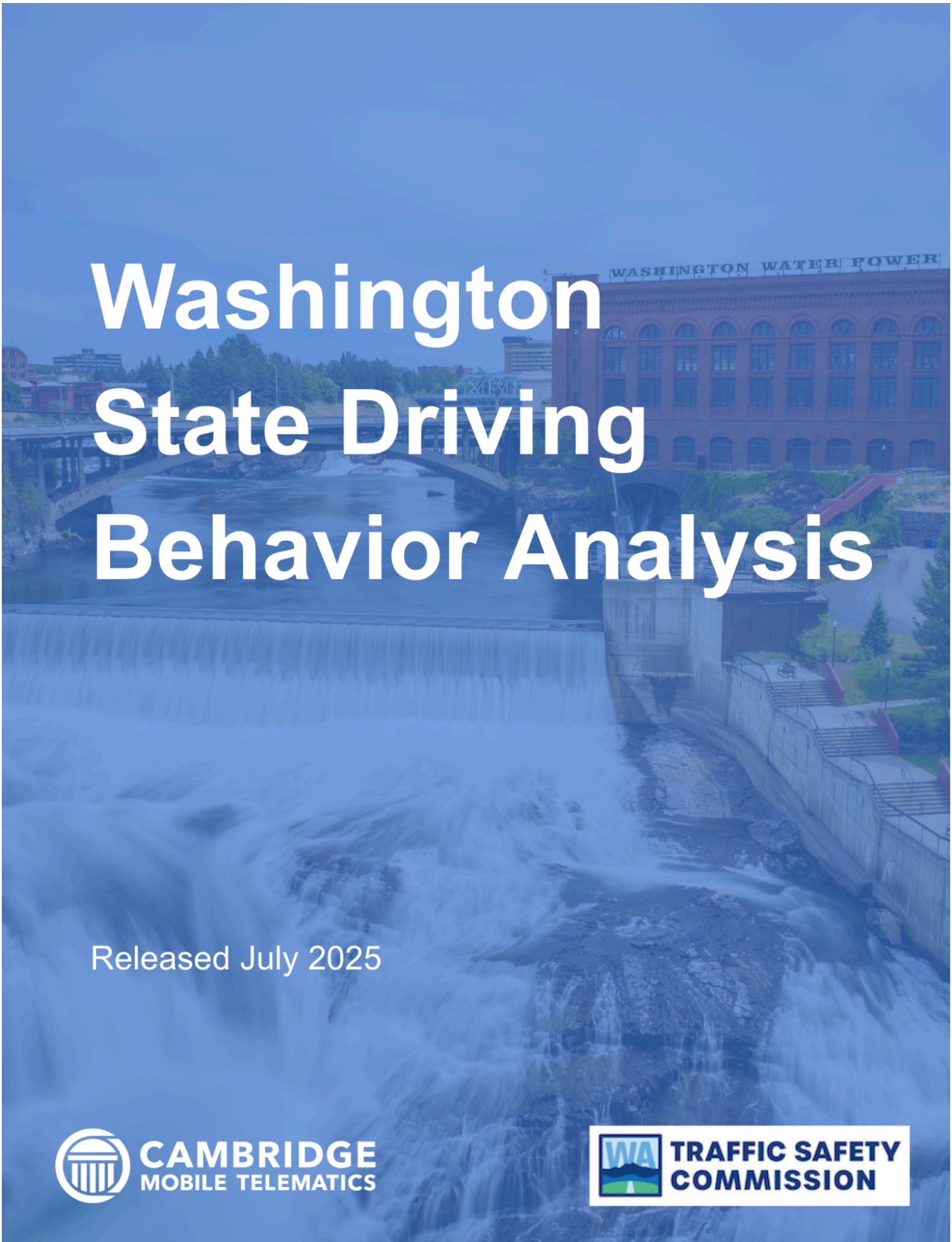


Washington State Driving Behavior Analysis

Released July 2025

CAMBRIDGE MOBILE TELEMATICS

WA TRAFFIC SAFETY COMMISSION

Table of Contents

Executive Summary

Telematics data uses smartphone sensors to collect anonymized and aggregated driver behavior including speeding, handheld phone use, and hard-braking. The data can be combined with traditional traffic safety data sources, such as crash reports and driver citations, to better understand driver behavior and high-risk crash areas on public roads.

The analysis had three goals:

1. Document the coverage of CMT's data across Washington's counties in terms of unique drivers and trips taken.
2. Compare risky behavior (phone motion distraction, phone call distraction, speeding and hard-braking) between counties and the three timeframes (June 2022, June 2023, and June 2024).
3. Understand patterns of compound risky behavior such as speeding and distraction.

Coverage per county was demonstrated to be statistically appropriate, with 7.4 million trips and 106,000 unique drivers for June 2024. This equated to almost 1.9 million hours of driving. Volumes have increased further since 2024.

County rates of phone distraction (phone motion and calls), speeding and hard-braking varied considerably by county, as would be expected by the variety of road types, traffic volume, and commuting volume. The change in phone distraction in the year studied was different between counties, with some improving and others getting considerably worse. From June 2023 to June 2024, the overall statewide rate didn't change substantially, with phone distraction dropping slightly while speeding increased.

Distraction occurs more commonly at speeds and on functional class roads where it's highly likely that vulnerable road users are present. Phone calls were common on both these roads and highways. Speeding rates were common on all classes of roads except for residential-type roads.The results show that about 1 in 4 (25%) of full trips had any distraction as measured by phone motion (same result as June 2023).

The report shows that CMT telematics data is substantial in Washington, and has been demonstrated as a valuable supplement to traditional traffic records data. The county-to-county comparisons offer the opportunity to target resources in areas with the most high-risk driver behavior.

About CMT and this Report

Cambridge Mobile Telematics (CMT) is the world's leading telematics service provider for drivers who opt-in to the program through their auto insurer. Its mission is to make the world's roads and drivers safer. Since its founding in 2010 (formerly the CarTel project at MIT), CMT's technology has gathered anonymized data on hundreds-of-billions of miles driven in the United States and globally. Its telematics platform DriveWell® provides an accurate view of driver, vehicle, and policy-level risk by fusing phone, IoT device, and connected car data into a single system. Every day, CMT's technology measures and protects 12 million drivers. The information gathered provides novel insights about drivers' reaction to new legislation and road interventions.

Washington State is using telematics data to provide insights on trends, county-to-county differences, and to identify areas of particular concern.

Telematics Risk Factors

CMT extracts risk factors from raw telematics data. These risk factors are known to be predictive of crashes, as evidenced by almost every state's acceptance of telematics factors in pricing insurance[1].

The telematics data used in this report is aggregated with respect to location, which anonymizes the data by removing personal identifiers and discarding route information at an individual trip level. By creating aggregates from many trips recorded by many distinct drivers, it is not possible to reverse the process and determine the actions of an individual.

The analysis in this report is derived from telematics data for June 2022, June 2023, and June 2024, recorded by tens of thousands of unique drivers.

Hard-braking based events

A hard-braking deceleration event is flagged when longitudinal acceleration with respect to the car frame of reference exceeds a certain threshold, over a sufficiently long period. Through actuarial studies, CMT has selected a threshold of > 3.2 m/s^2 to maximize the correlation between a pattern of hard-braking and the likelihood of a crash.

Events at or above this threshold are considered abrupt and not a typical part of safe driving aside from isolated incidents. The minimum duration of an event to be counted must be 0.6s.

While these events take place over a minimum time of 0.6 and could be a number of seconds long, they are considered to be singular events caused by a decision made at one point on the

[1] California is the only state as of September 2024 that does not allow telematics to be used to price insurance.

road. The count of these events are normalized by distance traveled on the trip to give a “count of hard-brakes per 100km”.

Speeding

A speeding risk event is normally defined as a driver exceeding the posted speed limit by 9.3mph (15kph) for 5 seconds or more. The threshold is increased to 12.4mph (20kph) over the limit when the posted speed limit is between 55 mph and 65 mph and back to 9.3mph when the posted speed limit is 70mph or greater.

Posted Speed Limit (mph)	**Speeding Risk Event Threshold (mph)**
60	72
65	77
70	79

Speeding events don’t occur at a single point in time, at a minimum they are 5 seconds long, but could of course last tens of minutes. Therefore, we count the length of total time spent speeding and divide it by the total trip time, and express it as minutes of speeding per hour of driving.

Speed limits are obtained through our use of various mapping solutions. Inevitably there are errors in these, either due to speed limit changes or bad data. Via feedback from drivers, CMT maintains corrections to the speed limit database. Not every segment of road has a speed limit recorded in our sources, but the vast majority of non-residential roads do.

Distraction

Phone use is a large and growing source of driver distraction. For the purposes of this study, CMT’s platform records two different phone-related events.

1. **Phone motion** is captured when the driver reaches for the phone and picks it up. Once the driver picks up the phone and the screen activates, the phone motion event begins. Phone motion is typically the movement of the driver bringing the phone to them and then putting it down.
2. **Phone calls** are the period when a phone call is in progress, whether the audio is routed via the phone, Bluetooth, or the car’s infotainment solution.

These event types are not mutually exclusive. When a driver picks up a phone to dial a call, it is likely that there will be phone motion, screen interaction, and phone call events recorded at the same time, though not necessarily for the same duration. CMT records these events only when the vehicle is traveling 9.3mph (15 kph) or faster to better correlate phone usage with risk of a crash. Only events lasting 3s or more are counted to reduce false positives

Similar to speeding, distraction events don't occur at a single point in time, at a minimum they are 3 seconds long, but again could last tens of minutes. Therefore, we count the length of total time spent distracted and divide it by the total trip time, and express it as minutes of distraction per hour of driving. In this report we consider phone motion and phone calls as the primary measures of distraction.

Trips Without Events

Many trips are taken without a risky event occurring. The time and distance of these trips are included in the denominators for the aggregate statistics described in this document.

Methodology

Event Rates

For this analysis a methodology was used that measures the drive time, drive distance, and risky events as defined above for counties in Washington (regardless of whether the trip started or ended in Washington; this is especially important for counties that border other states and have a well-used road connection to them).

Driving distance and time were apportioned in a straight-line fashion to the county they occurred in rather than just allocating them to the start or end county of the trip. This method is not as precise as analyzing every road segment traversed but offers considerable time and cost benefits to the analysis. Events were geolocated to the county they occurred in.

Coverage

When considering telematics data it's important to understand the coverage that is available. The following map shows the number of unique trips recorded in each county for June 2024. Unsurprisingly the highest number of trips can be found in the more populated counties.

