

Analytical Benefits of a Smartphone-Based Survey From a Smaller Region

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EXECUTIVE SUMMARY

The 2018 Whatcom Regional Transportation Study – a household travel survey (HTS) conducted in Whatcom County, WA – used a modern multi-modal approach to collect demographic and travel pattern information from regional residents. This approach included an online demographic survey and a one-day online or up to seven-day smartphone GPS app travel diary.

In addition to achieving a high final sample rate of 1.8%, the multi-day smartphone approach provided WCOG with greater quantity and quality of data, supporting many of WCOG's data use cases.

- Multi-day smartphone data collection resulted in:**
- Higher trip and key behavior counts
 - More representative sample for travel behavior
 - Greater spatial coverage in the WA region

FINAL DATASET



1 WCOG AND HTS DATA USE CASES

The Whatcom Council of Governments (WCOG) provides a variety of services and programs for the 90K+ households (210K+ residents) in the Whatcom region.

Key Transportation Topics:

- High passenger and freight volume at U.S. – Canadian border crossing.
- Increase in ride-hailing and urban bicycling.
- Decrease in bus ridership.
- Rapid population growth in past 10 years.
- High share of ex-region commuters.

Primary HTS Data Use Cases:

- General transportation planning.
- Active transportation planning.
- Trip-based travel demand modeling.
- Understanding special travel markets.

