

Personal Location Masking as a Source of Geodata Bias

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Webinar Series: Ethics and Biases in the Geographical Sciences

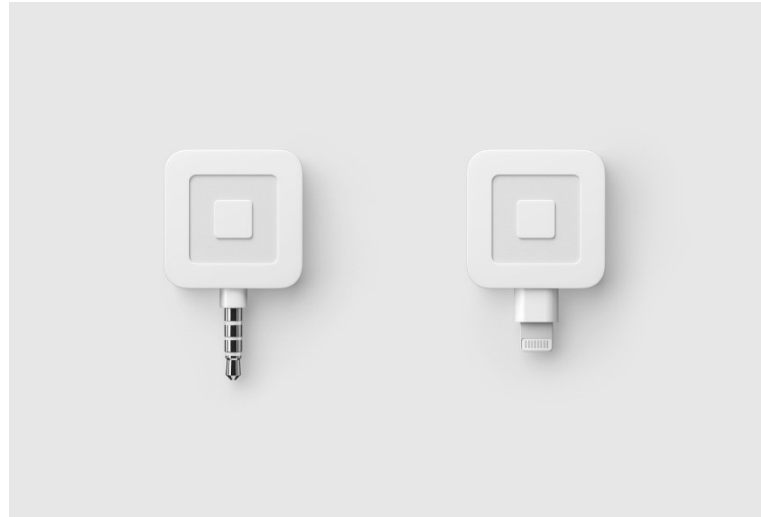
June 11, 2020 | The National Academies of Sciences, Engineering, and Medicine



Pervasive Location Collection



Photo by capnsnap on Unsplash



Square



Photo by Michał Jakubowski on Unsplash

Geoprivacy

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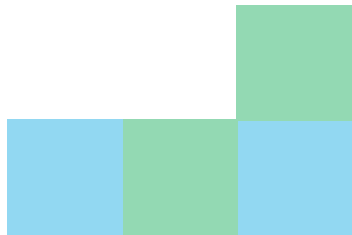
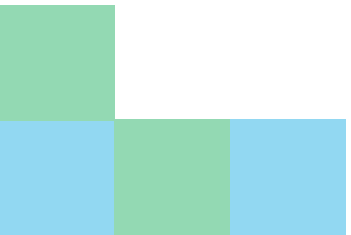
the right of individuals to determine the
extent to which their location is shared with
others

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Duckham and Kulik 2006; Elwood and Leszczynski 2011; Kar, Crowsey, and Zale 2012




