

Wildfires, power outages, and vulnerability in California



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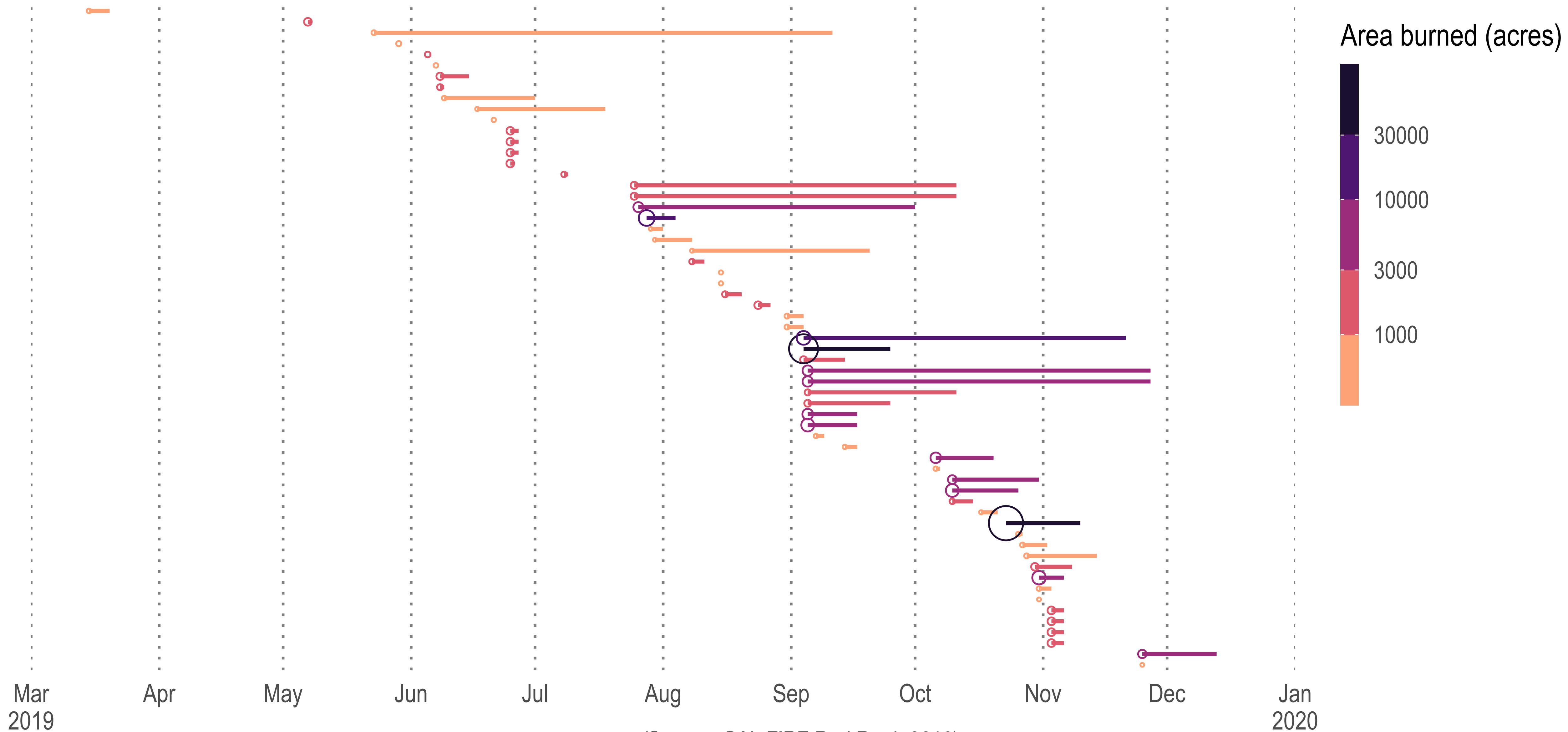
Department of Epidemiology and Population Health
Stanford University School of Medicine



Shenyue Jia, PhD

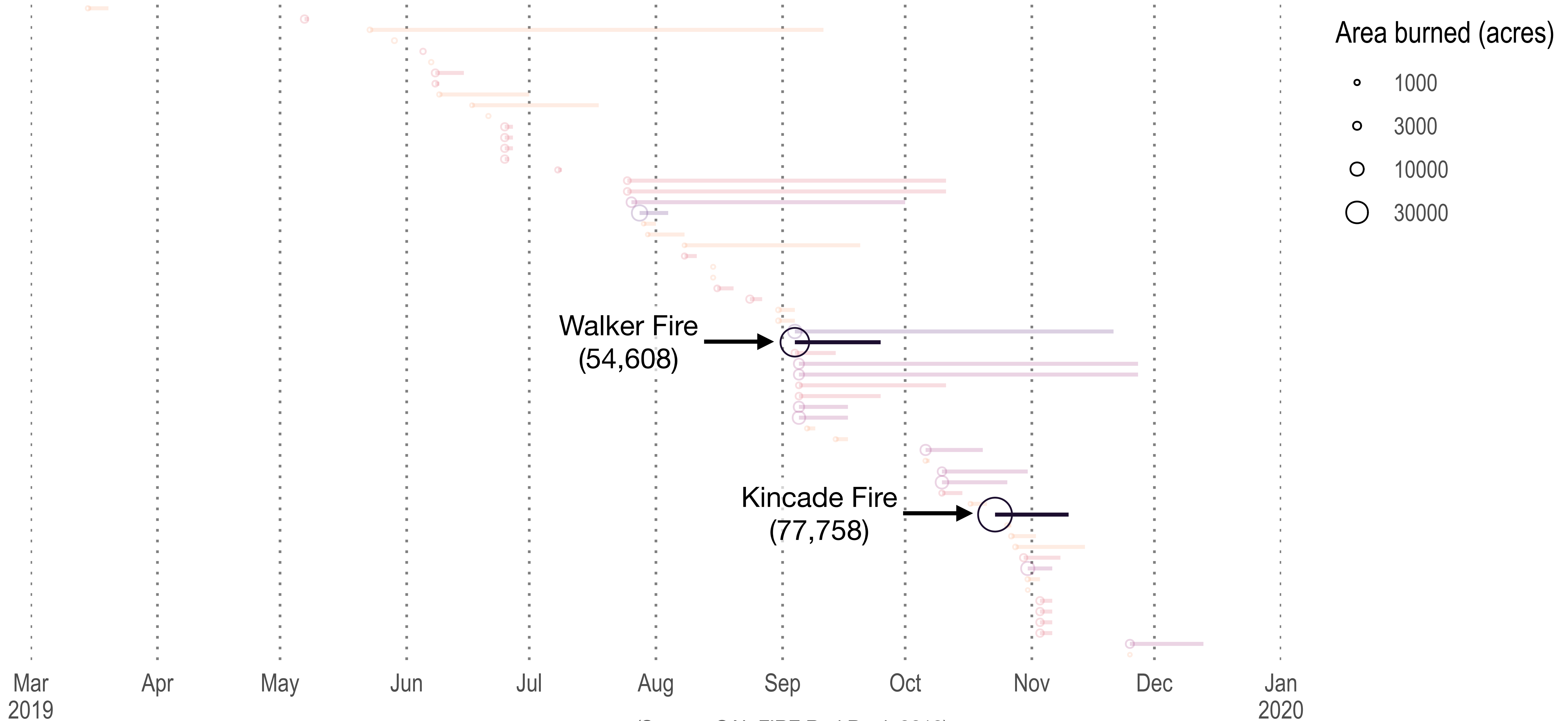
Center for Excellence in Earth Systems Modeling and Observations
Chapman University

California Fires in 2019



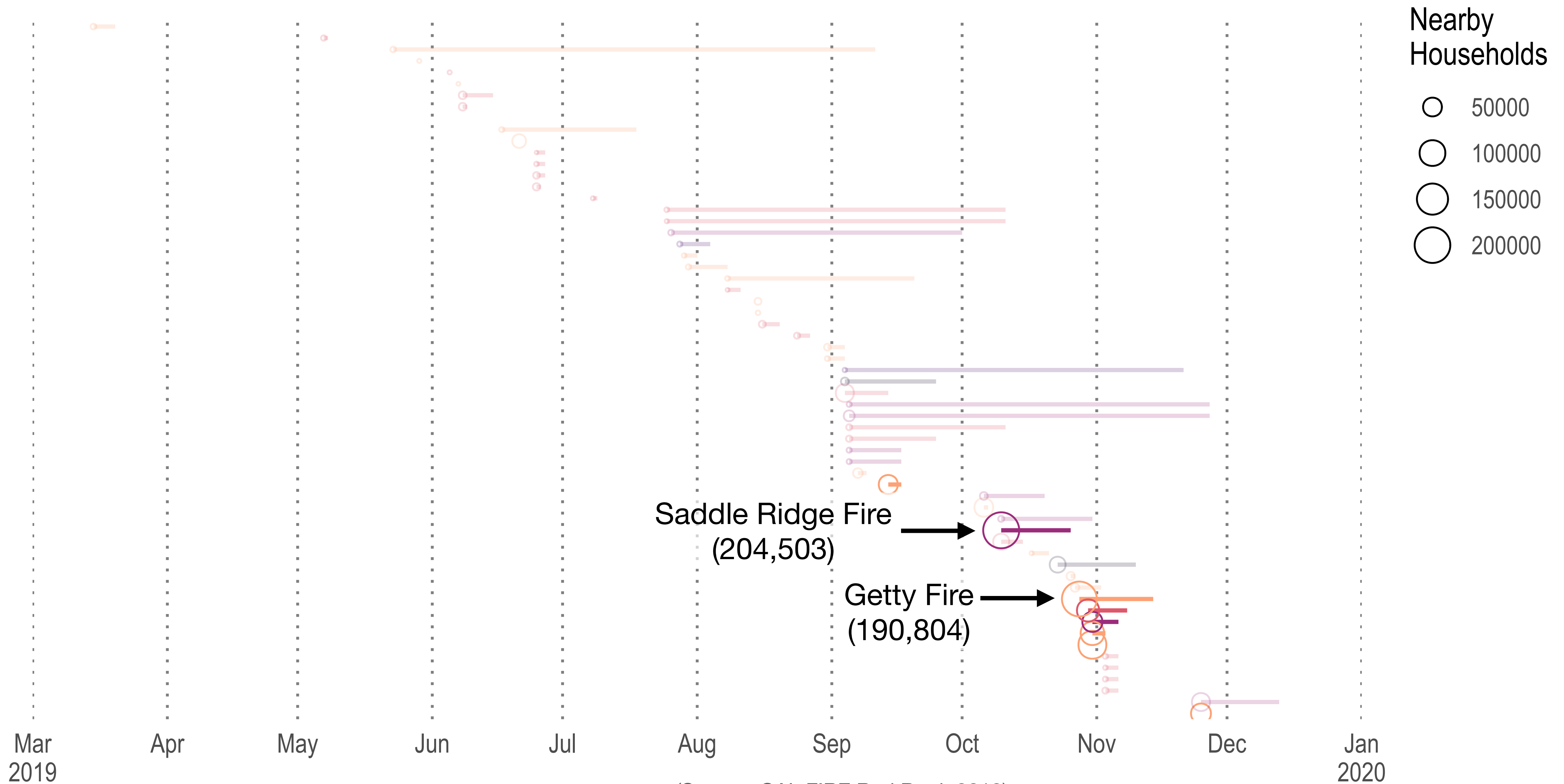
(Source: CAL FIRE Red Book 2019)

Two Largest Fires in 2019



(Source: CAL FIRE Red Book 2019)

