Evaluation of Arizona’s statewide handheld cellphone ban using roadside observation and telematics data

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ABSTRACT

Introduction: The current study assessed whether a statewide ban against drivers holding phones reduces such behavior. In 2019, Arizona passed a statewide prohibition on holding a cellphone while driving. Police could issue written warnings immediately but could only issue citations beginning in 2021.

Method: We used a pre–post study with control group design to estimate handheld phone use in Arizona before and after citations were permitted relative to Nevada. The before-citations period was limited to April 2019 through December 2020. Roadside observations of handheld phone use occurred in July 2019 and 2021. Telematics data from Cambridge Mobile Telematics on percentages of trips and trip duration with handheld phone use among drivers using their platform was collected for the same before period and two different post periods, one short- and one long-term (2021 and 2021–2024).

Results: Statewide analyses showed consistently lower likelihood of handheld calling in Arizona after citations were permitted, though only the telematics analyses were statistically significant. For example, the telematics data showed that the percentage of trip time with handheld calls decreased 26% by 2024. Roadside observation indicated phone manipulation decreased in Arizona after January 2021 but not significantly. Short-term telematics analysis found small changes in phone manipulation: the percentage of trip time with manipulation decreased, but the percentage of trips with any manipulation increased. The long-term analysis showed that both measures increased by 2024. Average monthly citations written by state troopers declined each year from 2021 to 2024.

Conclusion: Handheld calling reductions in Arizona estimated after the law's effective date were robust and consistent with earlier work. The lack of robust decline in cellphone manipulation may have been influenced by preexisting local ordinances prohibiting phone use in some Arizona jurisdictions or the limited before-citations period. The increase in cellphone manipulation over time is consistent with the decline in enforcement.

Practical implications: Long-term increases in manipulation suggest that the temptation to use smartphones is stronger than concerns about receiving a citation, and therefore additional interventions will be required.

1. INTRODUCTION

Driver distraction from visual–manual cellphone use introduces significant crash risk, with tasks that require more visual–manual demand, such as dialing a 10-digit number, associated with greater increases than those that require less, such as adjusting the radio (Dingus et al., 2016; Kidd & McCartt, 2015; Klauer et al., 2006). Conversely, tasks with mostly auditory–vocal or cognitive demand are associated with inconsistent changes in crash odds, and some research shows that tasks such as phone conversations may be helpful to drivers combating fatigue (e.g., Fitch et al., 2014). These data are consistent with an interpretation that most distraction-related crash risk is explained by competition for visual resources between driving and other activities such as searching for a song on a playlist, reaching for an object, reading, or writing (Wickens, 1981).

This link between looking away from the road to attend to something unrelated to driving and subsequently crashing is strong. Crash likelihood grows the longer drivers' eyes are focused off-road, and frequently the only thing separating visually distracted drivers who crash from those who do not is a co-occurring sudden change in the forward environment (see Victor et al., 2014) such as a lead vehicle slamming on its brakes or lane shift. This explains why Owens et al. (2018) found rear-end and lane-drift crashes to be more strongly associated with visual–manual distraction than all crashes.

Despite the evidence that visual inattention in any form increases crash risk, cellphones have received the majority of attention from researchers, regulators, and media. The high prevalence of visual–manual cellphone use relative to other visual–manual distractions that have comparable levels of crash risk partly justifies this focus. For example, visual–manual cellphone use and reaching for an object other than a cellphone both more than double crash risk, but visual–manual cellphone use was 6 times more common in the Strategic Highway Research Program 2 (SHRP2) naturalistic driving dataset (Dingus et al., 2016).