COVID-19

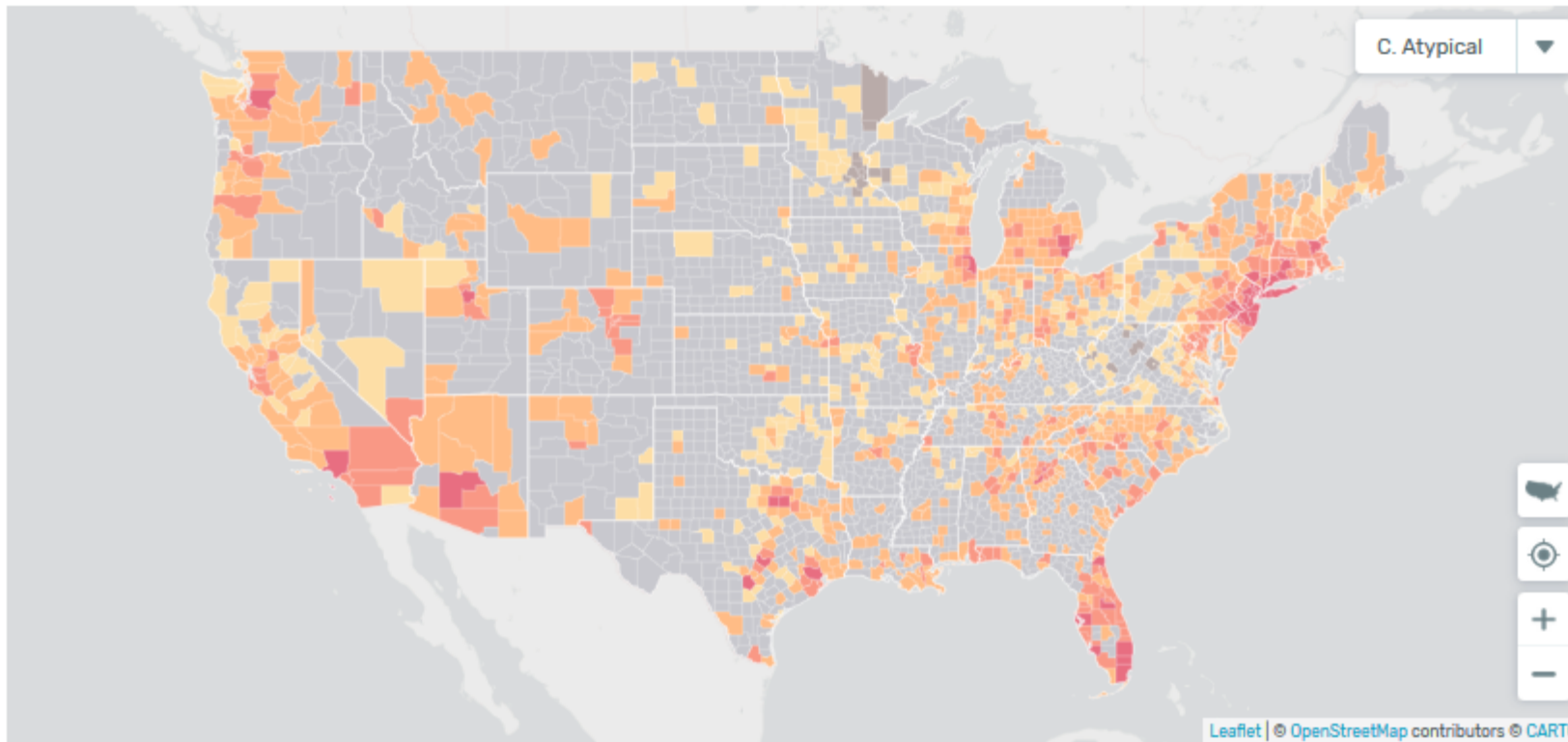


Note: we've updated our forecast of expected influenza-like illness to extend from March 1 through August 7th. For more information, [please see our FAQ](#). [5-22-2020]

Look up influenza-like illness near you:

