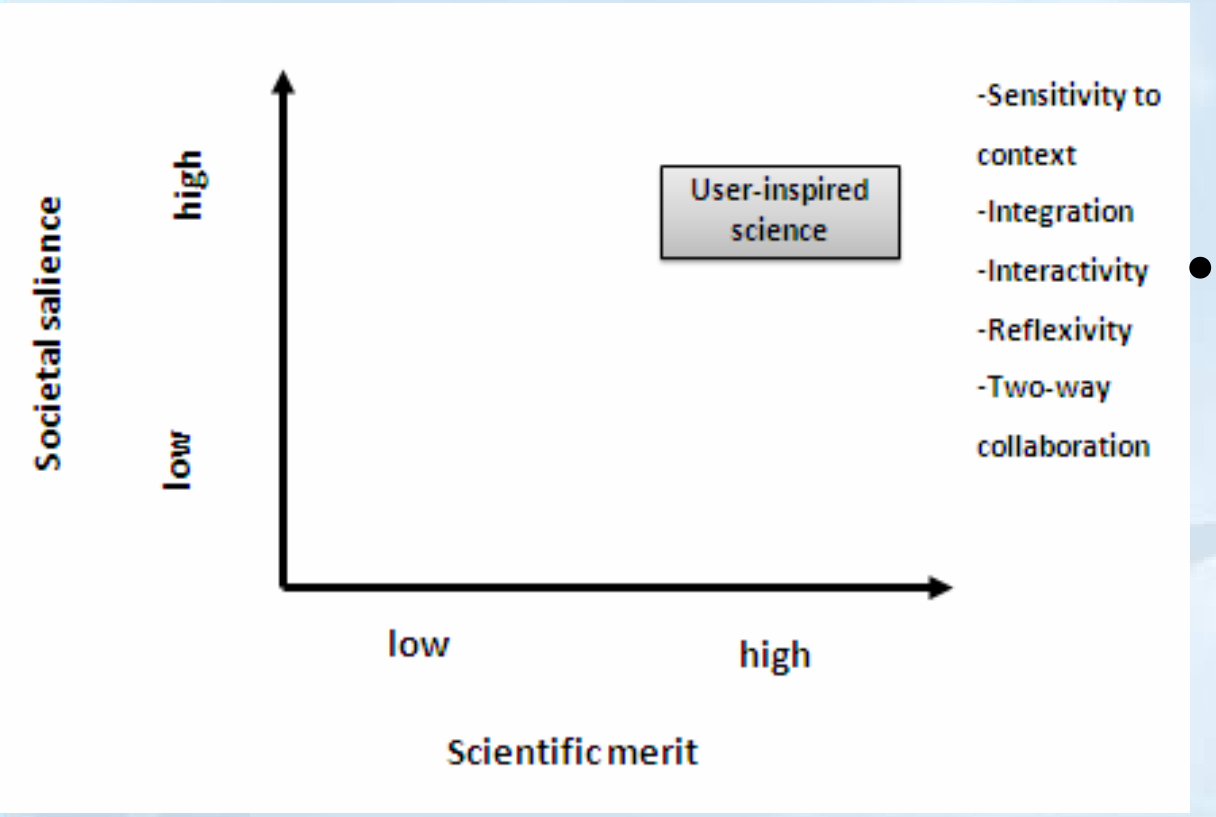
From Problem Space to Solution Space
End-to-end integration

Colloquia on Knowledge Integration at the Science-Policy Interface

Patricia Romero-Lankao, Maria Manez, Maria Carmona

Two assumptions

User-inspired interdisciplinary science



* Romero-Lankao, Borbor-Cordova, Abrutsky, Günther, Behrentz, and Dawidowsky (2012) Environmental Science and Policy Special Issue on Integrated Assessments

- Any effort to move away from current unsustainable involves change
- A way to affect change is to try to do it yourself by engaging in new forms of
  - doing and understanding science
  - creating science policy interfaces (e.g., integrated water resources management)

From Problem Space to Solution Space
End-to-end integration

- User-inspired interdisciplinary science, integrated assessments, etc.
- Portfolio of management & response approaches
- Understanding processes shaping response capacity

Integrated Understanding of Urban Vulnerability and Risk (Insights and Lessons from ADAPTE)

