Emerging Infectious Diseases in a Wetter, Hotter, more Urban World

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Water-borne diseases: Cholera, typhoid, leptospirosis

Vector-borne diseases: Dengue, chikungunya, zika

Strengthening climate-health surveillance and research capacities in Ecuador

Aim: Create a long-term research platform for climate-sensitive diseases and other priority areas, e.g., other pathogens, clinical trials, vector control interventions.

Approach:

- Strong institutional partners and formalized MOUs.
- A social-ecological systems approach to study design and analysis.
- Strengthening of virus-vector-climate surveillance systems (diverse data streams) and ongoing training and capacity building.
- Integration of data through spatiotemporal modeling.
- Service to improve the health of local communities.

Outcome:

- Generate the evidence base for the effects of climate on health
- Identify and test effective public health responses and interventions.

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CMD
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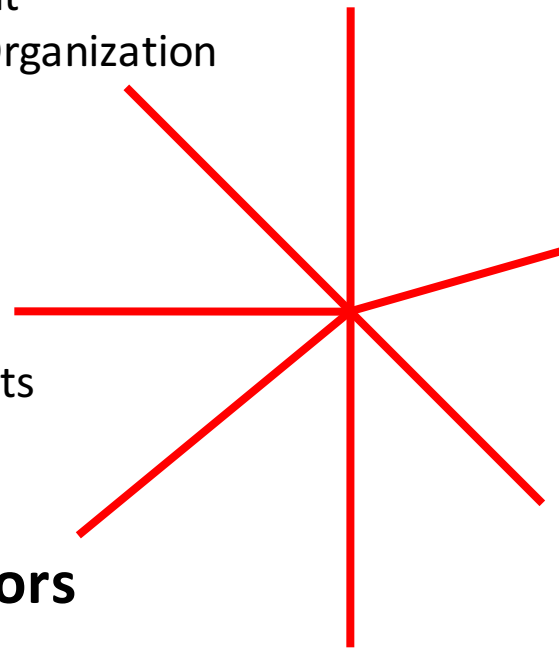
Policy

Ministry of Health
National Institute of Meteorology
Ministry of Environment
Pan American Health Organization

Public-Private Partnerships

Pharmaceuticals (vaccines, diagnostics)
Insecticides, mosquito surveillance traps



Biomedical science

Medicine
Virology
Immunology
Epidemiology

Social science

Sociologists
Political scientists
Communications experts

Funding & Regulatory agencies

NSF, NIH, DoD, FDA, IAI, Gates
SENESCYT, ARCSA

Civil society actors

Community leaders
NGOs
Media
Artists

Biophysical science

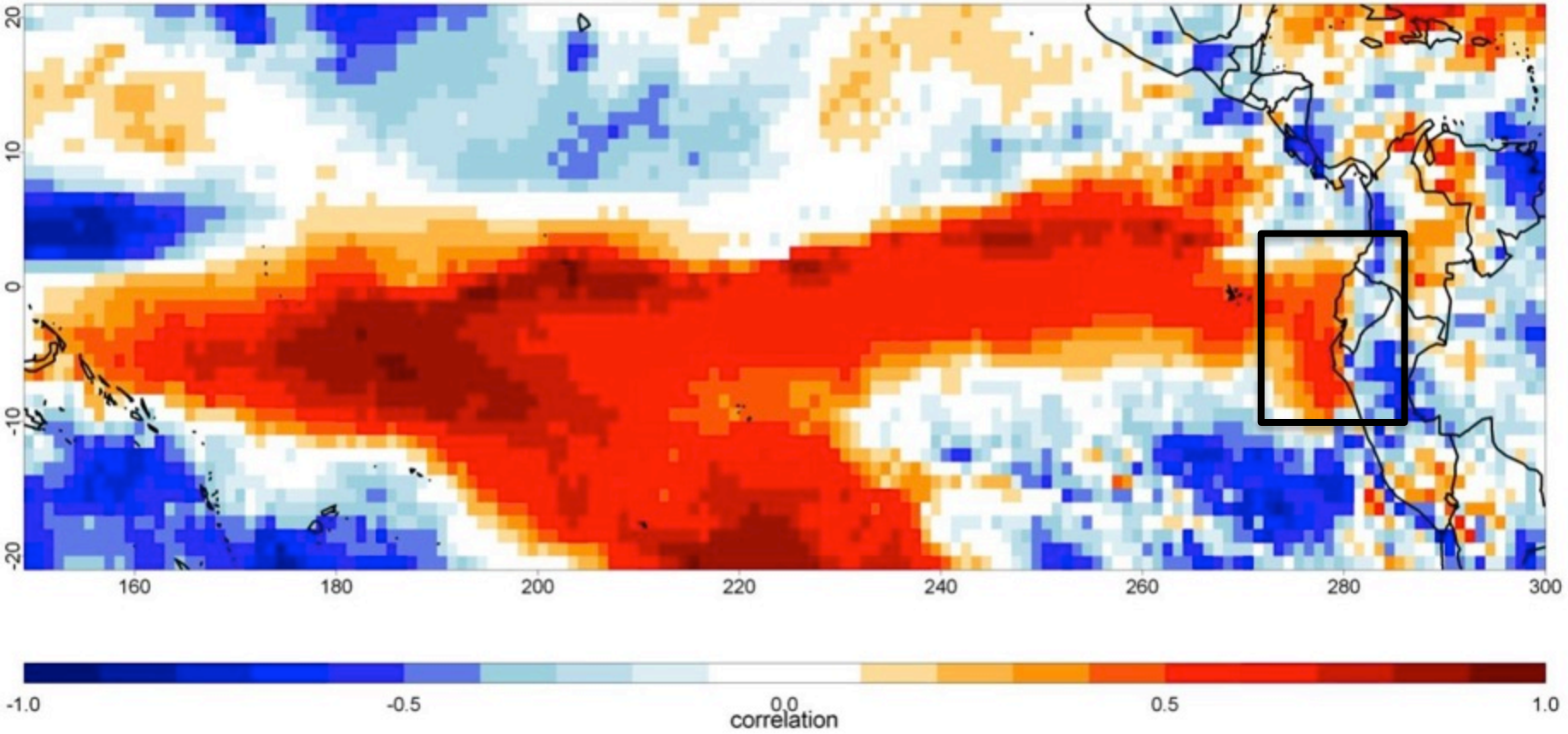
Climate science
Modelers (GIS, statistics)
Ecology
Entomology