 Search zip code or county name

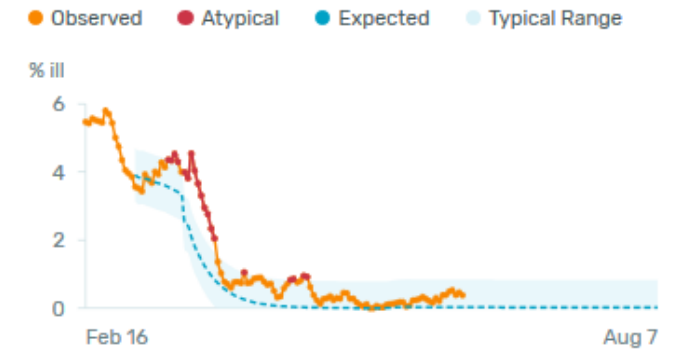
Cumulative Atypical Illness 

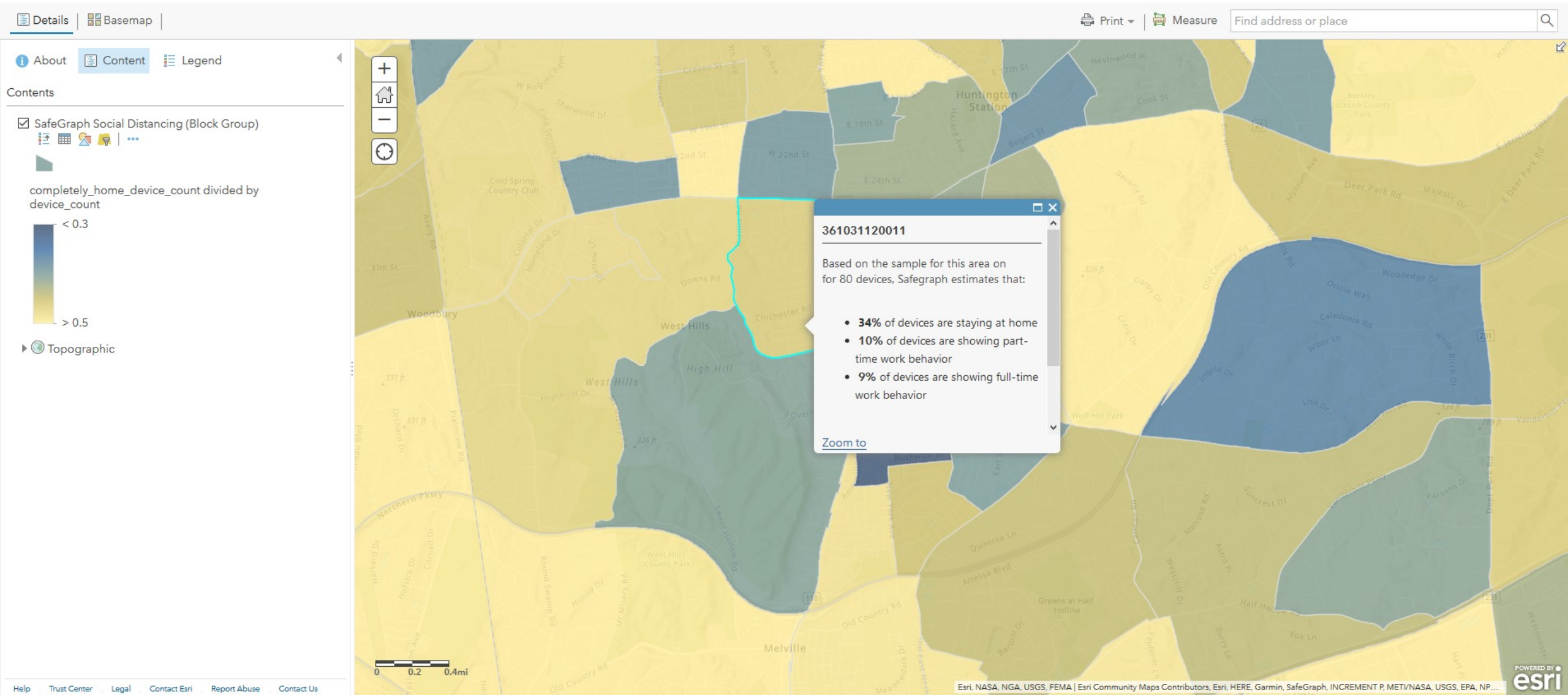


Last updated: June 9, 2020

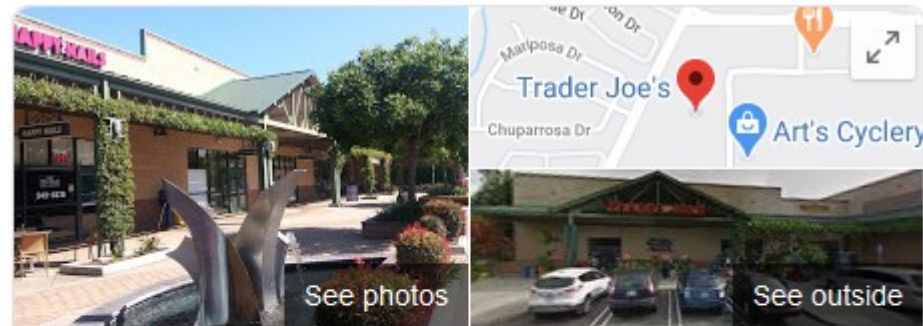
Kinsa

Maricopa County, AZ and surrounding area





Google



Trader Joe's

Website

Directions

Save

4.6 ★★★★★ 853 Google reviews

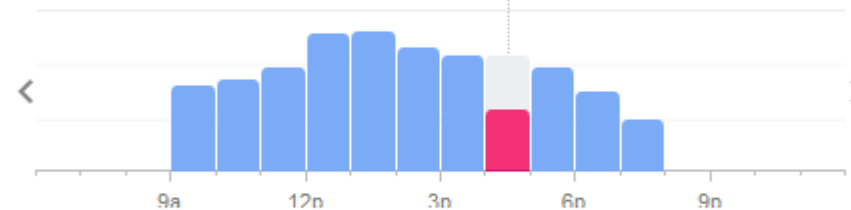
\$\$ · Grocery store

Grocery chain with a variety of signature items, plus produce, dairy & more (most sell wine & beer).

Popular times ?

Wednesdays

👤 Live: Less busy than usual



Plan your visit

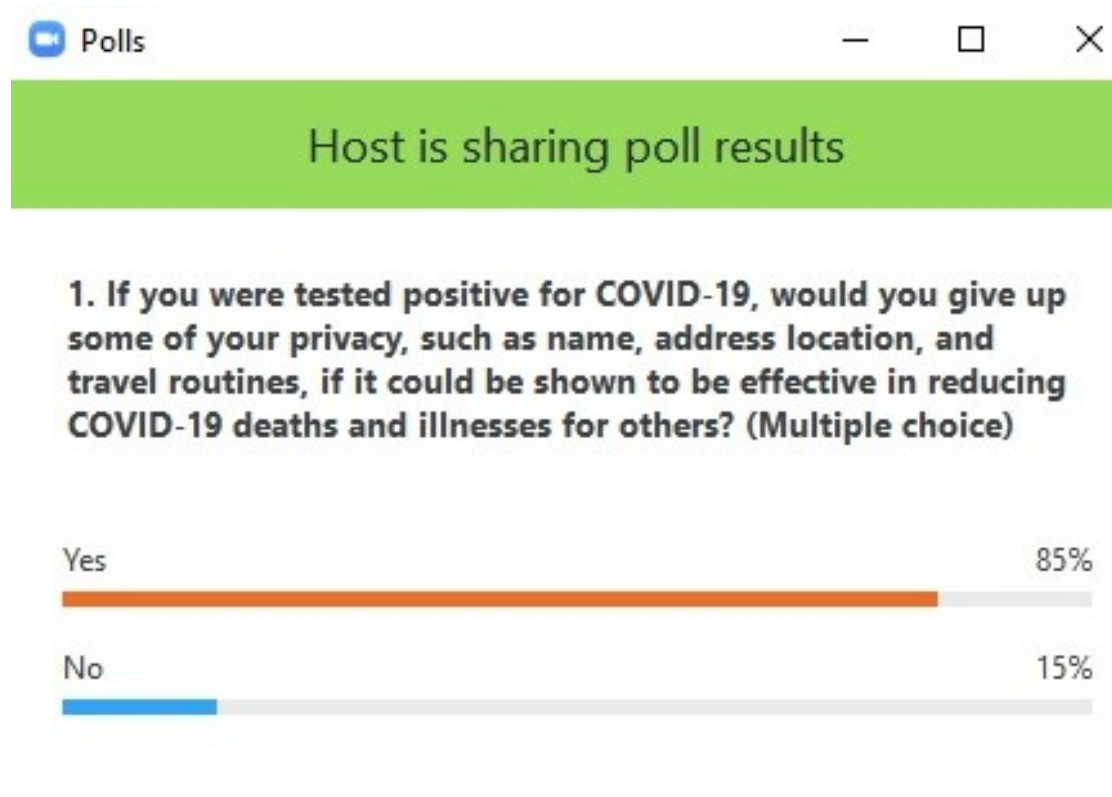
People typically spend **25 min** here

Mobile Contact Tracing



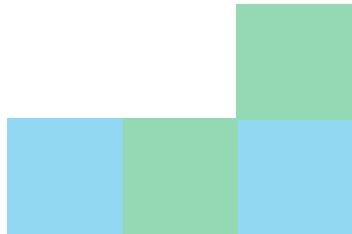
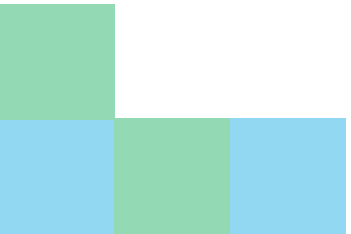
Arizona Department of Health Services

