

ADAPTATION TO THE HEALTH CONSEQUENCES OF CLIMATE CHANGE AS A POTENTIAL INFLUENCE ON PUBLIC HEALTH LAW AND POLICY: FROM PREPAREDNESS TO RESILIENCE

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I. INTRODUCTION

The effects of climate change on human health are already in evidence. The World Health Organization estimates that right now, worldwide, about 150,000 people a year die from effects of global warming,² a number that pales in comparison to what may be seen in the future. A process of transformation has begun on this planet that is likely to change human civilization as we know it. The extent and character of that transformation, however, is not yet written in stone. We still have the opportunity to prevent much of the degradation of the global environment on which we depend for our health and sustenance. Potentially sweeping measures to reduce the concentration of greenhouse gasses in the atmosphere (“mitigation” in the language of the climate community) are currently being debated at the national and international level. Enough damage has been done, however, that the time has come to focus not only on mitigation of climate change, but also on strengthening the capacity of human systems to respond to its impacts (“adaptation” in the language of the climate community). Adaptation will require scientific, social, cultural, economic, political, and legal innovation. Because the health effects of climate change, which include effects on severe weather events, as well as more slowly emerging processes such as exacerbation of respiratory and cardiovascular disease and increased exposure to infectious disease, are likely to be so significant and far reaching, a key component of our ability to adapt to a “new normal” will be our global public health infrastructure.

Funding for adaptation (including health adaptation) is currently playing an important role in international negotiations on a successor to the Kyoto Protocol to the United Nations Framework Convention on Climate Change.³ Adaptation is garnering considerable attention in the United States as well. Potentially groundbreaking climate change legislation recently introduced in

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2. World Health Organization, Climate and Health Fact Sheet No. 266 (August 2007), available at <http://www.who.int/mediacentre/factsheets/fs266/en/>.

3. See Lindsay F. Wiley, *Healthy Planet, Healthy People: Integrating Global Health into the International Response to Climate Change*, 25 J. ENV’T.L. & LITIG. (forthcoming spring 2010).

the U.S. Congress addresses both domestic and international adaptation planning.⁴ Both Senate and House bills include a subpart on public health that directs the Department of Health and Human Services to develop a strategic action plan for “preparing for and responding to the impacts of climate change on public health in the United States and other nations, particularly developing nations.”⁵ Both bills include provisions for research on the health impacts of climate change, planning and preparedness activities at the state and local level, training for public health and health care practitioners, and public health education programs.⁶ The political future of this legislation is uncertain, but it indicates growing interest in the United States in taking meaningful action to respond to climate change through both mitigation and adaptation approaches. The inclusion of significant provisions on climate change and public health also suggests that public health law and policy will be an important part of climate change adaptation planning in the United States.

Emerging interest in climate change as a public health issue comes at a time of rapid growth in public health law and policy in response to a range of other new threats to health. Although recent developments in the United States and internationally have led to a significant increase in funding and attention to public health infrastructure and preparedness,⁷ perhaps counterintuitively, recent emphasis on preparedness for extraordinary events like terrorist attacks and infectious disease pandemics may be to the detriment of our ability to cope with the health impacts of climate change. The connection between public health emergency preparedness and climate change adaptation is complex. Existing emergency preparedness law will necessarily be an important backdrop for health-focused climate change adaptation efforts (especially with regard to natural disasters and infectious disease outbreaks). Yet the focus on *emergency* preparedness in recent years does not necessarily situate us well for handling the substantial, but slowly emerging, intensification of more routine health threats that we expect to see as an impact of climate change. Although the “all hazards” model of preparedness

4. Clean Energy Jobs and American Power Act, S. 1733, 111th Cong. §§ 301 et seq. (2009); American Clean Energy and Security Act of 2009, H.R. 2454, 205th Cong. §§ 451-495 (2009).

5. Clean Energy Jobs and American Power Act, S. 1733, 111th Cong. §353 (2009), available at <http://kerry.senate.gov/cleanenergyjobsandamericanpower/pdf/bill.pdf>; American Clean Energy and Security Act of 2009, H.R. 2454, 111th Cong. §463 (2009).

6. The House bill, which passed by a narrow majority in June 2009, specifies that these activities will be financed through the creation of a Climate Change Health Protection and Promotion Fund with an allocation of 0.1 percent of the proceeds generated by the proposed carbon credit auction – an estimated \$90 million per year. See H.R. 2454 at §467. The Senate bill introduced in September 2009 includes similar provisions, but was not initially specific as to the source or level of funding for public health activities. See S. 1733 at §212.

7. See, e.g., James G. Hodge, Jr., *Bioterrorism Law and Policy: Critical Choices in Public Health*, 30 J.L. Med. & Ethics 254 (2002).

attempts to address the need to allocate funds toward preparedness for all events to increase the likelihood that those funds will ultimately prove useful,⁸ that model has in fact given short shrift to natural disasters and disease outbreaks, and maintains an emphasis on rapidly developing emergencies rather than more slowly emerging crises. One reason that public health law has focused in recent years on preparedness for the extraordinary is that extraordinary risks capture the imagination of laypeople and policymakers alike in ways that routine needs do not.⁹ Emergency preparedness measures that lurch from one sensational potential crisis to the next (biological terrorism, avian flu, SARS, H1N1) have done little to move public health law forward toward an objective with more lasting relevance.

In this article, I argue that climate change is poised to be the next major challenge with the potential to alter the balance on some of the essential issues of public health law: These include questions of public versus private responsibility for health; the appropriate jurisdictional level for addressing health threats; the balancing of individual rights against community needs; and the challenges associated with informing public choices about risk. I argue that the adaptation response to climate change has the potential to improve public health infrastructure in ways that will better position us to handle routine needs as they intensify and to move public health law and policy toward an approach that emphasizes “resilience”¹⁰ rather than “preparedness.”

8. See, e.g., Ernest B. Abbott, *Homeland Security in the 21st Century: New Inroads on the State Police Power*, 36 URB. LAW. 837, 840-41 (2004) (describing the evolution of the “all-hazards” approach to emergency management).

9. See Paul Slovic & Elke U. Weber, *Perception of Risk Posed by Extreme Events* (paper prepared for discussion at “Risk Management Strategies in an Uncertain World”, Palisades, New York, April 12-13, 2002), available at http://www.ldeo.columbia.edu/chrr/documents/meetings/roundtable/white_papers/slovic_wp.pdf; Paul Slovic, *Beyond Numbers: A Broader Perspective on Risk Perception and Risk Communication*, in ACCEPTABLE EVIDENCE: SCIENCE AND VALUES IN RISK MANAGEMENT 48, 50 (Deborah G. Mayo & Rachelle D. Hollander eds., 1991) (media attention to dramatic and sensational risks exacerbates public's tendency to overestimate the probability of their occurrence).

10. Resilience is a concept drawn from the discipline of ecology, where it is used to describe the ability of an ecosystem to withstand shock and rebuild itself when necessary. See C.S. Holling, *Resilience and Stability of Ecological Systems*, 4 ANN. REV. ECOLOGY & SYSTEMATICS 1, 17 (1973). In discussions of climate change adaptation, resilience has been treated as a key component of natural systems adaptation (the ability of ecosystems to adapt to the changed conditions of climate change in a way that preserves biodiversity). WORLD WILDLIFE FOUNDATION, BUYING TIME: A USERS MANUAL FOR BUILDING RESISTANCE AND RESILIENCE TO CLIMATE CHANGE IN NATURAL SYSTEMS (L.J. Hansen et al. eds., 2003), available at <http://www.worldwildlife.org/climate/Publications/WWFBinaryitem4922.pdf>. It has also been used to describe a quality of human systems, including in discussions of emergency preparedness, which increasingly refer to community resilience as a determinant of preparedness. See, e.g., Rebecca Katz & Jeffrey Levi, *Should a Reformed System be Prepared for Public Health Emergencies, and What Does that Mean Anyway?*, 36 J. L. MED. & ETHICS 716, 719-20 (2008). Arguably, this calculus should be reversed, such that preparedness is considered as a constituent part of resilience.

In the next part, I review current research on the likely health impacts of climate change in the United States, which include effects on severe weather events, as well as more slowly emerging processes such as exacerbation of air pollution with resulting impacts on respiratory and cardiovascular disease and increased exposure to vector-, food- and water-borne infectious disease. In Part III, I discuss the concept of public health preparedness for terrorism and pandemic threats as a dominant influence on public health law and policy in recent years and the resulting federalization and resurgence of the command and control approach to public health law.

In Part IV, I examine how public health law might play a role in climate change adaptation through a detailed discussion of three case studies that highlight the types of conflicts that are likely to arise in public health law in response to climate change: (1) the incompatibility of the Strategic National Stockpile of pharmaceutical and medical supplies with the needs of disaster response following Hurricane Katrina; (2) privacy-based barriers to public health surveillance programs seeking to track trends in pediatric asthma; and (3) conflicts over the use of pesticides for vector control to fight West Nile Virus in the United States. Upon delving more deeply into these three examples, a picture emerges of the ways in which climate change weighs in on some of the key concerns of public health and public health law.

Because the health threats associated with climate change are likely to exacerbate underlying health disparities (in that they are particularly concerning for vulnerable subpopulations such as the poor, city-dwellers, the elderly, and those who suffer from chronic health conditions),¹¹ climate change adaptation will raise issues of health equity and put pressure on the traditional divide between public and private responsibility for health. Because the health impacts of climate change are predominantly local in nature but are likely to overwhelm local resources, climate change adaptation will require us to revisit jurisdictional issues regarding the funding and control of health programs to emphasize adequate support for community-based responses. Traditional public health approaches requiring curtailment of personal liberty through measures like quarantine or forced immunization will not be relevant to climate change adaptation. Responding to severe health threats that are not immediately urgent, however, will require new ways of thinking about the balance between individual rights and community needs that go beyond reliance on the concept of a public health “emergency” to override more deliberative processes. Finally, because some measures that might be used to adapt to the impacts of climate change will pose potential risks of their own, adaptation planning will raise the challenge of informing public choices about risk in the context of complex risk-risk trade-offs. I argue that, taken together, these considerations have the potential to move public health law toward a

11. See generally Vernellia R. Randall, Glen Safford & Walter W. Williams, *Public Health Preparedness and the Law in Communities of Color*, 31 J.L. MED. & ETHICS 45 (2003).

new approach that emphasizes “resilience” rather than “preparedness.” This approach would be deliberative, equity-driven, and community-based, and would seek to balance respect for lay values with correction of facts regarding various risks.

II. THE PUBLIC HEALTH CONSEQUENCES OF CLIMATE CHANGE IN THE UNITED STATES

In the United States, climate change is likely to alter the shape of public health needs both through the introduction of new threats and the intensification and geographical shifting of current threats.¹² One of the most imminent and tangible threats of climate change is an increase in the extremity and frequency, as well as a geographical shift of weather incidents that have the potential to cause death and disability. Although it is difficult to quantify the effect of climate change on these events, evidence does suggest that the increase in intensity of Atlantic hurricanes and tropical storms over the last few decades is due in part to increased surface water temperatures in the tropical Atlantic, where hurricanes form.¹³ Warmer surface temperatures in the Gulf of Mexico and along the Atlantic Coast of the United States during the hurricane season also play a role in determining the intensity of storms when they make landfall.¹⁴ There is strong scientific support for projections that the wind speeds and rainfall associated with North Atlantic hurricanes and tropical storms will increase as a result of climate change.¹⁵ Additionally, sea

12. See generally U.S. CLIMATE CHANGE SCIENCE PROGRAM, ANALYSES OF THE EFFECTS OF GLOBAL CHANGE ON HUMAN HEALTH AND WELFARE AND HUMAN SYSTEMS 17 (Janet L. Gamble ed., 2008) [hereinafter CCSP Report], available at <http://downloads.climate-science.gov/sap/sap4-6/sap4-6-final-report-all.pdf>. On the health impacts of climate change worldwide, see generally INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2007: IMPACTS, ADAPTATION, AND VULNERABILITY: WORKING GROUP II CONTRIBUTION TO THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (2007), available at <http://www.ipcc.ch/ipccreports/ar4-wg2.htm>; INTEGRATION OF PUBLIC HEALTH WITH ADAPTATION TO CLIMATE CHANGE: LESSONS LEARNED AND NEW DIRECTIONS (Kristie L. Ebi, Joel B. Smith & Ian Burton eds., 2005); Anthony J. McMichael, Rosalie E. Woodruff & Simon Hales, *Climate Change and Human Health: Present and Future Risks*, 367 THE LANCET 859 (2006); Anthony Costello, et al., *Managing the Health Effects of Climate Change*, 373 THE LANCET 1693 (2009), available at <http://www.ucl.ac.uk/global-health/ucl-lancet-climate-change.pdf>.

