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Michael B. Gerrard
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CLIMATE AND HEALTH IN NEW YORK STATE

Asante Shipp Hilts, DrPH, MPH, Millicent Eidson, MA, DVM, DACVPM,
and Wan-Hsiang Hsu, PhD

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Background

The geographic diversity of New York causes its climate to vary greatly by geographic region.² The climate of a particular region is determined by factors such as topography, elevation, and proximity to large bodies of water. Variations in climate are often measured as differences in temperature, humidity, precipitation (rain, snow, and ice), and other measures.

Climate change is defined as a statistically significant change in the mean (average) or variability of measures of climate that lasts for an extended period of time, typically decades or longer.³ Changes in Earth’s climate can be attributed to internal climate system processes (e.g., the El Niño variation that affects rainfall distribution), external forcing factors (e.g., changes in solar radiation or volcanic activity), and anthropogenic (human) activities. The consensus of scientific studies and nearly all climate scientists is that human activities have had an effect on climate change. Specifically, human activities supported by the burning of fossil fuels release greenhouse gases that can build up in Earth’s atmosphere.

Greenhouse gases in the Earth’s atmosphere (air surrounding the Earth) have increased substantially over the last 260 years. One of these gases, carbon dioxide (CO₂), has reached a higher level than at any other time during the last 850,000 years.⁴ The

This article is a summary, with some updates, of the New York State Department of Health (DOH) 2015 Climate and Health Profile.¹ Review of the full report is recommended for more detailed information on climate and health in New York State.

¹ N.Y. STATE DEPT. OF HEALTH (DOH), BUILDING RESILIENCE AGAINST CLIMATE EFFECTS (BRACE) IN NEW YORK STATE: CLIMATE AND HEALTH PROFILE (June 2015), <http://www.health.ny.gov/environmental/weather/docs/climatehealthprofile6-2015.pdf>.

² NAT’L CLIMATIC DATA CTR., CLIMATE OF NEW YORK (undated), http://dicce.sri.com/downloads/Additional_articles_websites_interest/05_New_York_State_Climate_Overview.pdf (last visited Nov. 2, 2016).

³ INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (IPCC), CLIMATE CHANGE 2007 – THE PHYSICAL SCIENCE BASIS: CONTRIBUTION OF WORKING GROUP I TO THE FOURTH ASSESSMENT REPORT OF THE IPCC § 9.1.1 (2007), http://www.ipcc.ch/publications_and_data/ar4/wg1/en/ch9s9-1.html#9-1-1.

⁴ IPCC, *Frequently Asked Question 2.1*, in CLIMATE CHANGE 2007 – THE PHYSICAL SCIENCE BASIS: CONTRIBUTION OF WORKING GROUP I TO THE FOURTH ASSESSMENT REPORT OF THE IPCC (2007), http://www.ipcc.ch/publications_and_data/ar4/wg1/en/faq-2-1.html.

buildup of these gases in our air has acted like a blanket to keep heat trapped that has been absorbed from the Sun. This has made Earth's average surface temperature warmer than at any time during the past 20,000 years, and the warming is continuing.⁵

Just like the Earth overall, we have seen that New York State is becoming warmer and wetter.⁶ Although different climate models show a range of possible values for future temperatures and precipitation amounts in New York, they show on average that we will continue seeing temperatures, rain, and snowfall increase.⁷ The ClimAID Report estimates that temperatures in different parts of the state will increase between 1.5°F and 4°F above a 1971–2000 baseline by the 2020s.⁸ With respect to precipitation (rain and snow), the National Climate Assessment reported that the Northeast region has experienced a bigger increase in extreme downfalls of rain and snow than any other part of the United States, with a 71% increase between 1958 and 2010 in precipitation falling during the heaviest 1% of storm events.⁹

Impacts of Climate Change on Human Health in New York State

The impact that future climate changes will have on public health is a major concern.¹⁰ Specifically, increasing precipitation, temperature extremes, greater variability, and the dispersion of disease vectors can put people's health at risk. To identify health risks arising as a result of climate change, it is important to study climate projections and observed climate trends. After health risks are identified, interventions can be designed to

counteract anticipated negative health impacts. Information on climate projections and their expected health impacts will inform public health agencies on how to best allocate their resources to deal with the threat of climate change. With support from the Centers for Disease Control and Prevention, DOH is researching these impacts and potential adaptation activities.¹¹

The public health burden associated with climate change is expected to increase. DOH has collaborated with stakeholders to conduct needs assessments identifying areas for improvement to meet the growing challenge of climate and health impacts. The results of these assessments have been used to prioritize efforts targeted at adapting to climate impacts such as extreme weather, heat, and vector-borne disease.

