

TO OUR HEALTH

background reading | health unit

The health of individuals and communities is inextricably linked to the environment. Every breath, sip, swallow, or bug bite could introduce something unfamiliar to our immune systems. Many of these dangers are human-made (or **anthropogenic**) like toxic chemicals, pollution from combustion, untreated sewage, or mishandled food. Some are natural, like the viruses and bacteria that have existed and mutated through the ages, but now find more human hosts among our growing populations. The environment can also hold the key to better human health from plant-based medicines, many yet to be discovered. Improving the health of our global family will require us to work toward a sustainable environment and to invest in infrastructure and access to quality health care for all people.

Health hazards old and new

The types of health risks we encounter can vary depending on where you live (urban vs. rural, less developed vs. more developed, tropical vs. temperate climates). For instance, different living conditions can affect exposure to different kinds of environmental threats. The **World Health Organization (WHO)** estimates that nearly one-quarter (23 percent) of all deaths worldwide could be prevented through healthier environments.¹



Environmental threats to human health fall into two main groups: “traditional hazards” associated with poverty and lack of development and “emerging hazards” associated with unsustainable development. Traditional hazards include lack of access to safe drinking water, inadequate basic sanitation in the household and community, indoor air pollution from cooking and heating with coal or biomass fuel, and inadequate solid waste disposal.

Emerging hazards result from development that lacks safeguards for protecting human health and the environment, and from unsustainable consumption of natural resources. They include water pollution from industry and chemical-intensive agriculture, urban air pollution from automobiles, coal-fired power plants and factories, and climate change. The changing pattern of environmental health risks – moving from “traditional” to “emerging” hazards over time and simultaneous with economic development – is known as the **risk transition**.

Economic development can be a double-edged sword when it comes to human health risks. While economic development brings improved standards of living and better access to health care, it can also come with increased urbanization, pollution and sanitation challenges.

Whether traditional or emerging, environmental hazards are not contained by city or national borders. Smoke from wildfires in California can travel across the U.S. and east to Europe. Industrial pollution from Southeast Asia can create smog in Oregon. A contagious virus transmitted to humans by a wild animal in a traditional Chinese wet market can circle the globe, infecting millions.

The development dilemma

In the quest to develop and improve the quality of life for their residents, rapidly developing countries can become mired in the so-called “development dilemma.” No country better typifies this dilemma than China, whose economy grew by an average of 10 percent a year for two decades (1992-2011).² This economic growth lifted many millions of Chinese out of poverty, but at a cost. The rising energy use, unprecedented **urbanization** and industrialization polluted China’s skies and waterways, leading to a public health crisis.

China’s environmental footprint is now larger than any other single country. It is the largest emitter of carbon (28 percent of global emissions), the largest producer and consumer of coal (about half of global consumption) and has seen a staggering rate of urbanization.³ From 2004 to 2020, the number of cars on Chinese roads grew ten-fold (from 27 million to 270 million) and the number of large cities (of more than 1 million people) grew from 72 to 134.⁴ By 2030, it is projected that more than 70 percent of China’s population will be urban dwellers, up from 36 percent in 2000.⁵ As a result of this rapid urbanization, air quality in many of its cities diminished to unhealthy levels, with air pollution-related deaths peaking in 2013. Since then, emissions control efforts have reduced pollution levels, though over 80 percent of the country’s population still live in areas that exceed WHO guidelines for healthy air.⁶ The human toll of this air pollution is estimated at 1.2 million premature deaths each year from respiratory and heart disease and some forms of cancer.⁷ Industry along China’s major rivers polluted the water supplies to the point of straining the country’s ability to produce food and provide drinkable water for its large population.



Shanghai skyline, China.

This public health crisis has led the Chinese government to institute restrictions on polluters and to plan a more sustainable path for China’s future. Consequently, China is now investing heavily in renewable energy and vowing to reduce its use of coal.

