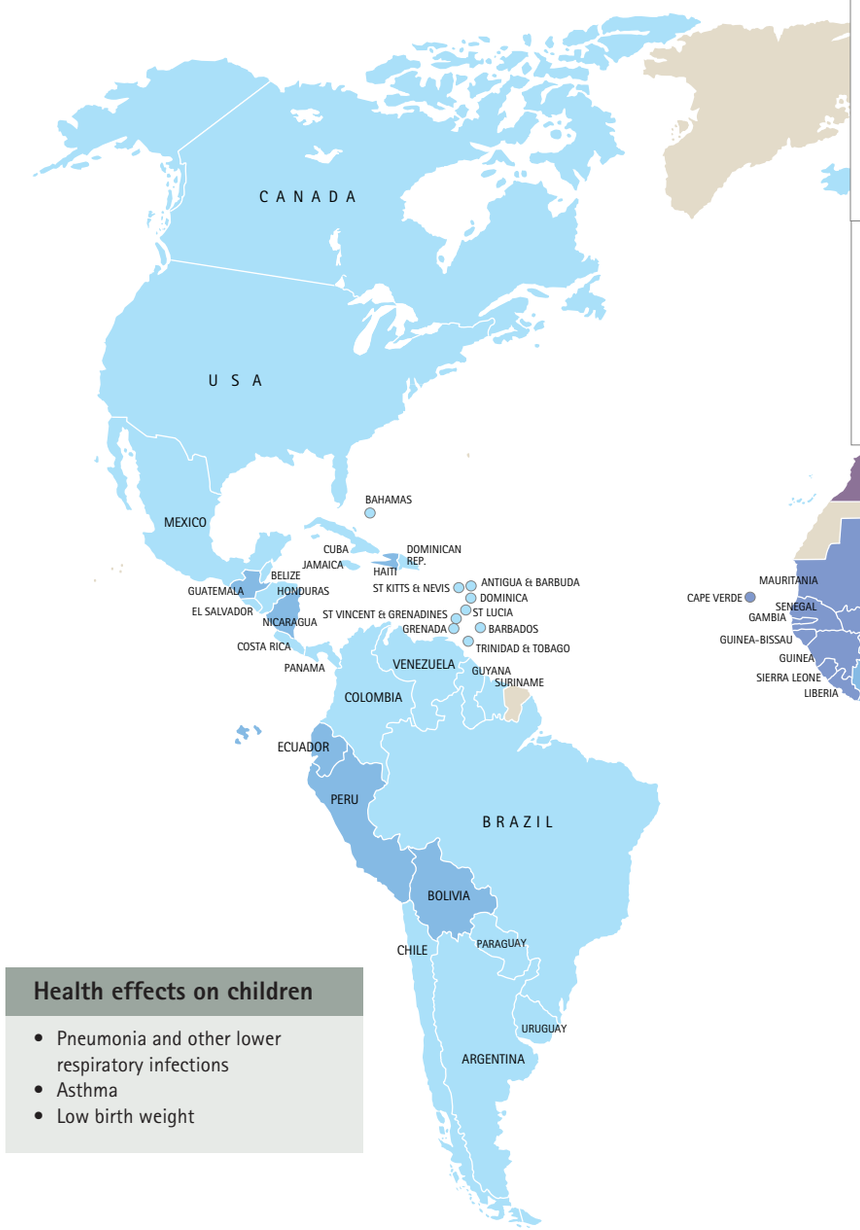
Average concentration of small particles (PM_{10}) in outdoor urban air by WHO sub-region
2000
micrograms per cubic metre (µg/m³)

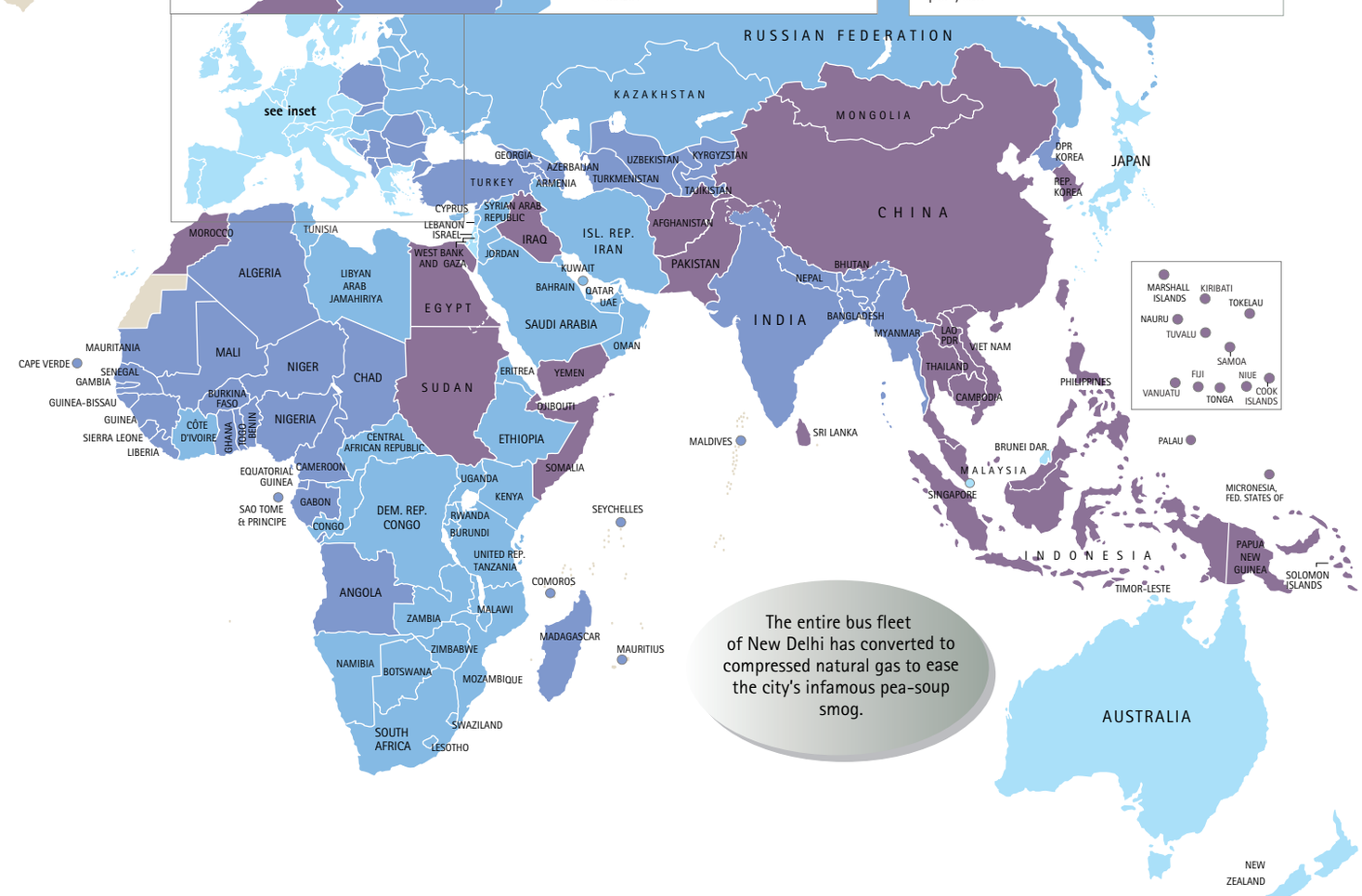
- over 25
- 21 – 25
- 16 – 20
- 11 – 15
- no data

Average concentration of small particles (PM_{10}) in selected European cities
2001
micrograms per cubic metre (µg/m³)

- 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 µg/m³, not to be exceeded more than 35 days per year.





The entire bus fleet of New Delhi has converted to compressed natural gas to ease the city's infamous pea-soup smog.

12 Child Injuries are Preventable

Emeka slipped while drawing water from the river near her village in Nigeria and did not return home . . .

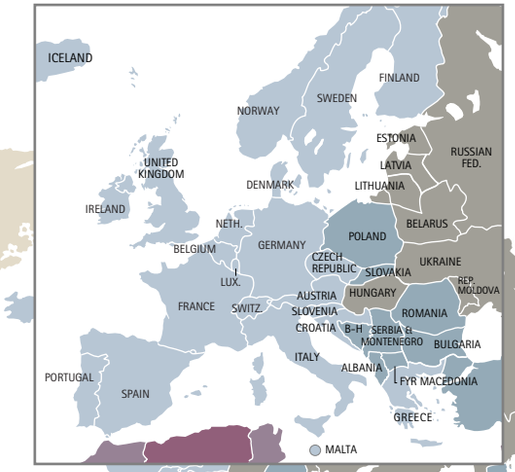
Drowning is the most common cause of injuries for infants, killing approximately 60 000 children under five every year and leaving roughly the same number permanently disabled. Children also suffer burns from open fires and kerosene stoves, and are injured in falls at home, at school and at playgrounds.

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.