In the United States, individual state laws that prohibit driver cellphone use are the most broadly applied regulatory effort to reduce visual–manual cellphone use. Initial bans such as the very first in New York prohibited handheld calls, but other states enacted bans on text messaging only as SMS grew in popularity and was also linked to higher crash risk. With the proliferation of smartphones and "apps" the term "cellphone manipulation" has emerged to describe the scrolling, swiping, typing, and other handheld actions common to current smartphone users. The National Highway Traffic Safety Administration's (NHTSA) annual National Occupant Protection Use Survey (NOPUS) shows an increasing trend in manipulation over the past decade that is concerning given the crash risk associated with the behavior (National Center for Statistics and Analysis [NCSA], 2024). In the current period of smartphone ubiquity, states have begun prohibiting drivers from holding a cellphone, rather than banning specific tasks like texting or conducting handheld phone calls.

The intent of these laws is to reduce the number of crashes caused by cellphone-related distraction, and tracking their impact on crash rates is vital. However, evaluations that measure changes in fatalities or collisions with their adoption have shown that results vary according to the way a particular law is worded (banning handheld calls, texting, or holding a phone), who is regulated by it (all drivers versus novices), or whether analysis focuses on drivers or nondrivers (see McCartt et al., 2014; Zhu et al., 2021). Reasons for inconsistent findings include use of less-than-ideal outcome measures. Police-reported distracted driving crash data is a primary data source for evaluations but is also accepted to be of suspect validity (e.g., NCSA, 2025). More recent evaluations suggest that adapting the wording of laws to ban the act of holding a cellphone has promise, although state-by-state inconsistencies remain (see Reagan et al., 2023).

Evaluations based on measuring reductions in prohibited behaviors can also provide evidence that laws achieved their desired outcomes. While this is less direct evidence of a safety benefit than crash reductions, reducing the behavior should also reduce the frequency of crashes linked to the behaviors. Such work, typically based on roadside observation of driver behavior, has also found mixed effects associated with cellphone bans. Rudisill and Zhu (2017) and Zhu et al. (2016) showed that drivers observed in states with universal phones bans were significantly less likely to make handheld calls than those in states without them. A series of studies of the short- and long-term effects of bans in New York and the District of Columbia (DC) by McCartt and colleagues indicated the laws achieved significant short-term reductions in both states but cellphone use only remained significantly lower over the long term in DC (McCartt et al., 2003; 2010; McCartt & Geary, 2004; McCartt & Hellinga, 2007).

In addition, multiple evaluations show consistent reductions in the prevalence of handheld phone calls in states that ban the behavior alone or in conjunction with bans on text messaging, whereas reductions in texting are inconsistently observed for texting bans (McCartt et al., 2014; Reagan & Cicchino, 2020). Simple before-and-after evaluations of laws adopting the newer strategy of strengthening wording of laws by banning the act of holding a phone show promise in reducing cellphone manipulation (Cambridge Mobile Telematics [CMT], 2023), but such findings are limited due to the absence of a control state.

Arizona passed state law ARS 28-914, which prohibited all drivers from holding or manipulating a wireless device, on April 22, 2019. Police were permitted to issue written warnings immediately but barred from issuing citations until the law became effective on January 1, 2021. Prior to ARS 28-914, there was no statewide all-driver ban on cellphone use, but 28 communities within Arizona had local ordinances that banned handheld calls, texting, or both. These communities could issue citations under the local ordinances through December 2020, after which only the state law applied. The minimum fine for a first violation under the state law is $75 and rises to $150 for subsequent violations.

1.1 Study objectives

Our main study objective was to evaluate the association between the implementation of Arizona's strongly worded cellphone law and handheld cellphone use, comparing trends in Arizona and Nevada before and after Arizona's law became effective. Nevada introduced a 2012 ban on handheld phone use with no other significant distracted driving legislation passed since and thus served as a control group. Other objectives were to compare the results from two data sources (roadside observations and telematics data) and analyze any potential differences between the short- and long-term effects of the law. Short-term relationships were analyzed with roadside observation and telematics datasets by examining handheld cellphone activity through 2021, which covered the first full year ARS 28-914 was in effect.

Telematics data through the second quarter of 2024 permitted evaluation of the long-term influence of the law, though no roadside observations were conducted for that period.