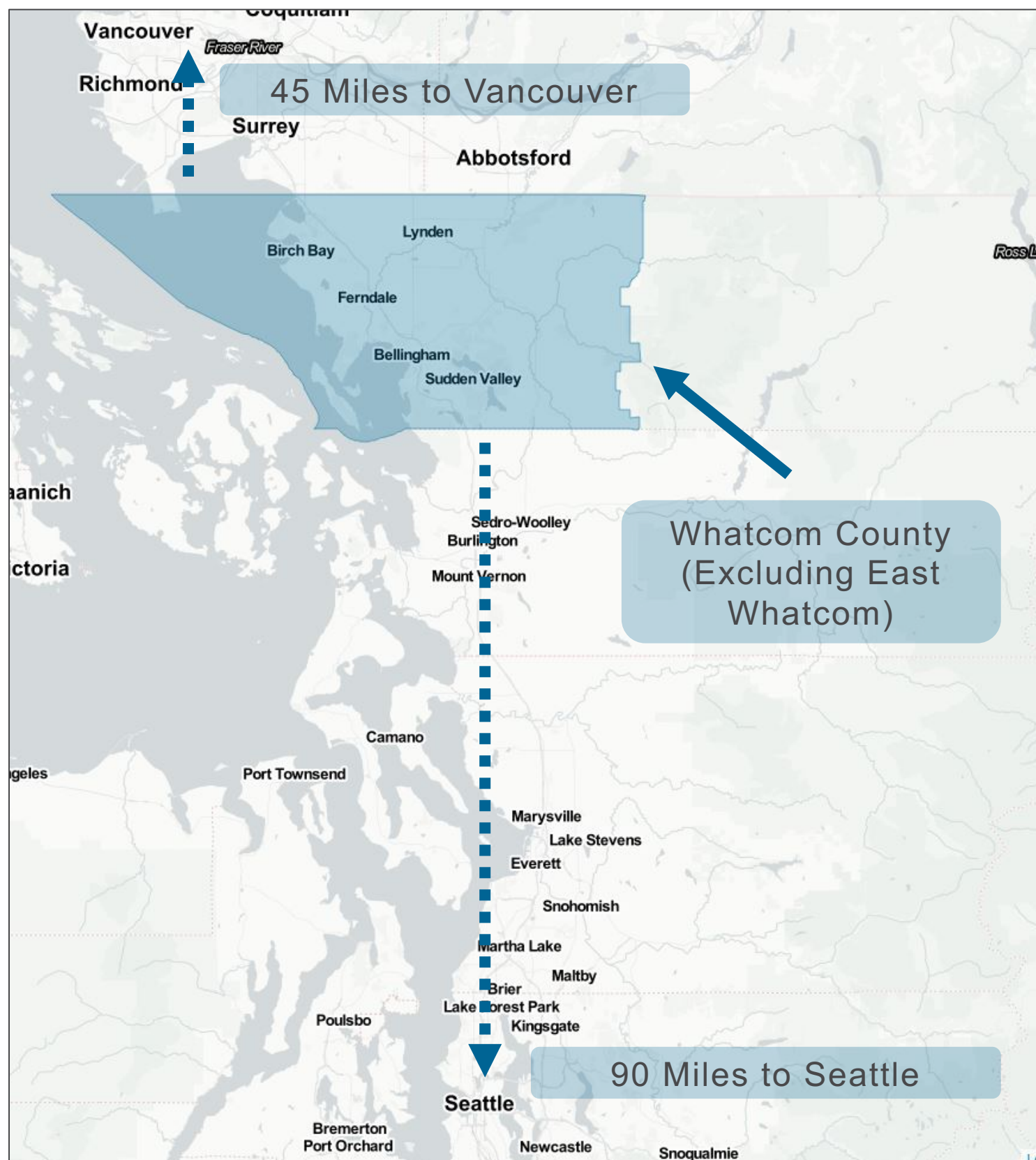
