



University of Washington Center for Health and the Global Environment (CHaNGE)

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Regional areas of focus: Africa, Asia, Caribbean, Central America, Europe, and the Pacific

Topical areas of focus of the Center for Health and the Global Environment (CHaNGE): CHaNGE collaboratively develops and promotes innovative, systems-based approaches to understanding and managing the risks of global environmental change, focusing on improving individual and community health and well-being in a changing environment. The Center conducts research and policy analysis, education and training, and technical assistance and capacity building that integrates health, environment, and social sciences. The Center's research agenda includes:

- Modeling future health risks as climate and development continue to change; identifying the magnitude and temporal and spatial patterns of change to inform effective risk management.
- Increasing understanding of how communities and nations can use data on environmental variables to manage risks.
- Designing and implementing adaptation policies and measures to prepare for and cope with the risks of climate change in a multi-stressor environment, taking into consideration vulnerable regions and populations.
- Estimating the health co-benefits of policy options to address global environmental change, particularly mitigation options to reduce the emissions of greenhouse gases.
- Developing and evaluating program and policy approaches/interventions to manage the impacts of global environmental change on health, including implementation strategies.

The Center for Health and the Global Environment includes Kristie L. Ebi, Ph.D., MPH; Jeremy J. Hess, M.D., MPH; and Cory W. Morin, Ph.D. Kristie Ebi has been conducting research and practice on adaptation to the health risks of climate variability and change for more than 20 years, and Dr. Hess has more than a decade of experience with health adaptation in the U.S. and in India.



Selected recent activities:

USAID ADAPTATION THOUGHT LEADERSHIP AND ASSESSMENTS

Working with Chemonics, International on the USAID Adaptation Thought Leadership and Assessments (ATLAS) project. The project aims to synthesize best practices, guide missions and their partners to the right tools for assessing risks and evaluating adaptation options, while also building capacity to translate this information into adaptation investment decisions and actions at the country, sector, and program levels that prioritize trade-offs for development programming. Dr. Ebi is providing summaries and analyses of the health risks of climate change in Africa, with a particular focus on Mozambique. Tasks include a summary of Africa-specific linkages between climate variability and change and human health; summary of Africa-specific policy and governance issues addressing the health risks of a changing climate; analytic assessment of climate and health risks, including a hot spot analysis for Mozambique.

TECHNICAL ASSISTANCE ON HEALTH ADAPTATION IN THE GREATER MEKONG SUBREGION

Providing technical assistance on health adaptation for the Asia Development Bank project supporting regional capacity development for Strengthening Resilience to Climate Change in the Health Sector in the Greater Mekong Subregion (Cambodia, Lao PDR and the SR of Vietnam) with the aim to reduce vulnerability to climate-induced health risks, especially for vulnerable populations, including the poor, migrants, and ethnic minority groups in the GMS. The outcome of the project will be enhanced capacity of participating countries and health agencies in climate change adaptation and is to be achieved through three outputs: (i) improvement of knowledge and understanding of the relationship between climate change and human health; (ii) strengthening of human resource skills in coping with climate change adaptation in the health sector; and (iii) sharing of knowledge products shared and promotion of advocacy.

WHO VULNERABILITY AND ADAPTATION ASSESSMENTS IN THE HEALTH SECTOR

In collaboration with WHO, wrote guidelines on conducting vulnerability and adaptation assessments in the health sector
<<http://www.who.int/globalchange/publications/vulnerability-adaptation/en/>> and guidelines on conducting the health component of a national adaptation plan
<<http://www.who.int/globalchange/publications/guidance-health-adaptation-planning/en/>>. We helped establish and conducted mid-term and terminal evaluations for the WHO/UNDP GEF project “Piloting climate change adaptation to protect human health”. The countries involved were Barbados, Bhutan, China, Fiji, Jordan, Kenya and Uzbekistan. These countries were chosen because they included small island nations (Barbados and Fiji), drought-prone countries (Jordan and Uzbekistan), and countries with mountainous regions where vectorborne diseases could change their geographic range with climate change (Bhutan and Kenya). China was included because it faces a wide range of potential challenges with climate change that could adversely affect human health.

REVIEW OF MULTINATIONAL HEALTH ADAPTATION PROJECTS IN LOW- AND MIDDLE-INCOME COUNTRIES

Project reports, program and project evaluations, and related documents, such as communication materials, were reviewed and synthesized for the first five years of implementation (2008–2013) of multinational health adaptation projects in low- and middle-income countries worldwide, including the WHO/UNDP GEF project; countries funded by the Millennium Development Goals Achievement Fund (MDG Fund) that included a health component; these were China, Jordan and the Philippines; and a WHO Regional Office for Europe (EURO) project “Protecting health from climate change: a seven-country initiative” funded by the International Climate Initiative of the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU). The countries included were Albania, Kazakhstan, Kyrgyzstan, the Russian Federation, Tajikistan, the former Yugoslav Republic of Macedonia and Uzbekistan. The goal of the review and assessment was to document lessons learned and good practice examples from health adaptation pilot projects in low- and middle-income countries to facilitate assessing and overcoming barriers to implementation and to scaling up. Results were published in a WHO document on *Lessons learned on health adaptation to climate variability and change: experiences across low- and middle-income countries* <<http://www.who.int/globalchange/publications/health-adaptation-climate-change/en/>>. Six themes arose from the review:

