
Climate Change: Its Impact on Human Health

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Abstract

Climate change is capturing the attention of the international community in an unprecedented manner. There is a strong link between climate change and health. A manner climate is expected to both increase the risk of heat-related illness and death worsens conditions for air quality. Climate change will likely increase the frequency and strength of extreme events (such as floods, droughts, and storms) that threaten human safety and health climate changes may allow some disease to spread more easily. This paper examines the concept of climate change, its impact on human Health in various ways, such as impacts from Heat waves, effect on human health and welfare, impact from extreme weather events, impact from reduced air quality and impacts from climate change requires public health strategies and improved surveillance. Mitigation of climate change by reducing the use of fossil fuels and increasing a number of uses of the renewable energy technologies should improve health in the nearby reducing exposure to air pollution.

Climate can be defined as average weather. Weather is the instantaneous atmospheric condition over a particular place (Henderson- Sellers and Robinson, 1986). Generally, any form of “Climate inconsistency” is called climate change (Adeyemi, 2000). Adeyemi made a distinction between climate change and climate change. Climate change refers to fluctuation in weather averages over a relatively short period of about 100years while climate change is normally regarded as a “complete shift” of climate of an area. For instance, a change from cold to warm or from wet to dry climates. Therefore, climate changes consist of short and medium term climate variability together with long- term gradual climate. Real climate change is a very slow process and is mostly defined through large global simulation models (GSM).

Not too many years ago, the concept of “climate change” was perceived as a subject that has little but academic importance, for the problems most often investigated related primarily to the remote past. As to why climates change has become much-discussed topic and a matter of considerable concern for future, Luthens and Tarbuck (1992) point to the following reasons:

1. Detailed reconstructions of past climates show that climate has varied on all time scales, which suggests that climate in the future will more likely differ from the present than stay the same.
2. Research that has focused on the environment has demonstrated that people have or will inadvertently change the climate.
3. There is observational evidence that, at least in some respects, world climate had become more variable.

Besides, the global experiences of ecological and natural disasters resulting from climate change underscore the need for the discourse. Climate changes can result from the action of any of the processes affecting the climate system. However, changes that affect the whole earth, or major portions thereof, for at least several years, are likely to arise from a relatively small number of causes (Henderson- Seller and Robinson, 1986). The duo argued that these changes can be split into external and internal factors. The former implies the agent of cause is outside the climate system while the latter is where the initial alteration is within the system itself.

In the same vein, Barrow (1995) classified the cause of climate changes into “Natural” and “Anthropogenic” climate changes. The factors that come under Barrow’s natural causative factors are similar to Henderson- Seller and Robinson’s external causes which include: changes in the luminosity of the sun; orbital and astronomical factors particularly the relationship between the earth and the sun; changes in the polarity of the earth’s magnetic field as it influence the upper atmosphere and thus the whole climate and volcanic activity. The internal causes of climate change are implicated in human activities as they alter eco- climatologically balance. certain substances (dust, soot, aerosol, methane carbon dioxide, etc) which are generated by burning forest and grass lands; farming activity; wind action in dry land; industry; combustion of fuel for power generation by vehicles or home heating; and warfare affect climate change (Barrow, 1995). However, isolating a particular cause for a particular change is extremely difficult because the interlinked nature of the system ensures that there are feedbacks, so that change in one component leads to a change in most, if not all other component of the climate system (Henderson- Seller and Robinson, 1986).

Weather and climate play a significant role in people’s health. Changes in climate affect the average weather conditions that we are accustomed to. Warmer average temperatures will likely lead to hotter days and more frequent and longer heat waves. This could increase the number of heat- related illnesses and deaths. Increases in the frequency or severity of extreme weather events such as storms could increase

the risk of dangerous flooding, high winds, and other direct threats to people and property. Warmer temperatures could increase the concentrations of unhealthy air and water pollutants. Changes in temperature, precipitation patterns, and extreme events could enhance spread of some diseases.