Fires that threatened households



Getty Fire

Nearby
Households



Mar
2019

Apr

May

Jun

Jul

Aug

Sep

Oct

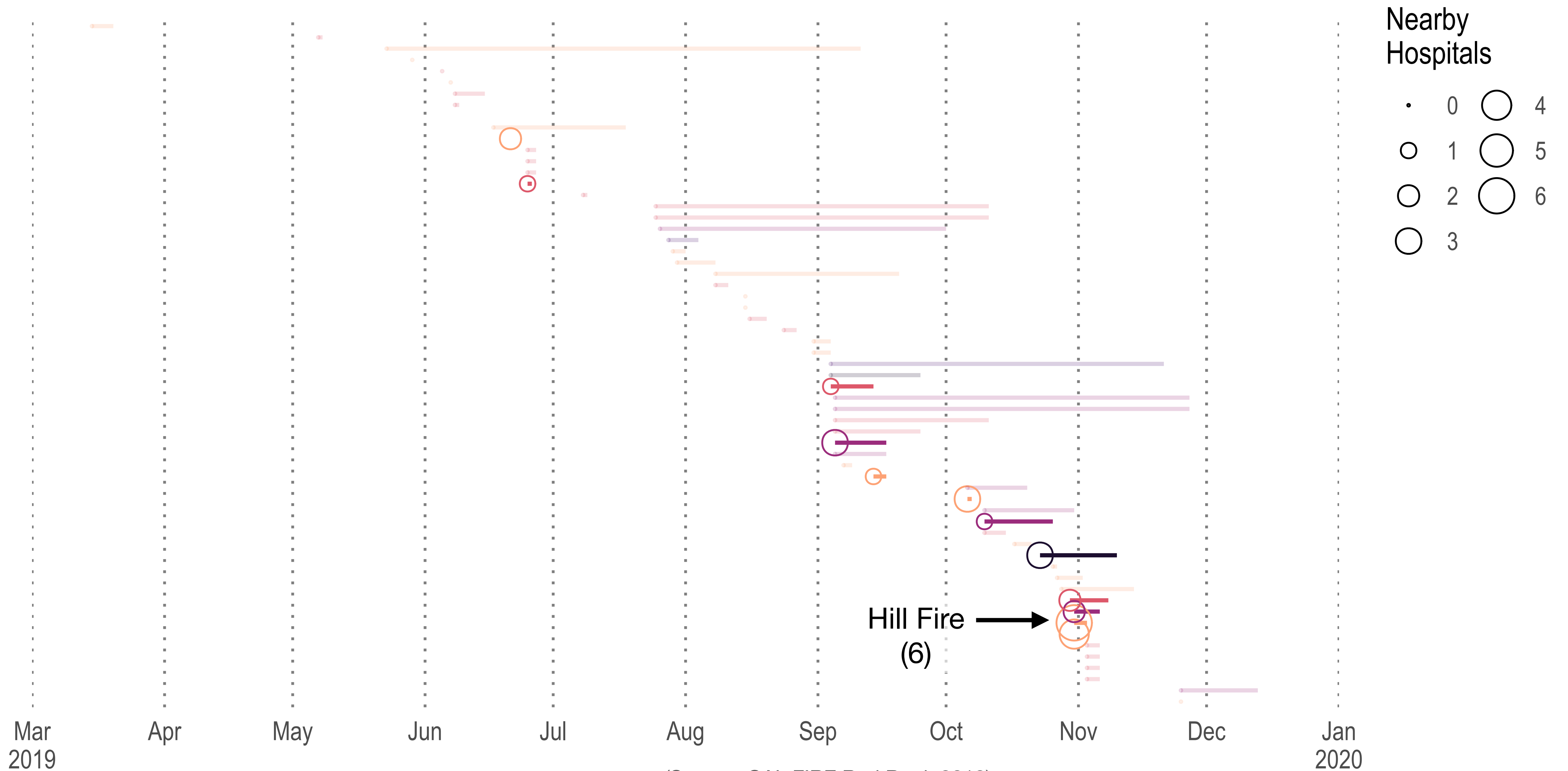
Nov

Dec

Jan
2020

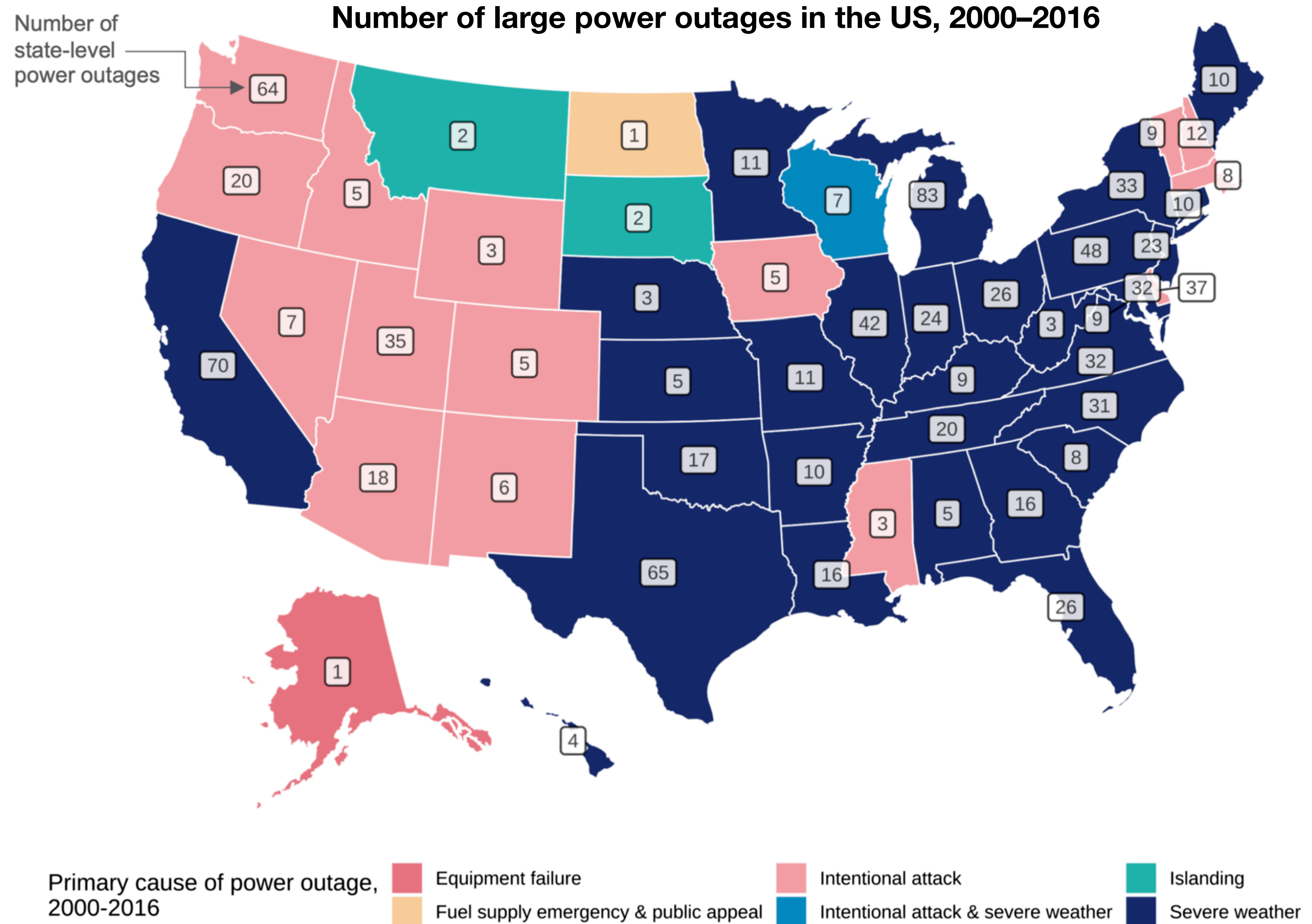
(Source: CAL FIRE Red Book 2019)

Fires that threatened hospitals



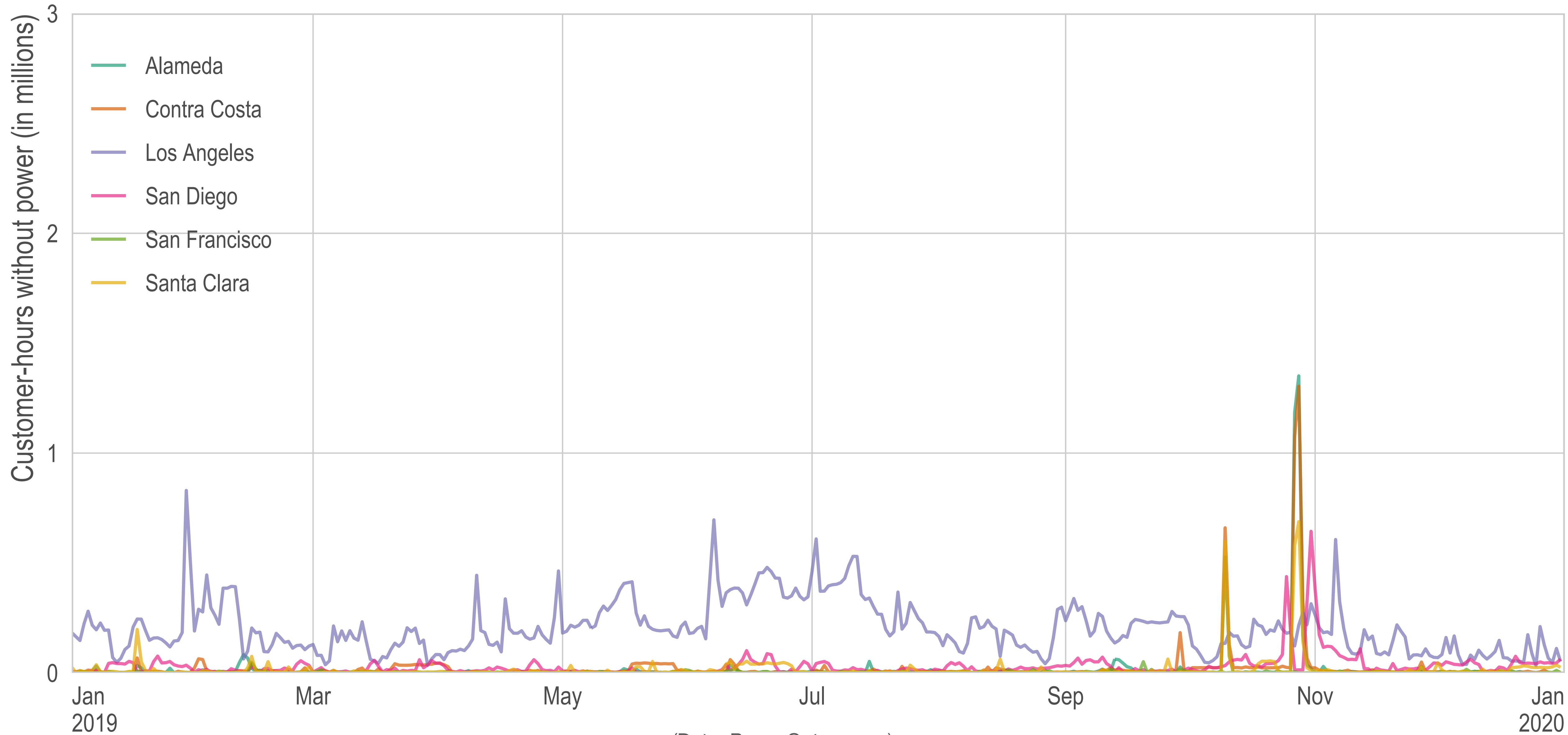
Power outages can be deadly

- Carbon monoxide poisoning
- Gastrointestinal illness
- Heart attack
- Injury
- Mental health
- Renal disease
- Temperature-related illness



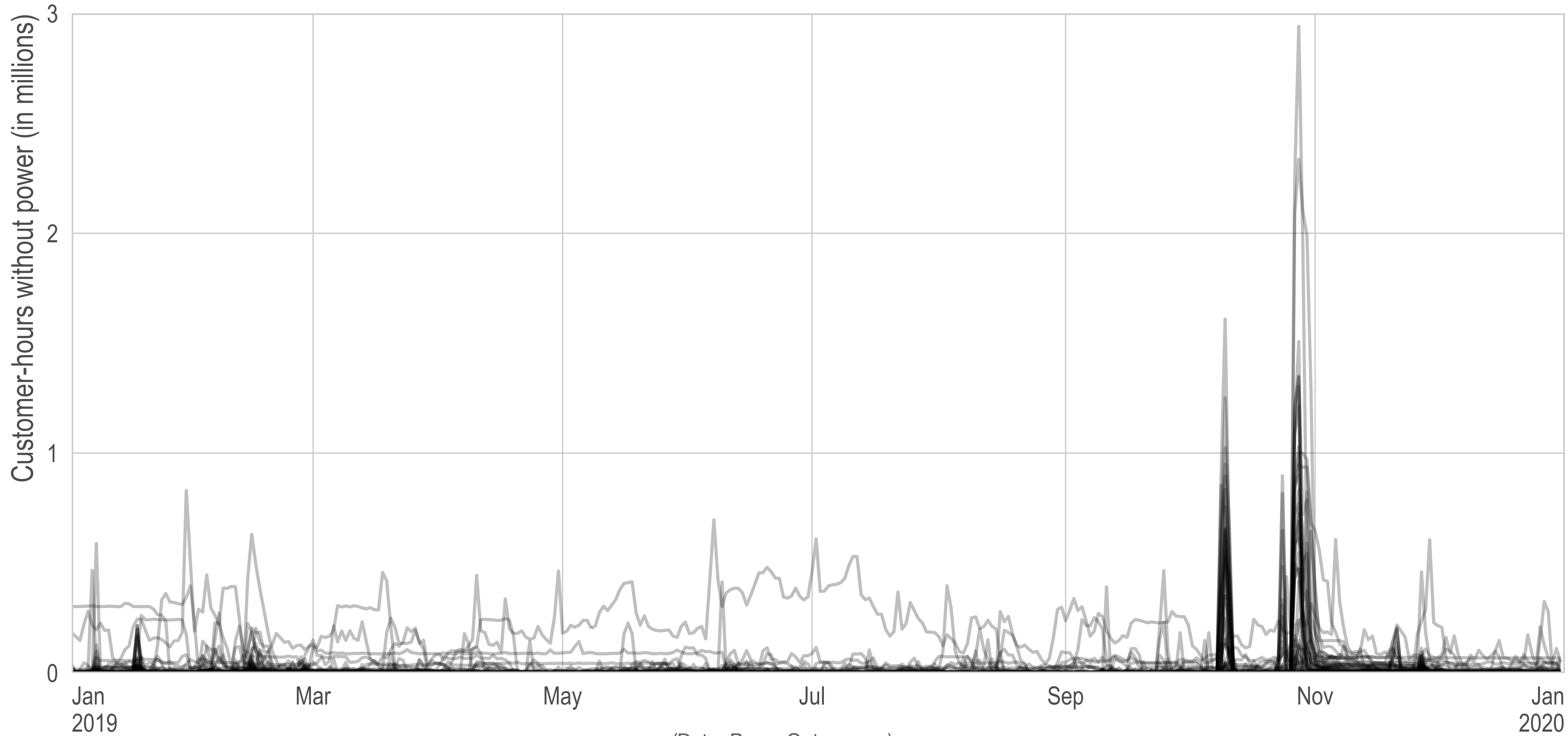
(Source: Casey, Fukurai, Hernandez, Balsari, & Kiang in *Current Environmental Health Reports* 2020)

Power outages for selected counties



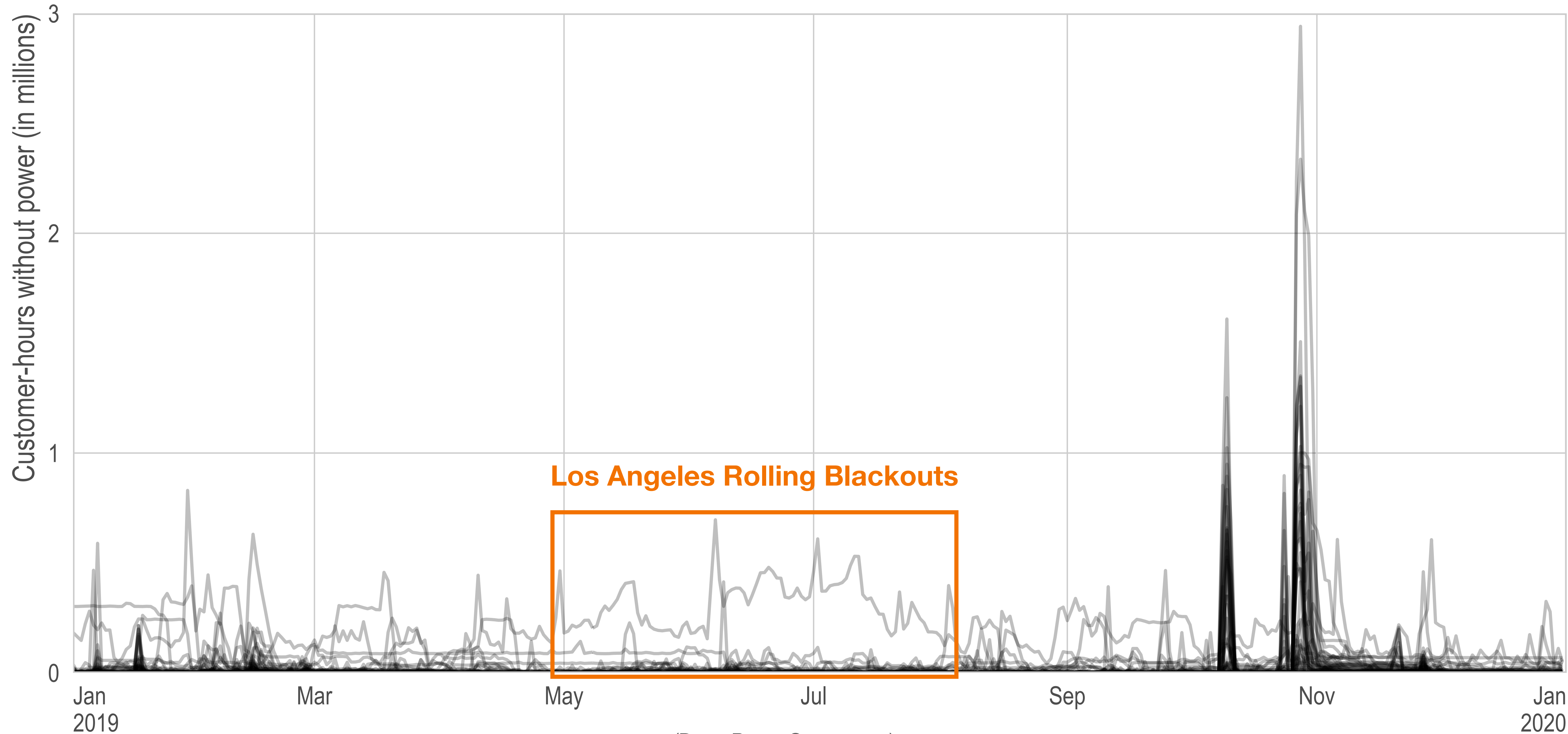
(Data: [PowerOutages.us](https://poweroutages.us))