Wireless telematics data are a compelling data source. The GPS and accelerometer units housed within smartphones allows the telematics company to reliably identify when drivers are handling their device and also to track other important metrics like the vehicle's location, speed, and rate of acceleration. Large volumes of this data are available because the technology is the key enabler of usage-based insurance (UBI), a relatively new offering that uses each driver's behavior to calculate individual premiums. A national survey found about 8% of drivers had UBI in 2024. This represents around 20 million drivers, which is not a trivial number (Preston, 2024; Federal Highway Administration, 2025).

The population of drivers with UBI does not represent all drivers, however, and UBI's appeal is lower premiums for drivers who drive less or safely (National Association of Insurance Commissioners, 2023), which raises questions about the utility of telematics data to evaluate larger trends in driver behavior. Presumably, drivers who think of themselves as careful are drawn to these programs, while those who drive aggressively avoid them. Data privacy concerns also likely influence participation.

Despite those limitations, Reagan et al. (2024) found telematics data shared trends with annual roadside observations conducted by NHTSA in its NOPUS. We chose to use both roadside observation and telematics data in the current study because of their complementary strengths and weaknesses that allowed us to supplement a traditional data source with more data points over a longer time period.

2. METHOD

2.1 Roadside observation method

Observations were collected by trained observers in July 2019 and July 2021. For each period, observations were conducted Monday through Thursday from 8 a.m. to 5 p.m. In Arizona, observations were concentrated in four localities based on status of local ordinances on cellphone bans. Mesa and Scottsdale had no prior local ban on handheld cellphone use. Phoenix had a ban on sending or reading text messages. Tucson had bans on handheld calling and texting. Mesa and Scottsdale were treated as one locality given their proximity and the fact that neither had prior ordinances in place. Collectively, the four cities account for about 40% of the state's population (U.S. Census Bureau, 2025).

In Nevada, observers collected data in Reno, Henderson, and Carson City. These cities account for 21% of Nevada's population. Las Vegas was intentionally excluded because of the large number of tourists who visit the city and are likely unaware of the state's cellphone ban.

Observation sites were higher-volume roadways selected from predetermined areas using the Federal Highway Administration's Highway Performance Management System database. In Arizona, 48 sites were evenly distributed across Mesa-Scottsdale (*n* = 16), Phoenix (*n* = 16), and Tucson (*n* = 16). Thirty observation sites were also evenly distributed across the Nevada cities.

A single observer collected data at each site in free-flow conditions and only recorded observations of drivers in the nearest through lane of traffic. Observers recorded perceived driver gender (male, female, unknown), estimated age group (19 and younger, 20–59, 60 and older) and handheld cellphone use. Observers coded the handheld cellphone activity into the following categories:

- Handheld cellphone conversation: holding cellphone to ear, between head and shoulder, or talking with cellphone held in hand.
- Manipulating cellphone: manually interacting with cellphone. Excludes looking at a cellphone in mount or other storage location.
- Holding handheld cellphone: Holding cellphone in hand but not manipulating it. Excludes holding related to handheld cellphone conversation or when device is resting on the lap out of driver's hand.

2.2 Telematics sampling and dataset construction

The sample comprised trips made by drivers who opted into the CMT telematics platform. CMT indicated that the vast majority of trips were made by drivers participating in usage-based insurance programs, while a small minority accessed the platform through public contests or other driver monitoring programs. The overwhelming majority of these drivers operate passenger vehicles, with an estimated 0.25% associated with commercial policies.

CMT constructed a dataset that included the count and duration of trips statewide in Arizona or Nevada for each quarter beginning with the second quarter of 2019 (i.e., April 1 through June 30, henceforth "Q2") and running through Q2 2024. April 2019 was chosen as the start date because the novelty of the product meant little CMT data were available from before that time. A trip had to both start and end within a state to be assigned to that state. Handheld calls were defined as calls in progress when the car was moving at least 9.3 mph (15 km/h) and audio is coming from the device and not from Bluetooth, headphones, or a speakerphone. CMT determined that a cellphone was being manipulated when the gyroscope indicated that it was tilting significantly, the GPS indicated that the vehicle was moving at least 9.3 mph (15 km/h), and the phone's screen was unlocked.

