

CDC Public Health Grand Rounds, December 2014

Climate Change and Health: From Science to Practice

Supplemental Information to accompany Dr. Kim Knowlton's talk

The full slide set can be accessed [here](#)

Figure numbers refer to the Human Health chapter of the 3rd National Climate Assessment published in 2014

Figure 9.2: (Slide 20) Ragweed pollen season length has increased in central North America between 1995 and 2011 by as much as 11 to 27 days in parts of the U.S. and Canada in response to rising temperatures. Increases in the length of this allergenic pollen season are correlated with increases in the number of days before the first frost. The largest increases have been observed in northern cities. (Data updated from Ziska et al. 2011¹³⁸)

Original figure, references, and additional information available at:

<http://nca2014.globalchange.gov/report/sectors/human-health#graphic-16648>

Figure 9.3: (Slide 21) Wildfires, which are projected to increase in some regions due to climate change, have health impacts that can extend hundreds of miles. Forest fires in Quebec, Canada, during July 2002 resulted in up to a 30-fold increase in airborne fine particle concentrations in Baltimore, Maryland, a city nearly a thousand miles downwind. These fine particles, which are extremely harmful to human health, not only affect outdoor air quality, but also penetrate indoors, increasing the long-distance effects of fires on health.¹³⁹ An average of 6.4 million acres burned in U.S. wildfires each year between 2000 and 2010, with 9.5 and 9.1 million acres burned in 2006 and 2012, respectively.¹⁴⁰ Total global deaths from the effects of landscape fire smoke have been estimated at 260,000 to 600,000 annually between the years 1997 and 2006.¹⁴¹

Original figure, references, and additional information available at:

nca2014.globalchange.gov/report/sectors/human-health#graphic-16649

Figure 9.4: (Slide 22) The maps show projected increases in the average temperature on the hottest days by late this century (2081-2100) relative to 1986-2005 under a scenario that assumes a rapid reduction in heat-trapping gases (RCP 2.6) and a scenario that assumes continued increases in these gases (RCP 8.5). The hottest days are those so hot they occur only once in 20 years. Across most of the continental United States, those days will be about 10°F to 15°F hotter in the future under the higher emissions scenario.

Original figure, references, and additional information available at:

nca2014.globalchange.gov/report/sectors/human-health#graphic-16650

Figure 9.6: (Slide 23) Maps show the increase in frequency of extreme daily precipitation events (a daily amount that now occurs just once in 20 years) by the later part of this century (2081-2100) compared to the latter part of the last century (1981-2000). Such extreme events are projected to occur more frequently everywhere in the United States. Under a rapid emissions reduction scenario (RCP 2.6), these events would occur nearly twice as often. For a scenario assuming continued increases in emissions (RCP 8.5), these events would occur up to five times as often.

Original figure, references, and additional information available at:

nca2014.globalchange.gov/report/sectors/human-health#graphic-16652

Figure 9.7: (Slide 24) Heavy downpours, which are increasing in the United States, have contributed to increases in heavy flood events. The figure above illustrates how people can become exposed to waterborne diseases. Human exposures to waterborne diseases can occur via drinking water, as well as recreational waters.^{102,103,104,143,144,101}

Original figure, references, and additional information available at:

nca2014.globalchange.gov/report/sectors/human-health#graphic-16653

Figure 9.8: (Slide 25) Remote sensing color image of harmful algal bloom in Lake Erie on October 9, 2011. The bright green areas have high concentrations of algae, which can be harmful to human health. The frequency and range of harmful blooms of algae are increasing.^{144,101} Because algal blooms are closely related to climate factors, projected changes in climate could affect algal blooms and lead to increases in water- and food-borne exposures and subsequent cases of illness.¹⁰¹ Other factors related to increases in harmful algal blooms include shifts in ocean conditions such as excess nutrient inputs.^{143,144,101} (Figure source: NASA Earth Observatory¹⁴⁵).

Original figure, references, and additional information available at:

nca2014.globalchange.gov/report/sectors/human-health#graphic-16654

Figure 9.9: (Slide 27) A variety of factors can increase the vulnerability of a specific demographic group to health effects due to climate change. For example, older adults are more vulnerable to heat stress because their bodies are less able to regulate their temperature. Overall population growth is projected to continue to at least 2050, with older adults comprising an increasing proportion of the population. Similarly, there are an increasing number of people who are obese and have diabetes, heart disease, or asthma, which makes them more vulnerable to a range of climate-related health impacts. Their numbers are also rising. The poor are less able to

afford the kinds of measures that can protect them from and treat them for various health impacts. (Data from CDC; Health E-Stat; U.S. Census Bureau 2010, 2012; and Akinbami et al. 2011^{250,251,252,253,254})

Original figure, references, and additional information available at:

nca2014.globalchange.gov/report/sectors/human-health#graphic-16655

Figure 9.10: (Slide 29) This map illustrates the national scope of the dispersion of displaced people from Hurricane Katrina. It shows the location by zip code of the 800,000 displaced Louisiana residents who requested federal emergency assistance. The evacuees ended up dispersed across the entire nation, illustrating the wide-ranging impacts that can flow from extreme weather events, such as those that are projected to increase in frequency and/or intensity as climate continues to change.

Original figure, references, and additional information available at:

<http://nca2014.globalchange.gov/report/sectors/human-health#graphic-16656>