Impacts of Climate Change on Health

The impacts of climate change on health will depend on many factors. These factors include the effectiveness of a community public health and safety systems to address or prepare for the risk and the behavior, age, gender, and economic status of individuals affected. Impacts will likely vary by region, the sensitivity of populations, the extent and length of exposure to climate change impacts, and society's ability to adapt to change.

Although the United States has well- developed public health system (compared with those of many developing countries), climate change will still likely affect many Americans. In addition, the impacts of climate change on public health around the globe could have important consequent for the United States. For example, more frequent and intense storms may require more disaster relief and declines in agriculture may increase food shortages.

Impacts from Heat Waves

Heat waves can lead to heat stroke and dehydration, and are the most common cause of weather- related deaths. Excessive heat is more likely to impact populations in northern latitudes where people are less prepared to cope with excessive temperatures. Young children, older adult's people with medical conditions and the poor are more vulnerable than others to heat-related illness. The share of the U.S. population composed of adults over age 65 is currently 12%, but is projected to grow to 21% by 2050, leading to a larger vulnerable population.

The "urban heat island refers to the fact that the local temperature in urban areas is a few degrees higher than the surrounding area. Source: USGCRP (2009). climate change will likely lead to more frequent, more severe, and longer heat waves in the summer (see 100-degree- days figure), as well as less severe cold spells in the winter. a recent assessment of the science suggests that increases in heat- related deaths due to climate change would outweigh decreases in deaths from cold- snaps.

Urban areas are typically warmer than their rural surroundings. Climate change could lead to even warmer temperatures in cities. This would increase the demand for electricity in the summer to run air conditioning, which in turn would increase pollution and greenhouse gas emissions from power plants. The impacts of future heat waves could be especially severe in large metropolitan areas. For example, in Los Angeles, annual heat-related deaths are projected to increase two- to seven- fold by the end of the 21st century, depending on the future growth of greenhouse gas emissions. Heat

waves are also often accompanied by periods of stagnant air, leading to increases in air pollution and the associated health effects.

Climate Change Affects Human Health and Welfare

In 2008, the U.S. Global Change Research Program produced a report that analyzed the impacts of global climate change on human health and welfare. The report finds that:

Many of the expected health effects likely to fall mostly on the poor, the very old, the very young, the disabled, and the uninsured.

Climate change will likely result in regional differences in U.S. impacts, due not only to a regional pattern of changes in climate but also to regional variations in the distribution of sensitive populations and the ability of communities to adapt to climate changes. Adaptation should begin now, starting with public health infrastructure. Individuals, communities, and government agencies can take steps to moderate the impacts of climate change on human health. (To learn more, see the Health Adaptation Section).

Impacts from Extreme Weather Events

The frequency and intensity of extreme precipitation events is projected to increase in some locations, as is the severity (wind speeds and rain) of tropical storms. These extreme weather events could cause injuries and, in some cases, death. As with heat waves, the people mostly at risk include young children, older adults, people with medical conditions, and the poor. Extreme events can also indirectly threaten human health in a number of ways. For example, extreme events can:

Caused flooded streets in New Orleans after hurricane Katrina in 2005.

Source: FEMA (2005)

- Reduce the availability of fresh food and water
- Interrupt communication, utility, and health care services
- Contribute to carbon monoxide poisoning from portable electric generators used during and after storms.
- Increase stomach and intestinal illness among evacuees.
- Contribute to mental health impacts such as depression and post-traumatic stress disorder (PTSD).

Impacts from Reduced Air Quality

Despite significant improvements in U.S. air quality since the 1970s, as of 2008 more than 126 million Americans lived in countries that did not meet national air quality standards.

Increases in Ozone

Scientists project that warmer temperatures from climate change will increase the frequency of days with unhealthy levels of ground-level ozone, a harmful air pollutant, and a component in smog. Ground-level ozone can damage lung tissue and can reduce lung function and inflame airways. This can increase respiratory symptoms and aggravate asthma or other lung diseases. It is especially harmful to children, older adults, outdoor workers, and those with asthma and other chronic lung diseases.