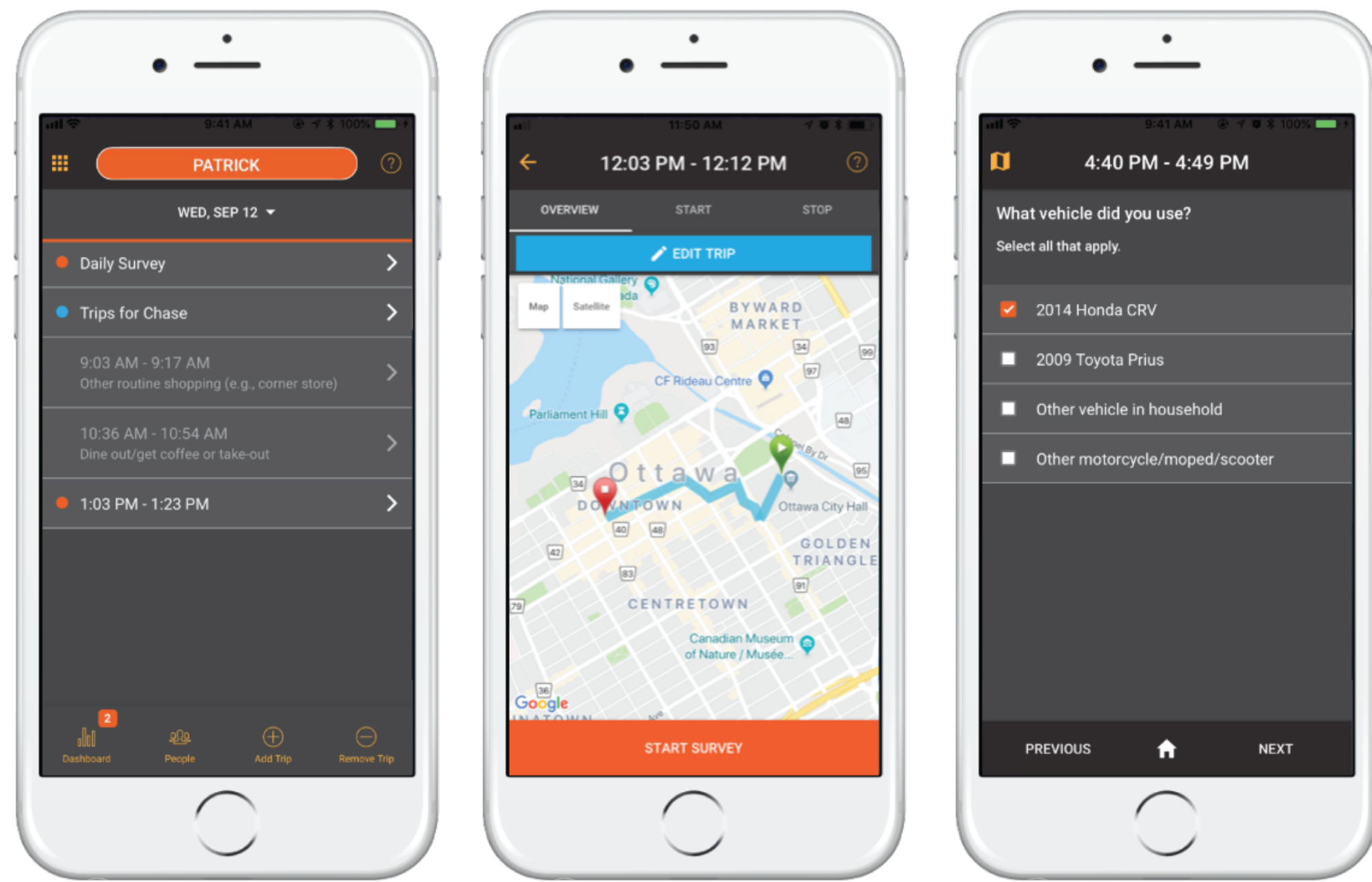