Power outages are common



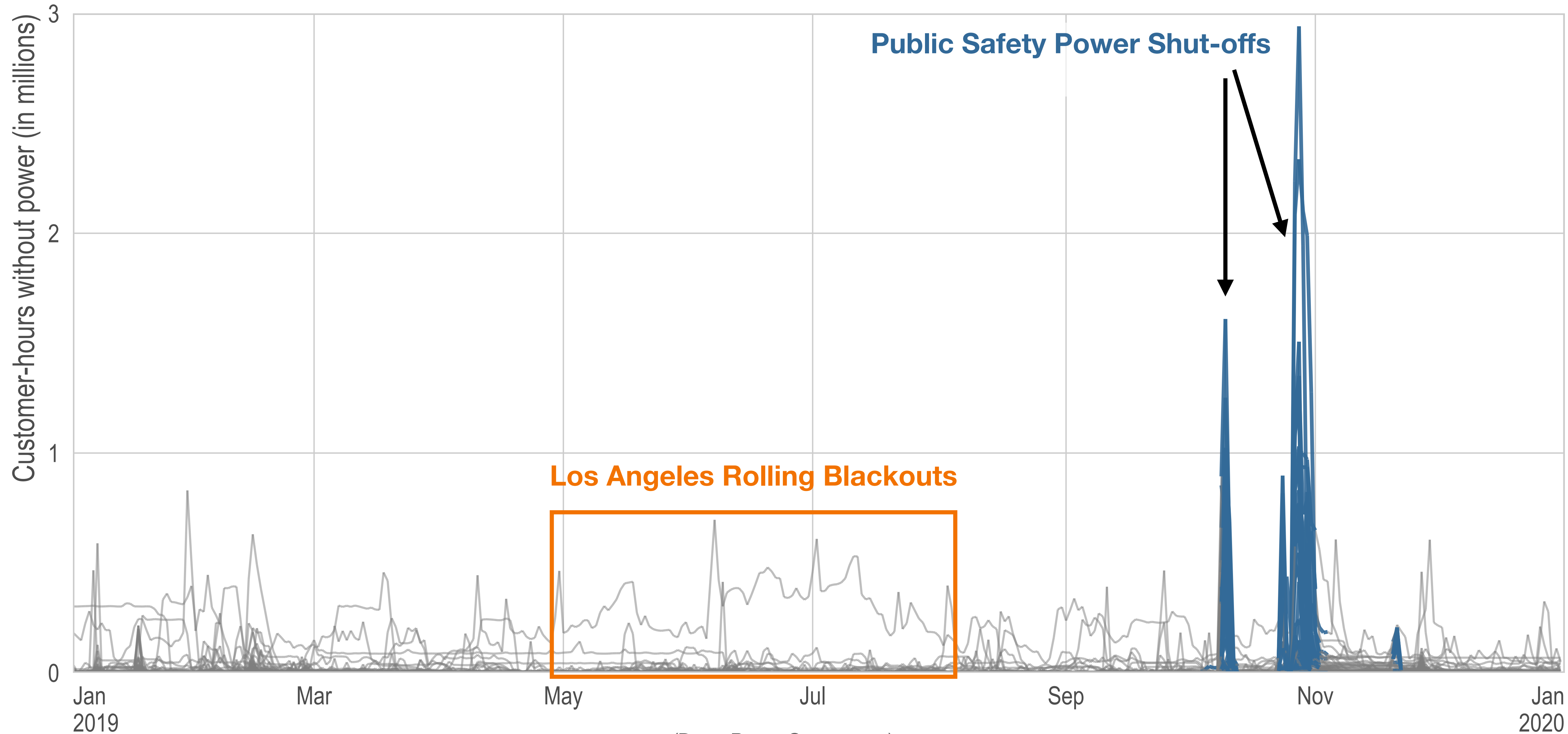
(Data: [PowerOutages.us](https://poweroutages.us))

Rolling blackouts in LA



(Data: [PowerOutages.us](https://poweroutages.us))

Public safety power shut-offs



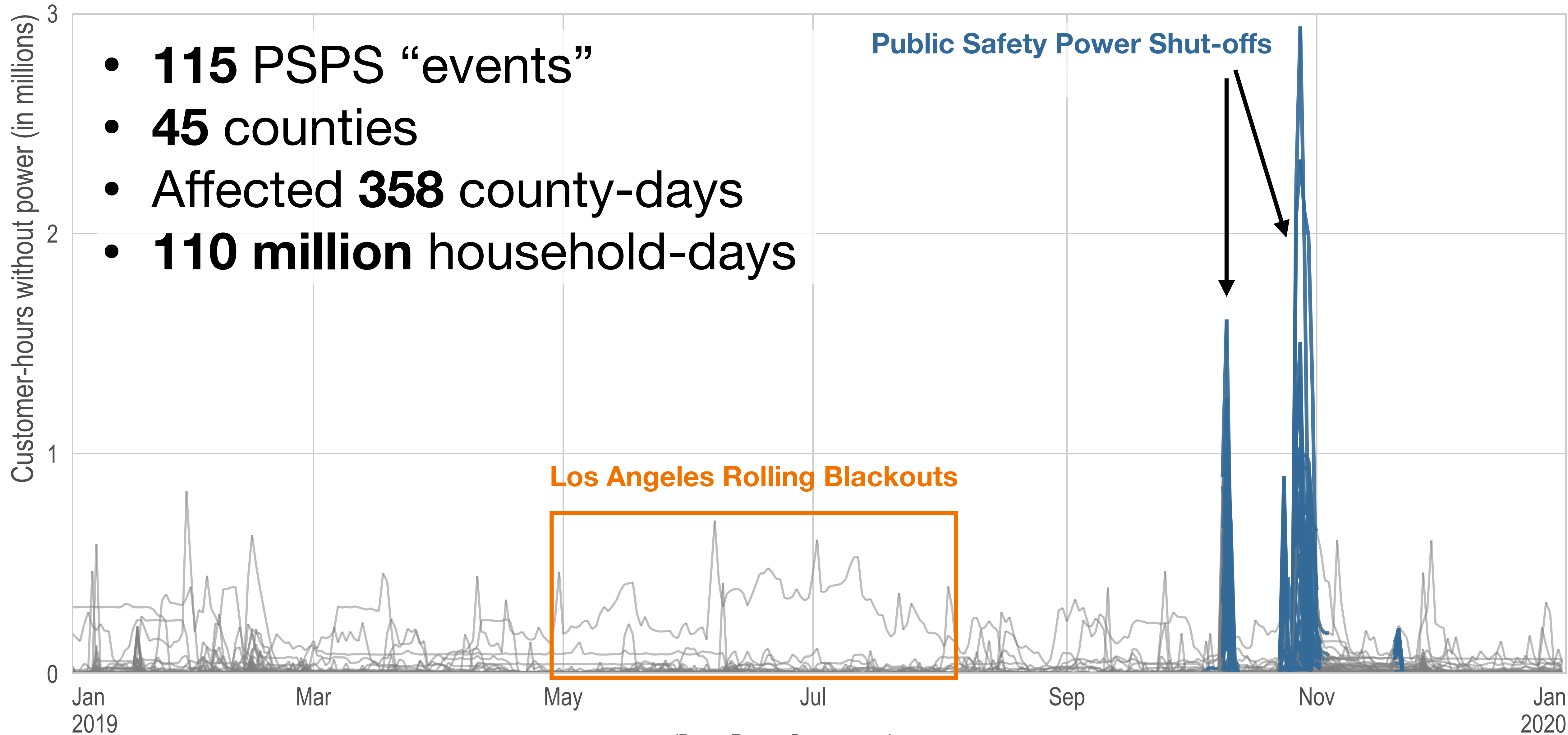
(Data: [PowerOutages.us](https://www.poweroutages.us))

Public safety power shut-offs

- **115** PSPS “events”
- **45** counties
- Affected **358** county-days
- **110 million** household-days

Public Safety Power Shut-offs

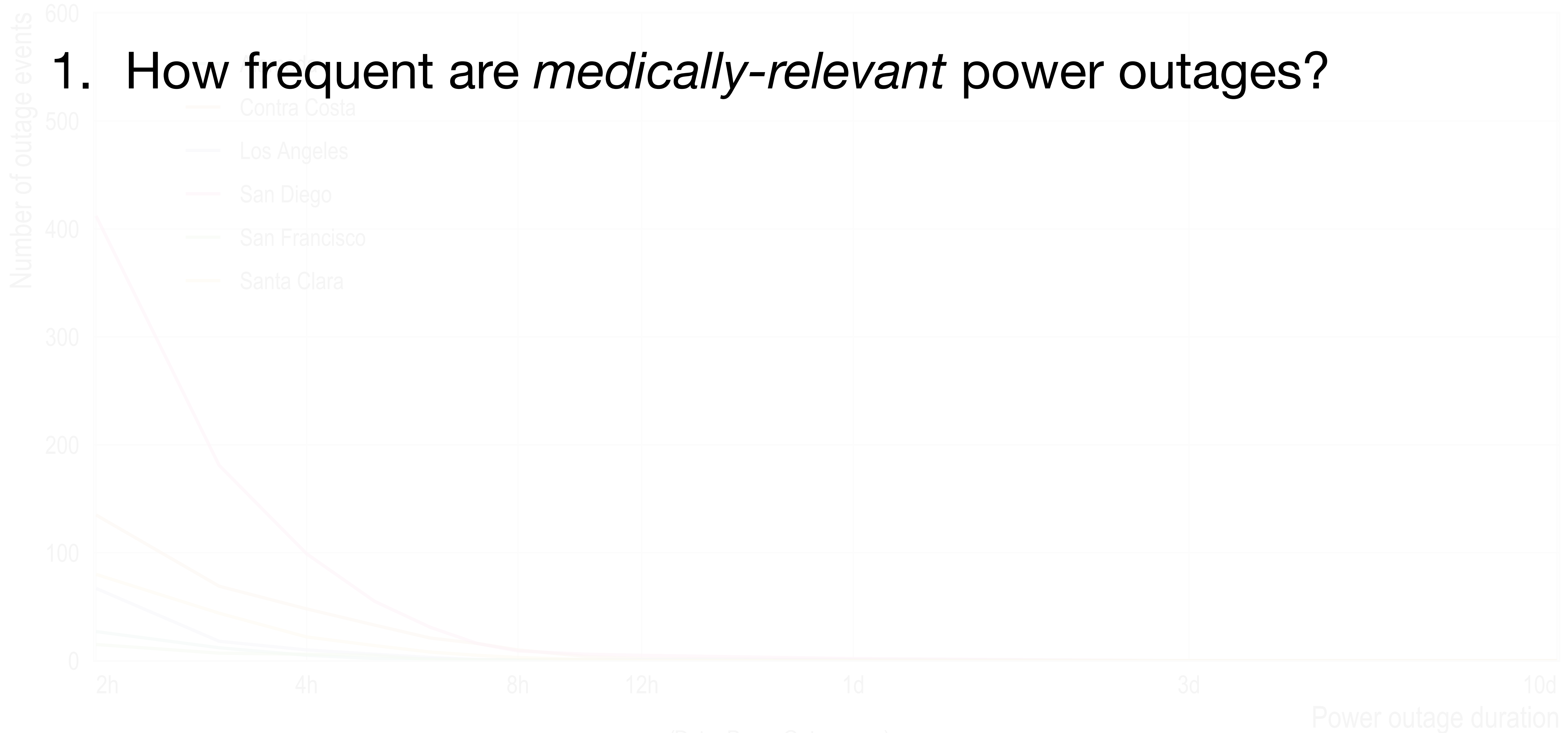
Los Angeles Rolling Blackouts



(Data: [PowerOutages.us](https://poweroutages.us))

Four Questions

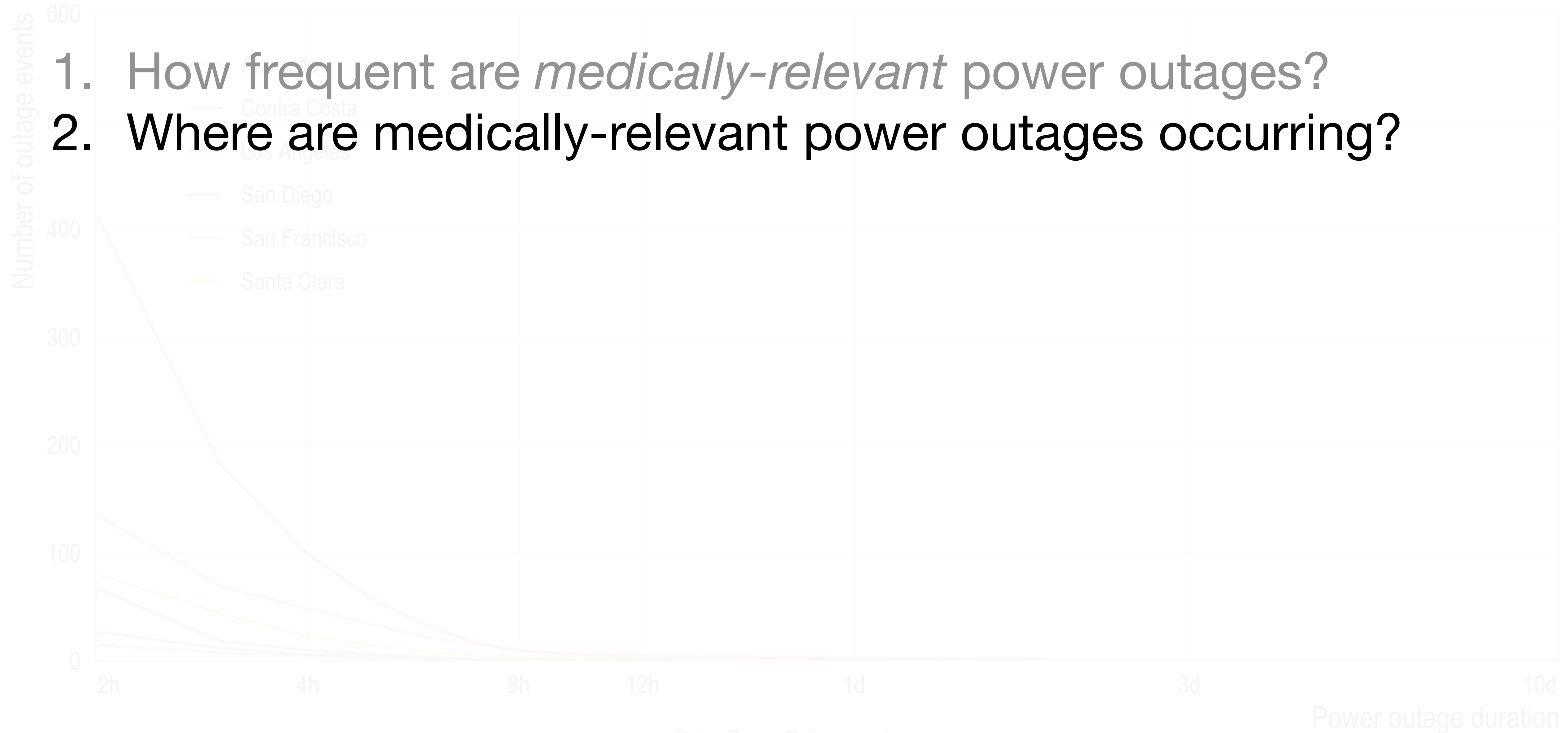
1. How frequent are *medically-relevant* power outages?



