

Climate Change: An Emergent Issue of Public Health in Peru

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One of the most known effects of climate change is the increase in temperature of the Earth's surface as well as its atmosphere. Scientific studies have shown that the rise in overall temperature and weather variability occurs through the emission of toxic gases as a result of activities such as deforestation and burning of fossil fuels. According to the WHO (World Health Organization), climate change affects important determinants of health: clean air, safe drinking water, sufficient food, and safe shelter.

It is recognized that major water-related aspects of climate change include rising sea levels, increased water temperature, flooding, decreased ocean pH, and invasions of nonnative species. Climate change impacts skin health; evidence shows that itching dermatitis becomes increasingly prevalent due to high ocean temperatures. Moreover, extreme climatic events have been linked with *Burkholderia pseudomallei*, which may cause localized infection, cellulitis, or necrotizing fasciitis. Further, skin cancers were reported due to ozone layer damage and persistent UV exposure.

The extent to which climate change impacts public health is enormous; evidence also shows its influence on the cardiovascular system. A well-defined U-shaped curve between temperature and cardiac event outcomes was reported. Increased climate change-related heat exposure is linked with high risk of cardiac events in people with pre-existing cardiac anomalies, those who perform strenuous physical labor and the elderly. Kolb et al. showed that the daily mortality of patients with congestive heart failure was found to be strongly associated with the maximum daily temperature, with an exponential rise starting around 25°C.

Similar to the way climate change impacts cardiac and skin health, it also affects the pulmonary system, due to increasing temperatures, exposure to pollen or mold allergens and disruption of ecosystems. Additionally, the raised temperatures expand the concentrations of ground-level ozone and particulates, which, combined, might aggravate the severity of rhinosinusitis, asthma, chronic obstructive pulmonary disease (COPD) and respiratory tract infections. Indeed, it has been documented that heat-wave-related mortality was found to

be higher among those with chronic respiratory disease, even among hospitalized patients and children.

Macroeconomic and simulation models were developed to study climate change's effect on world populations. Several authors included in their analyses variables such as socioeconomic status, healthcare access, heat exposure, water sanitation, and other factors to quantify the future impact for the upcoming 30 years. It is projected that climate change will have a significant effect on poverty, especially through higher food prices and the reduction of agricultural production in Africa and South Asia, and through health in all regions. Estimations expect 250,000 additional deaths per year from malnutrition, malaria, diarrhea and heat stress. Impacts would be greatest under low economic growth scenarios because of higher mortality rates projected in low- and middle-income countries.

Within this context, Peru is one of the countries highly vulnerable to climate change, with many climate vulnerability characteristics recognized in the 1992 United Nations Framework Convention on Climate Change (UNFCCC), including low coastal zones; arid and semi-arid areas; exposure to floods and zones prone to natural disasters. The complex geography added to the deforestation of some areas was associated with altitudinal changes in habitat from vectors of Malaria and Chagas disease. *V. parahemolyticus* infection and diarrheal outbreaks were reported associated with "El Niño 1997."

The deleterious effects of climate change have extended into the area of non-infectious diseases as well. For example, it was reported that non-communicable diseases caused

about 63% of all deaths, with cardiovascular conditions, cancer, chronic respiratory diseases and diabetes being among the most common causes of death as well as expected economic repercussions. Furthermore, climate change could bring new pests that may invade virgin areas and become problematic for biodiversity and the usefulness of the land for crop production. Based upon how this effect is controlled, higher use of pesticides or herbicides could lead to major food contamination and greater human exposure, which could precipitate the risk of cancers (e.g. liver cancer through aflatoxin contamination).

High frequency and intensity of severe temperatures, added to the competition for scant natural resources, on top of prevalent social disparities, are prone to cause anxiety and stress. Even if some of the impacts of climate change are minimal, the general perception and fear of climate change may jeopardize mental health.

Also, there may be an increased risk of injury for outdoor workers and people close to areas prone to experience heavy storms. Bushfires and air pollution intensified by extreme weather conditions may exacerbate cardio-respiratory diseases and allergic reactions mostly between asthmatics and the elderly^{14, 31}. Areas of warming and progressive loss of iced-sea territories might affect traditional living, food production and eating patterns. These modifications could trigger reduced physical mobility, magnifying the tendency to obesity, metabolic syndrome, and diabetes.

Many policies have the potential to reduce greenhouse gas emissions and produce major health co-benefits while confronting climate change. In 2015, the WHO Executive Board determined an action plan based on 4

keynotes: Partnerships, Awareness raising, Science/Evidence and Support implementation for public health response.

According to the Intergovernmental Panel on Climate Change (IPCC), 24-30 percent of total climate mitigation potential can be provided by halting and reversing tropical deforestation. Like Peru, Mexico has similar issues regarding climate change. However, the Mexican initiatives have started to reduce deforestation rates. Mexico is switching to natural gas and steadily saving energy, thus reducing annual emissions growth by 5 percent or 10 million tons of carbon per year.

Another example is India, where energy-related carbon dioxide emissions were reduced over recent decades through economic restructuring, enforcement of existing clean air laws by the nation's highest court, agricultural adaptation strategies, and renewable energy programs.

Finally, the ideal climate change mitigation action plan in Peru will challenge the central government to collaborate with the media and nonprofit organizations in order to reduce the future impact of climate change, especially in rural populations. This could be achieved through the design of effective educational and training workshops, which would involve the community's active participation in acquiring basic knowledge relating to efficient water use, energy-saving measures, and preventative health practices that would strive to establish an ecologically responsible culture.

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