Figure 1: Map of WCOG Study Region in NW Washington

2 MULTI-MODAL STUDY DESIGN

The 2018 WCOG HTS used a two-part survey design. Part 1 required households to complete an online demographic survey. After completing Part 1, households were asked to complete Part 2 (the travel diary) online for one day or on the study smartphone app, rMove™, for up to seven consecutive days. Households that completed the survey were given gift card incentives that varied by method (\$10 per household online or \$15 per adult in rMove).

Figure 2: rMove Smartphone App
rMove passively collected users' locations and movements to generate travel diary trip surveys. The app generated surveys after each trip and each full travel day.



Among households that completed the study, 60% used the rMove travel diary.

3 HIGHER TRIP AND KEY BEHAVIOR COUNTS

The smartphone data collection method provided more accurate trip counts than the online recollection diary method. The greater volume of smartphone data also provided significantly more observations for travel behaviors that support general and active transportation planning.

Figure 3: Person Trips by Diary Method. The smartphone data collection method captured more accurate trip counts compared to manual data collection using the online diary method.

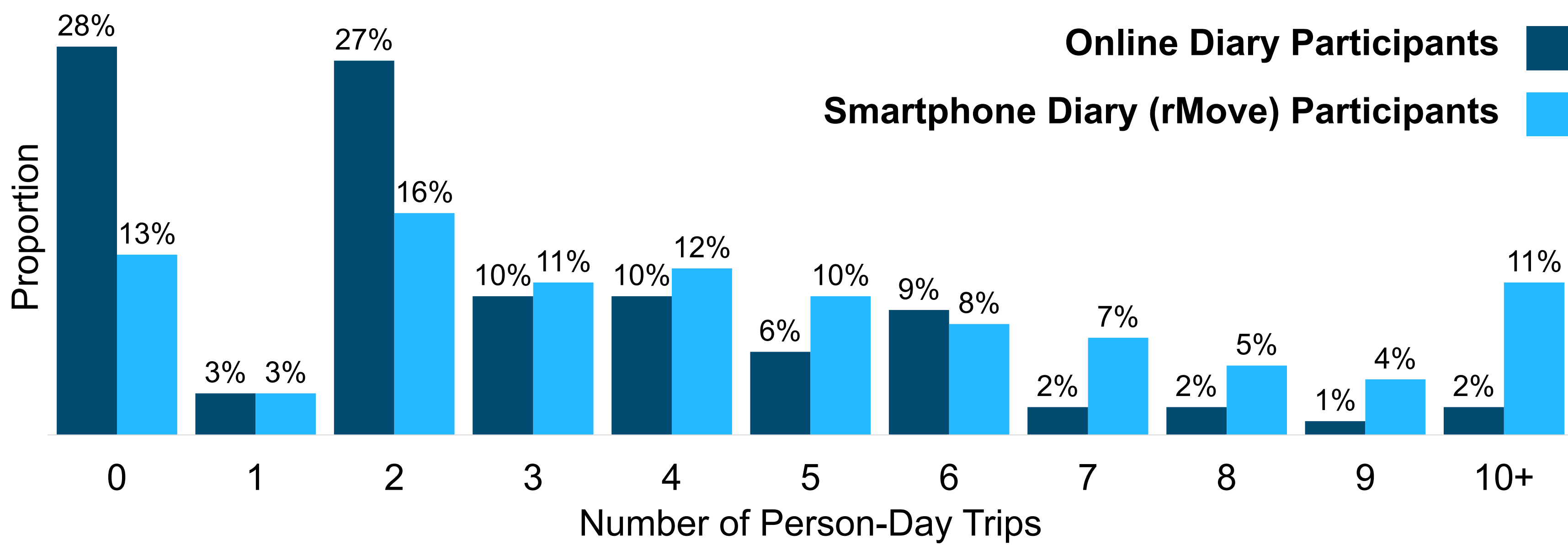


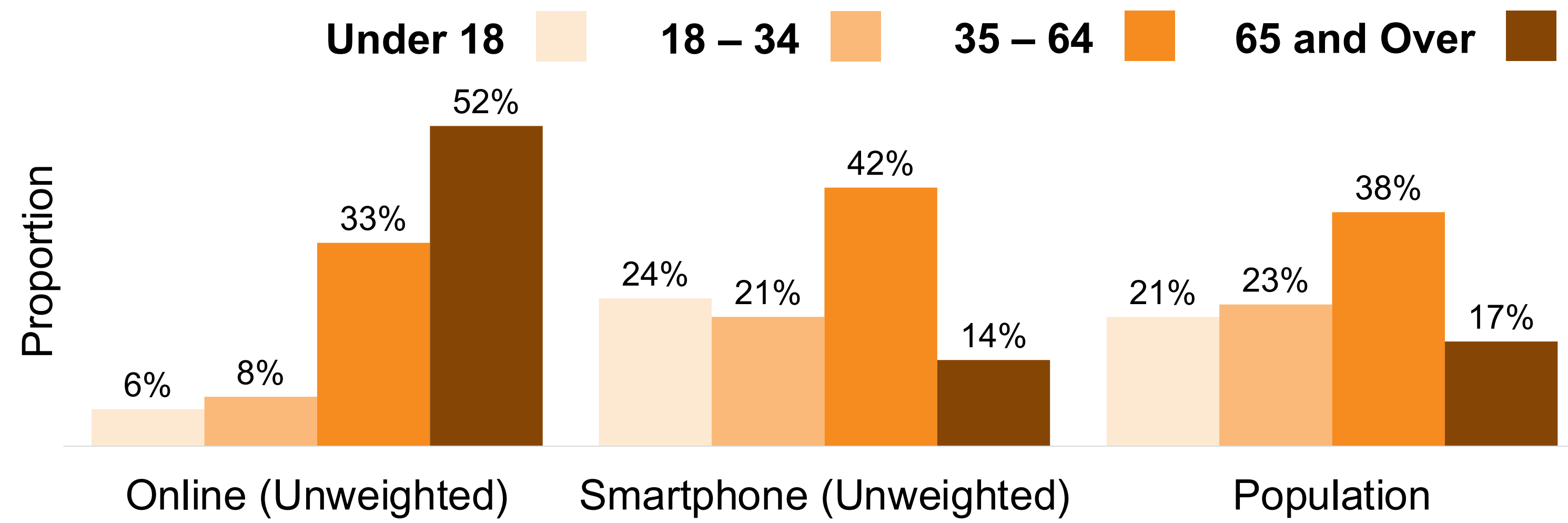
Figure 4: Key Behaviors by Travel Day. Multi-day data collection resulted in a 131% increase in unique bicyclists and 196% increase in persons who made cross-border trips to British Columbia.



4 MORE REPRESENTATIVE SAMPLE

Smartphone participants were generally more representative of the regional population than those who used the online diary. This was an important distinction because demographics like age and income greatly impact travel behavior and correlate with other travel determinates, like employment.

Figure 5: Age By Diary Method. Smartphone participants were younger on average and matched the regional population's age distribution more closely.