(Data: [PowerOutages.us](https://poweroutages.us))

Four Questions

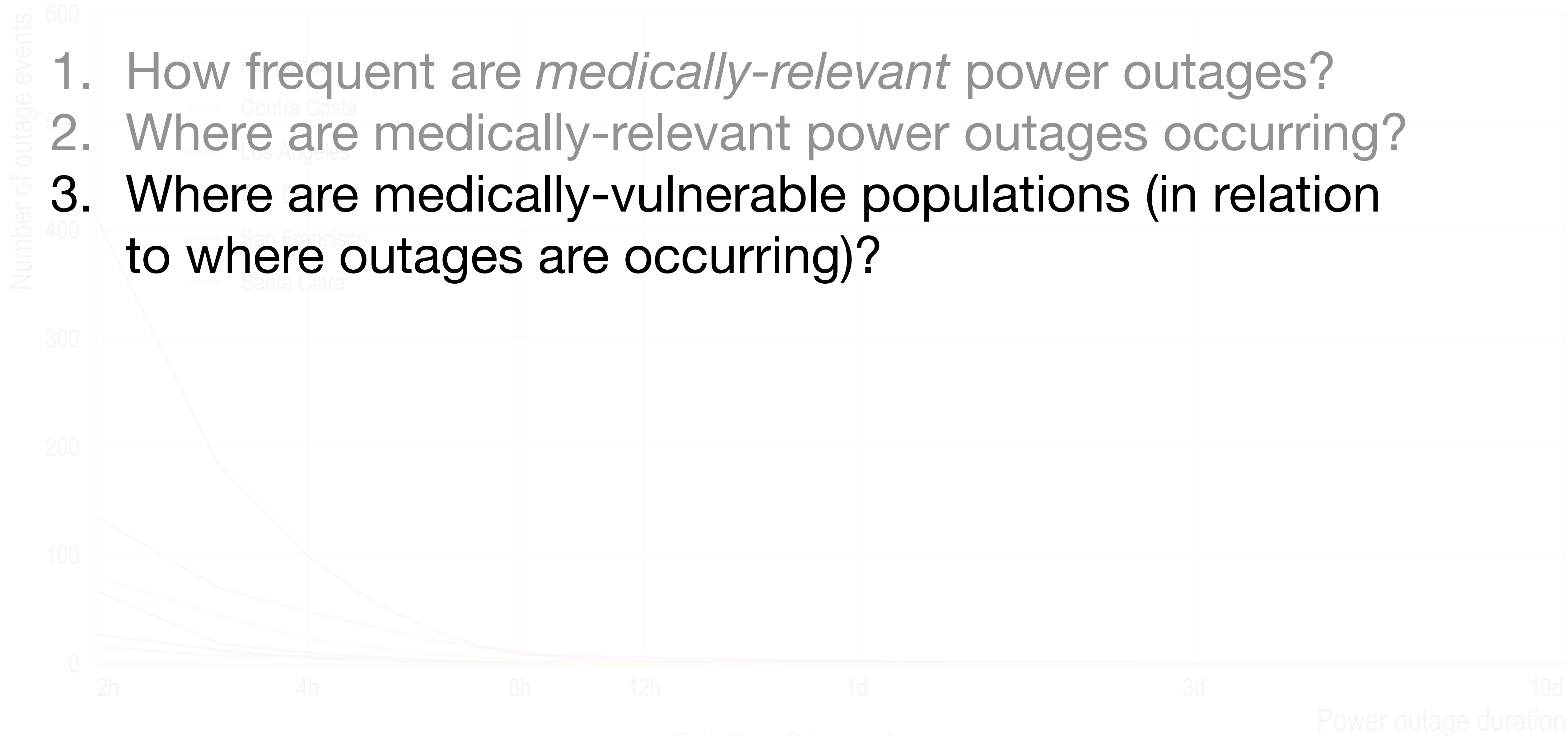
1. How frequent are *medically-relevant* power outages?
2. Where are medically-relevant power outages occurring?



(Data: [PowerOutages.us](https://poweroutages.us))

Four Questions

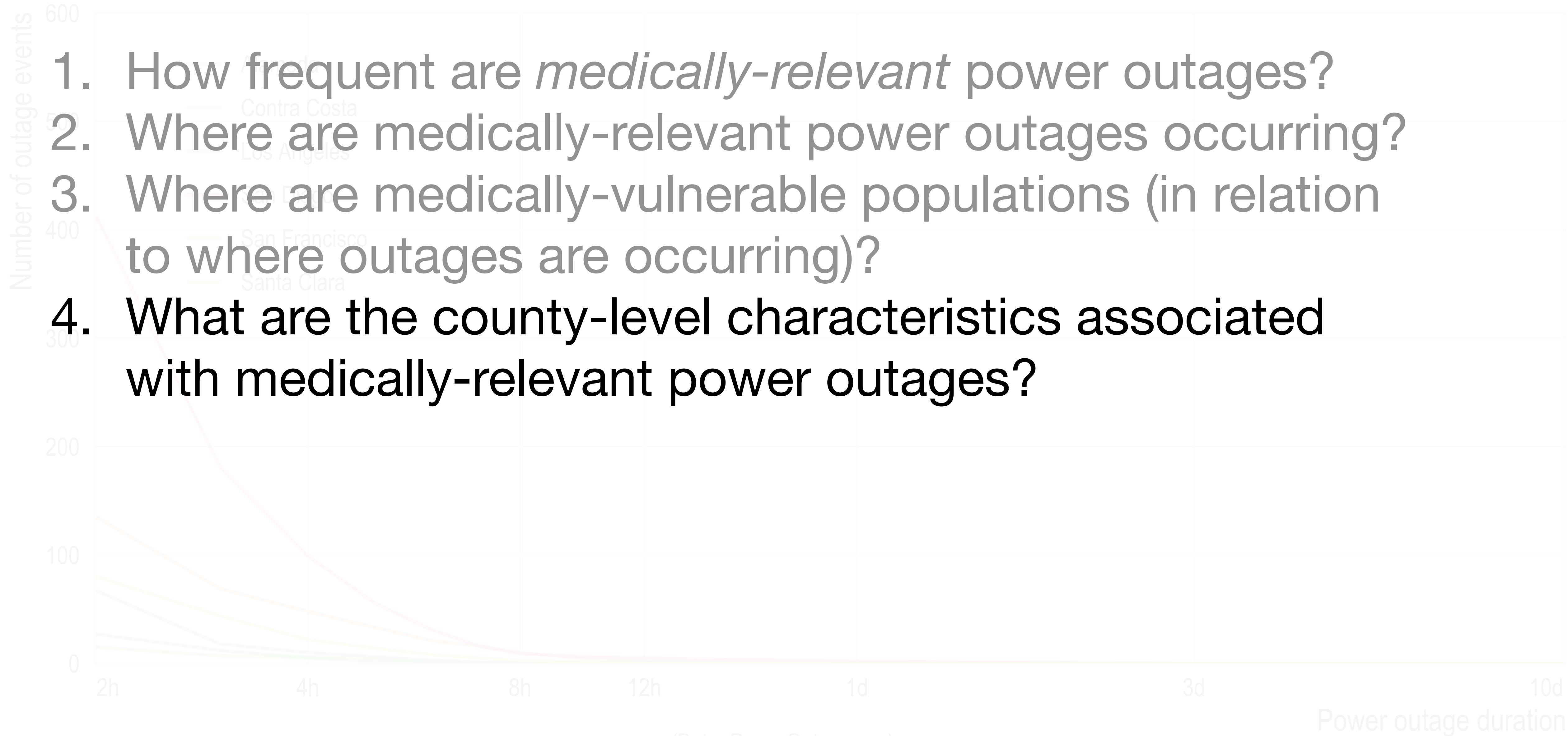
1. How frequent are *medically-relevant* power outages?
2. Where are medically-relevant power outages occurring?
3. Where are medically-vulnerable populations (in relation to where outages are occurring)?



(Data: [PowerOutages.us](https://poweroutages.us))

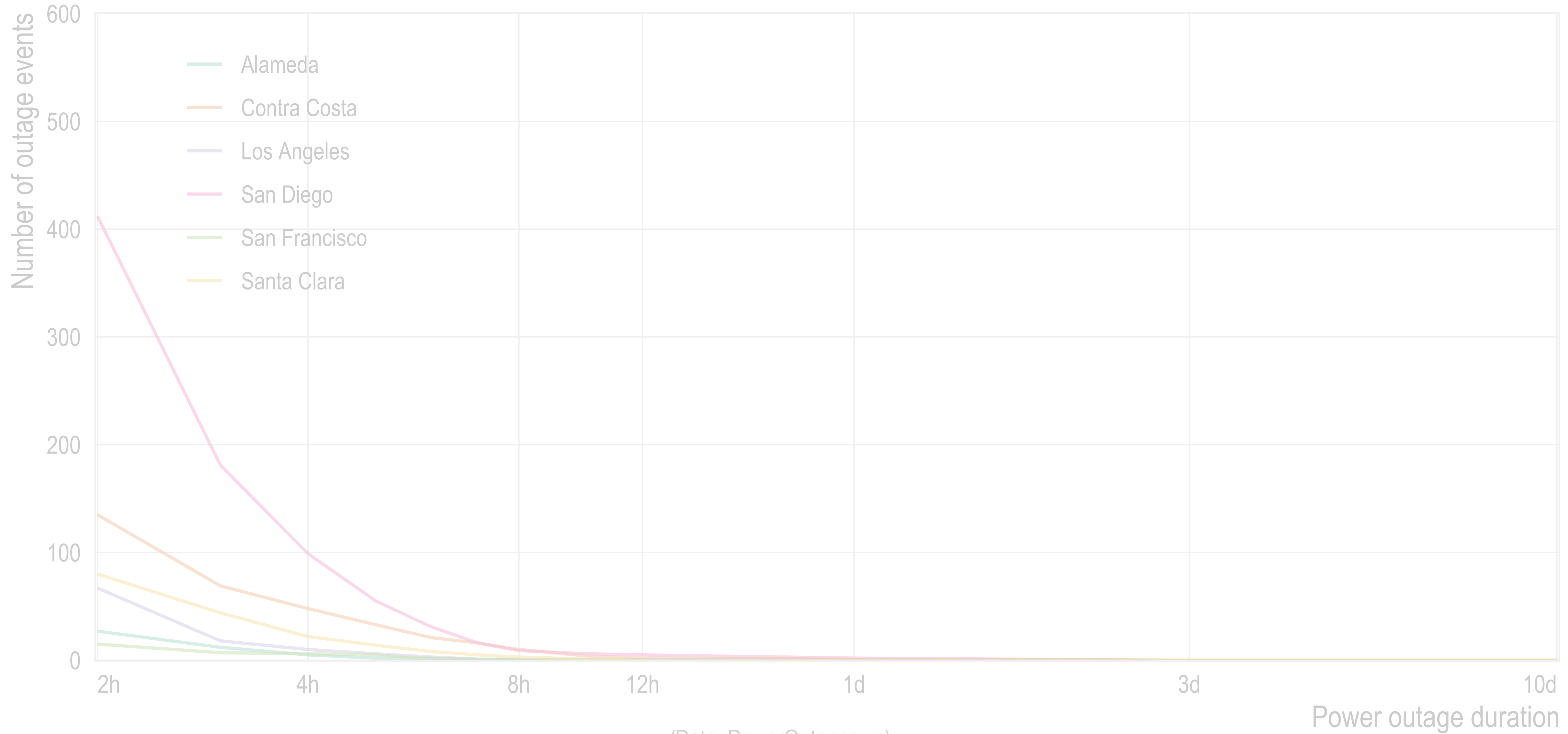
Four Questions

1. How frequent are *medically-relevant* power outages?
2. Where are medically-relevant power outages occurring?
3. Where are medically-vulnerable populations (in relation to where outages are occurring)?
4. What are the county-level characteristics associated with medically-relevant power outages?

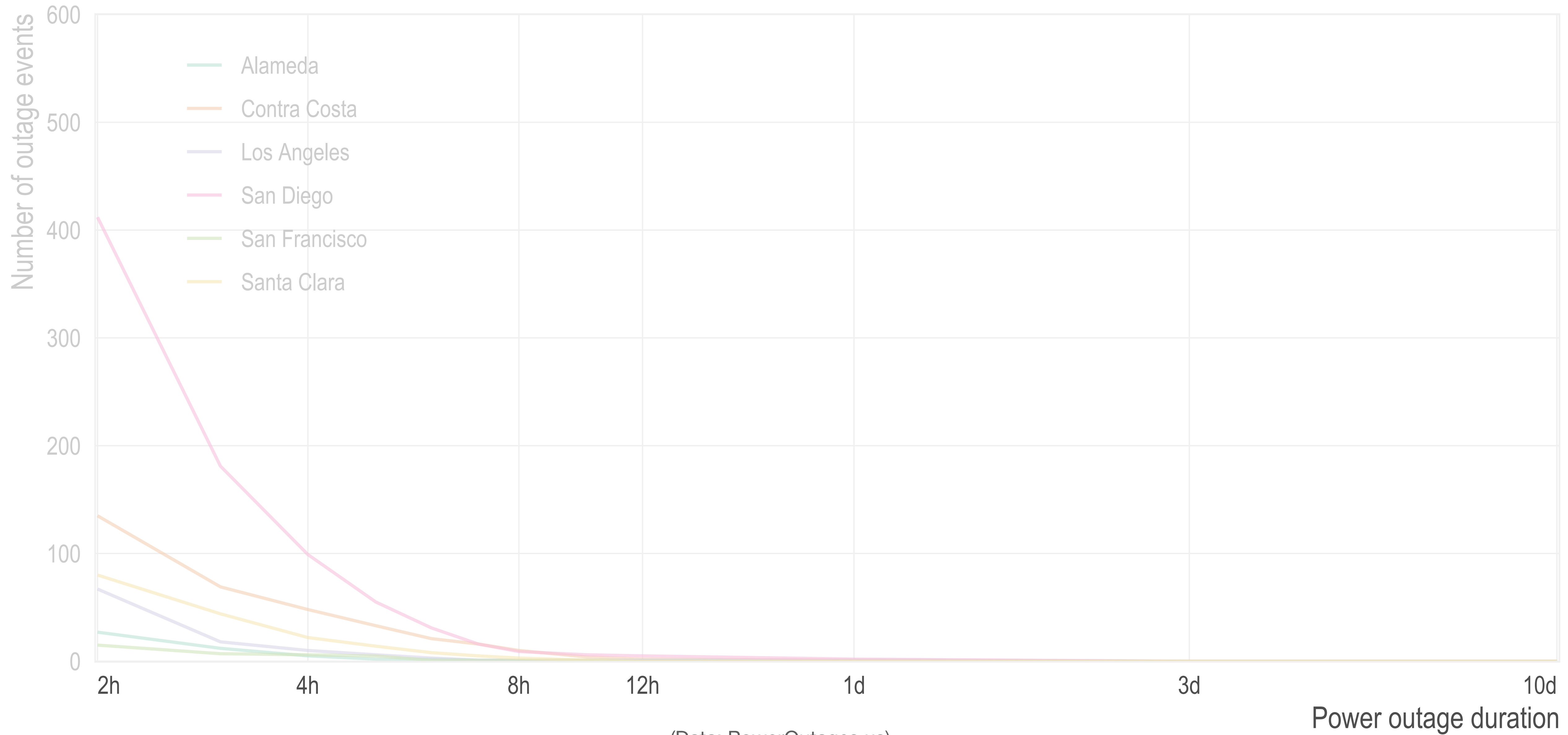


(Data: [PowerOutages.us](https://poweroutages.us))