13. See CCSP Report, *supra* note 12, at 17.

14. See BRENDA EKWURZEL, KEVIN TRENBERTH & KERRY EMANUEL, UNION OF CONCERNED SCIENTISTS, HURRICANES IN A WARMER WORLD: EXPLORING THE POTENTIAL CAUSES OF INCREASED STORM INTENSITY (2006), available at http://www.ucsusa.org/global_warming/science_and_impacts/science/hurricanes-and-climate-change.html (citing and summarizing research regarding the impact of climate change on hurricane frequency and intensity).

15. See generally U.S. CLIMATE CHANGE SCIENCE PROGRAM, SYNTHESIS AND ASSESSMENT PRODUCT 3.3: WEATHER AND CLIMATE EXTREMES IN A CHANGING CLIMATE, REGIONS OF FOCUS: NORTH AMERICA, HAWAII, CARIBBEAN, AND U.S. PACIFIC ISLANDS

level rise has the potential to dramatically increase storm surge.¹⁶ It is less clear whether, in addition to becoming more intense, these storms will become more frequent, although it is very likely that the spatial distribution of hurricanes and tropical storms will change, bringing greater frequency to some areas. An increase in the frequency and severity of floods due to climate change is also likely, based on what is known about the hydrological cycle. Rising average temperatures intensify evaporation and thus increase precipitation.¹⁷ There is evidence of an increase in the frequency of extreme precipitation events in multiple regions of the United States in recent years.¹⁸ Out of control wildfires, which are not classified as weather events, but are strongly affected by climate conditions, are also likely to become more frequent and more severe. As certain parts of the country become increasingly dry, evidence suggests that there will be an increase in the severity of wildfires as measured by the energy released and the number of fires that cannot be contained initially.¹⁹ Models predict that much of the Western United States will see an increase in wildfire risk while the Pacific Northwest will see higher levels of rainfall, and thus a lower wildfire risk.²⁰

Hurricanes, floods and wildfires can, and in the United States often do, result in direct mortality and injuries, but indirect mortality and morbidity can be even more devastating. Wildfires cause an increase in particulate air pollution which, in turn, can lead to respiratory illness and eye injuries.²¹ We may also see increased exposure to infectious disease through contaminated floodwaters or unsanitary shelter conditions following an event,²² increased exposure to hazardous chemicals through contaminated floodwaters,²³ carbon monoxide poisoning due to the use of generators following an event,²⁴

(Thomas R. Karl et al. eds., 2008) [hereinafter CCSP], available at <http://www.climate-science.gov/Library/sap/sap3-3/final-report/sap3-3-final-all.pdf>.

16. See Robin Kundis Craig, *infra*, at 521.

17. CCSP Report, *supra* note 12, at 2-17 (citing A. Bronstert, *Floods and Climate Change: Interactions and Impacts*, 23 RISK ANALYSIS 545 (2003); K.E. Kunkel, *North American Trends in Extreme Precipitation*, 29 NATURAL HAZARDS 291 (2003); C.A. Senior et al., *Predictions of Extreme Precipitation and Sea-Level Rise Under Climate Change*, 360A PHIL. TRANSACTIONS OF THE ROYAL SOC'Y OF LONDON 1301 (2002)).

18. CCSP, *supra* note 15, at 8.

19. CCSP Report, *supra* note 12, at 2-18 (citing T.J. Brown et al., *The Impact of Twenty-First Century Climate Change on Wildland Fire Danger in the Western United States: An Applications Perspective*, 62 CLIMATIC CHANGE 365 (2004); J.S. Fried et al., *The Impact of Climate Change on Wildfire Severity: A Regional Forecast for Northern California*, 64 CLIMATIC CHANGE 169 (2004)).

20. *Id.*

21. *Id.* at 2-7.

22. *Id.* at 2-6 (citing CDC, *Norovirus Outbreak Among Evacuees From Hurricane Katrina*, 54 MORBIDITY & MORTALITY WEEKLY REPORT 727 (2005)).

23. See Kundis Craig, *supra* note 16.

24. CCSP Report, *supra* note 12, at 2-6 (citing CDC, *Carbon Monoxide Poisonings After Two Major Hurricanes*, 55 MORBIDITY & MORTALITY WEEKLY REPORT 236 (2005)).

disruption in medication and health care for those suffering from chronic diseases such as HIV/AIDS, diabetes, and cardiovascular disease, and the mental health effects of natural disasters.²⁵ The mental health impact, in the form of increased anxiety, depression, and post-traumatic stress disorder, tends to be longer-lasting and may represent a greater disease burden than the physical effects of such an event because a larger population is likely to be affected.²⁶ These indirect effects can be difficult to quantify or predict but consideration of their magnitude is essential to effective preparedness for extreme weather events. It is also important to note that demographic changes in the U.S. population will further increase the risk of these climate-related health threats as the population ages and shifts to coastal areas, and as urban sprawl continues.²⁷

Despite the intense media attention given to natural disasters like floods and hurricanes that provide captivating visual images, heat waves are in fact the number one cause of weather-related deaths in the United States,²⁸ and are likely to become more frequent and extreme in coming decades. Climate change will bring an increase in average temperatures, as well as an increase in the number of days with extreme temperatures. Extreme heat can exacerbate chronic health conditions and has been associated with increased mortality from cardiovascular disease, respiratory disease, renal disease, diabetes, and nervous system disorders.²⁹ Particularly vulnerable groups include the elderly, the very young, city residents, the less educated, the socially isolated, the mentally ill, and people on certain medications, in addition to those without access to air conditioning and outdoor laborers.³⁰ The list of groups found to

25. *Id.* at 2-7 (citing K.L. Middleton et al., *Natural Disasters and Posttraumatic Stress Disorder Symptom Complex: Evidence From the Oklahoma Tornado Outbreak*, 9 INT'L J. STRESS MGMT. 229 (2002); C.V. Russoniello et al., *Childhood Posttraumatic Stress Disorder and Efforts to Cope After Hurricane Floyd*, 28 BEHAV. MED. 61 (2002); P. Verger et al., *Assessment of Exposure to a Flood Disaster in a Mental-Health Study*, 13 J. EXPOSURE ANALYSIS & ENVTL. EPIDEMIOLOGY 436 (2003); C.S. North et al., *The Course of PTSD, Major Depression, Substance Abuse, and Somatization After a Natural Disaster*, 192 J. NERVOUS & MENTAL DISEASE 823 (2005); B.J. Fried et al., *Use of Mental Health Services After Hurricane Floyd in North Carolina*, 56 PSYCHIATRIC SERVICES 1367 (2005); R.H. Weisler et al., *Mental Health and Recovery in the Gulf Coast After Hurricanes Katrina and Rita*, 296 J. AM. MED. ASS'N. 585 (2006)).

26. *Id.* (citing E.T. Gerrity & B.W. Flynn, *Mental Health Consequences of Disasters*, in THE PUBLIC HEALTH CONSEQUENCES OF DISASTERS 101-21 (E.K. Noji ed., Oxford University Press 1997)).

27. *Id.* at 2-18.

28. *Physicians for Social Responsibility: Testimony Before the Senate Environmental and Public Works Committee*, 111th Cong. 2 (2007) (statement of Michael McCally, M.D., Ph.D., Executive Director of Physicians for Social Responsibility) [hereinafter *Testimony*], available at http://epw.senate.gov/public/index.cfm?FuseAction=Hearings.Testimony&Hearing_ID=ab4f7563-802a-23ad-468e-b225c43aef22&Witness_ID=04f4c94c-39a5-4430-ba35-dd78ce8df9e4.

29. CCSP Report, *supra* note 12, at 2-5.

30. *Id.* (citing J. Diaz et al., *Heat Waves in Madrid 1986-1997: Effects on the Health of the Elderly*, 75 INT'L ARCHIVES OF OCCUPATIONAL & ENVTL. HEALTH 163 (2002); E. KLINENBERG,

be particularly vulnerable to heat-related mortality and morbidity highlights well-known health disparities in the United States. The burden of heat waves in the United States are also likely to increase in coming years due to continued urban sprawl, the aging of our population, and the increase in the prevalence of obesity, diabetes, and other chronic diseases that are associated with heat-related mortality and morbidity.

There are more gradual effects on health as well. Poor air quality, which already affects the health of many Americans with respiratory and cardiovascular disease, will be exacerbated by rising temperatures.³¹ Asthma and other respiratory diseases are on the rise in part due to declining air quality in many parts of the United States.³² Millions of Americans are currently exposed to ground-level ozone and fine particulate matter (PM_{2.5}) that exceed the National Ambient Air Quality Standards. Both of these pollutants have a significant impact on human health. One recent study comparing the health effects of preindustrial and present day air quality showed that increasing

HEAT WAVE: A SOCIAL AUTOPSY OF DISASTER IN CHICAGO (2002); M.A. McGeehin & M. Mirabelli, *The Potential Impacts of Climate Variability and Change on Temperature-Related Morbidity and Mortality in the United States*, 109 ENVTL. HEALTH PERSPECTIVES 185 (2001); J.C. Semenza et al., *Heat-Related Deaths During the July 1995 Heat Wave in Chicago*, 335 NEW ENGL. J. MED. 84 (1996); S. Whitman et al., *Mortality in Chicago Attributed to the July 1995 Heat Wave*, 87 AM. J. PUB. HEALTH 1515 (1997); R. Basu et al., *Temperature and Mortality Among the Elderly in the United States: A Comparison of Epidemiologic Methods*, 16 EPIDEMIOLOGY 58 (2005); N. Gouveia et al., *Socio-economic Differentials in the Temperature-Mortality Relationship in Sao Paulo, Brazil*, 32 INT'L J. OF EPIDEMIOLOGY 390 (2003); J.H. Greenberg et al., *The Epidemiology of Heat-Related Deaths, Texas – 1950, 1970-79, and 1980*, 73 AM. J. PUB. HEALTH 805-07 (1983); M.S. O'Neill et al., *Health, Wealth, and Air Pollution: Advancing Theory and Methods*, 111 ENVTL. HEALTH PERSPECTIVES 1861 (2003); J. Schwartz, *Who is Sensitive to Extremes of Temperature? A Case-Only Analysis*, 16 EPIDEMIOLOGY 67 (2005); T.S. Jones et al., *Morbidity and Mortality Associated With the July 1980 Heat Wave in St. Louis and Kansas City, MO*, 247 J. AM. MED. ASS'N. 3327 (1982); R.S. Kovats et al., *Contrasting Patterns of Mortality and Hospital Admissions During Hot Weather and Heat Waves in Greater London, UK*, 61 OCCUPATIONAL & ENVTL. MED. 893 (2004); J. Schwartz et al., *Hospital Admissions for Heart Disease: The Effects of Temperature and Humidity*, 15 EPIDEMIOLOGY 755 (2004); J.C. Semenza et al., *Excess Hospital Admissions During the July 1995 Heat Wave in Chicago*, 16 AM. J. PREVENTIVE MED. 269 (1999); S.J. Watkins et al., *Winter Excess Morbidity: Is it a Summer Phenomenon?*, 23 J. OF PUB. HEALTH MED. 237 (2001)).

31. *Id.* at 2-6 (citing D.V. Bates, *Ambient Ozone and Mortality*, 16 EPIDEMIOLOGY 427 (2005); P.G. Goodman et al., *Cause-Specific Mortality and the Extended Effects of Particulate Pollution and Temperature Exposure*, 112 ENVTL. HEALTH PERSPECTIVES 179 (2004) (erratum appears in 112 ENVTL. HEALTH PERSPECTIVES A729); W.R. Keatinge & G.C. Donaldson, *Mortality Related to Cold and Air Pollution in London After Allowance for Effects of Associated Weather Patterns*, 86 ENVTL. RES. 209 (2001); M.S. O'Neill et al., *Impact of Control for Air Pollution and Respiratory Epidemics on the Estimated Associations of Temperature and Daily Mortality*, 50 INT'L J. BIOMETEOROLOGY 121 (2005); C. Ren et al., *Does Particulate Matter Modify the Association Between Temperature and Cardiorespiratory Diseases?*, 114 ENVTL. HEALTH PERSPECTIVES 1690 (2006)).

32. *The Association of State and Territorial Health Officials: Before the Senate Environmental & Public Works Committee*, 111th Cong. (2007) (statement of Susan R. Cooper, MSN, RN, Commissioner, Tennessee Department of Health), available at http://epw.senate.gov/public/index.cfm?FuseAction=Files.View&FileStore_id=b6cad5d8c87c-4df2-bc94-92acc5e32a71.

carbon dioxide concentrations led to a corresponding increase in ground-level ozone and particulate matter, which in turn increased mortality by approximately 1.1% for each degree of temperature increase.³³

Ground-level ozone is formed by chemical reactions between certain air pollutants (mainly nitrogen oxides and volatile organic compounds) and sunlight.³⁴ It is distinguished from upper-level atmospheric ozone, which protects us from harmful UV rays. Ground-level ozone pollution causes both short-term, reversible diminished lung function and longer lasting inflammation of lung tissue.³⁵ Living in areas with high ozone concentration has been associated with an increase in asthma-related hospital visits,³⁶ premature death,³⁷ and may also increase the risk of developing asthma.³⁸ Breathing patterns during physical exertion increase the dose of ozone that a person receives for a given exposure and so athletes, outdoor laborers, and children are more vulnerable to the health effects.³⁹ Asthmatics may also be at greater risk.⁴⁰

Particulate matter (PM_{2.5}) is a different sort of pollutant from ozone. It includes all airborne particles that are less than 2.5 micrometers in diameter.⁴¹ The particles can be emitted from sources of pollution or formed through atmospheric reactions among various pollutant gasses.⁴² Most of the particles included in this category, especially soot from diesel, sulfates and nitrates, are created through fuel burning.⁴³ Exposure to PM_{2.5} has been associated with coughing and difficulty breathing, diminished lung function, exacerbation of asthma, the development of chronic bronchitis, as well as increased incidence

33. *Id.* (citing M.Z. Jacobson, *On the Causal Link Between Carbon Dioxide and Air Pollution Mortality*, 35 GEOPHYSICAL RES. LETTERS L03809 (2008), available at <http://www.agu.org/pubs/crossref/2008/2007GL031101.shtml>).

