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# Climate & Health News

Newsletter of the JHU-UPF Public Policy Center Climate Change Working Group



JOHNS HOPKINS  
UNIVERSITY

**PUBLIC POLICY CENTER**



upf. Universitat  
Pompeu Fabra  
Barcelona

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**1ST Edition**

Welcome to the first edition of the September *Climate and Health News*. Leading the news over the last few days, the US has faced among its toughest climate challenges, with raging [wildfires in the West](#) (our Managing Editor, Eileen McRae, is currently in the Pacific Northwest and was forced to stay indoors for several days due to "hazardous air quality" from the region's fires), and Houston was hit by unprecedented flooding (see special section on Hurricane Harvey [which has caused 63 deaths](#), including [health lessons from Katrina](#)), and major hurricanes threatening the southeast. This follows extreme [flooding disasters in India, Nepal and Bangladesh](#) earlier last month that have killed 1,200 and left millions homeless.

While newly-published climate health research last month continued to focus on extreme heat, research on impacts of storms and precipitation is increasing; see a new review of [extreme storm water-related impacts](#) on health (finding inadequate attention to modifiable preventive factors); [longer term impacts of Hurricane Sandy](#) on mental health; and the [increase of vulnerable elderly in storm-prone Southeast China](#). Also in this edition, see approaches for early warning of [leishmaniasis](#) in Tunisia and for [foot-and-mouth disease](#) in Viet Nam.

We'll be back later in the month with the second September edition. Comments, suggestions and feedback welcome!

## NEWS

### **EXTREME HEAT, DROUGHT & WILDFIRES**

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#### [Wildfires burn out of control in US Pacific Northwest](#)

The growing blaze east of Portland, Oregon in the scenic Columbia River Gorge, was one of dozens of wildfires in western US states that sent smoke into cities from Seattle to Denver — prompting health warnings. People in



Photo Left: Wildfire as seen from near Stevenson Wash., across the Columbia River, burning in the Columbia River Gorge above Cascade Locks, Ore., Sept. 4, 2017. (Photo: Tristan Fortsch/KATU-TV via AP)

Photo Right: Jason Wheeler looks out across the Columbia River from the north side of Bridge of the Gods at the smoky community of Cascade Locks, Ore. Sept. 5, 2017 after being evacuated from his home yesterday. (Photo: Chris Pietsch/The Register-Guard via AP)

### [Los Angeles fire spread halted, work to contain it continues](#)

Fire officials said progression of the largest wildfire in Los Angeles' history has been halted. The La Tuna Fire, named after the canyon area where it erupted on Friday, forced the evacuation of more than 700 homes, as steady winds helped it tear through thick brush that has not burned in decades and temperatures hovered around 100 degrees Fahrenheit (38 degrees Celsius). – *Reuters*

### [How climate is linked to a sudden spike in American road fatalities](#)

A recently-published study found a 7% spike in road deaths in 2015, and more than half of the variation in deaths was explained by temperature, which reached record highs comparing 2015 to 2014. In warmer weather people tend to take more trips. The most vulnerable road users, including cyclists and pedestrians, were most affected. – *International Business Times*

## **EXTREME PRECIPITATION, STORMS & FLOODING**

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### **Hurricane Harvey**

#### [Death toll bumps up to at least 63 amid Hurricane Harvey recovery](#)

Among the 63 confirmed Hurricane Harvey fatalities, 30 were in Harris County, home to Houston. Many deaths were due to drowning on roads due to fast-rising waters. However, indirect causes of death including complications due to power outages. Rain totaled 54 inches (1.3 meters) in some areas. The cost of recovery could be as much as \$180 billion. – *CBS News*



Simonton, Texas. Satellite images show Simonton, Texas, before Hurricane Harvey (left) and after (right). The "after" image was taken on Aug. 30, 2017 by DigitalGlobe's WorldView-2 satellite. CREDIT: Satellite images ©2017 DigitalGlobe

### [Hurricane Harvey and Trump's cuts to weather research](#)

The National Weather Service (NWS) budget would be cut under Trump's proposed budget. The NWS provides weather forecasts and warnings, and makes data available to companies for weather alerts. The US is already lagging behind Europe in its weather forecasting accuracy, and further cuts would worsen the situation, affect both military and civilian ability to account for storms. — *Newsweek*