Last Webinar's Poll

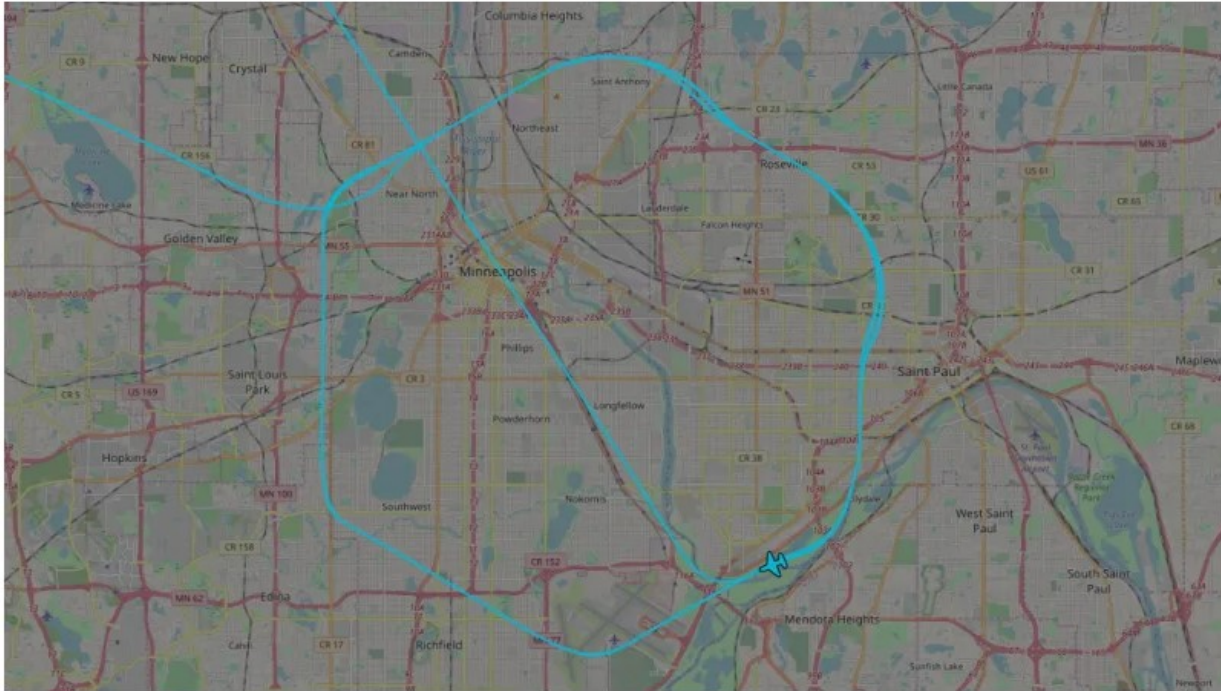




Police Brutality Protests



Protest Surveillance



Screenshot: [ADS-B Exchange](#)

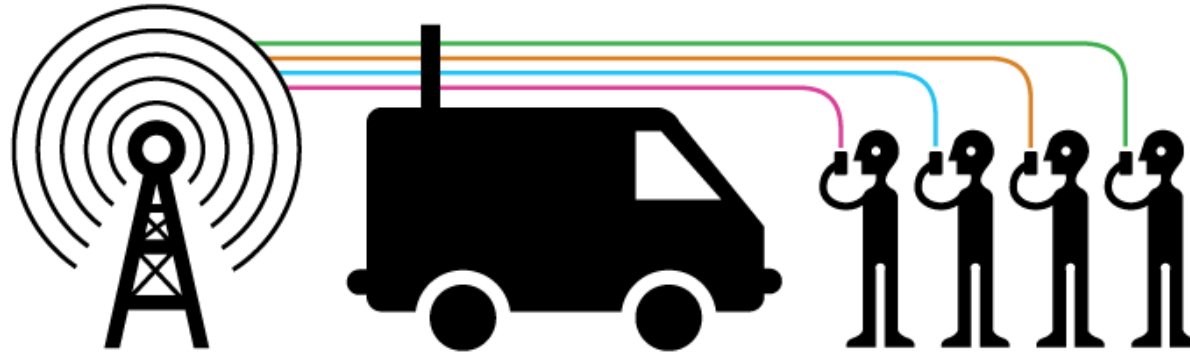


Customs and Border Protection regularly uses Predator surveillance drones to surveil the border, but on Friday, one took a detour. | Gary Williams/Getty Images

Protest Surveillance

CELL-SITE SIMULATOR SURVEILLANCE

Cell-site simulators trick your phone into thinking they are base stations.



Depending on the type of cell-site simulator in use, they can collect the following information:

- 1. identifying information about the device like International Mobile Subscriber Identity (IMSI) number
- 2. metadata about calls like who you are dialing and duration of call
- 3. intercept the content of SMS and voice calls
- 4. intercept data usage, such as websites visited.

Protest Surveillance



Charlie Warzel and Stuart A. Thompson. 2019. How Your Phone Betrays Democracy. *The New York Times*. Satellite Imagery: Microsoft & DigitalGlobe

<https://www.nytimes.com/interactive/2019/12/21/opinion/location-data-democracy-protests.html>

Smartphone Location Bias

Patterns of usage and ownership

1 phone = 1 human?

