National Institutes of Health

Fact Sheet *Health Effects of Climate Change*

All human societies, from primitive to advanced, have had to adapt to the challenges posed by climate. It affects where people live, how they make a living, what they eat, the abundance or lack of fresh water and even what they do in their leisure time. Deeply embedded in this fundamental relationship between climate and human life are the many ways in which climate has always played a role in human health. Climate defines health concerns such as the direct effects of excess heat or cold, the lack of sufficient water during drought seasons or perennially in certain parts of the world, and the risk of various water-borne or vector-borne diseases based on conditions favorable to their spread.

Yesterday

- Some variation in climate has long been recognized, such as a series of especially cold winters or the impact of drought. But climate has historically been seen as a consistent characteristic of particular areas and thought of as defining various types of health concerns in regions and nations on a more or less permanent basis.

- Though it is clear that shifts in climate have occurred over time in the past, these changes have occurred very slowly and likewise, the human response has been extremely gradual over generations.

Today

- It is now established that climate changes are occurring at an increasingly rapid rate. These changes require active monitoring and coordinated responses in all aspects of their effects on human society, including health effects.

Researchers, clinicians, and public health officials are becoming alerted to the dynamic relationship between climate changes and human health. Some of these changes are readily apparent, while others are more subtle and require additional studies.

- Clearly, when populated areas heat up, residents have to adapt to heat as a stressor to vulnerable populations such as the very young and older people, or those already stressed by disease or poverty.

- As the ambient temperature of a region rises, the ecology changes, and therefore populations of disease-carrying animals or insects may increase. Disease vectors such as mosquitoes, ticks, and flies may occur in greater numbers over longer periods during the year and with less die-off over a less cold winter.

- Warming may also change patterns of air movement and pollution, causing expanded or changed patterns of human exposure and resulting health effects. Today, human populations are on a learning curve to understand how to address health effects related to climate change.

- Many avenues of research currently funded by NIH are relevant to these disease concerns. For example, existing investments in research on air pollution and respiratory disease, characteristics governing vector range, and impacts of exposure to agricultural chemicals, are yielding important research results that are directly relevant to solving the eventual problems regarding health impacts that will be presented by climate change.

Tomorrow

- Recently released reports from the Institute of Medicine, the Intergovernmental Panel on Climate Change, and the U.S. Climate Change Science Program (CCSP) outline many changes that are likely to occur in our climate, weather, ecosystems, water supply and other aspects of our physical environment as a result of global warming. These changes have significant anticipated health impacts.

- A key section of the CCSP report, *Analyses of the Effects of Global Change on Human Health and Welfare and Human Systems*, outlines direct impacts of climate change on human health. The report is available online at: http://downloads.climatescience.gov/sap/sap4-6/sap4-6-final-all.pdf . Key findings of the report include:
  - Heat related morbidity and mortality will likely increase, especially among vulnerable groups such as the young, the old, the ill and the poor.
  - Higher temperatures will likely increase tropospheric ozone concentrations that contribute to cardiovascular and pulmonary illness.
  - There will likely be an increase in food and water-borne pathogens under changing climate and environmental conditions.
  - Changes in precipitation patterns will affect water supplies nationwide and globally.
  - Climate change is likely to accentuate disparities already evident in the American health care system.
- While much is known about the real and potential impacts of climate change, much is unknown– especially in the area of sustainability of the adaptive responses to climate change. There are a number of research areas that hold promise for addressing health impacts of climate change. Important research areas include:
  - Climate driven changes in the oceans and attendant impacts on human health.
  - Health effects of changes in air, soil, and water quality, distribution of toxicants, and new mixtures of air pollutants formed by changing temperature and humidity.
  - Mathematical modeling at the local and regional levels to assess risk and develop predictive and preventive strategies and development of monitoring systems to assess health impacts.
  - Physical impacts of heat exposure especially in aging and other vulnerable populations; gene-environment interactions in particular.
  - Behavioral and social science research on preventative strategies for vulnerable populations, mental health impacts of extreme weather events and economic analyses to understand long term effects of climate change and mitigation strategies.
  - Change in range of vector-borne and zoonotic pathogens and alterations in transmission of food or water-borne pathogens.
  - Climate driven changes in allergic disease.
  - Multi-disciplinary training for the next generation of earth and life scientists to prepare for climate and health research needs of tomorrow.

Contact: Christine B. Flowers, NIEHS
919 541-3665 bruskec@niehs.nih.gov