### [Black, white, rich, poor: Harvey didn't discriminate](#)

It raged through neighborhoods rich and poor, black and white, upscale and working class. Across Houston and surrounding communities, no group sidestepped its paralyzing deluges and apocalyptic floods. The poor tend to suffer most in disasters. After Hurricane Katrina in 2005, which claimed 1,800 lives, the world was left with nightmarish images of residents of New Orleans' impoverished Lower Ninth Ward, screaming for help from their rooftops, a prime example of urban inequality and environmental injustice. There is every expectation that Houston's poor and working class, lacking the resources of the affluent, will struggle most to rebuild. But as the waters recede, Houston residents of all colors and socio-economic statuses find themselves united in their loss, their despair — and their resilience. -- *Associated Press*

### [Harvey raises red flags on infrastructure, climate planning](#)

Houston is America's poster child of sprawl — with development policies that give little regard to the need for drainage systems. The city is criss-crossed by a complex network of bayous that are easily overwhelmed by heavy rain, made worse by sudden inflows of water from impervious surfaces like concrete. Katharine Hayhoe, a climate scientist at Texas Tech University, said Houston is a "perfect storm" of flood risk due to population growth, crumbling infrastructure, and development based on the "obsolete assumption" that we have a stable climate. — *Mashable*



Joe Garcia, right, rescued from his flooded home as floodwaters from Tropical Storm Harvey rise, Aug. 28, 2017. IMAGE: AP/REX/SHUTTERSTOCK

### [Is Harvey also a threat to the air we breathe?](#)

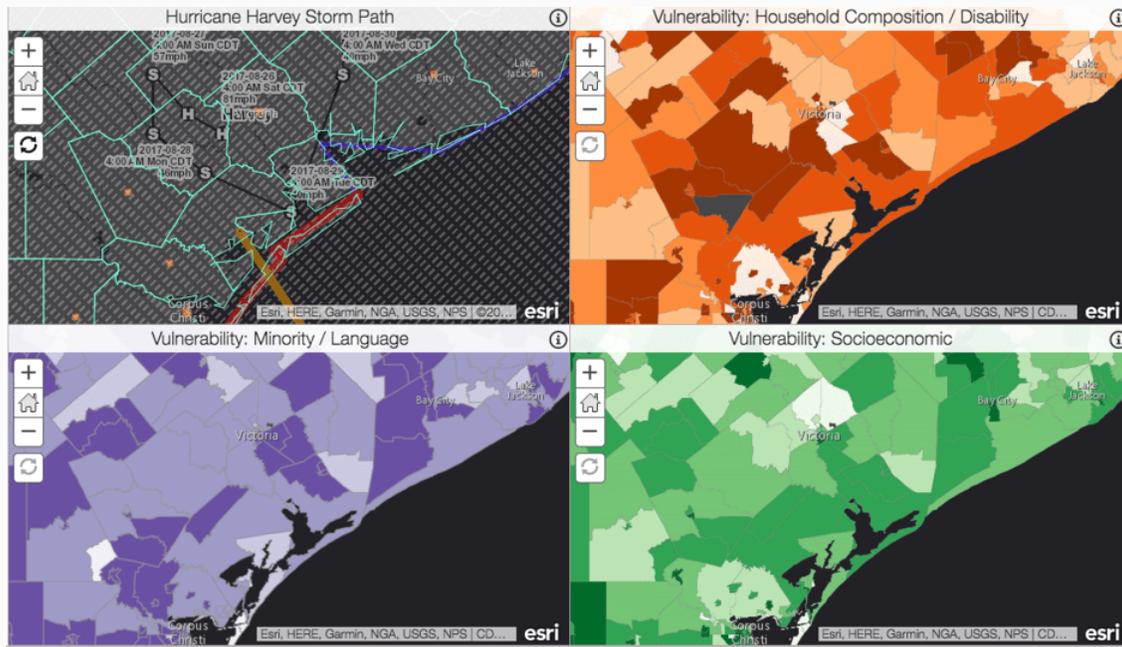
Houston's refineries, facing the reality of Harvey and catastrophic flooding, abruptly started shutting down operations before the storm. While these shutdowns may be necessary, they can produce significant amounts of air pollution as the systems belch out all kinds of emissions during the shutdown process. "Harvey is also a threat to the air we breathe," Bakeyah Nelson, executive director of Air Alliance Houston, stated in a release. "When petrochemical plants prepare for storms, they release thousands of pounds of pollutants into the air..." — *Houston Press*