Phase 1 (2007-2012): Establishing the evidence base for climate and social-ecological risk factors for dengue transmission

Machala, Ecuador (~250,000 pop.)
Dengue is hyperendemic (DENV1-4)
CHIKV emerged in 2015
ZIKV emerged in 2016

Ecuador

Teleconnections:
El Niño (ocean warming) affects local rainfall



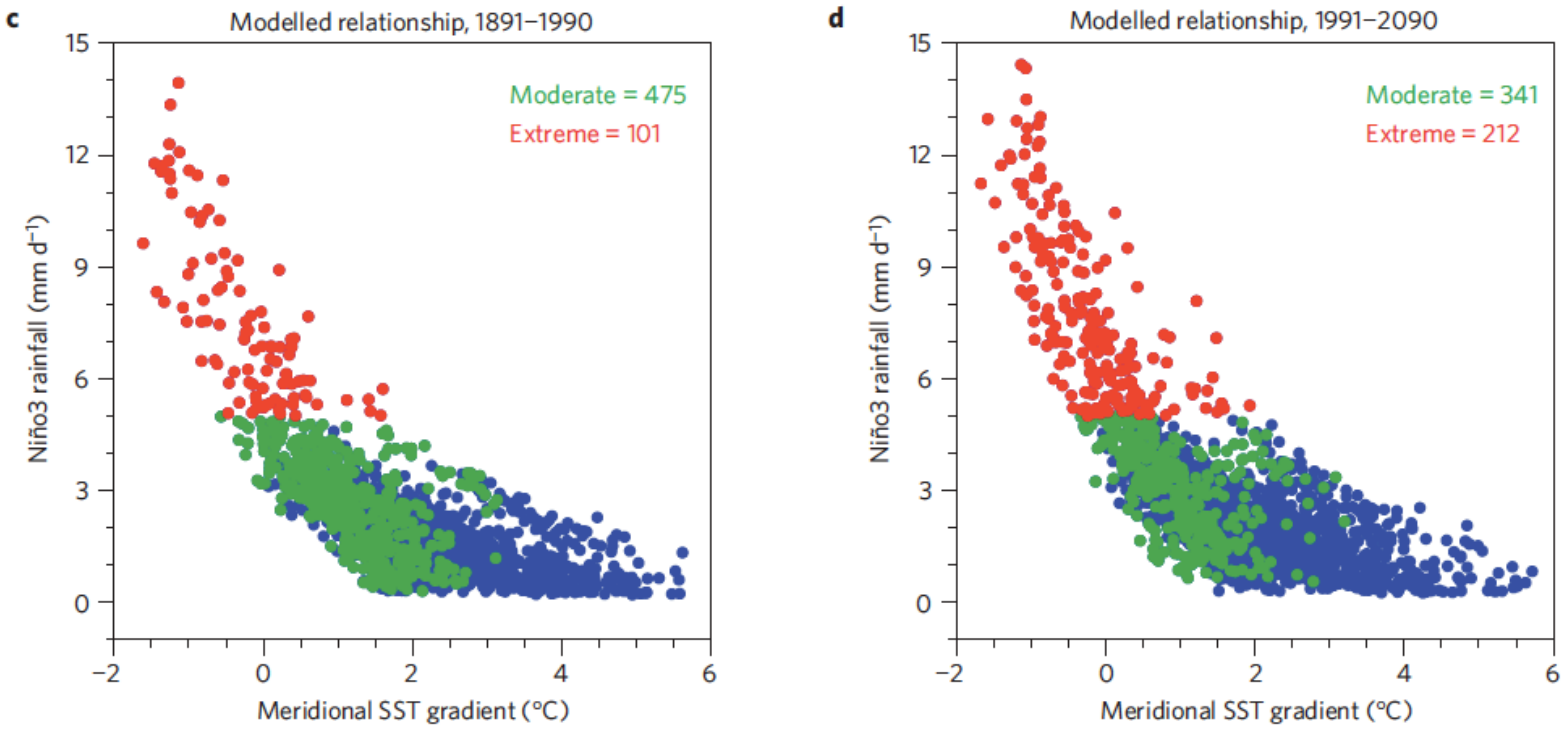
Correlation between the Oceanic Niño Index (ONI)
in Oct-Nov-Dec y rainfall in Feb-Mar-April

(Stewart Ibarra & Lowe, 2011, ASTMH poster)

nature climate change
LETTERS
PUBLISHED ONLINE: 19 JANUARY 2014 | DOI: 10.1038/NCLIMATE2100

Increasing frequency of extreme El Niño events due to greenhouse warming

Wenju Cai[1,2]*, Simon Borlace[1], Matthieu Lengaigne[3], Peter van Rensch[1], Mat Collins[4], Gabriel Vecchi[5], Axel Timmermann[6], Agus Santoso[7], Michael J. McPhaden[8], Lixin Wu[2], Matthew H. England[7], Guojian Wang[1,2], Eric Guilyardi[3,9] and Fei-Fei Jin[10]



The frequency of extreme El Niño events will increase from one event every 20 years, to one event every 10 years.

