Understanding Active Transportation Needs in Rural Residential Clusters: A Geospatial Framework and Community Survey Approach

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Washington State Department of Transportation

R-SEAT
Rural Safe Efficient Advanced Transportation Center

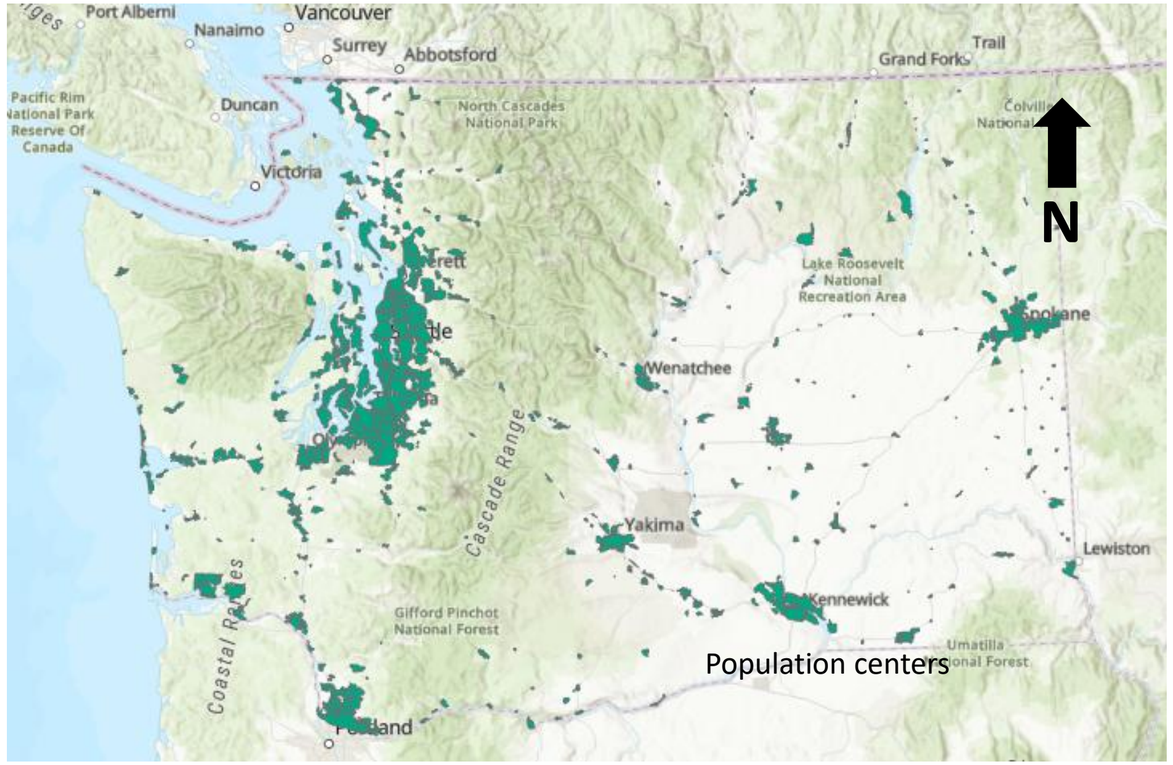
BACKGROUND

- An RRC is a small, unincorporated cluster of homes along a state highway, outside Population Centers (PCs)
  - Often rely on active transportation or limited transit options to reach nearby essential destinations

Typical image representing a RRCs

BACKGROUND

- PCs include cities, towns, urban growth areas, and census-designated places
- Complete Streets mandate (RCW 47.04.035) prioritizes AT improvements where people live, travel, and access key destinations
- PC data supports Complete Streets by identifying and prioritizing AT investment locations
- This research extends WSDOT's PC prioritization to rural clusters with high AT needs



Population Centers (PCs)

GEOSPATIAL FRAMEWORK FOR IDENTIFYING RRCS

Step 1: Study Area

Step 2: Roadway Network

Step 3: Residential Parcels

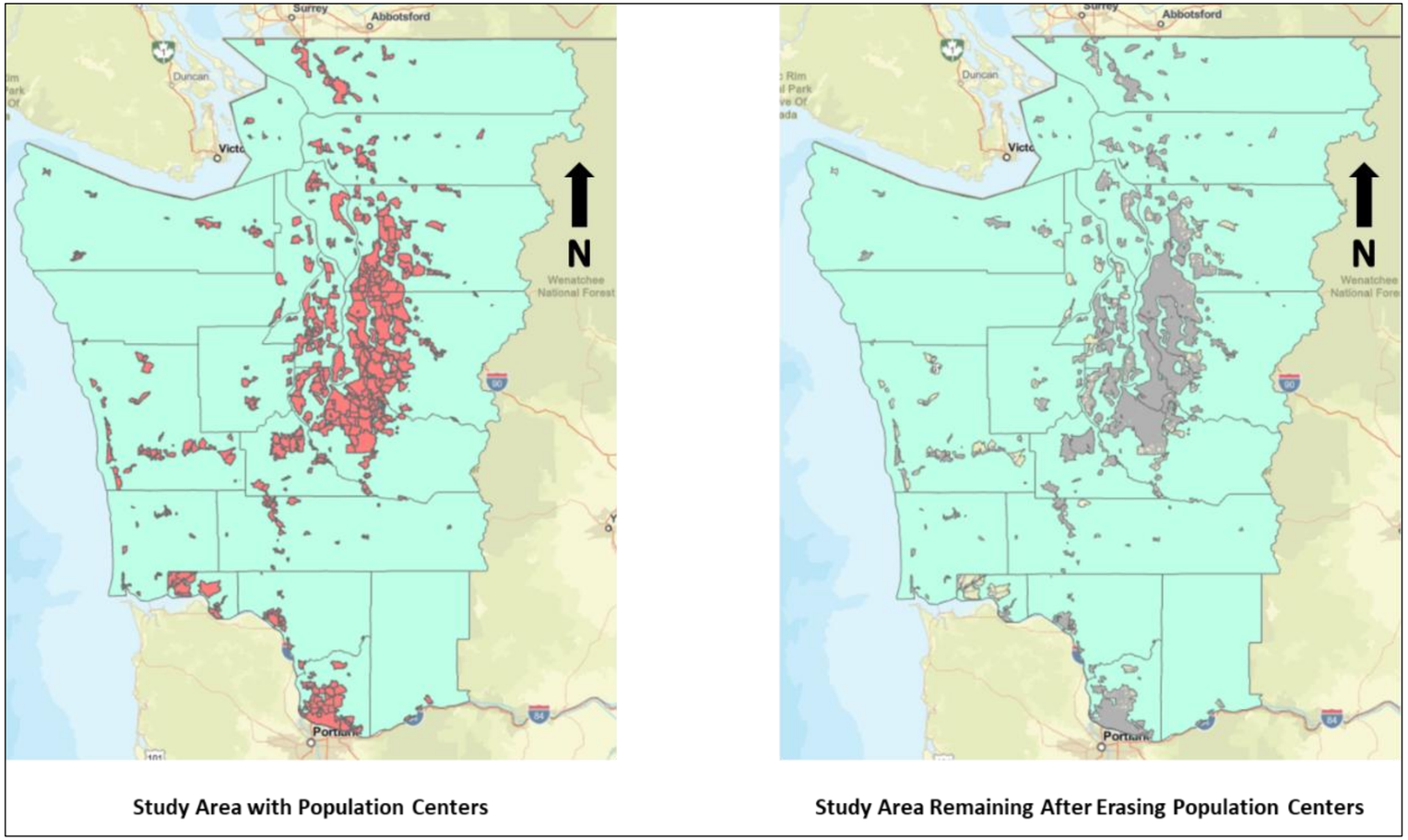
Step 4: Essential Destinations

Step 5: Residential Parcels in Close Proximity to Essential Destinations

Step 6: Clustering of Residential Parcels

STEP 1: STUDY AREA

- Included 19 counties in western Washington State
- Data Sources
  - WA county boundaries
  - WSDOT population centers (PCSs)
    - According to RCW 47.04.010, "PCs include incorporated cities and towns, including their UGA, and CDPs in Washington State".
    - PC boundaries let WSDOT address the Complete Streets requirement (RCW 47.04.035) and support prioritization in the 2021 WSDOT Active Transportation Plan