Health Impacts from Severe Weather and Precipitation Extremes (Drought, Floods, Heavy Rainfall)

Severe weather can have both direct and indirect health impacts. These impacts have already become apparent in New York State. Superstorm Sandy was directly responsible for 97 deaths in the New York City metropolitan area.¹² Indirect impacts included displacement of people from their homes, interruption of public health services, septic system failures due to excessive water,¹³ and an increase in risky behaviors (e.g., unsafe generator use).¹⁴ Sandy also impacted the preparedness and response activities of local and state health departments.¹⁵ The effects of severe weather are not limited to those described above. Severe weather can have widespread and sometimes unexpected consequences for public health.

⁵ WORLD HEALTH ORG., CLIMATE CHANGE AND HUMAN HEALTH: RISKS AND RESPONSES (A.J. McMichael et al. eds. 2003), <http://www.who.int/globalchange/publications/climchange.pdf>.

⁶ T. Z. Insaf et al., *Climate trends in indices for temperature and precipitation across New York State, 1948–2008*, 6 AIR QUAL. ATMOS. & HEALTH 247 (2013).

⁷ KENNETH E. KUNKEL ET AL., NAT'L OCEANIC & ATMOSPHERIC ADMIN., REGIONAL CLIMATE TRENDS AND SCENARIOS FOR THE U.S. NATIONAL CLIMATE ASSESSMENT: PART 1. CLIMATE OF THE NORTHEAST U.S., NOAA Tech. Rep. NESDIS 142-1 (Jan. 2013), https://scenarios.globalchange.gov/sites/default/files/NOAA_NESDIS_Tech_Report_142-1-Climate_of_the_Northeast_U.S._1.pdf.

⁸ RADLEY M. HORTON ET AL., N.Y. STATE ENERGY RESEARCH & DEV. AUTH. (NYSERDA), CLIMATE CHANGE IN NEW YORK STATE – UPDATING THE 2011 CLIM AID CLIMATE RISK INFORMATION SUPPLEMENT TO NYSERDA REPORT 11-18 (RESPONDING TO CLIMATE CHANGE IN NEW YORK STATE), Final Rep. 14-26 (Sept. 2014), <https://www.nyserdny.gov/-/media/Files/Publications/Research/Environmental/ClimAID/2014-ClimAid-Report.pdf>; NYSERDA, RESPONDING TO CLIMATE CHANGE IN NEW YORK STATE: THE CLIM A ID INTEGRATED ASSESSMENT FOR EFFECTIVE CLIMATE CHANGE ADAPTATION (SYNTHESIS REPORT), Final Rep. 11-18 (Cynthia Rosenzweig et al. eds. 2011), <https://www.nyserdny.gov/-/media/Files/Publications/Research/Environmental/EMEP/climaid/ClimAID-synthesis-report.pdf>.

⁹ Radley Horton et al., *Northeast*, in U.S. GLOBAL CHANGE RESEARCH PROGRAM, CLIMATE CHANGE IMPACTS IN THE UNITED STATES: THE THIRD NATIONAL CLIMATE ASSESSMENT 371–95 (Jerry M. Melillo et al. eds. 2014), <http://nca2014.globalchange.gov/downloads>.

¹⁰ U.S. GLOBAL CHANGE RESEARCH PROGRAM, THE IMPACTS OF CLIMATE CHANGE ON HUMAN HEALTH IN THE UNITED STATES: A SCIENTIFIC ASSESSMENT (2016), <https://health2016.globalchange.gov/>.

¹¹ CDC Climate Ready States and Cities Initiative, CENTERS FOR DISEASE CONTROL & PREVENTION, http://www.cdc.gov/climateandhealth/climate_ready.htm (last updated Dec. 22, 2014).