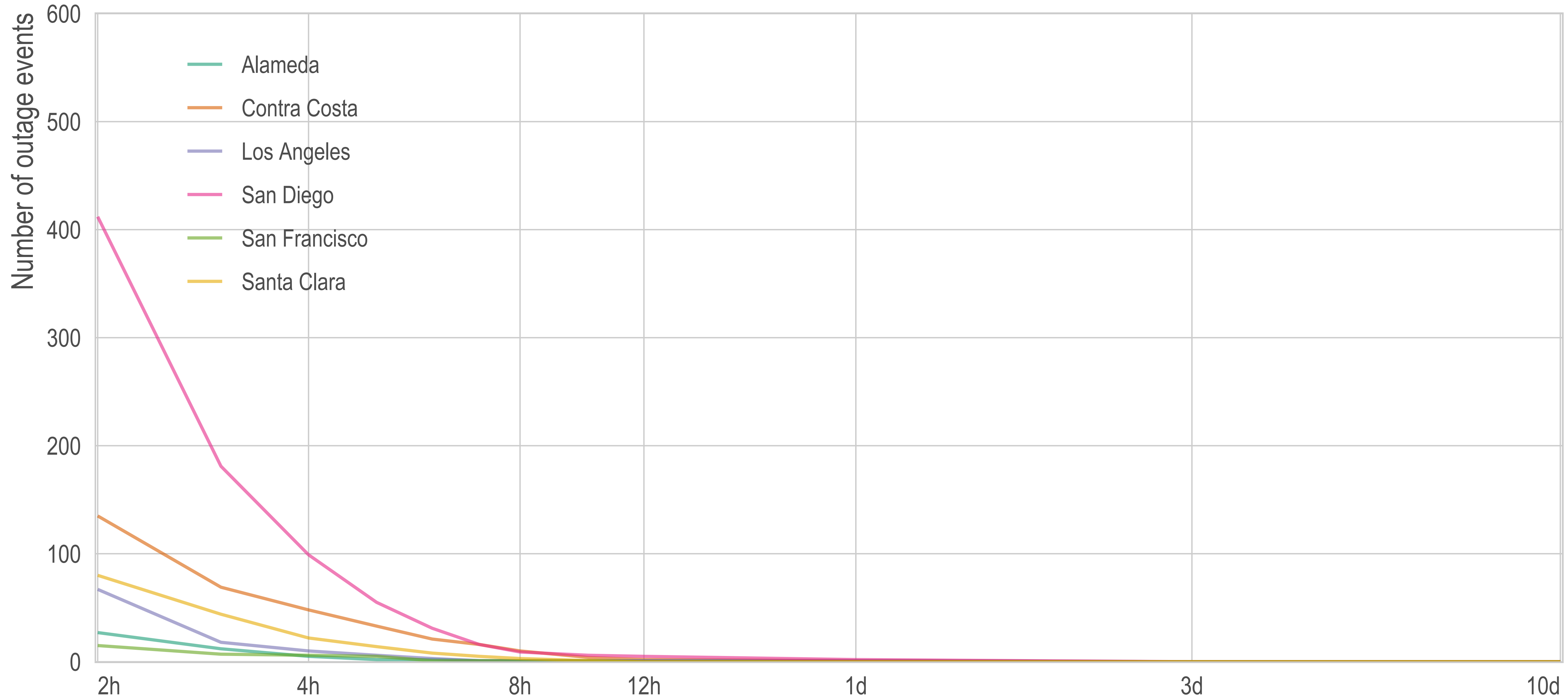
Events affecting at least 500 households



Lasting between 2h and 10d



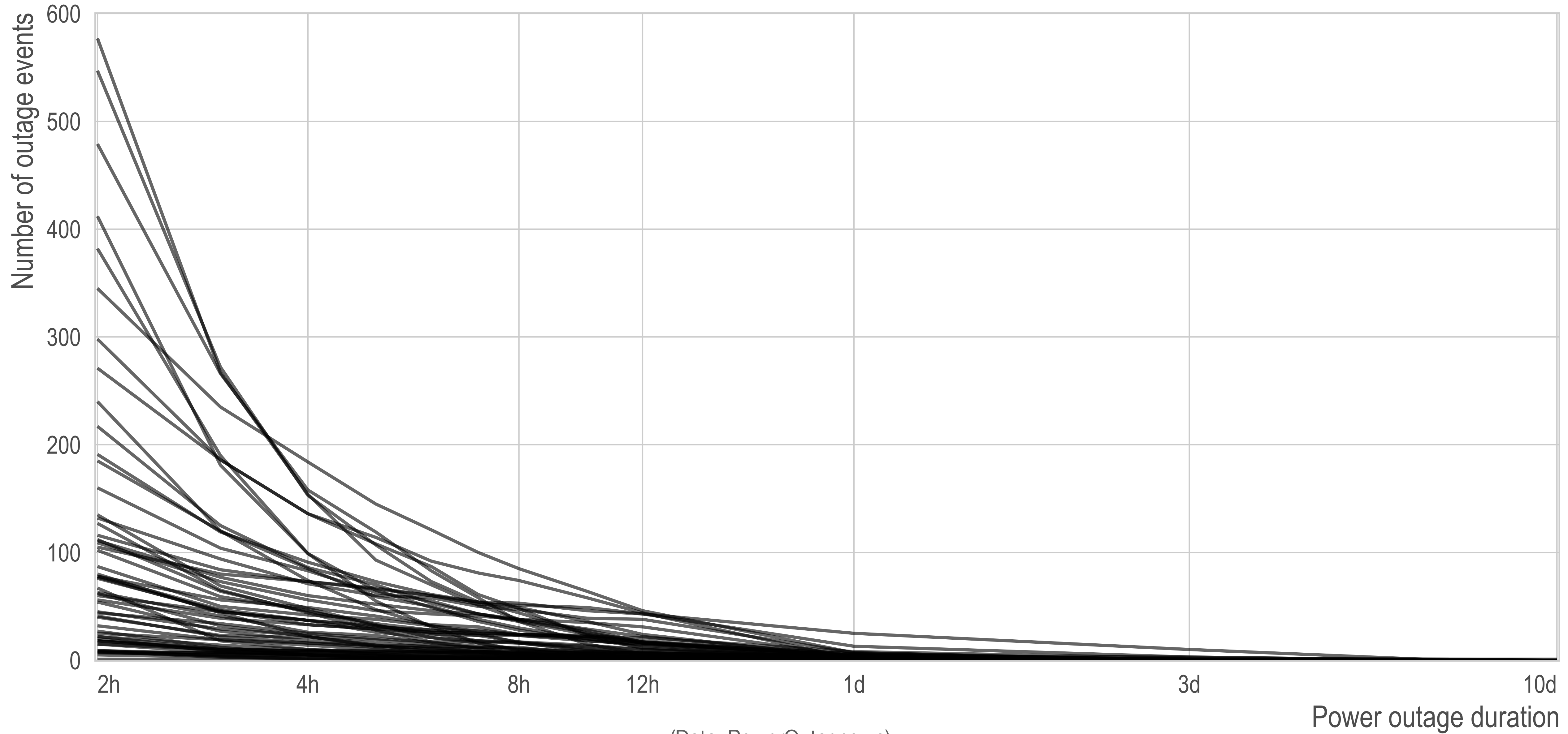
Large events by duration



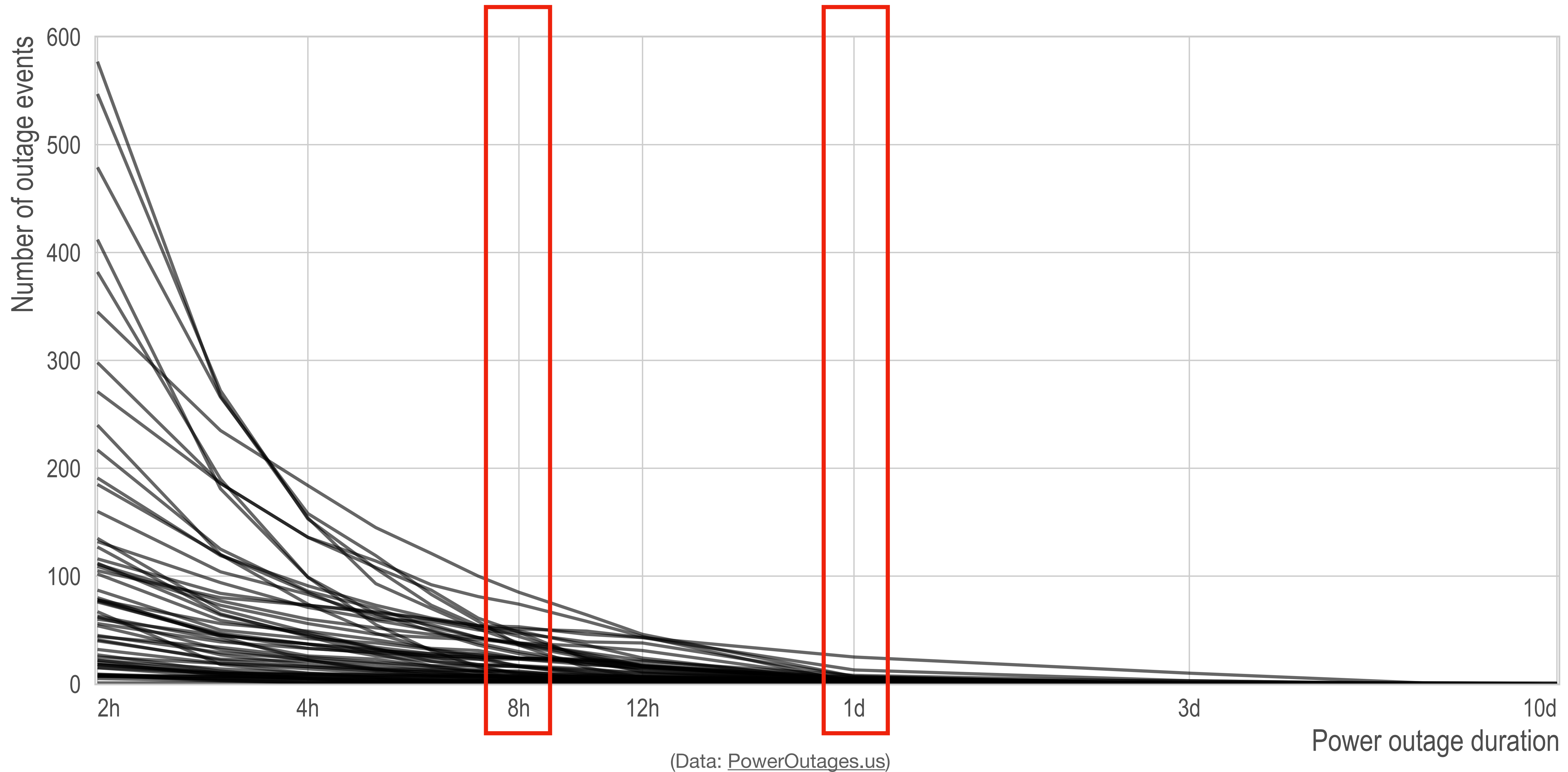
(Data: [PowerOutages.us](https://poweroutages.us))