Like China, India, too, has seen rapid development and industrialization and all of the health hazards that go with it. In 2019, 21 of the 30 cities with the worst air quality in the world were in India.⁸ The country’s increased industrial and agricultural activities, combined with population growth, have impacted air and water quality, and expanded solid and hazardous waste generation. A recent report from the Yale Center for Environmental Law and Policy ranked India 168th out of 180 countries on environmental quality, with the lowest rankings for air quality (179th) and heavy metal (lead) exposure (174th).⁹ India is set to overtake China as the world’s most populous country by 2027.¹⁰

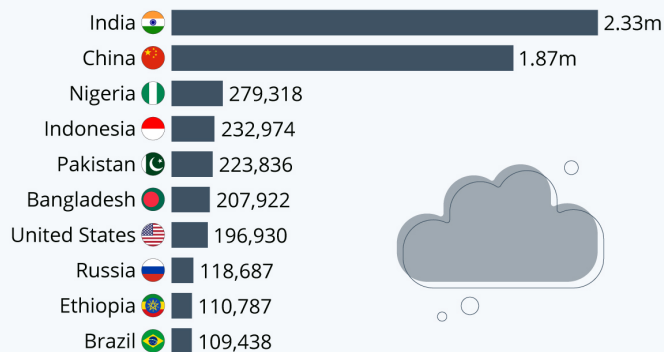
No room to breathe

As in China and India, population growth, industrialization and urbanization have resulted in a profound deterioration of air quality in many parts of the world. Air pollution (both indoor and outdoor) is already a serious problem in many countries and is becoming worse as urban populations grow and the number of vehicles on the road rises. In 2016, WHO found that 91 percent of the world population was living in places that didn't meet their air quality guidelines.¹¹ Some of the worst concentrated pollutants in the ambient air that can affect human health are particulate matter (PM), ozone, nitrogen dioxide, sulfur dioxide, and carbon monoxide.

Of all the air pollutants, **particulate matter (PM)** – suspended particles of ash, soot dust, and chemicals – affects the most people. Chronic exposure to PM raises the risks of developing cardiovascular and respiratory diseases, including lung cancer. In less developed countries, much of this exposure to PM comes from the indoor burning of solid fuels on open fires and traditional cooking stoves. In more developed and rapidly developing countries, ambient (outdoor) air pollution is the main threat and led to 4.2 million premature deaths worldwide in 2016, according to WHO.¹² PM exposure in these countries mostly comes from automobile exhaust, coal plants, and industry.

Study: Pollution Kills 8.3 Million People Annually

Estimated number of premature pollution-related deaths per year*



* Exposure to toxic air, water, soil, and chemical pollution
Source: Global Alliance On Health And Pollution



statista



Outdoor latrine in Papua New Guinea.

Sanitation challenges

Many of us take for granted the availability of clean water from indoor taps and toilets that are hooked up to septic tanks or sewage systems. Yet lack of access to safe water and proper sanitation are leading causes of illness and death in many parts of the world. In fact, one-quarter of the world's population, 2 billion people, don't have access to toilets or even community latrines, and open defecation is common.¹³ One in 10 people doesn't have access to clean drinking water.¹⁴ This is the case in both the rural areas of the least developed countries, but also in the informal settlements on the edges of growing cities.

Contaminated water and poor sanitation are linked to a number of diseases including cholera, diarrhea, dysentery, hepatitis A, typhoid, polio and intestinal worms. Nearly half a million people die each year from diarrhea, one of the top killers of children under age five in low-income countries.¹⁵ Most cases of diarrhea result from contaminated water or food. These are deaths that could be prevented with investments in improved infrastructure, sanitation facilities, and hygiene promotion.

Nature's response



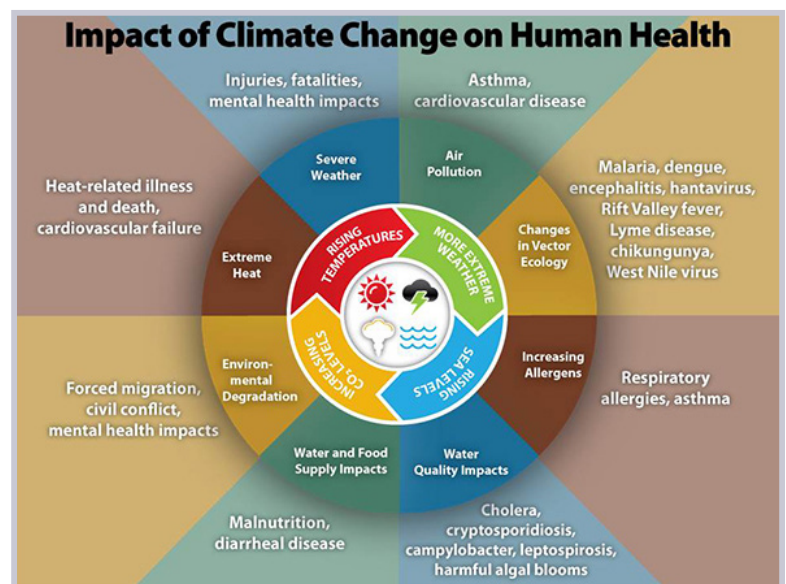
The bark of yew trees like this one is the source of the chemotherapy drug paclitaxel.

