Weekly Panel Report for United States

Week: Mon 14 Nov 2022 - Sun 20 Nov 2022

Compiled on 2022.12.05.

Introduction

Motionworks' primary business involves measuring exposure to out-of-home (OOH) advertising to help facilitate transactions between the owners of advertising infrastructure and the agents and advertisers buying the ads. Traditionally, average annual estimates of traffic volumes near billboards and annual ridership for transit stations were sufficient to inform these transactions. However, with the behavioral changes brought about by the pandemic and advances in automation technology, the industry needs more frequent updates to the metrics. Motionworks stepped up to fill this urgent need.

Motionworks curates the highest quality data sources available—including feeds of mobile location data, consumer marketing resources, business marketing resources, mapping data, and the US Census—to create a robust, digital representation of the population week-over-week. It is sensitive to both short-term changes in travel behavior (e.g. COVID-19 lockdowns, social distancing protocols) and long-term shifts (e.g. changing land use, new transportation projects).

Historically, the best sources of population movement intelligence included a combination of the US Census' American Community Survey (ACS) and the US Federal Highway Administration's National Household Travel Survey (NHTS). The ACS is a continuous, annual survey that in the 2019 dataset collected complete surveys from 2.1M housing units and 150K persons in group quarters, totaling approximately 5.7M persons (1.7% of the total population over a year). In the most recent 2017 NHTS, which is irregularly collected, 129K households completed one-day interviews, which resulted in approximately 337K person-days over a year (one travel day for 0.1% of the total population in a year). Moreover, the NHTS allows for states and municipalities to pay to have additional data collected from their region, which introduces a systematic, geographic error even when using the survey weights. In 2017, 79.9% of survey respondents were from these regions.

The combination of all Motionworks' mobile location data feeds saw 1.6B unique device identifiers over the course of 2022 in the US to date[1], or 338M per month on average. By the numbers, this suggests 100% of the total population each month of the year are seen. However, not all device observations are the same.

Many of those devices do not provide enough observations to de-

[1] Device identifiers are cycled, which is why we have more device identifiers than people in the US.

termine anything meaningful and cannot deliver population intelligence on par with the ACS or NHTS. To overcome this inherent issue in mobile location data, Motionworks curates a "panel" of devices. The panel makes up an analogous dataset to the travel and activity data of the NHTS, where each device provides enough activity to build an itinerary comparable to the NHTS data for their entire week. The Motionworks panel is on the order of 5M individual devices per week since May of 2022.

The US Census ACS surveys 1.7% of the total population over a year, the FHWA NHTS surveys 0.1% of the total population in a year, and Motionworks observes 100% of the total population **each month** of the year.

Motionworks maintains a panel of mobile devices from which all data products and solutions are built. These devices represent the most usable devices that provide consistent, frequent, and reliable location data. In order to be considered for the panel, devices not only have to be visible 7-days per week for at least 8 hours per day, they must also have stable enough patterns of activity to establish home neighborhoods (US Census block groups) and reasonable travel and activity patterns.

The type of panel utilized by Motionworks differs from the type of quantitative panels typically used in traditional surveys. All movement data are passively captured without reliance upon respondent stated behavior.

The device panel is defined and implemented on a weekly basis (Monday - Sunday). The sampling rate of the panel devices each week is tracked and analyzed on various geographic and demographic dimensions. Looking at the panel through time, Motionworks also examines characteristics of the panel to demonstrate that it appropriately handles fluctuations as data brokers contributing to the feed are optimized and as operating system features evolve. This allows Motionworks to identify issues and inconsistencies in the feeds, update the methodologies as technologies change, and evaluate new data sources and their impact on the panel.

Sampling by Geography

The panel is balanced geographically at different levels. In this section, the panel for the week ending on Sunday, November 20 2022 is examined after final selection of panel participants.

State

The aggregate sampling rates by state provides an overview of coverage nationally, and highlights the key outliers with D.C. (many government devices automatically opt out) and California (with additional privacy legislation as outliers to the rest of the country).

