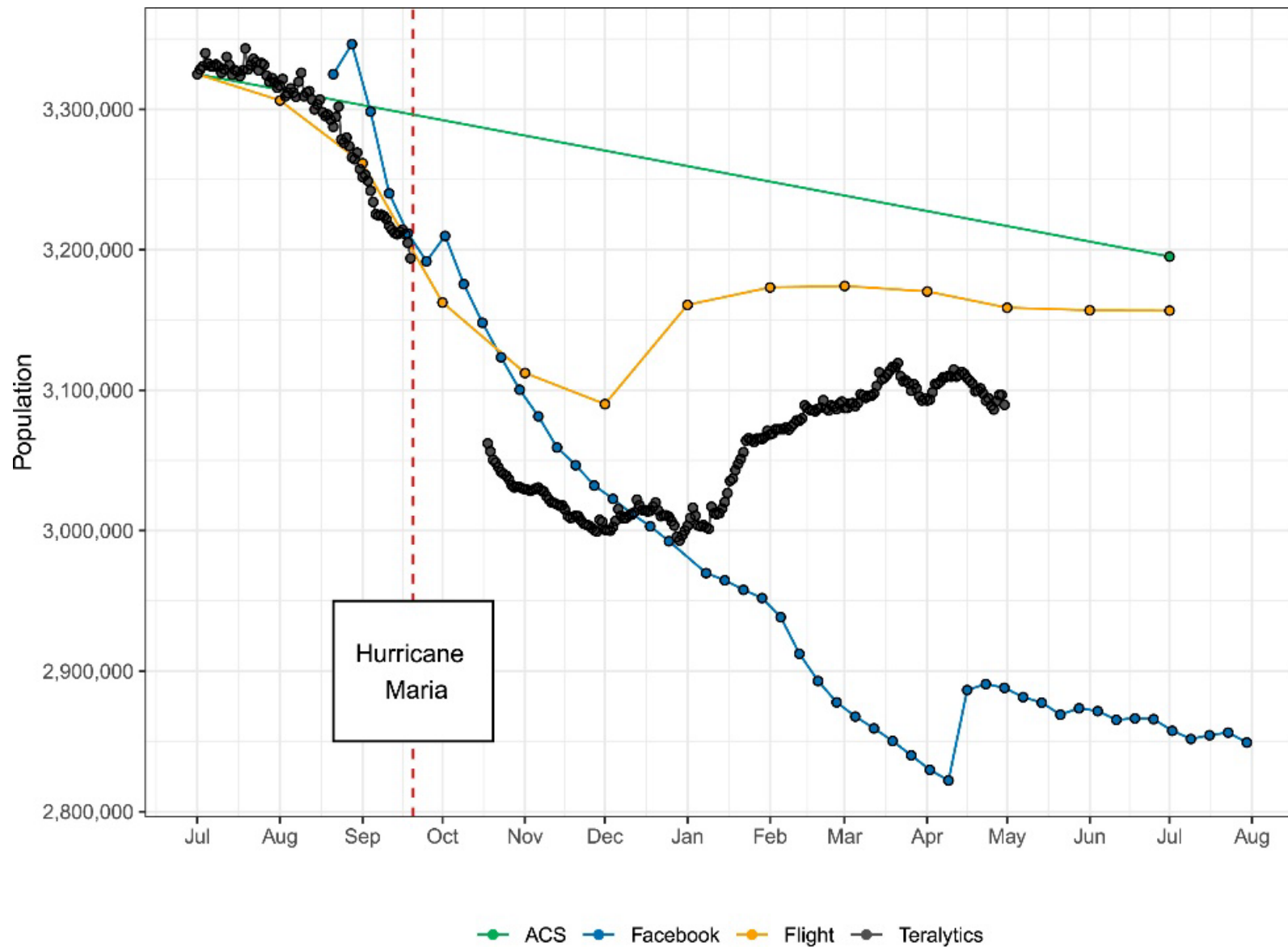


Climate hazards and migration data

- We agree that bringing together climate exposures and human responses involves data and measurement challenges
 - What is the smallest common unit of analysis?
 - Nation, state, county, geographic defined unit, block groups, households, individuals
 - What questions are we trying to answer?
 - Do climate-related exposures / hazards have a marginal effect on human migration?
 - Are there selection effects, e.g. disparities, in hazard-related migration?
- Spatial and temporal data on a hazard event that produced migration response:
 - Hurricane Maria's impact on Puerto Rico