34. Mass. Tech. Collaborative Renewable Energy Trust, Glossary: Environmental Issues, <http://www.masstech.org/cleanenergy/energy/glossaryenvironment.htm> (last visited July 10, 2009).

35. CCSP Report, *supra* note 12, at 2-14 (citing L.J. Folinsbee et al., *Pulmonary Function and Symptom Responses After 6.6-Hour Exposure to 0.12 ppm Ozone With Moderate Exercise*, 38 J. AIR POLLUTION CONTROL ASS'N 38 (1988); R.B. Devlin et al., 4 AM. J. RESPIRATORY CELL & MOLECULAR BIOLOGY 72 (1991)).

36. CCSP Report, *supra* note 12, at 2-14 (citing J. Schwartz, *Short Term Fluctuations in Air Pollution and Hospital Admissions of the Elderly for Respiratory Disease*, 50 THORAX 531 (1995)).

37. *Id.* (citing P.L. Kinney & H. Ozakaynak, *Associations of Daily Mortality and Air Pollution in Los Angeles County*, 54 ENVTL. RESEARCH 99 (1991)).

38. *Id.* (citing R. McConnell et al., *Asthma in Exercising Children Exposed to Ozone: A Cohort Study*, 359 LANCET 386 (2002)).

39. *Id.*

40. *Id.*

41. U.S. Environmental Protection Agency, Fine Particle (PM_{2.5}) Designations: Basic Information, <http://www.epa.gov/pmdesignations/basicinfo.htm> (last visited October 2, 2009).

42. *Id.*

43. *Id.*

of heart attack and arrhythmias.⁴⁴ High concentrations of PM2.5 have also been associated with increases in school absences, hospital admissions, and emergency room visits, as well as higher rates of premature mortality.⁴⁵ The health effects of PM2.5 appear to be related to arterial narrowing and consequent effects for heart health. Thus, vulnerable groups include those with high blood pressure and preexisting heart conditions.⁴⁶

Changing weather patterns are also expected to result in an increased incidence of zoonotic,⁴⁷ vector, food, and water-borne diseases in the United States.⁴⁸ Environmental conditions affect the survival, persistence, habitat range, and transmission of a variety of pathogens.⁴⁹ Vector-borne infectious diseases like malaria and West Nile Virus are those that are transmitted from human to human by blood-feeding arthropods such as mosquitoes and ticks.⁵⁰ Mosquito-borne diseases are likely to become an increasing concern in the United States as milder winters and changing precipitation patterns favor an increase in mosquito populations. West Nile Virus, which was virtually nonexistent in the United States until 1999, has now been reported in forty seven states, with over 25,000 cases and 1,000 deaths reported.⁵¹ In 2005, the first case of Dengue Fever acquired in the United States was reported in an area of Texas near the Mexico border.⁵² Climate change may also impact the size and range of tick populations, increasing the incidence of the diseases they carry.⁵³ Zoonotic diseases, like Hantavirus carried by rodents or H5N1

44. CCSP Report, *supra* note 12, at 2-14, 2-15 (citing D.W. Dockery et al., *An Association Between Air Pollution and Mortality in Six U.S. Cities*, 329 NEW ENGL. J. MED. 1753 (1993)); J.M. Samet et al., *Fine Particulate Air Pollution and Mortality in 20 U.S. Cities, 1987-1994*, 343 NEW ENGL. J. MED. 1742 (2000); C.A. Pope III et al., *Particulate Air Pollution as a Predictor of Mortality in a Prospective Study of U.S. Adults*, 151 AM. J. RESPIRATORY & CRITICAL CARE MED. 669 (1995); C.A. Pope & D.W. Dockery, 54 J. AIR & WASTE MGMT. ASS'N 709 (2006); F. Dominici et al., *Fine Particulate Air Pollution and Hospital Admission for Cardiovascular and Respiratory Diseases*, 295 J. AM. MED. ASS'N 1127 (2006); F. Laden et al., *Reduction in Fine Particulate Air Pollution and Mortality: Extended*, 173 AM. J. RESPIRATORY & CRITICAL CARE MED. 667 (2006).

45. CCSP Report, *supra* note 12, at 2-15.

46. *Id.*

47. See, e.g., P. Gale et al., *Predicting the Impact of Climate Change on Livestock Disease in Great Britain*, 162 VETERINARY REC. 214 (2008).

48. *Id.*; see, e.g., Kathryn Senior, *Climate Change and Infectious Disease: A Dangerous Liaison?*, 8 LANCET INFECTIOUS DISEASES 92 (2008).

49. CCSP Report, *supra* note 12, at ES-7.

50. *Id.* at 2-8.

51. *Testimony*, *supra* note 28; see U.S. CENTERS FOR DISEASE CONTROL AND PREVENTION, WEST NILE VIRUS, STATISTICS, SURVEILLANCE, AND CONTROL, <http://www.cdc.gov/ncidod/dvbid/westnile/surv&control.htm> (reporting statistics for each year from 1999 to present) (last visited October 2, 2009) [hereinafter STATISTICS].

52. U.S. Center for Disease Control and Prevention, *Dengue Hemorrhagic Fever—U.S. Mexico Border, 2005*, 56 MORBIDITY & MORTALITY WEEKLY REPORT 785, Aug. 10, 2007.

53. See, e.g., Elisabet Lindgren & Rolf Gustafson, *Tick-borne Encephalitis in Sweden and Climate Change*, 358 THE LANCET 16 (2001).

influenza carried by birds, develop in an animal population reservoir and are then transferred through animal-human contact. The incidence of zoonotic diseases is similarly affected by weather patterns as the habitats and size of animal populations shift in ways that may bring them into greater contact with humans. Indeed, the Hantavirus outbreak in the Western United States in the 1990s was associated with a change in weather patterns due to effects of the El Niño Southern Oscillation (ENSO).⁵⁴ Surprisingly to some, food-borne illness is also sensitive to changes in the climate.⁵⁵ Kristi L. Ebi, Ph.D., a lead author of the Human Health chapter of the *Intergovernmental Panel on Climate Change's Fourth Assessment Report*, has said that the likely effects of climate change on food and water-borne illnesses, like salmonella, deserve more attention from the popular press.⁵⁶ We are likely to see a decrease in the availability and quality of water in the United States due to the effects of climate change. The intensity of droughts is likely to be exacerbated by higher temperatures and changing weather patterns. Global climate models project that the Northeastern United States will see an increased frequency of prolonged droughts⁵⁷ and the Southwest will experience a major reduction in the availability of water.⁵⁸ Water quality will also be an increasing concern. For example, harmful algae blooms are on the rise as average surface water temperatures increase.⁵⁹

These more imminent effects of climate change are likely to be followed by even more serious threats to health due to unprecedented food and water shortages, mass migration, and increases in armed conflict as the growing world population fights for access to ever-decreasing resources.⁶⁰ The mutually reinforcing trends of environmental degradation and climate change are likely to alter the security of human settlements across the globe in fundamental ways. Climate change will intensify a global food crisis already in

54. See, e.g., Gregory E. Glass et al., *Using Remotely Sensed Data to Identify Areas at Risk for Hantavirus Pulmonary Syndrome*, 6 EMERGING INFECTIOUS DISEASES 238 (2000).

55. See, e.g., R.S. Kovats et al., *The Effect of Temperature on Food Poisoning: A Time-Series Analysis of Salmonellosis in Ten European Countries*, 132 EPIDEMIOLOGY AND INFECTION 443 (2004).

56. Janet A. Phoenix, *Climate Change and Public Health Reporting*, THE YALE FORUM ON CLIMATE CHANGE & THE MEDIA, Apr. 3, 2008, <http://www.yaleclimatemediaforum.org/2008/04/climate-change-and-public-health-reporting>.

57. Katherine Hayhoe et al., *Emissions Pathways, Climate Change, and Impacts on California*, 101 PROC. OF THE NAT'L ACAD. OF SCI. U.S. AM. 12422 (2004).

58. PETER BLACKLUND ET AL., U.S. CLIMATE CHANGE SCIENCE PROGRAM, THE EFFECTS OF CLIMATE CHANGE ON AGRICULTURE, LAND RESOURCES, WATER RESOURCES, AND BIODIVERSITY IN THE UNITED STATES 2, 138-40 (Margaret Walsh ed. 2008), available at <http://www.usda.gov/oce/global-change/files/CCSPFinalReport.pdf>.

59. K.G. Sellner et al., *Harmful Algal Blooms: Causes, Impacts and Detection*, 30 J. INDUS. MICROBIOL. BIOTECHNOL. 406 (2003).

60. See, e.g., LESTER R. BROWN, PLAN B: RESCUING A PLANET UNDER STRESS AND A CIVILIZATION IN TROUBLE (2003).

evidence today.⁶¹ Water scarcity will have far reaching consequences for health.⁶² The natural disasters described above, as well as other, more gradual processes such as rising sea levels, loss of soil moisture in some areas and increasing precipitation in others, melting glaciers, and changing seasonality of snow melt are likely to make many parts of the world uninhabitable, or at least uneconomic. According to the United Nations University Institute for Environment and Human Security, up to ten million people are currently induced to migrate by changing environmental conditions each year and as the situation worsens there may be as many as fifty million “environmental refugees” by the end of the current decade.⁶³ “Over the course of a few decades, if not sooner, hundreds of millions of people may be compelled to relocate because of environmental pressures.”⁶⁴ The global health consequences of food and water insecurity and mass migration are likely to require significant multilateral action, not only to address reduction of carbon emissions or to address humanitarian crises, but to address fundamental issues about how diminishing resources will be distributed. An effective multilateral response will probably require a major shift in the way that the United States handles its obligations to those outside its borders, obligations which gain moral impetus from the connection between the prosperity enjoyed in the United States over the last several decades and the devastation that is coming to the developing world.

There are four key characteristics of the health impacts of climate change that are particularly important for understanding how public health *law* should be part of the adaptation response. First, not all of the health impacts of climate change can be properly characterized as *events*. Extreme weather events are part of the impact of climate change, but more gradually emerging processes such as the exacerbation of air pollution and changes in infectious disease patterns will require approaches that go beyond the preparedness, response, and recovery cycle used to address disasters and emergencies.

Second, and perhaps most significant from a legal perspective, climate change impacts are likely to exacerbate underlying health disparities. Socioeconomic status plays a role in determining the causal pathway by which environmental conditions affect health on many levels and in a myriad of ways. Health disparities are implicated by more traditional emergency and

61. CENTER FOR STRATEGIC AND INTERNATIONAL STUDIES, A CALL FOR A STRATEGIC U.S. APPROACH TO THE GLOBAL FOOD CRISIS: A REPORT OF THE CSIS TASK FORCE ON THE GLOBAL FOOD CRISIS: CORE FINDINGS AND RECOMMENDATIONS 4, 9 (2008), *available at* http://www.csis.org/media/csis/pubs/080728_food_security.pdf.

62. *See* CORRINE J. SCHUSTER-WALLACE ET AL., SAFE WATER AS THE KEY TO GLOBAL HEALTH (2008), *available at* <http://www.inweh.unu.edu/inweh/Health/2008PolicyBrief.pdf>.

63. David Adam, *50m Environmental Refugees by End of Decade, UN Warns*, THE GUARDIAN, Oct. 12, 2005, *available at* <http://www.guardian.co.uk/environment/2005/oct/12/naturaldisasters.climatechange1>.