County

The sampling rate by county is shown in the map. It provides additional insight into geographical bias in the panel. While the sampling rate for
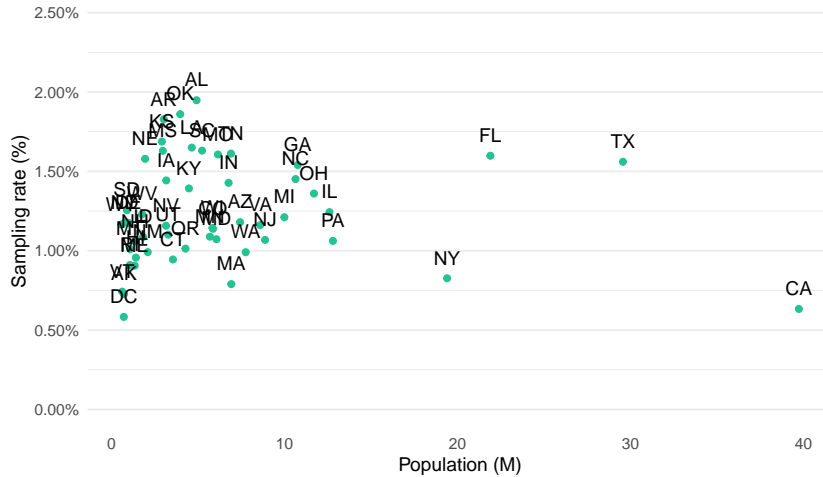
Figure 1: Sampling rates at the state level.

all US counties averages 1.3% this week, the map shows that there are slight geographic patterns to the variance around this mean.
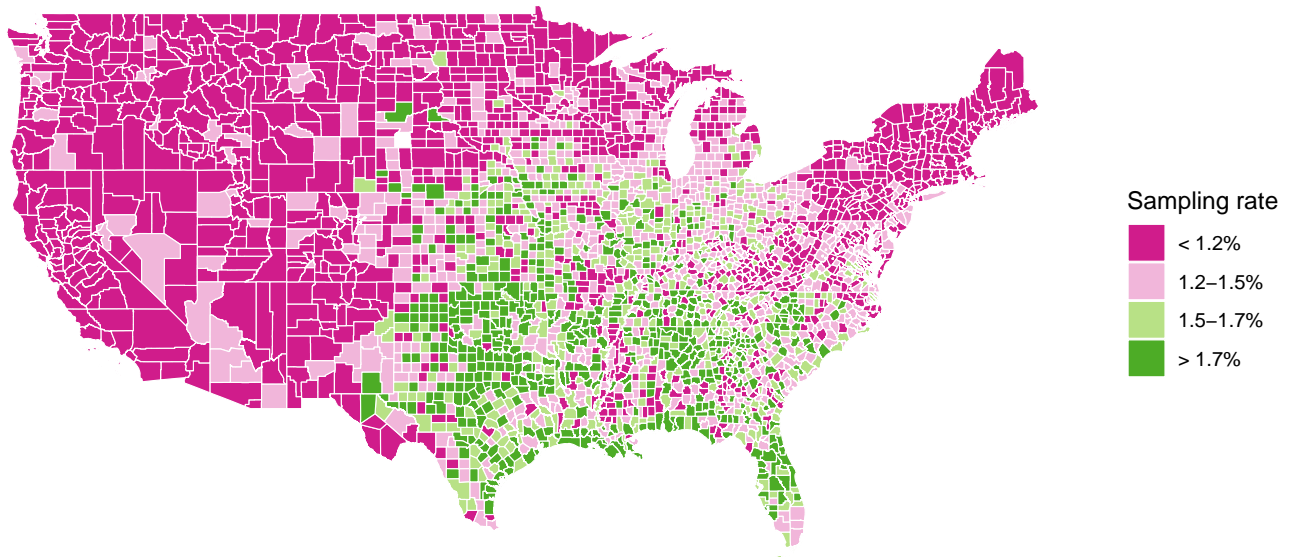

Sampling rate

- < 1.2%
- 1.2–1.5%
- 1.5–1.7%
- > 1.7%

Figure 2: Sampling rates at the county level.

Block Group

At the most detailed level, the sampling rate for every individual "neighborhood" is considered at the block group level. A block group is a neighborhood scale geography targeting homogeneous populations of approximately 400 households or 1,000 persons. In no case can a block group have more than 3,000 persons or less than 600 persons unless it is unpopulated like lakes or undeveloped areas.