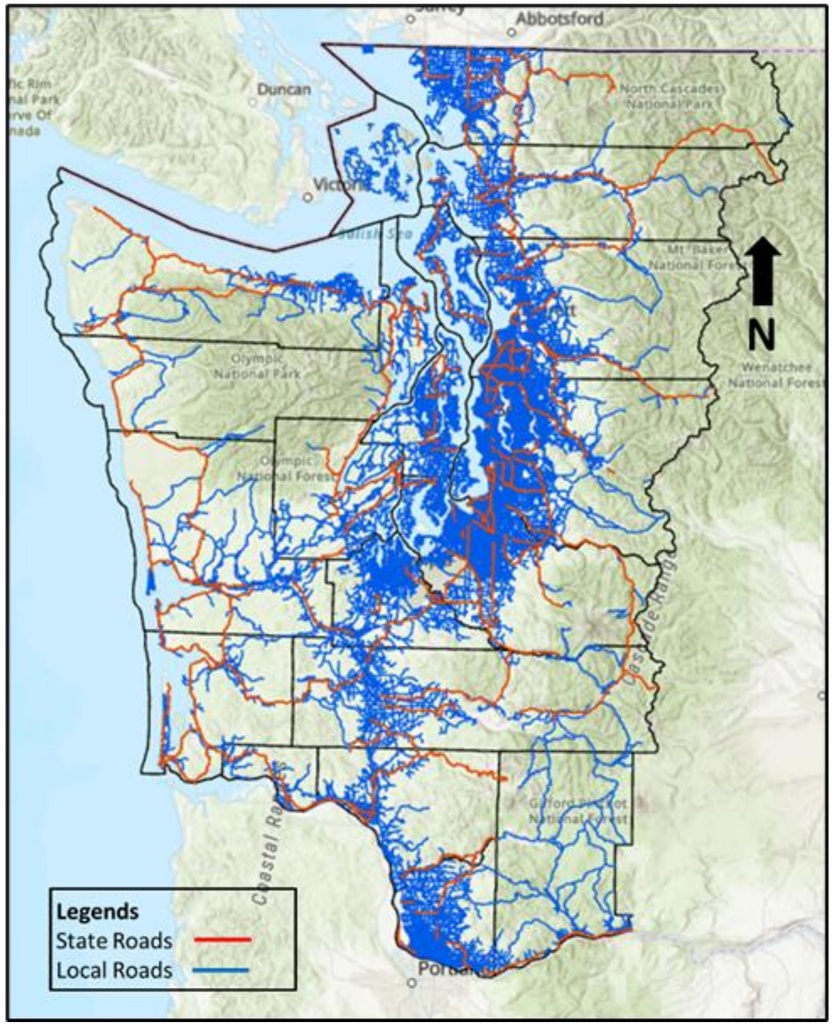


Study Area with Population Centers

Study Area Remaining After Erasing Population Centers

STEP 2: ROADWAY NETWORK

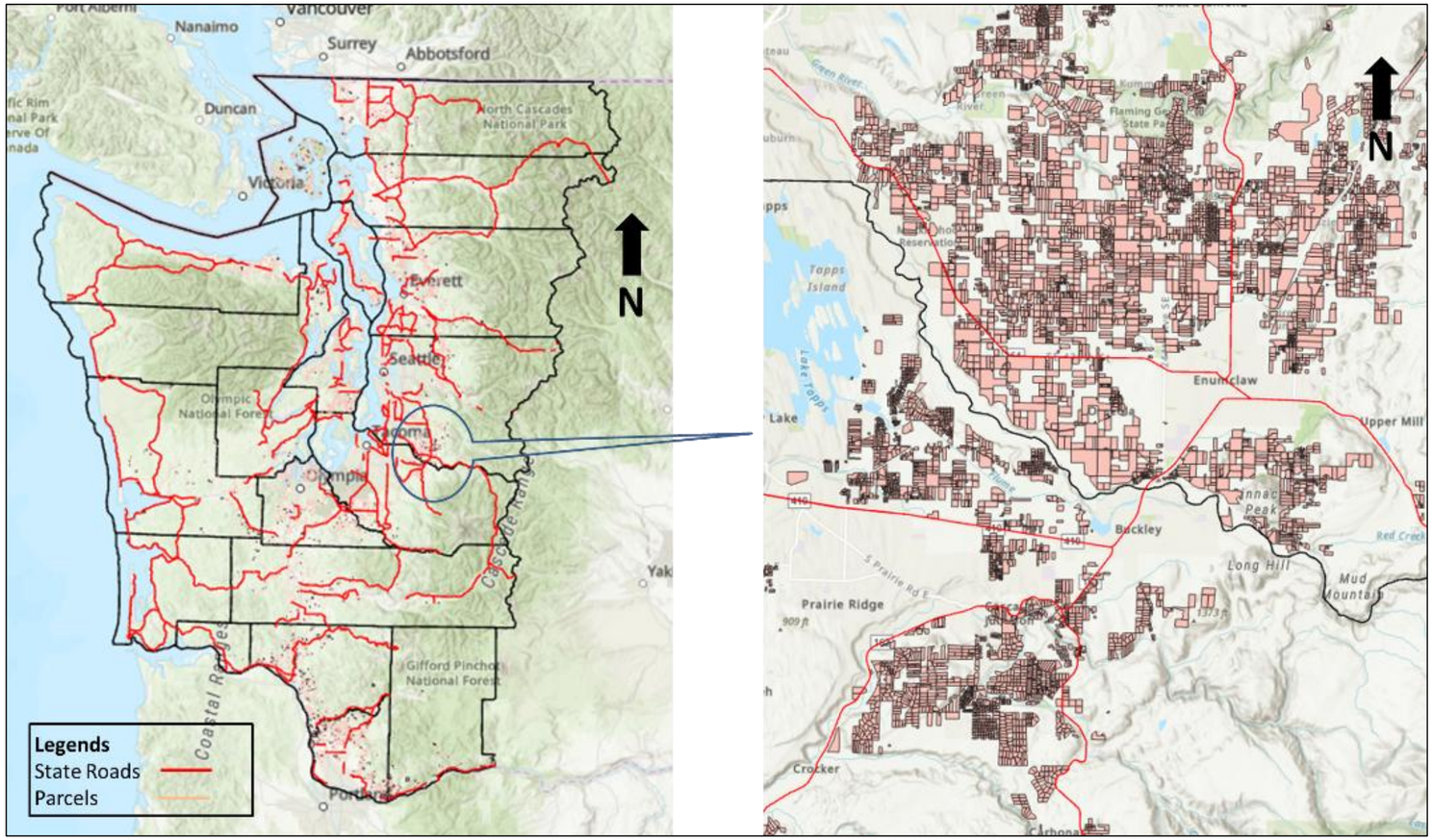
- Data collection
  - State Routes (excluding interstates and expressways/freeways) – WSDOT Functional Class Data for the State Routes
  - To supplement the state route network, Local Agency Public Road data were used to estimate the potential trips from parcels to POIs located on state roadways
- State and local road layers were cleaned, merged, planarized, and quality-checked to create a connected roadway network for analysis.



Study area with state and local roads

STEP 3: PARCEL DATA

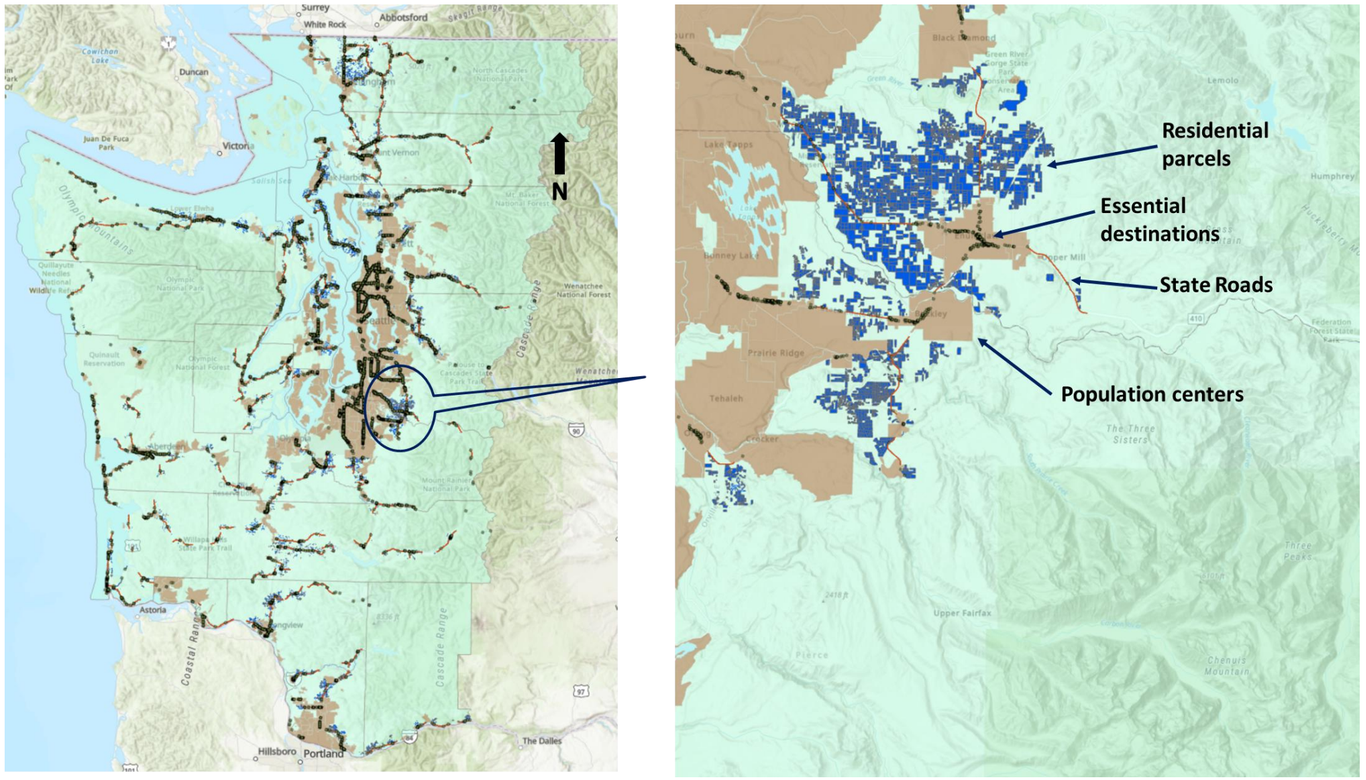
- Used statewide parcel data as the primary unit of analysis to identify residential areas, since parcels provide finer detail than census block groups and include land-use information.
- Filtered parcels using land-use codes to select residential properties, with county-specific adjustments for Whatcom and King counties.
- Selected 239,595 rural residential parcels, including 168,155 parcels within 3 miles of state roads, for further RRC analysis in the 19-county study area.



