

**Climate change and conflict:
What do we know and where is research going?**

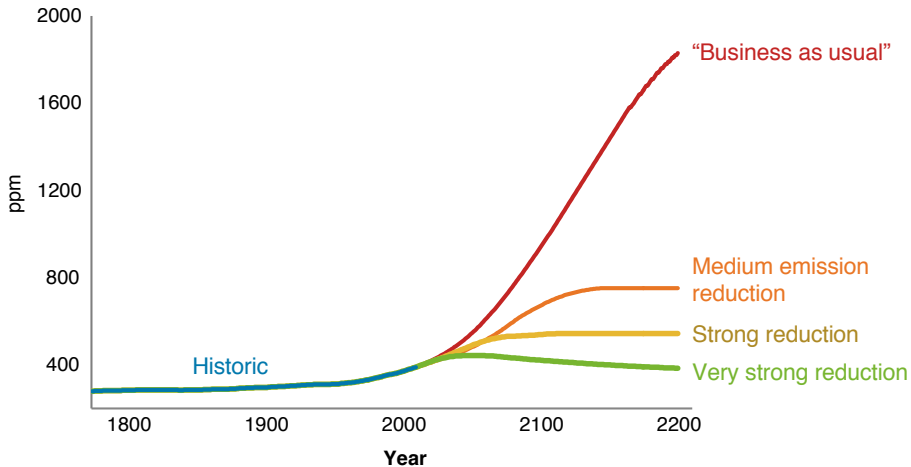
Solomon Hsiang

Global Policy Laboratory
University of California, Berkeley

15th Annual Workshop of the Households in Conflict Network
October 17, 2019 — Paris School of Economics

Climate Management in the Anthropocene

Atmospheric carbon-dioxide



Core scientific problem

The resources used to mitigate climate change should reflect the benefit of these investments to society.

Ultimately, this requires that we distinguish between

Hypothesis 1: The climate has small impact on modern human society.

Hypothesis 2: The climate has a large impact.

(Thinkers have debated this issue for centuries.)

This is a hard problem because

- climate is high-dimensional
- human society is high-dimensional
- many confounding factors

Tackling the problem through research design

The Ideal Experiment

1. Take two identical planets.
2. Change the climate of one (treatment).
3. Compare to control planet.

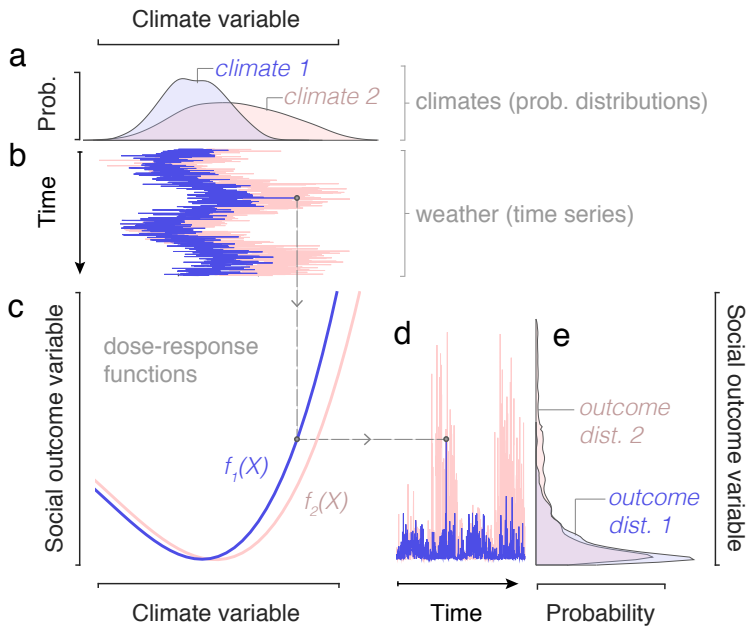
The Quasi-Experiment (that we can actually do)

Step one: Reconstruct a history of each population's physical exposure to climatic conditions.

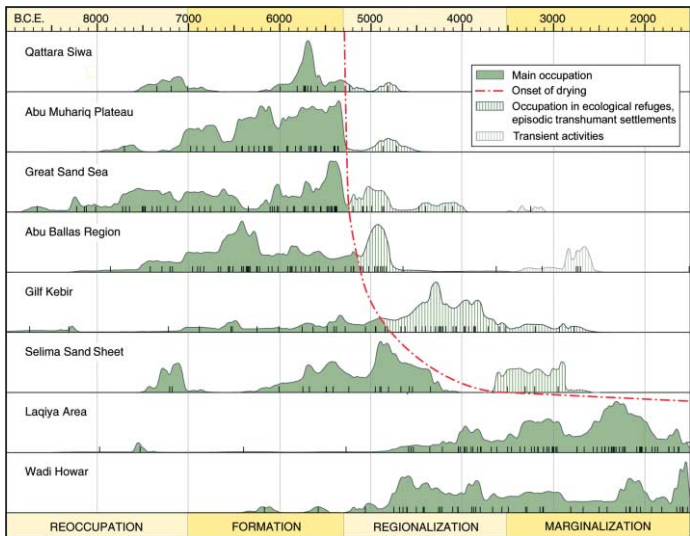
Step two: Estimate the effect of changes over time for each population:

High climate exposure - "treatment"

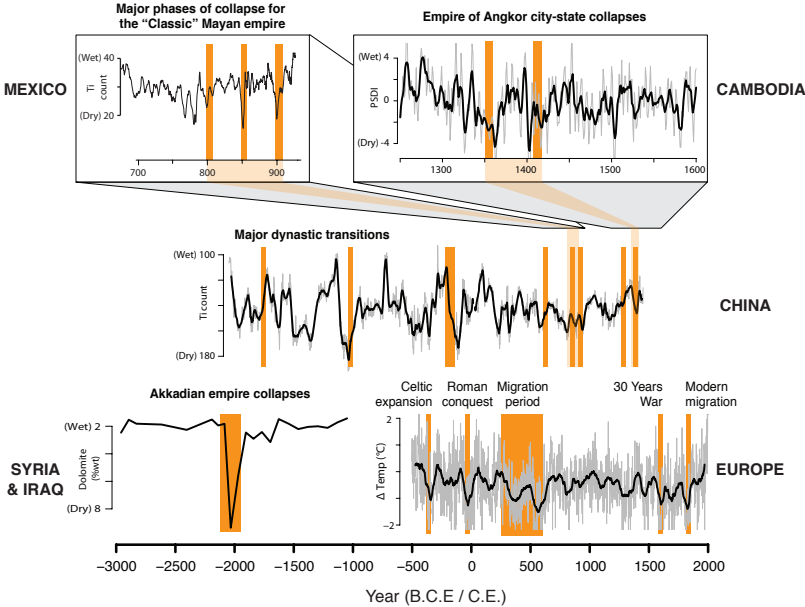
Low climate exposure - "control"



