

Preventive Health Measures Environmental Ethics

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Abstract—The key to environmental risks globally and regionally, quantifying the amount of death and disease caused by factors such as unsafe drinking-water and sanitation, and indoor and outdoor air pollution.

This study examines how specific diseases and injuries are impacted by environmental risks, and which regions and populations are most vulnerable to environmentally-mediated diseases and injuries.

Approximately one-quarter of the global disease burden, and more than one-third of the burden among children, is due to modifiable environmental factors. Analysis how different diseases are impacted by environmental risks and by how much. Environmentally-mediated disease burden is much higher in the developing world than in developed countries.

The infant death rate from environmental causes is higher in developing than in developed countries, reflecting the human health gain that could be achieved by supporting healthy environments. This paper details the health impacts of environmental risks across of identified diseases and injuries. Findings are particularly relevant to health care policymakers and practitioners. Our evolving knowledge about environment-health interactions can support the design of more effective preventive and public health strategies that reduce corresponding risks to health.

Findings can be used to highlight the most promising areas for immediate intervention, linkages and quantify population risk (burden of disease) for various environmental risk factors.

Measures can be taken to reduce this environmental disease burden. The promotion of safe household water storage and better hygiene measures, the use of cleaner fuels, management of toxic substances in the home and workplace. At the same time, actions by sectors such as construction, energy, transport, agriculture, and industry are urgently required, in cooperation with the health sector, to address the root environmental causes of ill health.

Coordinated investments can promote more cost-effective development strategies with multiple social and economic co-benefits, in addition to global health gains, both immediate and long term.

1. INTRODUCTION

HOW MUCH DISEASE CAN BE PREVENTED THROUGH HEALTHIER ENVIRONMENTS?

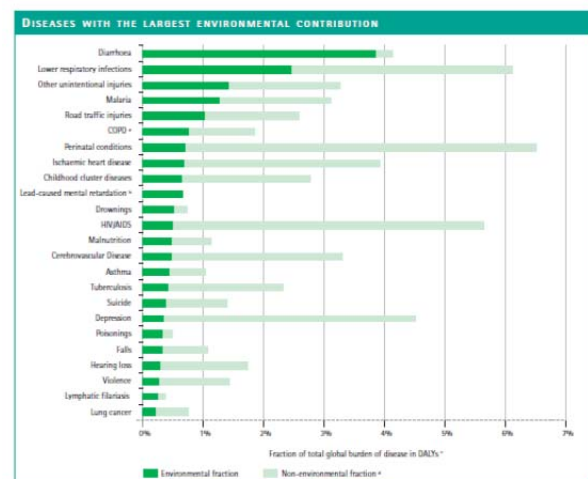
How healthier environment is responsible for preventing disease?

This question lies at the heart of our global efforts to address the root causes of ill health through improved preventive

health strategies - using the full range of policies, interventions and technologies in our arsenal of knowledge. This present study examines how *specific diseases and injuries* are impacted by environmental risks, and which regions and populations are most vulnerable to environmentally-mediated diseases and injuries.

Listed below are the various diseases where environment is one of the major cause and improving environmental quality can fight against the disease up to great extent. The list of diseases are as mentioned below:-

Respiratory infections, Diarrhoea, Malaria, Intestinal nematode infections, Trachoma, Schistosomiasis, Chagas disease, Lymphatic filariasis, Onchocerciasis, Leishmaniasis, Dengue, Japanese encephalitis, HIV/AIDS, Sexually transmitted diseases, Hepatitis B and hepatitis C, Tuberculosis, Perinatal conditions, Congenital anomalies, Malnutrition, Cancers, Neuropsychiatric disorders, Cataracts, Deafness, Cardiovascular diseases, Chronic obstructive pulmonary disease, Asthma, Musculoskeletal diseases, Road traffic injuries, Unintentional poisonings, Falls, Fires, Drowning, Other unintentional injuries, Suicide, Interpersonal violence, Physical inactivity, Other diseases.



* Abbreviations: COVID-19 = Coronavirus disease 2019; COVID-19 = Chronic obstructive pulmonary disease.
* Lead-caused mental retardation is defined in the WHO list of diseases for 2002, accessed at: www.who.int/evidence.
* DALYs represents a weighted measure of death, illness and disability.
* For each disease the fraction attributable to environmental risks is shown in dark green. Light green plus dark green represents the total burden of disease.

Out of which diarrhoea, lower respiratory infections, various forms of unintentional injuries, and malaria have maximum contribution of environment quality. This 'environmentally-mediated' disease burden is much higher in the developing world than in developed countries. The health impacts of environmental risks across more than 80 diseases and injuries. Findings are particularly relevant to health care policymakers and practitioners. Our evolving knowledge about environment-health interactions can support the design of more effective preventive and public health strategies that reduce corresponding risks to health.