Trip counts and durations were grouped into one of three bins across each daily 24-hr cycle within each week: from 7:00 a.m. to 5:59 p.m., 6:00 p.m. to 8:59 p.m., and 9:00 p.m. to 6:59 a.m. the following morning. CMT merged trips made during late night and early morning hours from 9:00 p.m. and 6:59 a.m. into a single bin to ensure sufficient exposure. We assigned any trips spanning multiple bins to the period during which they originated. In total, the telematics sample covered 215 million trips and 3.4 billion hours of driving in Arizona and 105 million trips and 1.6 billion hours in Nevada.

Data were condensed to generate a record for each of the three time-of-day periods for each day of the week in each quarter (e.g. 7:00 a.m. to 5:59 p.m. Mondays during Q2 2019). For Q2 2019–Q2 2024, the final dataset had 441 records per state (3 time periods x 7 days x 21 quarters = 441).

To increase diversity and address survivor bias, we followed the strategy suggested by van Rein et al (2014) and limited sampling trips to drivers with fewer than 90 days tenure in a CMT customer's program. CMT recommended the strategy based on assumed relationships between increased tenure and safe driving, as drivers with poor driving metrics may be more likely to leave or are dropped from an insurance company's program at the 90-day point. In rare cases of drivers who switched to a different insurer that also uses CMT's platform, they would have separate IDs under the two policies and CMT would not know it was the same person.

For some customers, CMT observes driver identity by use of a tag that attaches to the windscreen, which communicates to the customer's phone via Bluetooth. For customers without tags, CMT uses a machine-learning classifier model to infer that the user is in a passenger vehicle (e.g., not on a bus, airplane, or bicycle) and is the driver. Inputs used with the classifier include prior user labeling of driver status, locality, type of origin and destination, the route, hour of day, day of week, month, driver behavior including speeding, acceleration, braking, and phone use, and vehicle turning radius. CMT provides an option for drivers to label trips as "driver's phone used by passenger," and drivers have the opportunity to reclassify their trips from driver to passenger. Only trips in which the user was in a passenger vehicle, did not relabel themselves as a passenger, and was predicted to be the driver by the classifier were included in the sample.

2.3 Analysis plan, roadside observational data

There were five independent variables used for the roadside data, the status of Arizona's strengthened law, state, year, gender, and age group. The status of Arizona's strengthened law was the primary independent variable and was created by coding the variables of state (Arizona vs. Nevada) and year (2019 vs. 2021) to indicate that the influence of the law was limited to observations made in Arizona in July 2021. Four dependent measures of handheld cellphone activity were analyzed: cellphone manipulation, handheld phone calls, holding a phone, and combined handheld phone use. The last variable sums the first three.

Logistic regression models were used for statistical tests, and maximum likelihood parameter estimates were considered significant when $p < 0.05$. Parameter estimates and associated confidence intervals were converted to rate ratios by calculating the inverse of the natural log of the estimate i.e., RR = Exp[X]) where X equals the parameter estimate. This is taking the odds ratio as an estimate of the rate ratio since the outcome events are generally rare. Lastly, rate ratio estimates and their confidence intervals were converted to the estimated percent change in the dependent measure in association with a change in the independent variable using the formula ([RR – 1] $\times$ 100). Thus, for example, a parameter estimate of −0.10 for the strengthened law on a measure of phone use represents a 9.5% decrease in the likelihood of observing that measure of phone use after the law's effective date relative to the experience in Nevada over the same period.

The influence of local ordinance status in Mesa-Scottsdale, Phoenix, and Tucson was assessed by repeating the analyses above three times so that the "study" site was limited to a given type of ordinance. Differences in the four measures of handheld cellphone use in each locality before and after the state law was implemented were tested by again using Nevada as the control state.