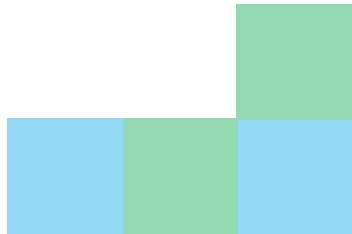
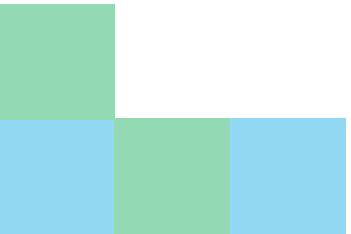
Location accuracy

	Smartphone Ownership
<i>Total</i>	81%
<i>Age 65+</i>	53%
<i>Income < \$30,000</i>	71%
<i>Rural Areas</i>	71%

Pew Research Center, 2019



Deliberate Location Inaccuracy



Pokémon GO Spoofing



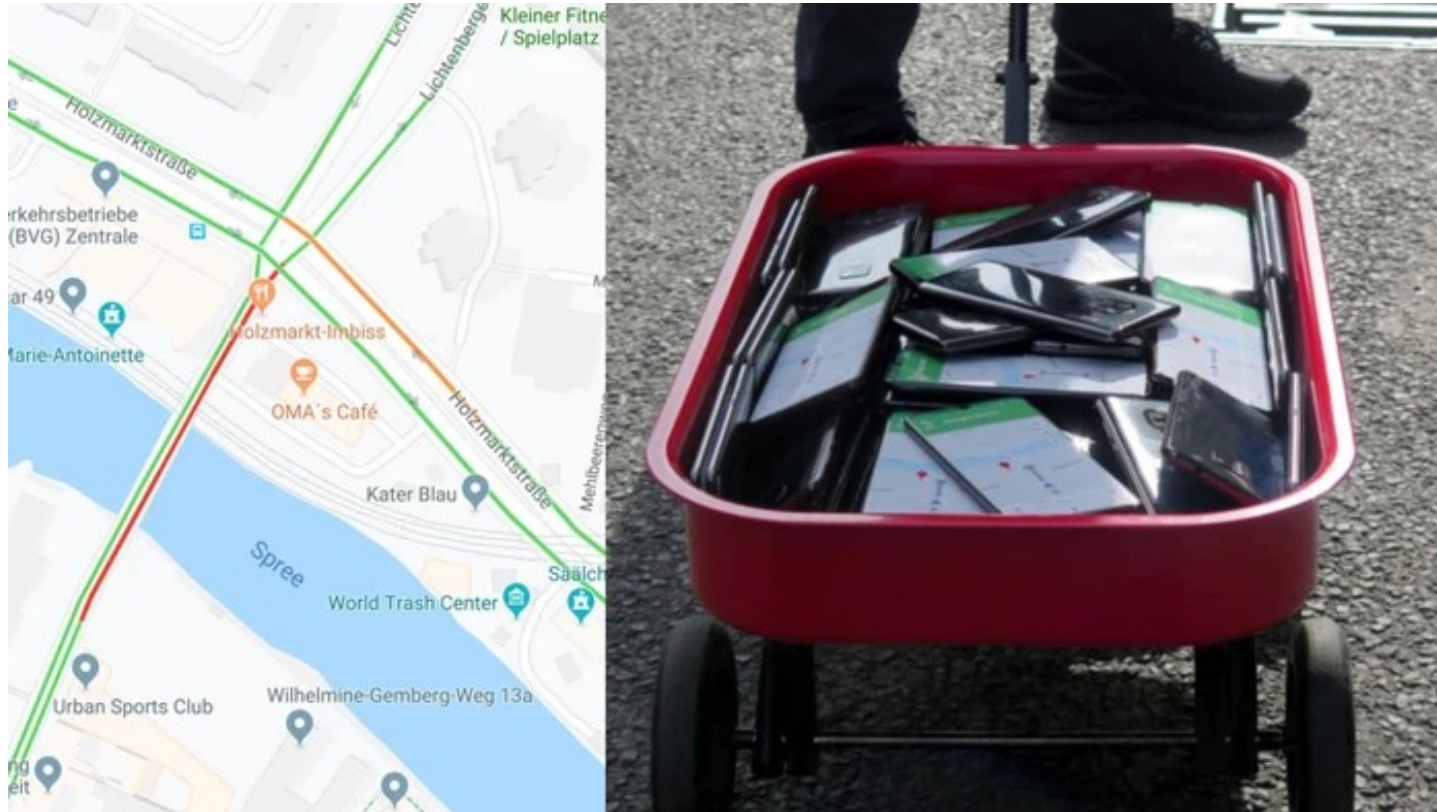
Bo Zhao & Shaozeng Zhang (2019) Rethinking Spatial Data Quality:
Pokémon Go as a Case Study of Location Spoofing, *The Professional Geographer*, 71:1, 96-108