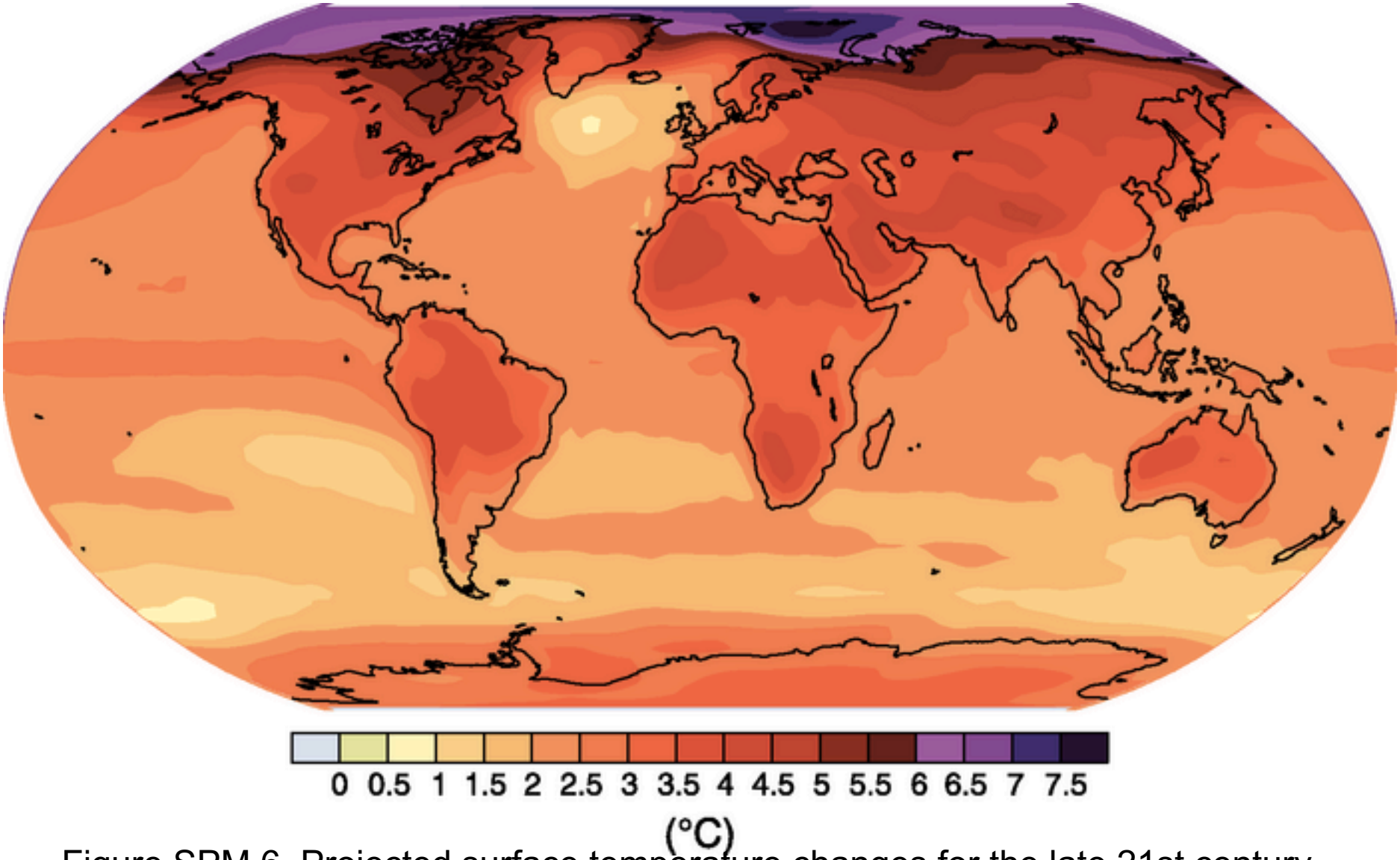


Figure SPM.6. Projected surface temperature changes for the late 21st century (2090-2099). The map shows the multi-AOGCM average projection for the A1B SRES scenario. Temperatures are relative to the period 1980-1999. (Source: IPCC)

Urban growth and inequity: The impact of climate on health depends on the vulnerability of the population