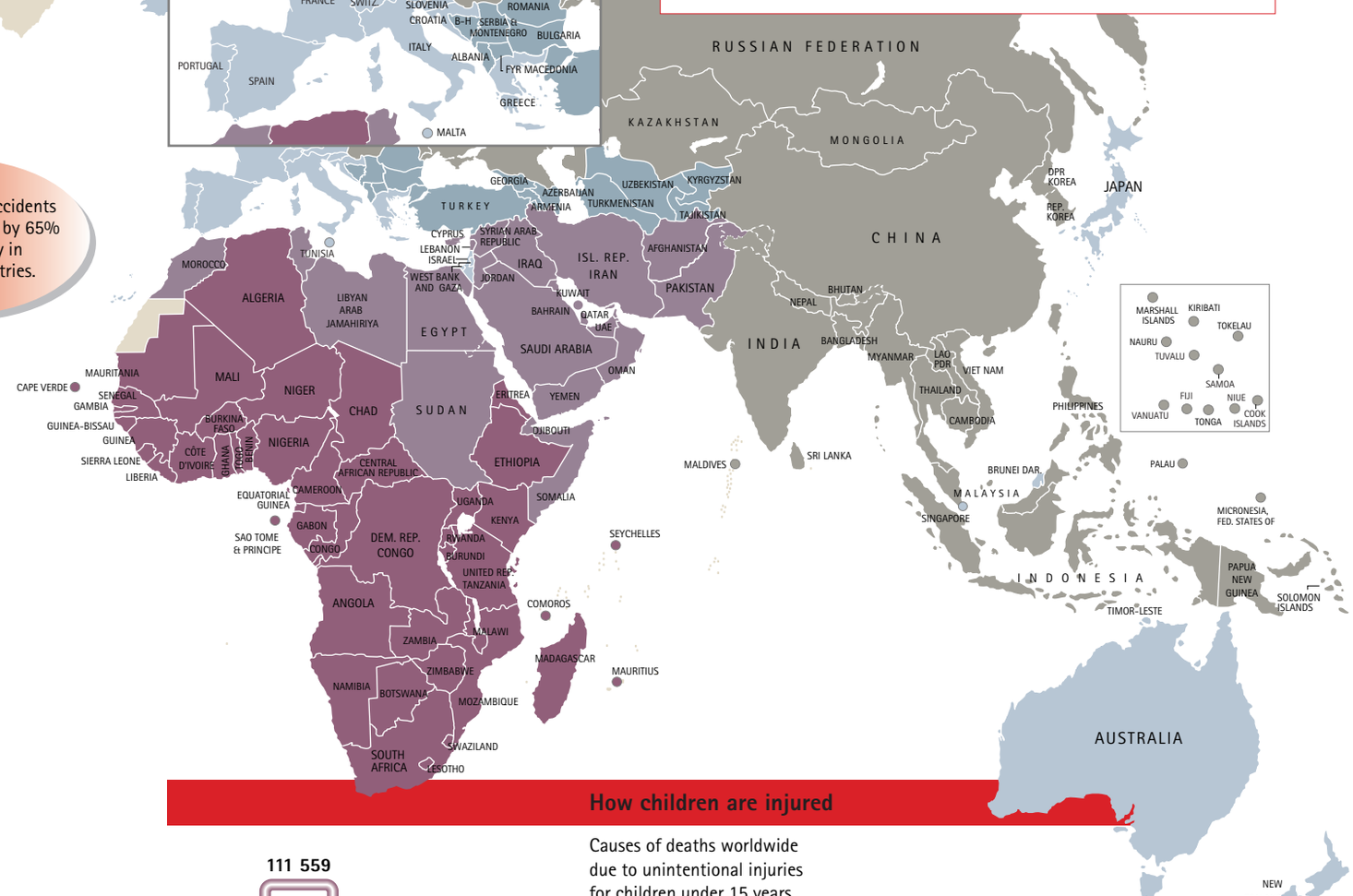
Deaths from road accidents are projected to rise by 65% by 2020, mostly in developing countries.



Dying on the roads

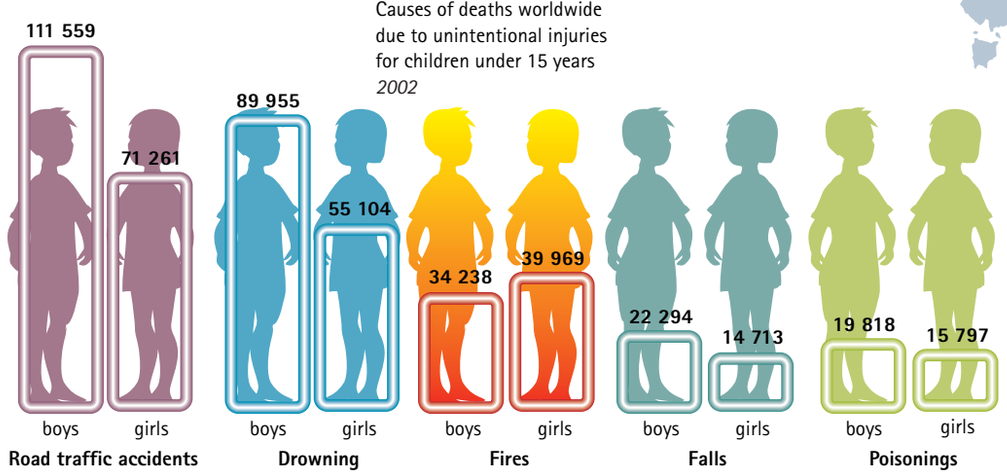
Deaths due to road traffic accidents of children aged 0–14 years per 100 000
2002
by WHO sub-region

- 20.0 and over
- 10.0 – 19.9
- 5.0 – 9.9
- 2.5 – 4.9
- under 2.5
- no data



How children are injured

Causes of deaths worldwide due to unintentional injuries for children under 15 years
2002



13 Child Labour: Growing Up Too Quickly

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 25 000 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.

Mines are an extremely dangerous working environment.

Child scavengers search through waste with their bare hands.

Working children

Percentage of children aged 5–14 years who are working
2001 or latest available data

- over 50%
- 26% – 50%
- 11% – 25%
- 10% and under
- no data

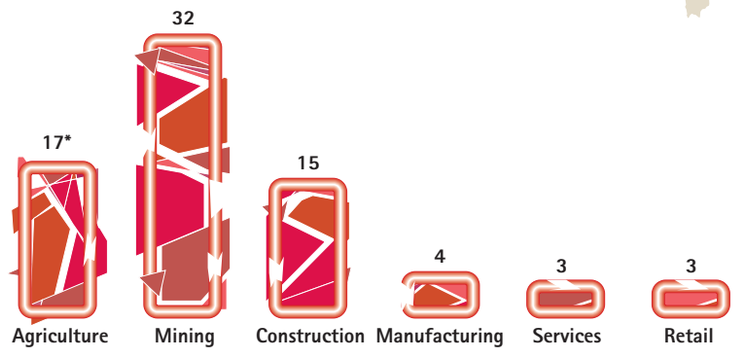
ILO Convention 182 to combat worst forms of child labour

X countries that have not yet ratified the convention *16 March 2004*

Over 30 million children are slaves or bonded workers.

Children dying on the job

Injury fatality rates per 100 000 child workers aged 5–17 years (full-time equivalent)
1994



* This figure refers to injury fatality rates per 100 000 child workers aged 15–17 years.

14 Lead: IQ Alert

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.

Lead-free environments enable successful learning.

21.9% of African-American children in older housing are poisoned by lead compared with 2.2% of all American children.

Lead in children's blood

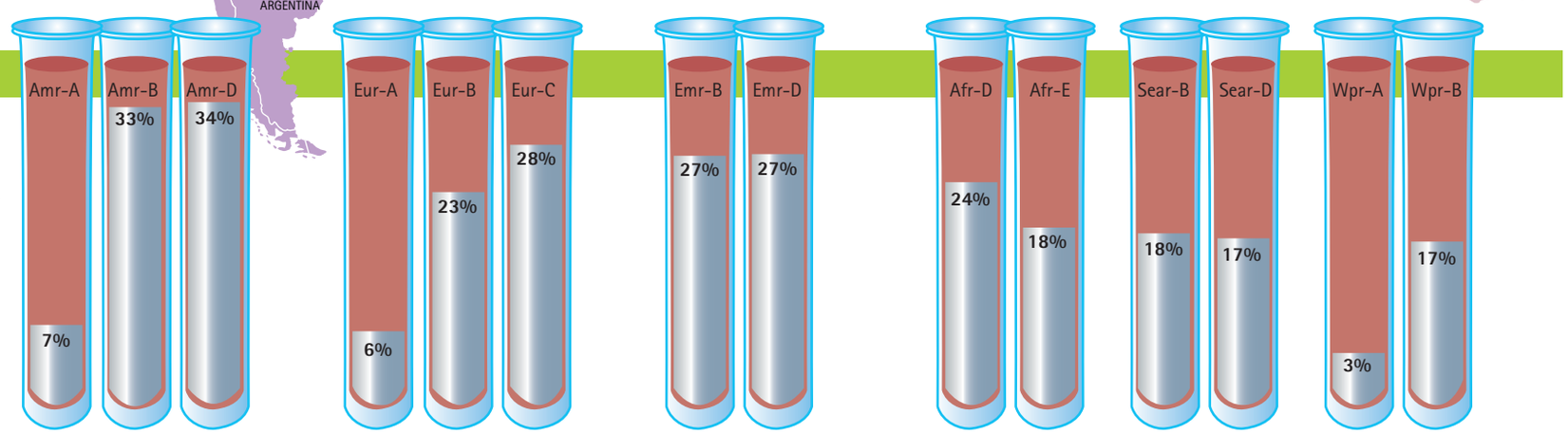
Mean blood lead level in urban children by WHO sub-region
2002 or latest available data
micrograms per decilitre (µg/dl)

- over 15.0
- 10.1 – 15.0
- 5.1 – 10.0
- 5.0 and under
- no data

Blood and lead

Percentage of children with blood lead levels above 10 micrograms per decilitre (µg/dl)
2002 or latest available data
by WHO sub-region

Blood lead levels above 10 µg/dl are a serious cause for concern.



15 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 who 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.