64. Jeffrey D. Sachs, *Climate Change Refugees*, 6 SCI. AM. 43 (2007).

disaster preparedness scenarios, as well, but the relationship is more complex and more significant in the case of climate change impacts. In a biological terrorist attack or an outbreak of a novel infectious disease, differential access to health care certainly could play some role in exacerbating underlying health disparities.⁶⁵ Natural disasters or other types of terrorist attack that have the potential to cause major disruption and dislocation implicate additional health equity considerations in their disproportionate impact on poor, urban populations that lack adequate resources to cope with such disruptions and are also more likely to suffer from underlying medical conditions like heart disease or diabetes that make disruption particularly dangerous.⁶⁶ The more gradually emerging health impacts of climate change—extreme heat, exacerbated air pollution, and changing infectious disease patterns—implicate health equity in far more complex ways. Personal capacity to adapt to these conditions depends on economic and social factors that go far beyond access to health care.⁶⁷ Consider the difference between the release of a biological toxin and the effect of extreme heat and poor air quality. In the case of the toxin, virtually no one will have stockpiled the specific countermeasures that might be used against the toxin, assuming such countermeasures even exist. Underlying health status (which is tied to social and economic status) may play some role in whether the body is able to fight off the toxin, but for the most part, we will all be in the same boat. In the case of heat and air pollution that exacerbate cardiovascular and respiratory disease, however, socioeconomic status plays a role on many different levels. For a relatively well-off person, an extreme heat or hazardous air quality day simply means a less pleasant trip between his air-conditioned home and his air-conditioned office and having to forgo his daily jog. For a low-income, urban dweller with chronic health conditions, no air conditioning, and a job that requires working outdoors, the situation is vastly different.

Third, there will be considerable local and regional variability in the impacts of climate change. This is partly due to geographic variation. As described above, some areas will become drier while others will experience increased precipitation and ecological changes that influence infectious disease patterns will differ by location as well. Differences in land use, built environment, and demography will also influence how climate change affects health in particular areas. Air pollution and extreme heat will be particularly concerning in urban settings, for example, and heat waves are most concerning in areas where populations are not accustomed to extreme heat and are less likely to have air conditioning.

65. See, e.g., Katz & Levi, *supra* note 10.

66. See Part IV.A., *infra*.

67. See, e.g., Ann E. Carlson, *Heat Waves, Global Warming, and Mitigation*, 26 UCLA ENVTL. L. & POL'Y 169 (2008).

Finally, adapting to the impacts of climate change is likely to raise a number of risk-risk tradeoffs. Adaptation strategies may themselves carry risks for human health and the environment. Genetically modified crops (such as varieties of rice that are more tolerant of salty water or varieties of wheat that are more drought tolerant) have been proposed as a potential tool for adapting agricultural production to climate change. There is considerable concern, particularly among the lay populace, about potential health and environmental risks associated with genetic modification and these worries will need to be taken into account in adaptation strategies. Similarly, a major component of plans to control vector mosquito populations is pesticide application in the environment generally as well as inside the home. This approach carries controversial risks of its own for the environment and for human health.⁶⁸ Taken together, these four particular characteristics of the health threats associated with climate change will require a somewhat different approach to planning and adaptation than has been employed to respond to terrorism and pandemic threats.

III. PUBLIC HEALTH PREPAREDNESS

In recent years, threats such as terrorism and emerging infectious disease outbreaks and pandemics have caused a change in the way the nation's public health system is perceived. Prior to the terrorist attacks of 2001, the public health system was in the throes of something of an identity crisis following the epidemiological transition in the twentieth century from a focus on endemic infectious diseases and poor nutrition as causes of mortality and morbidity to a focus on chronic, noncommunicable "lifestyle" diseases like cardiovascular disease and diabetes.⁶⁹ The emergence of HIV/AIDS put to rest claims that the age of infectious disease had come to an end, but traditional infectious disease control measures were ill-suited in combating its spread. "Old" public health had accomplished the eradication of cholera, polio, and small pox in the United States, but what should be its role in fighting HIV, obesity, cancer, and high blood pressure? Public health law in particular, which had been on fairly firm ground in negotiating the curtailment of individual liberties in the interest of fighting the spread of communicable diseases during the previous era, found itself in less sure territory.⁷⁰ Public health agencies struggling to address the growing burden of "lifestyle" diseases turned to functions that public

68. See Part IV.C., *infra*.

69. See, e.g., Richard A. Epstein, *In Defense of the "Old" Public Health: The Legal Framework for the Regulation of Public Health*, 69 BROOK. L. REV. 1421, 1422-26 (2004).

70. See, e.g., *id.*; cf. David P. Fidler, *From International Sanitary Conventions to Global Health Security: The New International Health Regulations*, 4 CHINESE J. INT'L L. 325 (2005) (describing the many factors contributing to the fall of the classical regime of infectious disease control in the context of international health law).

health law played very little role in supporting: technical guidelines and public awareness campaigns aimed at promoting consensual changes to individual health behaviors. At the same time, public health experts were beginning to shed light on the important role played by “upstream”⁷¹ social,⁷² economic,⁷³ and environmental⁷⁴ factors in determining individual and community health.⁷⁵ Growing concern about health disparities—evidence that socioeconomically advantaged people live longer, healthier lives and that this association persists across virtually every type and degree of disadvantage—led to controversy over whether public health interventions should seek to promote social justice.⁷⁶ To quote a recent article on the challenge of defining a role for public health law in modern liberal democracies, “[t]he use of *law* as a policy tool to respond comprehensively to environmental exposures, unhealthy lifestyles, and accidental injuries threatens to impinge on the interests of a wide variety of industries, and to significantly expand sites for state intervention.”⁷⁷

Against this backdrop, the jetliner and anthrax attacks of 2001, the SARS outbreak of 2003, and concern over the emergence of new strains of pandemic influenza have focused attention on public health preparedness. Public health preparedness encompasses readiness for widespread infectious disease due to a natural outbreak or intentional bioterrorism, as well as preparedness to ensure health security in the face of non-biological terrorist attacks or natural

71. The upstream/downstream parable is a mainstay of public health. See, e.g., SANDRA STEINGRABER, *LIVING DOWNSTREAM: AN ECOLOGIST LOOKS AT CANCER AND THE ENVIRONMENT* (1997) (“The residents who live [in a village by the river], according to the parable, began noticing increasing numbers of drowning people caught in the river’s swift current and so went to work inventing ever more elaborate technologies to resuscitate them. So preoccupied were these heroic villagers with rescue and treatment that they never thought to look upstream to see who was pushing the victims in.”).

72. See, e.g., WORLD HEALTH ORGANIZATION, COMMISSION ON SOCIAL DETERMINANTS OF HEALTH, *CLOSING THE GAP OF A GENERATION: THE FINAL REPORT OF THE COMMISSION ON SOCIAL DETERMINANTS OF HEALTH* (2008), available at http://whqlibdoc.who.int/publications/2008/9789241563703_eng.pdf; See Angus Deaton, *Policy Implications of the Gradient of Health and Wealth*, 21 *HEALTH AFFAIRS* 13 (2002).

73. See, e.g., Lant Pritchett & Lawrence H. Summers, *Wealthier is Healthier*, 31 *J. HUMAN RESOURCES* 841 (1996).

74. See, e.g., Hilary Benn, *The Environmental Determinants of Health*, GLOBAL HEALTH PROMOTION, March 2009 (Supplemental 1), at 42, (Abstract of Address presented November 2008) available at http://ped.sagepub.com/cgi/reprint/16/1_suppl/42.

75. See Lawrence O. Gostin et al., *The Law and the Public’s Health: A Study of Infectious Disease Law in the United States*, 99 *COLUM. L. REV.* 59, 69-78 (1999) (describing the evolution of public health models of disease and their influence on public health law).

76. Cf. Dan E. Beauchamp, *Community: The Neglected Tradition of Public Health* 15 (6) *HASTINGS CTR. REP.* 28 (1985); Scott Burris, *The Invisibility of Public Health: Population-Level Measures in a Politics of Market Individualism*, 87 *AM. J. PUB. HEALTH* 1607 (1997).

77. Roger S. Magnusson, *Mapping the Scope and Opportunities for Public Health Law in Liberal Democracies*, 35 *J.L. MED. & ETHICS* 571, 572 (2007).

disasters. To quote a recent article on the reinvigoration of the “command and control” model of public health in response to new threats,

[T]he conceptual framework of emergency preparedness and response [has] subsume[d] ever larger segments of the field of public health. Authorizations of funding for public health activities underscore the need to prepare for emergencies, and contingency planning has been folded into an all-hazards framework that channels public health policy and programs.⁷⁸

“All-hazards” has become the watchword in preparedness. In the United States, the approach is embodied at the federal level in the National Response Framework (NRF). The NRF attempts to integrate existing preparedness, response, and recovery programs into a single “all-hazards” plan that can be adapted to any domestic terrorist attack, natural disaster, or public health emergency.⁷⁹ At the state level, this approach has been embodied in the Model State Emergency Health Powers Act (MSEHPA), some version or portion of which has been adopted in thirty-eight states and the District of Columbia.⁸⁰ And at the international level, the newly revised International Health Regulations (IHR), adopted by the World Health Organization (WHO) in 2005, draw somewhat obliquely on the all hazards model.⁸¹ The old IHR—which had limited relevance to modern global health governance given their application only to cholera, yellow fever, and plague—were completely revised and now require, among other things, reporting of any “public health event of international concern.”⁸²

In principle, the all-hazards approach is an excellent idea. Particularly at a time when the United States and other nations are investing significant resources into preparedness for rare events that may never occur, it is politically useful to say that these infrastructure expenditures and legal reforms will serve the dual purpose of preparing us for more likely events like natural disasters. And in practice, there have certainly been benefits for public health infrastructure’s capacity to handle more routine threats due to the broad definition of the types of emergencies for which the influx of new

78. Nan D. Hunter, *‘Public-Private’ Health Law: Multiple Directions in Public Health*, 10 J. HEALTH CARE L. & POL’Y 89, 90 (2007).

79. DEP’T OF HOMELAND SEC., NAT’L RESPONSE FRAMEWORK 3-4 (2008), available at <http://www.fema.gov/pdf/emergency/nrf/nrf-core.pdf>.

80. Center for Law and the Public’s Health, *The Model State Emergency Health Powers Act: Legislative Surveillance Table* (2006), available at <http://www.publichealthlaw.net/MSEHPA/MSEHPA%20Surveillance.pdf>.

81. See David P. Fidler, *From International Sanitary Conventions to Global Health Security: The New International Health Regulations*, 4 CHINESE J. INT’L L. 325, 344 (2005) (discussing the broadened scope of the revised Regulations).

82. World Health Organization, *International Health Regulations* (2005), available at http://whqlibdoc.who.int/publications/2008/9789241580410_eng.pdf.

preparedness funding can be expended. Several critics have pointed out, however, that the all-hazards approach generally gives short shrift to non-terrorism related events,⁸³ a weakness that could become increasingly concerning in the face of increasing natural disasters and regional changes in infectious and chronic disease threats as a result of climate change.

IV. THE LIKELY DEMANDS OF CLIMATE CHANGE ON PUBLIC HEALTH INFRASTRUCTURE, LAW, AND POLICY AND WEAKNESSES IN THE CURRENT PUBLIC HEALTH LEGAL FRAMEWORK

In coming decades, the likely health effects of climate change will challenge our nation's already overburdened public health infrastructure in new ways. Every public health function will be called upon in response to climate change, but a few key roles will be particularly important to address the more imminent effects outlined above. Here, I'd like to focus on three likely demands on the United States public health system in response to climate change in which public health law will play a major role: (1) disaster preparedness and response, (2) disease surveillance, and (3) infectious disease control, especially vector control. Obviously, a number of other public health functions and health policies will also impact our ability to adapt to the health consequences of climate change over the next few decades. In particular, accessible and affordable health care will become an increasingly pressing concern in the face of all of the threats posed by climate change,⁸⁴ but those areas are outside the scope of this article.

Whether or not they are in fact evidence that anthropogenic climate change is already having an impact on health, events like Hurricane Katrina, the increase in incidence and severity of asthma, and the emergence of West Nile Virus in the United States provide a glimpse of current capacity to respond to the types of events that are likely to become increasingly common as our climate changes. This article will examine three case studies that highlight the types of conflicts that are likely to arise in public health law in coming decades in response to these types of threats: (1) the incompatibility of the Strategic National Stockpile of pharmaceutical and medical supplies with the needs of disaster response following Hurricane Katrina; (2) privacy-based barriers to public health surveillance programs seeking to track trends in pediatric asthma; and (3) conflicts over the use of pesticides for vector control to fight West Nile Virus in the United States.

Upon delving more deeply into these three examples, a picture emerges of the ways in which climate change weighs in on some of the key concerns of public health and public health law. Public health law has in many ways been

83. See Section IV, *infra*.

84. Cf. Katz & Levi, *supra* note 10 (arguing that health care reform should take emergency preparedness considerations into account).

structured around the issue of striking the balance between individual rights and the common good. This balance becomes all the more complicated in the face of threats against which the curtailment of liberty is less obviously effective.⁸⁵ Another public health law concern that has become increasingly important during a time of federalization is determining which level of government is best suited to protect the public's health.⁸⁶ This determination is made all the more difficult in the face of threats that are local in nature but are far beyond the reach of local resources.⁸⁷ Public health law has also increasingly focused on health disparities and the issue of how to draw the line between public and private responsibility for health in the context of a rapidly widening gap between the haves and the have-nots. Because many of the health impacts of climate change are likely to disproportionately affect vulnerable subpopulations such as the elderly, the poor, city-dwellers, and those with chronic medical conditions, issues of health equity will certainly come into play.⁸⁸ And finally, public health lawyers constantly face the difficulty of setting health priorities given that perception of risk is often clouded by "irrational" factors.⁸⁹ For example, the greater indignation, fear, and uncertainty associated with perishing in a large-scale terrorist attack as opposed to dying from complications of diabetes due to a disruption in one's ability to obtain necessary medications has a major impact on the political will available to address these problems. First, the epidemiological transition and evolving models of public health, and then terrorism and pandemic preparedness have played a major role in shaping these discussions. Climate change is poised to be the next major transition with the potential to alter the balance on these important questions regarding public health law and policy.