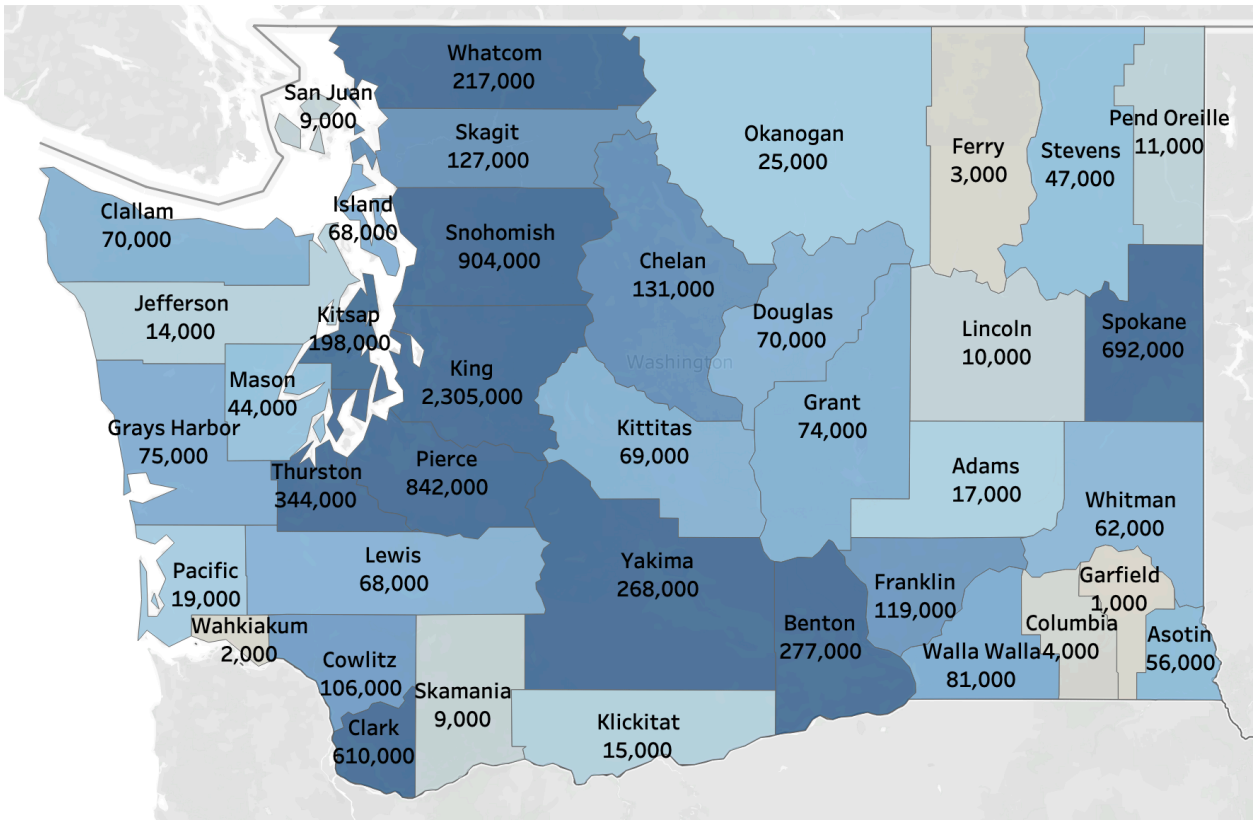


Figure 2. Trips recorded in each county in for the June 2024 corpus (rounded to the nearest 1,000)

For unique drivers, we can express the count per county as a percent of that county's population. This isn't a perfect normalization as the same proportion of residents will not drive in each county, and many drivers seen in a county will not live in the county; however, it's helpful to understand that even rural counties have reasonable coverage.

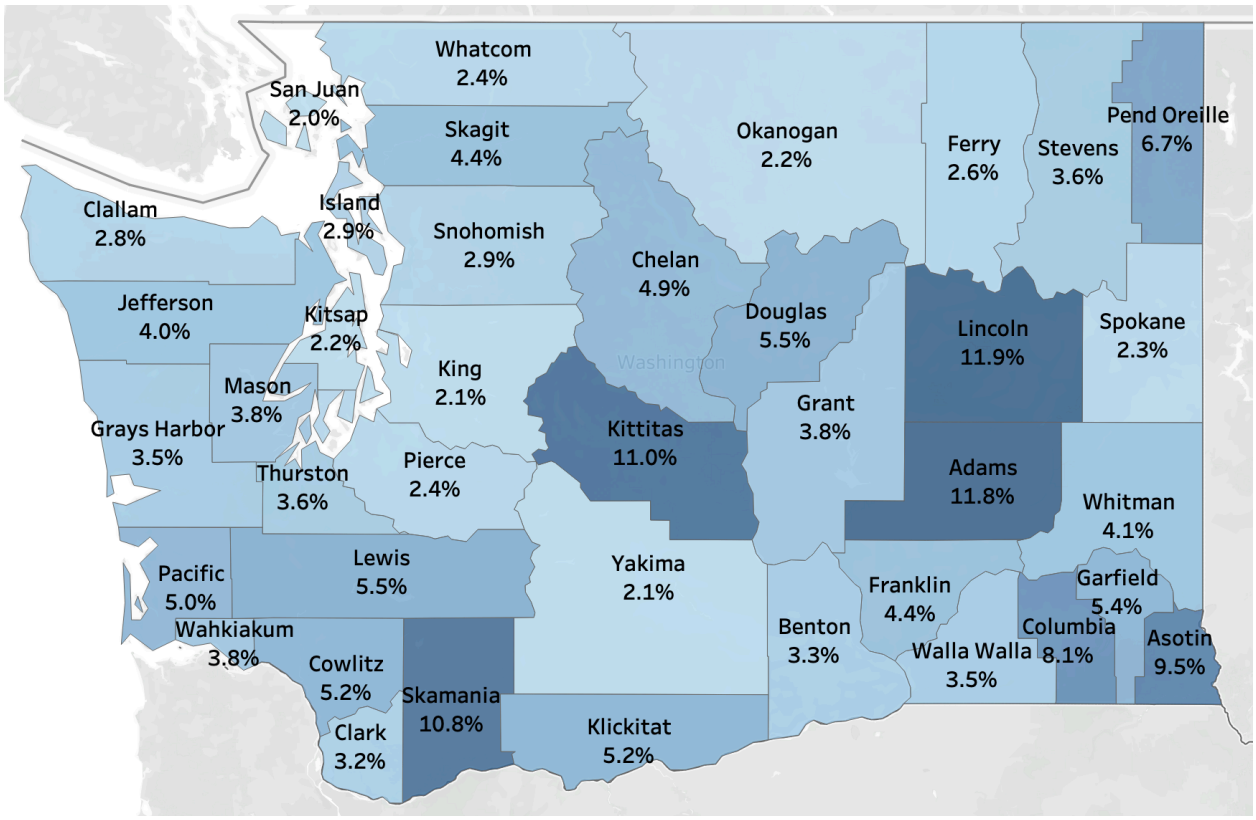


Figure 3. Unique drivers as a percent of county population in each county in for the June 2024 corpus. Rural counties are well represented when normalized this way.

State-wide the number of drivers available for the analysis increased from 83,900 to 106,000 over the gap of a year (2023 to 2024), while the total trips analyzed went from 6.1 million to 7.4 million. The total number of unique drivers at the state level is lower than the unique drivers summed per county from the chart above, as most drivers will cross county lines at least once in the course of a month (so will be counted in two or more counties). For June of 2024, a total of 1.9 million hours of driving were analyzed.

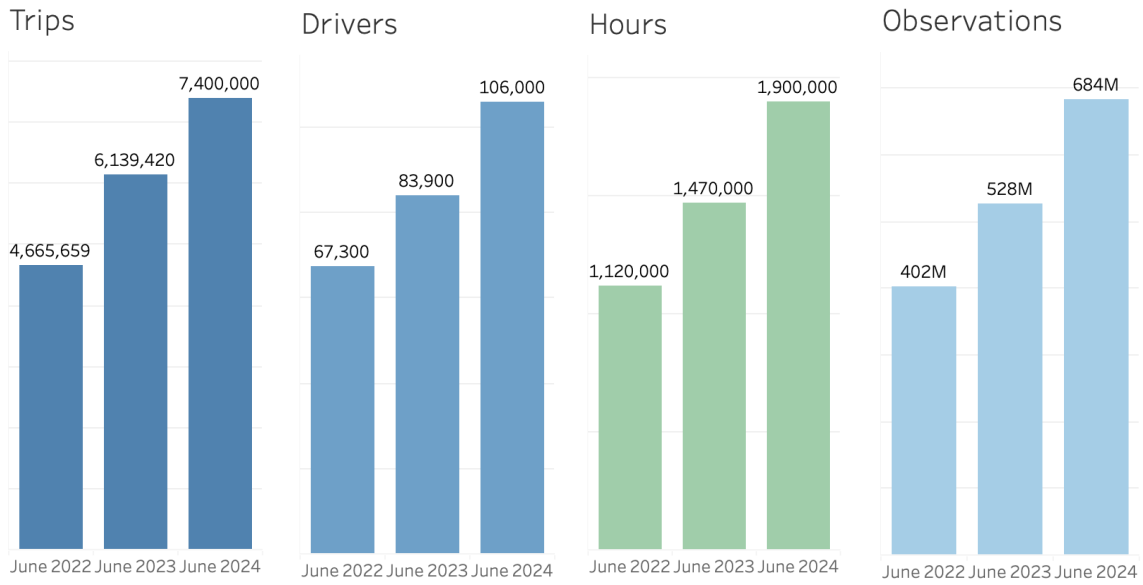
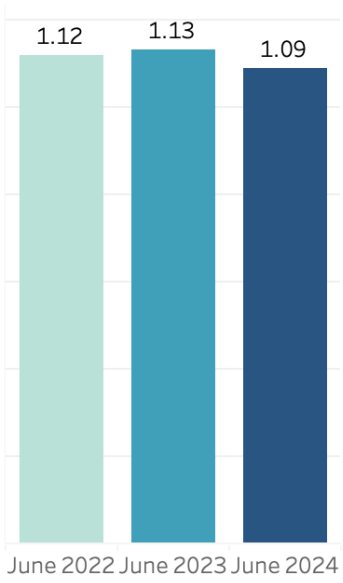


Figure 4. Trips, drivers, total trip hours, and effective roadside observations for Washington State for the three periods of study.

Results

Distracted driving - Phone Motion



Phone motion statewide dropped a little from 2023 to 2024, mirroring a nationwide trend. There isn't a good correlation with population by county; CMT's annual road risk study showed that more rural *states* typically have higher distraction rates, but that isn't reflected on a county level in Washington[2].

There's a swath of connected counties (Douglas, Grant, Adams, and Franklin) that have higher distraction rates. It's possible that the road types, traffic volume, and speeds in those counties lend themselves to higher distraction.

Figure 5. Statewide phone motion rate

[2] The State of US Road Risk in 2024. Cambridge Mobile Telematics.