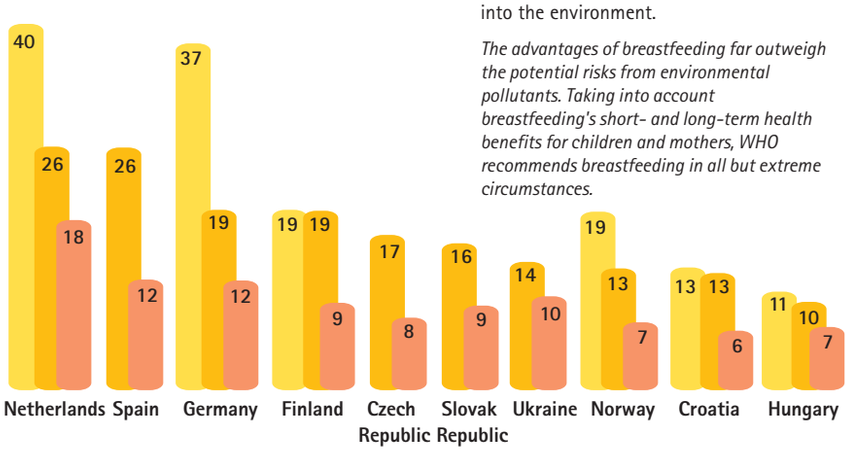
Dioxins, dibenzofurans, and polychlorinated biphenyls are persistent organic pollutants (POPs) that work their way up the food chain by dissolving and remaining stored in the body fat of animals. These so-called "endocrine disruptors" may upset a child's hormone balance.

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.

Safer breast milk

Dioxin (TEQ) concentration in human breast milk
1988–2002
picograms per gram of fat (pg/g)



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. Taking into account breastfeeding's short- and long-term health benefits for children and mothers, WHO recommends breastfeeding in all but extreme circumstances.

Fetus at risk

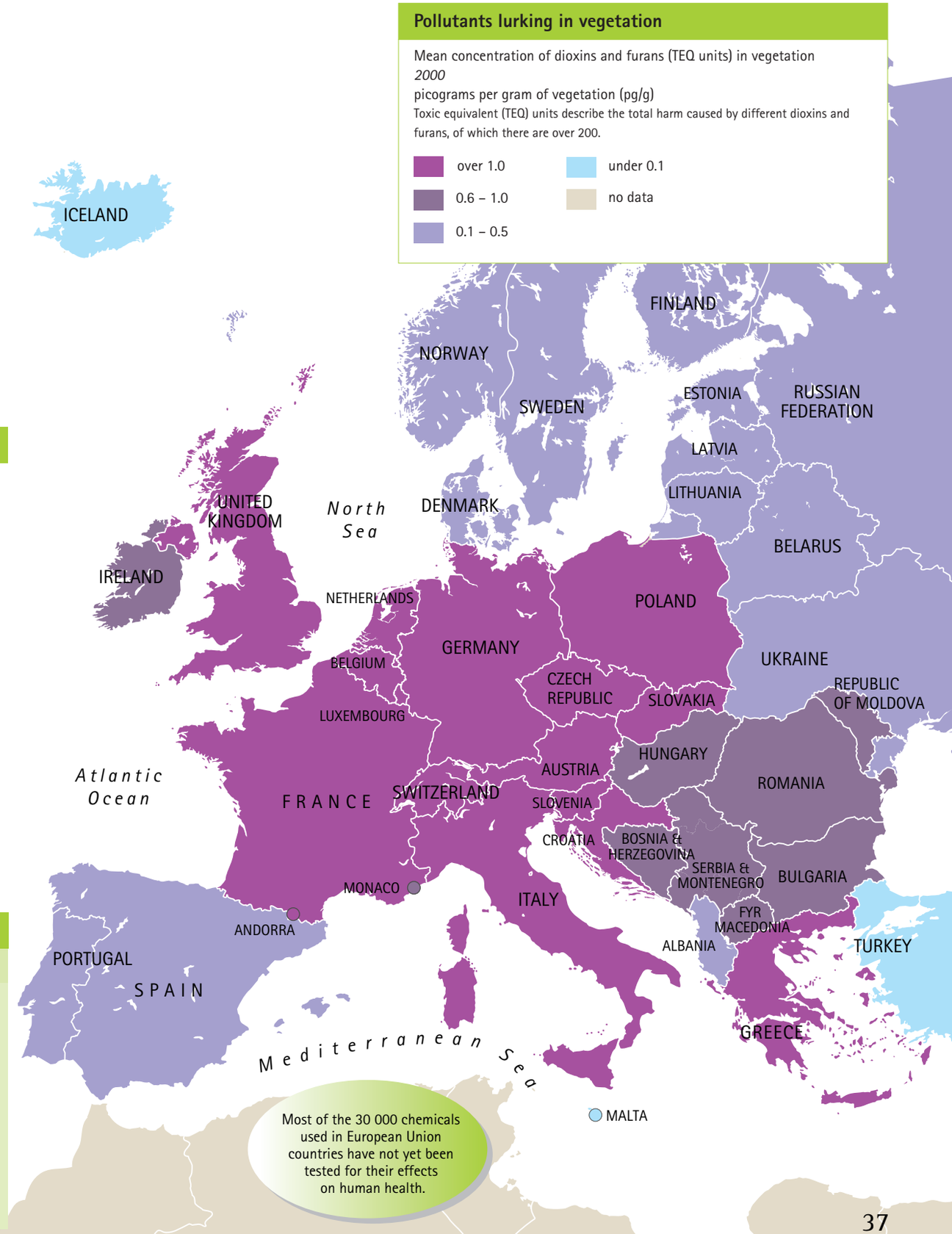
Many contaminants in the diet of pregnant mothers present a hazard to the developing fetus:

- 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 IQ 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)
Toxic equivalent (TEQ) units describe the total harm caused by different dioxins and furans, of which there are over 200.

over 1.0 | 0.6 – 1.0 | 0.1 – 0.5 | under 0.1 | no data



Most of the 30 000 chemicals used in European Union countries have not yet been tested for their effects on human health.

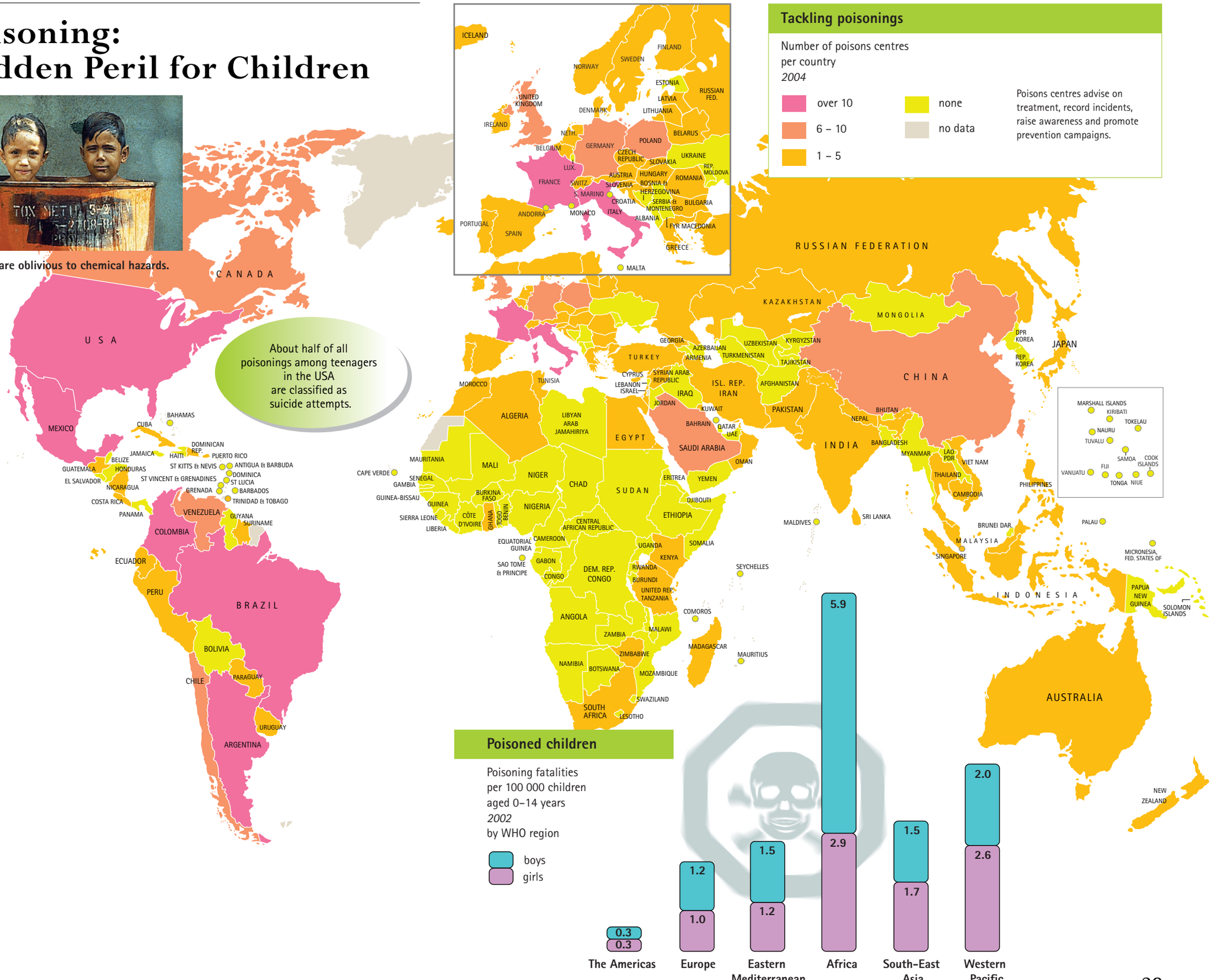
16 Poisoning: Hidden Peril for Children

Five Japanese children, poisoned by mercury-contaminated shellfish in 1956, were the first documented cases of a major industrial pollution tragedy: an entire fishing town in Minamata Bay, Japan suffering from a debilitating nervous condition, birth defects, deafness and death.