sleeping sickness and Chagas disease. Global warming is also expanding the geographic range of some tropical diseases carried by insects, including malaria, dengue and Zika. Each year, infectious diseases spread by insects kill 700,000 people, over half from malaria alone.¹⁶

Some of the world's deadliest viruses are **zoonotic**, jumping from other animal species to humans. Bats are reservoirs for more than 60 viruses that can infect humans including coronavirus, Ebola, SARS (severe acute respiratory syndrome), and rabies.¹⁷ Though humans rarely come into close contact with bats, the bats infect other animals that do interact with humans. These animal encounters become more likely when we clear and deforest wild lands to expand agriculture, or when we use wild animals as commodities for food or traditional medicines.

The health effects of a changing climate are also resulting from more extreme weather events. For instance, floods are increasing in frequency and intensity, contaminating fresh water, disrupting health services and creating more breeding grounds for disease-carrying mosquitoes. Natural disasters threaten people's shelters and agricultural lands. WHO estimates that between 2030 and 2050, climate change is expected to cause approximately 250,000 additional deaths per year due to **malnutrition**, malaria, diarrhea and heat stress, especially in the poorest countries with the least ability to cope with changing conditions.¹⁸ Higher temperatures and droughts also increase the risk and extent of wildfires around the globe, which expose millions of people to hazardous air pollution.

Beyond polluted air and contaminated food and water, people have also created systemic environmental problems – like climate change and the destruction of **ecosystems** – that are now endangering human health. For instance, both of these trends have increased the population's risk for infectious diseases carried by **disease vectors** like mosquitoes and ticks. Ecosystems can serve as buffer zones to keep different disease-carrying species in their own habitats and away from people. Deforestation and desertification can bring vectors and the diseases they carry closer to human settlements. Black flies, tsetse flies and Anopheles mosquitoes in West Africa have changed their distribution in recent decades with the loss of savannah and riverine forests, and put people at greater risk of contracting yellow fever, African



Source: CDC

Healthy ecosystems sustain human health in innumerable ways. For example, forest canopies filter our air, mangroves protect our coasts from flooding, and pollinators (bees, bats, butterflies and beetles) are indispensable in bringing produce to our dining tables. Biomedical research has long relied on plants, animals, and microbes to treat human diseases. Drugs such as quinine (anti-malarial drug), morphine (painkiller) and paclitaxel (for cancer) are all derived from plants, and many more have yet to be discovered. Threatened animal species, such as poison dart frogs of Central and South America, are a source of important alkaloid compounds to treat pain. The endangered polar bears have aided biomedical research on fatty acid metabolism that may provide clues for the prevention and treatment of human conditions such as obesity and diabetes. Monkeys have been critical to research on viruses such as HIV/AIDS, hepatitis, and Ebola.

Mothers and children

All of the environmental health risks – both traditional and emerging – have the greatest effect on the most vulnerable populations, especially young children. Children breathe more air, consume more food and drink more water than adults in proportion to their body weight. This exposes children to more pollutants and chemicals that can pose long-term harm to their health and development. Playing or washing in polluted bodies of water can put children at risk of picking up water-borne intestinal diseases, which can cause malnutrition and hinder growth. Air pollution (from both indoor and outdoor sources) can affect cognitive development, reduce lung function and trigger asthma, causing lifelong respiratory problems.

With their immature immune systems, children are especially susceptible to a range of communicable diseases. Substantial improvements in child survival has been made in the last 30 years, especially with widespread vaccinations against common childhood diseases like measles, mumps, and whooping cough. These immunizations prevent 2-3 million deaths each year and have been one of the greatest areas of progress for global childhood health. Today's mortality rate among young children is less than half of what it was in 1990.¹⁹

Healthy babies require healthy mothers. Pregnant women are susceptible to environmental risks due to their increased nutrient requirements. Mothers' exposure to certain pollutants and chemicals during pregnancy can contribute to birth defects. Food insecurity in many low-income countries contributes to nutrient deficiencies, which can, in turn, weaken immune systems and put pregnant women and infants at greater risk of contracting and dying from all sorts of pathogens.