A. Disaster Response: The Strategic National Stockpile and the Failures of the All Hazards Approach in the Government Response to Hurricane Katrina

The failed response to Hurricane Katrina has been widely discussed as an indication of how unprepared the United States is for a large-scale public health emergency of any kind, but it particularly highlights some of the ways in which purportedly "all-hazards" measures for terrorism preparedness are in

85. See Epstein, *supra* note 69.

86. See LAWRENCE O. GOSTIN, PUBLIC HEALTH LAW: POWER, DUTY, RESTRAINT 55 (2000).

87. See, e.g., U.S. SENATE COMMITTEE ON HOMELAND SECURITY AND GOVERNMENTAL AFFAIRS, HURRICANE KATRINA: A NATION STILL UNPREPARED, S. Rep. No. 109-322, at 4-5 (2006).

88. See generally Vernellia R. Randall, Glen Safford & Walter W. Williams, *Public Health Preparedness and the Law in Communities of Color*, 31 J.L. MED. & ETHICS 45 (2003).

89. See, e.g., Slovic and Weber, *supra* note 9.

fact ill-suited to natural disasters. Here, I discuss a specific example that also points to the failure of disaster response measures to adequately address the needs of vulnerable populations and marginalized groups. In the aftermath of the government's failed response to Hurricane Katrina, one of many factors that emerged as having contributed to the devastating impact of the disaster was "the push pack story," which highlighted the failure of the Strategic National Stockpile (SNS) to appropriately meet the needs of hurricane survivors and the misfit between the NRF and non-terrorism related events.⁹⁰

The SNS is a stockpile of "drugs, vaccines and other biological products, medical devices and other supplies ... to provide for the emergency health security of the United States ... in the event of a bioterrorist attack or other public health emergency" maintained by the Secretary for Health and Human Services, in conjunction with the CDC and the Department of Homeland Security (DHS).⁹¹ In many ways, the political maneuvering behind the brief but convoluted history of the SNS is an excellent illustration of the turbulent influence of recent events on public health law and policy and provides insight into the current culture of public health preparedness that will be the backdrop against which climate change adaptation will be addressed in the context of public health law in coming years. For these reasons, I will describe this history in some detail.

The history of the SNS begins with the institution of a pharmaceutical stockpile program in 1998. In response to embassy bombings in Kenya and Tanzania and escalating tensions in Saudi Arabia, President Bill Clinton issued Presidential Decision Directive-62 (PDD-62), ordering the development of plans to deter and respond to terrorist attacks on the United States.⁹² In addition to giving the Department of Health and Human Services (DHHS) lead authority in efforts to prepare for an emergency involving chemical, biological, radiological and nuclear weapons, PDD-62 ordered DHHS and the Department of Veterans Affairs to stockpile countermeasures. Congress appropriated 160 million dollars to fund the National Pharmaceutical Stockpile (NPS) in 1999⁹³ and directed the CDC, within DHHS, to procure vaccines.⁹⁴

90. Leah J. Tulin, *Poverty and Chronic Conditions During Natural Disasters: A Glimpse at Health, Healing, and Hurricane Katrina*, 14 GEO. J. ON POVERTY L. & POL'Y 115, 138-39 (2007).

91. 42 U.S.C. § 247d-6b(a)(1) (Supp. V 2005).

92. Presidential Decision Directive-62, 34 Weekly Comp. Pres. Doc. 21 (May 22, 1998), *unclassified abstract available at* <http://www.ojp.gov/adp/docs/pdd63.htm>.

93. Kapil Kumar Bhanot, *What Defines a Public Health Emergency? An Analysis of the Strategic National Stockpile and the National Childhood Vaccine Injury Act: The Need for Prevention of Nonterror National Medical Emergencies*, 21 J. CONTEMP. HEALTH L. & POL'Y 137, 148 (2004) (citing *Bioterrorism: Our Frontline Response, Evaluating U.S. Public Health and Medical Readiness: Hearing Before the S. Health, Educ., Labor & Pension Comm., Subcomm. on Pub. Health*, 106th Cong. 18 (1999) (statement by William Clark, Deputy Director, Office of Emergency Preparedness, U.S. Department of Health and Human Services) ("Today, I must say our medical bioresponse capabilities are limited, but we are using the \$160 million appropriated for Bioterrorism in FY 99 to change that . . .").

The NPS was clearly designed to respond to terrorist attacks,⁹⁵ and was organized around the provision of twelve-hour “push packages” that could arrive in any city in the United States within twelve hours. Currently, each fifty-pound push pack costs about six million dollars and contains over 100 different types of supplies.⁹⁶ From the inception of the NPS, the packages were designed to include large quantities of pharmaceuticals, antidotes and other medical supplies, with a focus on vaccines to protect against anthrax, plaque, tularemia, and nerve agents. The push packs were (and still are) stored at warehouses in a dozen undisclosed locations throughout the country, to be delivered by the federal government to state and local governments through coordination with private contractors.⁹⁷ The first deployment of a push pack from the NPS was in response to the September 11, 2001 terrorist attacks. The package arrived in New York within seven hours of the order to deploy after the attack,⁹⁸ but was ultimately useless given the nature of the devastation.

In response to the September 11th attacks, Congress passed a flurry of antiterrorism legislation, including the Public Health Security and Bioterrorism Response Act of 2002,⁹⁹ which transformed the NPS into the SNS, broadened

94. Centers for Disease Control and Prevention, *Helping State and Local Jurisdictions Prepare for a National Emergency* (Aug. 11, 2003). Because this and other sources relevant to the development of the NPS are no longer easily accessible, refer to Bhanot, *supra* note 93 at 146-51, for a description of sources and the historical development of the SNS prior to 2004.

95. *Strategic National Stockpile (SNS)*, CENTERS FOR DISEASE CONTROL AND PREVENTION (2008), available at <http://emergency.cdc.gov/stockpile/index.asp> (hereinafter *Strategic National Stockpile*).

An act of terrorism (or a large scale natural disaster) targeting the U.S. civilian population will require rapid access to large quantities of pharmaceuticals and medical supplies. Such quantities may not be readily available unless special stockpiles are created. No one can anticipate exactly where a terrorist will strike and few state or local governments have the resources to create sufficient stockpiles on their own. Therefore, a national stockpile has been created as a resource for all.

Id. (indicating that preparedness for natural disasters is considered secondarily to terrorism preparedness).

96. A FAILURE OF INITIATIVE: FINAL REPORT OF THE SELECT BIPARTISAN COMMITTEE TO INVESTIGATE THE PREPARATION FOR AND RESPONSE TO HURRICANE KATRINA, 109th Cong., H.R. Rep. No. 109-396 at 275 (2d Sess. 2006), available at <http://www.gpoaccess.gov/Katrinareport/mainreport.pdf>.

97. See *Strategic National Stockpile*, CENTERS FOR DISEASE CONTROL AND PREVENTION (2008), <http://emergency.cdc.gov/stockpile/#transport> (last visited Sept. 20, 2009).

98. Stephen D. Prior, *Who You Gonna Call? Responding to a Medical Emergency with the Strategic National Stockpile*, National Defense University Center for Technology and National Security Policy 1 (June 2004), available at <http://www.ndu.edu/ctnsp/SNS-wb-kd-wb-kd.pdf> (last visited Mar. 16, 2009).

99. Public Health Security and Bioterrorism Response Act, 42 U.S.C. § 300hh-12 (2002).

the program's purpose, and increased its funding.¹⁰⁰ Notably, Congress gave the SNS a considerably broader mission than the NPS: "to provide for the emergency health security of the United States, including the emergency health security of children and other vulnerable populations, in the event of a bioterrorist attack or other public health emergency."¹⁰¹ The Homeland Security Act of 2003 brought about the largest reorganization of the federal government since World War II and had a significant effect on the SNS.¹⁰² The HSA moved a number of DHHS functions to the newly created Department of Homeland Security (DHS) and put the SNS under the authority of the DHS Undersecretary for Emergency Preparedness and Response, in consultation with the HHS Secretary.¹⁰³ This transfer represented a renewed commitment of the SNS to its antiterrorism mission and preparedness for non-terrorism related public health emergencies, which had only been added to the SNS agenda the year before, largely fell by the wayside.

In response to increasing concern about bioterrorism, as well as newly emerging and re-emerging infectious disease threats such as the SARS outbreak of 2002 to 2003, Congress passed the Project Bioshield Act of 2004,¹⁰⁴ which authorized a ten-year, 5.6 billion dollar program to encourage the development and production of new countermeasures for chemical, biological, radiological and nuclear (CBRN) agents. Congress moved authority over the SNS back from DHS to DHHS and granted to the HHS Secretary "sole responsibility for developing and executing a strategy for research, procurement, acquisition, storage, and delivery of the countermeasures to and from the [Strategic] National Stockpile."¹⁰⁵

The SNS also interacts in important ways with other government programs and agencies, all aimed at the development and provision of novel countermeasures for uncommon events. The FDA is responsible for

100. Prior, *supra* note 98, at 3.

101. Public Health Security and Bioterrorism Response Act, *supra* note 99, at § 300hh-12(a)(1) (2002). *See also* 149 CONG. REC. E919 (May 22, 2002) (enacted) (speech of Hon. John D. Dingell explaining the various provisions of the Public Health and Bioterrorism Response Act of 2002 including the authorization of activities "to recognize the special needs of children and other vulnerable populations").

102. Homeland Security Act of 2002, Pub. L. No. 107-296, 116 Stat. 2135 (codified as amended in scattered sections of the U.S.C.); President's Message to Congress Transmitting Proposed Legislation to Create the Department of Homeland Security (June 18, 2002).

103. 6 U.S.C. § 313(6), Pub. L. No. 107-296 § 1705, 116 Stat. 2316 (repealed 2004) (amending 41 U.S.C. § 300hh-12 by transferring the Strategic National Stockpile to the Department of Homeland Security).

104. Project BioShield Act of 2004, Pub. L. No. 108-276, 118 Stat. 835 (2004).

105. Bioterrorism Preparedness and Role of DHS Chief Medical Officer: Statement for the Record Before the Committee on Appropriations, Subcommittee on Homeland Security, 110th Cong. (2007) (statement of Jeffrey W. Runge, MD, Chief Medical Officer, Office of Health Affairs).

regulating and approving vaccines, countermeasures, and other medicines under the Federal Food, Drug, and Cosmetic Act. Because this process is often lengthy and strictly risk-averse, the Project Bioshield Act of 2004 amended the Public Health Service Act¹⁰⁶ to permit emergency use of countermeasure treatments not yet approved by the FDA. Newly created “Emergency Use Authorization” allowed the FDA to loosen their regulations and expedite the process for approving countermeasures for use in public health emergencies.¹⁰⁷ The 2006 Pandemic and All Hazards Preparedness Act (PAHPA)¹⁰⁸ also directed the FDA to provide technical assistance in the development of medical countermeasures.¹⁰⁹

The Biodefense Advanced Research and Development Authority (BARDA) and the 1.07 billion dollar Biodefense Medical Countermeasures Development Fund were established by Congress in 2006, under PAHPA.¹¹⁰ BARDA’s most important role is to support and advance the development of promising countermeasures. PAHPA sought to augment countermeasure development by funding projects that are beyond the National Institutes of Health’s (NIH) basic research funding, but are not yet at the stage of development at which funding can be provided under the SNS procurement program.¹¹¹ BARDA now manages Project Bioshield and the Public Health Emergency Countermeasures Enterprise (PHEMCE), both of which are focused on “the development and purchase of the necessary vaccines, drugs, therapies, and diagnostic tools for public health medical emergencies.”¹¹²

While selection and procurement decisions regarding the SNS and related programs are complicated by interagency coordination issues within the federal government, the distribution process is additionally plagued by interjurisdictional considerations. The SNS forms part of a federal preparedness framework that must balance the role of the federal government against those of state and local governments that have traditionally been primarily responsible for public health matters. Biosecurity presents unique challenges for defining the role of the federal government in preparedness and

106. 42 U.S.C. §§ 201-205 (2008).

107. Project BioShield Act of 2004, *supra* note 104, at 853-54. The Emergency Use Authorization provisions were put to use for the first time in response to the emergence of pandemic novel H1N1 influenza in 2009.

108. Pandemic and All-Hazards Preparedness Act, Pub. L. No. 109-417, 120 Stat. 2831 (2006).

109. *Id.* at 2831, 2875.

110. *Id.* at 2831.