Children are oblivious to chemical hazards.

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 to14 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, bleach 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.



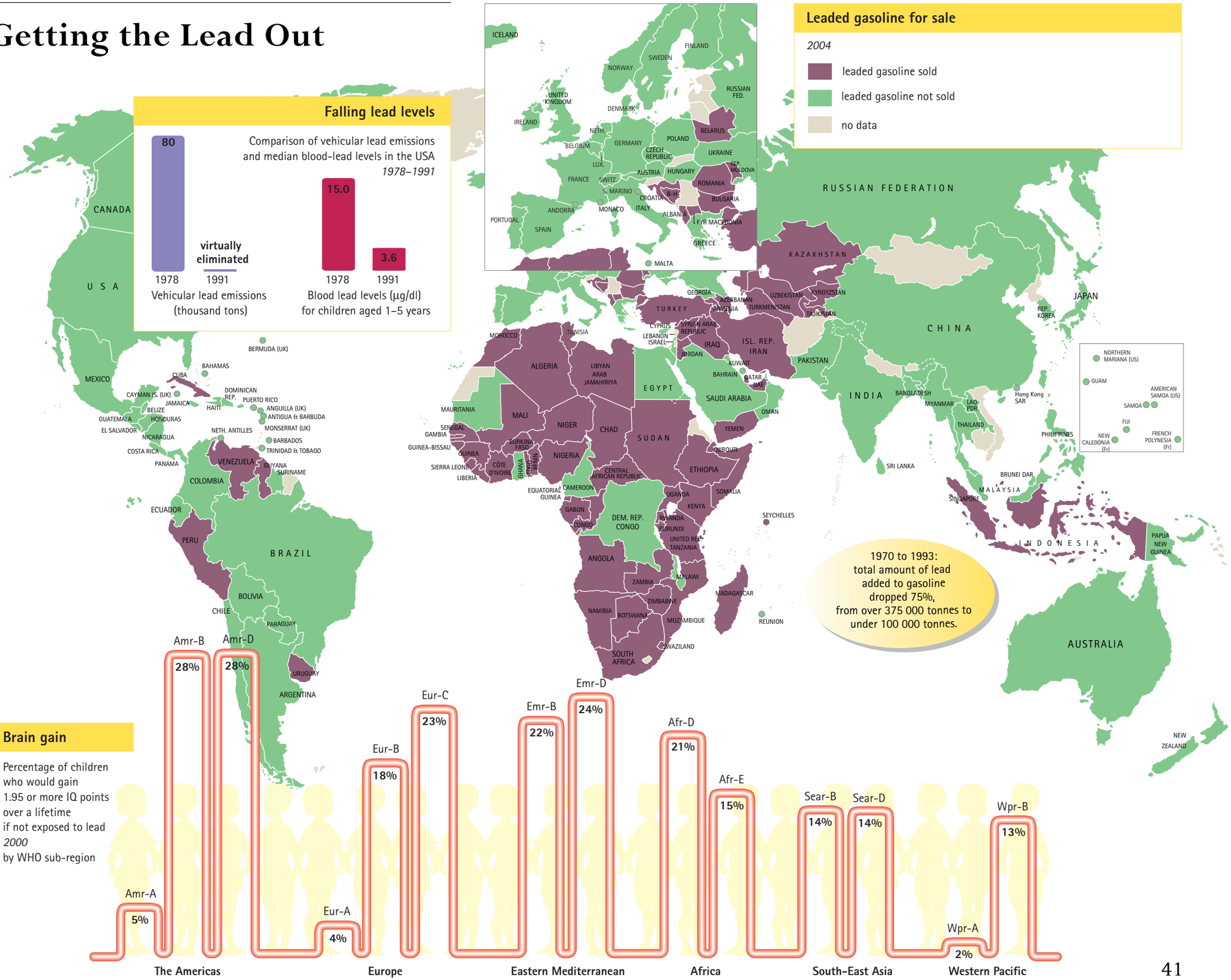
17 Getting the Lead Out

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 savings. Children in the USA are already benefiting from past policies, resulting in increased worker productivity 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.



18 Healthy Schools: Empowering Children

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 immunization, 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

The global network in one continent

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

- over 2000
- 1001 – 2000
- 51 – 1000
- 50 and under
- no data

World Health Day

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

19 Enjoying the Sun Safely

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.

Dangers of UV radiation exposure

Short-term:
- Sun burn
- Suppression of the immune system
- Eye inflammation (including photokeratitis, photoconjunctivitis)

Long-term:
- Skin cancer
- Skin ageing
- Cataract

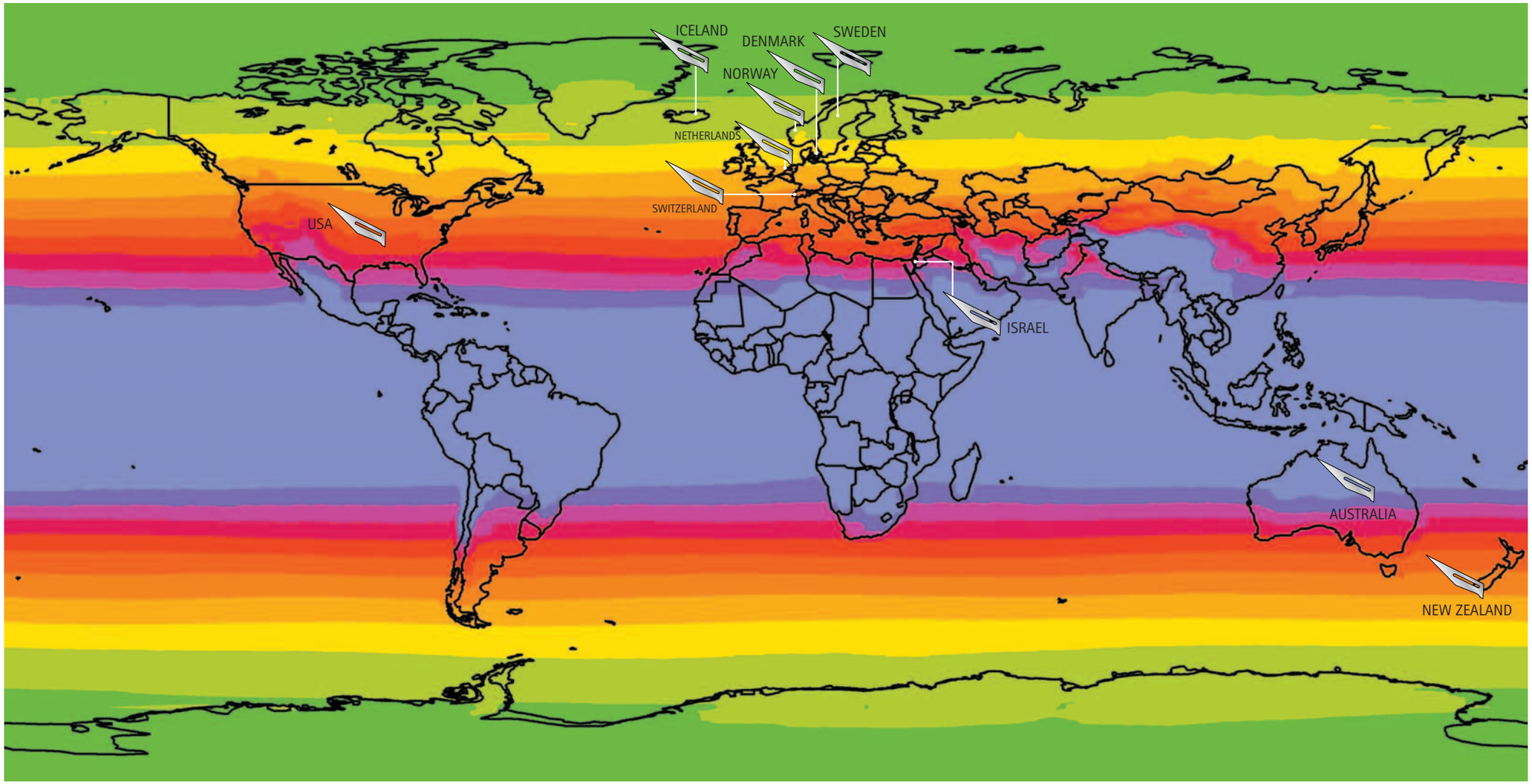
The sun's rays

Mean annual UV radiation level
2003
banded according to Global Solar UV Index

Melanoma
countries with the highest melanoma incidence rates *2000*

UV INDEX 1	UV INDEX 2	UV INDEX 3	UV INDEX 4	UV INDEX 5	UV INDEX 6	UV INDEX 7	UV INDEX 8	UV INDEX 9	UV INDEX 10	UV INDEX 11+
NO PROTECTION REQUIRED		PROTECTION REQUIRED					EXTRA PROTECTION			
You can safely stay outside!		Seek shade during midday hours! Slip on a shirt, slop on sunscreen and slap on a hat!					Avoid being outside during midday hours! Make sure you seek shade! Shirt, suncreen and hat are a must!			

The index describes the level of solar UV radiation at around midday, from zero (no UV radiation) upwards. The higher the value the greater the damage to skin and eyes, and the more care needs to be taken in the sun. UV radiation varies according to the season.