- *More effective projects had a clear vision of how the adaptation project fit within country development goals and had strong country ownership;*
- *More effective projects focused on the policies and measures needed to facilitate a country’s vision of what being adapted to climate change would look like;*
- *Successful projects either had capacity in climate change and health or built it before project implementation began;*
- *Institutionalizing managing the health risks of climate variability and change is one basis for resilient health systems;*
- *Multi-sectoral collaboration was key to success; and*
- *Adaptation projects can facilitate mitigation.*

APPLICATIONS TO LEAST DEVELOPED COUNTRY FUND FOR HEALTH ADAPTATION PROJECTS

Working with WHO Regional Offices in the South East Asia and the Western Pacific, applications were developed for the Least Developed Country Fund for health adaptation projects. The Project Identification Form was approved for a six-country project covering Bangladesh, Cambodia, Lao PDR, Myanmar, Nepal, and Timor Leste. Full proposals are under development that will cover strengthening institutional capacities to effectively integrate climate risks and adaptation options in health sector planning and implementation; enable effective decision-making for health interventions through generation of information and improved surveillance and/or early warning systems; enhance climate resilience in health service delivery; and promote regional cooperation and knowledge exchange for scale-up and replication of interventions, and for effectively integrating H-NAPs into ongoing NAP processes.

Approval is pending for the four LDCs in the Pacific (Kiribati, Solomon Islands, Tuvalu, and Vanuatu).

TRAINING MATERIALS ON THE HEALTH RISKS OF CLIMATE VARIABILITY AND CHANGE

Working with the WHO Regional Offices in the South East Asia and the Western Pacific, and with other technical experts, training materials were created on the health risks of climate variability and change.

CREATION AND USE OF PROCESS-BASED MODELS TO ASSESS THE RISK OF MOSQUITO-BORNE DISEASES

The Dynamic Mosquito Simulation Model (DyMSiM) is a coupled entomological-epidemiological model that simulates mosquito population dynamics, pathogen incubation and transmission dynamics, and human infection status using meteorological data as a driver. In collaboration with partners at the National Aeronautics and Space Administration (NASA) we are using this model to develop a forecast system for *Aedes aegypti* transmitted pathogens in Caribbean countries using real-time weather forecasts. The goal is to produce weekly predictions of disease caseloads so that vector-control and public health agencies can better implement transmission intervention strategies.

DyMSiM has also been used with partners at NASA, the National Center for Atmospheric Research (NCAR), and other Universities to estimate the seasonal risk of Zika virus transmission in the southern United States. Using historic climate data for 50 major cities in the southern US to drive the model, simulations of *Ae. aegypti* populations in conjunction with travel data helped identify the seasonal and spatial variation in Zika virus transmission risk.

DEVELOPING RESILIENCE TO EXTREME HEAT IN INDIA

Since 2011, an international coalition including the Ahmedabad Municipal Corporation (AMC), the Indian Institute of Public Health-Ghandinagar (IIPH-G), the Natural Resources Defense Council (NRDC), and the University of Washington (UW) has been working to strengthen resilience to extreme heat in Ahmedabad, the largest city in Gujarat state in India. The work was spawned by a severe heat wave in Ahmedabad in 2010 that was associated with a dramatic rise in all-cause mortality. At the same time, the leaders of Gujarat state had articulated concern about climate change and were interested in positioning the state at the forefront of mitigation and adaptation activities for South Asia.

In this context, the coalition worked on needs assessment and capacity building in the public health and health care delivery sectors, research into epidemiology of heat illness in the region, and developing an extreme heat early warning system and municipal heat action plan. The work was funded by the Climate Knowledge Development Network (CDKN) and the United States National Institutes of Health. The coalition held a series of workshops as well as focus groups and a study of vulnerability factors in slum communities. This work led to publication of a series of information briefs highlighting important components of adaptation to extreme heat in Ahmedabad and to scholarly work on vulnerability to extreme heat among slum dwellers.

Building on this local knowledge and momentum and incorporating best practices from heat early warning systems in other regions, the coalition developed and implemented South Asia's

first heat early warning system in Ahmedabad. The system was piloted in 2013 and fully implemented in 2014. During the period in which the heat early warning system and action plan have been in place, all-cause mortality during extreme heat events has dropped significantly. A broad coalition including municipal leaders, public health and medical experts, and community groups, were essential to the project's success. Other cities in India have taken notice of the programming and its impacts, and the coalition is now supporting other cities including Nagpur and Bhubaneswar. The coalition has also served as a resource to the Indian National Disaster Management Authority (NDMA) and the Indian Meteorological Department (IMD) to advance heat resilience efforts nationally.

