Quantifying the Impact of Climate on Human Conflict

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This talk: Climate and conflict

• What is the impact of climate on conflict and violence?
  → Important implications for understanding future climate change impacts and policy priorities

• Comprehensively assess existing research, and analyze (and re-analyze) multiple datasets to estimate the impact of climate on conflict across societies, history

• Based on a new paper with Sol Hsiang (Princeton)
This talk: Climate and conflict

- Existing research spans multiple academic disciplines (economics, political science, criminology, history, archeology, climate science), timeframes, scattered datasets, statistical methods, and conceptual frameworks

- No comprehensive synthesis or meta-analysis exists

- **Main conclusion:** a striking degree of agreement that high temperatures and other extreme climate outcomes are associated with more violence.

Evidence on climate and violence

- **62 studies** (published, unpublished), using 49 datasets.
- A rapidly expanding field: the median study is from 2011.

- New analysis: we obtained 17 different datasets, and re-analyzed data from **11 papers** and reinterpreted results from **11 others**, sometimes with divergent results and conclusions than the original article.

- Many existing studies do not include year or location fixed effects; include outcomes (i.e., income) as “controls”; do not jointly estimate the impact of climate variables; do not account for spatial clustering and serial correlation.
Evidence on climate and violence

- Three main types of studies:
  1. Historical climatology and paleoclimatology (N=12)
     - Did key historical episodes occur during climatic anomalies, using “tree ring” data?
  2. Experimental psychology studies (N=2)
     - Are lab subjects more aggressive at high temperatures?
  3. Observational studies using panel data (N=48)
     - Is armed conflict more common in high temperature and/or low rainfall years?

(1) Historical climatology and paleoclimatology

- Evidence from a variety of civilizations (Maya, Angkor Wat, Chinese dynasties, Akkadian empire) that exceptionally dry and/or hot periods are associated with political collapse

  - E.g., the Maya civilization experienced three extended multi-year droughts in the 9th century AD that are thought to have precipitated its collapse (Haug et al. 2003, Science)

  - Collapse of the 9th century Chinese Tang dynasty linked to the same extended drying (Yancheva et al. 2007, Nature)
(2) Experimental psychology studies

- Laboratory studies find impacts of ambient temperature on subject aggression; possible hormonal channels.

- Vrij et al. (1994): **Dutch police in a training exercise** were more likely to shoot at a simulated intruder when randomly placed in a high temperature room (27° C / 80° F) than at lower temperature (21° C / 70° F).

- Does aggression lead to “escalation” of potential conflicts?

- Kenrick et al. (1986): high temperatures are linked to more horn honking in a field experiment, when experimenters deliberately stood still when lights turned green
Observational studies using panel data

- The largest number of studies estimate impacts of climate on national-scale violence, often on armed civil conflict.

- **Miguel, Satyanath and Sergenti (2004)** were first to show that civil conflict is more likely following adverse rainfall shocks across African countries during 1981-1999. Rainfall correlates with GDP growth (IV first stage).

- Building on MSS, recent studies regress outcome $y$ on weather deviations, and country and time fixed effects:
  \[
  y_{it} = \alpha + \beta_1 Temp_{it} + \beta_2 Precip_{it} + \eta_i + \delta_t + \varepsilon_{it}
  \]

- The results are remarkably consistent: all 24 empirical studies that focus on temperature estimate a positive association between higher temperatures and violence. This pattern seems extremely unlikely to happen by chance.
- 16 of 18 rainfall studies have a consistent sign.
- Three quarters are statistically significant at 95% confidence.
- Holds at scales ranging from the village, to region, country and the globe, using a common statistical specification.
Temperature and violence in Africa, across scales

Climatic impacts on intergroup violence, crime

Kenya
Political & inter-group violence (Kenya) - Thielen (JPJR, 2012)

Brazil
Redistributive inter-group conflict (Brazil) - Hidalgo et al. (RESiStat, 2010)

India
Inter-group riots (India) - Bohnen & Serpent (JPJR, 2010)

USA
Violent personal crime (USA) - Jacob et al. (JPJR, 2007)
Rape (USA) - Ranson (2013)
Violent inter-group retaliation (USA) - Larrick et al. (PS, 2010)
Estimated climatic impacts and CI’s

- Are effects “large”?
- In a meta-analysis, the mean impact of a 1 s.d. change in temperature is a **+19% increase** in intergroup conflict

Projected temperature increase (s.d.), to 2050

- Most of Sub-Saharan Africa and South Asia is projected to experience average warming of **at least 3 s.d. (2°C)** by 2050, suggesting the risk of conflict could rise considerably
Climate and conflict: looking forward

- **The bottom line**: there is a remarkably consistent relationship between adverse weather and human violence across time and space.
  - Climate change could have serious implications for global political stability and economic development.

- Global **mitigation** (pollution control) efforts are critical but currently stalled politically

- An **adaptation** agenda is also desperately needed:
  - New crop varieties, insurance schemes, and other programs to reduce sensitivity to future climate change.