Many measures can indeed be taken almost immediately to reduce this environmental disease burden. Just a few examples include the promotion of safe household water storage and better hygiene measures, the use of cleaner fuels and safer, more judicious use and management of toxic substances in the home and workplace. At the same time, actions by sectors such as energy, transport, agriculture, and industry are urgently required, in cooperation with the health sector, to address the root environmental causes of ill health.

Acting together on the basis of coordinated health, environment and development policies, we can strengthen this platform, and make a real difference in human well-being and quality of life.

Coordinated investments can promote more cost-effective development strategies with multiple social and economic co-benefits, in addition to global health gains, both immediate and long term. Repositioning the health sector to act more effectively on preventive health policies, while enhancing intersectoral partnerships, is thus critical to addressing the environmental causes of disease and injury, meeting the Millennium Development Goals, and achieving better health for all.

This global assessment provides quantitative estimates of 'burden of disease' from environmental factors across the major categories of reported diseases and injuries.

By focusing on the disease endpoint, and how various kinds of diseases are impacted by environmental influences, the analysis forges new ground in an understanding of interactions between environment and health. The estimates, in effect, reflect how much death, illness and disability could realistically be avoided every year as a result of reduced human exposures to environmental hazards.

Specifically considered here are "modifiable" environmental factors realistically amenable to change using available technologies, policies, and preventive and public health measures. These environmental factors include physical, chemical and biological hazards that directly affect health and also increase unhealthy behaviours (e.g. physical inactivity).

The results and conclusions are of particular relevance to the health-care sector, where policies and programmes generally address specific diseases or injuries. A better understanding of

the disease impacts of various environmental factors can help guide policymakers in designing preventive health measures that not only reduce disease, but also reduce costs to the health-care system. The findings also are highly relevant to non-health sectors, whose activities influence many of the root environmental factors – such as air and water quality, patterns of energy use, and patterns of land use and urban design – which affect health and behaviour directly and indirectly.

Along with reducing disease burden, many of the same health sector and non-health sector measures that reduce environmental risks and exposures also can generate other co-benefits, e.g. improved quality of life and well-being, and even improved opportunities for education and employment. Overall, then, an improved environment also will contribute to achieving the Millennium Development Goals. A brief summary of specific findings is presented below, in terms of key questions that were explored.

Environmental factors, such as inadequate pedestrian and cycling infrastructures, also make a significant contribution to injuries from road traffic accidents (40%). However, health impacts of certain longer term changes in urban geography and mobility patterns are yet to be measured.

An estimated 42% of chronic obstructive pulmonary disease (COPD), a gradual loss of lung function, is attributable to environmental risk factors such as occupational exposures to dust and chemicals, as well as indoor air pollution from household solid fuel use. Other forms of indoor and outdoor air pollution – ranging from transport to second-hand tobacco smoke – also play a role. A list of the 24 diseases with the largest environmental contribution to overall burden is noted in the following figure. Detailed description of environmental factors and impacts on all diseases considered is provided in subsequent chapters, as are statistical tables and annexes covering global, and regional disease burden, as well as special sub-groups such as children.

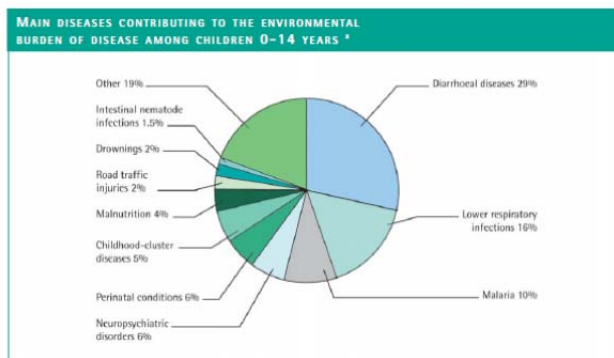
2. POPULATIONS SUFFER THE MOST FROM ENVIRONMENTAL HAZARDS TO HEALTH

Globally, the per capita number of healthy life years lost to environmental risk factors was about 5-times greater in children under five years of age than in the total population.

Diarrhoea, malaria and respiratory infections all have very large fractions of disease attributable to environment, and also are among the biggest killers of children under five years old. In developing countries, the environmental fraction of these three diseases accounted for an average of 26% of all deaths in children under five years old. Perinatal conditions (e.g. prematurity and low birth weight); protein-energy malnutrition and unintentional injuries – other major childhood killers – also have a significant environmental.

On average, children in developing countries lose 8-times more healthy life years, per capita, than their counterparts in developed countries from environmentally-caused diseases. In

certain very poor regions of the world, however, the disparity is far greater; the number of healthy life years lost as a result of childhood lower respiratory infections is 800-times greater, per capita; 25-times greater for road traffic injuries; and 140-times greater for diarrhoeal diseases. Even these statistics fail to capture the longer term effects of exposures that occur at a young age, but do not manifest themselves as disease until years later.



Diseases with the largest absolute burden attributable to modifiable environmental factors included: diarrhoea, lower respiratory infections, malaria and unintentional injuries. Detail study of how identified diseases are largely affected by environment and how change/ modification in environment can reduce the risk of identified diseases.