20 Climate Change

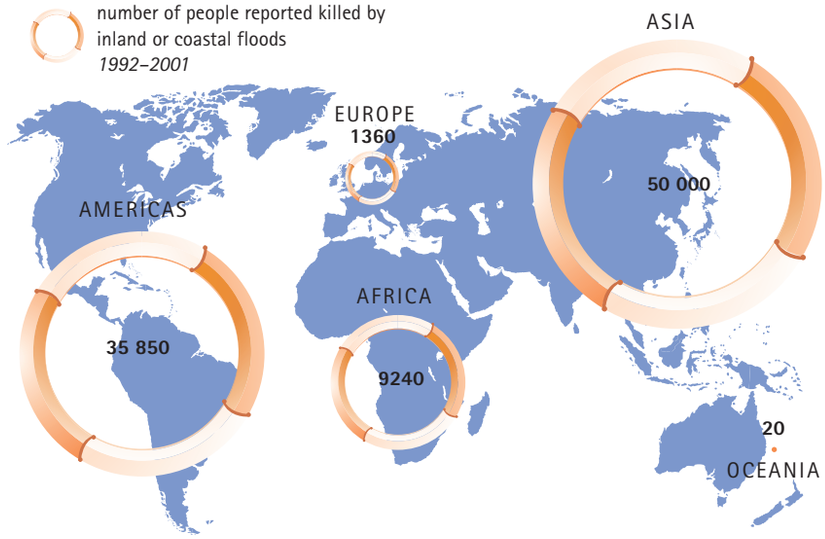
"Whoever wishes to investigate medicine properly, should proceed thus: in the first place to consider the seasons of the year, and what effects each of them produces, for they are not all alike, but differ much from themselves in regard to their changes."
Hippocrates (460–377 BC)

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 fail, 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.

Extreme weather

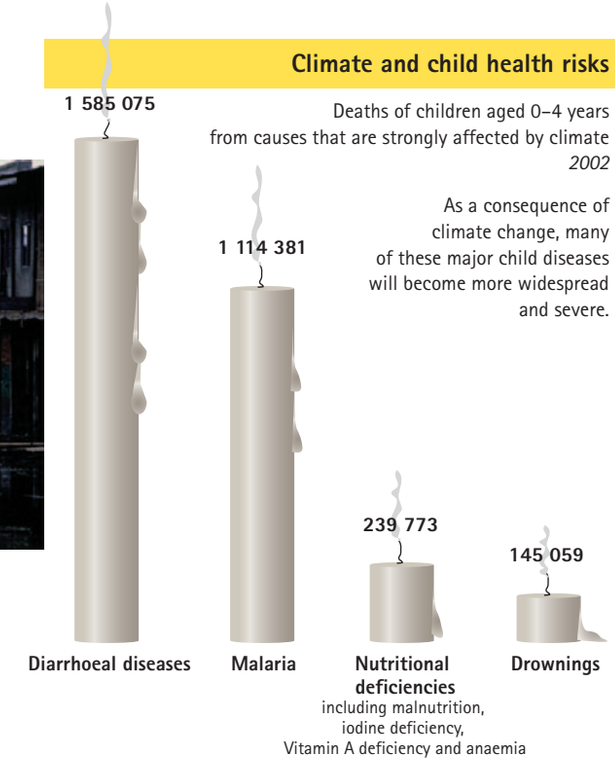


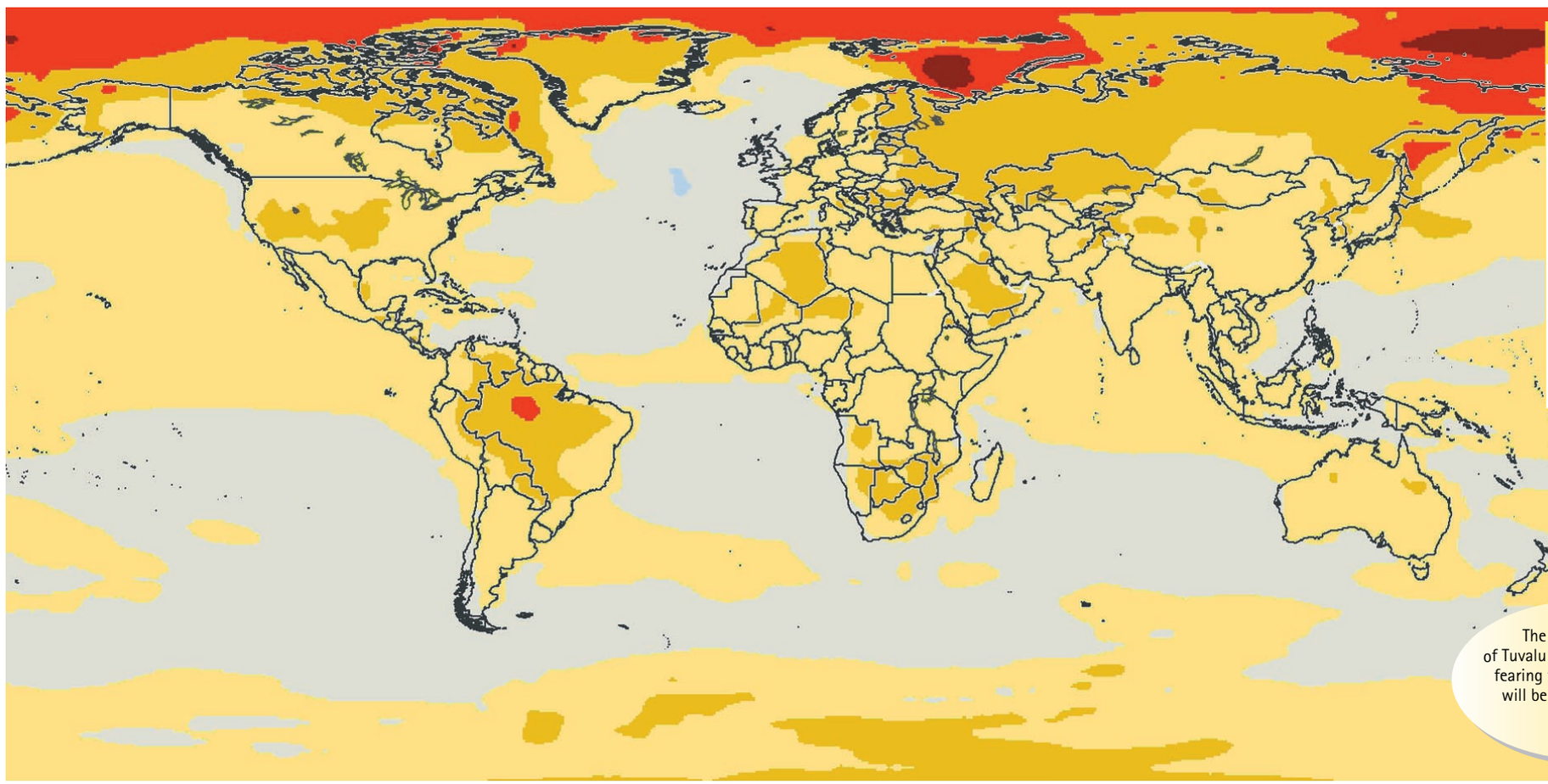
Floods will become more common with global warming.

Climate and child health risks

Deaths of children aged 0–4 years from causes that are strongly affected by climate
2002

As a consequence of climate change, many of these major child diseases will become more widespread and severe.





The 10 000 residents of Tuvalu are preparing to leave, fearing their tiny island state will be submerged beneath the rising sea.

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 travellers to boil or strain drinking water.

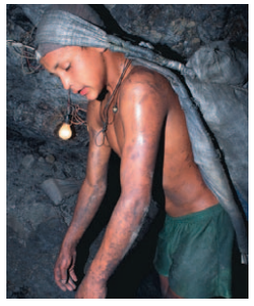
13th century Holy Roman Emperor Frederic II (1194–1280) installs pour-flush toilets in his Castel del Monte, inspired by Arab technology.

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

1775 Percival Pott notes an elevated incidence of scrotal cancer in small English boys assisting chimney sweeps, establishing the link between the work environment and cancer.

1842 The British Royal Commission on Employment of Children in the Mines reports "cruel slaving revolting to humanity", on finding children chained to carts and working 15-hour days.



1843 In the USA, Oliver Wendell Holmes proclaims the importance of hand washing to control the spread of disease.

1854 Louis Pasteur discovers that heat removes undesirable organisms. Today, pasteurization is used to prevent the spoilage of milk and milk products.

1855 John Snow publishes *On the Mode of Communication of Cholera*, identifying dirty water supplies as the cause of cholera outbreaks in London.

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 Poza Rica killer smog, caused by gas fumes from an oil refinery, leaves 22 dead and hundreds hospitalized in Mexico.

1959 Volvo introduces the three-point ("lap-and-shoulder") seat belt, invented by the Swede Nils Bohlin.

1962 Rachel Carson's book *Silent Spring*, which issues grave warnings about pesticide use and predicts massive destruction of the planet's ecosystems, launches the environmental movement in the USA.

1970 The USA introduces the first protective child car seat.

1970 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.

1982–98 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 isocyanate gas leaks from a Union Carbide pesticide plant in Bhopal, India, killing 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.

1989 The United Nations Convention on the Rights of the Child is adopted.

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

1992 Agenda 21: the United Nations introduces a world programme of action on sustainable development, linking the environment, economy and society.

1997 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 15–59 years.