Mixed and participatory methods

Stakeholder engagement with communities, climate and health sectors

Entomological surveys

Household surveys

Community focus groups

Spatiotemporal analyses of existing climate and health data

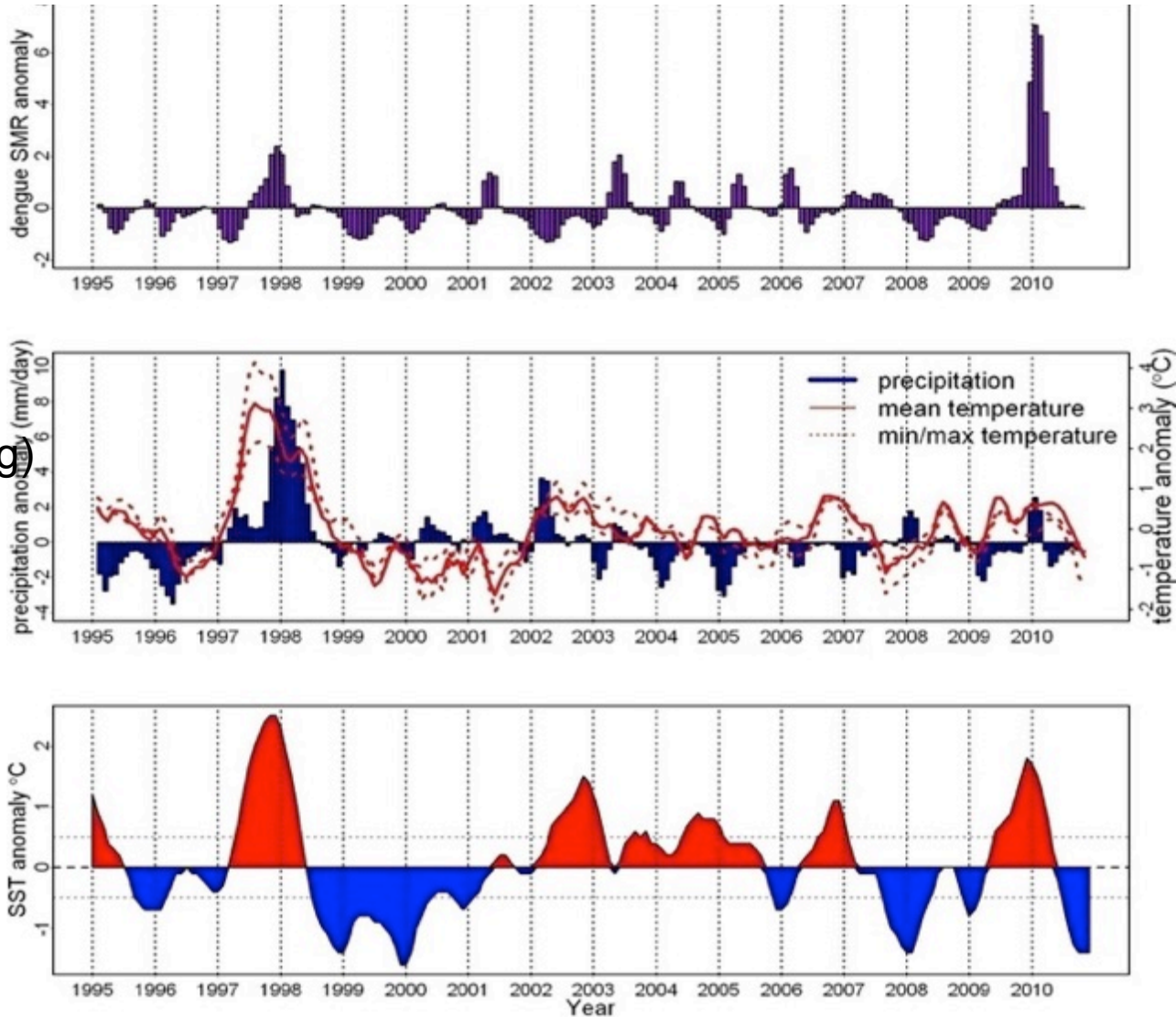
Am. J. Trop. Med. Hyg., 88(5), 2013, pp. 971–981
doi:10.4269/ajtmh.12-0478

Climate and Non-Climate Drivers of Dengue Epidemics in Southern Coastal Ecuador

Anna M. Stewart-Ibarra* and Rachel Lowe

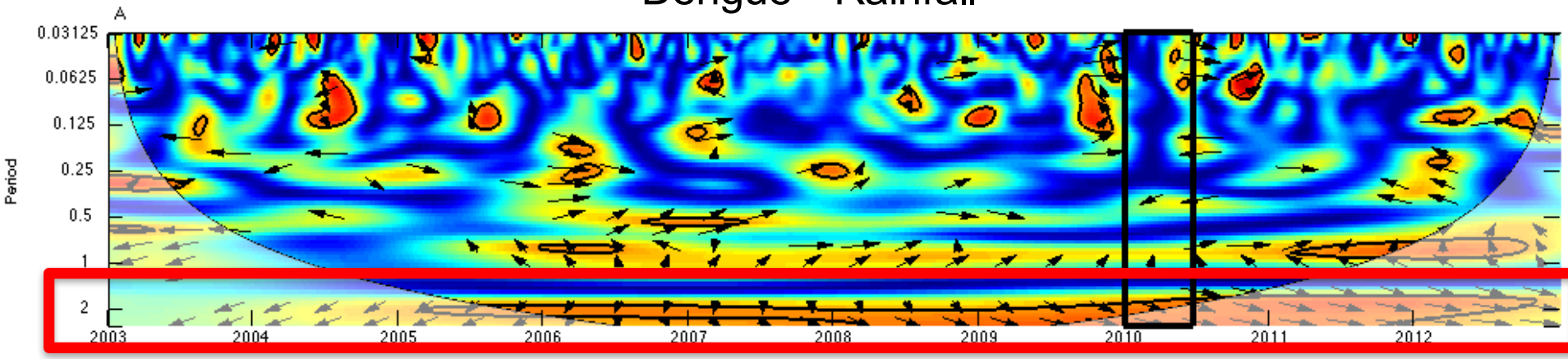
Predictors:

- ONI (3 mon lag)
- Tmin (2 mon lag)
- Rainfall (1 mon lag)
- Num. serotypes (3 mon lag)
- *Aedes* indices (1 mon lag)

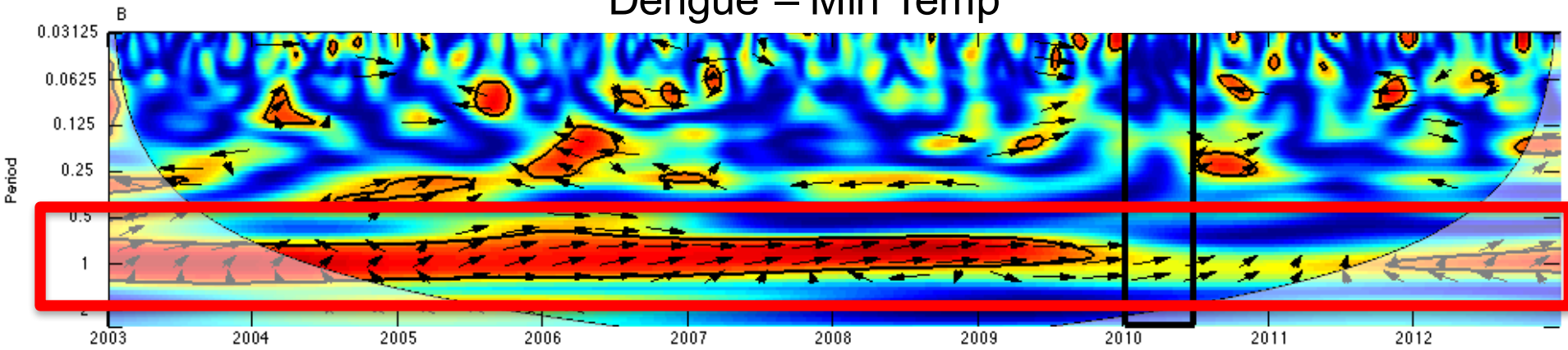


Evidence of multiyear cycles of climate & dengue in Machala

Wavelet coherence spectrum
Dengue - Rainfall



Dengue – Min Temp



(Stewart Ibarra, Muñoz, et al. 2014, BMC Infectious Disease)

Improved seasonal climate forecasts and ENSO forecasts for better dengue predictions.