2.4 Analysis plan, telematics data

CMT provided quarterly data (Q1: January 1 through March 31, Q4: October 1 through December 31) based on trips made in Arizona and Nevada from April 1, 2019 through June 30, 2024. Counts of trips with handheld calls and cellphone motion, durations of handheld calls and cellphone motion, total trip counts, and total trip duration were used to create four outcome measures on handheld cellphone calls and cellphone motion. Cellphone motion was considered a proxy for cellphone manipulation, and we use the CMT term "cellphone motion" in the methods and results but "cellphone manipulation" in the discussion for consistency with the roadside data and prior literature. The percentage trips with a handheld call and the percentage trips with cellphone motion were dependent measures that indicate the driver engaged in the activity at least once on the trip. The percentages of trip duration that drivers were conversing on handheld calls or logged cellphone motion represent the proportion of driving time during which drivers were on handheld calls or manipulating their phone.

Seven independent variables were used to estimate the short- and long-term relationships between Arizona's 2019 law and quarterly handheld cellphone activity among drivers using CMT's telematics platform. As with the roadside data, the primary predictor was Arizona's law, which measured the change in handheld cellphone activity unique to Arizona in the annual quarters before and after the law's January 2021 effective date relative to the handheld activity of drivers in Nevada over the same pre- and post-period. Variables were included for state (Arizona versus Nevada) and cellphone ban effective date (pre-test Q2 2019 through 2020 vs. post-test 2021 or 2021–2024). The remaining independent measures represented temporal cycles and categories: an annual trend variable from 2019 to 2021 or 2024 represented change in cellphone use associated with a one-year increase in time, a quarterly trend represented seasonal changes in cellphone use associated with each quarter, a weekend vs. weekday variable contrasted cellphone use from 7 a.m. Monday through Friday 8:59 p.m. against use from 9 p.m. Friday through 6:59 a.m. Monday, and time of day compared distractions during trips in the evening (6 p.m. to 8:59 p.m.) or overnight/early morning (9 p.m. to 6:59 a.m. the next day) against daytime hours (7 a.m. to 5:59 p.m.). State was coded as a repeated measure to account for the likelihood that the same drivers were measured repeatedly within each state throughout the study.

Logistic regression was used for analysis similar to the roadside data, with parameter estimates and standard errors presented in summary tables and results interpreted in terms of the percentage change and associated confidence intervals. Thus, a parameter estimate of −0.24 for the law on the percentage of trips with a handheld call indicates that drivers in Arizona had a 21.3% lower likelihood that a handheld call occurred on a trip after the law was implemented relative to Nevada's experience.

2.5 Enforcement data

A summary of enforcement data obtained by the Arizona Governor's Office of Highway Safety from the Arizona Department of Public Safety (ADPS) is included. Counts of warnings and citations written by state troopers in support of ARS 28-914 from April 2019 through 2024 were used to provide monthly statewide averages for Arizona. Enforcement data only covered warnings and citations for ARS 28-914 and not for prior local ordinances.

3. RESULTS

3.1 Roadside observation results

3.1.1 Statewide results. Overall, 34,661 drivers were observed in Arizona and Nevada in 2019 and 2021. However, the analysis was based on a sample of 34,637 observations, as 24 cases were excluded due to missing or unknown values for a behavior, age, or gender. Table 1 indicates that more than 55% of drivers observed in each state and year were males and about 80% were estimated to be 20 to 59 years old. Gender was evenly distributed across the states and years. Age groups were distributed fairly evenly too, with a slightly higher percentage of the youngest group in Arizona than Nevada.

Table 1. Gender and age group distributions of drivers observed in Arizona and Nevada, July 2019 and 2021.

	Arizona		Nevada	
	2019 (*n*=12,485)	2021 (*n*=11,153)	2019 (*n*=5,660)	2021 (*n*=5,339)
Gender				
Male	56.2	57.3	56.9	59.1
Female	43.8	42.7	43.1	40.9
Age group				
19 and younger	8.9	8.6	5.7	4.7
20 to 59	78.7	81.3	81.3	80.3
60 and older	12.4	10.2	13.2	15.0

Table 2. Prevalence of cellphone distractions observed in Arizona and Nevada, July 2019 and 2021.