ANNEX 1: SELECTED REFERENCES FROM 2006 TO PRESENT RELEVANT TO MANAGING THE HEALTH RISKS OF CLIMATE VARIABILITY AND CHANGE

KRISTIE L. EBI

Ebi KL, Ziska LH, Yohe GW (2016) The shape of impacts to come: lessons and opportunities for adaptation from uneven increase in global and regional temperatures. *Climatic Change* (in press)

Ebi KL, Fawcett SB, Spiegel J, Tovalin H (2016) Carbon pollution increases health inequalities: lessons in resilience from the most vulnerable. *Rev Panam Publica* (in press)

Astrom DO, Tornevi A, Ebi KL, Rocklov J, Forsberg B (2016) Evolution of minimum mortality temperature in Stockholm, Sweden, 1901-2009. *Environ Health Perspect* 124:740-744

Liu-Helmersson J, Quam M, Wilder-Smith A, Stenlund H, Ebi K, Massad E, Rocklov J (2016) Climate change and Aedes vectors: 21st century projection for dengue transmission in Europe. *EBioMedicine* 7:267-277

Ebi KL, Nealon J (2016) Dengue in a changing climate. *Environ Res* 151:115-123.

O'Neill BC, Kriegler E, Ebi KL, Kemp-Benedict E, Riahi K, Rothman D, van Ruijven B, van Vuuren DP, Birkmann J, Kok K, Levy M, Solecki W (2016) The roads ahead: narratives for shared socioeconomic pathways describing world futures in the 21st century. *Global Environmental Change* doi:10.1016/j.gloenvcha.2015.01.004

Guentchev GS, Rood RB, Ammann CM, Barsugli JJ, Ebi K, et al. (2016) Evaluating the Appropriateness of Downscaled Climate Information for Projecting Risks of Salmonella. *Int J Environ Res Public Health* 13(3). doi:10.3390/ijerph13030267

Ebi K, Bowen KJ (2016) Extreme events as sources of health vulnerability: Drought as an example. *Weather and Climate Extremes* 11:95–102. doi:10.1016/j.wace.2015.10.001

Ebi K, Hess JJ, Isaksen TB (2016) Using Uncertain Climate and Development Information in Health Adaptation Planning. *Current Environmental Health Reports* 1-7. doi:10.1007/s40572-016-0077-0

Hay JE, Easterling D, Ebi K, Kitoh A, Parry M (2016a) Conclusion to the special issue: Observed and projected changes in weather and climate extremes. *Weather and Climate Extremes* 11:103–105. doi:10.1016/j.wace.2015.11.002

Hay JE, Easterling D, Ebi K, Kitoh A, Parry M (2016b) Introduction to the special issue: Observed and projected changes in weather and climate extremes. *Weather and Climate Extremes* 11:1–3. doi:10.1016/j.wace.2015.08.006

Kanhai LDK, Singh D, Lauckner B, Ebi K, Chadee DD (2016) Knowledge, attitude and practices of coastal communities in Trinidad and Tobago about Tsunamis. *Natural Hazards* 81(2):1349-1372. doi:10.1007/s11069-015-2138-3

McIver L, Kim R, Woodward A, Hales S, Spickett J, Katscherian D, . . . Ebi KL (2015) Health Impacts of Climate Change in Pacific Island Countries: A Regional Assessment of Vulnerabilities and Adaptation Priorities. *Environ Health Perspect*. doi:10.1289/ehp.1509756

- Ebi KL (2015) Greater understanding is needed of whether warmer and shorter winters associated with climate change could reduce winter mortality. *Environ Res Let* doi:10.1088/1748-9326/10/11/111002
- Ebi KL, Prats EV (2015) Health in National Climate Change Adaptation Planning. *Annals Global Health* 81(3):418-426. doi:10.1016/j.aogh.2015.07.001
- Huang Z, Lin Hm Liu Y, ... Ebi KL, Tong S, Ma W, Wang L (2015) Individual-level and community-level effect modifiers of the temperature–mortality relationship in 66 Chinese communities. *BMJ Open* doi:10.1136/bmjopen-2015-009172
- Petkova EP, Ebi KL, Culp D, Redlener I (2015) Climate change and health on the U.S. Gulf Coast: public health adaptation is needed to address future risks. *Int J Environ Res Public Health* 12:9342–56. doi:10.3390/ijerph120809342
- Zhu C, Zeng Q, McMichael AJ, Ebi KL, Ni K, Khan AS, et al. (2015) Historical and experimental evidence for enhanced concentration of artemisinin, a global anti-malarial treatment, with recent and projected increases in atmospheric carbon dioxide. *Climatic Change* 132:295–306. doi:10.1007/s10584-015-1421-3
- Kim Y, Kim H, Honda Y, Guo YL, Chen BY, Woo JM, Ebi KL (2015) Suicide and Ambient Temperature in East Asian Countries: A Time-Stratified Case-Crossover Analysis. *Environ Health Perspect* 124:75–80. doi:10.1289/ehp.1409392
- Bowen K, Ebi, KL. (2015) Governing the Health Risks of Climate Change: Towards Multi-Sector Responses. *Current Opinion in Environmental Sustainability* 12:80–85. doi:10.1016/j.cosust.2014.12.001
- Paterson J, Berry P, Ebi, KL, Varangu L (2014) Health Care Facilities Resilient to Climate Change Impacts. *Int J Environ Res Public Health* 11:13097-13116. doi:10.3390/ijerph111213097
- Astrom C, Ebi KL, Langner J, Forsberg B (2014) Developing a heatwave early warning system for Sweden: evaluating sensitivity of different modelling approaches to forecast temperature. *Int J Environ Res Public Health* 12:254-267. doi:10.3390/ijerph120100254
- Holmner A, Ebi KL, Lazuardi L, Nilsson M (2014) Carbon footprint of telemedicine solutions: unexplored opportunity for reducing carbon emissions in the health sector. *PLOS One* 9(9): e105040. doi:10.1371/journal.pone.0105040
- Balbus JM, Greenblatt JB, Chari R, Millstein D, Ebi KL (2014) A wedge-based approach to estimating health co-benefits of climate change mitigation activities in the United States. *Climatic Change* 127:199-210. doi:10.1007/s10584-014-1262-5
- Rocklov J, Forsberg B, Ebi KL, Bellander T (2014) Susceptibility to mortality related to temperature and heat and cold wave duration in the population of Stockholm County, Sweden. *Global Health Action* 7: 22737. <http://dx.doi.org/10.3402/gha.v7.22737>
- Ebi KL (2014) Health in the new scenarios for climate change research. *Int J Environ Res Public Health* 11:30-46. doi:10.3390/ijerph110100030
- Ebi KL, Rocklov J (2014) Climate change and health modelling: horses for courses. *Global Health Action* 7:24154; <http://dx.doi.org/10.3402/gha.v7.24154>