Power outage duration

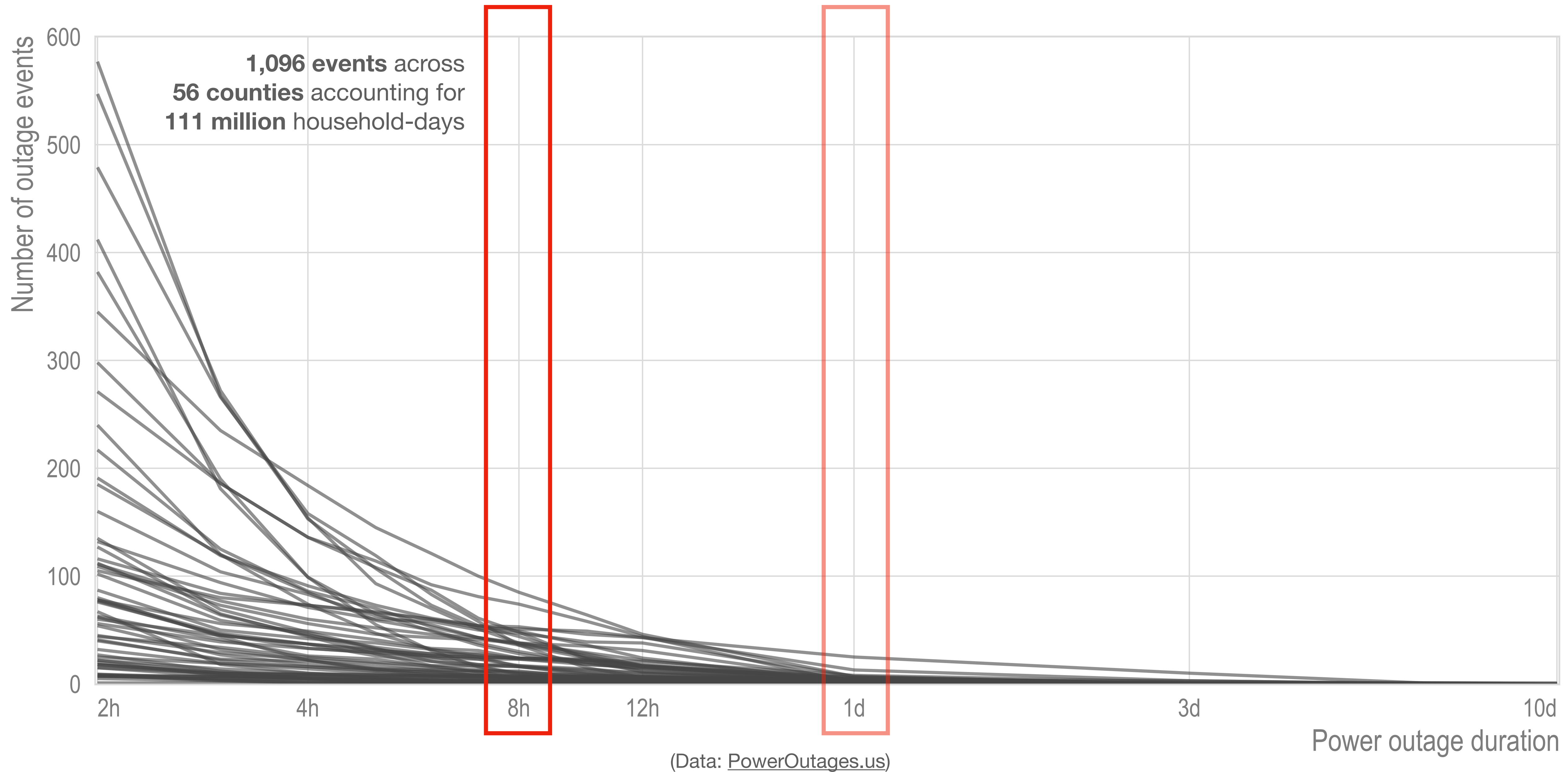
Large events by duration



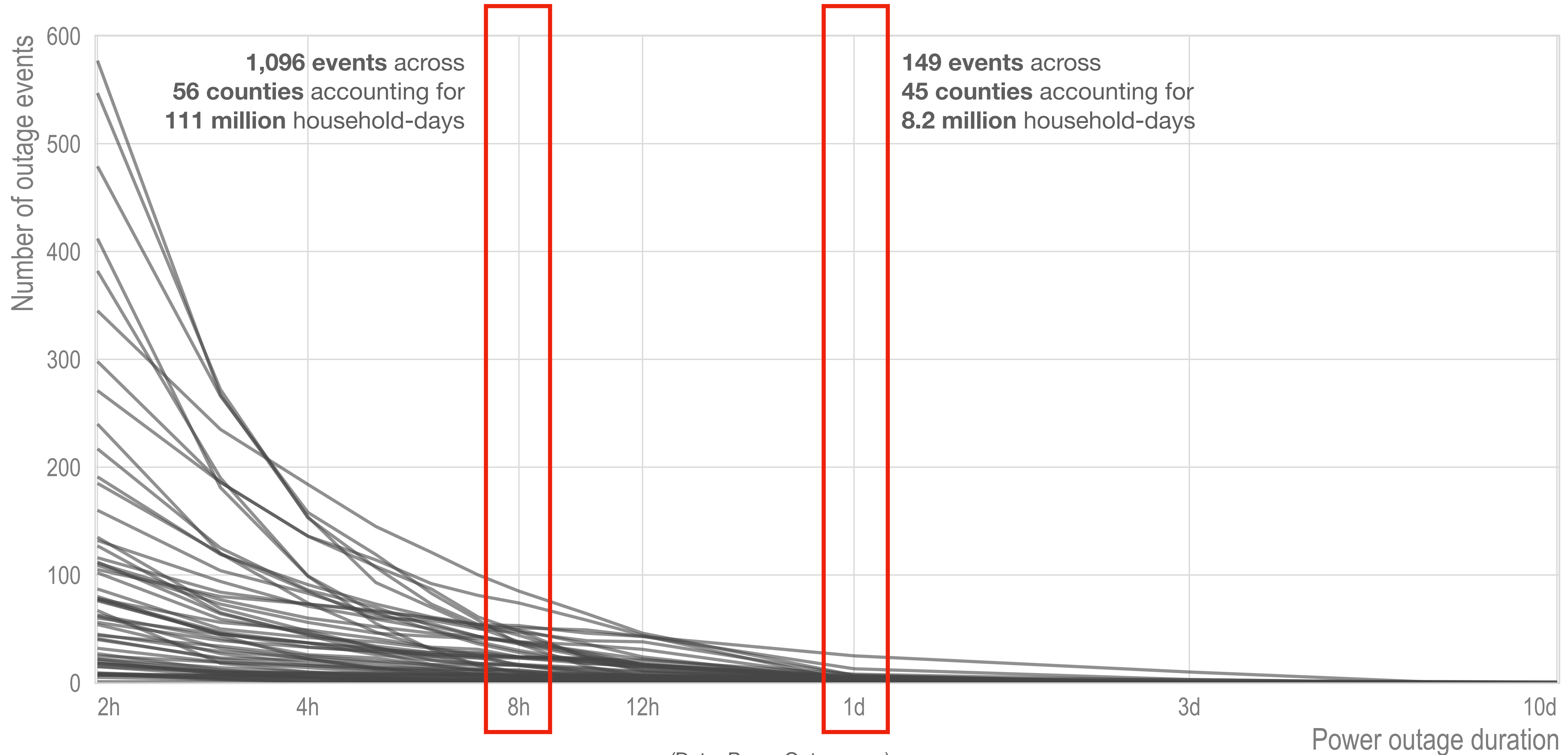
Medically-relevant events: 8h and 1d



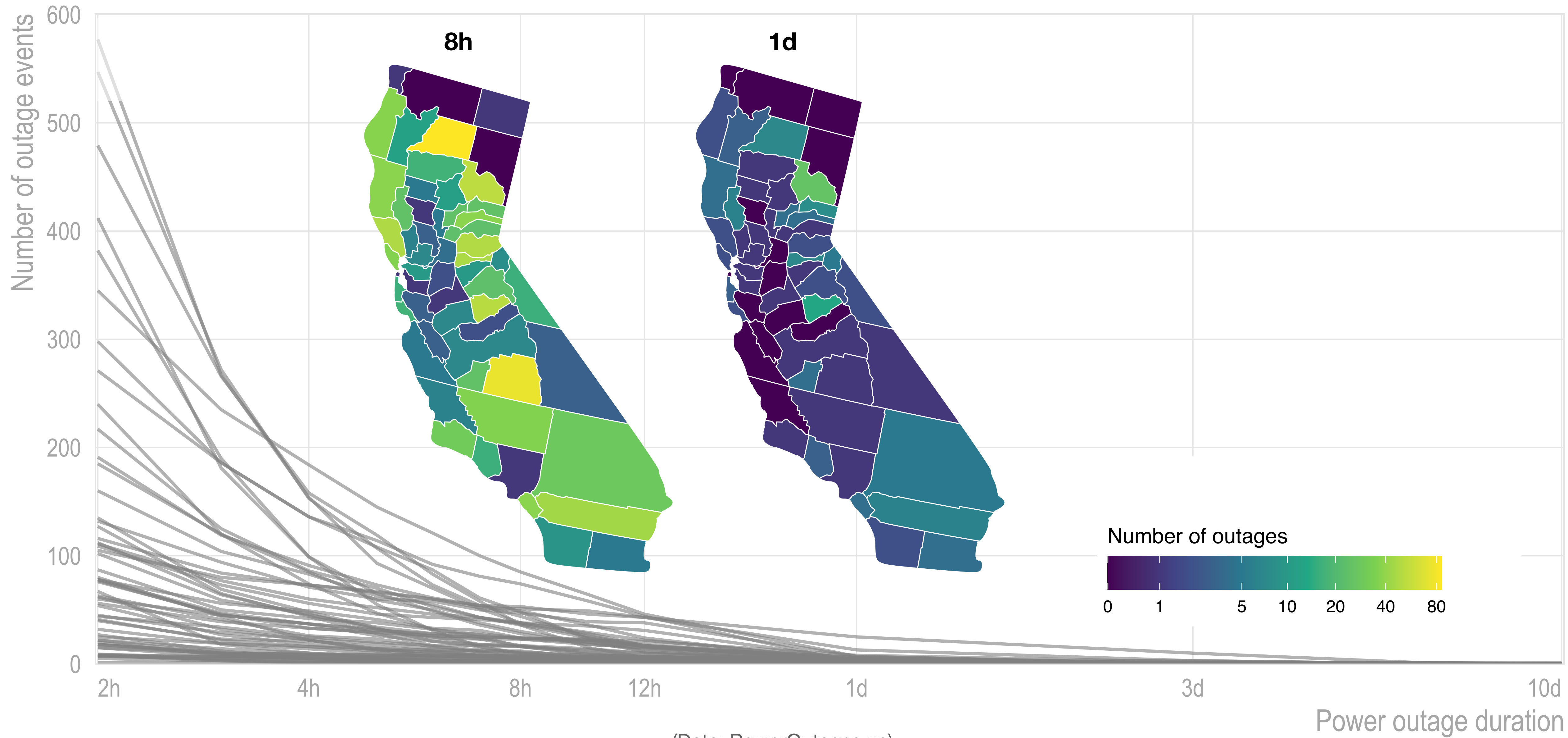
Nearly 1,100 8h events



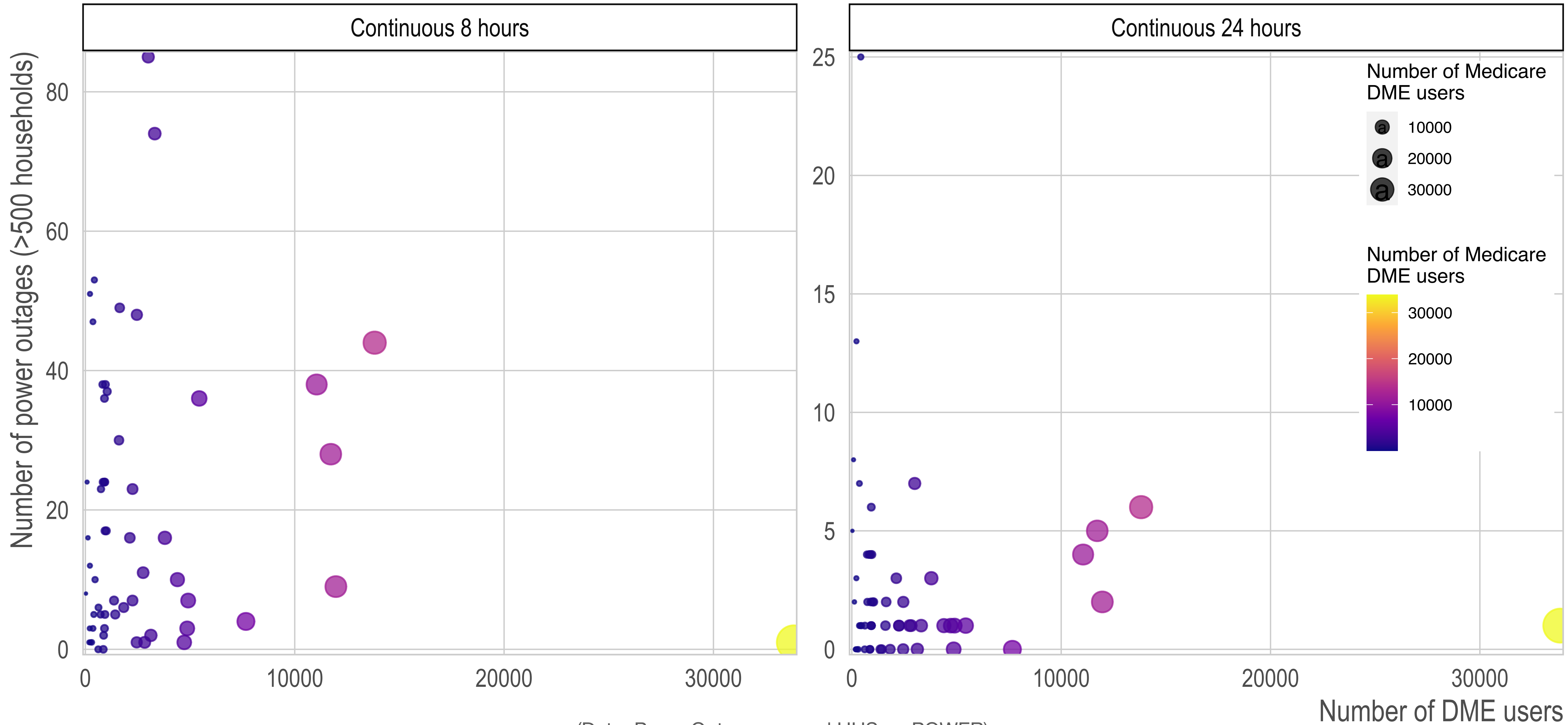
149 events lasting at least 1 day



Spatial distribution of large events

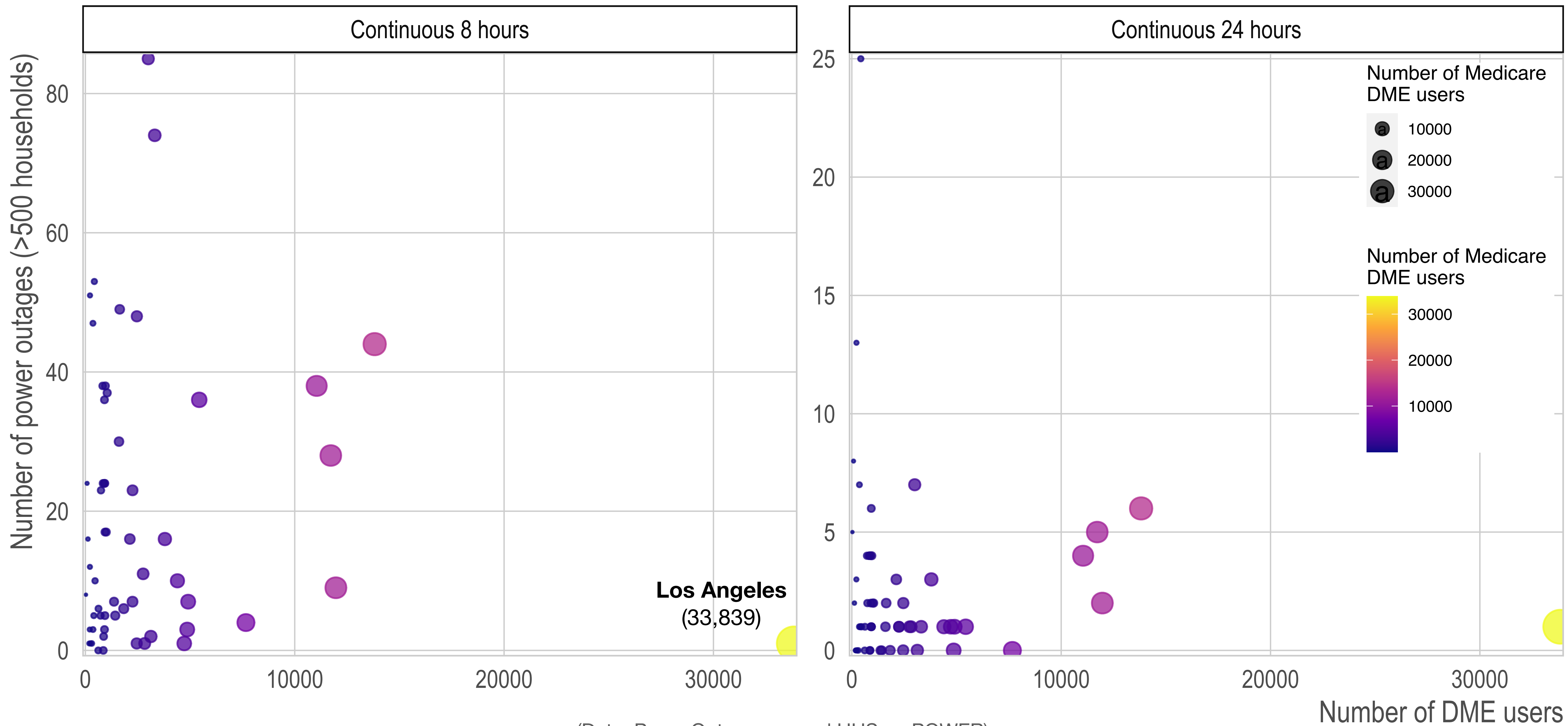


Highly vulnerable populations