¹² David M. Abramson & Irwin E. Redlener, *Hurricane Sandy: Lessons Learned, Again*, 6 DISASTER MED. & PUB. HEALTH PREP. 328 (2012).

¹³ Radley Horton et al., *Northeast*, in U.S. GLOBAL CHANGE RESEARCH PROGRAM, CLIMATE CHANGE IMPACTS IN THE UNITED STATES: THE THIRD NATIONAL CLIMATE ASSESSMENT 371–95 (Jerry M. Melillo et al. eds. 2014), <http://nca2014.globalchange.gov/downloads>.

¹⁴ Jacquelyn Clower et al., *Carbon Monoxide Exposures Reported to Poison Centers and Related to Hurricane Sandy – Northeastern United States, 2012*, 61 MORBIDITY & MORTALITY WEEKLY REP. 905 (2012).

¹⁵ Asante Shipp Hilts et al., *New York State Public Health System Response to Hurricane Sandy: An Analysis of Emergency Reports*, 10 DISASTER MED. & PUB. HEALTH PREP. 308 (2016); Asante Shipp Hilts et al., *New York State Public Health System Response to Hurricane Sandy: An Analysis of Survey Feedback*, 10 DISASTER MED. & PUB. HEALTH PREP. 454 (2016); Asante Shipp Hilts et al., *New York State Public Health System Response to Hurricane Sandy: Lessons from the Field*, 10 DISASTER MED. & PUB. HEALTH PREP. 443 (2016).

Precipitation extremes (drought, floods, and heavy rainfall) can have severe public health consequences. Heavy downpours are projected to increase in frequency and duration. Potential health impacts include overburdening sewage and water treatment systems, increasing mold hazards detrimental to indoor air quality, and elevated incidence of water-borne disease.¹⁶ On average, approximately 98 deaths are attributed to flooding annually in the U.S. Floods can directly cause injury and death, making them a direct health hazard. However, storms and flooding can also have indirect impacts related to displacement, aggravation of chronic health conditions such as asthma, mental health issues in disaster survivors, and increases in infectious disease.¹⁷

Heat-Related Illness

Heat-related illnesses may also increase as a result of climate change. The impact of increasing temperatures can be directly measured by looking at heat-related illnesses such as heat edema, heat stroke, heat cramps, heat stress, dehydration,¹⁸ and mortality.¹⁹ Indirect impacts of heat include the exacerbation

of pre-existing health conditions such as renal, lung, and cardiovascular disease.²⁰ Due to a phenomenon known as the urban heat island effect, living in an urban area increases risk of heat-related morbidity and mortality.²¹ Increasing temperatures can also lead to environmental hazards. Rising temperatures have been associated with increases in the presence of harmful algal blooms (HABs) in water bodies.²² Toxins produced by these algal blooms can damage the liver and nervous system as well as induce a variety of other illnesses.

Illnesses Related to Air Pollution

Climate scientists predict that as climate change progresses concentrations of ground-level ozone and particulate matter will increase in many locations.²³ Summertime ozone concentrations are expected to increase in the Northeast.²⁴ Ground-level ozone has been associated with harmful health effects for people suffering from respiratory conditions (asthma, chronic pulmonary disease, etc.), increased hospitalizations, and mortality.²⁵ Particulate matter has been associated with increased morbidity and mortality.²⁶

¹⁶ George Luber et al., *Human Health*, in U.S. GLOBAL CHANGE RESEARCH PROGRAM, CLIMATE CHANGE IMPACTS IN THE UNITED STATES: THE THIRD NATIONAL CLIMATE ASSESSMENT 220–56 (Jerry M. Melillo et al. eds. 2014), <http://nca2014.globalchange.gov/downloads>.

¹⁷ CHRISTOPHER J. PORTIER ET AL., INTERAGENCY WORKING GRP. ON CLIMATE CHANGE & HEALTH, A HUMAN HEALTH PERSPECTIVE ON CLIMATE CHANGE: A REPORT OUTLINING THE RESEARCH NEEDS ON THE HUMAN HEALTH EFFECTS OF CLIMATE CHANGE (Apr. 2010), https://www.niehs.nih.gov/health/materials/a_human_health_perspective_full_report_508.pdf.