Mortality strata	Child mortality	Adult male mortality
A	very low	very low
B	low	low
C	low	high
D	high	high
E	high	very high

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	Algeria, Angola, Benin, Burkina Faso, Cameroon, Cape Verde, Chad, Comoros, Equatorial Guinea, Gabon, Gambia, Ghana, Guinea, Guinea- Bissau, Liberia, Madagascar, Mali, Mauritania, Mauritius, Niger, Nigeria, Sao Tome and Principe, Senegal, Seychelles, Sierra Leone, Togo
Afr-E	Africa with high child and very high adult mortality	Botswana, Burundi, Central African Republic, Congo, Côte d'Ivoire, Democratic Republic of the Congo, Eritrea, Ethiopia, Kenya, Lesotho, Malawi, Mozambique, Namibia, Rwanda, South Africa, Swaziland, Uganda, United Republic of Tanzania, Zambia, Zimbabwe
The Americas		
Amr-A	Americas with very low child and very low adult mortality	Canada, Cuba, United States of America
Amr-B	Americas with low child and low adult mortality	Antigua and Barbuda, Argentina, Bahamas, Barbados, Belize, Brazil, Chile, Colombia, Costa Rica, Dominica, Dominican Republic, El Salvador, Grenada, Guyana, Honduras, Jamaica, Mexico, Panama, Paraguay, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Suriname, Trinidad and Tobago, Uruguay, Venezuela (Bolivarian Republic of)
Amr-D	Americas with high child and high adult mortality	Bolivia, Ecuador, Guatemala, Haiti, Nicaragua, Peru
South-East Asia		
Sear-B	South-East Asia with low child and low adult mortality	Indonesia, Sri Lanka, Thailand
Sear-D	South-East Asia with high child and high adult mortality	Bangladesh, Bhutan, Democratic People's Republic of Korea, India, Maldives, Myanmar, Nepal, Timor-Leste
Europe		
Eur-A	Europe with very low child and very low adult mortality	Andorra, Austria, Belgium, Croatia, Cyprus, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Israel, Italy, Luxembourg, Malta, Monaco, Netherlands, Norway, Portugal, San Marino, Slovenia, Spain, Sweden, Switzerland, United Kingdom
Eur-B	Europe with low child and low adult mortality	Albania, Armenia, Azerbaijan, Bosnia and Herzegovina, Bulgaria, Georgia, Kyrgyzstan, Poland, Romania, Slovakia, Tajikistan, The former Yugoslav Republic of Macedonia, Serbia and Montenegro, Turkey, Turkmenistan, Uzbekistan
Eur-C	Europe with low child and high adult mortality	Belarus, Estonia, Hungary, Kazakhstan, Latvia, Lithuania, Republic of Moldova, Russian Federation, Ukraine
Eastern Mediterranean		
Emr-B	Eastern Mediterranean with low child and low adult mortality	Bahrain, Iran (Islamic Republic of), Jordan, Kuwait, Lebanon, Libyan Arab Jamahiriya, Oman, Qatar, Saudi Arabia, Syrian Arab Republic, Tunisia, United Arab Emirates
Emr-D	Eastern Mediterranean with high child and high adult mortality	Afghanistan, Djibouti, Egypt*, Iraq, Morocco, Pakistan, Somalia, Sudan, Yemen
Western Pacific		
Wpr-A	Western Pacific with very low child and very low adult mortality	Australia, Brunei Darussalam, Japan, New Zealand, Singapore
Wpr-B	Western Pacific with low child and low adult mortality	Cambodia**, China, Cook Islands, Fiji, Kiribati, Lao People's Democratic Republic**, Malaysia, Marshall Islands, Micronesia (Federated States of), Mongolia, Nauru, Niue, Palau, Papua New Guinea**, Philippines, Republic of Korea, Samoa, Solomon Islands, Tonga, Tuvalu, Vanuatu, Viet Nam

* 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 Emr-D for the presentation of sub-regional totals 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.

World Data Table

Country	Population 2002 total in thousands	Population 2002 % of total under 18 years	Gross National Income (GNI) per capita US$ 2002	Child mortality under-five mortality per 1000 live births 2000	Water % of households with access to improved water supply 2000 or latest available data	Sanitation % of households without access to improved sanitation 2000 or latest available data	Water collection % of population who must travel more than half an hour to fetch water 2001 or latest available data	Indoor smoke % of households using solid fuel for cooking 2000 or latest available data	Child labour % of children aged 5–14 years who are working 2001 or latest available data	Poisons centres number 2004	Dioxins and furans mean concentration of TEQ units in vegetation (pg/g) 2000	Country
Afghanistan	22 930	50%	250	257	13%	88%	–	> 95%	–	0	–	Afghanistan
Albania	3 141	34%	1 380	27	97%	9%	–	76%	32%	0	0.3	Albania
Algeria	31 266	40%	1 720	51	89%	8%	–	4%	–	2	–	Algeria
Andorra	69	19%	–	5	100%	0%	–	< 5%	–	0	–	Andorra
Angola	13 184	54%	660	262	38%	56%	–	> 95%	5%	0	–	Angola
Antigua and Barbuda	73	34%	9 390	21	91%	5%	–	< 5%	–	0	–	Antigua and Barbuda
Argentina	37 981	32%	4 060	19	94%	18%	–	< 5%	21%	18	–	Argentina
Armenia	3 072	28%	790	37	–	–	–	66%	–	0	–	Armenia
Australia	19 544	24%	19 740	6	100%	0%	–	< 55%	–	5	–	Australia
Austria	8 111	20%	23 390	6	100%	0%	–	< 5%	–	1	2.1	Austria
Azerbaijan	8 297	36%	710	75	78%	19%	–	37%	13%	0	–	Azerbaijan
Bahamas	310	35%	14 860	18	97%	0%	–	< 5%	–	0	–	Bahamas
Bahrain	709	34%	11 130	13	–	–	–	< 5%	–	0	–	Bahrain
Bangladesh	143 809	45%	360	82	97%	52%	–	> 95%	6%	0	–	Bangladesh
Barbados	269	24%	9 750	19	100%	0%	–	57%	–	0	–	Barbados
Belarus	9 940	22%	1 360	14	100%	–	–	11%	–	1	0.3	Belarus
Belgium	10 296	21%	23 250	6	–	–	–	< 5%	–	1	4.0	Belgium
Belize	251	45%	2 960	41	92%	50%	–	< 5%	–	0	–	Belize
Benin	6 558	53%	380	161	63%	77%	17%	89%	–	0	–	Benin
Bhutan	2 190	49%	590	98	62%	30%	–	< 5%	–	0	–	Bhutan
Bolivia	8 645	45%	900	80	83%	30%	–	61%	26%	0	–	Bolivia
Bosnia and Herzegovina	4 126	22%	1 270	18	–	–	–	74%	18%	0	0.9	Bosnia and Herzegovina
Botswana	1 770	47%	2 980	93	95%	34%	–	65%	–	0	–	Botswana
Brazil	176 257	34%	2 850	41	87%	24%	–	27%	9%	31	–	Brazil
Brunei Darussalam	350	36%	24 100	14	–	–	–	70%	–	0	–	Brunei Darussalam
Bulgaria	7 965	19%	1 790	16	100%	0%	–	31%	–	1	0.8	Bulgaria
Burkina Faso	12 624	56%	220	225	42%	71%	31%	> 95%	–	0	–	Burkina Faso
Burundi	6 602	55%	100	190	78%	12%	–	> 95%	32%	0	–	Burundi
Cambodia	13 810	50%	280	134	30%	83%	–	> 95%	8%	1	–	Cambodia
Cameroon	15 729	49%	560	155	58%	21%	27%	77%	58%	0	–	Cameroon
Canada	31 271	22%	22 300	6	100%	0%	–	< 5%	–	9	–	Canada
Cape Verde	454	48%	1 290	40	74%	29%	–	< 5%	–	0	–	Cape Verde
Central African Rep.	3 819	50%	260	179	70%	75%	28%	> 95%	64%	0	–	Central African Rep.
Chad	8 348	53%	220	193	27%	71%	45%	95%	66%	0	–	Chad
Chile	15 613	33%	4 260	16	93%	4%	–	15%	–	8	–	Chile
China	1 294 867	29%	940	37	75%	60%	–	80%	–	6	–	China
Colombia	43 526	38%	1 830	24	91%	14%	–	36%	5%	13	–	Colombia
Comoros	747	49%	390	82	96%	2%	–	< 5%	37%	0	–	Comoros
Congo	3 633	53%	700	106	51%	–	–	67%	–	0	–	Congo
Congo, Dem. Rep.	51 201	54%	90	212	45%	79%	–	> 95%	–	0	–	Congo, Dem. Rep.
Cook Islands	18	44%	-	23	100%	0%	–	< 5%	–	0	–	Cook Islands
Costa Rica	4 094	37%	4 100	11	95%	7%	–	58%	9%	1	–	Costa Rica
Côte d'Ivoire	16 365	49%	610	167	81%	48%	12%	93%	49%	0	–	Côte d'Ivoire
Croatia	4 439	21%	4 640	8	–	–	–	16%	–	1	1.2	Croatia
Cuba	11 271	25%	1 170	9	91%	2%	–	42%	–	1	–	Cuba
Cyprus	796	27%	12 320	8	100%	0%	–	24%	–	1	0.0	Cyprus
Czech Republic	10 246	19%	5 560	5	–	–	–	< 5%	–	1	4.7	Czech Republic
Denmark	5 351	22%	30 290	6	100%	–	–	< 5%	–	1	0.2	Denmark