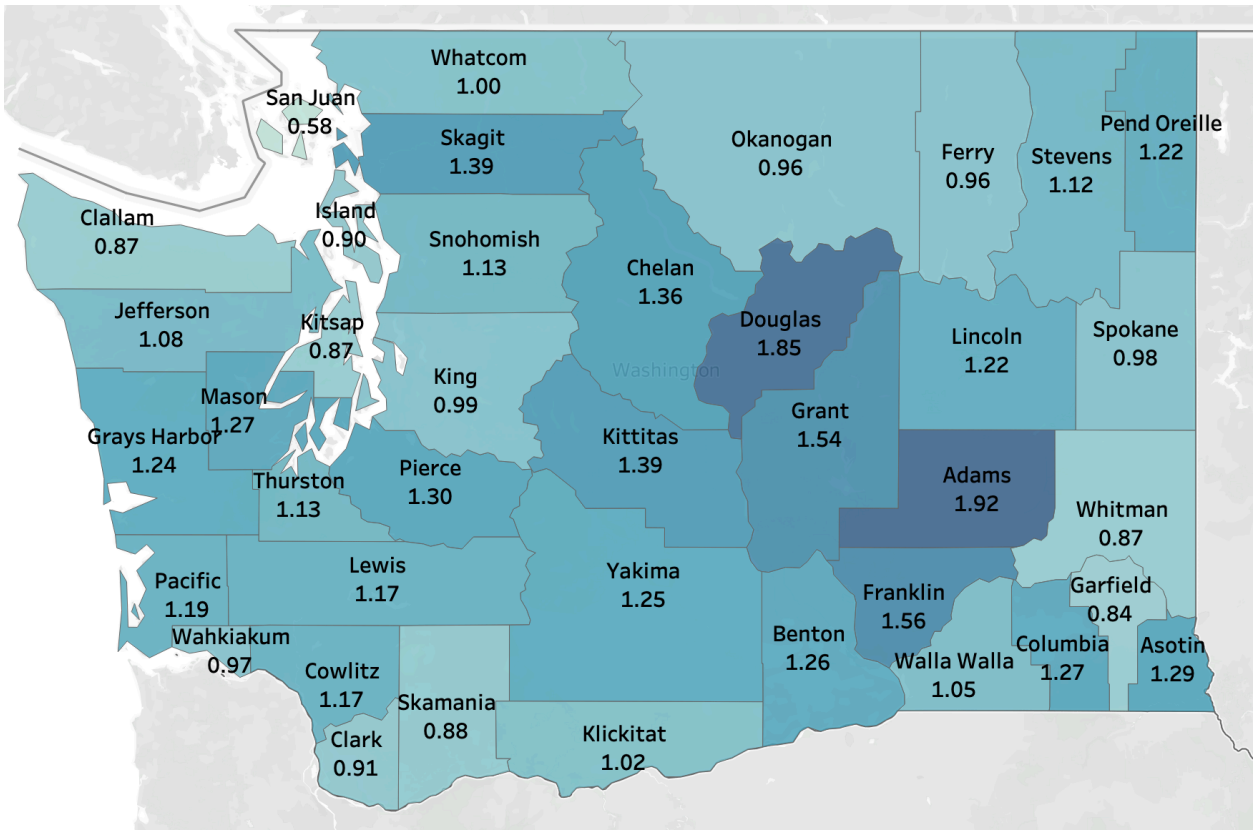


Figure 6. Phone Motion distraction rates by county for June 2024 (minutes of phone motion per hour of driving)

The rates also vary considerably over the year gap, with some counties getting worse, while others improved. The counties that exhibited the largest distraction changes between 2023 and 2024 (San Juan and Jefferson) are those with fewer drivers, making them more susceptible to statistical noise. As the number of drivers increases each year (and has considerably increased in late 2024 through mid-2025) the noise will reduce, and we can be more confident about trends in these less populous counties.

"One in four (25%) of trips had a phone distraction event."

In each year 2022-2024 in the month of June, the data shows that about 1 in 4 (25%) of full trips had any distraction as measured by phone motion.

"Of the 106,000 drivers in the 2024 cohort, 86,500 (81%) used their phone during a trip at least once in the month."

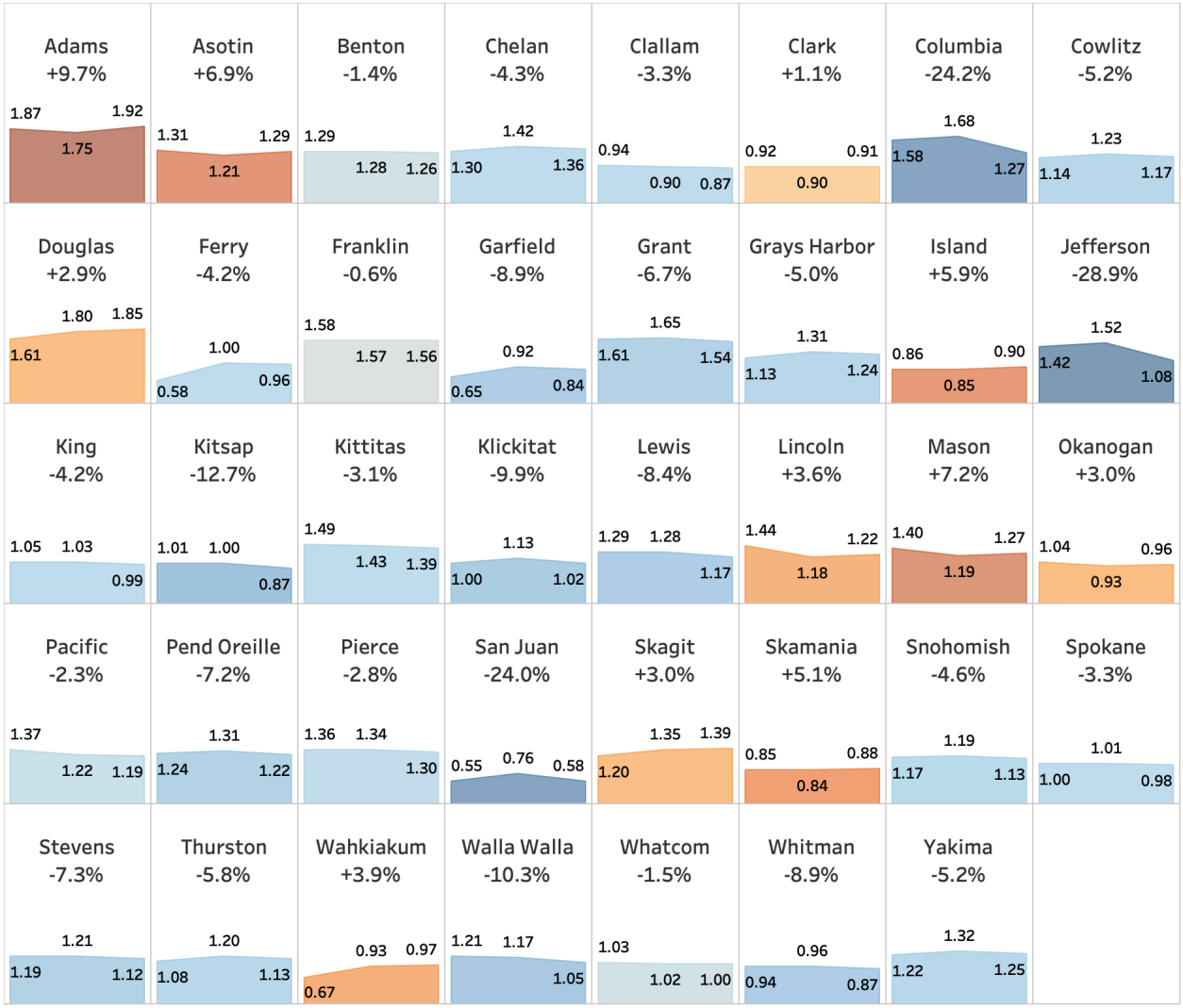
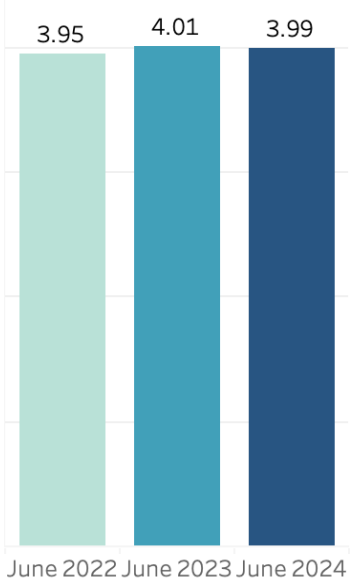


Figure 7. Change in phone distraction minutes per hour of driving from June 2022 to June 2024 by county. The charts are colored by the percent change from 2023 to 2024 with orange showing an increase in distraction and blue a decrease. ***Statewide distracted driving declined from 1.13 minutes per hour in June 2023 to 1.09 minutes per hour in June 2024.***

Distracted driving - Phone Calls



Phone calls show different spatial and temporal patterns than phone motion. In this study we do not differentiate between hands-free and hand-held calls. The general consensus in the scientific literature is that there is limited, if any, difference in cognitive impairment between the two types [3,4]. Actuarial data combined with CMT's data implies the same. If the driver uses the phone to dial, there will be accompanying distraction involved with looking away from the road.

The swath of rural counties with high phone motion also tend to have high phone call use, but notably King County with Seattle and the surrounding commuter counties are high as well.

Figure 8. Statewide phone call rate

[3] Yoko Ishigami, Raymond M. Klein, Is a hands-free phone safer than a handheld phone, Journal of Safety Research, Volume 40, Issue 2, 2009
[4] Agathe Backer-Grøndahl, Fridulv Sagberg, Driving and telephoning: Relative accident risk when using hand-held and hands-free mobile phones, Safety Science, Volume 49, Issue 2, 2011

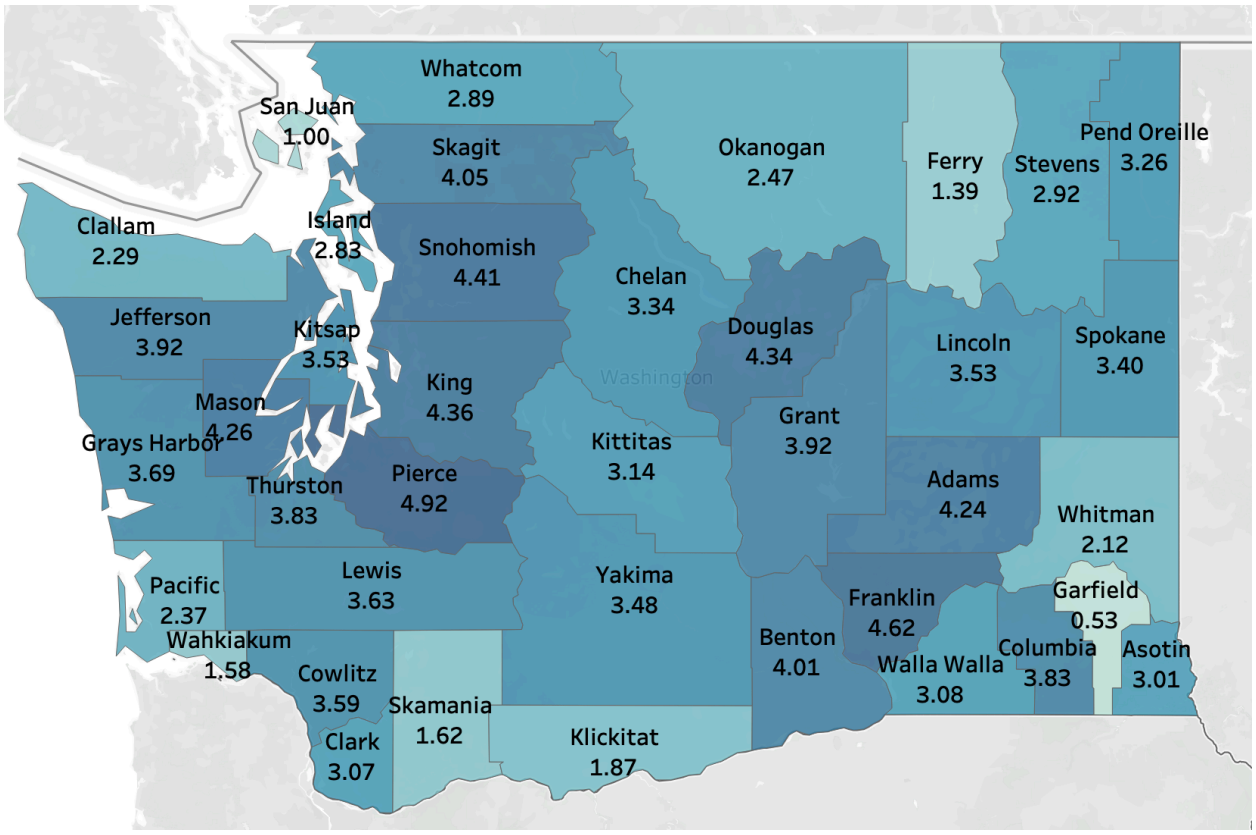


Figure 9. Phone call distraction rates by county for June 2024 (minutes of phone calls per hour of driving)

There was considerable variation in the change in phone call usage by county, with some increasing and others decreasing from June 2023 to June 2024.