Study area with residential parcels located outside of PCs

STEP 4: ESSENTIAL DESTINATIONS

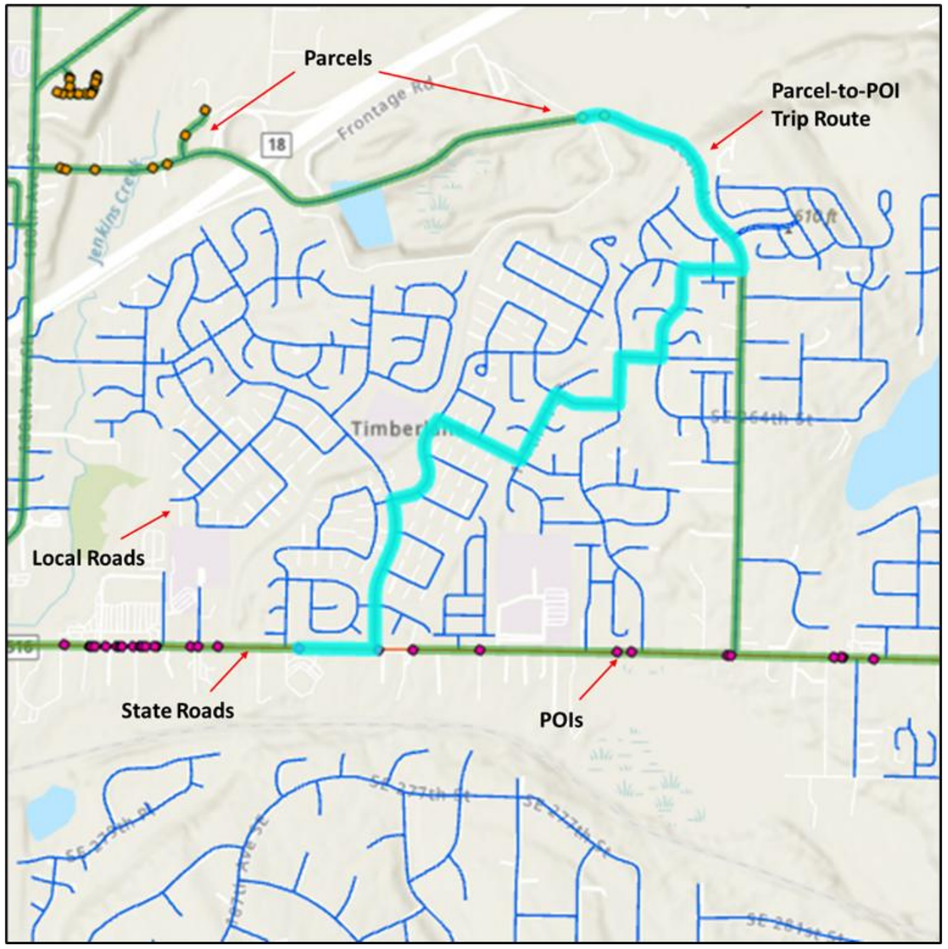
- Data was sourced from:
  - Overture data (POIs)
  - WSDOT transit stop data
- Used POI data from the Overture Maps dataset to represent essential destinations (e.g., food, healthcare, education, retail) relevant to rural residents
- Created a combined dataset of 19,778 POIs and transit stops to support analysis of accessibility and trip generators along state roads in the study area



Study area with essential destinations along state roads

STEP 5: RESIDENTIAL PARCELS IN CLOSE PROXIMITY TO ESSENTIAL DESTINATIONS

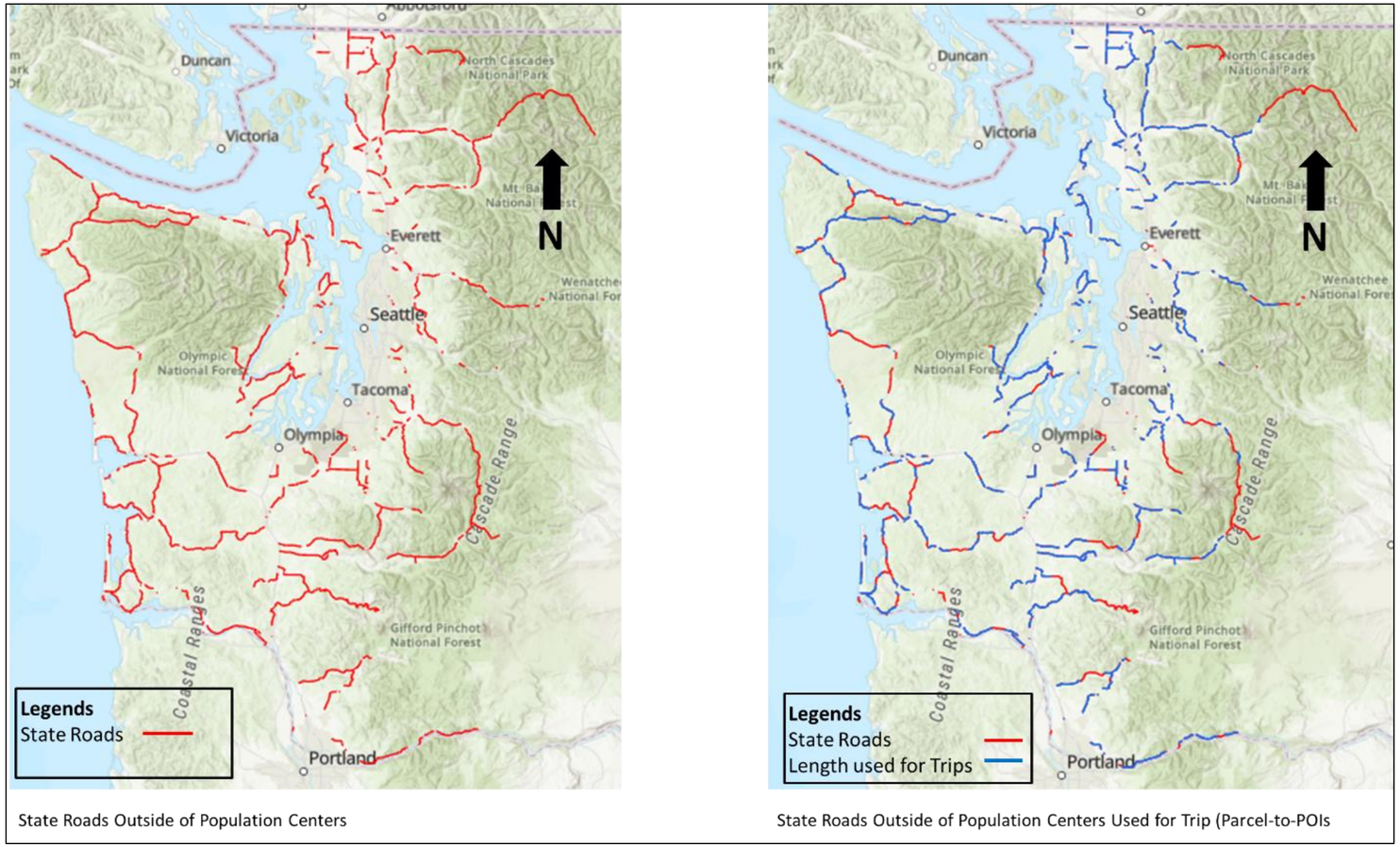
- Identified RRC parcels by requiring access to at least one essential POI within a reasonable walking/biking distance, using a 3-mile network threshold based on NCHRP Report 770 guidance.
- Used a network-based Closest Facility analysis in ArcGIS with residential parcel centroids as incidents and selected POIs as facilities to model parcel-to-destination trips.
- Found that 116,073 of 168,155 parcels had at least one POI within 3 miles and were retained for further RRC analysis