Pre-history: desiccation of the the Green Sahara

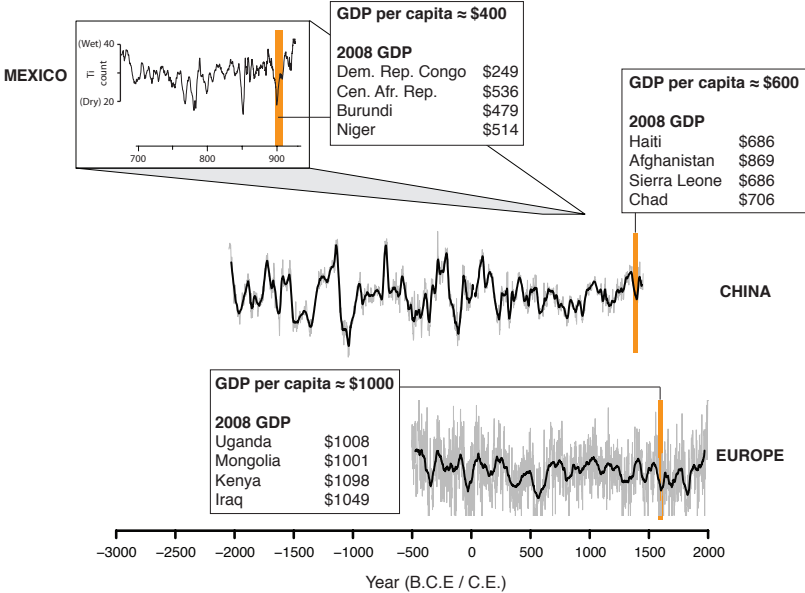


Historical evidence: climate shifts can destabilize societies



Hsiang, Burke & Miguel (Science, 2013)

Historical evidence: climate shifts can destabilize societies



Hsiang, Burke & Miguel (Science, 2013)

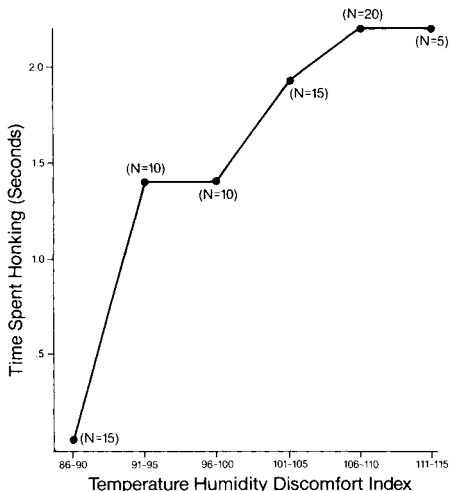
Finding a curious magazine reference (no data)...

“Almost all our subjects were high school dropouts, juvenile delinquents, parolees, and those awaiting the draft. When these people were subjected to high temperatures in groups of 48, there was continual arguing needling, agitating, jibing, fist-fighting, threatening, and even an attempted knifing. At lower temperatures or in small groups, this behavior diminished. However, when graduate students were similarly tested, later that fall, there was no aggressive behavior even at the highest heat-and-crowding levels.”

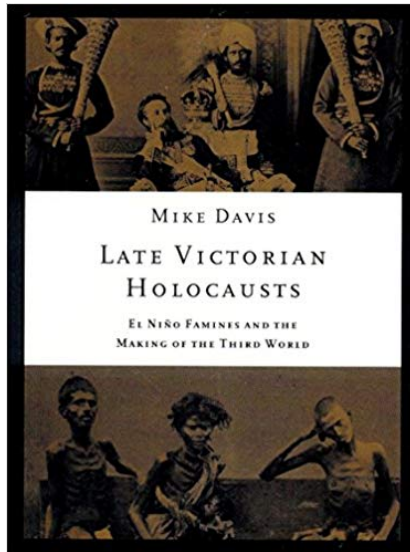
- F. Rohles (*Psychology Today*, 1967)

Today: Experimental psychology studies

- **Heat increases road rage** (Kenrick et al., 1986).
- **Heat increases police aggression** (Vrij et al., 1994).
- **Heat increases profanity on Twitter** (Baylis, 2017).