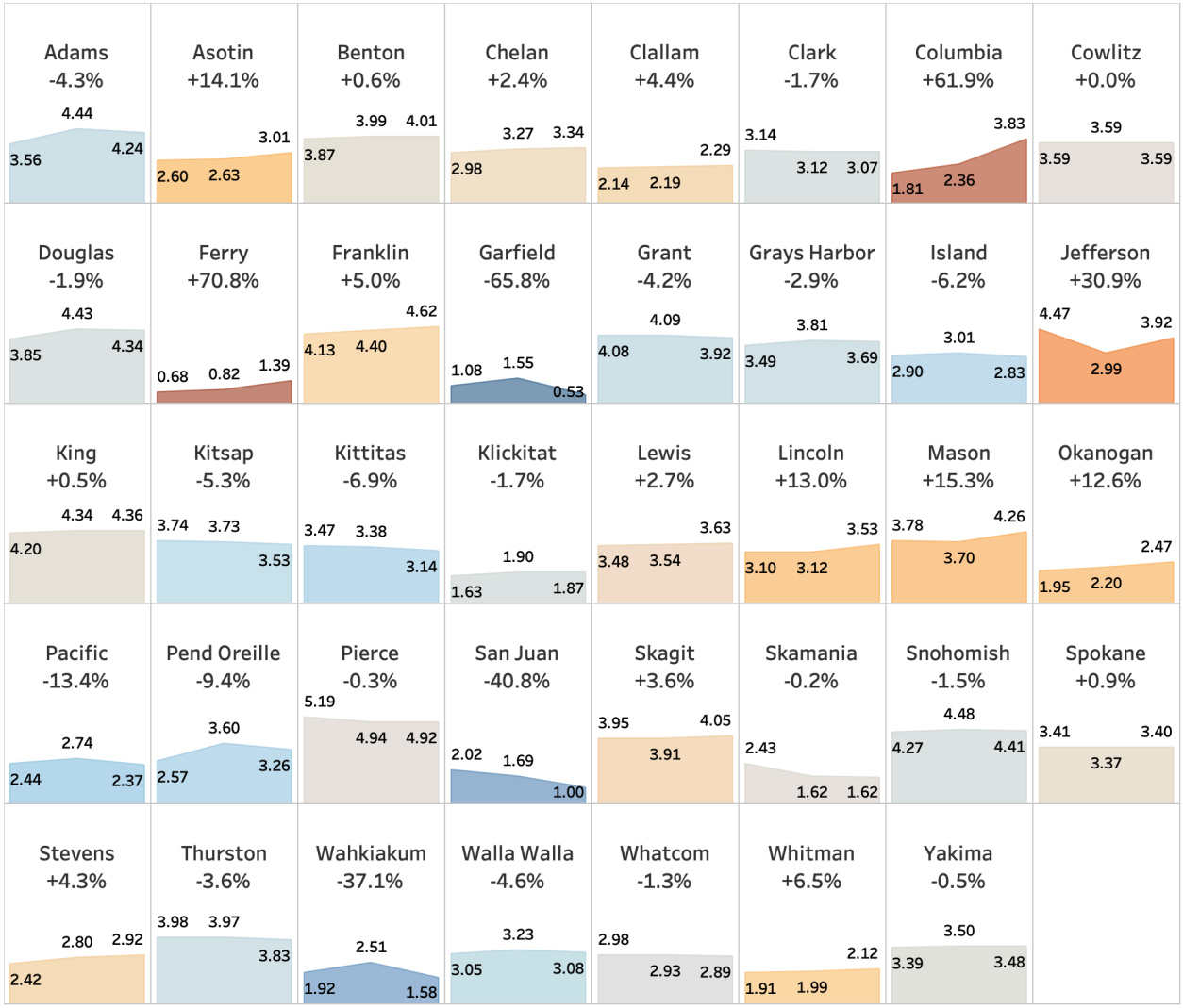


Figure 10. Change in phone call minutes per hour of driving from June 2022 to June 2024 by county. The charts are colored by the percent change from 2023 to 2024. ***Statewide phone calls driving showed a slight increase from 3.95 minutes per hour to 4.01 minutes per hour.***

Phone call rates are statistically correlated with the rank of each county's population (from the most populous King County at number 1 to Garfield at 39, see Figure 11). On first consideration this shouldn't be the case as we are normalizing to the miles of driving that occurs. However, it could be speculated that commuters are more likely to be engaged in phone call use and that is correlated with county population and proximity to a city.

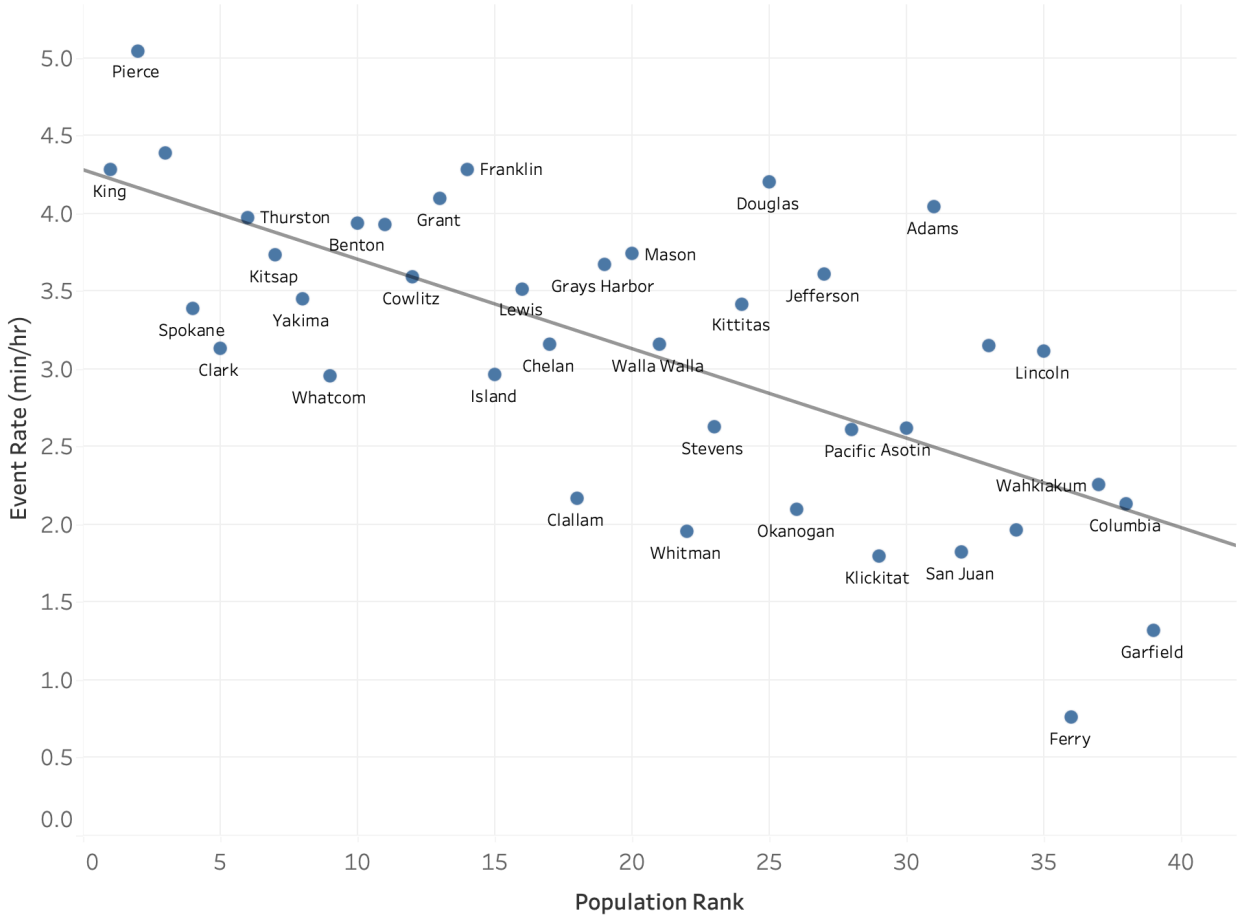
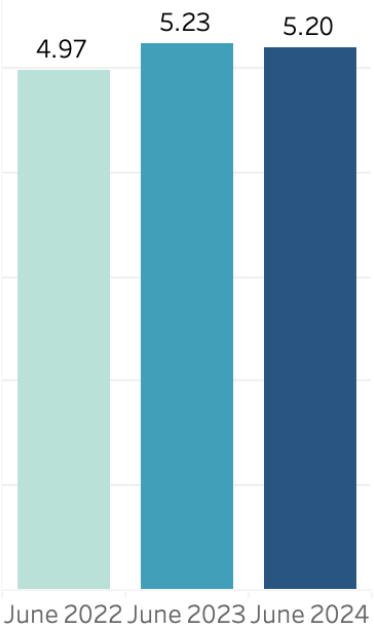


Figure 11. Phone call rates vs. the population rank (1st = King, 39th=Garfield) showing a statistically significant relationship (R^2 = 0.47, $p<0.001$)

"Thirteen percent of trips had a phone call event in June 2024. Over the course of the month, 73% of drivers had at least one phone call during the trips they took."

Hard Braking



High frequency of hard braking (>3.2m/s^2) is one of the leading indicators of crash risk, especially involving vulnerable road users, both from an individual driver perspective[5,6], and by extension, road segments, and counties.

The nature of the roads in the county (fewer hard brakes occur per mile on a highway than on a road with intersections) and the volume of cars in a county (as other drivers, traffic, and the presence of pedestrians/cyclists are often the cause of hard brakes) drastically affect hard braking rates.

Figure 12. Statewide hard brake rate

[5] Dingus, T. A., F. Guo, S. Lee, J. F. Antin, M. Perez, M. Buchanan-King, and J. Hankey, Driver crash risk factors and prevalence evaluation using naturalistic driving data. Proceedings of the National Academy of Sciences, Vol. 113, No. 10, 2016, pp. 2636–2641.
[6] Palat, B., G. S. Pierre, and P. Delhomme, Evaluating individual risk proneness with vehicle dynamics and self-report data: toward the efficient detection of At-risk drivers. Accident Analysis and Prevention, Vol. 123, 2019, pp. 140–149.