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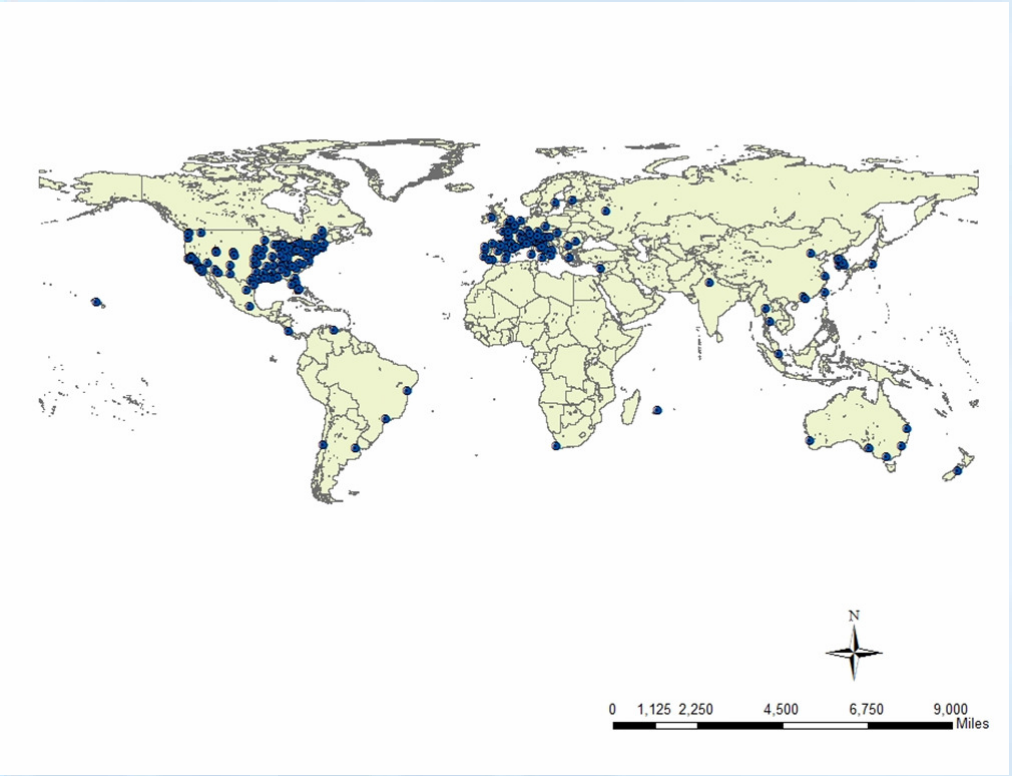
Patricia Romero-Lankao

Nov. 11, 2012

III. ADAPTE example of user-inspired research

Relatively little is known in Latin America about current urban vulnerability to temperature & air pollution



Romero Lankao, Qin and Dickinson (2012) Meta-analysis on urban vulnerability to temperature hazards
(224 cities, 56 papers)

ADAPTE fills the gap by applying user-inspired interdisciplinary approach to explore

1. Effects of *exposure* to temperature and air pollution
2. Differences in *mortality* and *vulnerability* across and within cities
3. *Societal* and *environmental* factors accounting for this differential distribution

Paty Romero-Lankao, Mercy Borbor-Cordova, Hua Qin, Sara Hughes, Jorgelina Hardoy Rosana Abrutzky, Roxana Borquez, Eduardo Behrentz, Laura Dawidowski, Olga Wilhelmi, Angélica Rosas Huerta, María Griselda Günther, Guadalupe Sierra ,Gastón Urquiza, Gustavo Pandiella, Melissa Haeffner. Andrea Lampis, Diana Rocío Rodríguez Triana, Juliana Rodríguez Azcuénaga;, Macaraena Mella, Caroline Clerc