- White-Newsome JL, Ekwurzel B, Baer-Schultz M, Ebi KL, O'Neill MS, Anderson GB (2014) Survey of county-level heat preparedness and response to the 2011 summer heat in 30 US states. *Environ Health Perspect* 122:573-579. doi:10.1289/ehp.1306693
- Ebi KL, Kram T, van Vuuren DP, O'Neill BC, Kriegler E (2014) A new toolkit for developing scenarios for climate change research and policy analysis. *Environment: Science and Policy for Sustainable Development* 56:2, 6-16. doi:10.1080/00139157.2014.881692
- Remais JV, Hess JJ, Ebi KL, Markandya A, Balbus JM, Wilkinson P, Haines A, Chalabi Z (2014) Estimating the health effects of greenhouse gas mitigation strategies: addressing parametric, model, and valuation challenges. *Environ Health Perspectives* 122:447-455. <http://dx.doi.org/10.1289/ehp.1306744>
- Suk JE, Ebi KL, Vose D, Wint, W, Alexander N, Mintiens K, Semenza JC (2014) Indicators for tracking European vulnerabilities to the risks of infectious disease transmission due to climate change. *Int J Environ Res Public Health* 11:2218-2235
- Ebi KL, Hallegatte S, Kram T, Arnell NW, Carter TR, Edmonds J, Kriegler E, Mathur R, O'Neill BC, Kewyan R, Winkler H, van Vuuren DP, Zwicker T (2014) A new scenario framework for climate change research: background, process, and future directions. *Climatic Change* 122:363-372. doi: 10.1007/s10584-013-0912-3
- van Vuuren DP, Kriegler E, O'Neill BC, Ebi KL, Riahl K, Carter TR, Edmonds J, Hallegatte S, Kram T, Mathur R, Winkler H (2014) A new scenario framework for climate change research: scenario matrix architecture. *Climatic Change* 122:373-386. doi:10.1007/s10584-013-0906-1
- O'Neill BC, Kriegler E, Riahl K, Ebi K, Hallegatte S, Carter TR, Mathur R, van Vuuren DP (2014) A new scenario framework for climate change research: the concept of shared socio-economic pathways. *Climatic Change* 122:387-400. doi:10.1007/s10584-013-0905-2
- Kriegler E, Edmonds J, Hallegatte S, Ebi KL, Kram T, Riahl K, Winkler H, van Vuuren DP (2014) A new scenario framework for climate change research: the concept of shared policy assumptions. *Climatic Change* 122:401-414. doi:10.1007/s10584-013-0971-5
- van Ruijven BJ, Levy M, Agrawal A, Biermann F, Birkmann J, Carter TR, Ebi, KL, et al. (2014) Enhancing the relevance of new scenarios for climate change impacts, adaptation, and vulnerability research. *Climatic Change* 122:481-494. doi:10.1007/s10584-013-0931-0
- Wilbanks TJ, Ebi KL (2014) SSPs from an impact and adaptation perspective. *Climatic Change* 122:473-479. doi:10.1007/s10584-013-0903-4
- Moss RH, Meehl GA, Lemos MC, Smith JB, Arnold JR, Arnott JC, ... Ebi KL, et al. (2013) Hell and high water: practice-relevant adaptation science. *Science* 342:696-699
- Astrom D, Forsberg B, Ebi KL, Rocklov J (2013) Attributing mortality from extreme temperatures to climate change in Stockholm, Sweden. *Nature Climate Change* 3:1050-1054. doi:10.1038/nclimate2022
- Astrom C, Orru H, Rocklov J, Strandberg G, Ebi KL, Forsberg B (2013) Heat-related respiratory hospital admissions in Europe in a changing climate: a health impact assessment. *BMJ Open* 3:e001842. doi:10.1136/bmjopen-2012-001842