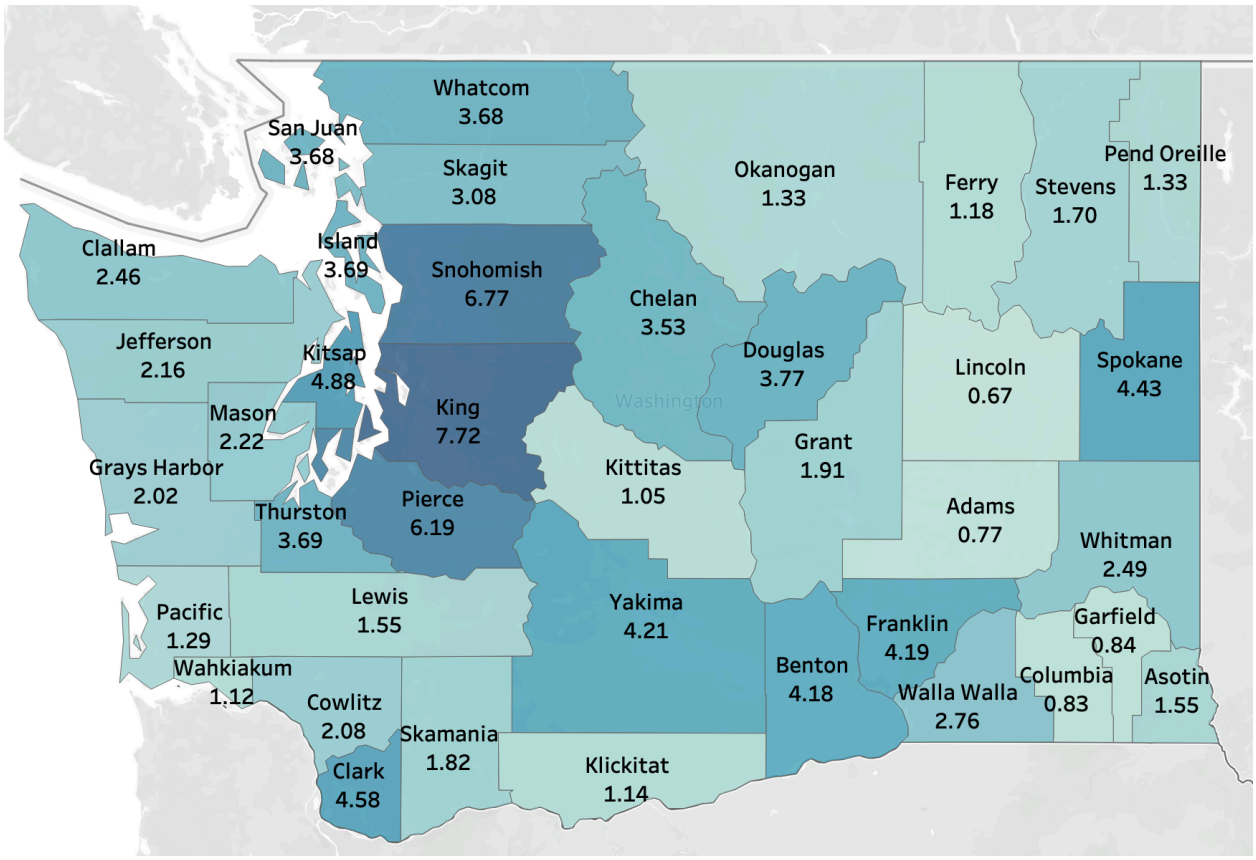


Figure 13. Hard brake rates by county for June 2024 (hard brakes per 100 miles of driving)

Unsurprisingly, rates are much higher in the more populated counties especially King, Snohomish, and Pierce. Like phone calls, hard brake rates are well correlated with the population rank of the county, despite the fact that there is normalization (Figure 14).

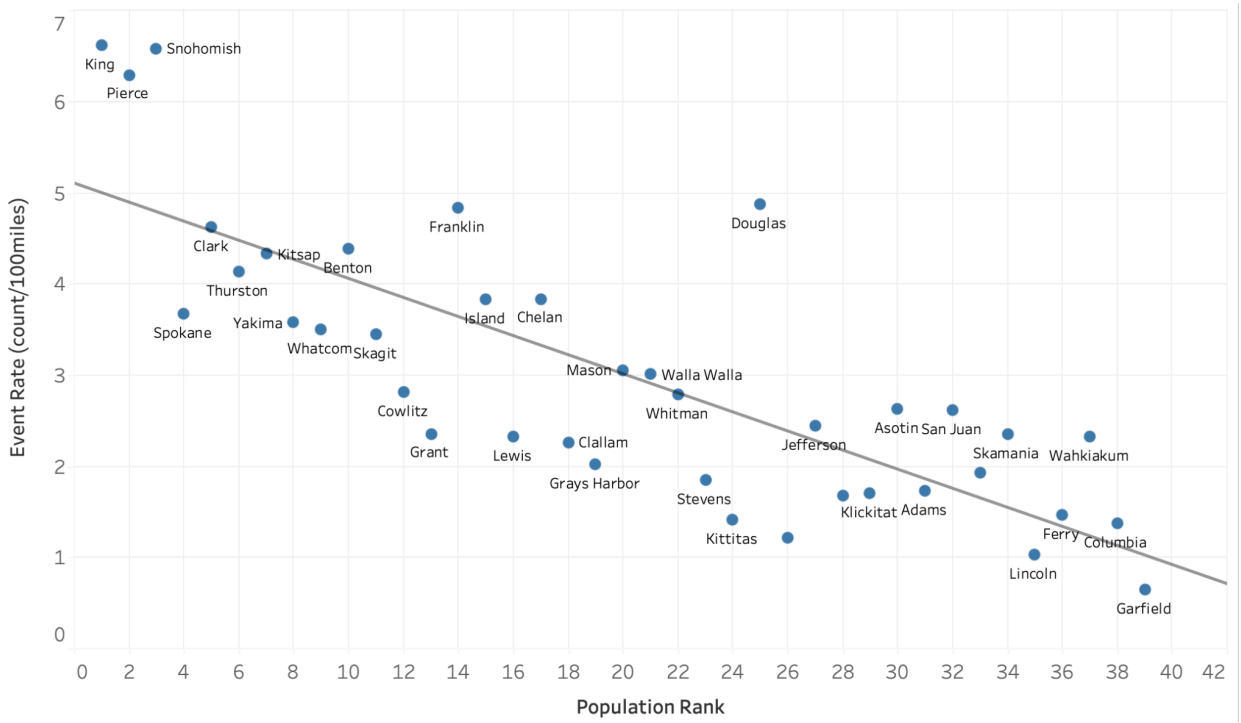


Figure 14. Hard brake rates vs. the population rank (1st = King, 39th=Garfield) showing a statistically significant relationship (R^2 = 0.62, $p<0.001$)

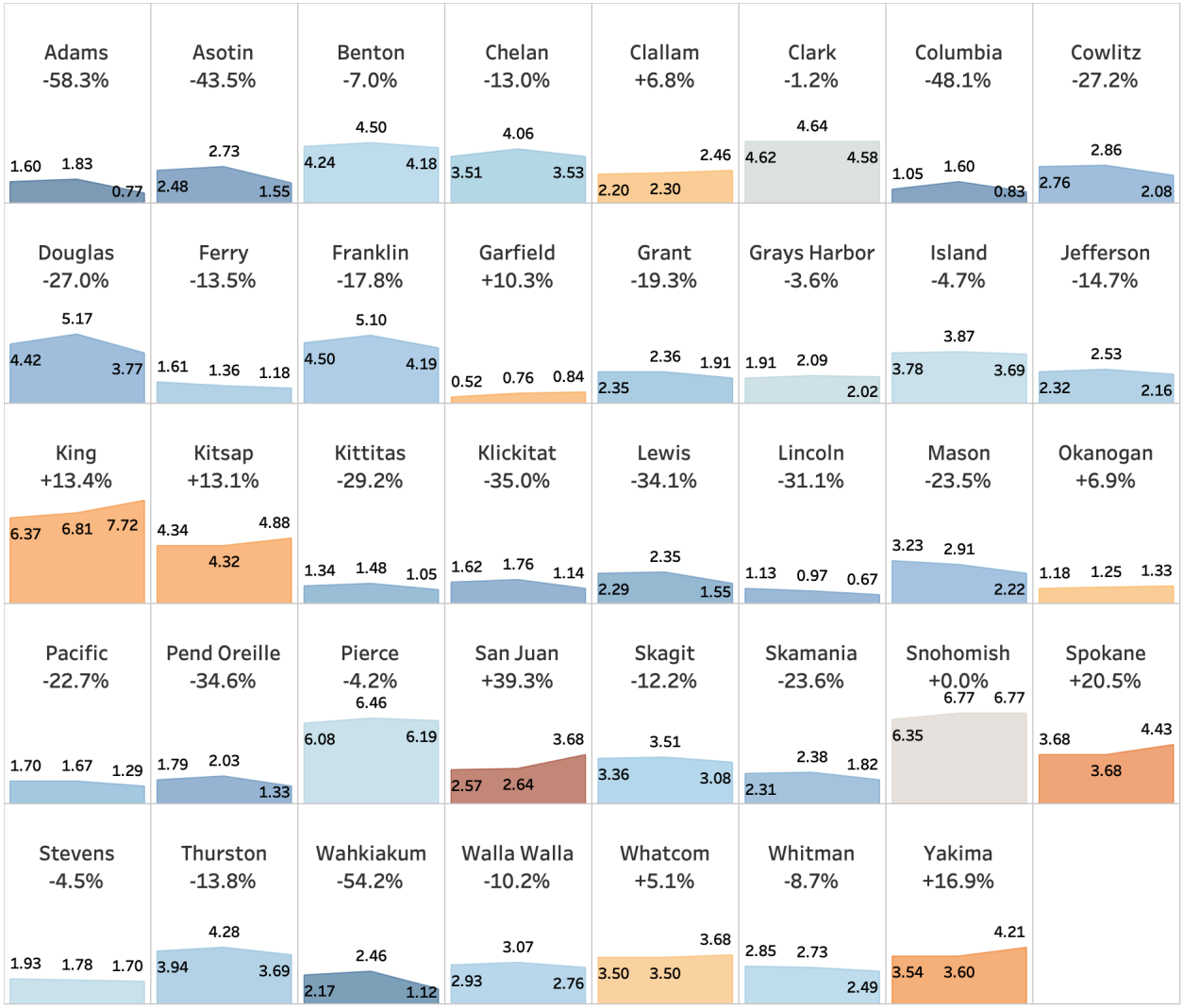
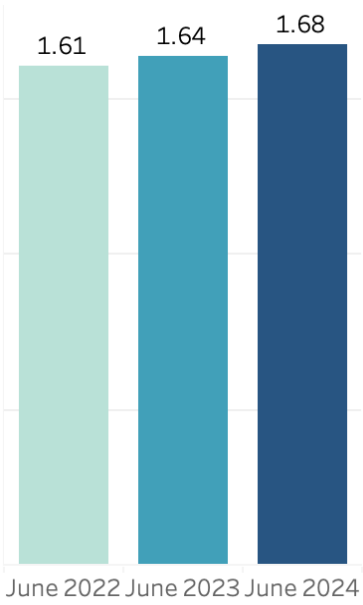


Figure 15. Change in hard brakes per 100 miles of driving from June 2022 to June 2024 by county. The charts are colored by the percent change from 2023 to 2024. ***Statewide hard braking decreased slightly, from 5.23 hard-brakes per 100 miles to 5.20.***

Rates of hard braking fluctuated considerably between counties over the three years. Concerningly, rates have increased in King county, where significant amounts of the driving in the state occur.

"Twenty-one percent of trips had a hard braking event in June 2024. Over the course of the month, 87% of drivers had at least one hard braking event during the trips they took."

Speeding



Speeding is similar to phone distraction and calls in that the event can take place over a number of miles or minutes; therefore, it's expressed as minutes of speeding per hour of driving (where a speeding event is a certain number of mph over limit as described previously). For example, 1.68 minutes of speeding (June 2024 speeding rate) at 55 mph or more in a 45 mph zone is equivalent to traveling at least one and a half miles at a high rate of speed. The speeding rate has slightly increased over the three year span.

Speeding, somewhat obviously, is a function of being able to speed on free-flowing roads. So again, the nature of the roads and traffic volume will play into county-to-county differences. Equally the presence of a highly traveled road where almost every driver is speeding can greatly influence county values.