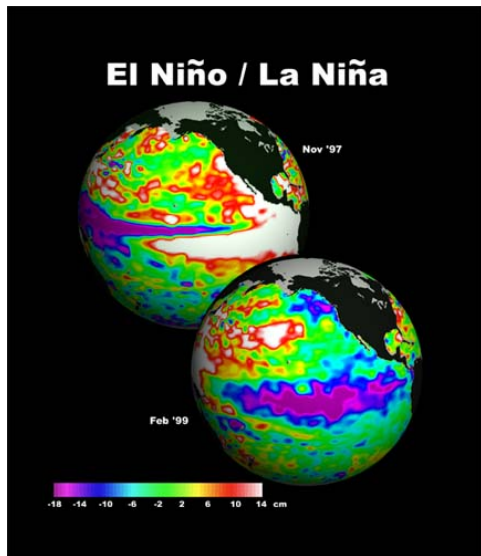
Picking up a book in 2008

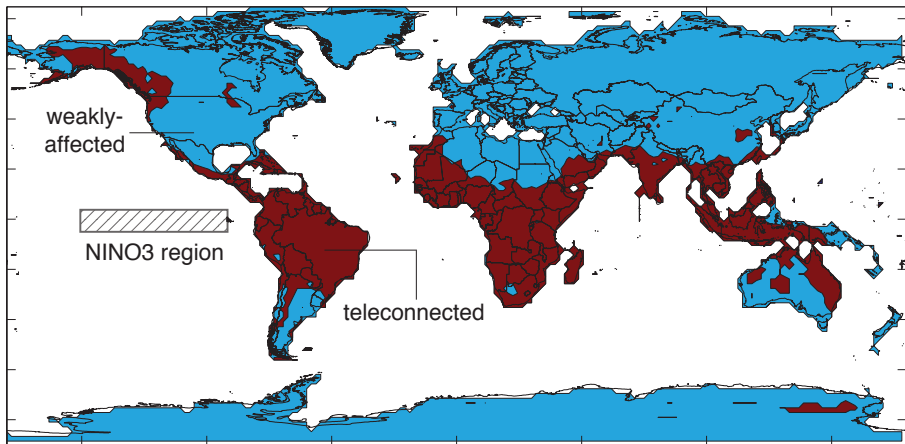


1877 El Niño (Madras)



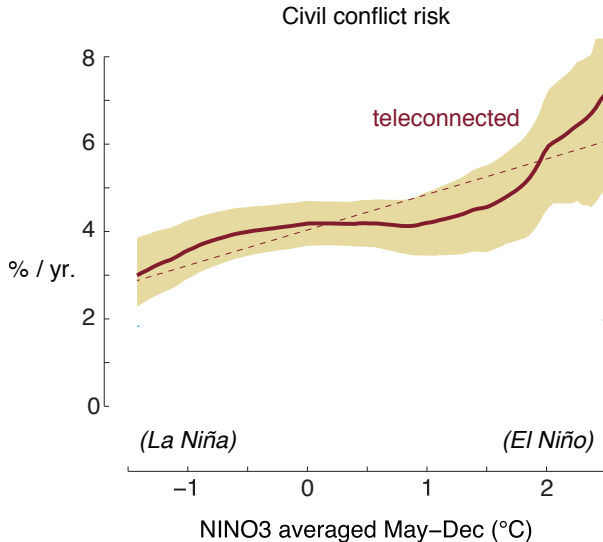
Does this still happen when the global climate changes?



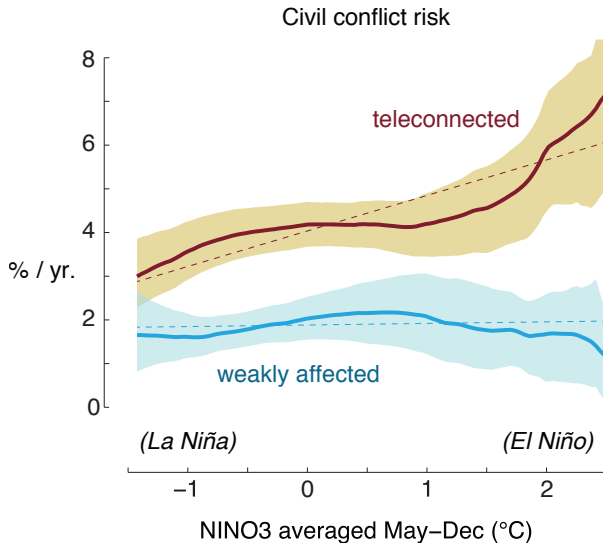


Hsiang, Meng & Cane (*Nature*, 2011)

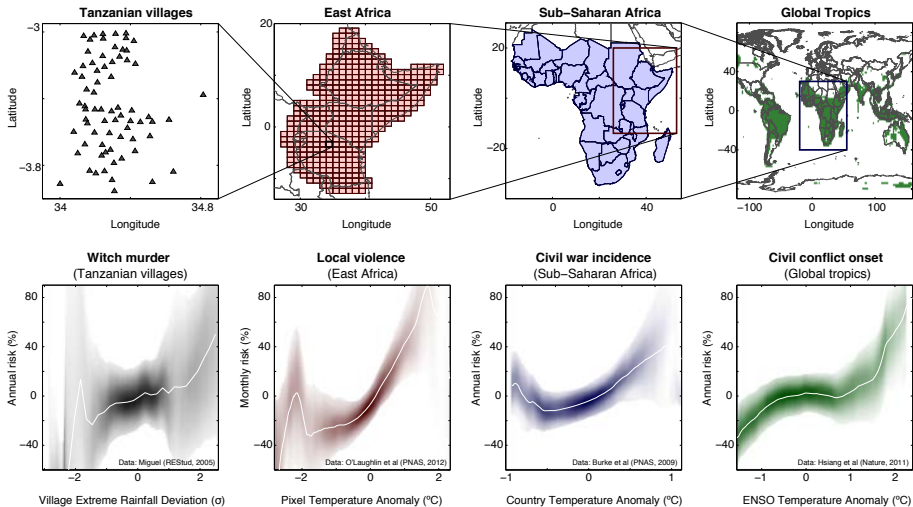
Modern civil conflicts (PRIO)



Modern civil conflicts (PRIO)

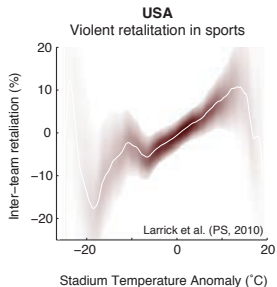
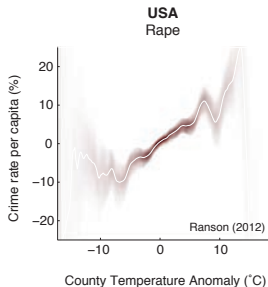
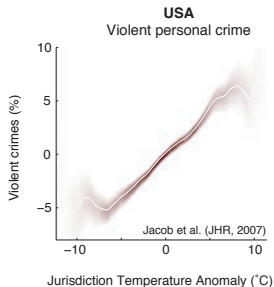
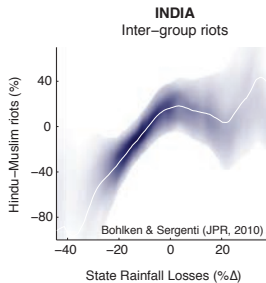
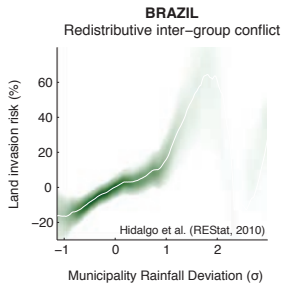
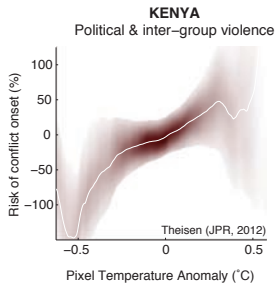