Ozone exposure also has been associated with increased susceptibility to respiratory infections medication use, doctor visits, and emergency department visits and hospital admissions for increase the risk of premature mortality, and possibly even the development of asthma.

Ground- level ozone is formed when certain air pollutants, such as carbon monoxide, oxides of nitrogen (also called NO_x), and volatile organic compounds, are exposed to each other in sunlight. Ground- level ozone is one of the pollutants in smog. Because warm, stagnant air tends to increase the formation of ozone, climate change is likely to increase levels of ground-level ozone in already- polluted areas of the United States and increase the number of days with poor air quality. if emissions of air pollutants remain fixed at today's levels until 2050, warming from climate change alone could increase the number of Red Ozone Alert Days (when the air is unhealthy for everyone) by 68% in the 50 largest eastern U.S. cities. (See Box below "EPA Report on Air Quality and Climate Change.")

Changes in Fine Particulate Matter

Particulate matter is the term for a category of extremely small particle and liquid droplets suspended in the atmosphere. fine particle include particles smaller than 2.5 micrometers (about one ten- thousand of an inch). These particles may be emitted directly or may be formed in the atmosphere from chemical reactions of gases such as sulfur dioxide, nitrogen dioxide, and volatile organic compounds.

➤ Inhaling fine particles can lead to a broad range of adverse health effects, including premature mortality, aggravation of cardiovascular and respiratory disease, development of chronic lung disease, exacerbation of asthma, and decreased lung function growth in children.

➤ Sources of fine particle pollution include power plants, gasoline and diesel engines, wood combustion, high- temperature industrial processes such as smelters and steel mills, and forest fires. inhaling fine particles can lead to a broad rang of adverse health effects, including premature mortality, aggravation of cardiovascular and respiratory disease, development of chronic lung disease, exacerbation of asthma, and decreased lung function growth in children.

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Due to the variety of sources and components of fine particulate matter scientists do not yet know whether climate change will increase or decrease matter is cleaned from the air by rainfall, so increases in precipitation could have a beneficial effect. At the same time, other climate-related changes in stagnant air episodes, wind patterns, emissions from vegetation and the chemistry of atmospheric pollutants will likely affect particulate matter levels. Climate change will also affect particulates through changes in wildfires, which are expected to become more frequent and intense in a warmer climate.

Changes in Allergens

Climate change may affect allergies and respiratory health. The spring pollen season is already occurring earlier in the United States due to climate change. The length of the season may also have increased. In addition, climate change may facilitate the spread of ragweed, an invasive plant with very allergenic pollen. Tests on ragweed show that increasing carbon dioxide concentrations and temperatures would increase the amount and timing of ragweed pollen production.

EPA Report on Air Quality and Climate Change

Improving America's air quality is one of EPA's top priorities. EPA's Global Change Research on U.S. air quality. A recent interim assessment finds that:

Climate change could increase surface-level ozone concentrations in areas where pollution level are already high.

- Climate change could make U.S. air quality management more difficult.
- Policy makers should consider the potential impacts of climate change on air quality when making air quality management decisions.

Impacts from Climate-Sensitive Diseases

Changes in climate may enhance the spread of some diseases. Disease-causing agents, called pathogens, can be transmitted through food, water, and animals such as deer, birds, mice, and insects. Climate change could affect all of these transmitters.

Food-borne Diseases

- Higher air temperatures can increase cases of salmonella and other bacteria-related food poisoning because bacteria grow more rapidly in warm environments. These diseases can cause gastrointestinal distress and, in severe cases, death.
- Flooding and heavy rainfall can cause overflows from sewage treatment plants into fresh water sources. Overflows could contaminate certain food crops with pathogen-containing feces.