¹⁸ Joseph A. Grubenhoff et al., *Heat-Related Illness*, CLIN. PED. EMERG. MED. vol. 8, at 59–64 (2007); Christofer Åström et al., *Heat-related respiratory hospital admissions in Europe in a changing climate: a health impact assessment*, BMJ OPEN 2013;3(1):e001842 (2013), <http://bmjopen.bmj.com/content/3/1/e001842>; George Luber & Michael McGeehin, *Climate Change and Extreme Heat Events*, 35 AM. J. PREV. MED. 429 (2008).

¹⁹ CÉLINE GOSSELIN ET AL., DIRECTION DE SANTÉ PUBLIQUE, AGENCE DE LA SANTÉ ET DES SERVICES SOCIAUX DE MONTRÉAL, EVALUATION OF THE EDUCATION CAMPAIGN ON HEALTH RISKS ASSOCIATED WITH HEAT WAVES AND ON RELATED PROTECTION MEASURES (2010), <http://www.santecom.qc.ca/bibliothequevirtuelle/hyperion/9782894949092.pdf>; Marie S. O'Neill & Kristie L. Ebi, *Temperature Extremes and Health: Impacts of Climate Variability and Change in the United States*, 51 J. OCCUP. & ENVTL. MED. 13 (2009); Marc G. Weisskopf et al., *Heat Wave Morbidity and Mortality, Milwaukee, Wis, 1999 vs 1995: An Improved Response?*, 92 AM. J. PUB. HEALTH 830 (2002); Kristie L. Ebi et al., *Heat Watch/Warning Systems Save Lives: Estimated Costs and Benefits for Philadelphia 1995–98*, 85 BULL. AM. METEOROL. SOC'Y 1067 (2004); Andy Haines et al., *Climate Change and Human Health: Impacts, Vulnerability and Public Health*, 120 PUB. HEALTH 585 (2006); Gennaro D'Amato et al., *Effects of climate change on environmental factors in respiratory allergic diseases*, 38 CLIN. EXP. ALLERGY 1264 (2008).

²⁰ John M. Balbus & Catherine Malina, *Identifying Vulnerable Subpopulations for Climate Change Health Effects in the United States*, 51 J. OCCUP. & ENVTL. MED. 33 (2009).

²¹ George Luber & Michael McGeehin, *Climate Change and Extreme Heat Events*, 35 AM. J. PREV. MED. 429 (2008).

²² Paul B. English et al., *Environmental Health Indicators of Climate Change for the United States: Findings from the State Environmental Health Indicator Collaborative*, 117 ENVTL. HEALTH PERSPECT. 1673 (2009).

²³ George Luber et al., *Human Health*, in U.S. GLOBAL CHANGE RESEARCH PROGRAM, CLIMATE CHANGE IMPACTS IN THE UNITED STATES: THE THIRD NATIONAL CLIMATE ASSESSMENT 220–56 (Jerry M. Melillo et al. eds. 2014), <http://nca2014.globalchange.gov/downloads>; Kristie L. Ebi & Glenn McGregor, *Climate Change, Tropospheric Ozone and Particulate Matter, and Health Impacts*, 116 ENVTL. HEALTH PERSPECT. 1449 (2008).

²⁴ U.S. ENVTL. PROT. AGENCY (EPA), ASSESSMENT OF THE IMPACTS OF GLOBAL CHANGE ON REGIONAL U.S. AIR QUALITY: A SYNTHESIS OF CLIMATE CHANGE IMPACTS ON GROUND-LEVEL OZONE (AN INTERIM REPORT OF THE U.S. EPA GLOBAL CHANGE RESEARCH PROGRAM), EPA/600/R-07/094F (Apr. 2009), http://ofmpub.epa.gov/eims/eimscomm.getfile?p_download_id=491176.

²⁵ IPCC, *Summary for Policymakers: Understanding and Attributing Climate Change*, in CLIMATE CHANGE 2007 – THE PHYSICAL SCIENCE BASIS: CONTRIBUTION OF WORKING GROUP I TO THE FOURTH ASSESSMENT REPORT OF THE IPCC (2007), http://www.ipcc.ch/publications_and_data/ar4/wg1/en/spmssp-understanding-and.html#fnr12.