Uber/Lyft Ride Spoofing



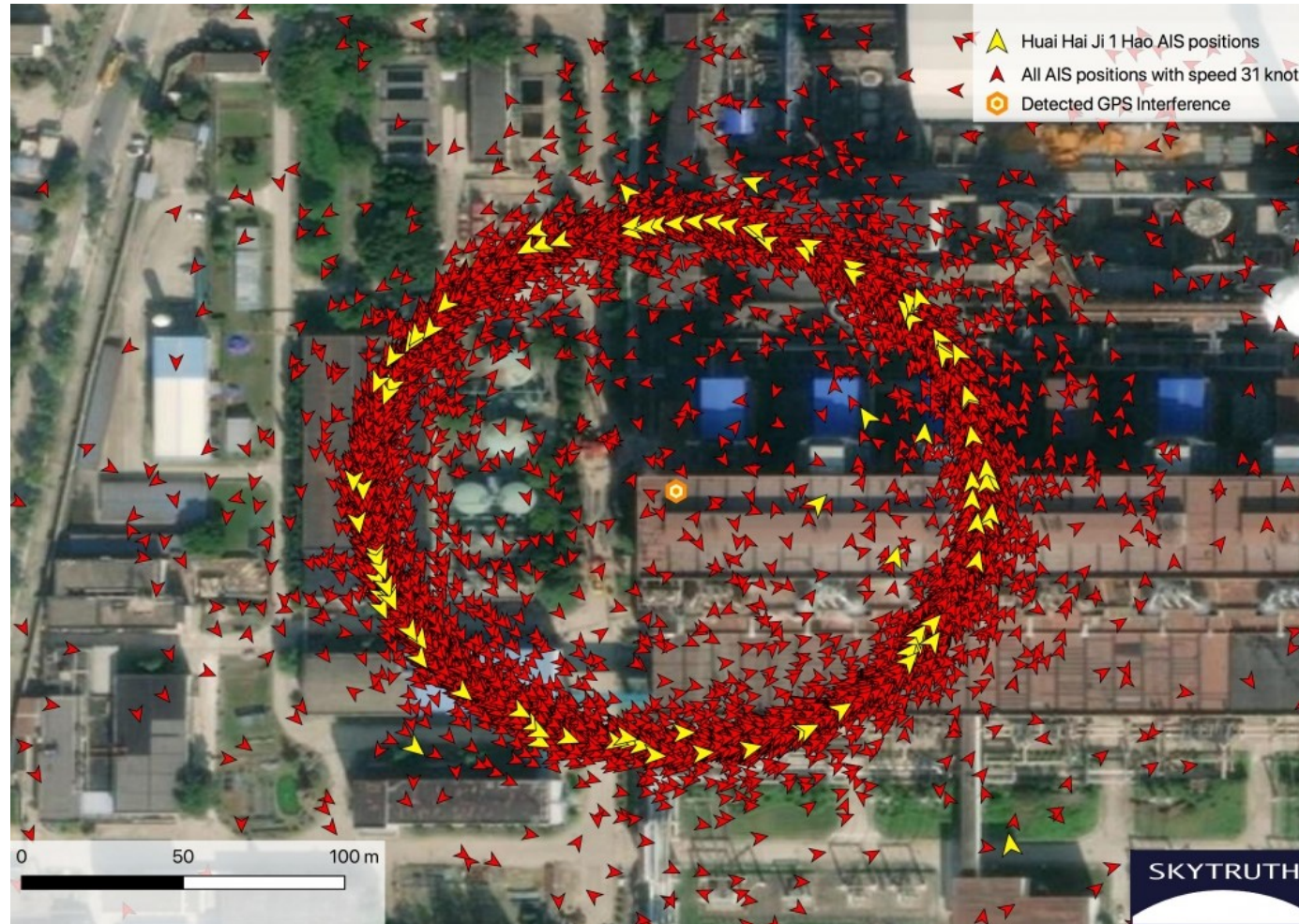
Photo by Thought Catalog on Unsplash

A Wagon of Smartphones



Gault, M. (04 February 2020) [“This man created traffic jams on Google Maps using a red wagon full of phones.”](#) Vice.

Circle Spoofing



SkyTruth. 2019.

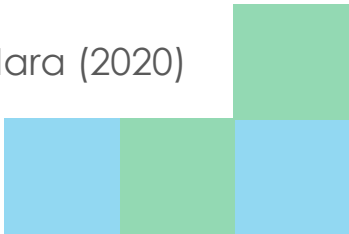
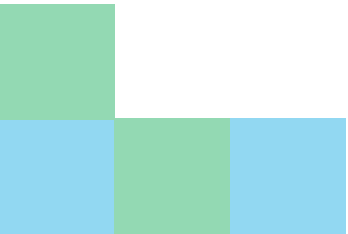
Personal Location Masking



the practice of obscuring one's personal location
data



Seidl, Jankowski, Clarke, & Nara (2020)

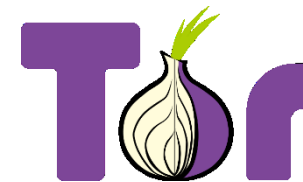


A Few Methods of Personal Location Masking

Providing incorrect address
Reducing address precision
Turning off location services
Changing IP address