Climate & violence across scales of social organization

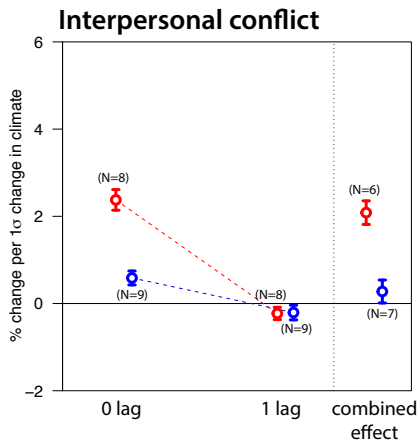
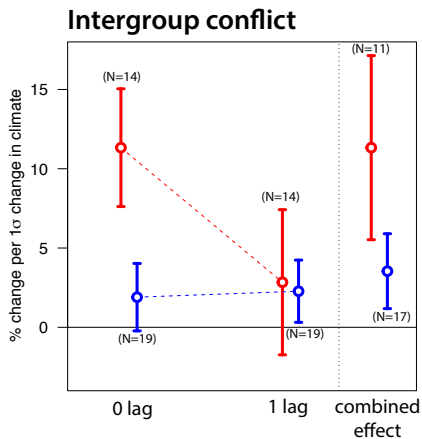


Hsiang, Burke & Miguel (Science 2013)

Replication around the world



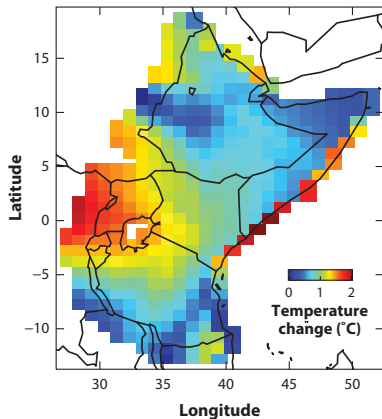
Synthesis via meta-analysis (55 studies)



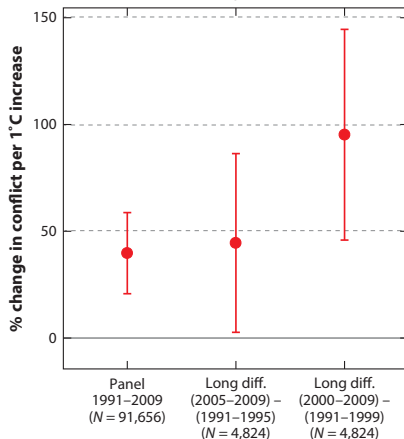
+1σ temperature → 11% intergroup conflict

Long run responses mirror (exceed?) short run

a Change in temperature (°C),
2005–2009 minus 1991–1995



b Short-versus long-run response



Stylized facts we can say

Plausibly causal association between climate variables & human conflict is observable across

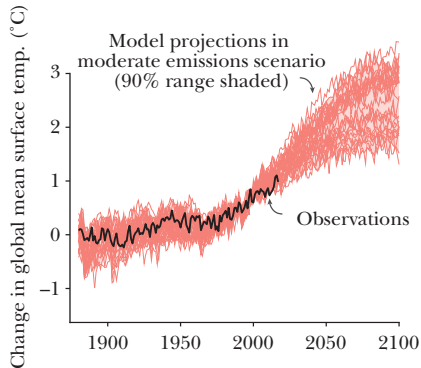
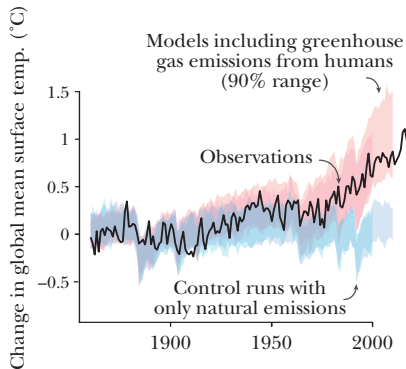
- ① all major regions of the world
- ② all of recorded human history
- ③ all scales of human aggregation (personal to nation-state)
- ④ all spatial scales (building to globe)
- ⑤ all temporal scales (hours to millennia)

What we are **not** saying with this result:

- The average effect is the effect everywhere (many papers show heterogeneity in-sample)

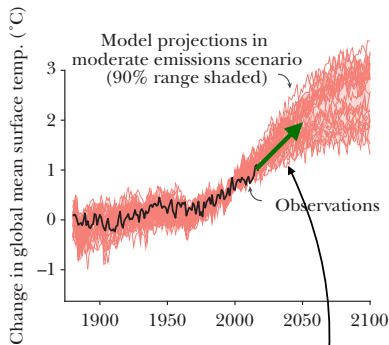
Is this quantitatively important for climate change?

Average Annual Global Mean Surface Temperature, Compared to Distributions of Climate Model Simulations



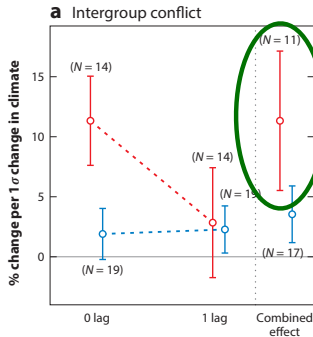
Hsiang & Kopp (J. Econ Perspectives, 2018)

Is this quantitatively important for climate change?



Hsiang & Kopp (*J. Econ Perspectives*, 2018)

Warming (RCP 4.5): 1C over 30 years



Burke, Hsiang, Miguel (*Annual Review of Economics*, 2015)

Temp effect: 11.3% per +s.d.

Is this quantitatively important for climate change?

Warming (RCP 4.5): 1C over 30 years

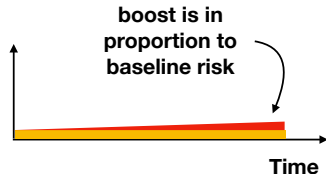
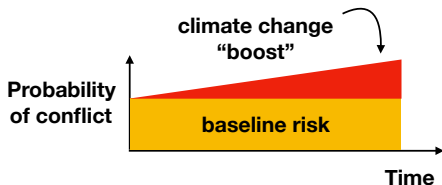
Temp effect: 11.3% per +s.d.

s.d. = 0.4C for avg country

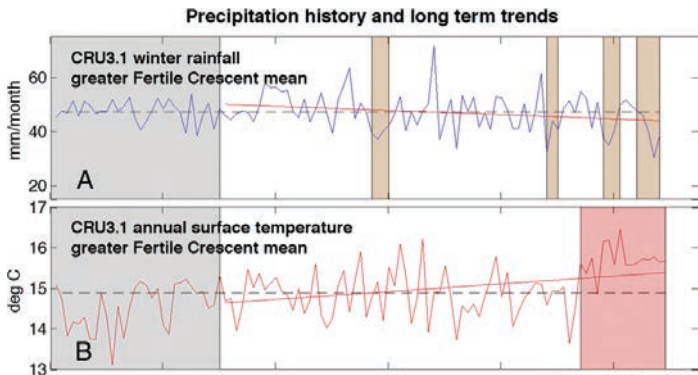
trend = 0.033 C / yr

Temp effect
= 28.25% / 1C for avg country

$(0.033 \text{ C / yr}) \times (28.25\% / 1\text{C}) = +0.93\% \text{ increase in risk / yr}$



Drought and conflict in Syria?