²⁶ Kristie L. Ebi & Glenn McGregor, *Climate Change, Tropospheric Ozone and Particulate Matter, and Health Impacts*, 116 ENVTL. HEALTH PERSPECT. 1449 (2008).

Allergies

Climate change could also increase the duration of allergy season.²⁷ Allergies are often triggered by exposure to allergens such as pollen and molds. Trends between longer pollen seasons and increases in asthma and hay fever have been noted.²⁸

Vector-Borne Disease

Climate is one of many factors that influence populations of disease vectors (ticks, mosquitoes, etc.).²⁹ Projections indicate that the Northeast will experience an increase in, as well as changes in the distribution of, vector-borne diseases.³⁰ The predicted rise in precipitation in New York State could increase the risk of arboviral diseases (e.g., West Nile) due to increased breeding opportunities for mosquitoes. Ticks rely on relatively high levels of humidity to survive.³¹ Evidence suggests that the increase in Lyme disease incidence in the northeastern states from 1993 to 2001 was associated with rising moisture levels.

Food- and Water-Borne Disease

The ways in which climate change may increase the risk of food- and water-borne disease have been described by the Interagency Working Group on Climate Change and Health.³² Climate-related factors that may increase the risk include the contamination of crops with harmful chemicals due to flooding, increased levels of bacteria such as *Vibrio* which contaminate seafood resulting from increased sea surface temperature, and the proliferation of enteric bacteria in soil and surface water due to increased land and air temperatures.³³ Links between both rainfall and runoff and water-borne disease outbreaks have been uncovered.³⁴ Climate change threatens the integrity of ground and surface water. Toxins from HABS have contaminated surface water used for the public water supply in other areas of the nation. DOH is investigating the association

between wet weather and rainfall or humidity and the occurrence of legionellosis.

Food Security

Climate change may negatively affect food security. Land and water resources are limiting factors in agricultural production. Changes in precipitation, water availability, drought, and other events can cause agricultural losses by reducing crop survival, increasing weeds, and altering pest populations.³⁵ Agricultural losses will be reflected in food costs and availability.³⁶

Vulnerable Populations

Not all populations are equally vulnerable to climate change. Therefore, it is necessary to identify populations that will be disproportionately impacted by climate change in order to most efficiently utilize available public health resources. Vulnerable populations are often described as less resilient to climate change events, meaning that they have little control over their exposure to such events and will likely face difficulty recovering in the events' aftermaths.

DOH has conducted research to identify vulnerable groups in New York State. These groups include the young, older adults, women who are pregnant, specific racial and ethnic populations such as Native Americans, people with low socioeconomic status, people with chronic disease or mental illness, residents of health care facilities, people who use well water or live in coastal areas or near hazardous waste sites, and people who work outdoors such as migrant and seasonal farmworkers. In general, climate change will affect these vulnerable groups by affecting their livelihood, increasing the risk of water contamination due to flooding or other weather events, increasing the cost of food, making health care and other services difficult to

²⁷ Lewis Ziska et al., *Recent warming by latitude associated with increased length of ragweed pollen season in central North America*, 108 PROC. NAT'L ACAD. SCI. 4248 (2011).

²⁸ Patrick Kinney et al., *Public Health*, in NYSEDA, RESPONDING TO CLIMATE CHANGE IN NEW YORK STATE: THE CLIMAIID INTEGRATED ASSESSMENT FOR EFFECTIVE CLIMATE CHANGE ADAPTATION, Final Rep. 11-18, at 397-438 (Cynthia Rosenzweig et al. eds. 2011), <http://www.nyseda.ny.gov/-/media/Files/Publications/Research/Environmental/EMEP/climaid/ClimAID-Public-Health.pdf>.

²⁹ George Luber et al., *Human Health*, in U.S. GLOBAL CHANGE RESEARCH PROGRAM, CLIMATE CHANGE IMPACTS IN THE UNITED STATES: THE THIRD NATIONAL CLIMATE ASSESSMENT 220-56 (Jerry M. Melillo et al. eds. 2014), <http://nca2014.globalchange.gov/downloads>.

³⁰ Radley Horton et al., *Northeast*, in U.S. GLOBAL CHANGE RESEARCH PROGRAM, CLIMATE CHANGE IMPACTS IN THE UNITED STATES: THE THIRD NATIONAL CLIMATE ASSESSMENT 371-95 (Jerry M. Melillo et al. eds. 2014), <http://nca2014.globalchange.gov/downloads>.