	Arizona			Nevada		
Observed distractions	2019	2021	% change	2019	2021	% change
Handheld phone calls	4.2	3.6	−14.3	1.7	1.6	−5.9
Cellphone manipulation	5.4	4.2	−22.2	2.5	2.1	−16.0
Holding a phone	2.1	2.8	33.3	0.8	0.9	12.5
Combined handheld phone use [a]	11.6	10.5	−9.5	5.1	4.5	−11.8

[a] Totals in bottom row are sums of percentages of behaviors listed in rows above with rounding error.

Table 2 presents the observed prevalence of cellphone behaviors observed in each state in 2019 and 2021. The percentage of drivers in Arizona observed to be engaged in combined handheld phone use decreased by 9.5% in 2021 compared with 2019. Drivers in Nevada, which introduced its handheld ban in

2012, were engaged in handheld cellphone use of any type at about half the rate as drivers in Arizona, and there was a similar decrease in 2021 relative to 2019. Cellphone manipulation was the most common individual activity. In both states, there were decreases in manipulation and handheld calls in 2021 that were offset slightly by increases in the percentage of drivers observed holding a phone.

Table 3. Likelihood of cellphone use associated with Arizona's law from logistic regression models.

Observed distractions	% change (lower CL, upper CL)	*p* value
Handheld phone calls	−7.4 (−32.8, 27. 6)	0.64
Cellphone manipulation	−8.1 (−30.2, 20.9)	0.55
Holding a phone	10.2 (−28.9, 70.9)	0.66
Combined handheld phone use	−2.6 (−19.3, 17.5)	0.78

Table 3 presents logistic regression model results. Arizona's strengthened law was associated with a 7.4% lower likelihood of observing handheld phone calls and an 8.1% lower likelihood of observing cellphone manipulation among drivers in the state compared with the 2019 observations and relative to drivers observed in Nevada over the same period. However, neither decrease was significant (handheld calls, $p = 0.64$; cellphone manipulation, $p = 0.55$). Conversely, drivers in Arizona had a 10.2% higher likelihood of being observed holding their cellphone after the law's effective date compared with drivers in Nevada. This increase was not significant ($p = 0.66$). The 2.6% lower likelihood of combined handheld phone use associated with the strengthened law was not significant either ($p = 0.78$). Full model results are listed in Table A1 in the appendix.

3.1.2 Results by Arizona locality. Table 4 shows that handheld phone calls, cellphone manipulation, and combined handheld phone use in Mesa-Scottsdale (which had no prior cellphone ban) and Phoenix (which had a prior ban that covered texting) were less prevalent in 2021 relative to 2019. Tucson had the lowest prevalence across the four cellphone behaviors in 2019 relative to the other localities. While the rate of cellphone manipulation there was 32.2% lower in 2021 than 2019, observed rates of handheld calling, cellphone holding, and total cellphone use increased in Tucson after the state law became effective.

Table 4. Prevalence of cellphone distractions observed in Arizona localities, July 2019 and 2021

Cellphone behavior by locality	2019	2021	% change
Mesa-Scottsdale (no prior ban)			
Handheld phone calls	4.2	2.8	−34.1
Cellphone manipulation	5.2	4.4	−15.6
Holding a phone in hand	1.2	2.3	96.6
Combined handheld cellphone use	10.6	9.5	−10.6
Phoenix (prior texting ban)			
Handheld phone calls	5.2	4.2	−19.7
Cellphone manipulation	5.8	4.8	−16.1
Holding a phone	2.9	2.6	−9.1
Combined handheld cellphone use	13.9	11.6	−16.0
Tucson (prior calling and texting bans)			
Handheld phone calls	2.8	3.6	28.0
Cellphone manipulation	4.9	3.3	−32.2
Holding a phone	1.9	3.3	69.6
Combined handheld cellphone use	9.6	10.2	5.7

Note. Combined handheld cellphone use is sum of the individual behaviors listed in rows above for each locality with rounding error.