Buffalo Bayou sloshing over its banks. Photo courtesy of Stephanie Thomas

### [Solutions: The vulnerable communities in Harvey's path, mapped](#)

Humanitarian aid organization Direct Relief has created interactive maps that show exactly where these communities are. The mapmakers have used the Centers for Disease Control and Prevention (CDC) social



(Andrew Schroeder/Direct Relief)

### **[Solutions: What Houston must do to prevent future flooding disasters](#)**

An editorial suggests there four common-sense things Houston officials should do to prevent future flooding with extreme storms: Preserve and restore as much surrounding prairie land as possible; restrict development in floodplains and buy flood-prone homes; plan for climate change (more frequent and intense rain storms); and educate the public the hard truths about vulnerability to flooding. – *Texas Tribune*



Evacuees from Meyerland — a neighborhood in southwest Houston hit hard by Harvey — arrive at the George R. Brown Convention

## [Houston, we have a problem: Lessons for health from the aftermath of Katrina](#)

While drowning was the most common cause of death during Hurricane Katrina (40 percent of fatalities), open wounds, cuts, and abrasions exposed many to marine pathogens and infections; 22 people who had waded through floodwaters were diagnosed with *Vibrio vulnificus* infections, 5 of whom died of septicemia. Power outages, with exposure to high temperatures, resulted in heat exhaustion and stroke. Rashes, acute respiratory illnesses, and toxic exposures increased. Mold-exacerbated asthma was the most common emergency room condition... -- *Daily Climate*

## OTHER EXTREME PRECIPITATION

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### [Floods in India and Bangladesh and Nepal kill 1,200 and leave millions homeless](#)

At least 1,200 people have been killed and millions have been left homeless following devastating floods that have hit India, Bangladesh and Nepal, in one of the worst flooding disasters to have affected the region in years. South Asia suffers from frequent flooding during the monsoon season, which lasts from June to September, but authorities have said this year's floods have been much worse, affecting an estimated 17 million people in India alone, with thousands sheltered in relief camps. – *Independent*



Children row a boat as they pass through damaged houses at a flood-affected village in Morigaon district in the northeastern state of Assam, India. (REUTERS/Anuwar Hazarika)

### [Photoessay: Floods and devastation in India, Nepal and Bangladesh.](#)

Hundreds have been killed by collapsed buildings or drowning, and millions displaced in landslides, flooding due to incessant rain. – *The Guardian*



Flood affected villagers have to move to find safer places in Araria district, Bihar, India. Heavy monsoon rains have unleashed landslides and floods that have killed scores of people in recent days and displaced millions more across northern India, southern Nepal and Bangladesh. Photograph: Aftab Alam Siddiqui/AP

### [Solutions: Miami taxpayers asked to foot the bill to protect the city from climate change.](#)

Miami is among the U.S. cities most vulnerable to rising seas due to climate change, and city officials estimate that they may have to spend at least \$900 million in the coming decades to upgrade the city's flood prevention and drainage systems to keep the Atlantic Ocean at bay. The city will ask voters to approve a \$400 million general obligation bond—new property taxes that will start chipping away at the cost of shoring up the city against the ravages of climate change. The bond will pay for water pumping stations and drainage and sewer system upgrades, among other improvements. — *CNN*

### [Solutions: Boston hurricane barrier eyed; cost estimate \\$10 billion](#)

A team at the University of Massachusetts Boston's Sustainable Solutions Lab is studying a hurricane barrier to wall off Boston Harbor from storm surges, similar to systems in Rotterdam in the Netherlands and one under development in Venice. By 2050, modeling indicates a likely sea level rise of 7.5 to 18 inches in Boston, with as much as 30 inches considered possible. The Boston Green Ribbon Commission predicts a 100-year storm could flood 2,000 buildings and impact 18,000 people by 2030, threatening property valued at \$20 billion. — *Boston Herald*

## **INFECTIOUS DISEASE**

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### [America is on the verge of ratpocalypse](#)

Warmer weather is fueling a rodent surge, straining public health systems and the economy. Major cities including New York, Houston, Boston, Philadelphia, Washington DC and San Francisco are seeing spikes in rat populations. Extreme summer heat and mild winter temperatures are playing a role. Rats carry E coli, salmonella, and hantavirus, and leptospirosis. -- *New Republic*