³¹ Susan Subak, *Effects of Climate on Variability in Lyme Disease Incidence in the Northeastern United States*, 157 AM. J. EPIDEMIOL. 531 (2003).

³² CHRISTOPHER J. PORTIER ET AL., INTERAGENCY WORKING GRP. ON CLIMATE CHANGE & HEALTH, A HUMAN HEALTH PERSPECTIVE ON CLIMATE CHANGE: A REPORT OUTLINING THE RESEARCH NEEDS ON THE HUMAN HEALTH EFFECTS OF CLIMATE CHANGE (Apr. 2010), https://www.niehs.nih.gov/health/materials/a_human_health_perspective_on_climate_change_full_report_508.pdf.

³³ Paul B. English et al., *Environmental Health Indicators of Climate Change for the United States: Findings from the State Environmental Health Indicator Collaborative*, 117 ENVTL. HEALTH PERSPECT. 1673 (2009).

³⁴ Frank C. Curriero et al., *The Association Between Extreme Precipitation and Waterborne Disease Outbreaks in the United States, 1948-1994*, 91 AM. J. PUB. HEALTH 1194 (2001).

³⁵ Jerry Hatfield et al., *Agriculture*, in U.S. GLOBAL CHANGE RESEARCH PROGRAM, CLIMATE CHANGE IMPACTS IN THE UNITED STATES: THE THIRD NATIONAL CLIMATE ASSESSMENT 220-56 (Jerry M. Melillo et al. eds. 2014), <http://nca2014.globalchange.gov/downloads>.

³⁶ Jerry Hatfield et al., *Agriculture*, in U.S. GLOBAL CHANGE RESEARCH PROGRAM, CLIMATE CHANGE IMPACTS IN THE UNITED STATES: THE THIRD NATIONAL CLIMATE ASSESSMENT 220-56 (Jerry M. Melillo et al. eds. 2014), <http://nca2014.globalchange.gov/downloads>.

access, and raising the risk for illness and disease such as heat-related illness or mosquito-borne disease.

Certain vulnerable groups are more susceptible to specific effects of climate change compared to others. Groups vary in their susceptibility to events such as extreme weather events (flooding, hurricanes, and drought), extreme heat, vector-borne and other infectious diseases, and food- and water-borne disease. The specific impacts of climate change on several vulnerable populations are summarized below. Additional vulnerable groups are discussed in the 2015 Climate and Health Profile.³⁷

Older Adults

Older adults (those 65 years of age or older) make up 15% of the New York State population.³⁸ The health of older adults is especially likely to be negatively affected by extreme weather events such as heat waves, poor air quality, and infectious disease. Physiological and socioeconomic factors such as disease prevalence, limited mobility, social isolation, and income loss increase older adults' susceptibility to climate change.³⁹ For instance, older adults are more vulnerable to negative health consequences from air pollution⁴⁰ and are more likely to have severe outcomes and complications from infection with food- or water-borne disease.⁴¹

Children

Children under five years of age comprise 6% of the New York State population.⁴² Their physiology makes them more vulnerable to certain climate impacts than adults.⁴³ For example, children are more susceptible to heat-related illnesses because of their low ratio of body mass to surface area, higher metabolic rate, and inability to increase cardiac output, among other

factors. They are more sensitive to air pollution and water- and food-borne illness.⁴⁴

Low Socioeconomic Status (SES) Populations

In New York State, 15.4% of the population is below the federal poverty line.⁴⁵ This is important to take into account because financial stress has the potential to decrease resilience to climate change and impair the ability of those affected to perform protective or adaptive behaviors.⁴⁶ Studies have demonstrated that SES is an important determinant of health and that those of low SES face the highest risks of premature morbidity and mortality.⁴⁷ Research has also revealed that lower SES is associated with lower housing quality, reduced access to services, and poorer physical, social, and environmental conditions.