modelled data in italics

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Djibouti	693	50%	900	150	100%	9%	–	6%	–	0	–	Djibouti
Dominica	78	34%	3 180	14	97%	17%	–	< 5%	–	0	–	Dominica
Dominican Republic	8 616	39%	2 320	37	86%	33%	–	48%	12%	2	–	Dominican Republic
Ecuador	12 810	39%	1 450	36	85%	14%	–	28%	39%	2	–	Ecuador
Egypt	70 507	42%	1 470	45	97%	2%	2%	23%	6%	2	–	Egypt
El Salvador	6 415	41%	2 080	37	77%	18%	–	65%	7%	0	–	El Salvador
Equatorial Guinea	481	50%	700	156	44%	47%	–	83%	–	0	–	Equatorial Guinea
Eritrea	3 991	52%	160	112	46%	87%	–	> 95%	–	0	–	Eritrea
Estonia	1 338	22%	4 130	11	93%	–	–	34%	–	0	0.2	Estonia
Ethiopia	68 961	52%	100	179	24%	88%	54%	> 95%	–	0	–	Ethiopia
Fiji	831	39%	2 160	28	47%	57%	–	< 5%	–	0	–	Fiji
Finland	5 197	22%	23 510	4	100%	0%	–	< 5%	–	1	0.4	Finland
France	59 850	23%	22 010	6	–	–	–	< 5%	–	13	1.4	France
Gabon	1 306	48%	3 120	91	86%	47%	–	34%	–	0	–	Gabon
Gambia	1 388	47%	280	128	62%	63%	–	> 95%	27%	0	–	Gambia
Georgia	5 177	24%	650	23	79%	0%	–	71%	30%	1	0.4	Georgia
Germany	82 414	19%	22 670	5	–	–	–	< 5%	–	10	1.7	Germany
Ghana	20 471	47%	270	105	73%	28%	25%	95%	10%	1	–	Ghana
Greece	10 970	18%	11 660	7	–	–	–	< 5%	–	2	1.0	Greece
Grenada	80	35%	3 500	23	95%	3%	–	< 5%	–	0	–	Grenada
Guatemala	12 036	50%	1 750	56	92%	19%	–	73%	20%	1	–	Guatemala
Guinea	8 359	51%	410	163	48%	42%	22%	> 95%	49%	0	–	Guinea
Guinea-Bissau	1 449	53%	150	215	56%	44%	–	95%	65%	0	–	Guinea-Bissau
Guyana	764	36%	840	58	94%	13%	–	< 5%	–	0	–	Guyana
Haiti	8 218	47%	440	136	46%	72%	–	82%	–	0	–	Haiti
Honduras	6 781	48%	920	44	88%	25%	–	66%	10%	0	–	Honduras
Hungary	9 923	20%	5 280	11	–	1%	–	*26%*	–	1	0.9	Hungary
Iceland	287	27%	27 970	3	–	–	–	< 5%	–	1	0.0	Iceland
India	1 049 549	39%	480	96	84%	72%	–	81%	14%	4	–	India
Indonesia	217 131	36%	710	50	78%	45%	–	50%	–	3	–	Indonesia
Iran, Isl. Rep.	68 070	41%	1 710	45	92%	17%	–	2%	–	2	–	Iran, Isl. Rep.
Iraq	24 510	48%	2 170	118	85%	21%	–	2%	–	0	–	Iraq
Ireland	3 911	26%	23 870	7	–	–	–	< 5%	–	1	0.9	Ireland
Israel	6 304	33%	16 710	7	–	–	–	< 5%	–	1	–	Israel
Italy	57 482	17%	18 960	6	–	–	–	< 5%	–	18	1.4	Italy
Jamaica	2 627	37%	2 820	16	92%	1%	–	47%	–	0	–	Jamaica
Japan	127 478	18%	33 550	5	–	–	–	< 5%	–	2	–	Japan
Jordan	5 329	45%	1 760	28	96%	1%	–	10%	–	0	–	Jordan
Kazakhstan	15 469	32%	1 510	36	91%	1%	–	51%	30%	2	–	Kazakhstan
Kenya	31 540	50%	360	113	57%	13%	31%	85%	36%	1	–	Kenya
Kiribati	87	42%	810	77	48%	52%	–	< 5%	–	0	–	Kiribati
Korea, Dem. People's Rep. of	22 541	31%	–	55	100%	1%	–	68%	–	0	–	Korea, Dem. People's Rep. of
Korea, Republic of	47 430	25%	9 930	7	92%	37%	–	< 5%	–	0	–	Korea, Republic of
Kuwait	2 443	30%	18 270	11	–	–	–	< 5%	–	1	–	Kuwait
Kyrgyzstan	5 067	39%	290	63	77%	0%	–	> 95%	9%	0	–	Kyrgyzstan
Lao People's Dem. Rep.	5 529	49%	310	143	37%	70%	–	95%	32%	0	–	Lao People's Dem. Rep.
Latvia	2 329	21%	3 480	14	–	–	–	19%	–	1	0.2	Latvia
Lebanon	3 596	36%	3 990	34	100%	1%	–	< 5%	45%	0	–	Lebanon

modelled data in italics

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Lesotho	1 800	48%	470	149	78%	51%	–	85%	25%	0	–	Lesotho
Liberia	3 239	53%	150	232	–	–	–	83%	–	0	–	Liberia
Libyan Arab Jamahiriya	5 445	39%	5 540	20	72%	3%	–	3%	–	0	–	Libyan Arab Jamahiriya
Lithuania	3 465	24%	3 660	11	–	–	–	42%	–	1	0.3	Lithuania
Luxembourg	447	22%	38 830	5	–	–	–	< 5%	–	0	4.9	Luxembourg
Macedonia, Former Yugos. Rep. of	2 046	27%	1 700	19	–	–	–	58%	–	0	0.5	Macedonia, Former Yugos. Rep. of
Madagascar	16 916	51%	240	139	47%	58%	24%	> 95%	19%	1	–	Madagascar
Malawi	11 871	52%	160	197	57%	24%	43%	> 95%	–	0	–	Malawi
Malaysia	23 965	39%	3 540	10	94%	–	–	29%	–	1	–	Malaysia
Maldives	309	50%	2 090	50	100%	44%	–	< 5%	–	0	–	Maldives
Mali	12 623	56%	240	233	65%	31%	12%	> 95%	78%	0	–	Mali
Malta	393	24%	9 200	7	100%	0%	–	< 5%	–	0	0.0	Malta
Marshall Islands	52	42%	2 270	44	–	–	–	< 5%	–	0	–	Marshall Islands
Mauritania	2 807	50%	410	173	37%	67%	–	69%	0%	0	–	Mauritania
Mauritius	1 210	30%	3 850	18	100%	1%	–	75%	–	0	–	Mauritius
Mexico	101 965	39%	5 910	29	88%	26%	–	22%	15%	13	–	Mexico
Micronesia, Federated States of	108	47%	1 980	60	–	–	–	< 5%	–	0	–	Micronesia, Federated States of
Moldova, Republic of	4 270	27%	460	29	92%	1%	–	72%	37%	0	0.6	Moldova, Republic of
Monaco	34	21%	–	5	100%	0%	–	< 5%	–	0	1.0	Monaco
Mongolia	2 559	40%	440	79	60%	70%	–	67%	–	0	–	Mongolia
Morocco	30 072	38%	1 190	46	80%	32%	22%	11%	11%	1	–	Morocco
Mozambique	18 537	51%	210	206	57%	57%	38%	87%	–	0	–	Mozambique
Myanmar	48 852	38%	220	108	72%	36%	–	> 95%	–	0	–	Myanmar
Namibia	1 961	50%	1 780	85	77%	59%	22%	83%	14%	0	–	Namibia
Nauru	13	39%	–	16	–	–	–	< 5%	–	0	–	Nauru
Nepal	24 609	47%	230	95	88%	72%	–	> 95%	45%	1	–	Nepal
Netherlands	16 067	22%	23 960	6	100%	0%	–	< 5%	–	1	1.8	Netherlands
New Zealand	3 846	27%	13 710	8	100%	–	–	< 5%	–	1	–	New Zealand
Nicaragua	5 335	49%	370	38	77%	15%	–	72%	–	1	–	Nicaragua
Niger	11 544	57%	170	255	59%	80%	26%	> 95%	70%	0	–	Niger
Nigeria	120 911	51%	290	183	62%	46%	28%	67%	–	0	–	Nigeria
Niue	2	51%	–	28	100%	0%	–	< 5%	–	0	–	Niue
Norway	4 514	23%	37 850	5	100%	–	–	< 5%	–	1	0.2	Norway
Oman	2 768	43%	7 720	18	39%	8%	–	< 5%	–	1	–	Oman
Pakistan	149 911	48%	410	110	90%	38%	–	76%	–	1	–	Pakistan
Palau	20	40%	6 780	24	79%	0%	–	< 5%	–	0	–	Palau
Panama	3 064	37%	4 020	25	90%	8%	–	37%	3%	0	–	Panama
Papua New Guinea	5 586	48%	530	99	42%	18%	–	> 95%	–	0	–	Papua New Guinea
Paraguay	5 740	46%	1 170	33	78%	6%	–	64%	6%	1	–	Paraguay
Peru	26 767	40%	2 050	42	80%	29%	–	40%	17%	1	–	Peru
Philippines	78 580	43%	1 020	40	86%	17%	–	85%	17%	1	–	Philippines
Poland	38 622	23%	4 570	9	–	–	–	37%	–	9	1.2	Poland
Portugal	10 049	20%	10 840	7	–	–	–	< 5%	3%	1	0.5	Portugal
Qatar	601	31%	12 000	15	–	–	–	< 5%	–	0	–	Qatar
Romania	22 387	22%	1 850	22	58%	47%	–	45%	–	2	0.5	Romania
Russian Federation	144 082	22%	2 140	19	99%	–	–	7%	–	1	0.3	Russian Federation
Rwanda	8 272	52%	230	182	41%	92%	49%	> 95%	37%	0	–	Rwanda
Saint Kitts and Nevis	42	33%	6 370	22	98%	4%	–	< 5%	–	0	–	Saint Kitts and Nevis