Hulton Archive/Getty Images

### [These infections are likely to get worse as the climate changes](#)

A research team analyzed 101 pathogens important to humans and animals and Europe and categorized them by how sensitive they are to a set of climate drivers. Pathogens included bacteria, fungi, helminths, protozoa, and viruses. More than 90% of pathogens were sensitive to between one and five climate drivers. *Vibrio cholera*, helminths, *Bacillus anthracis* (anthrax) and *Borrelia burgdorferi* (Lyme disease) showed the highest sensitivity to climate drivers. – *Invisiverse*

## CO-BENEFITS

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### [Renewable energy isn't just cutting costs, it's saving lives](#)

A recent study analyzes the impact of solar and wind energy in the U.S, showing how these renewables have saved both lives and money during a nine-year period (from 2007 to 2015). By reducing greenhouse gas emissions, increased dependence in solar and wind energy sources have improved air quality in the U.S., at a rate that varies by region. “We find cumulative wind and solar air-quality benefits of ... US\$29.7–112.8 billion, mostly from 3,000 to 12,700 avoided premature mortalities,” due to air pollution the researchers. – *Futurism*

## POLITICS AND POLICY

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### [A tragic but auspicious moment for climate action in the US](#)

Congress is back at work on a formidable agenda of pressing issues. But with the West on fire, the Gulf Coast under water and Floridians bracing for one of the most powerful hurricanes on record, there is one issue in particular that House and Senate leaders should add to their immediate-action list. Starting with the Climate Solutions Caucus in the House – a group of more than 50 Republicans and Democrats formed to “address the impacts, causes and challenges of our changing climate” – *Huffington Post*

NIH deletes references to climate change on government website  
The term "climate change" was changed to simply "climate" on the website of the National Institute for Environmental Health Sciences (NIEHS) of the NIH, the world's leading national public health research body. – *The Guardian*



Photo from a Nasa study of the impact of ice melt as a result of climate change in parts of the Arctic's oldest and thickest sea ice. Photograph: UPI / Barcroft Images

### [Harvard study finds Exxon misled public about climate change](#)

An analysis of Exxon's research and public statements shows a sharp contrast between what the oil giant knew about climate change and what it told the public. Study authors reviewed 187 public and internal Exxon documents over the past four decades. They judged that 83 percent of peer-reviewed papers written by company scientists acknowledged that climate change is real and caused by humans. But among Exxon's advertisements on the editorial pages of *The New York Times*, a proxy for communications aimed at a broad public audience, only 12 percent acknowledged climate change as real and human-caused, while 81 percent expressed doubt. – *InsideClimateNews*

## SCIENCE

### EXTREME HEAT

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### [The recommended Threshold Limit Values for heat exposure fail to maintain body core temperature within safe limits in older working adults](#)

The American Conference of Governmental and Industrial Hygienists (ACGIH®) Threshold Limit Values (TLV® guidelines) for work in the heat are designed to ensure a stable core temperature that does not exceed 38°C. In this research, 9 healthy older (58 ± 5 years) males performed a 120-min work-simulated protocol in accordance with the TLV® guidelines in different wet-bulb globe temperatures (WBGT). We found temperature exceeded

## [Review: Climate conditions, workplace heat and occupational health in South-East Asia in the context of climate change](#)

People working in jobs of moderate or heavy work intensity in hot environment can experience high internal heat production; this heat needs to be released to protect health, which is difficult or impossible at high temperature and humidity. Heat-related physical exhaustion also leads to reduced work capacity and labour productivity, which may cause substantial economic losses. Countries of the World Health Organization South-East Asia Region experience higher ambient heat (and humidity) levels during large parts of the year. Prevention activities and application of basic occupational health principles are needed.



Photo Credit: Apiwat Sukpimontri/USAID Mekong ARCC Project

## [Redefining the Stone Belt: Precipitation is Associated with Increased Risk of Urinary Stone Disease \(USA\)](#)

The American Southeast has been labeled the "Stone Belt" due to its relatively high burden of urinary stone disease, presumed associated with higher temperatures. This research examined association of all patients who underwent surgical procedure for urinary stone disease in California from 2010-2012 with climate variables. We found that higher precipitation and mean temperature were both independently associated with an increased operative stone disease burden (n=63,994 patients). Our results appear to agree with trends seen elsewhere of higher stone prevalence in warm wet climates, and not warm arid, climates.