The histogram shows the distribution of sampling rates across all block groups in the US. The figure just after shows the empirical cumulative distribution function of the same. The empirical cumulative distribution indicates, for example, that at 5% along the x-axis the line crosses the y-axis just shy of 1.00, which is also known approximately as the 99th percentile. This illustrates that virtually all the block groups, or 99% of them, have a sampling rate of 5% or less. The 75th percentile block group has a sampling rate of about 2%, meaning 75% of the block groups have a sampling rate of 2% or less.
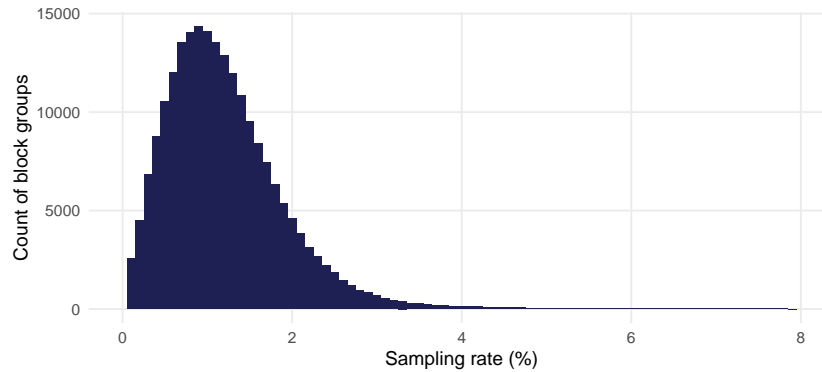

Figure 3: Distribution of sampling rates at the block group level.
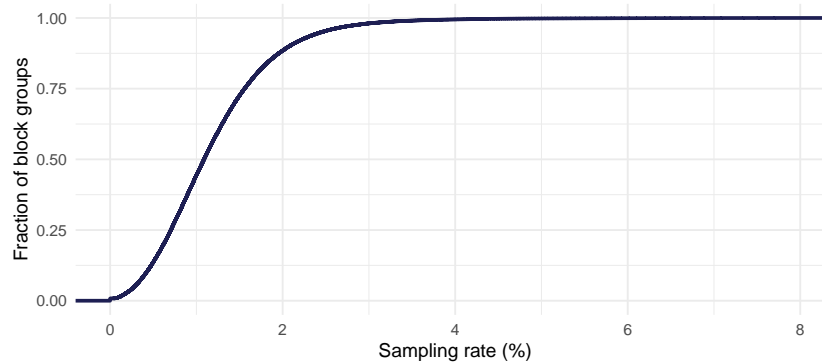

Figure 4: Empirical cumulative distribution of sampling rates at the block group level.

Boxplots are used to show the variation of block group level sampling rates within each state. The colored box in the center shows the 25th, 50th, and 75th percentiles of the sampling rate. Notice that the y-axis uses a logarithmic scale. This demonstrates that the distribution of block group level sampling rates are distributed roughly evenly across states because the size of the boxes representing the middle 50% within each state is about equal with a few previously-noted exceptions: D.C. and California.
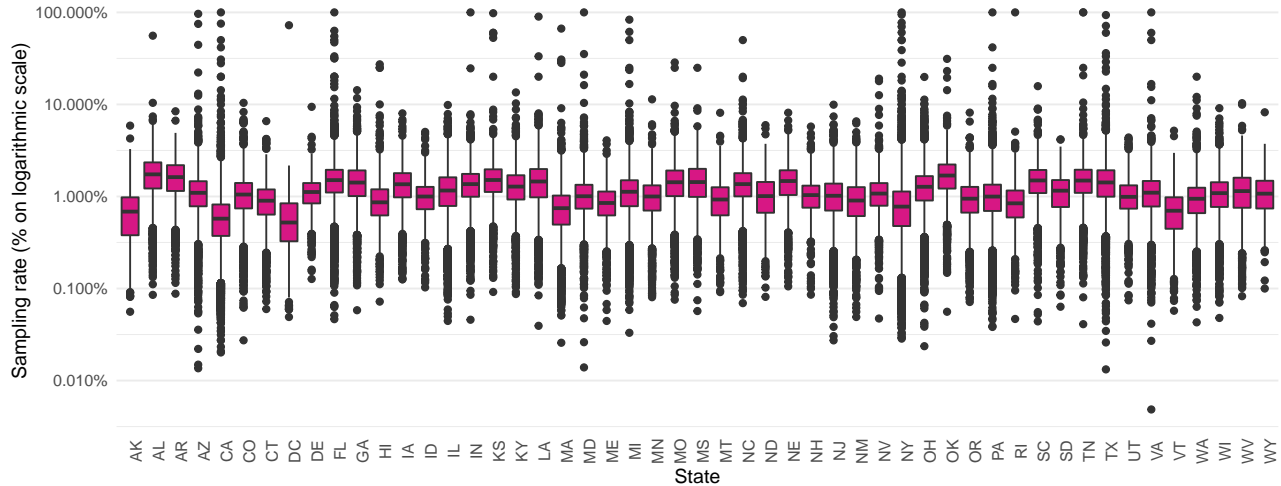
Figure 5: Boxplot distribution of sampling rates at the block group level within each state.