Ethnic and Racial Minorities

In New York State, 18.8% of people identify as Hispanic or Latino, 17.6% as Black or African American, 8.8% as Asian, and 1% as American Indian.⁴⁸ Racial minorities are more likely to be of low SES.⁴⁹ Minority neighborhoods also have greater morbidity and mortality rates, greater health risk factors, and elevated exposure to environmental toxicants.⁵⁰

Actions Taken by New York State to Address Climate-Health Risks

Engagement of Stakeholders

DOH has worked to involve internal and external stakeholders in the effort to identify and address climate-related health

³⁷ DOH, BUILDING RESILIENCE AGAINST CLIMATE EFFECTS (BRACE) IN NEW YORK STATE: CLIMATE AND HEALTH PROFILE (June 2015), <http://www.health.ny.gov/environmental/weather/docs/climatehealthprofile6-2015.pdf>.

³⁸ *QuickFacts*, U.S. CENSUS BUREAU (last visited Nov. 3, 2016) (based on July 1, 2015 data), <http://quickfacts.census.gov/qfd/states/36000.html>.

³⁹ Janet L. Gamble et al., *Climate Change and Older Americans: State of the Science*, 121 ENVTL. HEALTH PERSPECT. 15 (2013).

⁴⁰ John M. Balbus & Catherine Malina, *Identifying Vulnerable Subpopulations for Climate Change Health Effects in the United States*, 51 J. OCCUP. & ENVTL. MED. 33 (2009).

⁴¹ Janet L. Gamble et al., *Climate Change and Older Americans: State of the Science*, 121 ENVTL. HEALTH PERSPECT. 15 (2013).

⁴² *QuickFacts*, U.S. CENSUS BUREAU (last visited Nov. 3, 2016) (based on July 1, 2015 data), <http://quickfacts.census.gov/qfd/states/36000.html>.

⁴³ Joseph A. Grubenhoff et al., *Heat-Related Illness*, CLIN. PED. EMERG. MED. vol. 8, at 59–64 (2007).

⁴⁴ John M. Balbus & Catherine Malina, *Identifying Vulnerable Subpopulations for Climate Change Health Effects in the United States*, 51 J. OCCUP. & ENVTL. MED. 33 (2009).

⁴⁵ *QuickFacts*, U.S. CENSUS BUREAU (last visited Nov. 3, 2016), <http://quickfacts.census.gov/qfd/states/36000.html>.

⁴⁶ JANET L. GAMBLE ET AL., U.S. CLIMATE CHANGE SCIENCE PROGRAM & SUBCOMMITTEE ON GLOBAL CHANGE RESEARCH, ANALYSES OF THE EFFECTS OF GLOBAL CHANGE ON HUMAN HEALTH AND WELFARE AND HUMAN SYSTEMS (2008), http://ofmpub.epa.gov/eims/eimscomm.getfile?p_download_id=475107; Frank C. Curriero et al., *Temperature and Mortality in 11 Cities of the Eastern United States*, 155 AM. J. EPIDEMIOL. 80 (2002); ERIC KLINENBERG, HEAT WAVE: A SOCIAL AUTOPSY OF DISASTER IN CHICAGO (2002).

⁴⁷ Marie S. O'Neill et al., *Health, Wealth, and Air Pollution: Advancing Theory and Methods*, 111 ENVTL. HEALTH PERSPECT. 1861 (2003).

⁴⁸ *QuickFacts*, U.S. CENSUS BUREAU (last visited Nov. 3, 2016) (based on July 1, 2015 data), <http://quickfacts.census.gov/qfd/states/36000.html>.

⁴⁹ Gilbert C. Gee & Devon C. Payne-Sturges, *Environmental Health Disparities: A Framework Integrating Psychosocial and Environmental Concepts*, 112 ENVTL. HEALTH PERSPECT. 1645 (2004).

⁵⁰ Gilbert C. Gee & Devon C. Payne-Sturges, *Environmental Health Disparities: A Framework Integrating Psychosocial and Environmental Concepts*, 112 ENVTL. HEALTH PERSPECT. 1645 (2004).

impacts. DOH developed a Climate and Health Stakeholder Needs Assessment to determine stakeholder organizations' knowledge of the impact of climate change on health, to inform them of the connection between climate and health, and to collect information on organizations' needs. The results of the assessment revealed that the organizations would like more information on the health impacts of climate change in order to advocate prioritization of efforts related to climate and health within their organizations. They have also asked for DOH guidance regarding the specific health impacts of climate change, costs associated with such impacts, and populations that will be particularly vulnerable.

