

# PlacIQ Exposure Indices

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## Academic Collaboration with PlacIQ During Pandemic

- We develop and publish the PlacIQ Exposure Indices for policy and academic users.
- PlacIQ conducts and releases its own research for commercial users.

# PlacelQ Exposure Indices

- We publish the following two indices daily:
  - ▶ Location Exposure Index (LEX): County-to-county movement
  - ▶ Device Exposure Index (DEX): Social contact within commercial venues
  
- We will soon release a companion paper:
  - ▶ Discuss suitability of smartphone data to quantifying movement and social contact.
  - ▶ Detailed description of our LEX and DEX data source and computations.

## PlacelQ Exposure Indices: Objectives

- Lower entry costs for new research
- Ease of comparing different research studies using data
- Transparent methodology
- Indices are IRB approved for release

## PlacelQ Exposure Indices: Device Visit Data

- Devices: Produce GPS “ping” whenever app request location data.
- Devices: Have unique ad ID, allows PlacelQ to aggregates pings from different apps.
- Visit: Intersection of ping with basemap of two dimensional polygons (“venues”)
- Visit cleaning based on:
  - ▶ Number and density of pings in or near venue
  - ▶ Source of ping data
  - ▶ Venue size

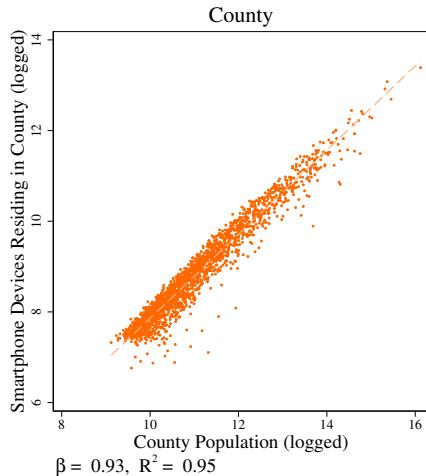
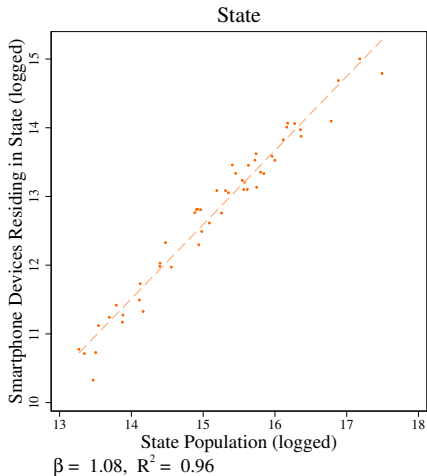
## PlacelQ Exposure Indices: Devices Covered

- Smartphone sample varies through time:
  - ▶ Typical device remains 6 months in sample, lots of heterogeneity.
  - ▶ Some devices don't ping regularly.
- Selecting our sample:
  - ▶ Keep devices that pinged 11 days over any 14-day period since Nov 2019 (53M devices).
  - ▶ If need demographics: Keep device where we can assign home location (30M devices).
- Large drop in devices generating pings starting March 2020
  - ▶ Can adjust our indices for sheltering-in-place
  - ▶ Even in normal times, smartphone sample size varies.

## PlacelQ Exposure Indices: Sample Representativeness

- Smartphone datasets cover significant fraction of US
  - ▶  $\approx$  80 percent of US adults own a smartphone
  - ▶  $\approx$  10 percent of US adult population in our daily clean device sample.
- Unrepresentative samples may arise from:
  - ▶ Bias in smartphone ownership (only 53 percent of 65 year and older own a smartphone)
  - ▶ Bias in app use and privacy settings
  - ▶ Sample selection rules specific to research application
  - ▶ Small geographic units.