## [Assessing urban population vulnerability and environmental risks across an urban area during heatwaves \(UK\)](#)

We simulated and analysed two major heatwaves in the UK, in August 2003 and July 2006, to assess spatial vulnerability to heat exposure across the West Midlands, an area containing ~5 million people. We found that urban heat island (UHI) intensity was substantial during both heatwaves, reaching a maximum of +9.6°C in Birmingham in July 2006. Older age groups were more susceptible to the effects of heat. Flats and terraced houses were associated with increased risk of overheating, as were more deprived populations. These housing types and lower income populations were generally located within the warmest areas.

## [The effects of hot nights on mortality in Barcelona, Spain](#)

New thermal indices were used in this research to describe the duration of night hours with air temperatures higher than the 95% percentile of the minimum temperature (hot night hours) and intensity as the summation of

these air temperatures in degrees (hot night degrees). An exposure-response relationship between mortality due to all natural respiratory and CVD causes and summer night temperatures was assessed using data from the Barcelona region between 2003 and 2013. The estimated associations show a relationship that persists significantly up to a lag of 1-2 days (natural causes: 1.1% per 10° (CI95% 0.6-1.5) for hot night hours and 5.8% per each 10° (CI95% 3.5-8.2%) for hot night degrees).



Torre Mapfe y Hotel Arts, Barcelona

### [Heat stress mortality and desired adaptation responses of healthcare system in Poland](#)

This paper presents results of research on heat-related mortality (HRM) in Polish cities in covering about 25% of the country's population. Daily mortality and weather data reports for the years 1991-2000 were used. The intensity of heat stress was assessed by the universal thermal climate index (UTCI). On days with strong and very strong heat stress, increased mortality (in relation to no thermal stress days) was 12 and 47%, respectively.

### [Biometeorological Assessment of Mortality Related to Extreme Temperatures in Helsinki Region, Finland, 1972-2014](#)

We aimed to define the relationship between mortality and temperature extremes in different age groups in the Helsinki-Uusimaa hospital district in Finland from 1972-2014. Relative mortality increased more in the hot than in the cold tail of the thermal distribution; the increase was strongest among those aged 75 years and older, but was somewhat elevated even among those younger than 65. However, the all-aged relative mortality decreased in time from 18.3% to 8.6%, suggesting sensitivity to heat stress decreased over the decades.

### [Ageing, exposure to pollution, and interactions between climate change and local seasons as oxidant conditions predicting incident hematologic malignancy \(Democratic Republic of Congo\)](#)

The global burden of hematologic malignancy (HM), including various types of leukaemia, is rapidly rising with ageing, exposure to polluted environments, and global and local climate variability all being well-established conditions of oxidative stress. This study evaluated the impact of these factors on the incidence of HM in patients at Kinshasa University Clinics (KUC), DR Congo (DRC). After adjustment, HM was associated with combined local dry season and La Nina (HR = 4.6; 95%CI 1.8-11.8; P < 0.001), and combined local dry season and El Nino (HR = 4; 95% CI 1.6-9.7; P = 0.004), as well as age and exposure to environmental pollutants.

## [Review: Climate Change-Related Water Disasters' Impact on Population Health](#)

Climate change-related water disasters (CCRWDs) can have devastating impacts on health. This research systematically reviewed the literature on impact of CCRWDs on health to identify factors amenable to preparedness. Three themes emerged: environmental disruption resulting in exposure to toxins, population susceptibility, and health systems infrastructure. Direct health impacts fell into four categories: weather-related morbidity and mortality, waterborne diseases, vector-borne diseases, and mental health effects. The majority of the research was focused on flooding and in high-income or middle-income countries. We found inadequate representation of research exploring modifiable factors associated with CCRWD health impacts



Rescue boats fill a flooded street as flood victims are evacuated floodwaters from Tropical Storm Harvey rise, August 28, 2017, in Houston. David J. Philip -AP

## [Longitudinal Impact of Hurricane Sandy Exposure on Mental Health Symptoms](#)

We examined long-term mental health consequences of Hurricane Sandy in New York City and Long Island residents using questionnaires at baseline and 1 year later (n=130). Results suggest statistically significant decreases in anxiety and post-traumatic stress disorder (PTSD) overall. However, experiencing a combination of personal and property damage was positively associated with long-term PTSD symptoms (but not anxiety or depression). Having anxiety, depression, or PTSD at baseline was a significant predictor of these outcomes later on. Long-term mental effects of hurricanes, especially PTSD, warrant attention.