Lowe D, Ebi KL, Forsberg B (2013) Factors increasing vulnerability to health effects before, during and after floods. *Int J Environ Res Public Health* 10:7015-7067. doi:10.3390/ijerph10127015

Bowen KJ, Ebi KL, Friel S, McMichael AJ (2013) A multi-level governance framework for incorporating social science insights into adapting to the health impacts of climate change. *Glob Health Action* 6:21820. doi:10.3402/gha.v6i0.21820

Bounoua L, Kahime K, Houti L, Blakey T, Ebi KL, Zhang P, et al. (2013) Linking climate to incidence of zoonotic cutaneous Leishmaniasis (*L. major*) in Pre-Saharan North Africa. *Int J Environ Res Public Health* 10:3172-3191. doi:10.3390/ijerph10083172

Ebi KL (2013) Is climate change affecting human health? *Environ Res Lett* 8:031002

Stern PC, Ebi KL, Leichenko R, Olsen RS, Steinbruner JD, Lempert R (2013) Managing Risk with Climate Vulnerability Science. *Nature Climate Change* 3:607-607

Ebi KL, Yohe G (2013) Adaptation in first and second best worlds. *Current Opinion in Environmental Sustainability* 5:373-377. <http://dx.doi.org/10.1016/j.cosust.2013.06.004>

Ebi KL, Mills D (2013) Winter mortality in a warming climate: a re-assessment. *WIREs Climate Change* doi: 10.1002/wcc.211

Ebi KL, Lindgren E, Suk JE, Semenza JC (2013) Adaptation to the infectious disease impacts of climate change. *Climatic Change* 118:355-365. doi 10.1007/s10584-012-0648-5

Sauerborn R, Ebi KL (2012) Climate change and natural disasters – integrating science and practice to protect health. *Global Health Action* 5:19295. <http://dx.doi.org/10.3402/gha.v5i0.19295>

Rocklov J, Ebi KL (2012) High dose extrapolation in climate change projections of heat-related mortality. *JABES* doi:10.1007/s13253-012-0104-z

Orru H, Andersson C, Ebi KL, Langner J, Astrom C, Forsberg B (2012) Impact of climate change on ozone related mortality and morbidity in Europe. *Eur Respir J* 41: 285-294

Murray V, Ebi KL (2012) IPCC Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation (SREX). *J Epidemiol Community Health* 66:759-60. 10.1136/jech-2012-201045

Ebi KL (2012) Key themes in the Working Group II contribution to the Intergovernmental Panel on Climate Change 5th assessment report. *Climatic Change* 114:417-426. doi 10.1007/s10584-012-0442-4

Semenza JC, Suk JE, Estevez V, Ebi KL, Lindgren E (2012) Mapping climate change vulnerabilities to infectious diseases in Europe. *Environ Health Perspect* 120:385-92

Li B, Sain S, Mearns LO, Anderson HA, Kovats S, Ebi KL, Bekkedal MYV, Kanarek MS, Patz JA (2012) The impact of extreme heat on morbidity in Milwaukee, Wisconsin. *Climatic Change* 110:959-976

Ebi KL (2012) High temperatures and cause-specific mortality. *Occup Environ Med* 69:3-4

Bowen KJ, Friel S, Ebi K, Butler CD, Miller F, McMichael AJ (2012) Governing for a healthy population: towards an understanding of how decision-making will determine our global health in a changing climate. *Int J Environ Res Public Health* 9(1):55-72

Ebi KL (2011) Resilience to the health risks of extreme weather events in a changing climate in the United States. *Int J Environ Res Public Health* 8(11):4582-4594

Lowe D, Ebi KL, Forsberg B (2011) Heatwave early warning systems and adaptation advice to reduce human health consequences of heatwaves. *Int J Environ Res Public Health* 8:4623-4648

Ebi KL (2011) Differentiating theory from evidence in determining confidence in an assessment finding. *Climatic Change* 108:693-700

Mastrandrea MD, Mach KJ, Plattner G-K, Edenhofer O, Stocker T, Field C, Ebi KL, Matschoss P (2011) The IPCC AR5 guidance note on consistent treatment of uncertainties: a common approach across the working groups. *Climatic Change* 108:675-691

Ebi KL, Padgham J, Doumbia M, Kergna A, Smith J, Butt T, McCarl B (2011) Smallholders adaptation to climate change in Mali. *Climatic Change* 108:423-436

Ebi K (2011) Climate change and health risks: assessing and responding to them through 'adaptive management'. *Health Affairs (Millwood)* 30(5):924-30

Rocklov J, Ebi K, Forsberg B (2011) Mortality related to temperature and persistent extreme temperatures – a study of cause-specific and age stratified mortality. *Occupational Environmental Health* 68:531-6

Ebi KL, Lobell D, Field C (2010) Climate change impacts on food security and nutrition. *SCN News* 38: Climate Change: food and nutrition security implications.
http://www.unscn.org/files/Publications/SCN_News/SCN_NEWS_38_03_06_10.pdf

Ebi KL, Paulson JA (2010) Climate change and child health in the United States. *Current Problems in Pediatric and Adolescent Health Care* 40:2-18