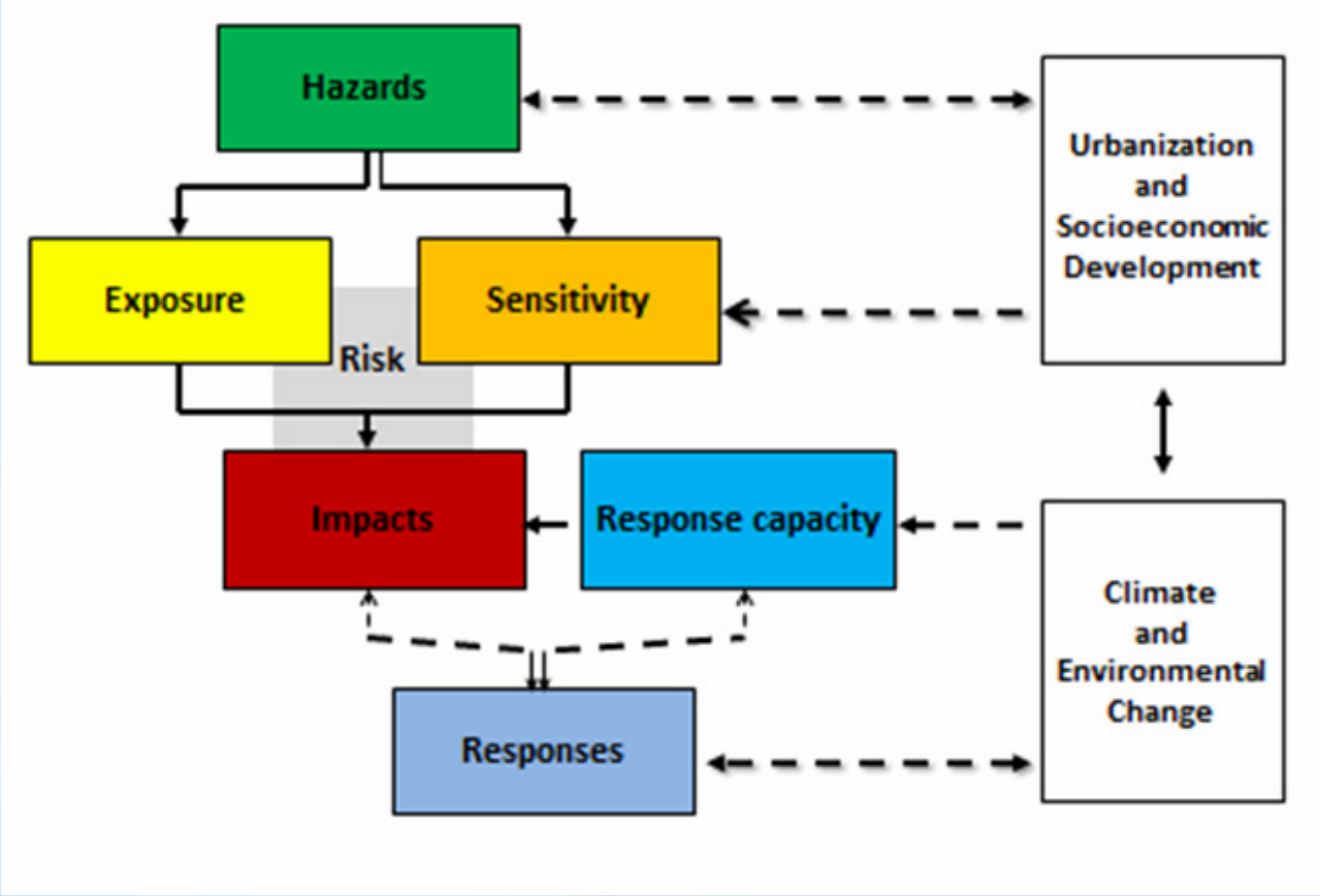
Urban vulnerability and risk, an integrated approach

Do health risks act across socioeconomic and spatial boundaries?

Risk Society Theory

Are hetalh risks "unequally" distributed along socioeconomic and spatial lines?

Political Ecology and Environmental Justice



Romero-Lankao and Qin 2011

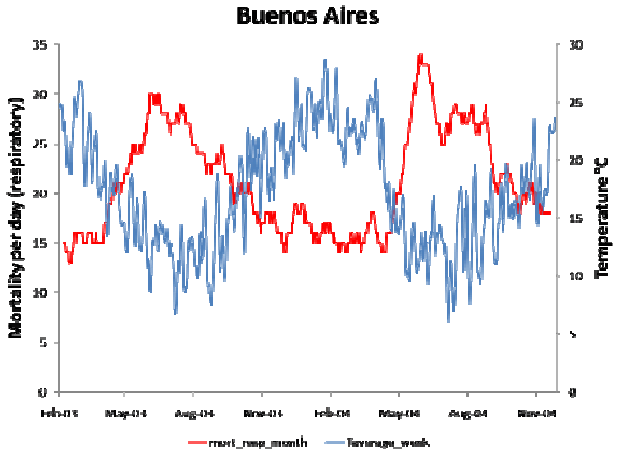
Data

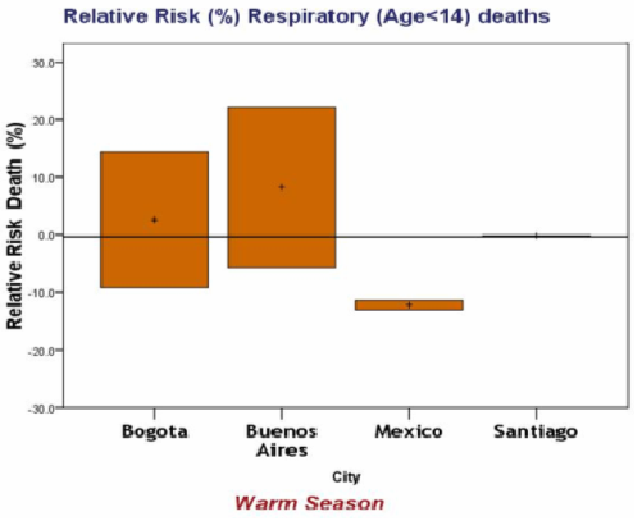
- **Temperature, humidity**
- **Air pollution data**
  - **PM_{10}, O_3, NO_2**
- **Health impacts**
  - **Cardiovascular and respiratory mortality and morbidity (county-level)**
- **Census-based socioeconomic data (municipality-level)**
  - Vulnerability: income, education, availability of assets,… affecting differences in impacts
- **Surveys and interviews (community-level)**
  - Adaptation: groundtruthing, perceptions of risks and responses to hazards and stresses