Water-borne Diseases

- Heavy rainfall or flooding can increase water-borne parasites such as Cryptosporidium and Giardia that are sometimes found in drinking water. These parasites can cause gastrointestinal distress and in severe cases, death.
- Heavy rainfall events cause storm water runoff that may contaminate water bodies used for recreation (such as lakes and beaches) with other bacteria. The most common illness contracted from contamination at beaches is gastroenteritis, an inflammation of the stomach and the intestines that can cause symptoms such as vomiting, headaches, and fever. Other minor illnesses include ear, eye, nose, and throat infections.

Animal-borne Diseases

Mosquitoes favor warm, wet climates and can spread diseases such as West Nile virus.

- ◆ The geographic range of ticks that carry Lyme disease is limited by temperature. As air temperatures rise, the range of these ticks is likely to fever, headache, fatigue, and a characteristic skin rash.
- ◆ In 2002, a new strain of West Nile Virus, which can cause serious, life-altering disease, emerged in the United States. Higher temperatures are favorable to the survival of this new strain.

The spread of climate-sensitive diseases will depend on both climate and non-climate factors. The United States has public health infrastructure and programs to monitor, manage, and prevent the spread of many diseases. The risks for climate-sensitive diseases can be much higher in poorer countries that have less capacity to prevent and treat illness. For more information please visit the International Impacts & Adaptation page.

Other Health Linkages

Other linkages exist between climate change and human health. For example, changes in temperature and precipitation, as well as droughts and floods, will likely affect agricultural yields and production. In some regions of the world, these impacts may compromise food security and threaten human health through malnutrition, the spread of infectious diseases, and food poisoning. The worst of these effects are projected to occur in developing countries, among vulnerable populations. Declines in human health in other countries might affect the United States through trade, migration and immigration and implications for national security.

Although the impacts of climate change have the potential to human health in the United States and around the world, there is a lot we can do to prepare for and adapt to these changes. Learn about how we can adapt to climate impact on health.

Effects of Climate Change on Humans

Climate change has brought about severe and possibly permanent alterations to our planet's geological, biological and ecological systems. The Intergovernmental Panel on Climate Change (IPCC) contended in 2003 that "there is new and stronger evidence that most of the warming observed over the last 50 years is attributable to human activities". these changes have led to the emergence of large- scale environmental hazards to human health, such as extreme weather, ozone depletion, loss of biodiversity, stresses to food- producing systems and the global spread of infectious diseases. The World Health Organization (WHO) estimates that 160,000 deaths, since 1950, are directly attributable to climate change. Many believe this to be a conservative estimate.

To date a neglected aspect of the climate change debate, much less research has been conducted on the impacts of climate change on health, food supply, economic growth, migration, security, societal change, and public goods, such as drinking water, than on the geophysical changes related to global warming. Human impacts can be both negative and positive. Climatic changes in Siberia, for instance, are expected to improve food production and local economic activity, at least in the short to medium term. Numerous studies suggest, however, that the current and future impacts of climate change on human society are and will continue to be overwhelmingly negative.

the majority of the adverse effects of climate change are experienced by poor and low- income communities around the world, who have much higher levels of vulnerability to environmental determinants of health, wealth and other factors, and much lower levels of capacity available for coping with environmental change. a report on the global human impact of climate change published by the Global Humanitarian Forum in 2009, estimated more than 300, 000 deaths and about \$125 billion in economic losses each year, and indicating that most climate change induced mortality is due to worsening floods and droughts in developing countries. This also raises questions of climate justice, since the 50 least developed countries of the world account for not more than 1% of worldwide emissions of greenhouse gases.