Network route created from parcel (Incidents) to POIs (Facilities)

STEP 6: CLUSTERING OF RESIDENTIAL PARCELS

- **Road segment-level analysis**
  - Analyzed state route segments using parcel-to-POI routes to measure accessibility, usage frequency, and segment coverage length
  - Calculated key metrics including trip counts, portion of segment used, and number of unique parcels served per segment
  - Developed segment-level indicators to prioritize road segments with the highest demand and greatest potential impact for infrastructure improvements



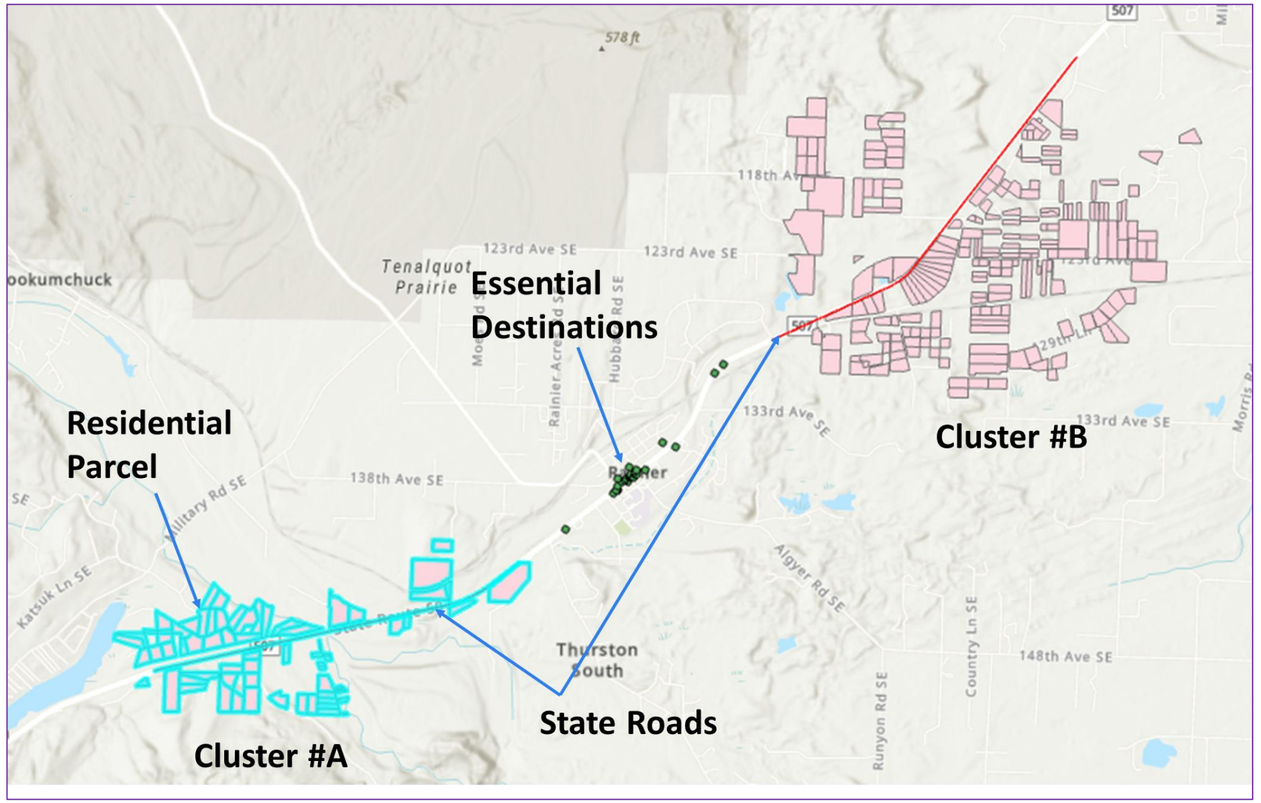
State Roads Outside of Population Centers

State Roads Outside of Population Centers Used for Trip (Parcel-to-POIs

Coverage Length of State Roads Segments

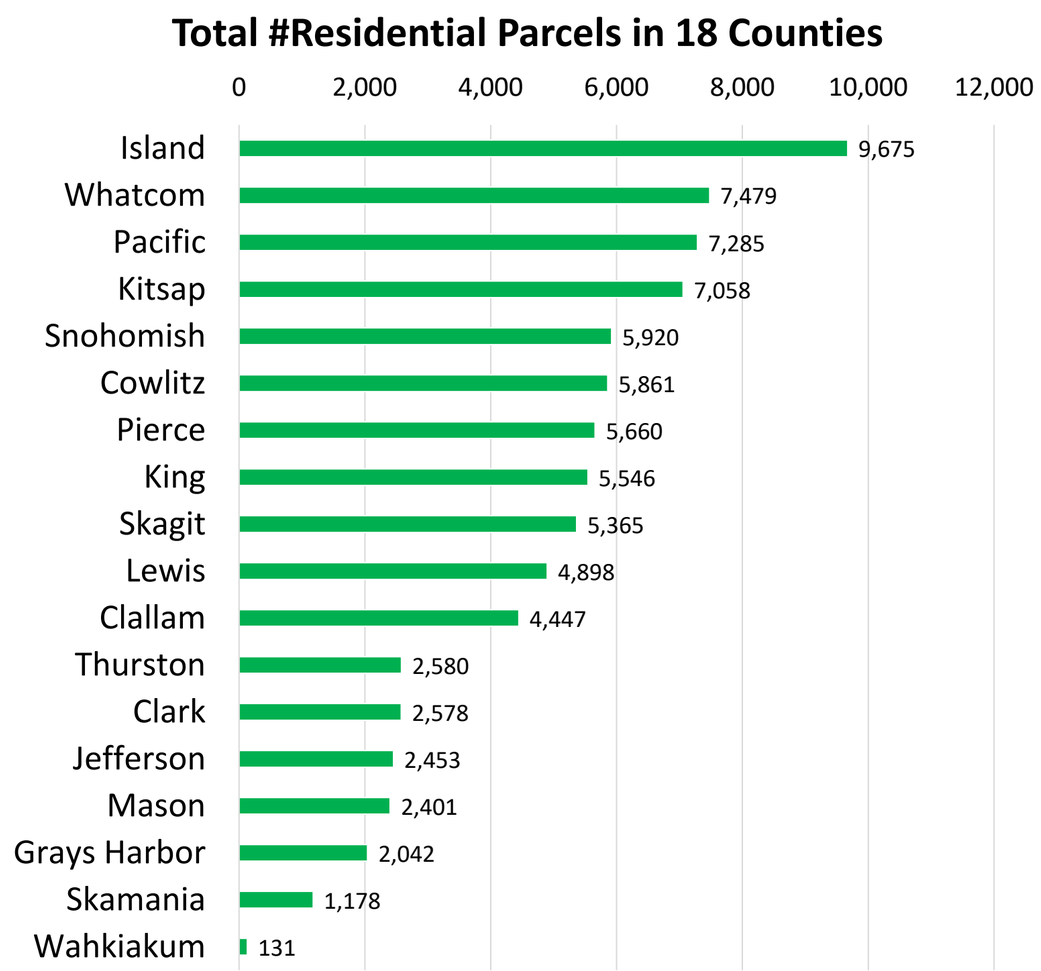
STEP 6: CLUSTERING OF RESIDENTIAL PARCELS