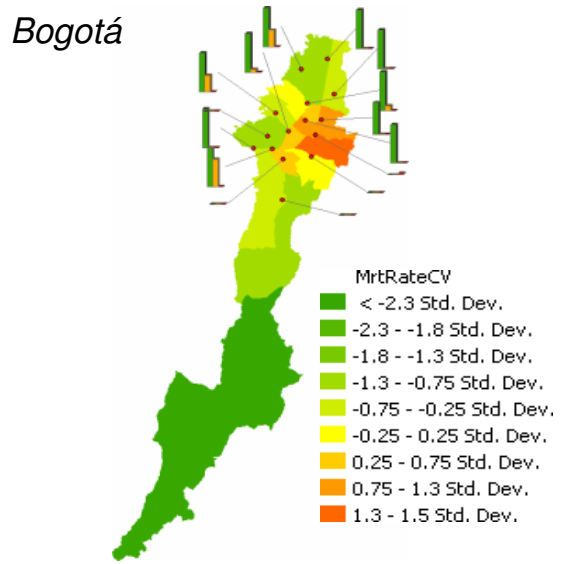
South American Emissions, Megacities and Climate (SAEMC)

Methods

- **Exploratory Time Series Analysis**
  - Seasonal decomposition and linear regressions (weather/pollution and health variables)
- **Generalized Linear Model (GLM) with Poisson log-linear distribution**
  - Changes in Relative Risk (RR) of health outcomes due to changes in temperature and air pollution
- **GIS/Spatial statistics**
  - Univariate linear regression models
- **Socioeconomic Vulnerability Index (livelihoods approach)**
- **Multivariate regression analysis:**
  - combined impacts of weather, air pollution and socioeconomic vulnerability
- **Qualitative analysis of**
  - Governmental and households actions and
  - Perception of risks and vulnerabilities/adaptive capacities