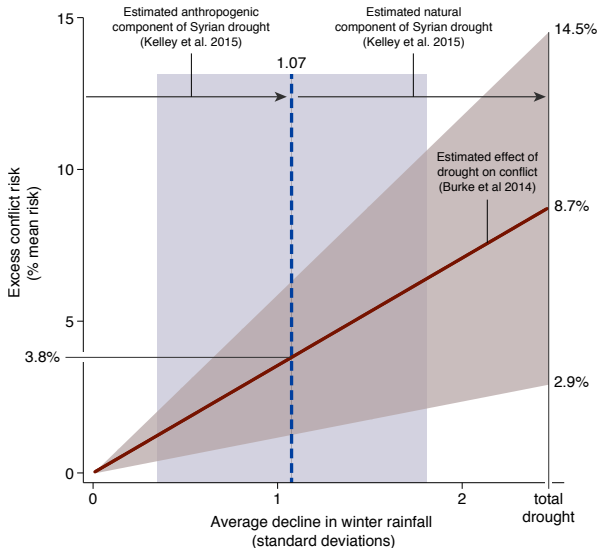
Kelly et al. (PNAS, 2014)

Finding: Climate change made the 2010 Syrian drought worse.

Remaining question: Did the draught cause the civil war?

How large do we think the climate's role was?

Separate risk caused by natural and anthropogenic components of the drought



Interpreting the reduced form relationship

$$\frac{d\text{Conflict}}{d\text{Climate}} = \sum_i \frac{\partial \text{Conflict}}{\partial \text{Pathway}_i} \cdot \frac{\partial \text{Pathway}_i}{\partial \text{Climate}}$$

What could the pathways be?

Hypothesis 1: **External economic factors**

→ e.g. deteriorating agricultural labor markets

Hypothesis 2: **Logistical factors**

→ e.g. individuals come into contact outdoors during summer

Hypothesis 3: **Government capacity**

→ e.g. weakened government enables violence

Hypothesis 4: **Internal psychological factors**

→ e.g. mechanics of decision-making changes

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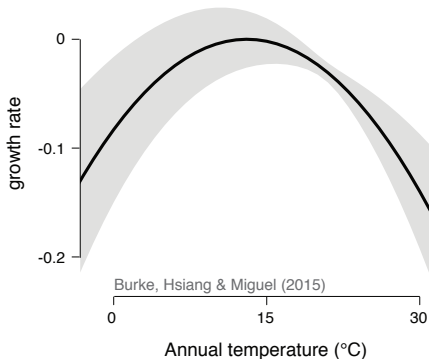
Hypothesis 4: **Internal psychological factors**

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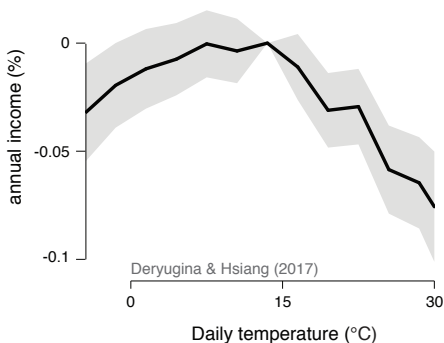
Climate as a major economic force (GDP growth)

Income per person

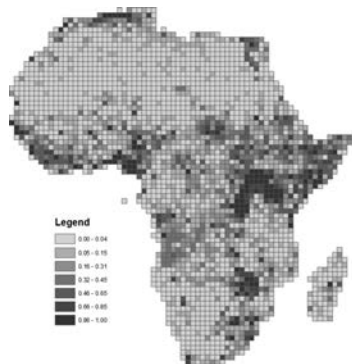
Globally (countries)



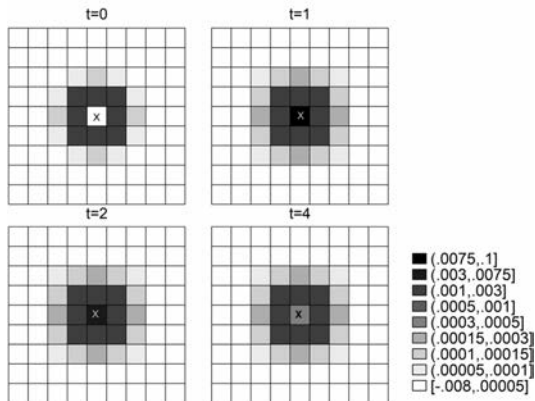
United States (counties)



Spatial dynamics in Africa



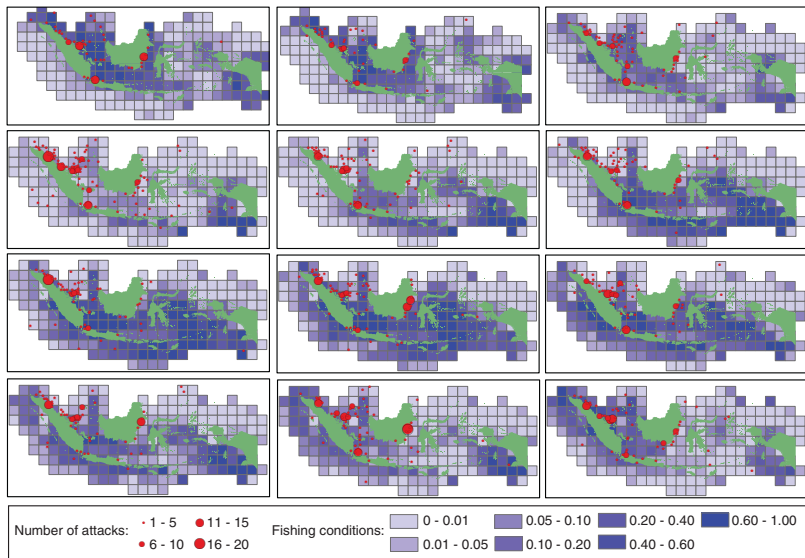
A. Fraction of Years with at Least One Conflict Event, 1997–2011