111. U.S. DEPARTMENT OF GOVERNMENT ACCOUNTABILITY OFFICE, PROJECT BIOSHIELD: ACTIONS NEEDED TO AVOID REPEATING PAST PROBLEMS WITH PROCURING NEW ANTHRAX VACCINE AND MANAGING THE STOCKPILE OF LICENSED VACCINE 9 (2007), available at <http://www.gao.gov/new.items/d0888.pdf>.

112. U.S. Department of Health and Human Services, *Biomedical Advanced Research and Development Authority*, <http://www.hhs.gov/aspr/barda/index.html> (last visited Sept. 20, 2009).

response efforts. It unites one of the most fundamental functions of the federal government, national security, with one of the most fundamental functions of the state governments, public health. As a result, SNS distribution follows a somewhat convoluted process. A simple statement from the CDC regarding the process whereby the SNS is activated belies a morass of bureaucracy: “To receive SNS assets, the affected state’s governor’s office will directly request the deployment of the SNS assets from the CDC or DHHS. DHHS, CDC, and other federal officials will evaluate the situation and determine a prompt course of action.”¹¹³

As part of the National Response Framework, the SNS is touted as being positioned to respond to any type of public health emergency, regardless of its cause. Like many aspects of the NRF, however, the predominant focus of the SNS on anti-terrorism has been detrimental to its ability to effectively meet the needs of the population following non-terrorist events.¹¹⁴ In loose correlation with the shifts from DHHS to DHS and back again, the purported commitment of the SNS to preparedness for non-terrorism related public health emergencies has wavered throughout its history. Regardless of how that commitment has changed on paper, the reality is that the SNS has never been well-suited to natural disaster response.

Natural disasters have a disproportionate impact on vulnerable populations such as the poor and those who suffer from chronic health conditions. Many survivors of the initial impact of Hurricane Katrina lost their medications and had great difficulty accessing and refilling prescriptions. “For a number of people, the loss of access to consistent medication may have had serious, even fatal consequences.”¹¹⁵ Individuals with diabetes, cardiovascular disease, HIV/AIDS, and other chronic diseases risk serious health complications or even death if their access to medications is disrupted. Even many months after the initial impact of the hurricane, individuals with chronic medical conditions were still unable to access the medical care they needed. Health care personnel working in New Orleans reported anecdotal evidence of a rise in patients with untreated chronic illness, especially hypertension, diabetes and HIV/AIDS.¹¹⁶ “These people come in with extremely severe problems Diabetics have been off their insulin for six months. They come to us in diabetic ketoacidosis.”¹¹⁷

113. *Strategic National Stockpile*, *supra* note 97.

114. Anita Dancs, *Terrorism or All Hazards?: Broadening Homeland Security* (2006), available at <http://www.proteusfund.org/spwg/pdfs/Terrorism%20Or%20All-Hazards.pdf> (briefing of the Proteus Fund Security Policy Working Group).

115. Tulin, *supra* note 90, at 131-32.

116. Ruth E. Berggren & Tyler J. Curiel, *After the Storm: Health Care Infrastructure in Post-Katrina New Orleans*, 354 N. ENGL. J. MED. 1549, 1549-50 (2006).

117. *Id.* at 1550 (quoting Alfred Abaunza, Chief Medical Officer, West Jefferson Medical Center); *see also* A.J. Sharma et al., *Chronic Disease and Related Conditions at Emergency*

In the aftermath of Hurricane Katrina, twelve-hour push packs were deployed from the SNS but did not actually arrive until four days after the storm hit.¹¹⁸ Local governments were responsible for managing evacuation of individuals with special needs but did not sufficiently prepare for the needs of those suffering from chronic illness.¹¹⁹ For example, the Superdome, the “shelter of last resort” that housed more than 12,000 evacuees, did not have the capacity to provide dialysis or food appropriate for diabetics.¹²⁰ Thus, the state and local government were “heavily dependent” on the SNS for provision of medical supplies.¹²¹ When the push-packs—which were designed primarily to respond to a chemical, biological, radiological, or a nuclear event—did arrive, they were mostly filled with items that were of no use whatsoever for treating natural disaster victims.¹²² There were few supplies for emergency management of chronic diseases like diabetes, cardiovascular disease, and HIV/AIDS. Congress’ report on the factors contributing to the devastating effects of Katrina pointed to the poor selection of materials included in the push-packs as a significant planning failure.¹²³

In many ways, the all-hazards approach to preparedness may actually harm our nation’s ability to respond adequately to the increasing severity and frequency of natural disasters that we are likely to see in coming decades as a result of climate change. The influx of federal preparedness funding and efforts devoted to developing and reworking the NRF may be just enough for political actors to feel that they have addressed and are addressing the need for better protection from extreme weather events and related threats. In reality, however, preparedness funding has suffered from its intense focus on the kinds of rare and dramatic events—chemical, biological, radiological, and nuclear attacks, and the immediate physical impact of hurricanes—that capture the public’s attention in a way that the long and steady aftermath of a natural disaster and its indirect effects on population health do not. Either all-hazards planning must take more complete account of non-terrorism related events, or more of the funding for preparedness must be diverted to building essential infrastructure for meeting more routine health needs. Because climate change is likely to act primarily as an intensifier of more routine threats to health

Treatment Facilities in the New Orleans Area After Hurricane Katrina, 2 DISASTER MED. PUBLIC HEALTH PREPAREDNESS 27 (2008).

118. A FAILURE OF INITIATIVE, *supra* note 96, at 275.

119. *Id.* at 279-80.

120. *Id.* at 279. After the flood, but before the evacuation, more than 23,000 people sought shelter in the Superdome. *Id.* at 280.

121. *Id.* at 275.

122. *Id.* In the aftermath of Katrina, to prevent waste of unsuitable and unnecessary supplies, CDC did permit states to request supplies from the SNS without requesting a full push-pack. *Id.*

123. *See id.*

(albeit in a way that is likely to overwhelm current resources in a way that defies imagination), climate change adaptation is far more likely to bring about reforms that are useful in a day-to-day way than those achieved through current preparedness efforts. Of course, devotion of significant resources to meeting more routine health threats is, perhaps ironically, more politically controversial in a nation where personal, rather than governmental, responsibility for health care has been the norm. While government provision of CBRN countermeasures enjoys broad political support, suggestions that the government should make provision for essential medicines for chronic illness may be met with significant resistance from those who believe that stockpiling such medicines is a personal responsibility.

The much-discussed disproportionate impact of Hurricane Katrina on poor, black residents of New Orleans highlights a broader concern about the types of threats we are likely to see as an impact of climate change. As discussed in Part II above, a key characteristic of climate change health effects in the United States is that they will disproportionately impact vulnerable subpopulations such as the elderly, children, the urban poor, and those suffering from chronic medical conditions. Recent developments in the wake of the Katrina disaster indicate a positive trend toward taking the special needs of these vulnerable subpopulations into account in emergency preparedness planning, but there is still much work to be done.¹²⁴ In particular, community-based public health emergency planning, emphasizing the importance of giving community groups a voice in the planning process, has emerged as a means for improving plans for special needs populations and for increasing community trust in government response.¹²⁵ These developments represent a significant step toward increased emphasis on health equity, and not merely health security, in public health emergency preparedness. Recent efforts to better integrate community groups and vulnerable subpopulations into public health planning have largely focused on emergency events such as hurricanes and wildfires that require evacuation, relocation, and rebuilding efforts. Similar approaches might also be applied to planning for other health impacts of climate change that are more slowly emerging, such as heat waves,

124. See Sharona Hoffman, *Preparing for Disaster: Protecting the Most Vulnerable in Emergencies*, 42 U.C. DAVIS L. REV. 1491, 1533-34 (2009) (pointing to recent reforms in PAHPA, the Post-Katrina Emergency Management Reform Act, and other measures that address the need for better emergency planning for at-risk individuals, special needs populations and the disabled, but arguing that stronger accountability and more detailed planning guidance is still needed).

125. See, e.g., Monica Schoch-Spana et al., *Expanding the Public's Role in Health Emergency Policy*, 7 BIOSECURITY AND BIOTERRORISM 1 (2009); see also FEDERAL EMERGENCY MANAGEMENT AUTHORITY & DHS OFFICE FOR CIVIL RIGHTS AND CIVIL LIBERTIES, INTERIM EMERGENCY MANAGEMENT PLANNING GUIDE FOR SPECIAL NEEDS POPULATIONS 7-12 (Version 1.0 2008), available at <http://www.fema.gov/pdf/media/2008/301.pdf> (recommending community-based planning).

hazardous air quality events and changing infectious disease patterns, in an effort to emphasize overall system resilience.

B. Public Health Surveillance: FERPA's Privacy Protections as a Barrier to Effective Tracking of Pediatric Asthma Trends as Air Quality Worsens

Public health preparedness is not only a matter of injecting considerable new funding into the development of countermeasures and infrastructure. It has also meant a significant legal reform effort to remove legal barriers, particularly those associated with individual rights, to public health emergency response and to revise existing or create new emergency legal regimes to be called into play in extreme situations. The Model State Emergency Health Powers Act is probably the best example of what public health preparedness law reform has accomplished in this regard.¹²⁶ But public health lawyers have played a role in addressing the need for emergency preparedness in other areas of the law as well, and have engaged in new dialogues with the stakeholders in these regimes to bring statutes and regulations outside of health law into line with new emergency preparedness initiatives.

One such dialogue has been the continuing development of health emergency exceptions to the Family Educational Rights and Privacy Act of 1974 (FERPA)¹²⁷ as a means to address pressing needs for public health surveillance. A review of the still-active history of this development, like the description of the SNS above, provides insight into the culture of emergency preparedness law. The balance between the need for public health surveillance and the desire to protect individual rights to privacy of health information has, in the context of FERPA, relied heavily on the concept of "emergency." While rare infectious outbreaks such as methicillin-resistant staphylococcus aureus (MRSA), which have recently captured the public's attention,¹²⁸ are clearly covered by the health emergency exception to the stringent privacy protections afforded by FERPA to students, asthma, which has a far greater disease burden, is not.¹²⁹

126. See The Centers for Law and the Public's Health, Model State Emergency Health Powers Act, available at <http://www.publichealthlaw.net/ModelLaws/MSEHPA.php> (last visited Mar. 17, 2009).

127. 20 U.S.C.A. 1232(g) (2002).

128. See, e.g., Winnie Hu & Sarah Kershaw, *Dead Student Had Infection, Officials Say*, N.Y. TIMES, Oct. 26, 2007, at B1, available at <http://www.nytimes.com/2007/10/26/nyregion/26infect.html?pagewanted=print>.

129. See Letter from LeRoy S. Rooker, Director, Family Compliance Policy Office, U.S. Department of Education, to Melanie P. Baise, Associate University Counsel, The University of New Mexico (Nov. 29, 2004) available at <http://www.ed.gov/policy/gen/guid/fpco/ferpa/library/baiseunmslc.html> (explaining that the health and security emergency exception applies only in a situation that presents imminent danger or requires immediate need to avert serious threats to public safety).

Asthma prevalence in the United States among adults is approximately 10.9%, representing 24.4 million Americans.¹³⁰ Additionally, asthma is one of the most common chronic childhood diseases and a leading cause of hospitalization, physician visits, and missed school days.¹³¹ Approximately 5.3% of children have current asthma and 12.1% of children are diagnosed with lifetime asthma.¹³² Low-income minority children are particularly vulnerable to the disease, with some communities reporting prevalence rates as high as twenty percent.¹³³ Fortunately, severe morbidity and mortality due to asthma are largely preventable through good patient and caregiver education and access to high quality health care.¹³⁴ As for many chronic diseases, treatment guidelines for asthma focus on long-term management of the disease to prevent acute episodes. Unfortunately, despite improvements in practice guidelines, many patients continue to be undertreated with “controller” medications (such as inhaled corticosteroids) intended for long-term management and prevention and overtreated with “rescue” medications (such as short-acting beta2 agonists). This pattern is associated with increased risk of hospitalization and death due to asthma.¹³⁵

Access to health information is essential to the ability of state and local health authorities to carry out their duty to protect the public’s health. Surveillance of health data allows health authorities to target health promotion and disease prevention programs, identify specific health needs within subgroups of the population, track long-term health outcomes among various groups, and evaluate the effectiveness of public health programs. Individual health information is also essential to monitoring levels of immunization coverage to prevent outbreaks of preventable infectious diseases. Public health surveillance relies upon studies of existing health data, as well as mandatory reporting of notifiable health conditions that are specified by law. State laws typically require that certain health conditions (mostly, but not only, communicable diseases) be reported by health practitioners to state authorities.¹³⁶ Public health surveillance is particularly important for tracking environmental health because it is so difficult to link environmental exposures to health outcomes. Individual health data allows health authorities to identify

130. Lucas Pleis Jr., *National Center for Health Statistics: Summary Health Statistics for U.S. Adults: National Health Interview Survey, 2007*, Series 10, no. 240 VITAL HEALTH & STATISTICS 21, 23 (2009).