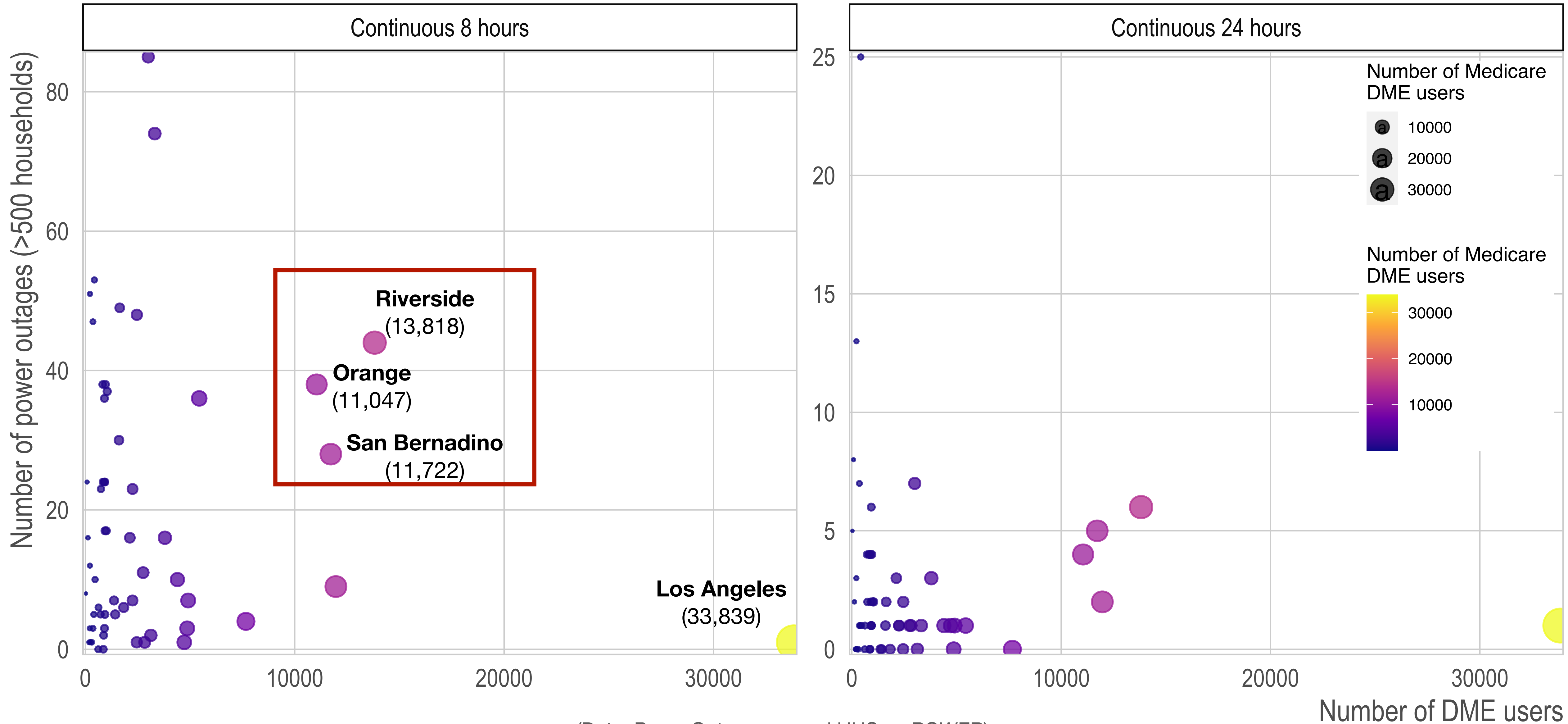
(Data: [PowerOutages.us](https://poweroutages.us) and HHS emPOWER)

Highly vulnerable populations



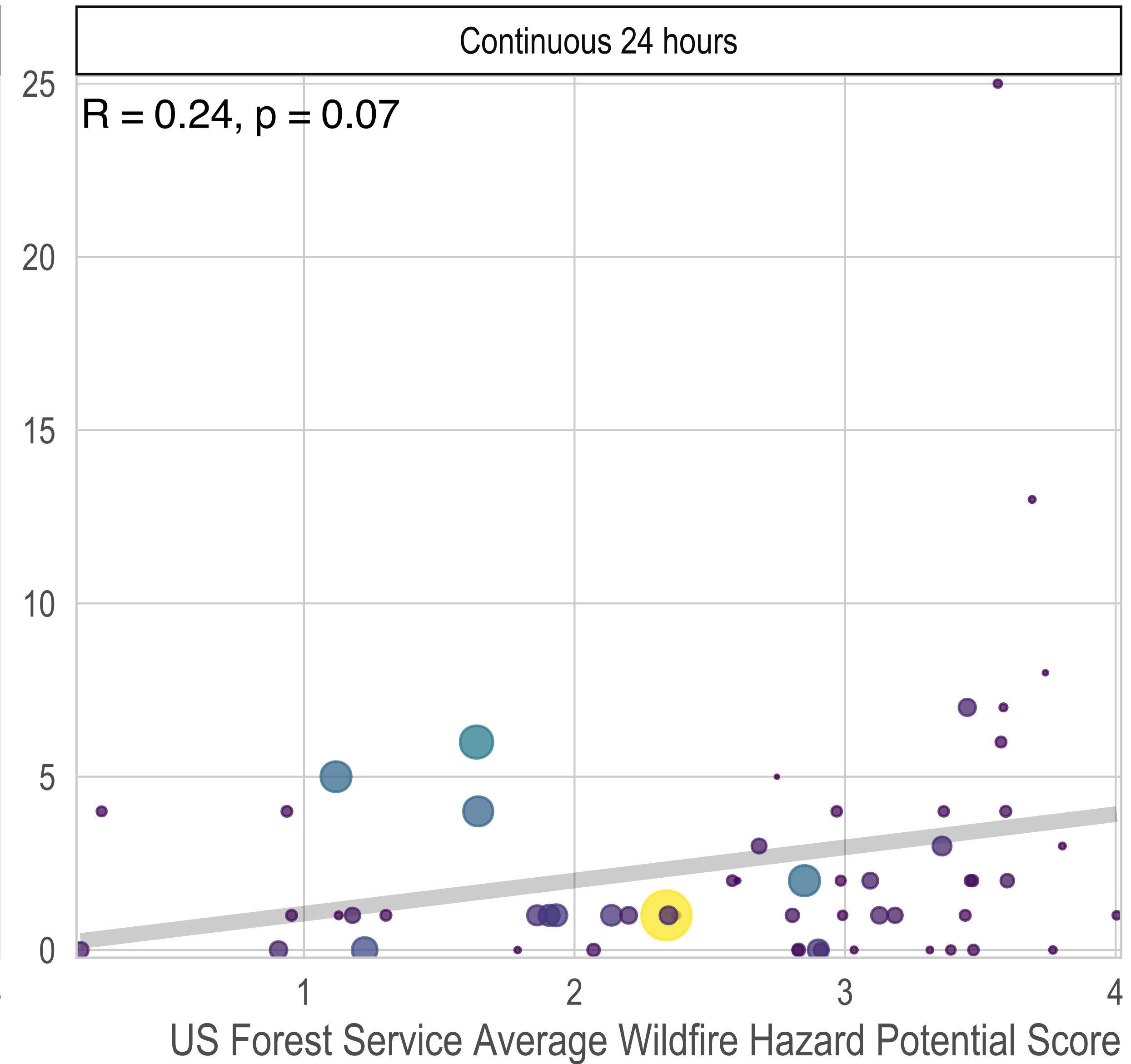
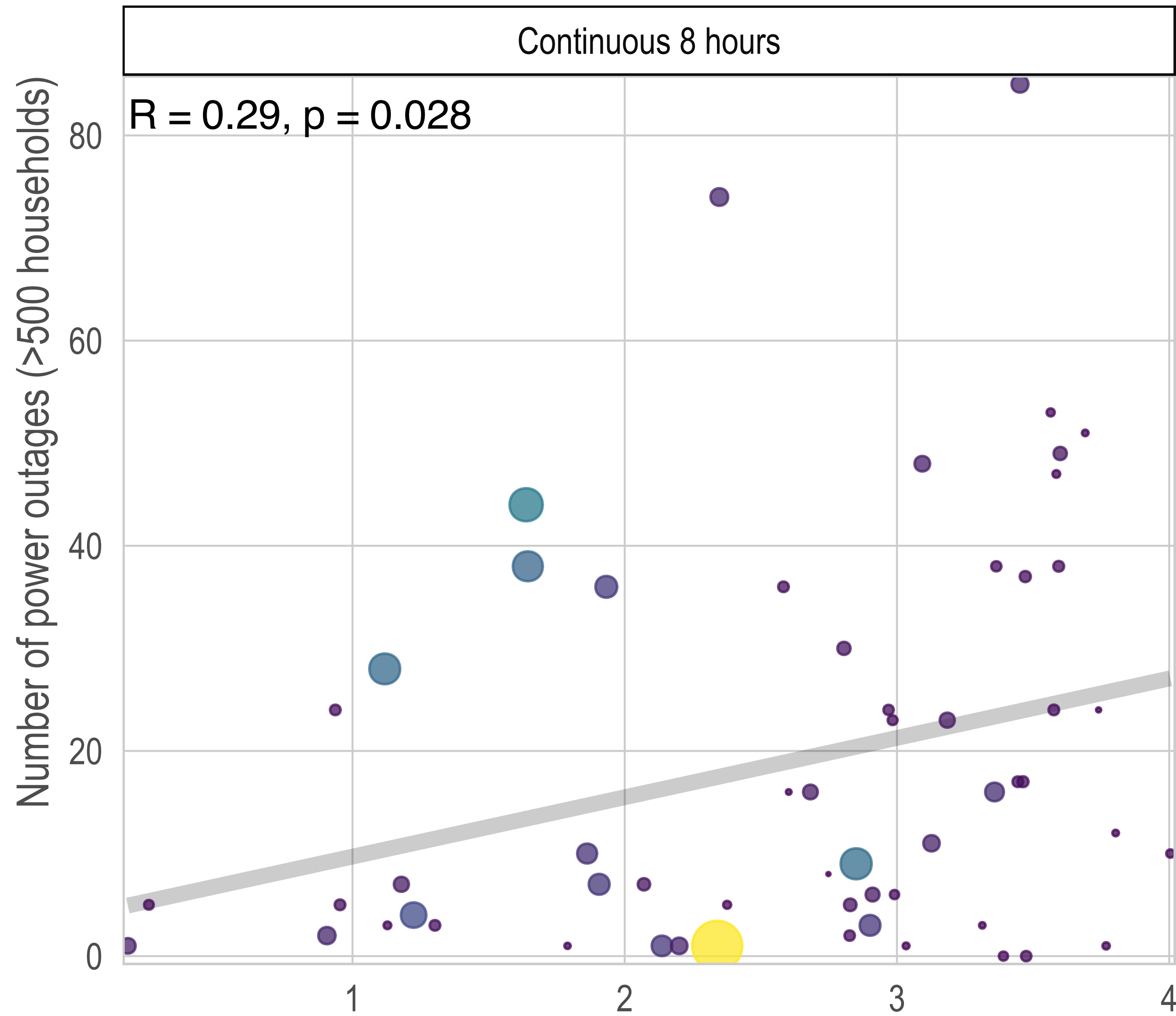
(Data: [PowerOutages.us](https://poweroutages.us) and HHS emPOWER)

Highly vulnerable populations

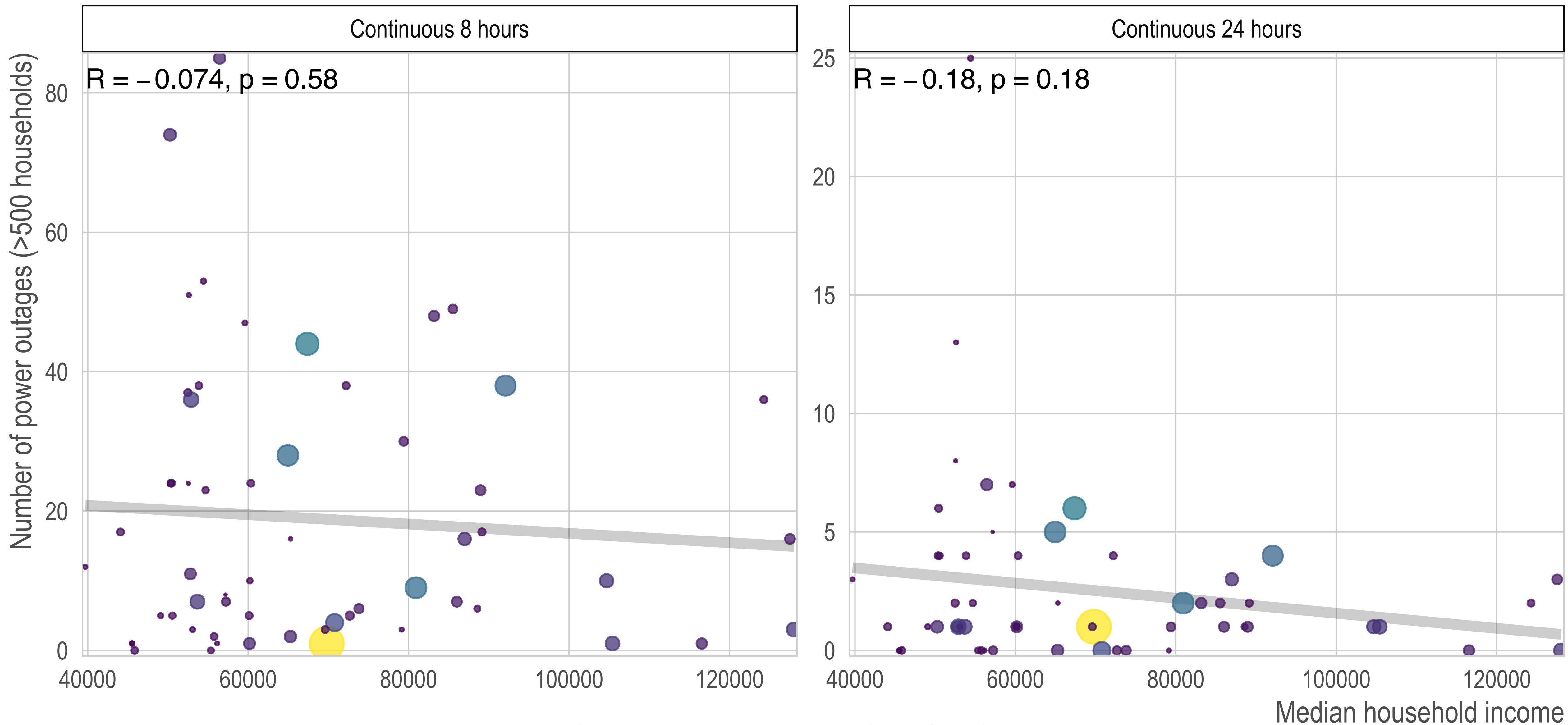


(Data: [PowerOutages.us](https://www.poweroutages.us/) and HHS emPOWER)