B. Spatial Impact of a One-Time SPEI Growing Season Shock on Conflict Incidence

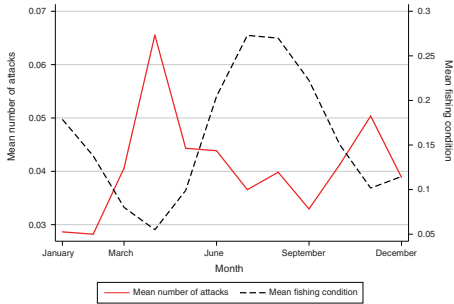
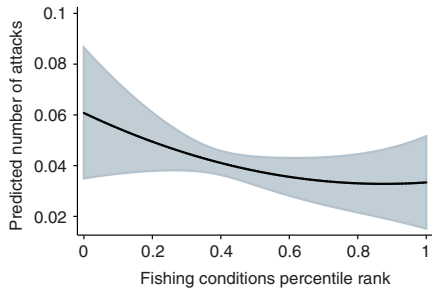
Harari & La Ferrara (ReStat, 2018)

Climate → labormarket → conflict



Axbard (AEJ: Applied, 2016)

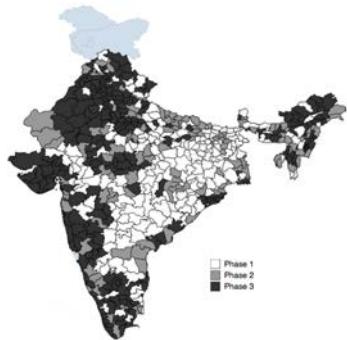
Climate → labormarket → conflict



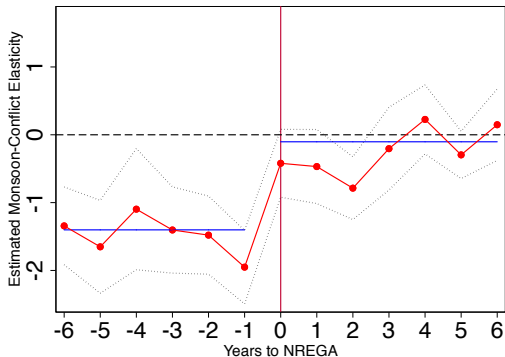
Axbard (AEJ: Applied, 2016)

Climate → unemployment → conflict

Panel C: Districts by NREGA Phase

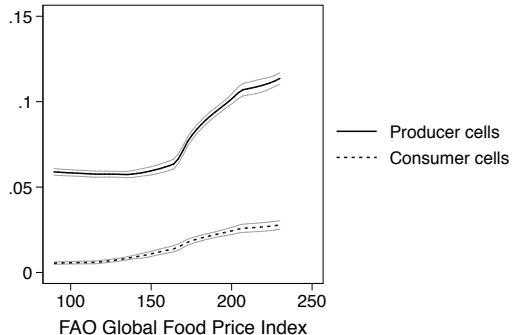
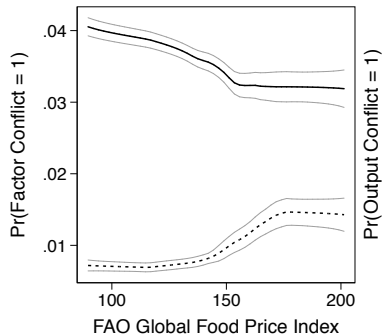


Panel A: Total Number of Events



Fetzer (2014)

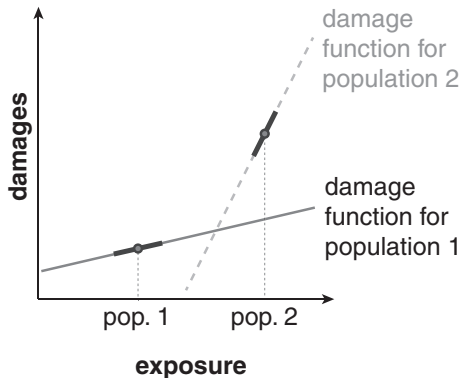
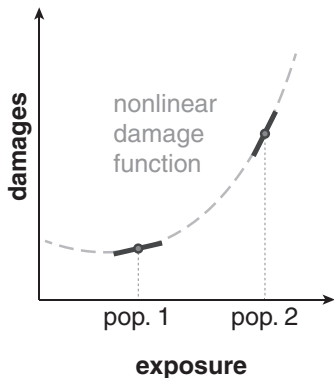
Climate → food prices → conflict



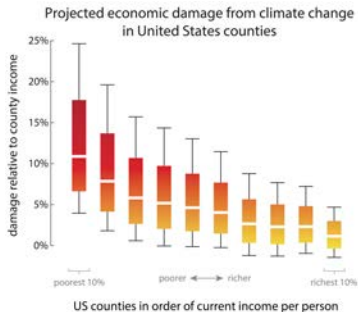
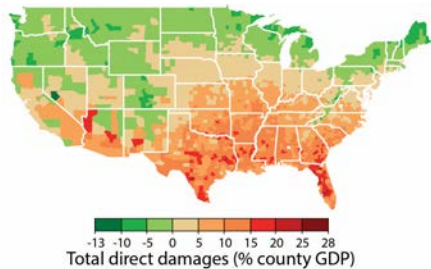
McGuirk & Burke (2017)

Climate → inequality → conflict (open question)

Two possible ways to generate inequality from climatic events:



Climate change driving economic inequality in the USA



Hsiang, Kopp, Jina, Rising, et al (Science 2017)

What could the pathways be?