# Number of Devices vs Census Residential Population





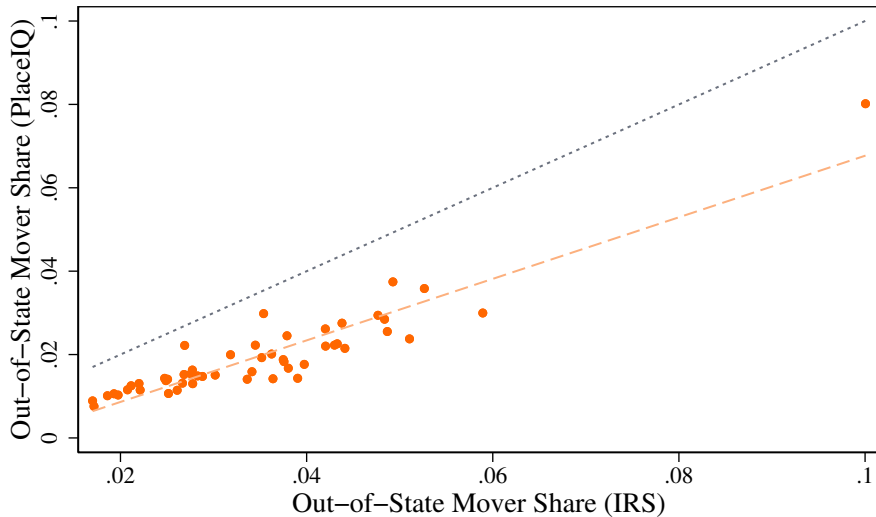
# Share of Devices Within Counties Blockgroup Demographic Decile



Deciles by Population

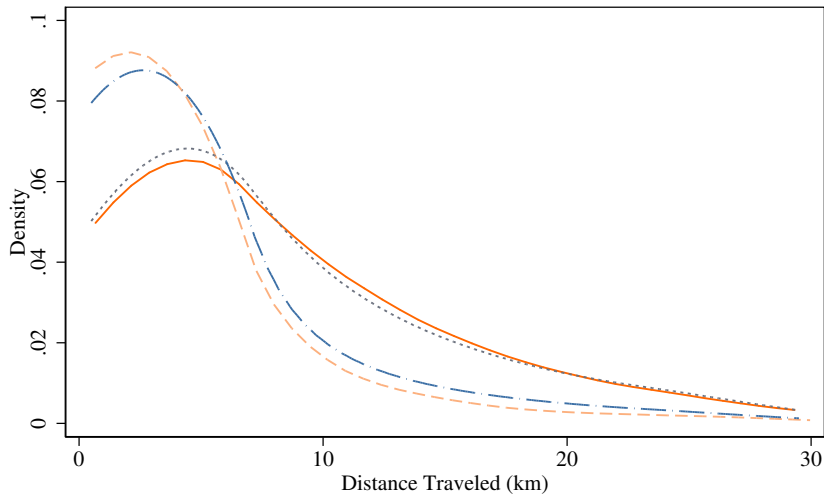
Proportion of devices residing in a characteristic decile is close to 10%.

## Device vs IRS Yearly Out-of-State Mover Share



--- Fitted Line      ..... 45 Degree Line

## Device vs NHTS Trip Length Distribution



— NHTS Low Pop Density      - - - NHTS High Pop Density  
..... PlaceIQ Low Pop. Density      - · - PlaceIQ High Pop. Density

# Exposure Indices Definition

- Location Exposure (LEX)

- ▶ Measures cross-county movement
- ▶ Location-to-location matrix: exposure to county A within county B:
- ▶ *The share of the devices that pinged in a county B that also pinged in county A at least once during the last 14 days.*

- Device Exposure (DEX)

- ▶ Measures social contact within commercial venue
- ▶ Average exposure of devices to other devices at commercial venues.
- ▶ *The number of distinct devices that visit any commercial venue that device visited on a given day, averaged over all devices in a county.*

## Conclusion

- Smartphone data captures movement and contact in real time.
- Smartphone data is broadly representative, but with a number of caveats.
- The PlacelQ Exposure Indices are updated daily and available at:  
<https://github.com/COVIDExposureIndices/COVIDExposureIndices>
- Thank you!