131. P.W. Newachek & W.R. Taylor, *Chronic Childhood Illness: Prevalence, Severity, and Impact*, 82 AM. J. PUBLIC HEALTH 364 (1992).

132. Mary Elizabeth Bollinger et al., *Transition to Managed Care Impacts Health Care Service Utilization by Children Insured by Medicaid*, 44 J. OF ASTHMA 717 (2007).

133. *Id.*

134. Lara J. Akinbami & Kenneth C. Schoendorf, *Trends in Childhood Asthma: Prevalence, Health Care Utilization, and Mortality*, 110 PEDIATRICS 315 (2002).

135. Bollinger, *supra* note 132.

136. *See, e.g.*, Mich. Comp. Laws Serv. § 333.5111 (LexisNexis 2005).

and study trends in chronic and environmental diseases, such as autism, developmental disabilities, cancer, and asthma¹³⁷ and to identify, evaluate, and track the effects of environmental exposures, such as exposure to lead or other potentially toxic substances.¹³⁸ After critics raised awareness to the fact that tracking programs did not exist at the state level for many of the exposures and health effects that may be linked to environmental exposures, in 2002, the CDC began developing a nationwide environmental health tracking program (EPHT). The program is designed to facilitate the collection, analysis and interpretation of data on environmental hazards, exposures, and health outcomes and to promote state and local capacity to protect environmental health.¹³⁹

The primary focus of recent efforts to improve public health surveillance capability (in the EPHT and other programs) has been on nationalizing surveillance through integration and standardization of state infectious disease reporting and on “syndromic surveillance,” which aims at rapid early-event detection of disease outbreaks or bioterrorism events.¹⁴⁰ In contrast to what is needed to track possible national terrorist attacks or a worldwide pandemic, the health threats associated with climate change are likely to be local or regional in nature and will require strong local surveillance more than increased centralization. Obviously, there is an urgent need for better funding of local surveillance efforts and, at a time when budgets at every level of government are tight, it may be difficult to argue that disease surveillance should be a top priority. On the other hand, removal of legal barriers to surveillance is a relatively inexpensive reform that strengthens local capabilities.

Although the primary federal health information privacy law, the Health Insurance Portability and Accountability Act (HIPAA) of 1996¹⁴¹, includes an exception for public health disclosures, another key federal privacy statute, FERPA, does not. FERPA was enacted to provide public school students and their parents or guardians with access to their educational records and some ability to control the use and disclosure of those records. The statute protects the privacy of student educational records and generally requires consent for

137. ASSOCIATION OF STATE AND TERRITORIAL HEALTH OFFICIALS, TRACKING CHILDHOOD ASTHMA WITH SCHOOL DATA IN THREE STATES: CASE STUDY 1 (2006).

138. Sheela Sathyanarayana et al., *Predicting Children's Blood Lead Levels From Exposure to School Drinking Water in Seattle, Washington, U.S.A.*, 6 AMBULATORY PEDIATRICS 288 (2006).

139. CENTERS FOR DISEASE CONTROL AND PREVENTION, NATIONAL ENVIRONMENTAL PUBLIC HEALTH TRACKING PROGRAM, BACKGROUND, <http://www.cdc.gov/nceh/tracking/background.htm>.

140. JEFFREY LEVI, ET AL., TRUST FOR AMERICA'S HEALTH, READY OR NOT?: PROTECTING THE PUBLIC'S HEALTH FROM DISEASES, DISASTERS, AND BIOTERRORISM 31-33 (2007), available at <http://healthyamericans.org/reports/bioterror07/BioTerrorReport2007.pdf>.

141. Pub. L. No. 104-191, 110 Stat. 1936 (1996).

disclosure of personally identifiable information from school records.¹⁴² Health information relevant to disease tracking that is included in school-based records is protected by FERPA, which prevents disclosure to public health authorities, without written consent from the student or parent.¹⁴³

FERPA does include a statutory exemption for disclosures “in connection with an emergency,” to “appropriate persons if the knowledge of such information is necessary to protect the health or safety of the student or other persons.”¹⁴⁴ However, the United States Department of Education’s Family Policy Compliance Office (FPCO), which implements FERPA, has heavily emphasized the immediacy of the alleged threat as the key to the emergency exemption.¹⁴⁵ A great deal of the surveillance data necessary for tracking and addressing the public health consequences of climate change would not be covered by the immediacy-based emergency exception. For example, in November 2004, the FPCO issued an interpretation letter addressing a conflict between FERPA and New Mexico Health Department regulations that required mandatory routine reporting of a variety of health conditions to the State Department of Health and immediate reporting of certain communicable diseases to the State Office of Epidemiology (SOE). The FPCO advised that, while the requirement that certain communicable diseases be reported immediately to the SOE fell under FERPA’s emergency exception, these releases must be narrowly tailored, temporally limited, and made to the appropriate authority.¹⁴⁶ Routine reporting of notifiable conditions was not in compliance with FERPA because there was no imminent danger or threat to the community.¹⁴⁷

In response to the Virginia Tech tragedy of April 2007, the Department of Education has recently revised the regulations pertaining to the health and safety emergency exceptions to FERPA. The revised regulations eliminate previous language requiring strict construction of the health and safety exception and provide for deference to educational institutions’ determinations that an “articulable and significant threat to the health or safety of a student or other individuals exists.”¹⁴⁸ Comments that accompanied the proposed regulations noted, however, that the “health and safety” exception does not allow disclosures on a routine, non-emergency basis,¹⁴⁹ suggesting that the FPCO’s determination in its New Mexico interpretation letter that not

142. *Supra* note 127.

143. *Id.* at § 1232(b).

144. *Id.* at § 1232(b)(1)(I).

145. 34 C.F.R. 99.36(c) (2009).

146. *Supra* note 129.

147. *Id.*

148. 34 C.F.R. 99.36(c) (2009).

149. Family Educational Rights and Privacy, 73 Fed. Reg. 74806 (proposed Dec. 9, 2008) (codified at 34 C.F.R. 99.36), at 74837.

all routine reporting of notifiable conditions meets the health and safety exception test may still hold.

FERPA has posed a major barrier to several states' recent efforts to track trends in childhood asthma. According to a study undertaken by the Association of State and Territorial Health Officials (ASTHO), which is lobbying the FPCO to broaden its interpretation of the health and safety exception, forty three states were conducting asthma surveillance as of 2004.¹⁵⁰ Most of these states were using mortality, hospital discharge, and Medicaid data as their primary sources of health information, but approximately one quarter of states were also using data from school records regarding absenteeism and school nurse reporting to gain a fuller understanding of the burden of childhood asthma.¹⁵¹ According to ASTHO,

Health related data contained in education records are supplemented with incident-specific and observational information. This unique information may not be included in other public health surveillance systems, such as mortality records and emergency room visits data. For example, a child who experiences frequent wheezing episodes when exercising in gym class, but has not been diagnosed by a physician as having asthma, is something a school nurse would likely include in the child's educational record.¹⁵²

These studies are significantly hampered by FERPA's requirements that individual consent must be obtained for the use of student health data in a nonemergency situation. Under these circumstances, individualized consent (which requires that parents affirmatively opt *in* rather than simply allowing them to opt *out*) introduces significant selection bias and use of aggregated data with all identifiable information removed creates the risk of inaccurate counts and double counting, and prevents follow-up research.¹⁵³

Privacy protections are essential to personal liberty, as well as to good health. Traditionally, many attempts to balance individual rights against the common good in the public health context and others have, like the health emergency exception to FERPA's protections, focused on the concept of emergency response. Emphasis on the immediacy of a health threat as justification for overriding personal privacy protections does not, however, meet the needs of the health threats posed by climate change, which are likely to occur more gradually. Efforts by the public health and public health law communities to bring individual rights and community needs into balance in this context have so far failed to adequately address health needs that are more routine but equally, if not more important, in terms of morbidity and

150. ASSOCIATION OF STATE AND TERRITORIAL HEALTH OFFICIALS, *supra* note 137.

151. *Id.*

152. *Id.*

153. *Id.* at 3.

mortality. This failure highlights the ways in which our ability to respond to the health threats posed by climate change—particularly those such as the increase in prevalence and exacerbation of morbidity and mortality due to asthma, which are likely to take the form of a gradually emerging crisis rather than an immediate emergency—may in fact be hindered rather than helped by the public health preparedness mindset.

There is, of course, a legitimate argument for why MRSA, a deadly bacteria that can spread from person to person extremely quickly if the institution where the outbreak occurs is not disinfected immediately, justifies a more significant infringement of individual privacy protections than asthma, a non-infectious “epidemic” that emerges slowly and against which surveillance efforts that require curtailment of individual rights are less effective. Nevertheless, the health crisis created by climate change over the course of decades is no less serious and requires no less a Herculean mobilization effort simply because it does not occur rapidly. And of course, HIPAA, which has a far broader application to health information than FERPA, does include a public health exception to its privacy protections that allows for routine, but important, disclosures.

As these routine health threats become far more intense and basic human needs are harder to meet in the face of climate change, however, it may be that strict privacy protections will increasingly have to give way to the need for population health surveillance, even in the context of noncommunicable health threats. Given that HIPAA does grant a farther-reaching exception for public health purposes, the impact of FERPA’s stringent protections is limited. Nonetheless, the story of the struggle between FERPA and public health reveals much about the huge role that emergency-focused public health law reform has played in recent years and the ways in which that focus is detrimental to our ability to respond to the health threats posed by climate change. One of the many challenges posed by climate change to public health law will be to reconceptualize the balance between individual rights and the public’s health in a way that can rise to the challenge of major health threats that emerge gradually. Such an approach would have to give up some of the special authority given to state interventions to protect health in the context of immediate urgency. Public health advocates will have to articulate their need for more flexible privacy protections in the context of a more slowly developing, deliberative process that weighs that need against other competing concerns.

C. Infectious Disease Control: West Nile Virus and Concerns About Widespread Use of Pesticides for Mosquito Control

West Nile Virus is a potentially fatal viral encephalitis transmitted from infected birds to humans via mosquitoes.¹⁵⁴ The first case acquired in the United States was reported in Queens, New York in 1999.¹⁵⁵ By 2004, cases were reported in all but one of the states in the continental United States.¹⁵⁶ From 1999 to 2002, the disease received major media attention as outbreaks spread rapidly to new areas.¹⁵⁷ In response to the new threat and the fear it generated, significant controversy erupted over ground and aerial pesticide spraying to control mosquito populations.¹⁵⁸

Regulating pesticide use has been an important part of environmental protection since the birth of the environmental movement with Rachel Carson's *Silent Spring*.¹⁵⁹ The debate surrounding the ban of DDT in the 1960s and 1970s focused on the impact of pesticides on the environment, particularly on bird populations, including the American Bald Eagle. Indeed, many pesticides commonly used for mosquito control are toxic to fish, marine arthropods like lobsters, birds, pollinating bees, and other beneficial insects. More than ninety eight percent of sprayed insecticides reach a destination other than their target species, including these non-target species, air, water, bottom sediments, and food.¹⁶⁰ These ecological effects can also have economic consequences for some stakeholders. For example, during the controversy over widespread mosquito spraying in New York to control West Nile Virus some blamed pesticide run-off for the total devastation of the lobster fishery in Long Island Sound.¹⁶¹ Organic farmers have also complained that mosquito spraying harms their livelihood.¹⁶² Recent debates regarding pesticide use for West Nile Virus control in the United States and the use of DDT for Malaria control in other countries have also begun to take

154. CENTERS FOR DISEASE CONTROL AND PREVENTION, EPIDEMIC/EPIZOOTIC WEST NILE VIRUS IN THE UNITED STATES: GUIDELINES FOR SURVEILLANCE, PREVENTION, AND CONTROL 4 (1999).

155. *Id.* at 8.

156. *See* STATISTICS, *supra* note 51.

157. *See* John P. Roche, *Print Media Coverage of Risk-Risk Tradeoffs Associated with West Nile Encephalitis and Pesticide Spraying*, 79 J. OF URBAN HEALTH 482 (2002).

158. *Id.*

159. RACHEL CARSON, *SILENT SPRING* (1962).

160. G. TYLER MILLER, JR., *SUSTAINING THE EARTH: AN INTEGRATED APPROACH* 211-16 (6th ed. 2004).

161. David M. Herszenhorn, *Dejected Fishermen Blame Mosquito Spraying in Mysterious Lobster Deaths*, N.Y. TIMES, July 31, 2000, at B1; Kirk Johnson, *Scientists See Slow Recovery for Lobsters in West L.I. Sound*, N.Y. TIMES, Mar. 8, 2003, at B4; Ken Valenti, *The Lobsters in Long Island Sound are Dying—Again*, JOURNAL NEWS, Oct. 11, 2002.