Figure 16. Statewide speeding rate

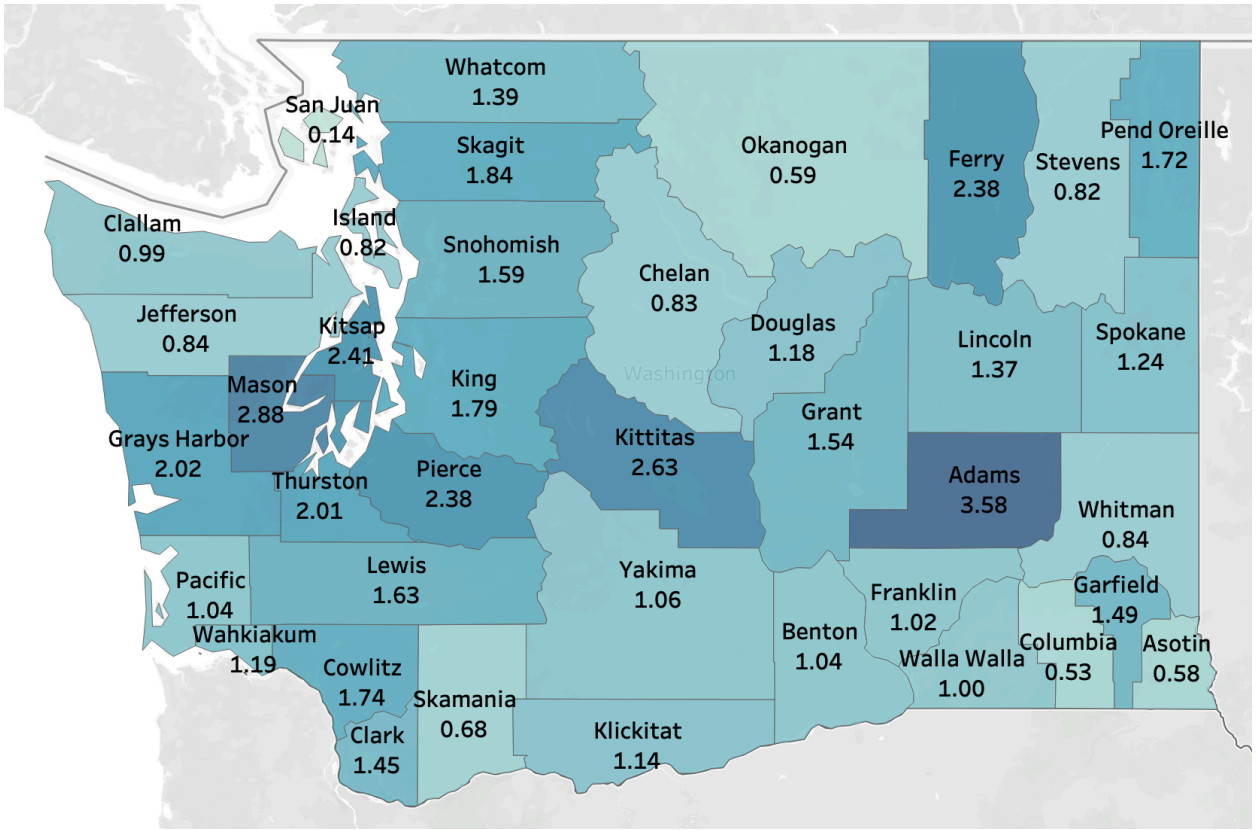


Figure 17. Speeding rates by county for June 2024 (minutes of speeding per hour of driving)

There was no correlation seen between speeding rate and county population. This may seem counterintuitive where counties with more rural roads lend themselves to more speeding as there's less traffic preventing it, but these counties also typically have less miles of limited access highways where speeding is ubiquitous.

Figure 18. Change in speeding per hour of driving from June 2022 to June 2024 by county. The charts are colored by the percent change from 2023 to 2024. ***Statewide speeding showed a slight increase from 1.64 minutes per hour to 1.68 minutes per hour.***

Adams and Ferry counties are outliers here. While Adams has a fairly low population, I-90 will have a significant amount of traffic that speeds. Equally the few other roads in the county lend themselves to speeding as shown below.

Figure 19. WA-26, one of the few main roads in Adams County, likely lends itself to speeding.

Ferry county has remarkably few roads, with State Route 21 running N/S and State Route 20 running E/W. The volume on these roads is likely low, with ample opportunity for speeding.

Figure 20. WA-20, one of the two main roads in Ferry County, is likely a low volume road lending itself to speeding, though more hilly than the counterpart shown in Adams county.

"Thirty-two percent of trips had a speeding event in June 2024. Over the course of the month, 90% of drivers had at least one speeding event during the trips they took."

Compound Events and Other Breakdowns

In this section we will look at the events broken down by other pieces of information we have about the risky behavior. In some cases, event counts or total minutes are shown instead of rates. The type of analysis in this study (at the county level rather than individual road segments) does not provide the denominators needed (for example, the total number of hours of the parts of trips spent at 30mph vs. 45 mph) to provide rates in every case.

Distraction (Phone Motion) vs. Speed and Roadway Classification

The implications of distraction are different at different speeds. Below 15 mph it's likely any crash would be a minor fender bender. At 20 mph to 35 mph a distraction related crash could cause serious injury to vulnerable road users and vehicle occupants. At 35 mph to 55 mph the distraction could still be on roads with vulnerable road users, and the crash is much more likely to result in death or permanently debilitating injury. Above 55 mph the distraction is more likely to be on a highway.

Obviously, the distance traveled while looking away from the road increases at these higher speeds, but equally the energy of any crash is the square of velocity, making crashes at this speed very dangerous to the occupants and any third-parties.

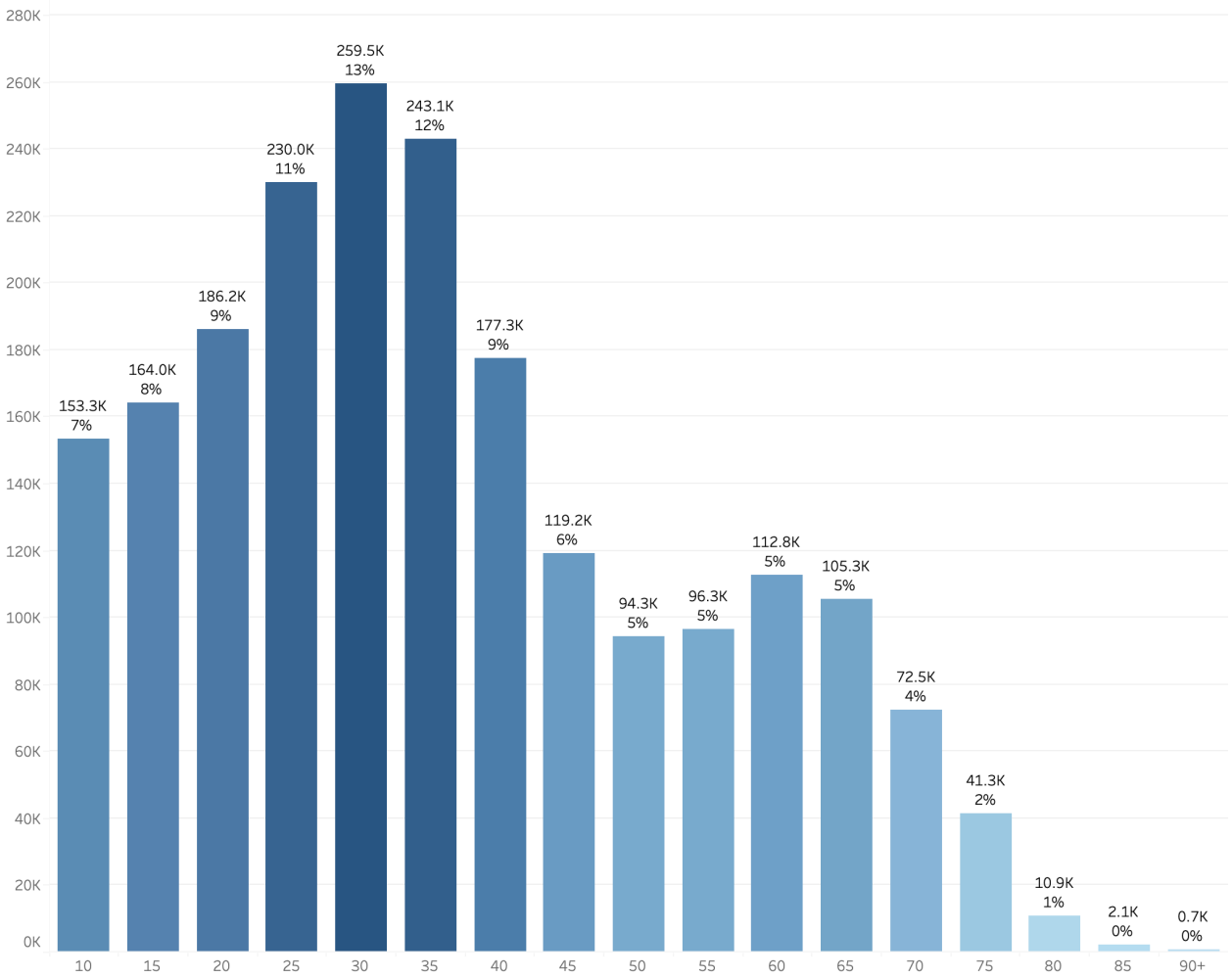


Figure 21. The minutes of phone motion distraction seen in Washington State in June 2024, broken out by the speed band (mph) the driver was traveling at the time of the distraction. The percentages show minutes of distraction at this speed divided by the total distraction minutes.

> ***"Engaging in phone distraction while also traveling at very high speeds is extremely dangerous. In June 2024, there were 13,700 minutes of distraction with the driver exceeding 80 mph"***

The chart above shows peaks between 25 mph and 40 mph (where pedestrians and cyclists are almost definitely present), and another at highway speeds of 60 mph and 65 mph, Concerningly there's a number of events occurring at even higher speeds; there were 13,700 minutes of distraction with the driver exceeding 80 mph.

The definition of roadway classification can vary by map provider or organization, but typically they follow this general pattern:

- Highway (FC1): High speed, high volume roads like interstates and highways (usually, but not always access-restricted)
- Primary arterials (FC2): Roads used to channel drivers onto FC1 roads, or major roads that are not highways. Sometimes called trunk roads
- Primary local (FC3): Roads that intersect FC2 roads and can still be important thoroughfares. Often called primary roads
- Secondary local (FC4): Roads that intersect FC3 roads and can be neighborhood feeders to Primary roads. Often called secondary roads
- Residential (FC5): Smaller roads like, but not limited to, residential and access roads

Firstly, we can consider time spent on each of these road types.