English PB, Sinclair AH, Ross Z, Anderson H, Boothe V, Davis C, Ebi K, Kagey B, Malecki K, Shultz R, Simms E (2011) Environmental health indicators of climate change for the United States: findings from the State Environmental Health Indicators Collaborative. *Environ Health Perspect* 117:1673-81

Ebi KL (2009) Facilitating climate justice through community-based adaptation in the health sector. *Environ Justice* 2:191-95

Ebi KL (2009) Managing the changing health risks of climate change. *Current Opinion in Environmental Sustainability* doi:10.1016/j.cosust.2009.07.011

Ebi KL (2009) Climate change and human health 101. *Am Med Assoc J Ethics* 2009;11:443-447

Campbell-Lendrum D, Bertollini R, Neira M, Ebi K, McMichael A (2009) Health and climate change: a roadmap for applied research. *Lancet* 373:1663-5

Ebi KL, Balbus J, Kinney PL, Lipp E, Mills D, O'Neill MS, Wilson M (2009) U.S. funding is insufficient to address the human health impacts of and public health responses to climate variability and change. *Environ Health Perspect* 117:857-862

- Ebi KL (2009) Public health responses to the risks of climate variability and change in the United States. *J Occup Environ Med* 51:4-12
- O'Neill, MS, Ebi, KL (2009) Temperature extremes and health: Impacts of climate variability and change in the United States. *J Occup Environ Med* 51:26-32
- Schmier JK, Ebi KL (2009) The impact of climate change and aeroallergens on children's health. *Allergy Asthma Proc* 30:229 -237. doi:10.2500/aap.2009.30.3229
- Ebi KL, Semenza J (2008) Community-based adaptation to the health impacts of climate change. *Am J Prevent Med* 35:501-507
- Ebi KL (2008) Adaptation costs for climate change-related cases of diarrhoeal diseases, malnutrition, and malaria in 2030. *Globalization Health* 4:9. doi:10.1186/1744-8603-4-9
- Ebi KL, McGregor G (2008) Climate change, tropospheric ozone and particulate matter, and health impacts. *Environ Health Perspect* 116:1449-1455; doi:10.1289/ehp.11463
- Ebi KL, Burton I (2008) Identifying practical adaptation options: an approach to address climate change-related health risks. *Environ Sci Policy* 11:359-369; doi:10.1016/j.envsci.2008.02.001
- Maibach EW, Chadwick A, McBride D, Chuk M, Ebi KL, Balbus J (2008) Climate change and local public health in the United States: preparedness, programs and perceptions of local public health department directors. *PLOS One*
<http://www.plosone.org/article/info:doi/10.1371/journal.pone.0002838>
- Ebi KL (2008) Healthy people 2100: modeling population health impacts of climate change. *Climatic Change* 88:5-19; doi: 10.1007/s10584-006-9233
- Pitcher H, Ebi KL, Brenkert A (2008) Population health model for integrated assessment models. *Climatic Change* 2008;88:35-57; doi: 10.1007/s10584-007-9286-8
- Maibach EW, Chadwick A, McBride D, Chuk M, Ebi KL, Balbus J (2008) Climate change and local public health in the United States: preparedness, programs and perceptions of local public health department directors. *PLoS One* 3:e2838
- Ebi KL, Helmer M, Vainio J (2008) The health impacts of climate change: getting started on a new theme. *Prehospital Disaster Med* 23:s60-4
- Ebi KL, Paulson JA (2007) Climate change and children. *Pediatr Clin North Am* 54:213-226
- Tol RSJ, Ebi KL, Yohe GW (2007) Infectious disease, development, and climate change: a scenario analysis. *Environ Develop Economics* 12:687-706
- Ebi KL, Woodruff R, von Hildebrand A, Corvalan C (2007) Climate change-related health impacts in the Hindu Kush-Himalayas. *Ecohealth* 4:264-270
- Kovats RS, Ebi KL (2006) Heatwaves and public health in Europe. *Eur J Public Health*
doi:10.1093/eurpub/ck1049
- Ebi KL, Mills DM, Grambsch A (2006) Climate change and health impacts in the United States: an update on the results of the US National Assessment. *Environ Health Perspect* 114:1318-1324. doi:10.1289/ehp.8880

Ebi KL, Kovats RS, Menne B (2006) An approach for assessing human health vulnerability and public health interventions to adapt to climate change. *Environ Health Perspect* 114:1930-1934. doi:10.1289/ehp.8430

Ebi KL, Lewis ND, Corvalan C (2006) Climate variability and change and their potential health effects in small island states: information for adaptation planning in the health sector. *Environ Health Perspect* 114:1957-1963. doi:10.1289/ehp.8429

Ebi KL, Smith J, Burton I, Scheraga J (2006) Some lessons learned from public health on the process of adaptation. *Mitigat Adapt Strat Global Change* 11:607-620. doi:10/1007/s11027-006-3257-7

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Hess JJ, Ebi KL. Iterative management of heat early warning systems in a changing climate. *Annals of the New York Academy of Sciences*. In press 2016.

Fard J, Roper K, Hess JJ. Simulation of Home-Hospital Impacts on Crowding - FM Implications. *Facilities*. In press 2016.

Winqvist A, Grundstein A, Chang HH, Hess J, Ebel S. Warm Season Temperatures and Emergency Department Visits in Atlanta, Georgia. *Env Res*, 2016, 147: 314-323.