Correlated with wildfire potential

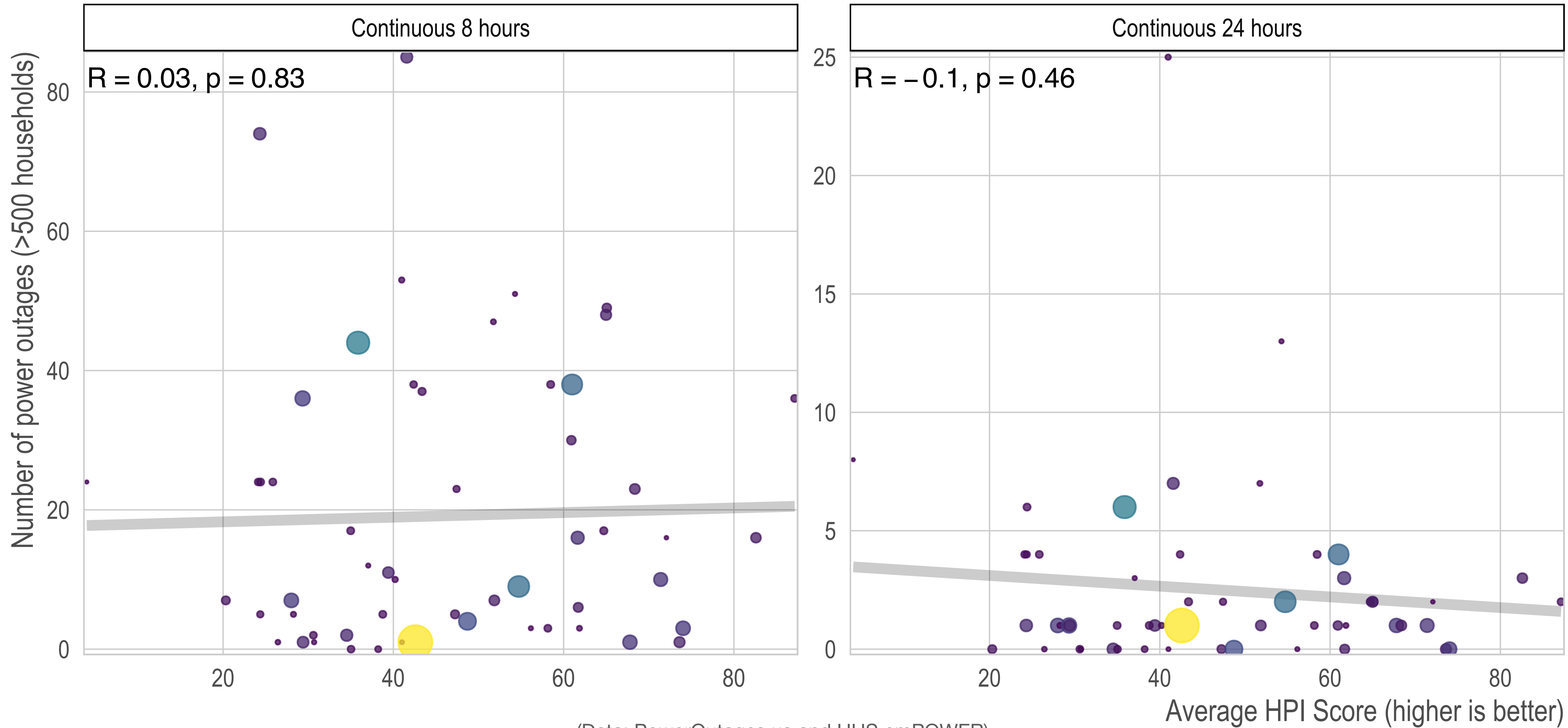


Not correlated with income



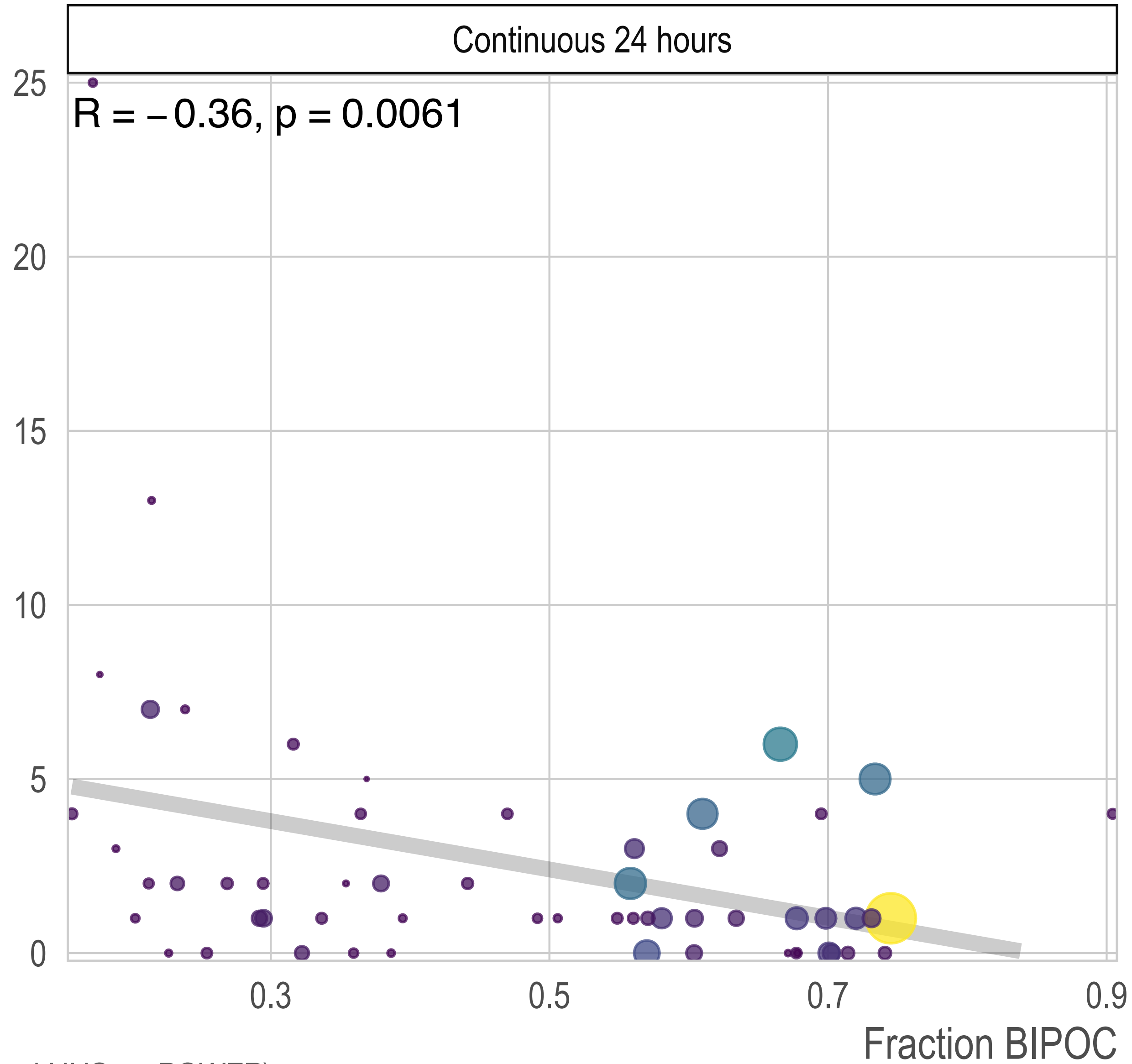
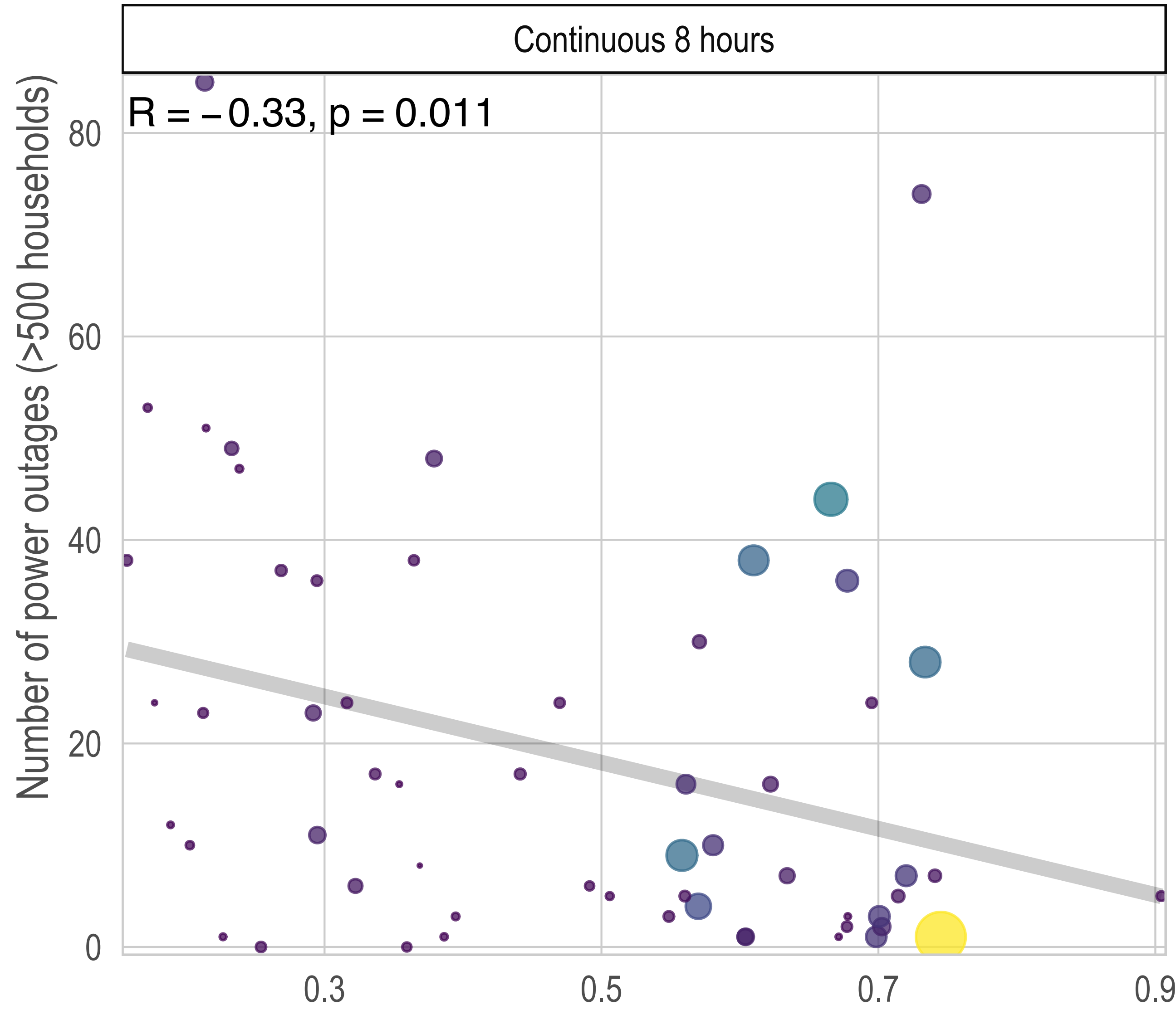
(Data: [PowerOutages.us](https://poweroutages.us) and HHS emPOWER)

Not correlated with social vulnerability



(Data: [PowerOutages.us](https://www.poweroutages.us) and HHS emPOWER)

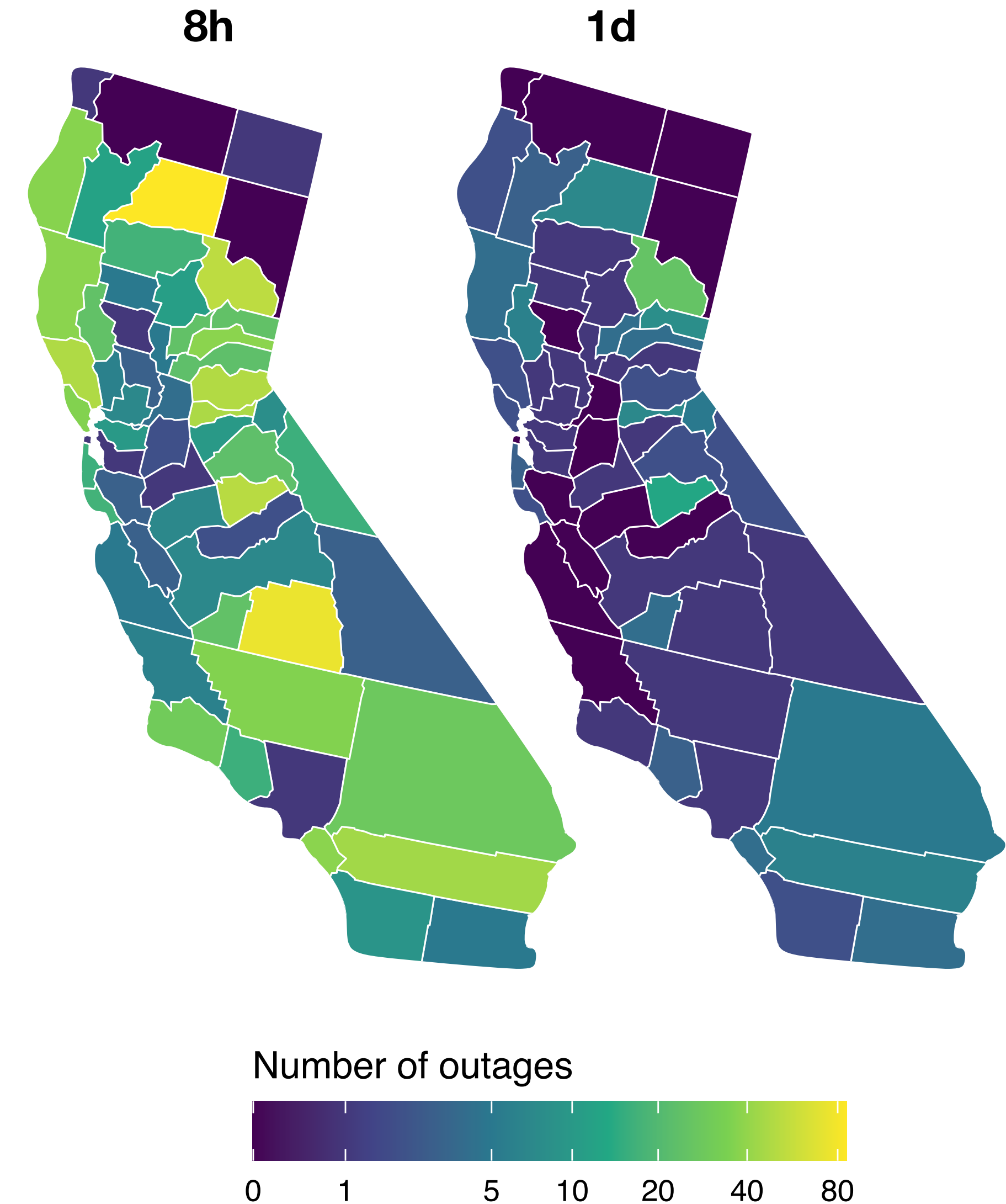
Correlated with less diverse counties



(Data: [PowerOutages.us](#) and HHS emPOWER)

Next Steps

- Sub-county level analyses
- Hospitalization and mobility data
- Creating a dashboard with historic and near-real time data
- Shelter and hospital locations
- Long-term care facilities
- Evacuation notices and mobility



Additional Slides

Distribution of households impacted