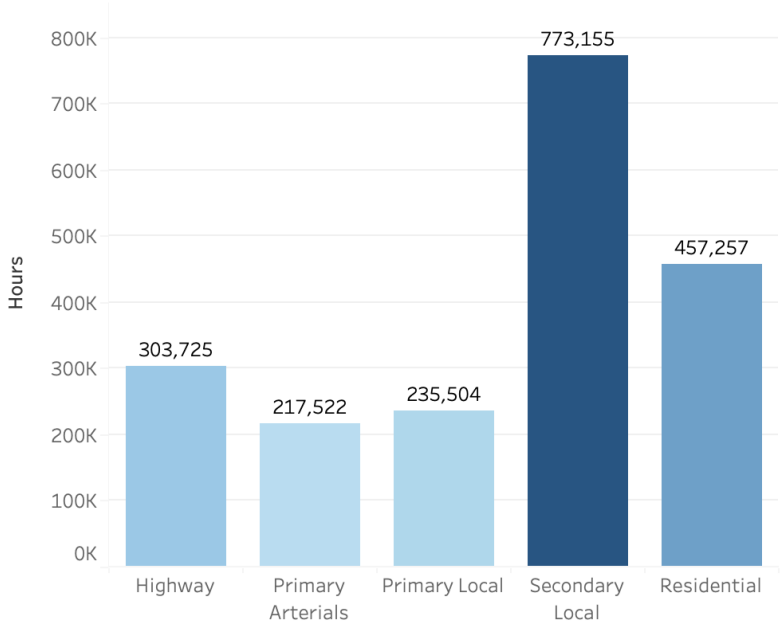


Figure 22. Hours spent on each type of road classification in June 2024 across the state. The total hours exceeds the hours reported earlier in the document as this includes hours of driving time spent outside of Washington state (but started or ended in state)

It can be seen that more time is spent on secondary local roads in Washington state than the other roadway classification. However, as seen in Figure 23, phone motion distraction is highest on residential roads, followed by secondary local roads.

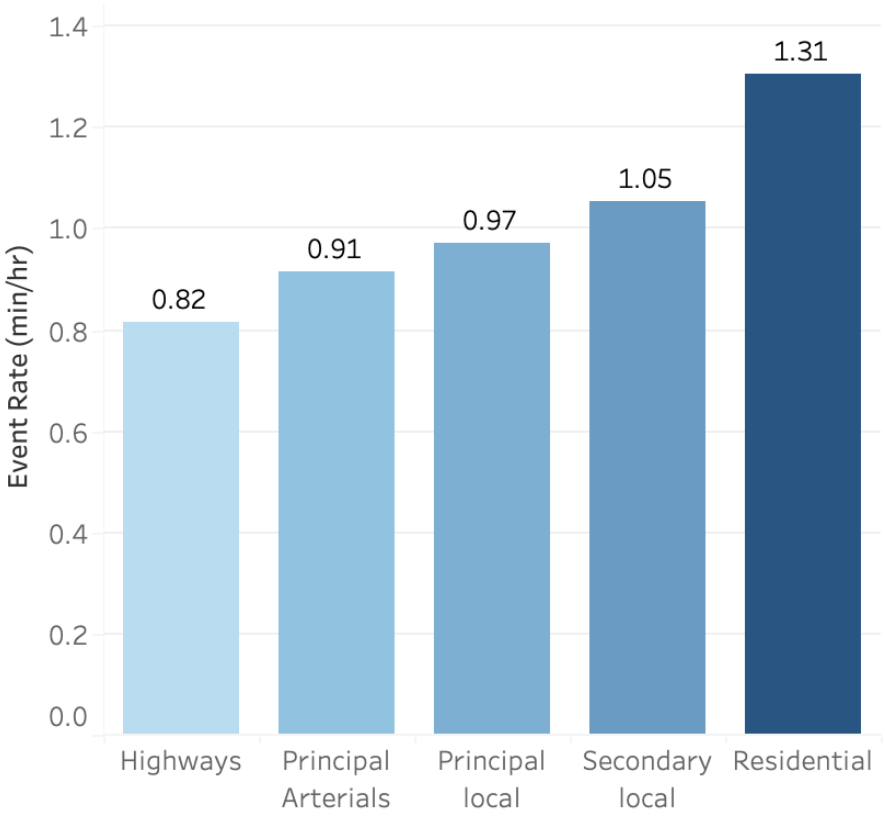


Figure 23. The rate of phone motion distraction in June 2024 across the state. The rates (minutes of distraction per hour of driving) increase as the roads get smaller.

It's of considerable concern that the distraction rate increases on the classes of roads that have a higher likelihood of vulnerable users being present on the roadway (i.e. there are few pedestrians in highways and primary arterial roads, but they are common on secondary and residential roads).

Distraction (Phone Calls) vs. Speed and Roadway Classification

Given that phone calls are more common than phone motion distraction we can also look at phone calls by travel speed band and roadway classification.

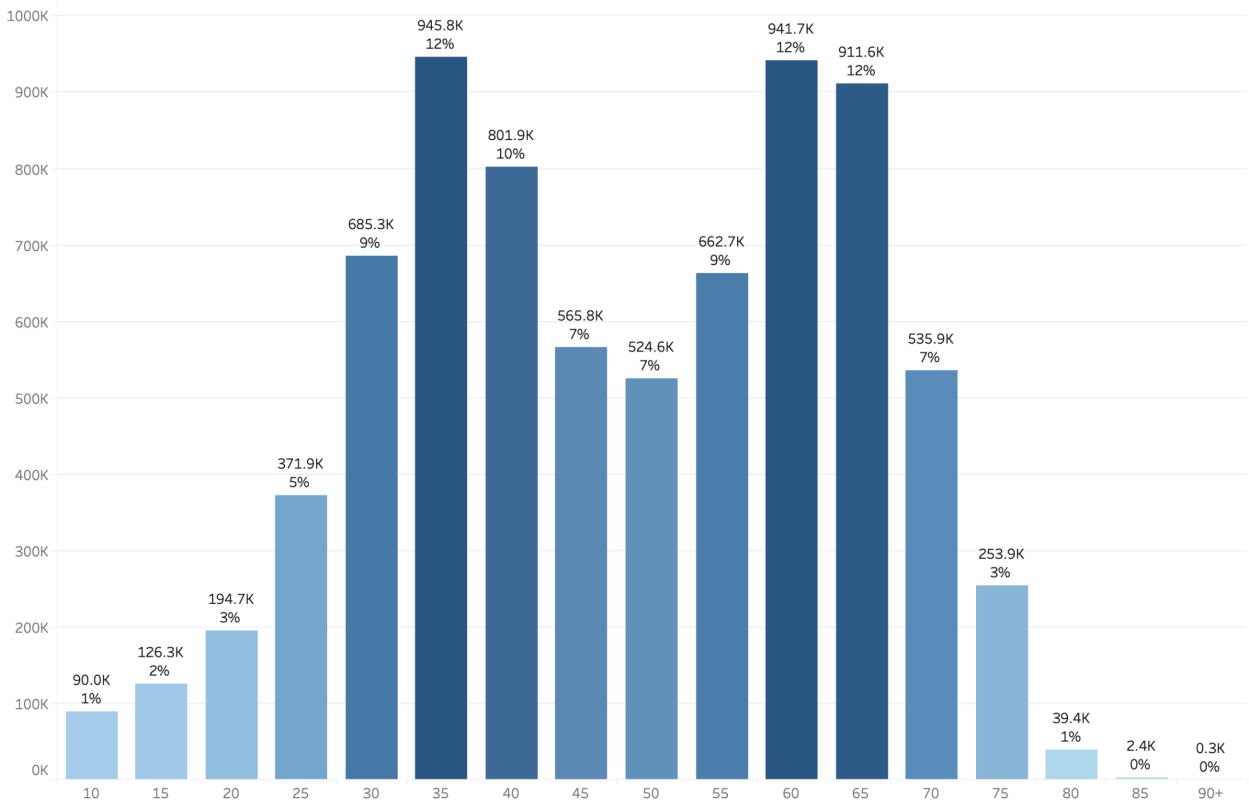


Figure 24. The minutes of phone call distraction seen in Washington State in June 2024; broken out by the speed band (mph) the driver was traveling at the time of the distraction. The percentages show minutes of distraction at this speed divided by the total distraction minutes.

Unsurprisingly, more pronounced peaks are observed at highway speeds, aligning with the tendency to perhaps say, 'I'll call you when I'm on the highway'. This is reflected in the rate of phone calls (minutes per hour of driving) per functional class being much more even than phone motion as shown in Figure 25 below. However, there is a similar peak at 35mph, a common speed on lower functional classes.

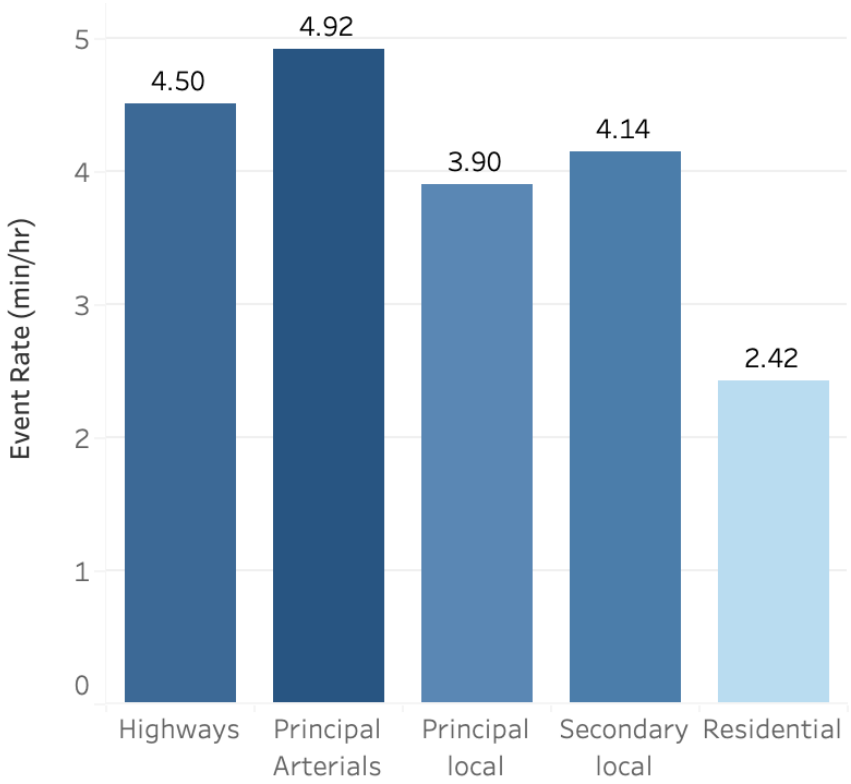


Figure 25. The rate of phone call distraction in June 2024 across the state. The rates (minutes of distraction per hour of driving) are fairly consistent except for residential roads.

Hard Brake vs. Speed and Roadway Classification

Similarly, we can look at what speeds hard brakes occur. Most occur under 30mph, synonymous with high traffic volumes, encountering vehicles turning, and the presence of vulnerable road users on lower roadway classifications.