Development of Interagency Climate Adaptation Initiatives in New York State Government

Five interagency teams were assembled to provide policy makers with information on the health impacts of climate change in New York, to develop climate projections, and to encourage climate adaptation. These teams included the Climate Action Council (CAC), ClimAID, the Sea Level Rise Task Force, the Interagency Adaptation Working Group, and Climate Smart Communities (CSC). Both the CAC and ClimAID have released recommendations for climate adaptation. The Sea Level Rise Task Force studies the impacts of rising sea levels on the state's coastlines and formulates recommendations for the protection of coastal communities and ecosystems. The Interagency Adaptation Workgroup is a self-guided, independent group that encourages collaboration to produce adaptation guidelines for local governments. Finally, CSC focuses on climate adaptation strategies at the local level.

Conclusion

The changing climate and the resulting impact to public health is our current reality, with expected increases in average temperatures, precipitation, and storms in New York State. The broad array of potential health outcomes associated with these changes impacts a diverse group of vulnerable populations. DOH is working collaboratively with other agencies to identify indicators of risk and interventions to address the risk. Additional information about the DOH efforts is available at the agency's Climate, Weather & Health website.⁵¹

Dr. Asante Shipp Hilts is the Senior Program Coordinator of the New York State Climate Ready States and Cities Initiative at the New York State Department of Health, Office of Public Health Practice. Previously she served as the Director of a County Health Department in New York State that was devastated by both Hurricane Irene and Tropical Storm Lee.

Dr. Millicent Eidson is Co-Principal Investigator for the New York State Department of Health Climate and Health Program, and Professor, Department of Epidemiology and Biostatistics, University at Albany School of Public Health. She is a former

Acting State Epidemiologist and State Public Health Veterinarian for the New York State Department of Health, and State Environmental Epidemiologist and State Public Health Veterinarian for the New Mexico Department of Health.

Dr. Wan-Hsiang Hsu is Co-Principal Investigator for the New York State Department of Health Climate and Health Program. She is a statistician with extensive experience for Environmental Health especially in areas of Climate Changes and Birth Defects.

LEGAL DEVELOPMENTS

ASBESTOS

In Two Cases, Appellate Division Affirmed Liability of Manufacturer of Products That Required Asbestos, Reduced Pain and Suffering Damages

The Appellate Division, First Department, affirmed jury verdicts against Crane Co. in asbestos personal injury actions, but ordered new trials as to damages for past and future pain and suffering unless the plaintiffs stipulated to reduced awards. The First Department said that the plaintiffs satisfied the standard for liability recently articulated by the Court of Appeals in *Matter of New York City Asbestos Litigation (Dummitt)*, which addressed the liability of a manufacturer of products that do not contain asbestos but which will foreseeably be used in combination with asbestos because it is necessary to enable the manufacturer's product to function. The First Department also found that the plaintiffs had set forth sufficient evidence to demonstrate that Crane's failure to warn was the proximate cause of the injuries of the plaintiffs, who had worked as an electrician and as an electrician and mechanic in environments where they were exposed to asbestos-containing dust associated with the insulation used with Crane's products. The court also said that it was rational for the jury to conclude that Crane acted recklessly in light of evidence showing that Crane had longstanding knowledge of the dangers of asbestos. In one case, the First Department said that the award of \$6 million for past pain and suffering deviated materially from what was reasonable compensation, but said that an award of \$3 million, though it was significant and exceeded some precedents, was appropriate and justified. In the second case, the First Department reduced the damages for future pain and suffering from \$5 million to \$4.5 million. *Matter of New York City Asbestos Litigation (Hackshaw v. ABB, Inc.)*, 2016 N.Y. App. Div. LEXIS 6449 (1st Dept. Oct. 6, 2016); *Matter of New York City Asbestos Litigation (Sweberg v. ABB, Inc.)*, 2016 N.Y. App. Div. LEXIS 6447 (1st Dept. Oct. 6, 2016).

⁵¹ *Climate, Weather & Health*, DOH, <http://www.health.ny.gov/environmental/weather/index.htm> (revised Aug. 2016).