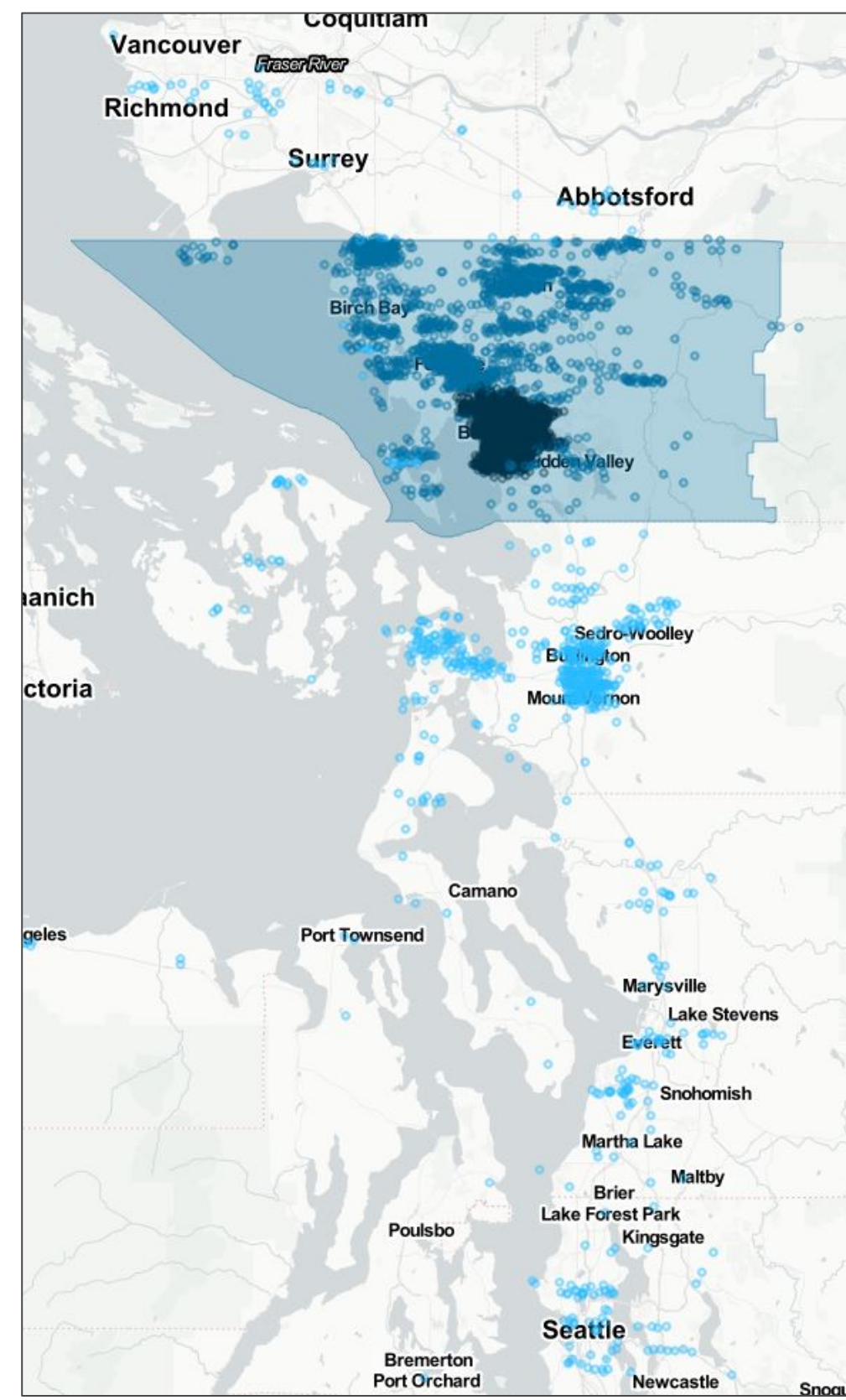
5 GREATER SPATIAL COVERAGE

Multi-day data collection increased the spatial coverage of trips significantly both inside and outside the region. For example, the study collected a median of 60 trips per regional block group on day 1 and a median of 268 trips per block group across all complete travel days.

Figure 5: Work and Work-Related Trip Destinations (Noise Added to Preserve Anonymity) 13.4% of trips with a reported purpose of "work" or "work-related" had a destination outside the Whatcom region. These observations were key for WCOG's planning given the high share of cross-border and long-distance commuting among regional residents.

- Trips in the City of Bellingham
- Trips in the rest of Whatcom County
- Trips outside Whatcom County

Within the region, multi-day data collection provided a 346% increase in median trips per block group.



6 SINCE THE STUDY

Since the study finished in 2019, WCOG has incorporated the survey data into their travel demand model update, performed corridor origin-destination samples and characteristics, and developed an accessible survey data platform using Tableau.