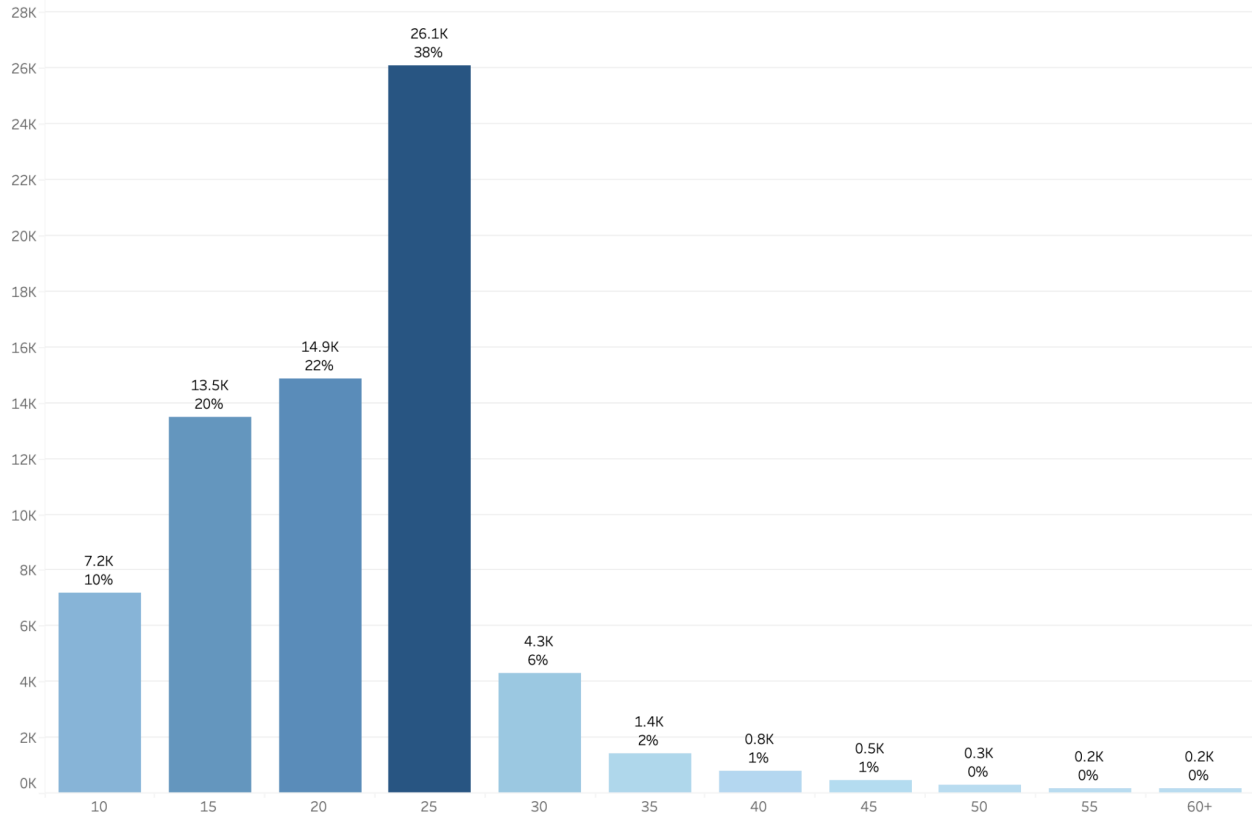


Figure 26. The count of hard brake events seen in Washington State in June 2024, broken out by the speed band (mph) the driver was traveling at the start of braking.

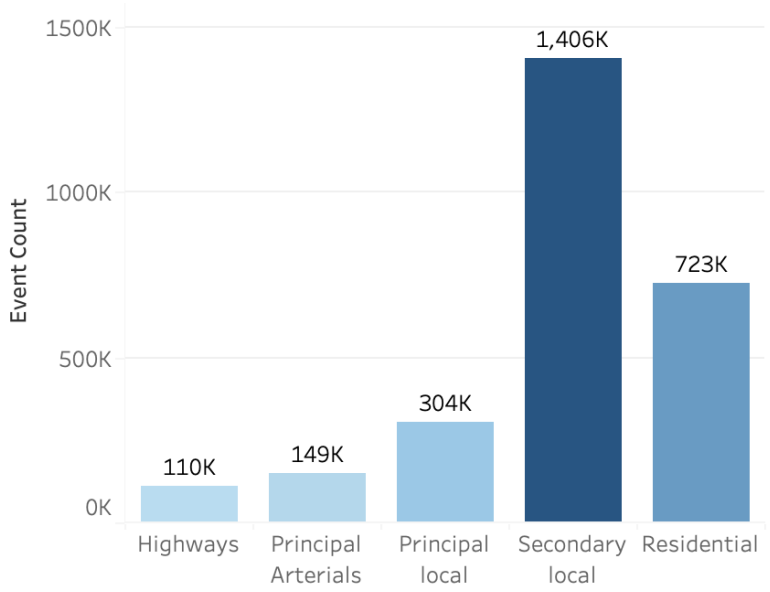


Figure 27. The count of braking events in June 2024 across the state. Roads with lower road classifications see higher hard-braking frequencies.

Speeding vs. Speed and Roadway Classification

The amount by which a driver exceeds the speed limit is important as it indicates the increased risk to drivers that may be observing the limit, or trying to pull out onto a road, and expecting adherence to the limit, as well as the increased risk of death to vulnerable road users. The chart below is both a function of the distance of roads in Washington state with the respective limit, and how inclined people are to speed on them. On highways with a 60 mph limit, about a third of speeding drivers exceeded that limit by more than 15 mph. This is a decrease from June 2023, when approximately one-half of speeding drivers exceeded the limit by more than 15 mph.

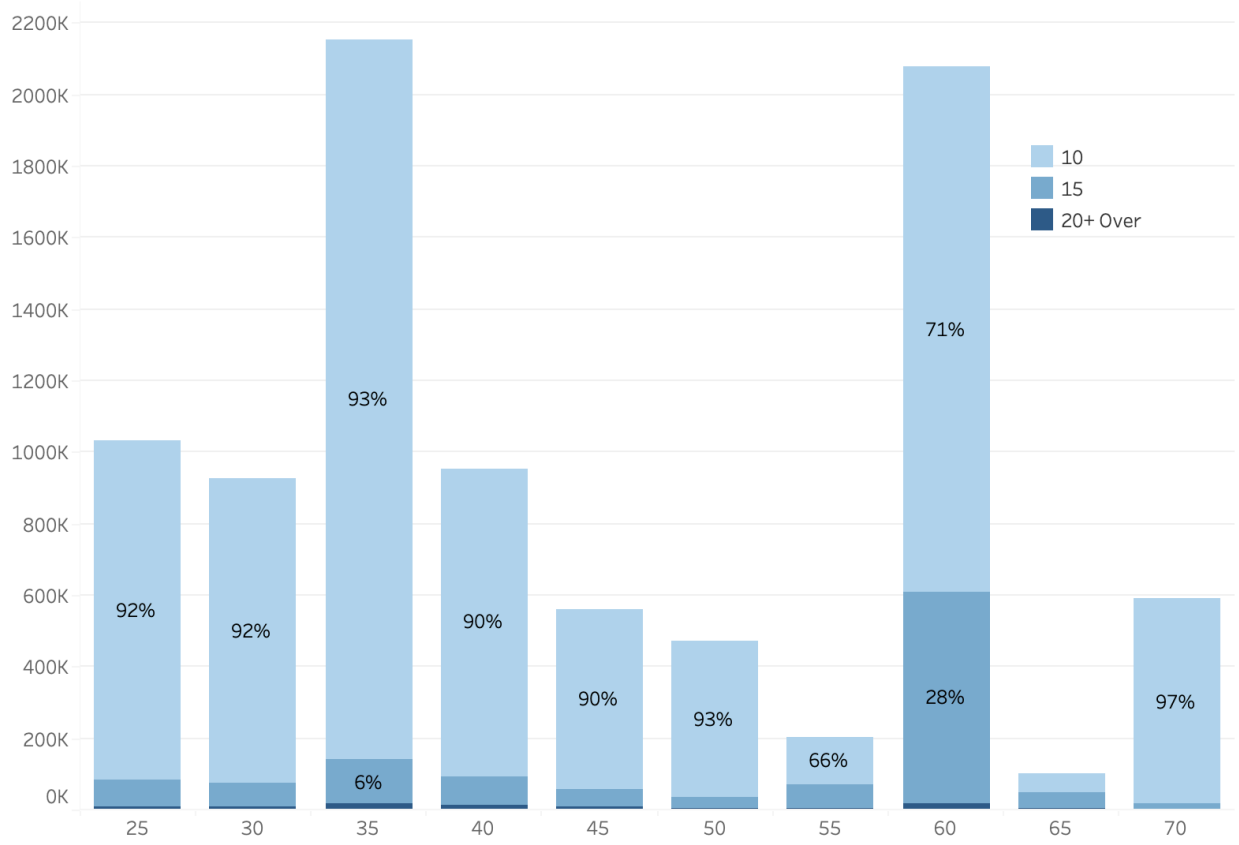


Figure 28. The count of speeding events by posted speed limit, and the amount that the limit was exceeded by (darker colors indicate greater amounts above the limit) for June 2024.

"On highways with a 60 mph posted speed limit, about a third of speeding drivers exceeded that limit by more than 15 mph"

Speed Limit	10 to 15 mph over	15 to 20 mph over	20+ Over
25	92%	7%	1%
30	92%	7%	1%
35	93%	6%	1%
40	90%	8%	1%
45	90%	9%	2%
50	93%	6%	1%
55	66%	31%	3%
60	71%	28%	1%
65	54%	40%	6%
70	97%	3%	0%

Table 1: The percent of speeders traveling in excess of the posted speed limit.

If we normalize the speeding vehicles by total time spent on a roadway classification by all cars in the dataset, the speeding rate is similar across all but residential roads, with highways not surprisingly showing the highest rates of speeding.

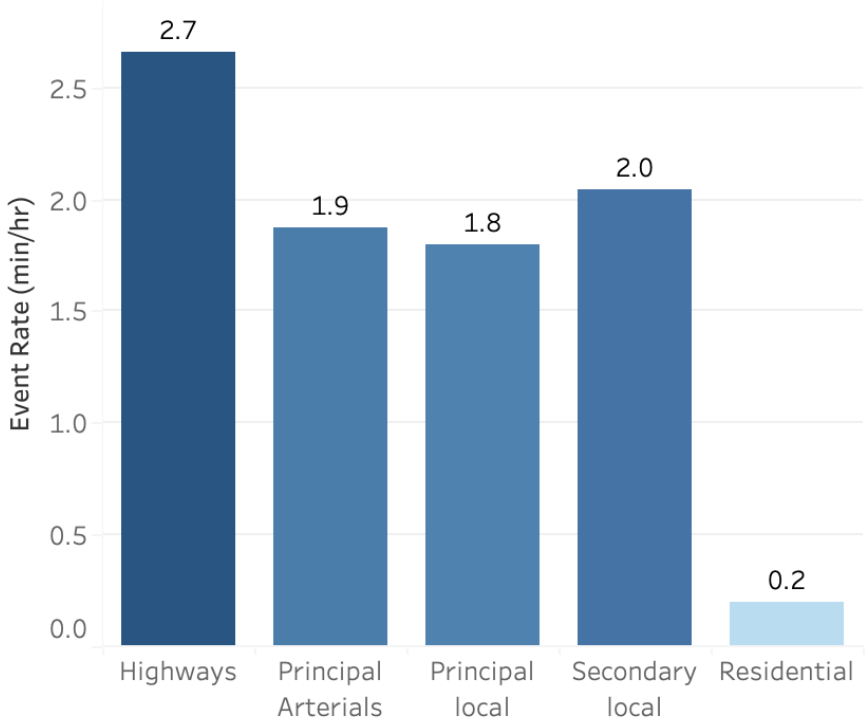


Figure 29. The speeding rate (minutes per hour of driving) by roadway classification shows speeding is ubiquitous on all but residential roads.

Conclusion

This report has shown that CMT's telematics data is substantial in Washington and can provide insights on driving trends and county-to-county differences. This information can be utilized to identify and address areas of concern. The report also suggests that telematics data could supplement or replace current roadside observation surveys in understanding driver behavior and risky driving areas. For example, telematics data provides a larger sample size and captures a more complete picture of driving habits compared to traditional methods like roadside observations or speed capture devices. This comprehensive view can aid in developing more effective traffic safety interventions.