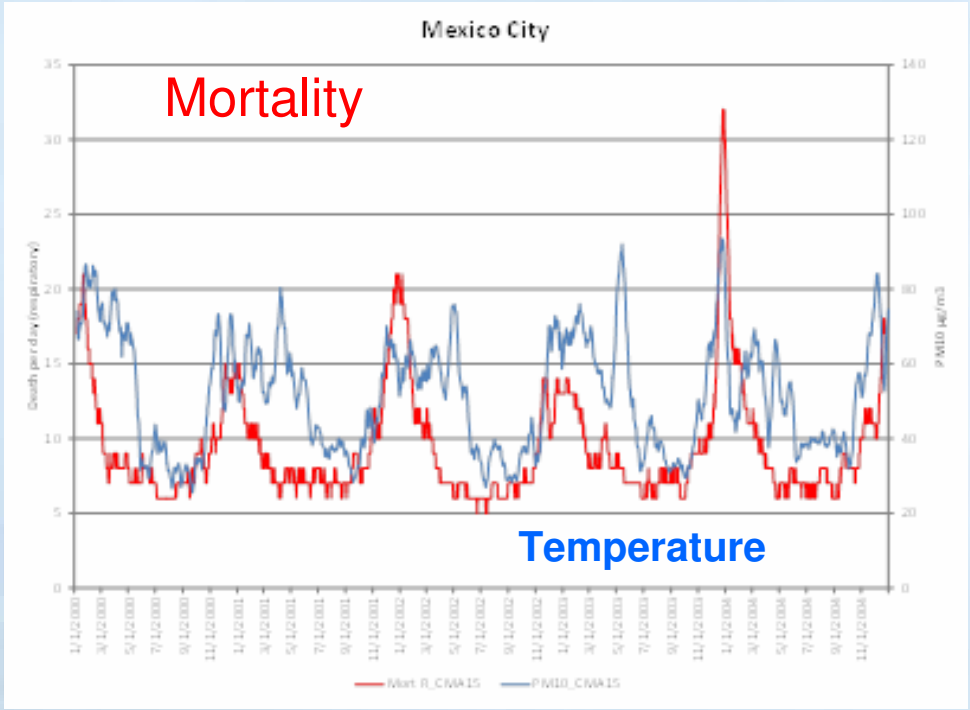




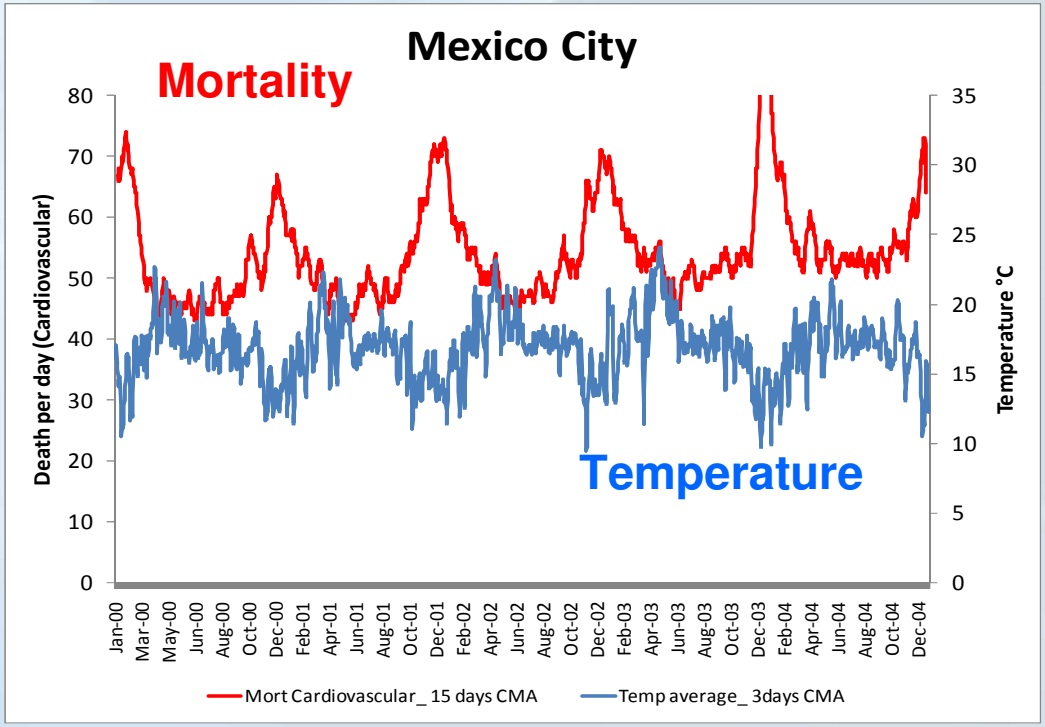
Exposure to Hazards & Impacts

Health risks vary with differing weather conditions, with different implications for different impacts and hazards