Pregnancy and childbirth bring health challenges the world over, but the risks are especially high in under-resourced areas, with inadequate numbers of medical professionals and health care facilities to meet the needs of the population. Approximately 810 women die each day from preventable causes related to pregnancy and childbirth, and most of those deaths occur in the least developed countries.²⁰ Though **maternal mortality** rates have dropped significantly in recent years, too many girls and women still lack access to skilled medical care during pregnancy, as well as during and after childbirth.



Child being vaccinated in Fiji.

To avoid maternal deaths, it's also important to prevent unwanted pregnancies and pregnancies among younger teens through **contraception** and sexuality education. Reproductive health care is an important part of overall wellness for the global population. An estimated 270 million women in less developed countries would like to delay or stop childbearing but don't have access to contraceptives.²¹ That's why one of the **United Nations Sustainable Development Goals (SDGs)** is to “ensure universal access to sexual and reproductive health-care services, including for **family planning**.”²²

Health inequities and environmental justice

In addition to young children, environmental hazards take their greatest toll on people with the fewest resources. In all parts of the world, impoverished people live where the land or rent is cheapest, often in areas with severely compromised environments. In urban, industrial areas, these communities might be situated near factories, oil refineries and power plants emitting smoke and toxins, or near highways with greater levels of automobile exhaust. In more rural areas, they might be downriver of polluting mining and drilling operations, or near industrial farms – with the potential to affect water, soil and air quality in surrounding communities.

Marginalized populations are also more likely to work in high-risk occupations that expose them to environmental hazards, like pesticides in farming or toxic chemicals in industrial processing. Living near environmentally compromised areas or working with hazardous materials results in higher incidences of acute and chronic diseases including asthma and cancer. These most affected populations, often people of color, have historically lacked a voice to properly participate in decisions to alleviate harms from these environmental hazards. This has spurred **environmental justice** campaigns in the U.S. and around the world.

People in low- and middle-income countries face lower life expectancies and higher burdens of disease than people in high-income countries. They are also disproportionately affected by the spread of infectious diseases. Alleviating this disease disparity will take investments in water and sanitation systems, as well as a global commitment to universal access to high-quality health care. According to the UN, less than half of the global population is currently covered by essential health services.²³



People live and work at the largest landfill in Manila, Philippines.

A prescription for global health

The connections between population, poverty, economic growth, and environmental degradation are clear. Addressing global environmental health challenges requires an integrated framework and international initiatives on sustainable development and social justice. Cooperative efforts in global health have grown significantly since the early 2000s, as new international goals and targets for addressing health challenges have been established, and new global health funding sources have emerged.

In 2000, world leaders came together to establish the **UN Millennium Development Goals (MDGs)**, setting 15-year targets for alleviating global poverty, hunger, and disease. In 2015, they expanded the scope of these targets with the Sustainable Development Goals, which consists of specific targets for health promotion by 2030. The targets include substantial reductions in child and maternal mortality, reductions in the death toll from pollution, and combatting communicable and noncommunicable diseases.

Great strides have been made in the past 20 years, but some progress was reversed when the coronavirus became a worldwide pandemic in the spring of 2020. By the end of that year, over 50 million people had been infected, and health workers were already seeing a disruption in health care worldwide, from stalled child immunization programs to undiagnosed malaria and TB cases, to a suspension of clinic services for family planning, routine disease prevention and more.²⁴

Achieving SDG targets involves public-private partnerships. There are currently several foundations and global health networks connecting governments, non-governmental organizations, and businesses to address global public health. These include the Clinton Health Access Initiative, the Bill and Melinda Gates Foundation, and the Global Fund to fight AIDs, Tuberculosis, and Malaria.

The global community has also outlined a number of specific infrastructure targets as part of the SDGs. Many of these deal with improving conditions that will bring about better health outcomes, such as investments in water and sewage treatment, waste management, health care facilities, clean energy and sustainable urban planning, especially in less developed countries. There is also a growing recognition that access to quality healthcare is a human right. One of the SDG targets for 2030, in fact, is to “achieve universal health coverage” with access to skilled health providers, vaccines and essential medicines at affordable prices.²⁵ Achieving improvements in public health at home and abroad will take a coordinated effort by all stakeholders, but the rewards could mean lowering the disease burden for current and future generations.

¹ World Health Organization. (2019). Healthy Environments for Healthier Populations: Why Do They Matter and What Can We Do? (WHO/CED/PHE/DO/19.01).