Puerto Rico migration after Hurricane Maria

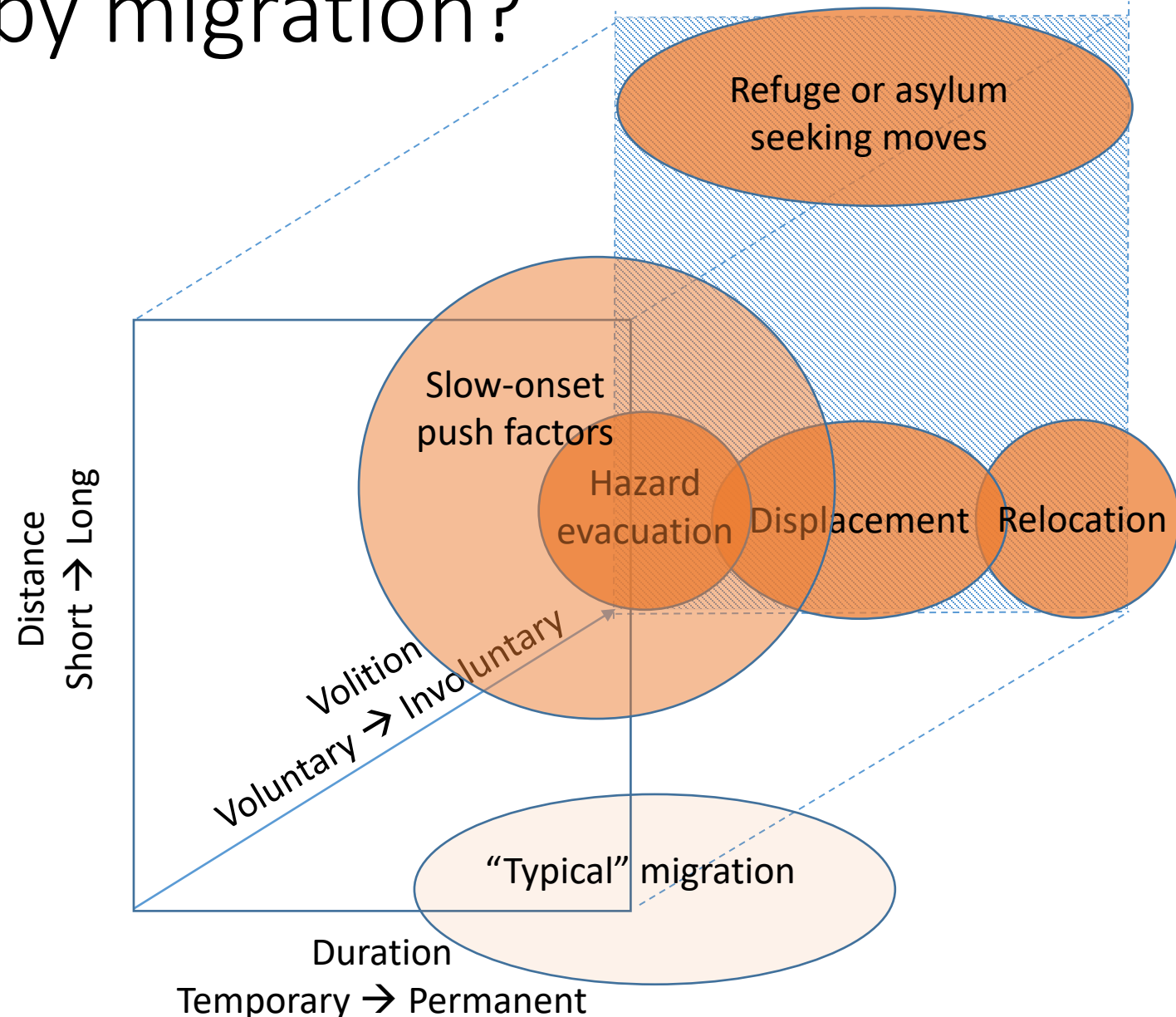
Migration data source	Cost / Access	Timeliness	Frequency of observations	Population representative	Demographic measures
Social media, e.g. Twitter	Low / Proprietary	Fast	Continuous	No	Few
Bureau of Transportation Statistics, e.g. passenger counts	Free / Government	Fast	Monthly	Yes	None
Consumer records, e.g. credit, cell phone	Low / Restricted	Slow	Quarterly	No	Few
IRS migration flows	Free / Public	Slow	Annual	No	Few
ACS/PRCS	Free / Public	Slow	Annual	Yes	Many
Specialized survey	High / Proprietary	Medium	One time	Yes	Many



Source: Acosta, et al. (2020). Quantifying the dynamics of migration after Hurricane Maria in Puerto Rico, Proceedings of the National Academy of Sciences 117(51): 32772-32778.