Long-Lead El Niño forecast information to support public health decision making

D. Petrova[1], S.J. Koopman[2], R. Lowe[1], A. Stewart-Ibarra[3], X. Rodó[1]

(1) Catalan Institute of Climate Science (IC3), Barcelona, Spain (2) VU Amsterdam, Netherlands (3) SUNY Upstate Medical University, New York, USA University

Contact: desislava.petrova@ic3.cat

Annual Meeting & 12th European Conference on Applications of Meteorology (ECAM). September 7-11. Sofia, Bulgaria

Predictability of December–April Rainfall in Coastal and Andean Ecuador

G. Cristina Recalde-Coronel

National Institute of Meteorology and Hydrology, and Observatorio Latinoamericano de Eventos Extraordinarios, and Escuela Superior Politécnica del Litoral, Guayaquil, Ecuador

Anthony G. Barnston

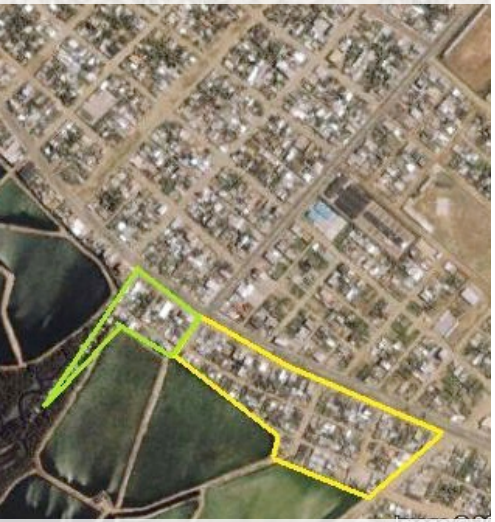
International Research Institute for Climate and Society, Palisades, New York

Ángel G. Muñoz

International Research Institute for Climate and Society, Palisades, New York, and Centro de Modelado Científico, Universidad del Zulia, and Observatorio Latinoamericano de Eventos Extraordinarios, Maracaibo, Venezuela

Evidence that the effect of climate on dengue varies within the city of Machala.

Central area



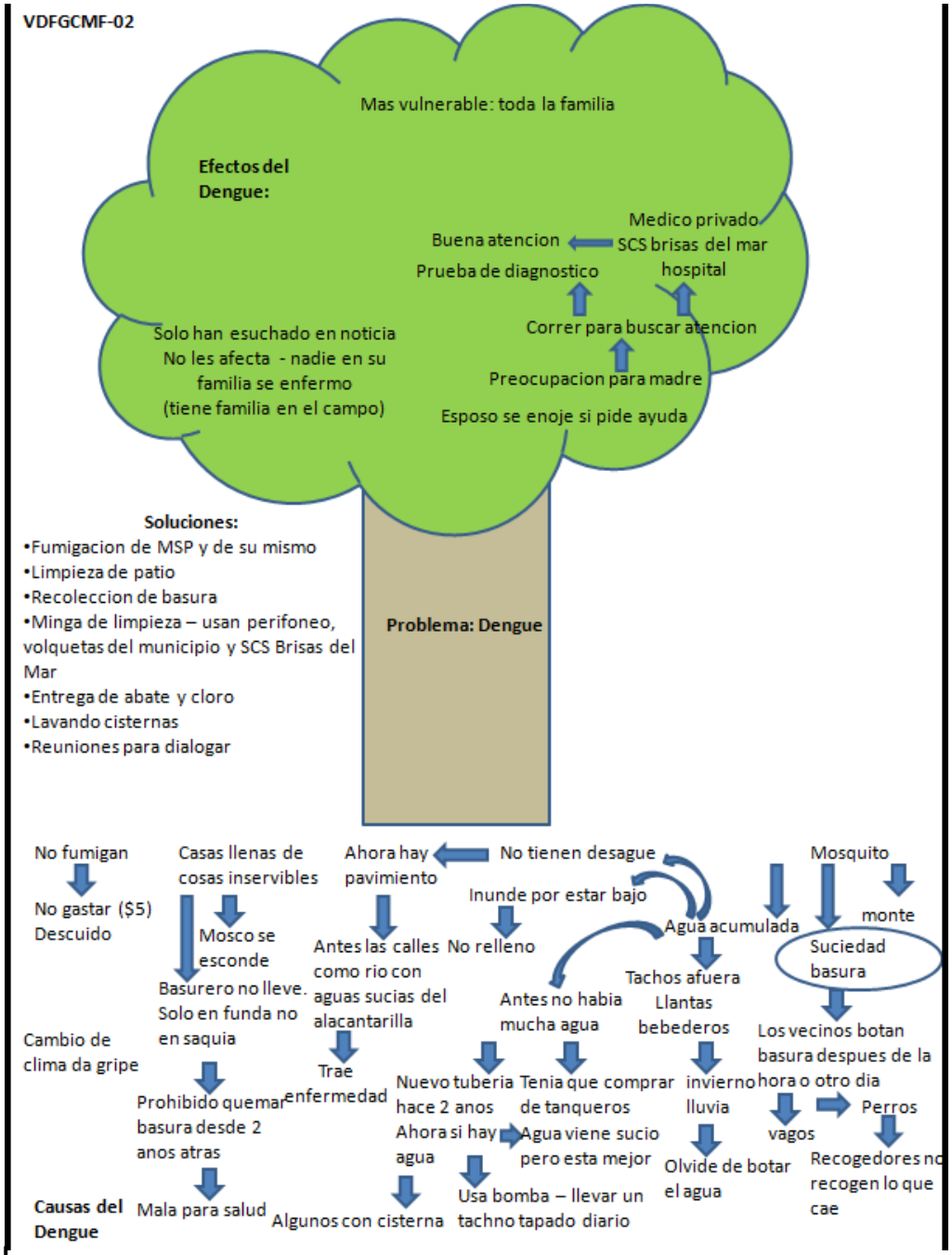
Peripheral area

(Stewart Ibarra, et al. 2013, PLOS ONE)