Table 5 shows that logistic regression models estimate that the law was associated with a 31.2% lower likelihood of conducting handheld calls and higher likelihoods of holding (61.7%) or manipulating a phone (3.0%) in Mesa-Scottsdale but none of the estimates were significant. Similarly, the estimated (−3.5%) decrease in combined handheld use was not significant. Drivers in Phoenix had a 13.1% lower likelihood of conducting handheld calls, holding (−22.9%) or manipulating a phone (−1.6%), or engaging in combined handheld use (−9.5%) associated with the law. However, none of the estimated reductions in Phoenix were significant. Drivers in Tucson had a 21.2% lower likelihood of manipulating their cellphone associated with enactment of the law but the reduction was not statistically significant (p=0.16). The estimated increases in conducting handheld calls (34.6%), holding a phone (40.1%) or combined handheld use (11.7%) were not significant either.

Table 5. Likelihood of cellphone use associated with Arizona's law by locality from logistic regression models.

	% change (lower CL, upper CL)	*p* value
Mesa-Scottsdale (no prior ban)		
Handheld phone calls	−31.2 (−54.0, 3.1)	0.07
Cellphone manipulation	3.0 (−26.6. 44.45)	0.87
Holding a phone	61.7 (−8.5, 185.9)	0.10
Combined handheld phone use	−3.5 (−23.6, 21.9)	0.77
Phoenix (prior texting ban)		
Handheld phone calls	−13.1 (−38.7, 23.2)	0.43
Cellphone manipulation	−1.6 (−27.5, 33.6)	0.92
Holding a phone	−22.9 (−52.1, 24.2)	0.29
Combined handheld phone use	−9.5 (−26.4, 11.3)	0.34
Tucson (prior calling and texting bans)		
Handheld phone calls	34.6 (−8.1, 97.2)	0.13
Cellphone manipulation	−21.2 (−43.3, 9.5)	0.16
Holding a phone	40.1 (−14.4, 129.4)	0.18
Combined handheld phone use	11.7 (−10.4, 39.1)	0.33

3.2 Telematics results

Table 6 summarizes the handheld cellphone activity among drivers in each state who used CMT's platform before and after January 2021. The top section of the table provides pre-law measures, the middle covers the short-term, post-law period evaluation that was limited to 2021, and the bottom lists the frequencies recorded in the long-term evaluation. Similar to the roadside data, the CMT data showed drivers in Arizona using CMT's platform exhibited a higher prevalence of each outcome measure than drivers using the platform in Nevada. Drivers in Arizona made handheld calls on lower percentages of trips and spent shorter percentages of trip time on handheld calls in both post-law periods relative to pre-2021 measures. In contrast, drivers in Nevada showed an increase in both measures of handheld phone calls. The percentage of trips with cellphone motion increased in both states in both the short- and long-term evaluation periods relative to pre-2021. In contrast, the percentage of trip time during which cellphone motion was recorded decreased during the short-term evaluation period and increased during the long-term evaluation period in both states.

Table 6. Cellphone use among drivers using CMT's telematics platform in Arizona and Nevada.

	Percent of trips with a handheld phone call	Percent of total trip time on handheld calls	Percent of trips with phone motion	Percent of total trip time with phone motion
Apr 2019 – Dec 2020				
Arizona	2.58	0.64	27.8	1.88
Nevada	1.88	0.45	26.2	1.71
Jan 2021 – Dec 2021				
Arizona	2.38	0.57	28.2	1.87
Nevada	2.07	0.51	26.8	1.69
Jan 2021 – Jun 2024				
Arizona	2.43	0.62	29.0	1.96
Nevada	2.23	0.59	27.2	1.74

Table 7 shows that all measures of cellphone use peaked in 2023. By quarter, cellphone motion was lower in the first quarter compared with the rest of the year. The day-of-week and time-of-day data also suggest higher levels of distraction on weekdays and during day or evening hours than on weekends or overnight/early morning.