1. **Diarrhoea.** A large proportion of diarrhoeal diseases is caused by faecal-oral pathogens. In the case of infectious diarrhoea, transmission routes are affected by interactions between physical infrastructure and human behaviours. If sanitation or related hygiene is poor, e.g. when hand washing facilities are inadequate, or when faeces are disposed of improperly, human excreta may contaminate hands, which can then contaminate food or other humans (person-to-person transmission). Faecal pathogens are frequently transferred to the waterborne sewage system through flush toilets or latrines, and these may subsequently contaminate surface waters and groundwater. Human excreta also can directly contaminate the soil and enter into contact with people; flies may carry pathogens from excreta to food, for example. Through these pathways, drinking-water, recreational water or food may be contaminated and cause diarrhoeal disease following ingestion. Animal excreta also transmit pathogens. The predominant route will depend upon the survival characteristics of the pathogen, as well as local infrastructure and human behaviour. Many interventions have proven efficient in interrupting the pathogen transmission cycle at various points.

2. **Lower respiratory infections.** These are associated with indoor air pollution related largely to household solid fuel use and possibly to second-hand tobacco smoke, as well as to outdoor air pollution. In developed countries, an estimated 20% of such infections are attributable to environmental

causes, rising to 42% in developing countries. Indoor and outdoor air quality are two of the main environmental factors of concern for acute lower respiratory infections. The effects of indoor and outdoor air pollution and other indoor conditions, at least 42% (95% Confidence Interval: 32–47%) of all lower respiratory infections were estimated to be attributable to the environment in developing countries. In developed countries, this rate was about halved to 20% (15–25%). The relationship of upper respiratory infections and otitis with environmental conditions was less well documented. In developing countries, about 24% (6–45%) of upper respiratory infections and otitis were attributable to environmental risk factors, such as outdoor and indoor air pollution, environmental tobacco and housing conditions. As with lower respiratory infections, the rate for upper respiratory infections and otitis was estimated to be lower in developed countries, at 12% (5–18%). Globally, more than 1.5 million deaths annually from respiratory infections are attributable to the environment.

3. **Malaria.** In humans, malaria is a disease caused by one of four parasite species belonging to the genus *Plasmodium*. The parasite is transmitted by the bite of an infected female mosquito of the genus *Anopheles*. The larval stages of *Anopheles* mosquitoes occur in a wide range of habitats, but most species share a preference for clean, unpolluted, stagnant or slowly moving fresh water.

There are three main approaches to the environmental management of malaria:

a. *Modify the environment.* This approach aims to permanently change land, water or vegetation conditions, so as to reduce vector habitats.

b. *Manipulate the environment.* This approach temporarily produces unfavourable conditions for vector propagation and therefore needs to be repeated.

c. *Modify or manipulate human habitation or behaviour.* This approach aims to reduce contact between humans and vectors.

The successful introduction of insecticide-treated mosquito nets has put them in a category of their own, and blurred the boundary between environmental management and chemical control. For the current survey, the use of mosquito netting was not considered to be environmental management.

Environmental modification steps to control malaria include:

1. Drainage
2. Levelling land
3. Filling depressions, borrow pits, pools and ponds
4. Contouring reservoirs
5. Modifying river boundaries
6. Lining canals to prevent seepage

Constructing hydraulic structures, such as weirs, to avoid stagnant water. In an urban environment, environmental modification options also include building drains and storm-drains, modifying house design (including gutters and roof drains), and installing wastewater management facilities. Other environmental tools for controlling malaria include water management (e.g. intermittent, or alternate wet and dry

irrigation; sprinkler, drip or central pivot irrigation); vegetation management in rural settings; safe practices for storing domestic water; management of solid waste in and around urban environments; and the maintenance of water supply and sanitation in urban areas.

3. WHAT CAN POLICYMAKERS AND THE PUBLIC DO ABOUT ENVIRONMENTAL RISKS TO HEALTH?

Public and preventive health strategies that consider environmental health interventions can be very important. Such interventions are cost-effective and yield benefits that also contribute to the overall well-being of communities.

Many environmental health interventions are economically competitive with more conventional curative health-sector interventions. Examples include phasing out leaded gasoline. Mental retardation due to lead exposures in general was estimated to be nearly 30 times higher in regions where leaded gasoline was still being used, as compared with regions where leaded gasoline had been completely phased out.

Providing access to improved drinking-water sources in developing countries would reduce considerably the time spent by women and children in collecting water. Providing access to improved sanitation and good hygiene behaviours would help break the overall cycle of faecal-oral pathogen contamination of water bodies, yielding benefits to health, poverty reduction, well-being and economic development.

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4. ACKNOWLEDGEMENT

I would like to thank my father **Dr. Vikram Khetrpal** (Surgical specialist) for giving me inborn knowledge for medical field even when I belong to altogether different field.

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