Participatory methods to assess:

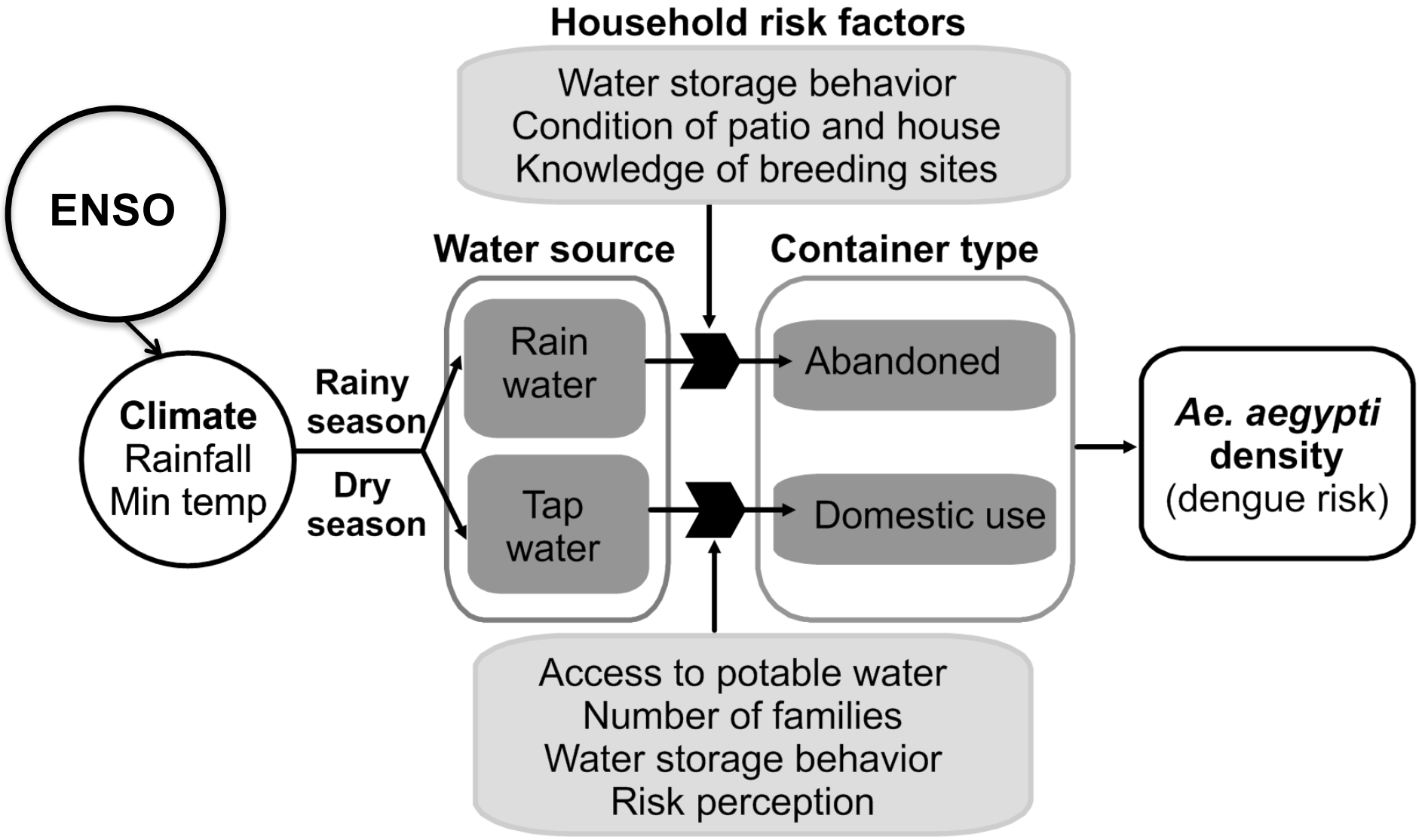
- Causal pathways
- Risk factors
- Misconceptions
- Roles of the community & government

Perceptions govern behavior, influencing people's ability & willingness to respond to public health interventions.