Ebi KL, Hess JJ, Busch Isaksen T. Using Uncertain Climate and Development Information in Health Adaptation Planning. *Curr Env Health Rep*. 2015. 10.1007/s40572-016-0077-0.

Vins H, Bell J, Saha S, Hess J. The Mental Health Outcomes of Drought: A Systematic Review and Causal Process Diagram. *International Journal of Environmental and Public Health*. 12(10):13251-13275; doi:10.3390/ijerph121013251.

Hess JJ, Wallenstein J, Ackerman JD, Akhter M, Ander D, Keadey MT, Capes JP. Scribe Impacts on Provider Experience, Operations, and Teaching in an Academic Emergency Medicine Practice. *Western Journal of Emergency Medicine*, doi: 10.5811/westjem.2015.6.25432.

Hodges M, Belle J, Carlton E, Liang S, Li H, Luo W, Freeman M, Liu Y, Gao Y, Hess J, Remais J. Delays reducing waterborne and water-related infectious diseases in China under climate change. *Nature Climate Change*. In press; doi:10.1038/nclimate2428.

Hess JJ, Eidson M, Tlumak JE, Raab KK, Lubber G. An Evidence-Based Public Health Approach to Climate Change Adaptation. *Environmental Health Perspectives*. November 2014; 122: 1177-1186; <http://dx.doi.org/10.1289/ehp.1307396>.

Marinucci G, Lubber G, Uejio CK, Saha S, Hess JJ. Building Resilience Against Climate Effects – A Novel Framework to Facilitate Climate Readiness in Public Health Agencies. *Int. J. Environ. Res. Public Health*. 2014; 11(6): 6433-6458; doi:10.3390/ijerph110606433. . Available at <http://www.mdpi.com/1660-4601/11/6/6433>.

Hess JJ, Saha S, Lubber G. Summertime Heat Illness in US Emergency Departments from 2006 through 2010: Analysis of a Nationally Representative Sample. *Environmental Health Perspectives*. 122:1209-1215. <http://dx.doi.org/10.1289/ehp.1306796>.

Knowlton K, Kulkarni SP, Azhar GS, Mavalankar D, Jaiswal A, Connolly M, Nori-Sarma A, Rajiva A, Dutta P, Deol B, Sanchez L, Khosla R, Webster PJ, Toma VE, Sheffield P, Hess JJ, writing for the Ahmedabad Heat and Climate Study Group. Development and Implementation of South Asia's First Heat-Health Action Plan in Ahmedabad, Gujarat, India. *International Journal of Environmental Research and Public Health*. 2014; 11(4): 3473-3492.

doi:[10.3390/ijerph110403473](https://doi.org/10.3390/ijerph110403473).

Azhar GS, Mavalankar D, Nori-Sarma A, Rajiva A, Dutta P, Sheffield P, Knowlton K, Hess JJ, for the Ahmedabad Heat and Climate Study Group. Heat-related mortality in India: Excess all-cause mortality associated with the 2010 Ahmedabad heat wave. *PLoS ONE -Public Library of Science ONE*. 2014; 9(3): e91831. doi:[10.1371/journal.pone.0091831](https://doi.org/10.1371/journal.pone.0091831).

Gingold DB, Strickland MJ, Hess JJ. Ciguatera fish poisoning and climate change: analysis of national poison center data in the United States 2001-2011. *Environmental Health Perspectives*. June 2014; 122: 580-586. <http://dx.doi.org/10.1289/ehp.1307196>.

Remais JV, Hess JJ, Ebi K, Markandya A, Balbus J, Wilkinson P, Haines A, Chalabi Z. Methodological issues in estimating the public health effects of greenhouse-gas emission reduction strategies: addressing parametric, model, and valuation challenges. *Environmental Health Perspectives*. 2014; 122(5): 447-455. doi:[10.1289/ehp.1306744](https://doi.org/10.1289/ehp.1306744).

Hess JJ, Schramm PJ, Lubert G. Public Health and Climate Change Adaptation at the Federal Level: One Agency's Response to Executive Order 13514. *American Journal of Public Health*. 2014; 104(3): e22-e30. doi: [10.2105/AJPH.2013.301796](https://doi.org/10.2105/AJPH.2013.301796).

Atallah H, Weerasuriya D, Hess J, Houry D, Wu D, Haley L. Time to antibiotics and hospital length of stay in emergency department patients admitted for pneumonia: a retrospective, cross-sectional analysis. *Universal Journal of Clinical Medicine*. In press.

Tran KV, Azhar GS, Nair R, Knowlton K, Jaiswal A, Sheffield P, Mavalankar D, Hess J. A Cross-Sectional, Randomized Cluster Sample Survey of Household Vulnerability to Extreme Heat among Slum Dwellers in Ahmedabad, India. *International Journal of Environmental Research and Public Health*. 2013; 10(6): 2515-2543; doi:[10.3390/ijerph10062515](https://doi.org/10.3390/ijerph10062515).

Winqvist A, Klein M, Tolbert P, Flanders D, Hess J, Sarnat S. Comparison of emergency department and hospital admissions data for air pollution time series. *Environmental Health*. 2012; 11: 70-83. doi [1186/1476-069X-11-70](https://doi.org/10.1186/1476-069X-11-70).