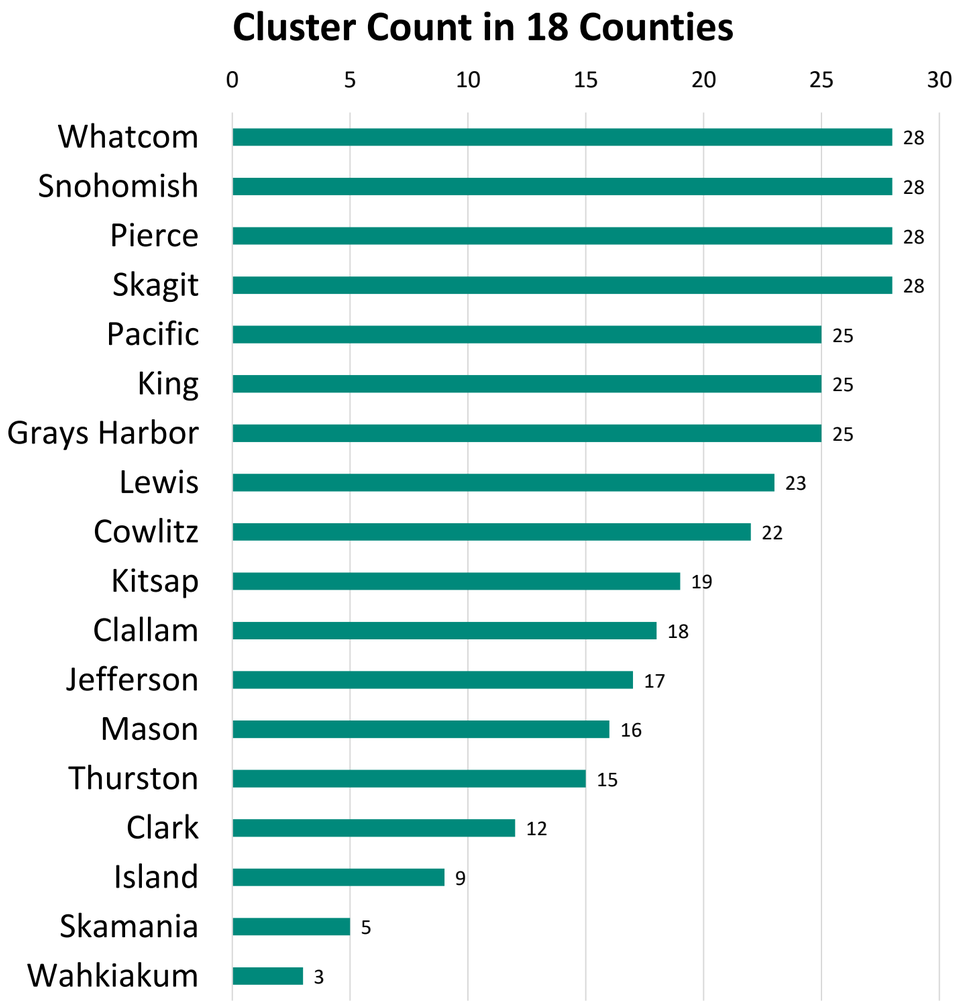
- **Road segment-level analysis**
  - Defined RRCs as clusters of parcels that rely on the same continuous state-road corridor outside PCs for access to nearby destinations
  - Assigned parcels to corridors based on actual route usage and dominant travel overlap, rather than simple proximity, to better reflect functional dependence on the roadway network
  - Linked corridor IDs back to parcels and roadway segments so cluster-based, segment-level, and travel-demand analyses could be connected in later steps



Rural Residential Cluster formed at the corridor level

DISTRIBUTION OF RRC CLUSTERS BY COUNTY





Total **346 RRC Clusters** representing over **82,000 residential parcels** in 18 counties

RURAL RESIDENT SURVEY

What We Asked

1 Daily Travel

How residents usually get around in their day-to-day life (walking, biking, rolling, driving, and transit).

7 questions

2 Facilities & Infrastructure

Walking and biking facilities available and how they affect residents' ability and comfort.

3 questions

3 Safety & Comfort

How safe and comfortable residents feel when walking, biking, rolling, or taking transit in their communities.

4 questions

4 Barriers & Challenges

Challenges or barriers residents face when walking, biking, rolling, or accessing transit in their community.

7 questions

5 Improvements & Needs

Changes or improvements that would make walking, biking, rolling, and using transit better for residents.

8 questions

6 About the Respondents

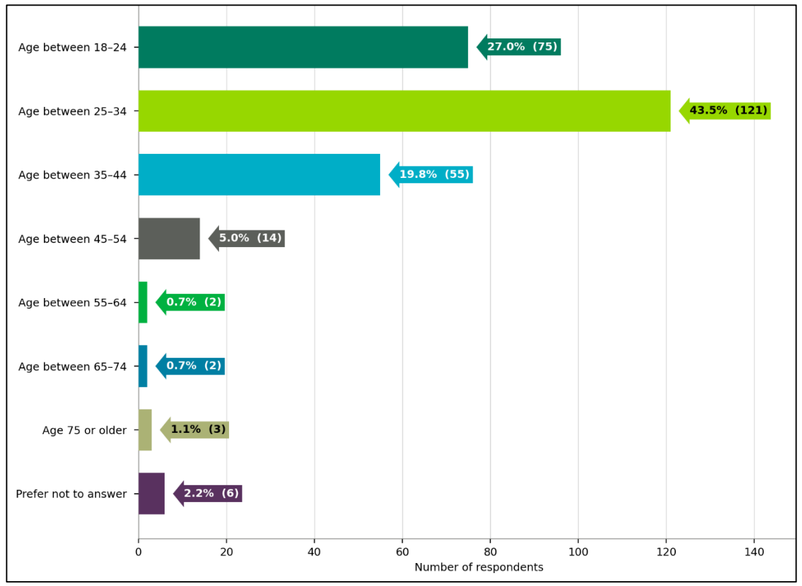
A few optional questions to help us understand who we heard from.

7 questions

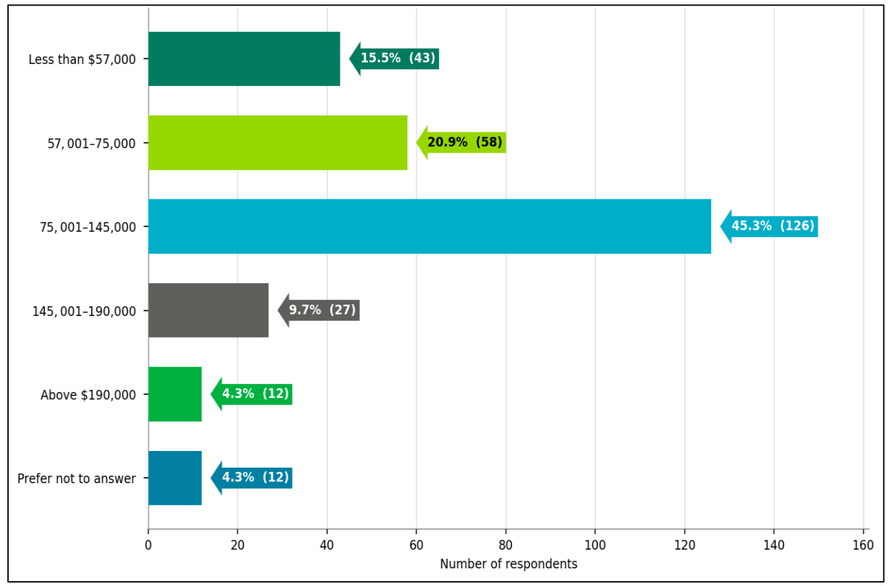
Total Questions: 36

Designed to capture travel behavior, barriers, and improvement needs.

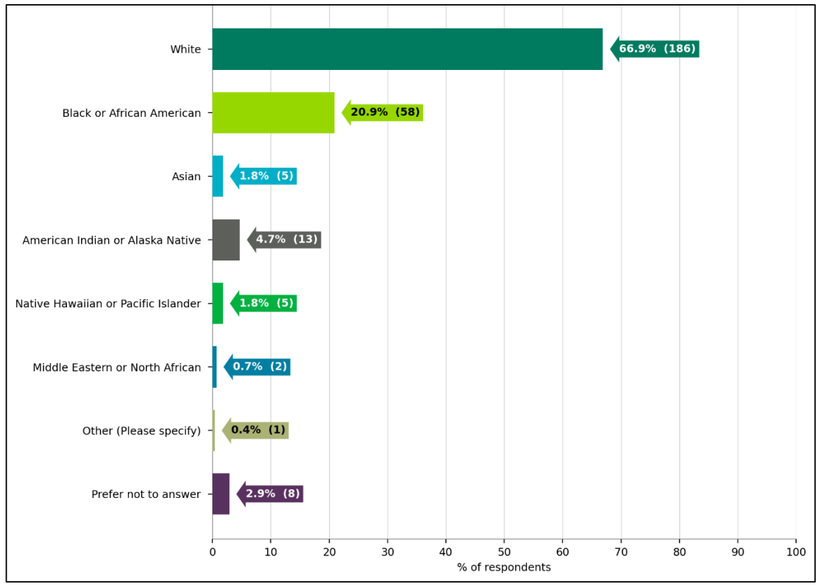
SURVEY DEMOGRAPHICS (N = 276)