162. Carolyn Y. Johnson, *Mosquito Spraying Protested, Defended*, BOSTON GLOBE, Aug. 7, 2006, at B1.

the effects of pesticides on human health, particularly for pregnant women and children, more seriously. Many of the pesticides used in the United States to spray for mosquitoes contain active ingredients that are known or suspected human carcinogens, endocrine disruptors, and neurotoxins.¹⁶³

In the first few seasons of West Nile outbreaks in the United States, local public health authorities were under pressure to make a quick decision regarding whether to spray. Public and political pressure tended to overestimate the risk of West Nile Virus (which was a knowable, short-term risk receiving considerable media attention despite the fact that relatively few people were being infected) and underestimate the risk of toxic exposure (which tends to have more subtle effects, brought about through a complex chain of causation, and occurring years or even decades down the road, and yet was a risk to which large populations were exposed). Media coverage of the rapid spread of the disease across the United States with outbreaks reported in new areas on a regular basis and the fact that early on the disease was rarely detected until someone was very ill probably contributed to heightened fear of the disease.¹⁶⁴

The early public health response to West Nile Virus highlighted issues of coordination among agencies with divergent missions and the appropriate role of the federal government in developing public health guidelines for local or regional health threats.¹⁶⁵ Local authorities relied heavily on the recommendations of the CDC, which initially required pesticide spraying in a two-mile radius surrounding the area in which even a single infected bird or mosquito was found.¹⁶⁶ This reliance was problematic for two reasons. First, the CDC's guidance was based almost solely on the infectious disease risk without sufficiently taking the risks of pesticide application into account.¹⁶⁷

163. See, e.g., William C. Sugg, III & Matthew L. Wilson, *Overkill: Why Pesticide Spraying for West Nile Virus May Cause More Harm than Good, A Report by Toxics Action Center and Maine Environmental Policy Institute*, available at <http://www.meeepi.org/wnv/overkillma.htm> (citing, *inter alia*, J. ROUITT REIGART & JAMES R. ROBERTS, RECOGNITION AND MANAGEMENT OF PESTICIDE POISONINGS 19, 34, 36 (5th ed. 1999)) (explaining special patient populations and methods of absorption through various sources of exposure); Cynthia L. Curl, Richard A. Fenske & Kai Elgethun, *Organophosphorus Pesticide Exposure of Urban and Suburban Preschool Children with Organic and Conventional Diets*, 111 ENVTL. HEALTH PERSPECTIVES 377 (2003) (studying the pesticide intake of a sample population in the Seattle area of middle to upper-middle class status); Robin M. Whyatt et al., *Residential Pesticide Use During Pregnancy Among a Cohort of Urban Minority Women*, 110 ENVTL. HEALTH PERSPECTIVES 507 (2002).

164. See Slovic and Weber, *supra* note 9.

165. See generally U.S. GENERAL ACCOUNTING OFFICE, WEST NILE VIRUS OUTBREAK: LESSONS FOR PUBLIC HEALTH PREPAREDNESS, GAO/HEHS-00-180 (Sept. 2000), available at <http://www.gao.gov/archive/2000/he00180.pdf>.

166. U.S. Center for Disease Control and Prevention, *West Nile Virus Activity – New York and New Jersey*, 49 MORBIDITY & MORTALITY WEEKLY REPORT 640, July 21, 2000, <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm4928a3.htm>.

167. See Sugg & Wilson, *supra* note 163.

And second, it may have been inappropriate for local governments to accept general guidelines from the federal government without question given that the level of local risk may vary and local tolerance toward the two different types of risk (infectious vs. potentially toxic environmental exposure) may vary as well. The CDC later revised its recommendations in 2003 to promote the use of less harmful alternatives (such as elimination of breeding grounds and public education about mosquito avoidance) before widespread pesticide spraying as a last resort.¹⁶⁸

The West Nile Virus outbreak prompted several states to consider new legal measures to allow for emergency override of pesticide and insecticide use controls in the case of disease outbreaks. Legal controversy erupted over some states' provisions for emergency spraying.¹⁶⁹ In Vermont, for example, a new law authorized the state department of agriculture to issue permits for insecticide use without the notice and comment period generally required by state law in cases where the state commissioner of health found an imminent risk to public health due to West Nile Virus or other serious mosquito-borne illness.¹⁷⁰ In New York, state law excludes emergency pesticide use to protect against an "imminent" threat to health from general public notice requirements. Widespread pesticide spraying in New York City in response to the West Nile Virus outbreak in the summer of 2000 prompted a lawsuit by environmental activist groups to enjoin the spraying, arguing that it was in violation of state and federal environmental protection laws. Ultimately, a federal Court of Appeals held that the spraying was legal.¹⁷¹

One of the consequences of climate change is that vector-borne infectious disease will become a more pressing concern in the United States. We're likely to see an increase in the incidence of diseases like West Nile Virus and Lyme Disease and possibly also the reemergence of malaria¹⁷² and other diseases previously eradicated in the United States, as well as the emergence of new pathogens. In response, the pressure to use pesticides more heavily is likely to mount. Some groups are likely to push for the use of more powerful

168. See CENTERS FOR DISEASE CONTROL AND PREVENTION, EPIDEMIC/EPIZOOTIC WEST NILE VIRUS IN THE UNITED STATES: GUIDELINES FOR SURVEILLANCE, PREVENTION, AND CONTROL (3rd Rev.) (2003), available at <http://www.cdc.gov/ncidod/dvbid/westnile/resources/wnv-guidelines-apr-2001.pdf>.

169. See James G. Hodge, Jr., Center for Law and the Public Health, *West Nile Virus in the United States: A State of the Art Assessment of Law and Policy* 5 (Aug. 15, 2002) (unpublished draft), available at <http://www.publichealthlaw.net/Research/PDF/wnv.pdf>.

170. *Id.* at 5-6.

171. *Id.* at 19.

172. See, e.g., Andrew K. Githeko et al., *Climate Change and Vector-Borne Diseases: A Regional Analysis*, 78 BULL. WORLD HEALTH ORG. 1136, 1141-42 (2000); P. Martens et al., *Climate Change and Future Populations at Risk of Malaria*, 9 GLOBAL ENVTL. CHANGE S89, S96-99 & fig.4 (1999); but cf. David J. Rogers & Sarah E. Randolph, *The Global Spread of Malaria in a Future, Warmer World*, 289 SCIENCE 1763 (2000) (suggesting a more limited future spread of malaria in North America).

pesticides such as DDT, which was banned in the United States, but continues to be used in Africa and elsewhere. The United State's ban has always included an exception for health emergencies and it may not be too far off base to imagine that its use in the United States may be revived by increasing vector-borne disease threats. Controversy over the United State's ban of DDT has recently been renewed¹⁷³ and has gotten particularly ugly: one group has called the United States ban a "Green Eco-Imperialist Legacy of Death" and (at least partially erroneously) attributed millions of malaria deaths to the ban of DDT.¹⁷⁴ In 2006, amid a great deal of controversy, the World Health Organization reversed its previous policy and recommended the use of DDT for indoor spraying to control malaria.¹⁷⁵

Increased pesticide use for public health vector control could have serious health and ecological consequences. In a synergistic process, human efforts to adapt to climate change through increased pesticide use will create additional burdens on ecosystems already under severe stress due to the changing climate.¹⁷⁶ In addition to these environmental concerns, vector control decisionmaking will need to address how the threat of infectious disease should be balanced against the threat of pesticide exposure and how public health concerns should be weighed against the rights of stakeholders whose livelihoods will be harmed by widespread pesticide use. Questions regarding the proper relationship between federal and international health authorities and state and local decisionmakers who are subject to the political process are also likely to become more prominent.

These decisions will be particularly difficult as emerging and reemerging infectious diseases may generate fear and media coverage far out of proportion to their real level of risk. Situations like this one that involve a trade-off between different risks are particularly likely to raise issues regarding the proper roles of experts in assessing the various risks involved. Cass Sunstein and others have discussed the difficulties of managing a balance between correcting misinformation about risks and respecting the values of the lay

173. David L. Mulliken, Jennifer D. Zambone & Christine G. Rolph, *DDT: A Persistent Lifesaver*, 19 NAT. RESOURCES & ENV'T 3, 4-6 (2005); C.F. Curtis & J.D. Lines, *Should DDT Be Banned by International Treaty?*, 16 PARASITOLOGY TODAY 119, 119-20 (2000).

174. See Junk Science, *The Malaria Clock: A Green Eco-Imperialist Legacy of Death*, http://www.junkscience.com/malaria_clock.html (last visited Jan. 28, 2009).

175. See Celia W. Dugger, *W.H.O. Supports Wider Use of DDT to Combat Malaria*, N.Y. TIMES, Sept. 16, 2006, at A7; see also Tina Rosenberg, *What the World Needs Now is DDT*, N.Y. TIMES MAGAZINE, Apr. 11, 2004, at B8 (arguing that DDT can be used safely to eliminate malarial mosquitoes).

176. Matthew D. Zinn, *Adapting to Climate Change: Environmental Law in a Warmer World*, 34 ECOLOGY L.Q. 61, 80 (2007); Intergovernmental Panel on Climate Change, *Climate Change and Biodiversity* 42 (Apr. 2002), available at <http://www.ipcc.ch/pub/tpbiodiv.pdf>.

populace regarding which risks may be tolerated.¹⁷⁷ Ideally, the well-informed choices of the lay populace about risk toleration should be respected. In reality, however, the facts/values distinction is made more problematic by the ways in which value preferences are themselves shaped by a variety of factors and conditions that undermine individual autonomy.¹⁷⁸ Advocates for action to mitigate and adapt to climate change must be cautious not to overstate the increased risk of vector-borne disease that is anticipated as a consequence of climate change, particularly in the United States, where the increased risk is likely to be minimal compared to other areas of the world. Highlighting risks like West Nile Virus in an attempt to raise awareness of the health consequences of climate change is to some extent helpful, but carries with it the threat of creating needless fear that may lead to irrational public health decisionmaking.

V. CONCLUSION

The health threats posed by climate change differ in important ways from the threats of bioterrorism and emerging infectious disease outbreaks that have been a major influence on public health law reform in recent years. Whereas terrorism and pandemic threats have perhaps received public attention out of proportion to their status as health risks, many of the health threats associated with climate change—especially the exacerbation of chronic diseases such as asthma and cardiovascular disease—are not likely to capture the public imagination in proportion to their likely disease burden. While the threat of terrorism has to some extent brought about a return to the “command and control” model of public health law, in which state power to restrict individual liberty is granted a longer leash, that state power is far less likely to be deployed to protect vulnerable populations from death and disability due to asthma than to require reporting of infectious disease cases that might indicate a biological terrorist attack. While the national security aspects of the terrorism threat have brought about a shift of responsibility from local and state government to federal control, that shift may not serve us well in the face of regional changes in disease burden due to climate change. And finally, while terrorism preparedness has focused on our capacity to provide extraordinary care and countermeasures to chemical, biological, radiological and nuclear weapons that may never be used, climate change preparedness would emphasize better care for the types of health threats that already represent a major burden, especially for our most vulnerable populations.

177. *See, e.g.*, Richard H. Pildes & Cass Sunstein, *Reinventing the Regulatory State*, 62 U. CHI. L.R. 1, 78-80 (1995).

178. *See, e.g.*, Jonathan B. Wiener, *Best Case Scenario*, 43 TULSA L.R. 933, 936-40 (2008).

Despite these differences, there is a danger that, in taking on the task of climate change adaptation, policymakers may naturally turn to the tropes of natural disaster law (preparedness, response, recovery), from which much of public health emergency preparedness is also drawn.¹⁷⁹ In this article, I have argued that climate change has the potential to move public health law toward a resilience model of threat-response that has significant co-benefits for the public health system's ability to handle routine needs as well. It is by no means certain, however, that focus on adaptation will in fact do anything more than continue the emphasis on preparedness in public health law. The adaptation provisions of the U.S. climate legislation currently under consideration in Congress repeatedly refer to "preparing for" and "responding to" the impacts of climate change. Though preparedness and response are certainly terms with common meanings, they are terms of art in natural disaster and emergency preparedness law. For policymakers and public health practitioners alike, these terms bring to mind a very specific type of action that is oriented toward discrete events rather than more gradually emerging processes. It is possible that the same differences that make adaptation to climate change impacts better for promoting public health resilience than preparedness for terrorism and pandemic threats will also make meaningfully different action to address climate change impacts less likely.

Health adaptation to climate change is a concept that is only just beginning to garner the attention of public health practitioners and policymakers. Public health legal scholars should engage with these developments now, while there is still an opportunity to shape the tropes that will channel funding and reform efforts. Now is the time to highlight the need for new approaches that are deliberative (rather than reliant on emergency response), equity-driven (rather than security driven), community-based (rather than controlled from the top-down), and informed by expert assessments of the risks involved (rather than driven primarily by ill informed reactions to dreaded threats). If these factors are taken into account, the adaptation response to climate change has the potential to improve public health infrastructure in ways that will better position us to handle routine needs as they intensify and to move public health law and policy toward an approach that emphasizes "resilience" rather than "preparedness."

179. See generally David G.C. McCann, *Preparing for the Worst*, 30 J. LEGAL MED. 329 (2009) (discussing the disaster management cycle of prevention, preparedness, response, and recovery).