Key Vulnerabilities

Most of the vulnerabilities to climate change are related to climate phenomena the exceed thresholds for adaptation; such as extreme weather events or abrupt climate change, as well as limited access to resources (financial, technical, human, institutional) to cope. in a literature assessment, Wilanks et al. (2007: 374- 375) described key vulnerabilities of industry, settlements, and society to climate change. Based on their expert judgment, the authors of the assessment gave each key vulnerability a confidence level. These confidence levels reflect the degree of belief that the authors had in their conclusions being correct:

Climate Change: It's Impact on Human Health

- **Very high confidence:** Interactions between climate change and urbanization is often notable in developing countries, where urbanization is often focused in vulnerable coastal areas.
- **High confidence:** Interaction between climate change and global economic growth: Stresses due to climate change are not only linked to the impacts of climate change, but also to the impacts of climate change policies. For example, these policies might affect development paths by requiring high cost fuel choices. Fixed physical infrastructures that are important in meeting human needs: these include infrastructures that are susceptible to damage from extreme weather events or sea level rise, and infrastructures that are already close to being inadequate.
- **Medium confidence:** Interactions with government and social cultural structures that already face other pressures, e.g., limited economic resources.

Health

Climate change poses a wide range of risks to population health- risks that will increase in future decades, often to critical levels, if global climate change continues on its current trajectory. The three main categories of health risks include: (i) direct-acting effects (e.g. due to heat waves, amplified air pollution, and physical weather disasters), (ii) impacts mediated via climate- related changes in ecological systems and relationships (e.g. crop yields, mosquito ecology, marine productivity), and (iii) the more diffuse (indirect) consequences relating to impoverishment, displacement, displacement, resource conflicts (e.g. water), and post-disaster mental health problems. Climate change threatens to slow, halt or reverse international progress towards reducing child under- nutrition, deaths from diarrheal diseases and the spread of other infectious diseases. Climate change acts predominantly by exacerbating the existing, often enormous, health problems, especially in the poorer parts of the world. current variations in weather condition in weather conditions already have many adverse impacts on the health of poor people in developing nations, and these too are likely to be 'multiplied by the added stresses of climate change.

A changing climate thus affects the prerequisites of population health: clean air and water, sufficient food, natural constraints on infectious disease agents, and the adequacy and security of shelter. a warmer and more variable climate leads to higher levels of some air pollutants and more frequent extreme weather events. It increases the rates and ranges of transmission of infectious diseases through unclean water and contaminated food, and by affecting vector organisms (such as mosquitoes) and intermediate or reservoir host species that harbor the infectious agent (such as cattle, bats and rodents). Changes in temperature, rainfall and seasonality compromise agricultural production in many regions, including some of the least developed countries, thus jeopardising child health and growth and the overall health and functional capacity of adults. As warming proceeds, the severity (and perhaps frequency) of weather- related disasters will increase and appears to have done so in a

number of regions of the world over the past several decades. Therefore, in summary, global warming, together with resultant changes in food and water supplies, can indirectly cause increases in a range of adverse health outcomes, including malnutrition, diarrhea, injuries, cardiovascular and respiratory diseases, and water-borne and insect-transmitted diseases.

Health equity and change have an impact on human health and quality of life, and are interlinked in a number of ways. The report of the WHO Commission on Social Determinants of Health points out that disadvantaged communities are likely to shoulder a disproportionate share of the burden of climate change because of their increased exposure and vulnerability to health threats. Over 90 percent of malaria and diarrhea deaths are borne by children aged 5 years or younger, mostly in developing countries. Other severely affected population groups include women, the elderly and people living in Small Island developing states and other coastal regions, mega-cities or mountainous areas.

Conclusion/ Recommendation

It is now widely accepted that climate change is occurring as a result of the accumulation of greenhouse gases in the atmosphere arising from the combustion of fossil fuels. Climate change affects health through a range of pathways, for example as a result of increased frequency and intensity of heat waves, reduction in cold-related deaths, increased floods and droughts, changes in the distribution of vector-borne diseases and effects on the risk of disasters and malnutrition. The overall balance of effects on health is likely to be negative and populations in low-income countries are likely to be particularly vulnerable to the adverse effects. The experience of the 2003 heat wave in Europe shows that high-income countries may also be adversely affected. Adaptation to climate change requires public health strategies and improved surveillance. Mitigation of climate change by reducing the use of fossil fuels and increasing a number of uses of the renewable energy technological should improve health in the near-term by reducing exposure to air pollution.

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Udemeobong Usen Ekong

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