Age Group



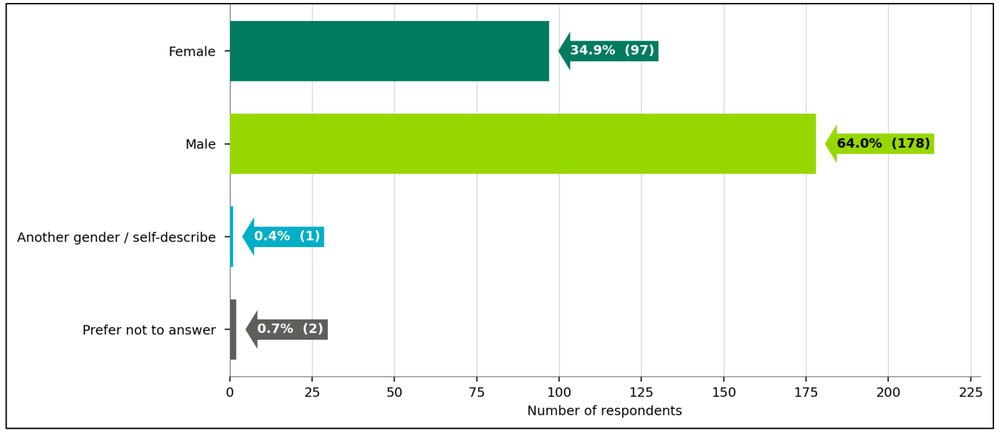
Household Income



Race

Who responded?

- **64%** Male
- **44%** Age 25–34
- **67%** White
- **45%** Household income $75k–$145k

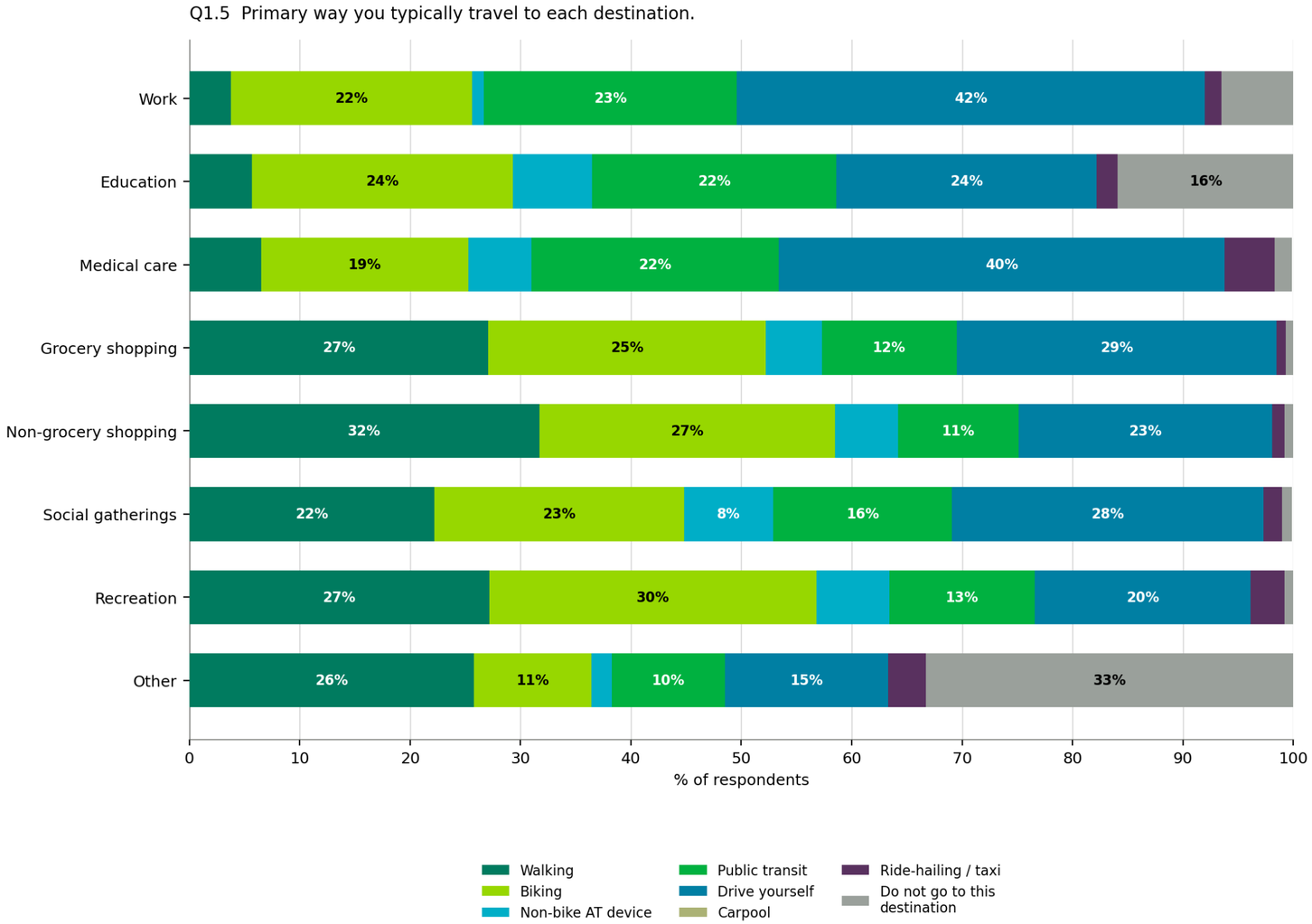


Gender

HOW RESIDENTS GET AROUND IN THEIR COMMUNITY

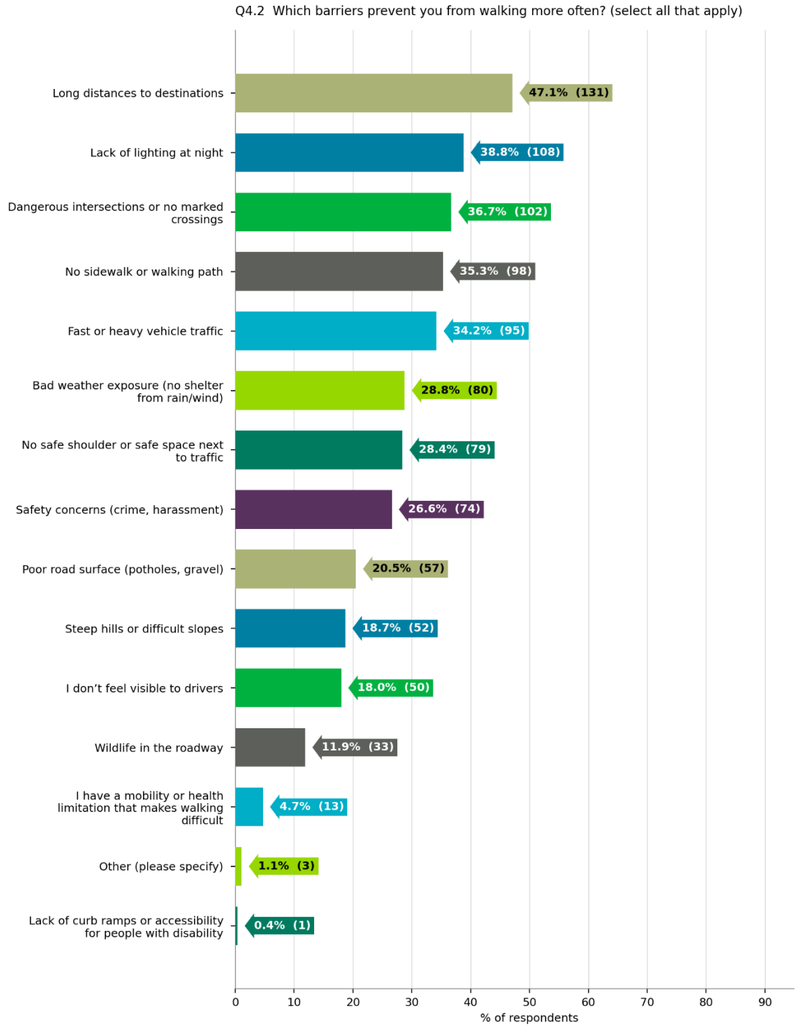
Among Respondents

- 56% have personal vehicles
- 26% share within family and neighbors, and friends
- Driving is important, especially for work and medical care
- Walking and biking are commonly used for shopping, recreation, and social trips