modelled data in italics

World Data Table

Country	Population 2002 total in thousands	Population 2002 % of total under 18 years	Gross National Income (GNI) per capita US$ 2002	Child mortality under-five mortality per 1000 live births 2000	Water % of households with access to improved water supply 2000 or latest available data	Sanitation % of households without access to improved sanitation 2000 or latest available data	Water collection % of population who must travel more than half an hour to fetch water 2001 or latest available data	Indoor smoke % of households using solid fuel for cooking 2000 or latest available data	Child labour % of children aged 5–14 years who are working 2001 or latest available data	Poisons centres number 2004	Dioxins and furans mean concentration of TEQ units in vegetation (pg/g) 2000	Country
Saint Lucia	148	36%	3 840	14	98%	11%	–	< 5%	–	0	–	Saint Lucia
Saint Vincent and Grenadines	119	38%	2 820	23	93%	4%	–	< 5%	–	0	–	Saint Vincent and Grenadines
Samoa	176	47%	1 420	26	99%	1%	–	< 5%	–	0	–	Samoa
San Marino	27	18%	–	5	–	–	–	< 5%	–	0	–	San Marino
Sao Tome and Principe	157	48%	290	90	–	–	–	< 5%	20%	0	–	Sao Tome and Principe
Saudi Arabia	23 520	45%	8 460	29	95%	0%	–	< 5%	–	6	–	Saudi Arabia
Senegal	9 855	50%	470	138	78%	30%	14%	79%	40%	0	–	Senegal
Serbia & Montenegro	10 535	24%	1 400	15	98%	0%	–	70%	–	0	0.6	Serbia & Montenegro
Seychelles	80	52%	6 530	14	–	–	–	< 5%	–	0	–	Seychelles
Sierra Leone	4 764	51%	140	316	57%	34%	–	92%	72%	0	–	Sierra Leone
Singapore	4 183	25%	20 690	4	100%	0%	–	< 5%	–	1	–	Singapore
Slovakia	5 398	23%	3 950	10	100%	0%	–	<5%	–	1	1.6	Slovakia
Slovenia	1 986	19%	9 810	6	100%	–	–	< 5%	–	1	1.6	Slovenia
Solomon Islands	463	50%	570	81	71%	66%	–	< 5%	–	0	–	Solomon Islands
Somalia	9 480	55%	130	219	–	–	–	< 5%	36%	0	–	Somalia
South Africa	44 759	40%	2 600	71	86%	13%	12%	28%	–	3	–	South Africa
Spain	40 977	18%	14 430	6	–	–	–	< 5%	–	3	0.4	Spain
Sri Lanka	18 910	31%	840	20	77%	6%	–	89%	–	1	–	Sri Lanka
Sudan	32 878	46%	350	110	75%	38%	–	> 95%	21%	0	–	Sudan
Suriname	432	38%	1 960	31	82%	7%	–	69%	–	1	–	Suriname
Swaziland	1 069	51%	1 180	135	–	–	–	88%	12%	0	–	Swaziland
Sweden	8 867	22%	24 820	4	100%	0%	–	< 5%	–	1	0.5	Sweden
Switzerland	7 171	20%	37 930	6	100%	0%	–	< 5%	–	1	2.8	Switzerland
Syrian Arab Republic	17 381	46%	1 130	27	80%	10%	–	19%	–	1	–	Syrian Arab Republic
Tajikistan	6 195	45%	180	63	60%	10%	–	> 95%	25%	0	–	Tajikistan
Tanzania, United Republic of	36 276	52%	280	156	68%	10%	47%	> 95%	–	1	–	Tanzania, United Republic of
Thailand	62 193	31%	1 980	31	84%	4%	–	72%	–	1	–	Thailand
Timor-Leste	739	48%	520	126	–	–	–	> 95%	–	–	–	Timor-Leste
Togo	4 801	51%	270	141	54%	66%	–	> 95%	66%	0	–	Togo
Tonga	103	44%	1 410	21	100%	–	–	< 5%	–	0	–	Tonga
Trinidad and Tobago	1 298	30%	6 490	21	90%	1%	–	< 5%	–	1	–	Trinidad and Tobago
Tunisia	9 728	35%	2 000	30	80%	16%	–	29%	–	1	–	Tunisia
Turkey	70 318	37%	2 500	44	82%	10%	–	11%	–	1	0.1	Turkey
Turkmenistan	4 794	41%	1 200	59	–	–	–	50%	–	0	–	Turkmenistan
Tuvalu	10	38%	–	65	100%	0%	–	< 5%	–	0	–	Tuvalu
Uganda	25 004	57%	250	147	52%	21%	59%	> 95%	–	0	–	Uganda
Ukraine	48 902	21%	770	21	98%	1%	–	56%	–	0	0.5	Ukraine
United Arab Emirates	2 937	31%	18 060	10	–	–	–	< 5%	–	0	–	United Arab Emirates
United Kingdom	59 068	23%	25 250	7	100%	0%	–	< 5%	–	6	1.2	United Kingdom
United States of America	291 038	26%	35 060	9	100%	0%	–	< 5%	–	66	–	United States of America
Uruguay	3 391	29%	4 370	16	98%	6%	–	< 5%	–	1	–	Uruguay
Uzbekistan	25 705	42%	450	36	85%	11%	–	79%	23%	0	–	Uzbekistan
Vanuatu	207	48%	1 080	44	88%	0%	–	< 5%	–	0	–	Vanuatu
Venezuela	25 226	39%	4 090	23	83%	32%	–	< 5%	4%	7	–	Venezuela
Viet Nam	80 278	38%	430	39	77%	53%	–	> 95%	–	1	–	Viet Nam
Yemen	19 315	56%	490	110	69%	62%	–	66%	17%	0	–	Yemen
Zambia	10 698	54%	330	185	64%	22%	22%	87%	11%	0	–	Zambia
Zimbabwe	12 835	51%	470	108	83%	38%	22%	67%	–	1	–	Zimbabwe

modelled data in italics

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Antigua & Barbuda 73.2
Argentina
  Buenos Aires 70.4
Bahamas 64.5
Barbados 77
Benin
  Atlantique Littoral 79.0
  Borgou Alibori 63.9
Bolivia
  Cochabamba 80.1
  La Paz 80.9
  Santa Cruz 81.2
Bosnia and Herzegovina 85.2
Botswana 70.9
Brazil
  Goiania 86.1
  Matto Grosso do Sul 87.2
  Paraiba 86.8
  Rio Grande do Norte 87.6
Bulgaria 59.7
Cambodia 83.7
Chile
  Coquimbo 74.6
  Santiago 71.5
  Valparaíso—Viña del Mar 76.4
China
  Chongqing 55.7
  Guangdong 64.3
  Shandong 63.1
  Tianjin 68.7
Cook Islands 75.3
Costa Rica 81.5
Croatia 76.8
Cuba
  Havana 80.7
Czech Rep 67.8
Dominica 74.3
El Salvador 87.8
Estonia 76.7
Ethiopia
  Addis Ababa 96.2
Fiji 54.0
FYR Macedonia 86.1
Gaza Strip and West Bank
  Gaza Strip 85.4
  North West Bank 82.8
  Middle West Bank 81.8
  South West Bank 82.6
Georgia 77.7
Ghana 58.2
Grenada 74.9
Guatemala
  Chimaltenago 83.5
  Guatemala City 77.7
Guyana 76.1
Haiti
  Port-au-Prince 74.9
Honduras
  San Pedro Sula La Ceiba 82.5
  Tegucigalpa 81.0
India
  Andra Pradesh 72.2
  Assam 61.7
  Arunachal Pradesh 42.8
  Bihar 73.7
  Goa 66.0
  Maharashtra 90.9
  Manipur 31.4
  Meghalay 52.6
  Mizoram 68.8
  Nagaland 33.2
  Orissa 64.1
  Rajasthan 57.7
  Sikkim 38.3
  Tamil Nadu 72.5
  Tripura 61.2
  Uttar Pradesh 60.7
  Uttaranchal 64.5
  West Bengal 84.6
Indonesia
  Jakarta 88.9
Iran 88.3
Jamaica 70.6
Jordan 74.4
Laos
  Luang Prabang Province 54.7
  Savannakhet 49.8
  Vientiane Municipality 60.1
  Vientiane Province 48.8
Latvia 76.1
Lesotho 33.0
Libya 75.5
Malawi
  Blantyre 90.1
  Lilongwe 85.1
Mexico
  Monterrey 77.6
  Guadalajara 56.0
Montenegro 88.3
Montserrat 88.3
Mozambique
  Gaza Inhambe 73.9
  Maputo City 77.8
Nepal 72.6
Nigeria
  Cross River State 60.2
Oman 86.0
Panama 80.3
Paraguay
  Altoparana Ituapua 82.9
  Amambay Caaguazu 83.8
  Asuncion 78.2
  Central 84.7
Peru
  Huancayo 89.3
  Ica City 86.3
  Lima 88.2
  Tarapato 90.5
  Trujillo 89.8
Philippines 40.4
Poland
  Urban 79.1
  Rural 86.5
  Republika Srpska 84.9
Russian Federation
  Moscow 71.0
  Sarov 78.2
St Kitts & Nevis 76.5
St Lucia 79.5
St Vincent & the Grenadines 70.5
Senegal
  Dakar 89.6
  Diourbal 90.2
Serbia 76.3
Seychelles 61.9
Slovakia 76.8
Slovenia 68.7
South Africa 53.4
Sri Lanka 91.4
Suriname 87.6
Syria 78.4
Togo 83.5
Trinidad & Tobago 84.7
Uganda
  Arua 31.9
  Kampala 65.4
  Mpigi 58.8
Ukraine
  Kiev 66.9
Uruguay
  Colonia 79.5
  Maldonado 76.3
  Montevideo 72.6
  Rivera 81.9
Venezuela
  Barinas 88.9
  Cojedes 86.8
  Lara 85.3
Vietnam
  Denang 86.5
  Haiphong 86.0
  Hanoi 89.1
  Hochiminh 87.9
  Tuenquang 86.4
Yemen
  Aden 77.7
  Hadhramout 73.5
  Sanaa 77.6
Zambia
  Chongwe/ Luangwa 40.6
  Kafue 36.9
  Lusaka 49.6
Zimbabwe
  Harare 43.2
  Manicaland 31.6

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