Positive correlation between mortality and PM10



Negative correlation between temperature and mortality

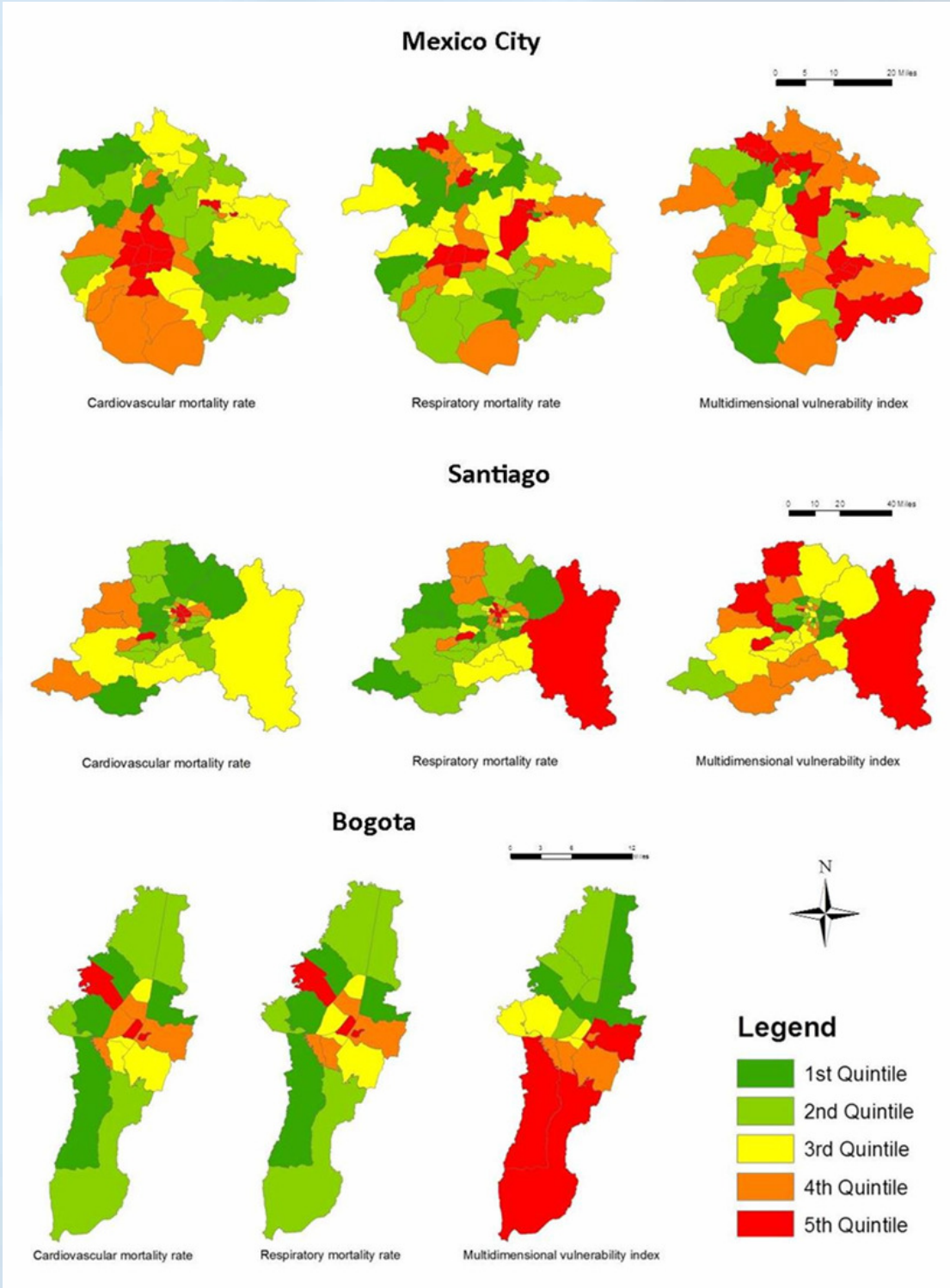


Source: Romero-Lankao, Qin, Hughes, Borbor, Haeffner (2012)

Sensitivity, Capacity & Impact

- ❑ Geographic distribution of mortality rates does not always coincide with the pattern of the socioeconomic vulnerability index

- ❑ Populations of communities with different socioeconomic vulnerability levels are at similar relative risk of mortality from exposure to PM_{10}, NO_2, Ozone



Source: Romero-Lankao, Qin and Borbor Cordova (2012)

Statistical and spatial analysis: annual concentration of pollutants is not correlated with socioeconomic vulnerability

Table 4 Results of the Correlation Analysis

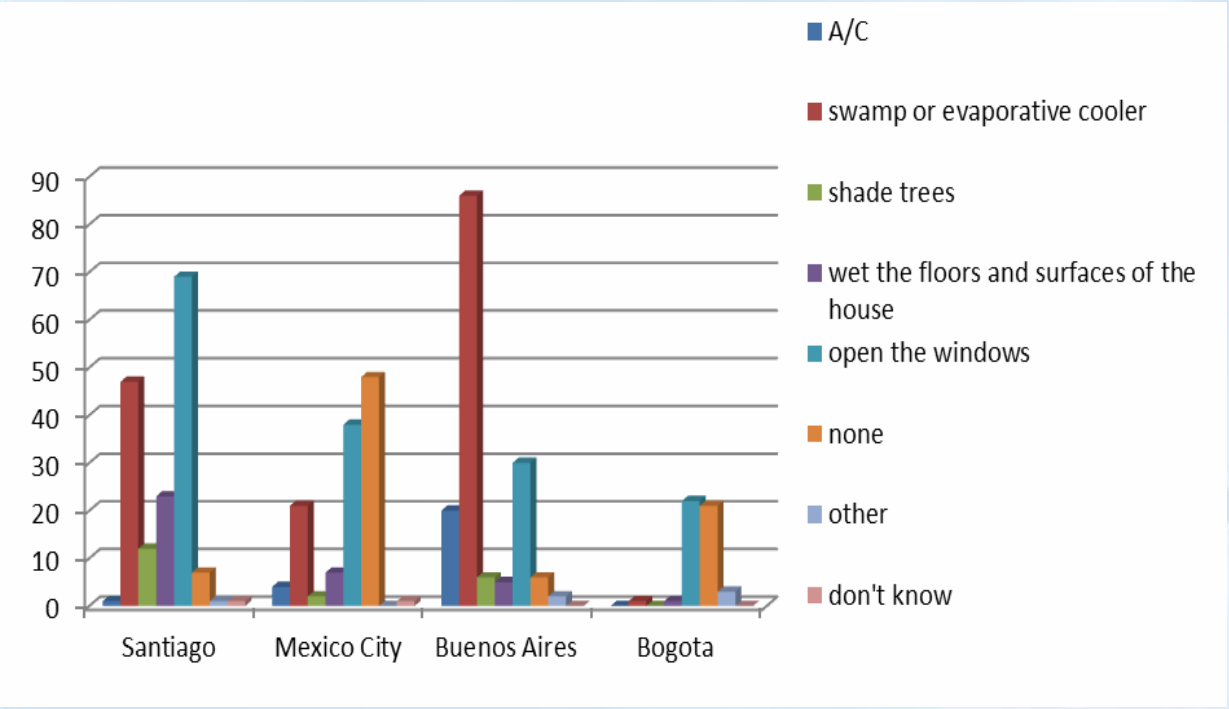
Variables	Mexico City			Bogota			Santiago		
	Pearson's r	Spearman's rho	Spatial correlation	Pearson's r	Spearman's rho	Spatial correlation	Pearson's r	Spearman's rho	Spatial correlation
ln (PM_{10}) & ln (MVI)	-0.165	-0.389	-0.346	-0.347	-0.041	-0.376	0.436	0.071	0.431
N	15	15	15	11	11	11	7	7	7
ln (NO_2) & ln (MVI)	0.026	0.118	0.106	0.634	0.452	0.687*	—[a]	—	—
N	18	18	18	8	8	8	—	—	—
ln (ozone) & ln (MVI)	-0.281	-0.256	-0.302	—[a]	—	—	-0.855*	-0.821*	-0.873***
N	17	17	17	—	—	—	7	7	7
ln (cardiovascular mortality rate) & ln (MVI)	-0.435**	-0.392**	-0.559*	0.169	0.086	0.227	-0.153	-0.160	-0.297
N	51	51	51	19	19	19	52	52	52
ln (respiratory mortality rate) & ln (MVI)	-0.077	-0.003	-0.200	0.149	0.035	0.206	0.003	-0.020	0.108
N	51	51	51	19	19	19	52	52	52