² The World Bank. World Development Indicators; Retrieved 2020 October 20 from <https://data.worldbank.org>

³ IEA. 2018 data. Retrieved 2020 October 20 from <https://www.iea.org>

⁴ Brown, Warren. (2004 October 17). Automakers find China ripe for new technology. Washington Post; Gasgoo. (2020 June 2014). China's automobile population amounts to 270 million units as of June 2020. Retrieved from http://autonews.gasgoo.com/china_news/70017340.html; United Nations Department of Economic and Social Affairs (UNDESA), Population Division. (2019). World Urbanization Prospects 2018. Retrieved 2020 October 20 from <https://population.un.org/wup/>

⁵ UNDESA, World Urbanization Prospects 2018.

⁶ Health Effects Institute. (2019). State of Global Air 2019. Special Report. https://www.stateofglobalair.org/sites/default/files/soga_2019_report.pdf

⁷ Yin, Peng, et. al. (2020 August 17). The effect of air pollution on deaths, disease burden, and life expectancy across China and its provinces, 1990-2017: an analysis for the Global Burden of Disease Study 2017. The Lancet Planetary Health, Volume 4, Issue 9; [https://doi.org/10.1016/S2542-5196\(20\)30161-3](https://doi.org/10.1016/S2542-5196(20)30161-3)

⁸ IQAir. (2020). 2019 World Air Quality Report: Region & City PM2.5 Ranking. Retrieved from <https://www.iqair.com/world-most-polluted-cities>

⁹ Wendling, Z. A., Emerson, J. W., de Sherbinin, A., Esty, D. C., et al. (2020). 2020 Environmental Performance Index. New Haven, CT: Yale Center for Environmental Law & Policy. Retrieved from <https://epi.yale.edu>

¹⁰ United Nations Department of Economic and Social Affairs (UNDESA). World Population Prospects. 2019 Revision. Retrieved from <https://population.un.org/wpp/>

^{11,12} World Health Organization. (2018, May 2). Ambient (outdoor) air pollution. Retrieved from [https://www.who.int/en/news-room/fact-sheets/detail/ambient-\(outdoor\)-air-quality-and-health](https://www.who.int/en/news-room/fact-sheets/detail/ambient-(outdoor)-air-quality-and-health)

- ¹³ World Health Organization. (2019 June 14). Sanitation (Fact sheet). Retrieved from <https://www.who.int/en/news-room/fact-sheets/detail/sanitation>
- ^{14,15} World Health Organization. (2019 June 14). (2016, November). Drinking-water. (Fact sheet). Retrieved from <https://www.who.int/en/news-room/fact-sheets/detail/drinking-water>
- ¹⁶ World Health Organization. (2020 March 2). Vector-borne diseases. (Fact sheet). Retrieved from <https://www.who.int/en/news-room/fact-sheets/detail/vector-borne-diseases>
- ¹⁷ Castro, J. (2013, February 6). Bats Host More Than 60 Human-Infecting Viruses. Live Science. Retrieved from <https://www.livescience.com/26898-bats-host-human-infecting-viruses.html>
- ¹⁸ World Health Organization. (2018, February 1). Climate change and health. (Fact sheet). Retrieved from <https://www.who.int/en/news-room/fact-sheets/detail/climate-change-and-health>
- ¹⁹ World Health Organization. (2020, September 8). Children: improving survival and well-being. (Fact sheet). Retrieved from <https://www.who.int/en/news-room/fact-sheets/detail/children-reducing-mortality>
- ²⁰ World Health Organization. (2019, September 19). Maternal mortality. (Fact sheet). Retrieved from <https://www.who.int/en/news-room/fact-sheets/detail/maternal-mortality>
- ²¹ World Health Organization. (2016, December). Family planning/Contraception. (Fact sheet). Retrieved from <https://www.who.int/en/news-room/fact-sheets/detail/family-planning-contraception>
- ^{22,23,25} United Nations Development Program (n.d.), Goal 3 targets. Retrieved from <http://www.undp.org/content/undp/en/home/sustainable-development-goals/goal-3-good-health-and-well-being/targets/>
- ²⁴ World Health Organization. (2020, August 31). In WHO global pulse survey, 90% of countries report disruptions to essential health services since COVID-19 pandemic. News Release. Retrieved from <https://www.who.int/news/item/31-08-2020-in-who-global-pulse-survey-90-of-countries-report-disruptions-to-essential-health-services-since-covid-19-pandemic>