Darrow L, Hess J, Rogers C, Tolbert P, Klein M, Sarnat S. Ambient pollen concentrations and emergency department visits for asthma and wheeze. *Journal of Allergy and Clinical Immunology*. 2012; 130(3): 630-638.

Gamble J, Hess JJ. Temperature and Violent Crime in Dallas, Texas: Observed Relationships and Possible Implications of Climate Change. *Western Journal of Emergency Medicine*. 2012; 13(3): 239-46.

Hess JJ, McDowell JZ, Lubert G. Integrating Climate Change Adaptation into Public Health Practice: Using Adaptive Management to Increase Adaptive Capacity and Build Resilience. *Environmental Health Perspectives*. 2012, 120(2): 171-179. doi: [10.1289/ehp.1103515](https://doi.org/10.1289/ehp.1103515): 2011.

McDowell JZ, Hess JJ. Accessing Adaptation: Multiple Stressors on Livelihoods in the Bolivian Highlands under a Changing Climate. *Global Environmental Change*. 2012; 22(2): 342-352. <http://dx.doi.org/10.1016/j.gloenvcha.2011.11.002>.

Embrey S, Remais JV, Hess JJ. Climate Change and Ecosystem Disruption: The Health Impacts of the North American Rocky Mountain Pine Beetle Infestation. *American Journal of Public Health*. 2011; 102(5): 818-827. doi: 10.2105/AJPH.2011.300520.

Frumkin H, Hess JJ, Parker C, Schwartz. Peak Petroleum: Fuel for Public Health Debate. *American Journal of Public Health*. 2011; 101: 1542. doi: 10.2105/AJPH.2011.300322.

Hess JJ, Bednarz D, Bae, JY, Pierce J. Petroleum and Health Care: Evaluating and Managing Health Care's Vulnerability to Petroleum Supply Shifts. *American Journal of Public Health*. 2011; 101: 1568-1579. doi: 10.2105/AJPH.2011.300233.

Hess JJ, Greenberg LA. Liquid Fuel Use in a Large, Dynamically-Deployed, Hospital-Based Emergency Medical Services System. *Prehospital and Disaster Medicine*. 2011; 26(5): 394-398. doi:10.1017/S1049023X11006595. http://journals.cambridge.org/repo_A843TVIN

Schwartz B, Parker C, Hess JJ, Frumkin H. Public Health and Medicine in an Age of Energy Scarcity: The Case of Petroleum. *American Journal of Public Health*. 2011; 101: 1560-1567. doi: 10.2105/AJPH.2010.205187.

Bush KF, Lubber G, Kotha SR, Dhaliwal RS, Kapil V, Pascual M, Brown DG, Frumkin H, Dhiman RC, Hess J, Wilson ML, Balakrishnan K, Eisenberg J, Kaur T, Rood R, Batterman S, Joseph A, Gronlund CJ, Agrawal A, Hu H. Impacts of Climate Change on Public Health in India: Future Research Directions. *Environmental Health Perspectives*. 2011; 119(6): 765-770. doi:10.1289/ehp.1003000: 2011.

Stone B, Hess J, Frumkin H. Urban Form and Extreme Heat Events: Are Sprawling Cities more Vulnerable to Climate Change than Compact Cities? *Environmental Health Perspectives*. 2010; 118: 1425-1428, doi: 10.1289/ehp.0901879: 2010.

Portier CJ, Thigpen-Tart K, Hess J, Lubber G, Maslak T, Radtke M, Strickman D, Trtanj JM, Carter SR, Dilworth CH, Grambsch A, Howard SN, Lutz JT, Rosenthal JP, Rowles T, Sandifer P, Scheraga J, Whung PY. A Human Health Perspective on Climate Change. *Environmental Health Perspectives*. 2010. doi:10.1289/ehp.1002272

Hess JJ, Heilpern KL, Davis TE, Frumkin H. Climate Change and Emergency Medicine: Impacts and Opportunities. *Academic Emergency Medicine*. 2009; 16: 782-94.

Frumkin H, Hess J, Vindigni S. Energy and public health: the challenge of peak petroleum. *Public Health Reports*. 2009; 124: 5-19.

Frumkin H, McMichael A, Hess JJ. Climate change and the health of the public. *American Journal of Preventive Medicine*. 2008; 35(5): 401-2.

Hess JJ, Malilay J, Parkinson A. Climate change: the importance of place, and places at special risk. *American Journal of Preventive Medicine*. 2008; 35(5) 468-78.

St. Louis M, Hess JJ. Climate Change and Global Health. *American Journal of Preventive Medicine*. 2008; 35(5): 527-38.

Frumkin H, Hess J, Luber G, Malilay J, McGeehin M. The public health response to climate change. *American Journal of Public Health*. 2008; 98: 435-445.

Frumkin H, Hess J, Vindigni S. Peak petroleum and public health. *JAMA Journal of the American Medical Association*. 2007; 298: 1688-1690.

Luber G, Hess J. Climate change and human health in the United States. *Journal of Environmental Health*. 2007; 70(5): 43-46.