Hypothesis 1: **External economic factors**

→ e.g. deteriorating agricultural labor markets

Hypothesis 2: **Logistical factors**

→ e.g. individuals come into contact outdoors during summer

Hypothesis 3: **Government capacity**

→ e.g. weakened government enables violence

Hypothesis 4: **Internal psychological factors**

→ e.g. mechanics of decision-making changes

Climate → logistics → conflict

[INSERT EVIDENCE HERE]

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Hypothesis 3: Government capacity

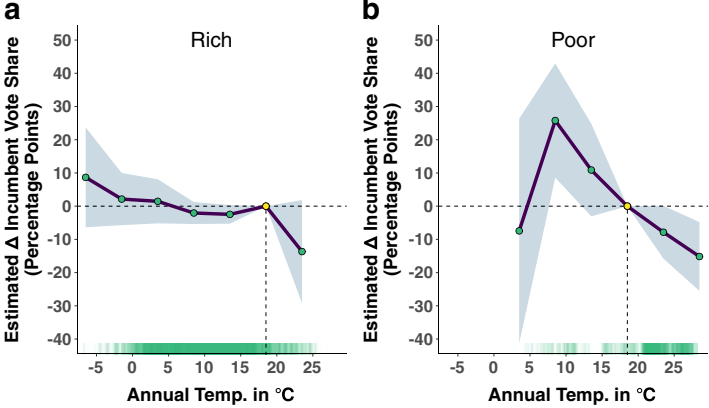
→ e.g. weakened government enables violence

Hypothesis 4: Internal psychological factors

→ e.g. mechanics of decision-making changes

Climate → loss of public support → conflict

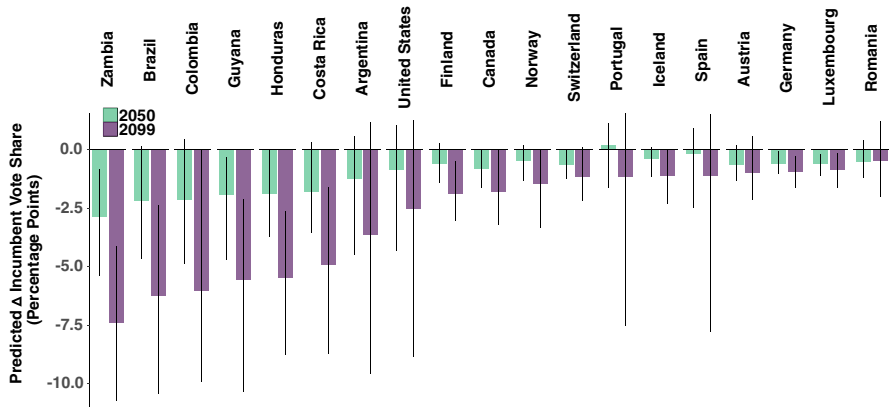
Democratic loss by incumbent



Obradovich (Climatic Change, 2017)

Climate → loss of public support → conflict

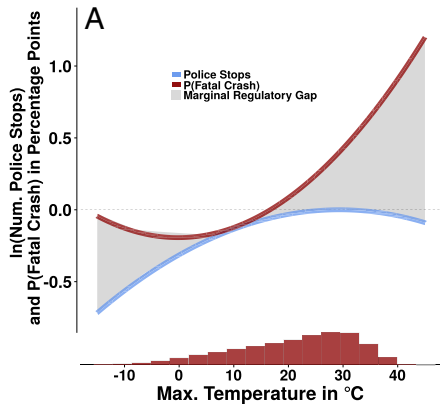
Projected to causes more democratic churn...



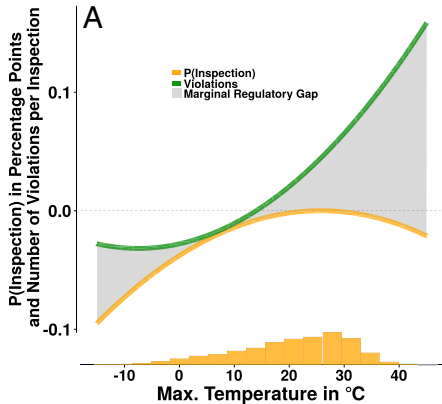
Obradovich (Climatic Change, 2017)

Climate → “everyday governance” → conflict

Police stops & fatal crashes



Food inspections & violations



Obradovich, Tingley, Rawhwan (PNAS, 2019)

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Individual psychology and intergroup violence?

ROMEO & JULIET

Act 3, Scene 1a (A street. Mercutio, Benvolio & Servants).

BENVOLIO:

I pray thee, good Mercutio, let's retire.

The day is hot, the Capulets abroad,

And if we meet we shall not 'scape a brawl,

For now these hot days is the mad blood stirring.

— *William Shakespeare*

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Then Tybalt kills Mercutio, Romeo kills Tybalt, blood war ensues...

The Benvolio Hypothesis:

Temperature → Mind → Interpersonal violence → Intergroup violence

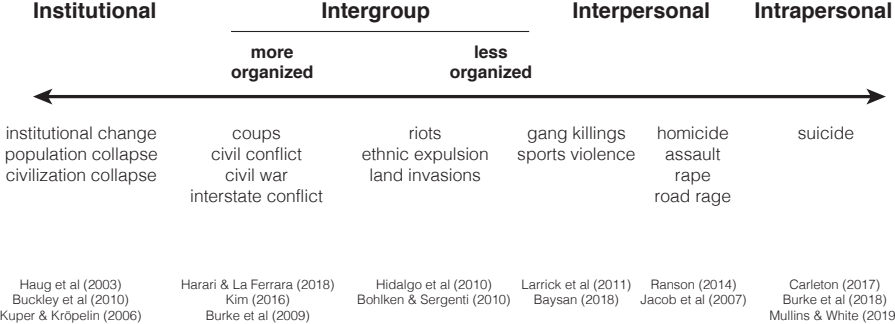
The Benvolio Hypothesis:

Temperature → Mind → Interpersonal violence → Intergroup violence

Requires:

- Isolation of a decision-making channel
- Exclude logistical, governance & economic channels
- Mechanism for escalation

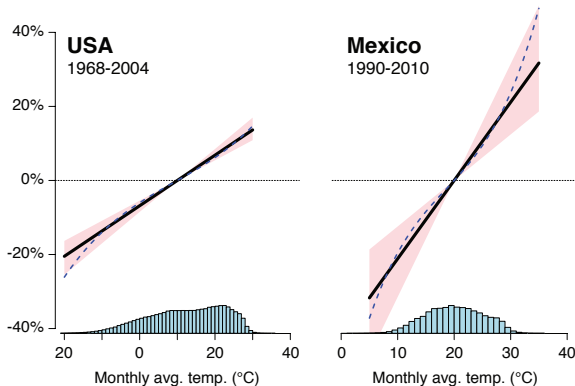
“The Spectrum of Violence”



Baysan et al (2019)