[a] No sufficient data for the analysis.
* = p < .05, ** = p < .01, *** = p < .001.

Source: Romero-Lankao, Qin and Borbor Cordova (2012 in review)

Perceptions and responses to risk: awareness important component of responses

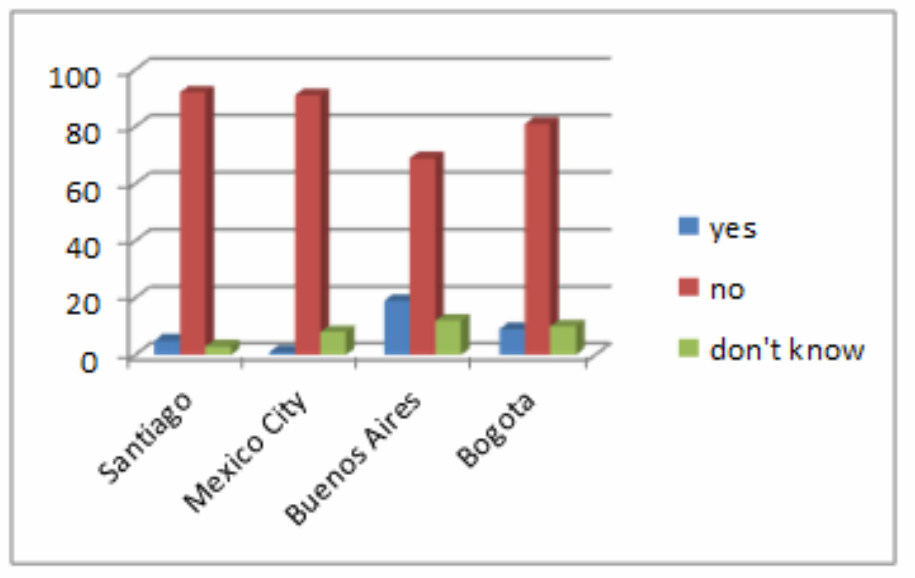
Actions to cool homes in the summer in selected communities



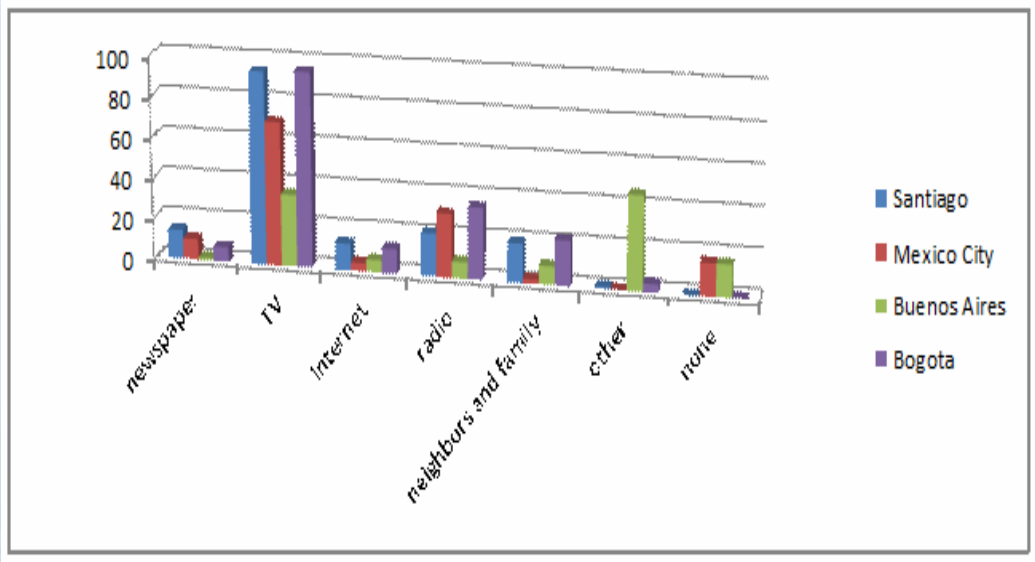
Responses depend on

- **City's latitude**
- **Temperature variability people are exposed to**
- **Available assets**
- **Available warning and emergency systems**
- **Social networks**

Awareness of Public Information Systems



How Respondents Receive Information about Events



Source: Romero-Lankao, Qin, Hughes, Borbor, Haeffner (2012)

Social networks (key determinant of capacity)

Buenos Aires

Discrepancy between how low and middle income communities use and relay information about emergency events

Low income communities:

- knew that an official system existed, but did not know how to use it.
- Instead, they relied on neighborhood networks and personal knowledge.