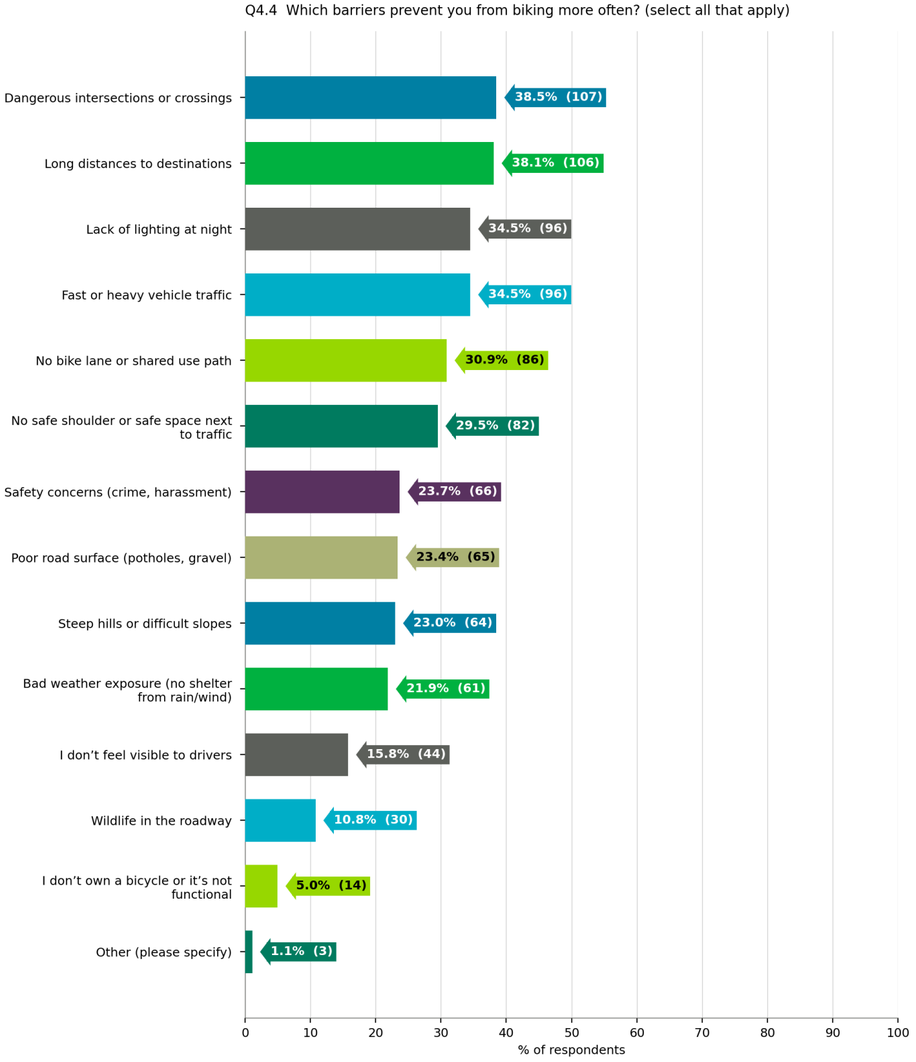


BARRIERS TO WALKING & BIKING

- **Walking and biking barriers are similar across modes, with long distances, unsafe crossings, poor lighting, traffic exposure, and missing facilities consistently ranking highest.**



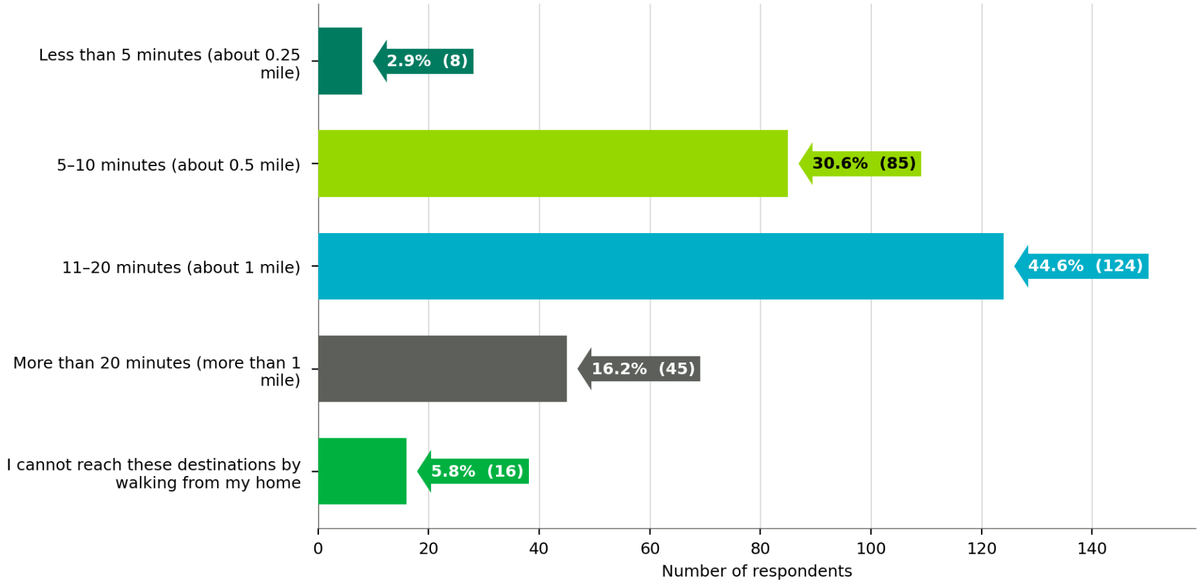
Barriers to Walking



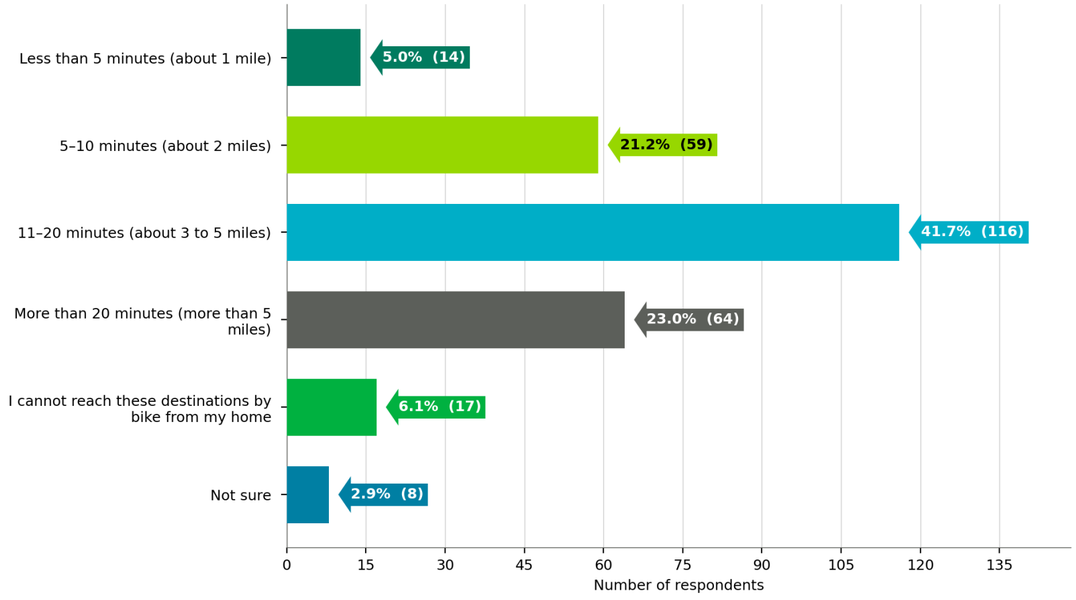
Barriers to Biking

WILLINGNESS TO WALK & BIKE

Q5.1 On a typical day, approximately how far would you be willing to walk to reach a nearby key destination, assuming sidewalks or safe walking paths are available?

