

Climate change, natural calamities and the triple burden of disease

To the Editor — In recent months, there has been an amplified interest in human disease and wellbeing, as well as increased awareness of the vast global disparities in both health risk and care. Despite the ongoing impacts of COVID-19, in general, many developed countries have undergone an epidemiological transition, resulting in a shift in the major types of disease¹: the disease pattern has changed to a low burden of communicable and nutrition-deficit diseases and a relatively higher burden of non-communicable diseases (NCDs) and injuries. However, low- and middle-income countries (LMICs) are still in a state of transition, and the burden of communicable diseases in these countries remains considerably high. While ongoing economic growth in LMICs has led to some decreases in these communicable diseases, it has simultaneously increased the burden of NCDs and injuries, giving LMICs a ‘triple burden of disease’². Using the country of Nepal as an example (Box 1), we highlight how climate change can further intensify this triple burden of communicable disease, NCDs and injuries, adding to the disproportionate economic costs of climate change for LMICs.

The environmental determinants of health, such as clean air, safe drinking water and sanitation, are affected by climate change, which can increase communicable diseases and infections, NCDs and injuries. In Nepal, while previously prevalent infectious diseases such as helminth infection, cholera, acute gastroenteritis, tetanus, respiratory infections and tuberculosis have decreased with economic development, emerging and re-emerging infectious diseases such as dengue, chikungunya, influenza (H5N1 and H1N1), scrub typhus, leptospirosis, cryptosporidiosis and malaria have increased³. Climate change can lead to geographic expansion of infectious diseases⁴, and has already been implicated in the spread of malaria to hilly and mountainous regions of Nepal³. Moreover, communicable diarrheal diseases and vector-borne diseases such as malaria and dengue are predicted to increase under climate change⁵, and it is estimated that between 2030 and 2050, climate change will cause 250,000 additional deaths globally per year from communicable and nutritional diseases. Most of these

Box 1 | Climate change has the potential to increase the triple burden of disease in LMICs such as Nepal

Nepal — a developing, seismically active, landlocked country in Southeast Asia — is among the most vulnerable countries in the world due to its fragile landscape, climate-sensitive ecosystem and socioeconomic circumstance. It is placed on the high-risk list in both the Climate Risk Index and the INFORM Risk Index (for humanitarian crises and disasters)¹⁸. The geographical diversity of Nepal makes it representative of the effects of climate change occurring across a wide range of LMICs. The lowland Terai region is more affected by seasonal flooding due to monsoon rains and a complex river system. By comparison, the hilly region is affected by landslides and debris flows, and the Himalayas are troubled by avalanche and glacial lake outburst floods. These floods, along with the droughts the land experiences, lead to loss of crop production and a food deficit, pushing many people into poverty.



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Additionally, Nepal is seismically very active and at high risk of earthquakes, which can potentially affect the whole country. It is estimated that more than 80% of the Nepalese population is at risk from these environmental hazards¹⁸.

deaths will occur in developing countries⁶. The situation is worsened by the occurrence of disasters such as floods and landslides, which lead to more clustered disease outbreaks and, under climate change, may occur more frequently and less predictably in space and time⁷. For example, in Nepal, floods and landslides are normally expected in the lowland Terai and hilly regions of Nepal but have also increased in the Himalayan region⁸. Such events are responsible for unexpected direct morbidity and mortality in these ill-equipped regions but can also compound water, sanitation and hygiene (WASH)-related health issues⁹. While economic development has improved facilities for agriculture, tourism and transportation, specific changes in LMICs linked to this development — such as rapid urbanization, agricultural expansion and increased transportation — are also responsible for disease spread across different geographical regions⁷.

In addition to communicable diseases, the interplay of demographic and lifestyle factors in many LMICs has led to an increase

in NCDs such as cardiovascular diseases, cancer, chronic respiratory diseases and diabetes¹. In Nepal, NCDs are responsible for nearly two-thirds of total deaths, and it is projected that by 2040, about 80% of total deaths in Nepal will be due to NCDs¹⁰. Climate change further increases the burden of NCDs through both direct and indirect effects¹¹, with changing climatic conditions and increasing temperature linked to acute and chronic respiratory illnesses and cardiovascular diseases¹², as well as to diseases such as cancer¹³. Climate change significantly affects global food systems and, by decreasing the yield, quality and affordability of food in many LMICs, leads to food insecurity and malnutrition, which is in turn linked to chronic disease¹⁴. Furthermore, beyond direct impacts, many NCDs may be caused by long-term impacts of infectious diseases, the former of which are expected to increase under climate change.

Climate change may also increase the likelihood of injuries that occur due to hydrometeorological and climatological

hazards, such as floods, landslides, avalanches, cyclones and wildfires¹⁵. These types of extreme event produce massive morbidity and mortality, especially in LMICs, as these countries do not have proper preparedness and disaster management plans¹⁶. In Nepal, between 1971 and 2016, over 26,000 natural disasters were reported, which claimed the lives of over 43,000 Nepalese and left over 83,000 people injured¹⁷. The trend of disaster occurrence has drastically increased since 2000, probably as a consequence of increasing hazards due to climate change¹⁷. Furthermore, economic development with increased transportation in LMICs has led to an increase in road traffic accidents, contributing to injury-related morbidity and mortality¹⁰.

Many LMICs are based on an agrarian economy, with mild-to-moderate support from industry and tourism, and all of these are vulnerable to the effects of climate change. These effects are thus predicted

to cause future instability and massive economic losses in these countries. The additive impact of climate on this state of the triple burden of disease in LMICs is often overlooked, yet it will present a challenge to the development and stability in these countries that must be addressed with concrete, effective, practicable and proactive health and climate policy. □

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Competing interests

The authors declare no competing interests.