North American self-harm suggests psychological pathway

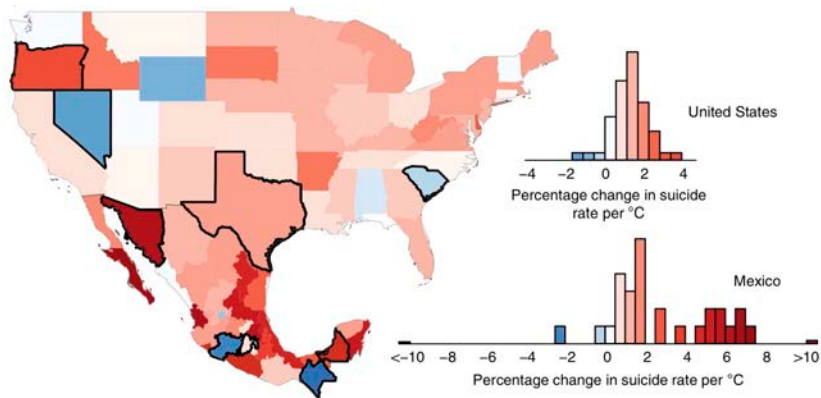
Percentage change in suicide rate



Burke et al. (Nature Climate Change, 2018)

Note: Self-harm causes more deaths globally than all forms of interpersonal + intergroup violence combined. In top 5 causes of death in USA, ages 10-54.

North American self-harm suggests psychological pathway



Burke et al. (Nature Climate Change, 2018)

Scrutinizing decision-making mechanics w/ lab experiments

- We ran two parallel large-scale behavioral experiments in Berkeley, USA (N = 903) and Nairobi, Kenya (N = 1015).
- Randomly assign subjects to Hot (30°C) or Control (22°C) room.
- Deployed a battery of 14 standard tests to understand if / how temperature affected social / economic decision-making
 - e.g. charitableness, patience, trust, **“joy of destruction”**

Scrutinizing decision-making mechanics w/ lab experiments

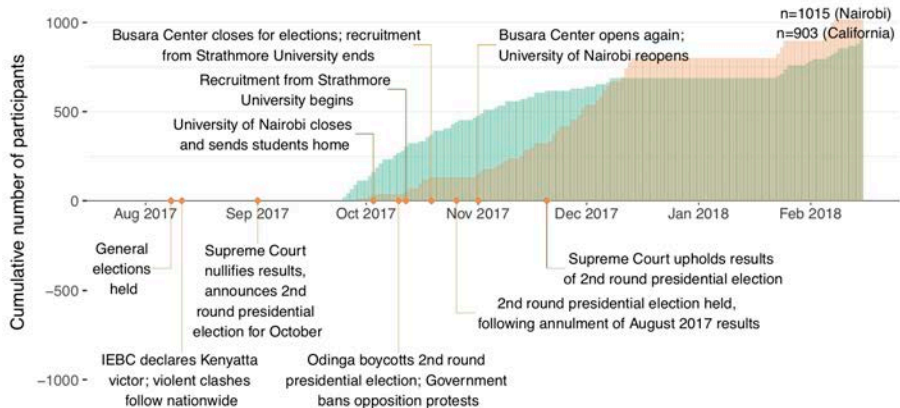
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 - e.g. charitableness, patience, trust, **“joy of destruction”**
 - almost nothing changed
 - **except destructiveness increases +50% in Kenya**

Kenyan presidential election is “stolen” during experiment

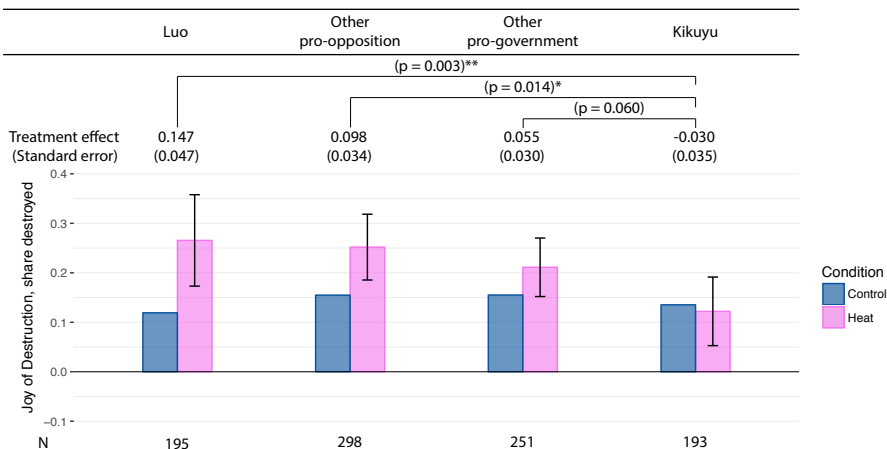
This was not planned.



Almas et al (2019)

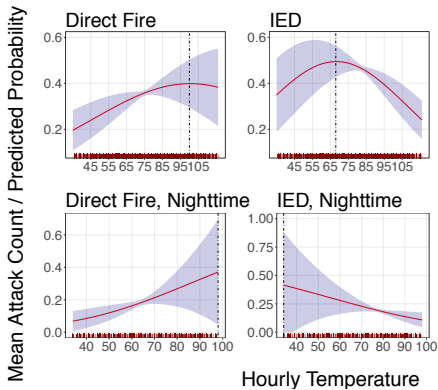
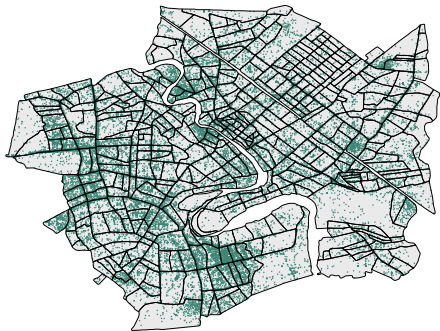
Unexpected findings × political context

Luo - felt election was stolen; **Kikuyu** - won election



Note: No effect in Berkeley. We interpret this cautiously.

Climate → psychologically motivated escalation → conflict



Shaver & Bollfrass (2018)

What could the pathways be?

Hypothesis 1: **External economic factors**

- labor markets → pretty strong evidence
- food prices → some evidence
- widening inequality → no direct evidence

Hypothesis 2: **Logistical factors**

→ basically no evidence

Hypothesis 3: **Government capacity**

→ some evidence

Hypothesis 4: **Internal psychological factors**

→ some evidence

Thank you

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