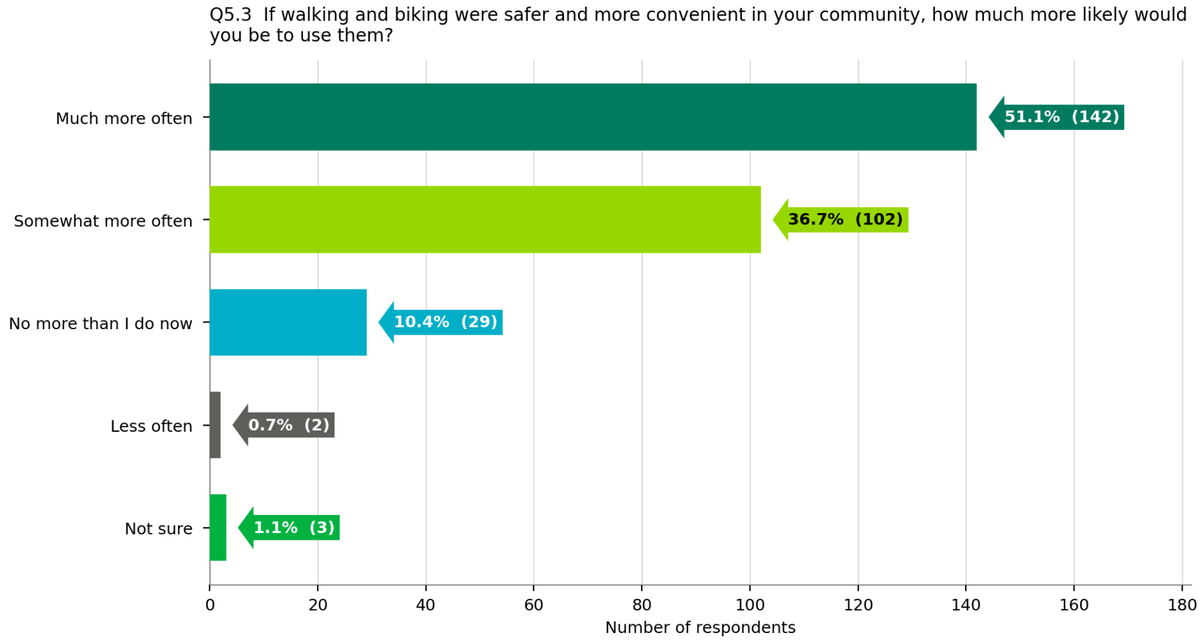


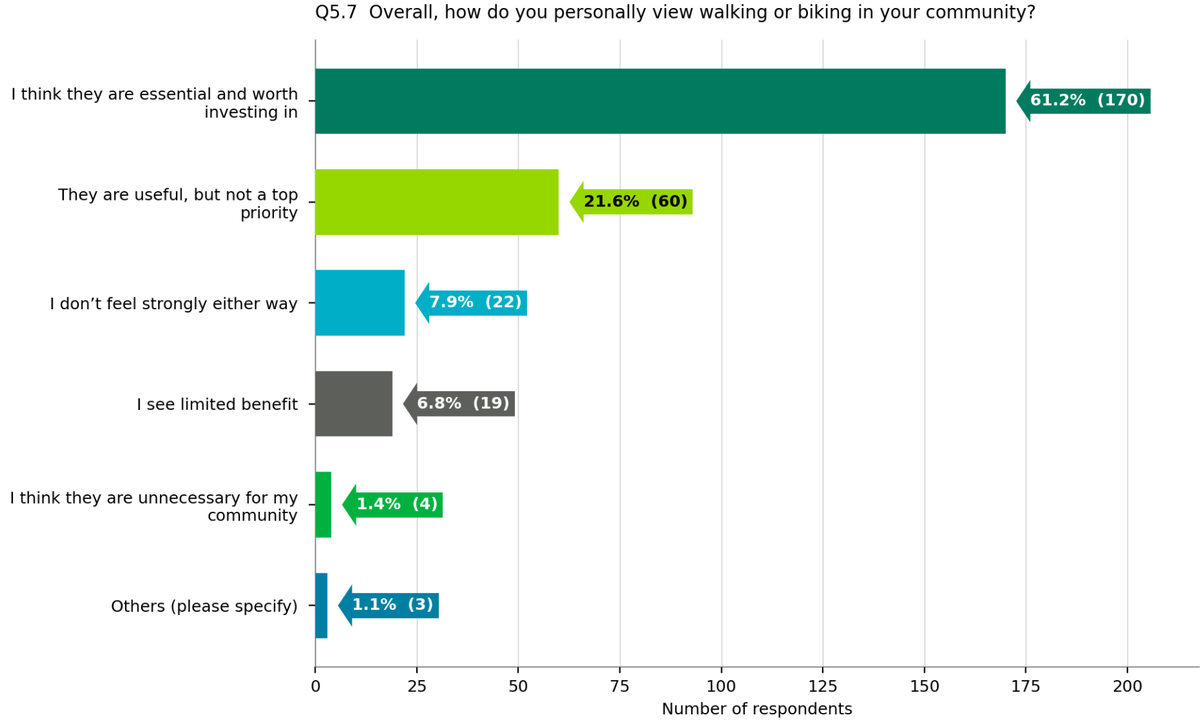
Q5.2 On a typical day, approximately how far would you be willing to bike to reach a nearby key destination, assuming safe biking routes are available?



- **If safe sidewalks, walking paths, or biking routes are available, many residents are willing to travel farther than very short distances to reach nearby destinations.**

MOST RESIDENTS WOULD WALK OR BIKE MORE IF SAFER OPTIONS WERE AVAILABLE

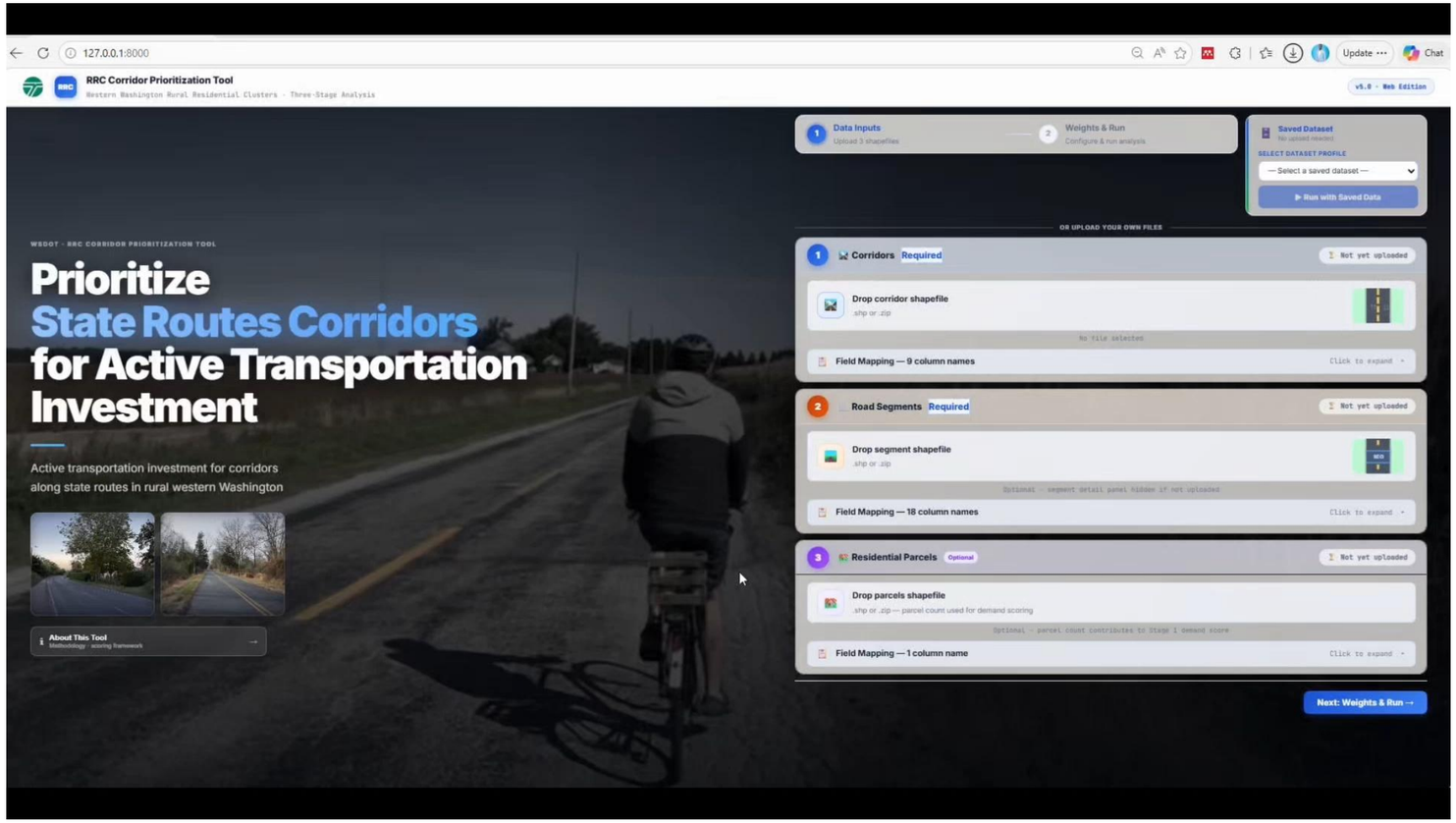




- **Residents see value in walking and biking, and most would use them more if safer options were available.**

NEXT STEPS

- Identify key active transportation barriers along state routes in RRCs
- Prioritize corridors and clusters based on demand, accessibility, and need
- Develop a scalable prioritization tool for statewide application
- Incorporate the insights of the interest-holders through transportation officials



THANK YOU

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