Jane Docent
123 What Street
90210



Section 1. Location

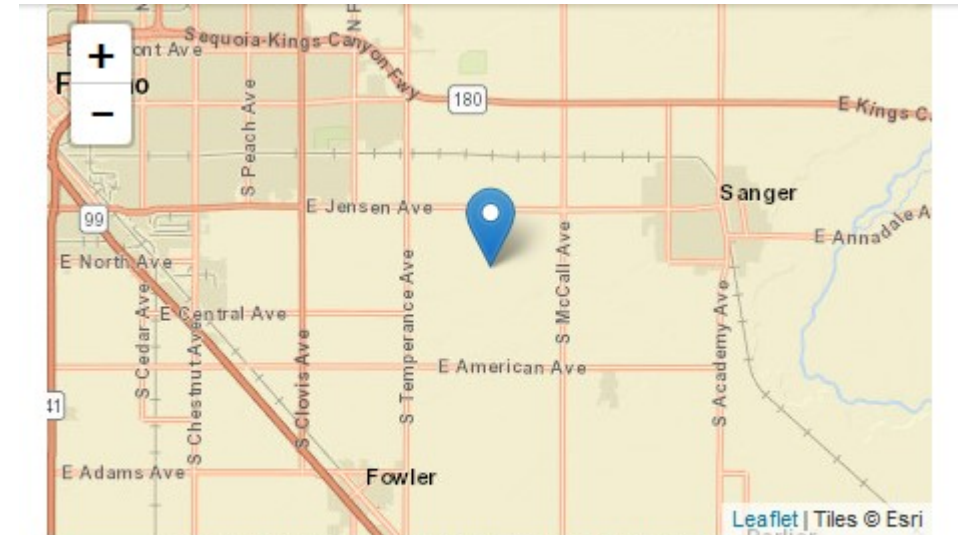
Please enter your home location.

Street	<input type="text"/>
Cross Street	<input type="text"/>
City	<input type="text"/>
State	<input type="text" value="CA"/>
Zip	<input type="text"/>

[Adjust my location on a map!](#)

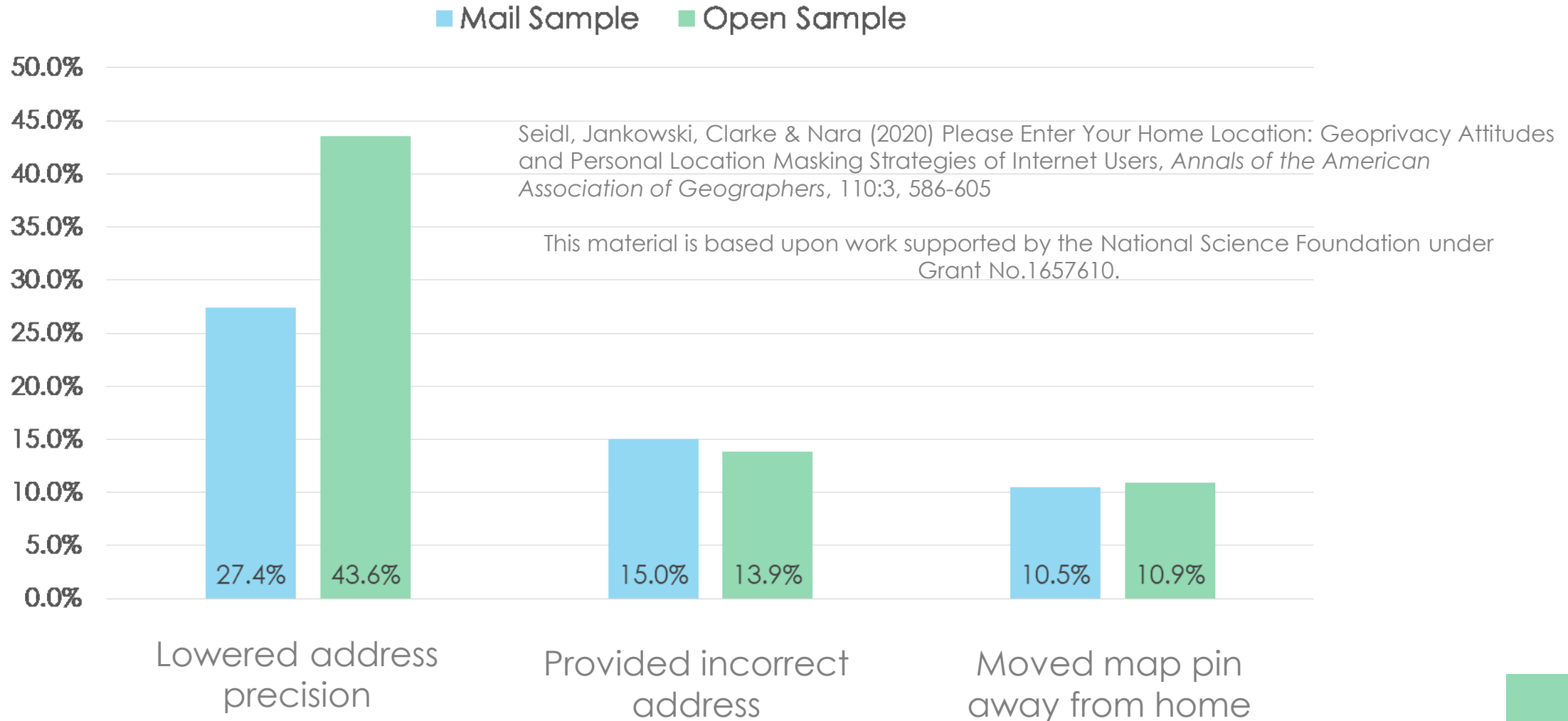
This will fill in the fields below.