Middle income communities

- were more dependent on official announcements

From coping to adapting

A house in San Fernando Buenos Aires, one day after a Sudestada

People in San Fernando Buenos Aires should elevate buildings enough to withstand flood forces from storm-surges (Sudestadas)

Because of an unstable & inadequate asset base (e.g., job loss, economic hardship) many construct below the flood line

Source: Romero Lankao, Hughes, Qin, Rosas, Borquez 2012

Individual access to assets and options is insufficient to respond to climate risks

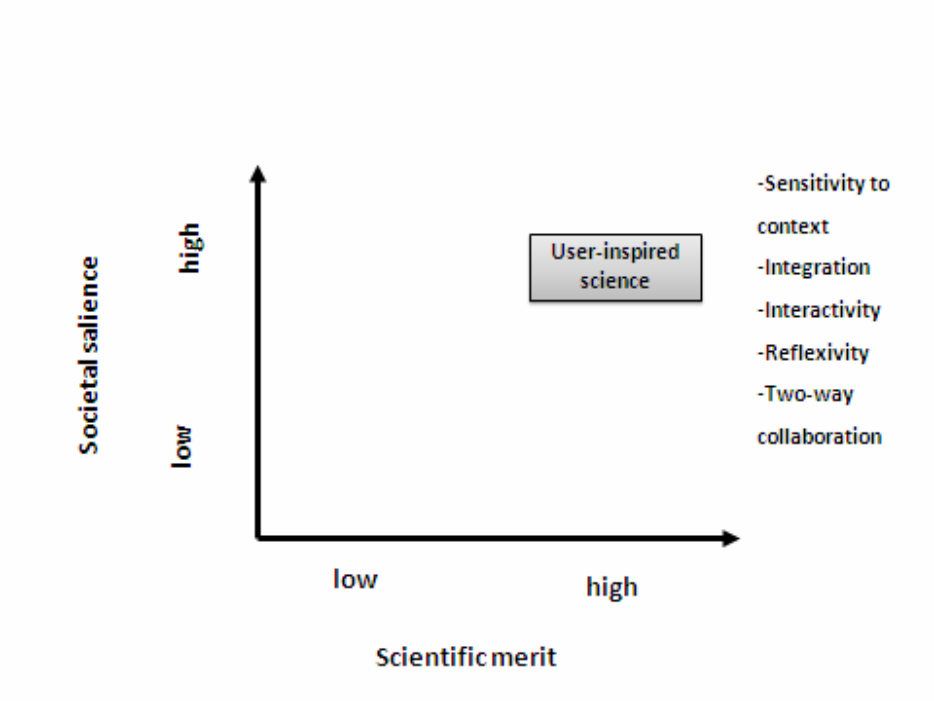
Structural and institutional governmental actions are key determinants of capacity

- E.g., settlement's "regular" status
  - Gives security from eviction
  - Incentivizes investment in house improvements
  - Is a requirement for infrastructure and service provision
  - Helps avoid stigmatizations that disempower people

"There were times that services would not come in the barrio because it was a red (dangerous, insecure) zone".

ADAPTE doing user-inspired interdisciplinary science

User-inspired interdisciplinary science



* Romero-Lankao, Borbor-Cordova, Abrutsky, Günther, Behrentz, and Dawidowsky (2012) Environmental Science and Policy Special Issue on Integrated Assessments

- **Common goal: research &/or policy relevant question**
- **Scholars with very different *mental models***
  - Shed light on diverse angles of complex question
  - Communication problems, frustration
- **Balance between two needs:**
  - Academic: bring forth new theories, methods, tools and insights
  - Societal: do research from which a social benefit may be derived
- **Equity of opinions between the scholars, and practitioners and communities**

Opportunities and challenges of ADAPTE as example of interdisciplinary research

ADAPTE workshop with community leaders, Buenos Aires Sept. 2011

- Sub-teams around areas of expertise and cities (students were key)
- Nature and interconnections between the different dimensions of vulnerability & risk
- Differences in culture & priorities of researchers and stakeholders
- Stakeholders have multiple competing goals, assets and powers
- Shorter-term, more tangible goals take priority
- Perceived longer-term goals, such as mitigation and adaptation are often dropped or down-played

Thank you!

The four A approach to enhance resilience to flooding in urban areas

Djordjevic´ et al., 2011