Yellow cabs line a flood street in Queens, New York in hurricane Sandy's wake.

## [Increase of Elderly Populations in the Rainstorm Hazard Areas of China](#)

In this research, the spatial distribution of population density was mapped based on the China's census data from 1990, 2000 and 2010, rainstorm events identified from 1975-2015, and tendency values mapped using GIS.

Results suggest that extreme precipitation trends are increasing in southeastern China, a region where the number of elderly, a key storm-vulnerable population, has increased by 86% (several-fold greater than overall population increase).

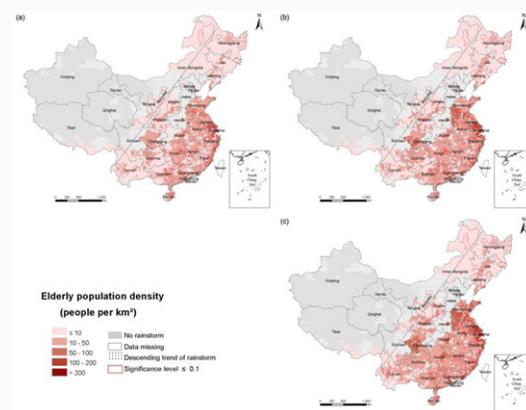
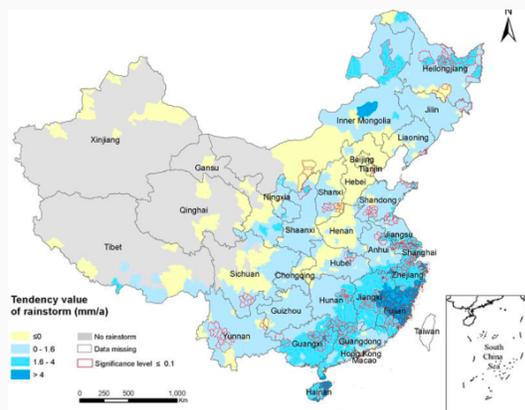


Figure 2: Trend of annual rainstorms (1975 to 2015) Figure 4: Density of the elderly population in the RSHA a) 1990 b) 2000 c) 2010

## INFECTIOUS DISEASES

### [Review: Identifying climate drivers of infectious disease dynamics: recent advances and challenges ahead](#)

We detail the mechanisms by which climate drivers can shape infectious disease incidence, from direct effects on vector life history to indirect effects on human susceptibility, and detail the scope of variation available with which to probe these mechanisms. We review approaches used to evaluate and quantify associations between climate and infectious disease incidence, discuss the array of data available to tackle this question, and detail

**[Solutions: The elimination of the dengue vector, \*Aedes aegypti\*, from Brisbane, Australia: The role of surveillance, larval habitat removal and policy](#)**

In Australia, the distribution of *Aedes aegypti* once spanned the eastern seaboard, however, during the 1900's this distribution markedly reduced and the mosquito disappeared from its southern range. This research examined historical records for Brisbane regarding targeted policies to manage *Ae. aegypti*. We conclude numerous factors were likely responsible, including removal of larval habitat (especially domestic rainwater tanks) in combination with increased mosquito surveillance and regulatory enforcement.

**[Solutions: Modeling zoonotic cutaneous leishmaniasis incidence in central Tunisia from 2009-2015: Forecasting models using climate variables as predictors](#)**

Transmission of zoonotic cutaneous leishmaniasis (ZCL) depends on the presence, density and distribution of the *Leishmania* rodent reservoir. This research examines associations between ZCL occurrence and possible risk factors, and develops a predictive model for ZCL co. Data were collected from 2009-2015 in three rural areas of Sidi Bouzid, Tunisia. Results highlight ZCL in August to January, and that rodent density, temperature, cumulative rainfall and relative humidity play role in sustaining ZCL incidence. This model could help establishment an early warning system for control and prevent ZCL.