Latitude	<input type="text" value="36.690446"/>
Longitude	<input type="text" value="-119.635620"/>

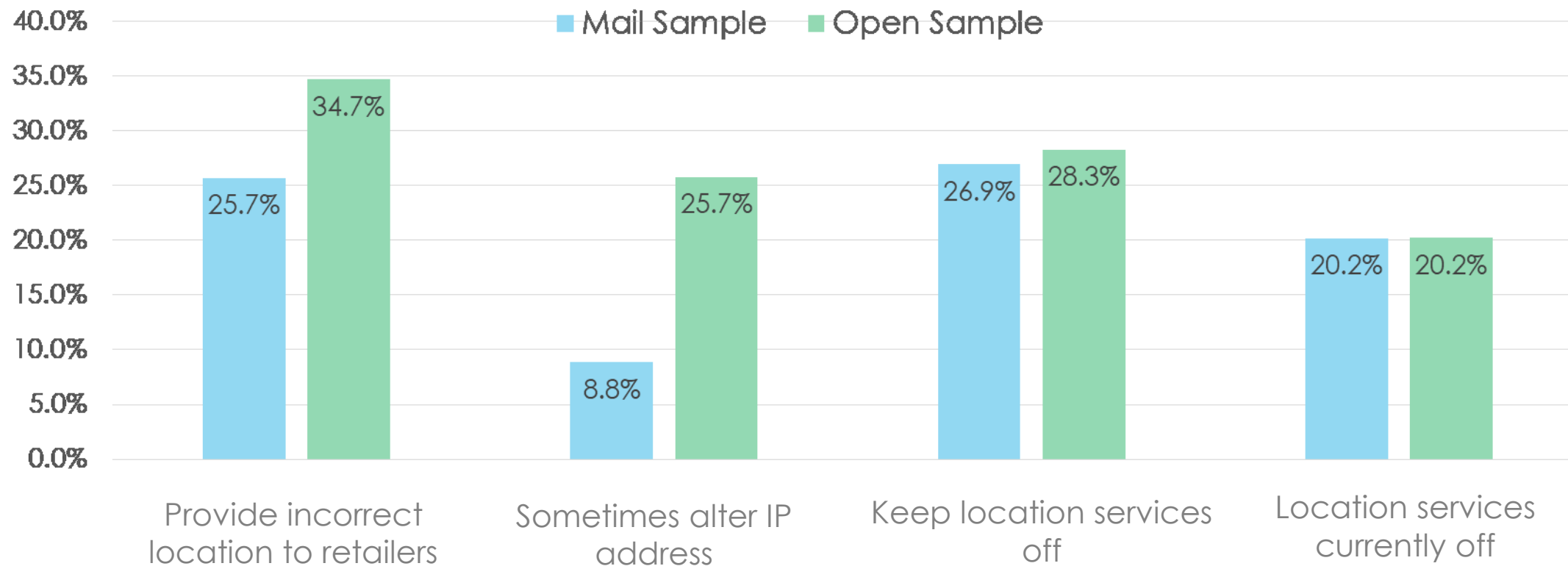


Click on the map or drag the pin to adjust your location.

Location Masking by Sample Group



Location Masking by Sample Group



Attitudes

believe websites do a good job of protecting their personal data

34%

support GPS devices in all motor vehicles

44%

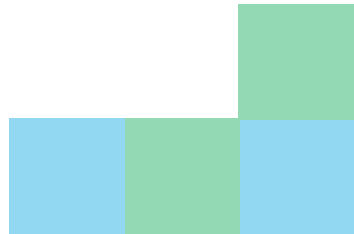
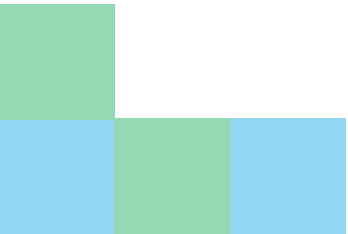
support anonymous internet browsing

73%

support right of companies to collect irrelevant location data

8%

Trust

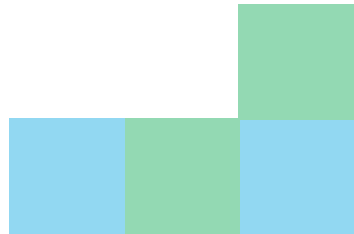
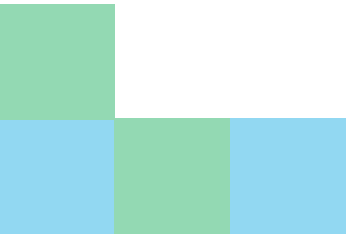


Potential Masking Trends

*Carrying a
smartphone may
be seen as
punitive*

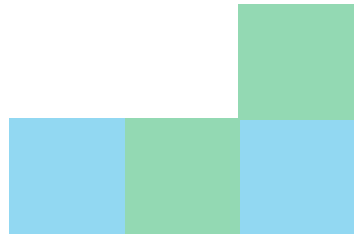
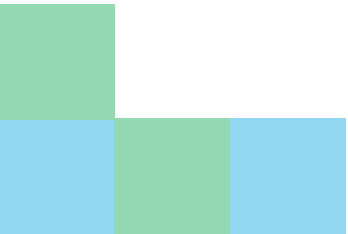
*Erosion of trust from
data breaches, false
identification*

*More masking activity
by the heavily
surveilled*



Conclusions

- Heightened public awareness of location tracking
- Masking may grow in response to increased surveillance
- Very low public support for collection of irrelevant location data
- Personal masking activity takes place across demographic groups
- Researchers should anticipate these sources of bias



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<https://globechalk.com>

Twitter: @DaraSeidl

The EthicalGEO logo consists of the text "EthicalGEO" in a white, sans-serif font, centered within a dark blue rectangular box. The box has a thin white border and a dark red horizontal bar at the bottom. The background of the box features a faint, stylized world map.

EthicalGEO

<https://ethicalgeo.org/>