Stewart Ibarra et al. 2014. BMC Public Heatlh

Social-ecological system for dengue

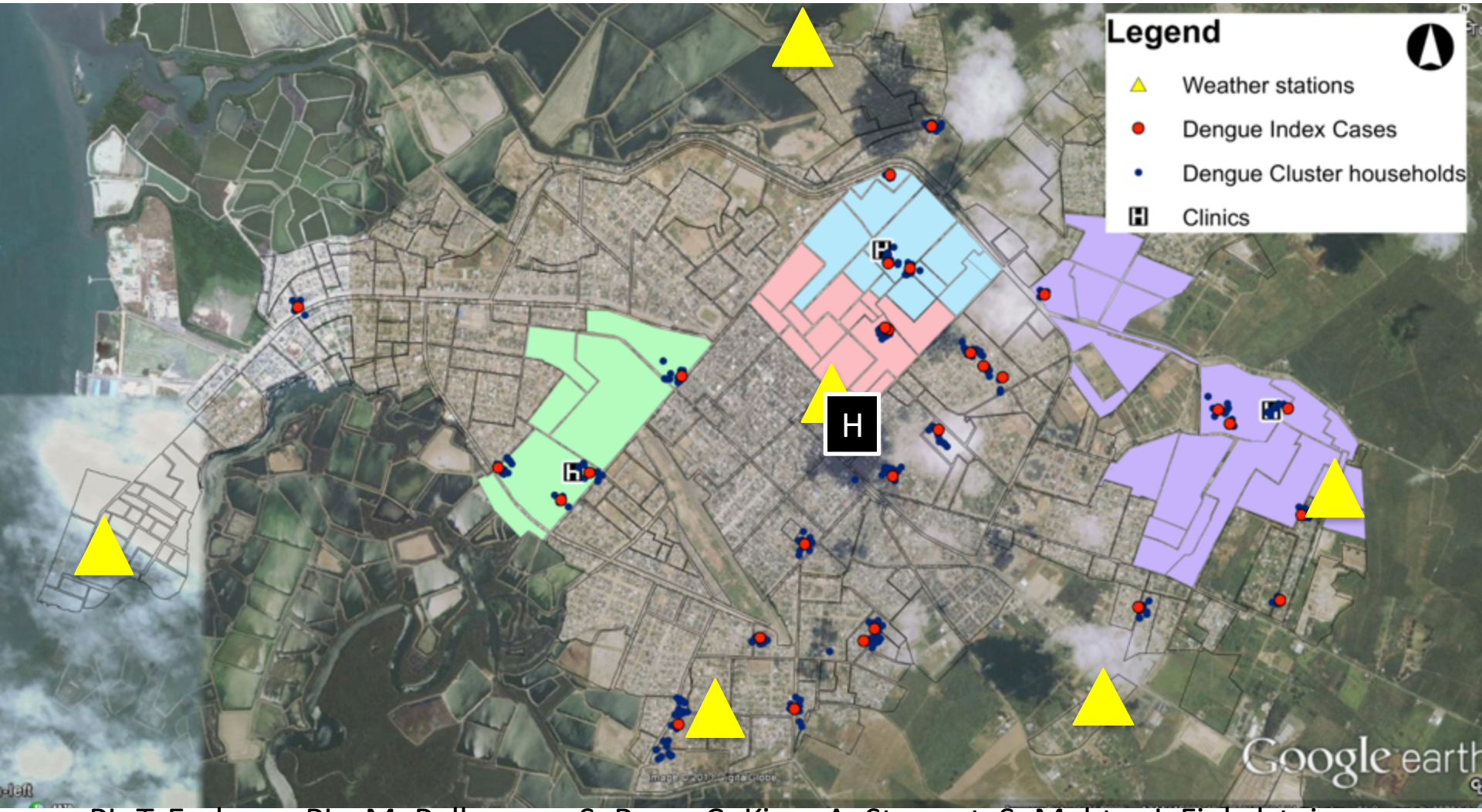


(Stewart Ibarra et al, 2013, PLOS ONE)

Phase II (2012-present): Creation of a research and training platform for climate-sensitive infectious diseases

Capacity Strengthening in Ecuador: Partnering to improve surveillance of febrile vector-borne diseases

High resolution longitudinal spatiotemporal data on human infections, virus serotypes and genotypes, mosquito vector, human nutrition, social-ecological risk factors, microclimate data



PI: T. Endy, co-PIs: M. Polhemus, S. Ryan, C. King, A. Stewart, S. Mehta, J. Finkelstein

In-situ Vector Dynamics in a High Burden Region in Ecuador

NSF Zika Rapid; 2016-2017. PI: A Stewart; Co-PIs: Ryan, Endy, Neira

Effects of temperature on vector-borne disease transmission: integrating theory with empirical data

NSF/NIH EEID; 2015-2020; PI: Erin Mordecai, Stanford University

- 3 year cohort study
- 240 households, 4 sites
- ibuttons for temp, RH
- Adult mosquito abundance
- Household risk factors
- Dengue & zika prevalence and incidence in mosquitoes and humans