Sampling by Demographics

To promote protection of privacy, Motionworks does not ingest individual demographics on device-level data from data providers. All of Motionworks demographics, even if person-level like age or gender, are associated with the demographics of the full population of the relevant neighborhood, which in the U.S. is block groups. "Home locations" are never tagged to anything more specific than a neighborhood. If visits are observed from a neighborhood characterized by households that tend to be single parents as well as multi-generational, all of this neighborhood-typical household's ages contribute to the characteristization of the estimated visit. Specifically, let us say this neighborhood-typical household tends to have equal distributions of people in age segments 0-17, 35-44, and 75+. If visits to a bar from this neighborhood are observed, the percent of visits by age segment at the bar would be 33.3% for each of the three age segments.

Claritas PRIZM Segmentation Systems

Motionworks uses one of Claritas' segmentation systems to look at age groups using the PRIZM Lifestage Groups[2]. The panel makeup is shown next to the population in the nearby bar charts as percentages of the total panel and total population. In this way, it is easy to visualize which Lifestage Groups are being over and under sampled.

The same bar chart for income groups and area types is shown using Claritas PRIZM Social Groups[3], which focus on the affluence (socioeconomic rank) of the households and area type where they live (urbanicity).

[2] PRIZM Lifestage Groups are described in detail in the appendix.

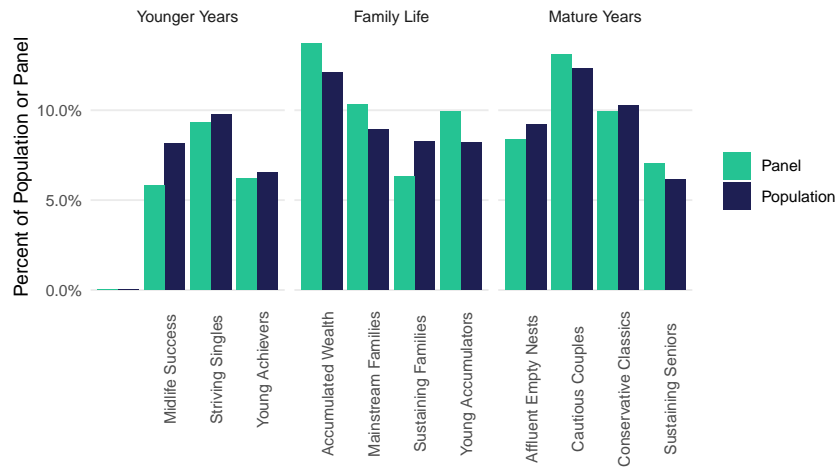[3] PRIZM Social Groups are described in detail in the appendix.

Figure 6: Distribution of panel along PRIZM Lifestage Groups as compared to the total population.

Figure 7: Distribution of panel along PRIZM Social Groups as compared to the total population.

Panel Over Time

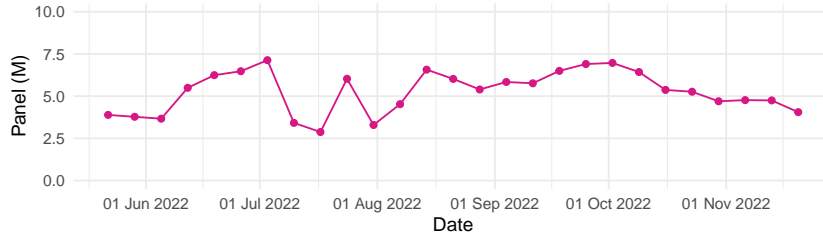The panel for the past six months week over week is shown up until Sunday, November 20 2022.

Figure 8: Panel size week over week.