What do we mean by migration?

- Distance
 - Local → International
 - Short → Long
- Duration
 - Temporary → Permanent
 - Days → Years
- Volition
 - Voluntary → Involuntary
 - Migration aspirations
 - Specific motivations
 - Pushes and pulls



Forced migration examples in the US



Evacuation and displacement

- Precipitated by disaster event and related losses
- Prolonged and complex residential mobility, often involving return to pre-disaster home
- Policy uncertainty prolonged residential mobility and exacerbated inequality



Homeowner buyouts

- Requested by localities after repeated hazard-related damages
- Gradual removal of residences away from hazardous areas
- Program benefits homeowners and exacerbates inequality



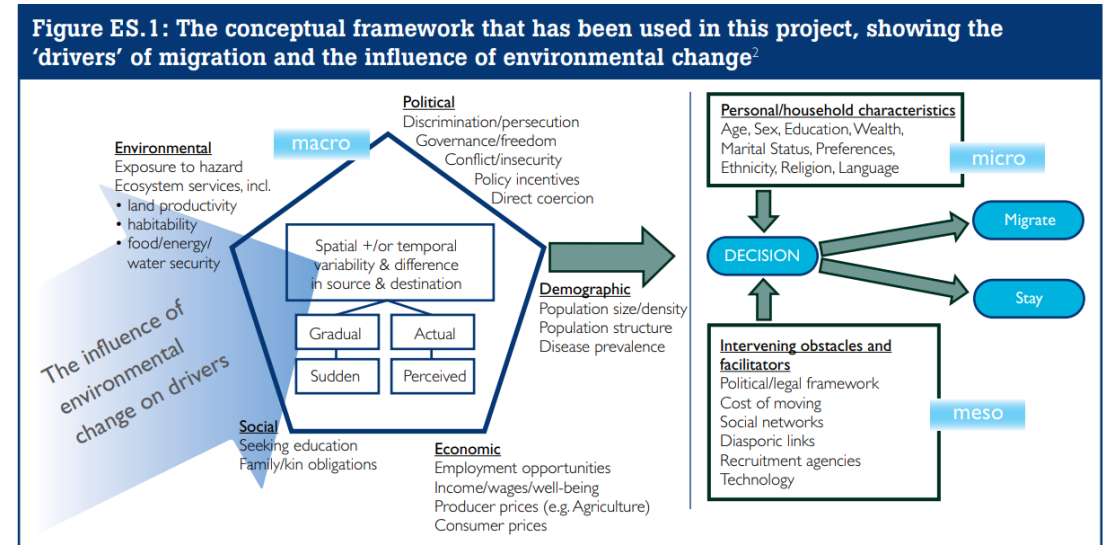
Community relocation

- Forced by slow environmental change, repeat hazard events, and/or government declaration
- Slow, negotiated process and many residents moved independently
- New location is 40 miles north and planned community is under construction

Theory and interpretive frameworks

- Meso and micro variables allow us to assess selective migration
- Common unit of analysis identifies community partners and stakeholders who can provide vital information on the linkages between the earth and social systems

-



Sudden lake drain event had more complex environmental causes and societal implications than remote sense data reveals...

LEO Network says:

This event resulted in a cross knowledge, multi-discipline collaboration including local and indigenous knowledge holders and NSF scientists associated with the topics of permafrost and rain-on-snow events. A rich dialogue has resulted and site visits, remote data collection and analysis. The dialogue that has transpired is provided below. Research involving the site is on-going and follow up images and reports will be provided as they are received. See published paper on event (attached) by Jones et. al. Thank you to the Tessiers and Jackie Schaeffer for sharing this observation and (Tessiers) being a welcoming host to the research teams that have participated. Thanks also to members of the NSF community who have contributed their time and resources towards this significant event and import symptom of the ongoing climate change-related impacts on the Arctic landscape. *M. Brubaker*