DRAFT FOR DISCUSSION

WORLD METEOROLOGICAL ORGANIZATION | World Health Organization

JOINT OFFICE FOR CLIMATE AND HEALTH

CLIMATE SERVICES FOR HEALTH

Improving public health decision-making in a new climate

CASE STUDIES

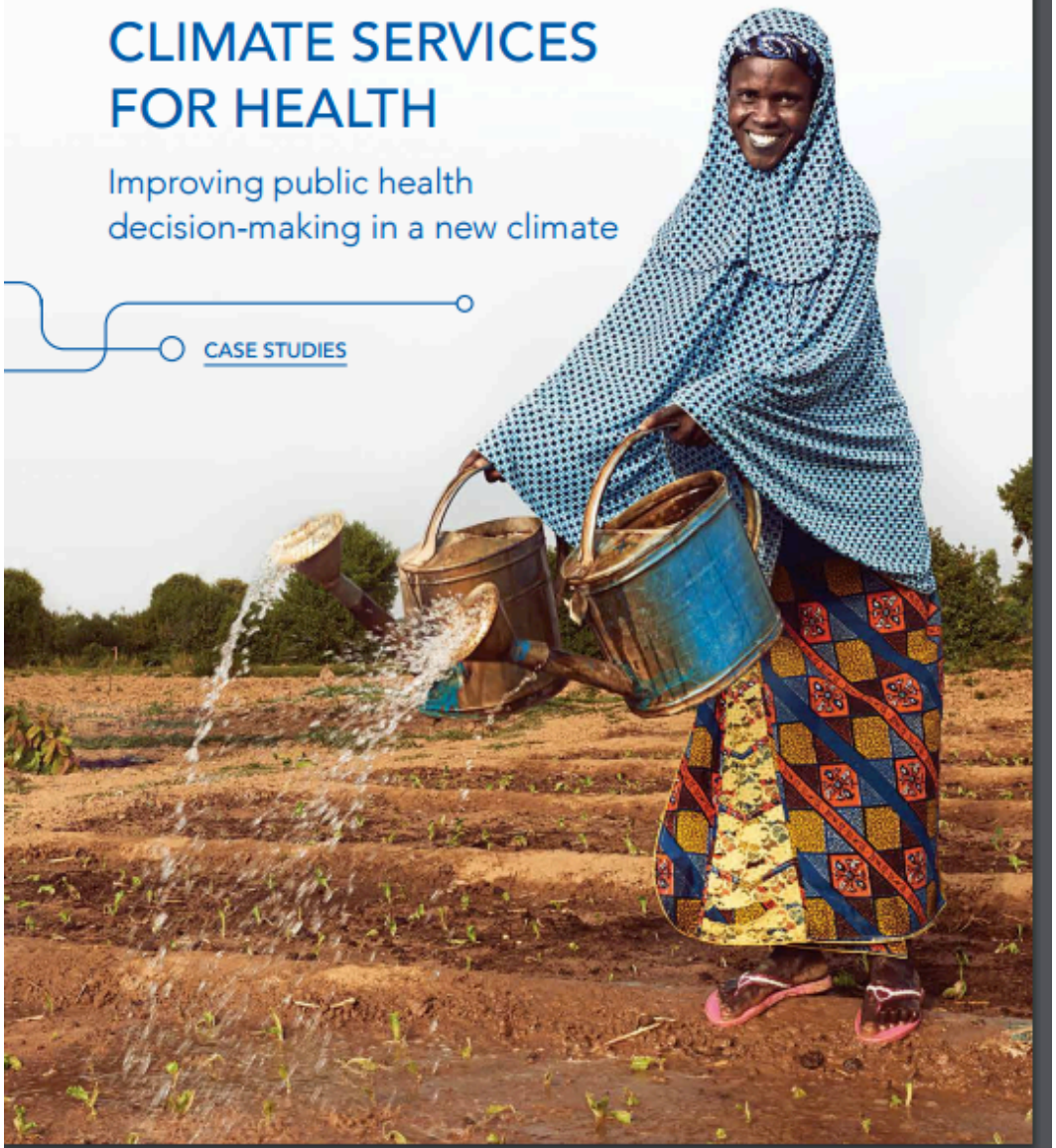


Photo credit: Dany Krom 2016

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On February 26, 2016, over 170 mm of rain fell in 10 hours, and coincided with high tides, causing the worst flooding since the 1997-1998 El Niño.

Photo credit: Dany Krom 2016

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Phase III (2016): Service to improve the health of local communities. An ethical and moral imperative.

ZONAS AFECTADAS POR EL TERREMOTO


21
21


N1
N2


ION STUARIUM
EMBAJADA DE JAPÓN

CNW
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Twelvefold increase in Zika cases since Ecuador earthquake

UNICEF and partners are supporting the national government by raising awareness and providing necessary supplies

NEW YORK/PANAMA/QUITO/TORONTO, July 19, 2016 /CNW/ - Three months after the Ecuador earthquake, the number of Zika Virus cases increased from 92 to 1,106 country-wide, with the sharpest increase in the quake-hit areas.

According to national data, 80 per cent of the Zika cases are in the province of Manabí where the April 16 earthquake left most damage. After the earthquake, the proliferation of stagnant waters, and concentration of displaced persons increased the risk of vector transmission.

Women between 15 and 49 years of age are the worst affected by the virus, accounting for 509 cases in Manabí.


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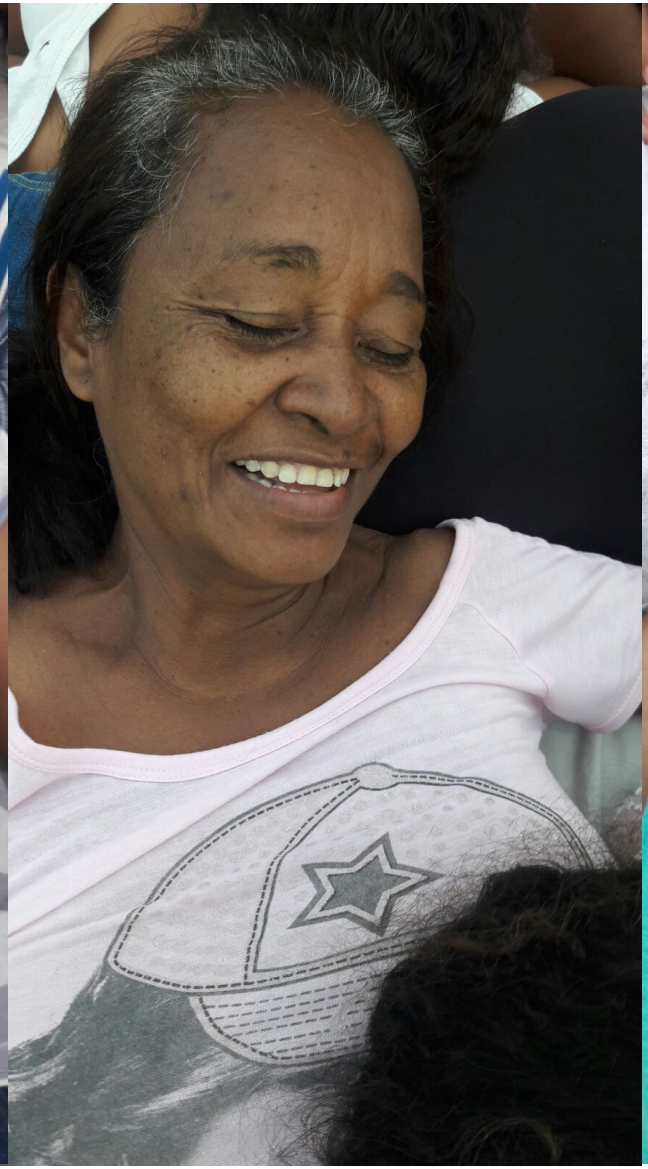


"In the face of the emergencies of human-induced climate change, social exclusion, & extreme poverty, we join together to declare that:

Human-induced climate change is a **scientific reality,** and its decisive mitigation is a **moral and religious imperative** for humanity."

Pontifical Academies of Sciences and Social Sciences