**[Solutions: Spatiotemporal variation of hand-foot-mouth disease in relation to socioecological factors: A multiple-province analysis in Vietnam](#)**

Hand-foot-and-mouth disease (HFMD) is a significant public health issue in Asia-Pacific countries. This study examined the association between socio-ecologic factors and HFMD using a Bayesian framework in multiple provinces across Vietnam. We found that HFMD increased with a 1°C monthly temperature above 26°C (RR:1.07; 95%CI: 1.052-1.088) and with a 1% increase in monthly humidity above 76% (RR: 1.031, 95%CI: 1.024-1.039); HFMD decreased with monthly cumulative rainfall. The climate-HFMD relationship varied by region. Findings may be used to develop an early warning system to manage HFMD.

## RELOCATION

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**[Review: Intersectoral approaches and integrated services in achieving the right to health for refugees upon resettlement: a scoping review protocol](#)**

Global insecurity and climate change are exacerbating the need for improved management of refugee resettlement services. International standards hold states responsible for protection of rights of non-citizens to an adequate standard of physical and mental health. However, programmes often lack coordination and monitoring. This paper describes the protocol for a scoping review to explore barriers and facilitators to the integration of health services for refugees; the content, process and actors involved; and the extent to which intersectoral approaches are leveraged, especially for vulnerable groups such as women and children.



Syrian refugee camp. BULENT KILIC/GETTY

## ADAPTATION PLANNING

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### [Health risks of climate change in the World Health Organization South-East Asia Region](#)

Countries in the World Health Organization (WHO) South-East Asia Region are particularly vulnerable to a changing climate. With support from the WHO, countries have started to include climate change as a key consideration in their national public health policies. National action plans for climate change also generally identify health as one of their priorities; however, limited information is available on implementation processes, involved ministries, time frame, stakeholder responsibilities, and project financing.

### [Health-sector responses to address the impacts of climate change in Nepal](#)

Nepal is highly vulnerable to global climate change. The vulnerable climate-sensitive sectors identified in Nepal's National Adaptation Programme of Action (NAPA) to Climate Change 2010 include agriculture, forestry, water, energy, public health, urbanization and infrastructure, and climate-induced disasters. Vector-borne diseases, diarrhoeal diseases including cholera, malnutrition, cardiorespiratory diseases, psychological stress, and health effects and injuries related to extreme weather are major climate-sensitive health risks. The Government has mainstreamed climate change into its development plans, policies and programmes, including climate-sensitive health risks. While translation into tangible action is still in its infancy, Nepal may be a good example for other low- and middle-income countries.



Photo Credit: [Mikel Dunham](#) in [Nepal's Wildlife & Environmental issues](#)

## CO-BENEFITS

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### [Updated Global Estimates of Respiratory Mortality in Adults Attributable to Long-Term Ozone Exposure](#)

This paper used updated effect estimates from the American Cancer Society Cancer Prevention Study II (ACS CPS-II) cohort to estimate global ozone (O<sub>3</sub>)-attributable mortality in adults (≥ 30 years). We estimated 1.04-1.23 million respiratory adult deaths attributable to O<sub>3</sub> exposures (compared with 0.40-0.55 million based on the earlier CPS-II estimates). Increases were larger in northern India, southeast China, and Pakistan than in Europe, eastern United States, and northeast China. Findings suggest that health benefits from air quality policies targeting O<sub>3</sub> and health co-benefits of climate mitigation policies are larger than previously thought.

### [Meat consumption reduction in Italian regions: Health co-benefits and decreases in GHG emissions](#)

The objective of the study is to assess impacts on health and attributable greenhouse gases (GHG) emissions of reduced red meat consumption in Italy, including consistent with a Mediterranean diet. We found avoidable deaths (as percentage change compared to baseline) were 2.3-4.5% for colorectal cancer, and 2.1%-4.0% for CVD; higher benefits would be observed in Northwestern Italy and among males. Diets fully compliant with the Mediterranean diet would save 5 million years of life lost prematurely among men and women over the next 18 years. GHG emissions saved with the Mediterranean diet scenario are in the range of 8,000-14,000 Gg of CO<sub>2</sub> equivalent per year. This suggests that in Italy, scenarios for reducing beef consumption are consistent with significant health and environmental co-benefits.



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Climate & Health News Editor: Mary Sheehan ([msheeh10@jhu.edu](mailto:msheeh10@jhu.edu)),  
Managing Editor: Eileen McRae ([emcrae4@jhu.edu](mailto:emcrae4@jhu.edu))