Table 7. Percent of trips with handheld calls or cellphone motion and percent of trip time with handheld calls or cellphone motion in Arizona and Nevada by year, quarter, day of week, and time of day, 2019–2024.

	% of trips with handheld calls	% of trip time with handheld calls	% of trips with phone motion	% of total trip time with phone motion
State				
Arizona	2.45	0.62	28.8	1.95
Nevada	2.18	0.57	27.0	1.73
Year				
2019	2.44	0.60	27.4	1.82
2020	2.27	0.56	27.1	1.82
2021	2.27	0.55	27.7	1.81
2022	2.25	0.56	28.5	1.91
2023	2.46	0.65	28.7	1.92
2024	2.42	0.64	28.4	1.87
Quarter				
Jan–Mar	2.35	0.61	27.6	1.80
Apr–Jun	2.36	0.60	28.4	1.91
Jul–Sep	2.35	0.60	29.0	1.96
Oct–Dec	2.39	0.60	28.0	1.86
Day of week				
Weekdays	2.50	0.67	28.4	1.89
Weekends	1.98	0.44	27.8	1.84
Time of day				
7:00 a.m.–5:59 p.m.	2.49	0.63	27.8	1.86
6:00 p.m.–8:59 p.m.	2.42	0.69	29.6	2.14
9:00 p.m.–6:59 a.m.	1.43	0.34	29.5	1.71

Table 8. Likelihood of handheld cellphone distractions among customers using CMT platform associated with Arizona's law from logistic regression models.

Outcomes by evaluation	% change (lower CL, upper CL)	*p* value
Short term evaluation (2019–2021)		
% of trips with handheld calls	−16.52 (−16.55, −16.50)	<.0001
% of trip time with handheld calls	−21.72 (−21.81, −21.64)	<.0001
% of trips with phone motion	0.22 (0.07, 0.37)	0.004
% of trip time with phone motion	−0.13 (−0.14, −0.11)	<0.0001
Long term evaluation (2019–2024)		
% of trips with handheld calls	−21.13 (−21.27, −20.99)	<.0001
% of trip time with handheld calls	−26.30 (−26.50, −26.10)	<.0001
% of trips with phone motion	3.39 (3.39, 3.40)	<.0001
% of trip time with phone motion	1.71 (1.66, 1.76)	<.0001

Table 8 lists the effects of Arizona's law on the likelihood of various cellphone-related behaviors as calculated using logistic regression models with the effects of all covariates held constant. In the short-term evaluation, drivers were less likely to make handheld calls on trips (−16.5%) and less likely to be conducting a handheld call at a given moment (−21.7%) after the law's effective date than beforehand relative to drivers in Nevada. Both these reductions were statistically significant. The law was associated with very small changes in cellphone motion.

The long-term evaluation found that the law was tied to a significant 21.1% lower likelihood of making handheld calls on trips and a significant 26.3% lower likelihood of being on handheld calls at a given moment. The law was also associated with small-but-significant increases in the likelihood of cellphone motion occurring on trips (3.39%) higher and occurring at a given moment (1.71%) over the longer term. Tables A2 and A3 in the Appendix have full model results for both telematics evaluations.

3.3 Summary of warnings and citations

The summary of enforcement provided by Arizona's Department of Public Services in Table 9 shows that the rate of citations exceeded warnings each year after ticketing was permitted. Average monthly warnings issued by troopers statewide decreased each year from 2019 to 2024, while the number of citations issued declined each year after the law became effective in January 2021.

Table 9. Average monthly warnings and citations in Arizona from 2019 to 2024 issued by state troopers.

Year	Warnings	Citations
2019 [a]	845.0	
2020	688.1	
2021	587.6	653.2
2022	551.0	587.5
2023	499.0	560.6
2024	432.5	434.8

[a] Enforcement data for 2019 limited to April to Dec. Law passed April 2019 with warnings permitted immediately.

4. DISCUSSION

The current three-pronged evaluation of Arizona's 2021 all-driver ban on holding a cellphone found some support that passing such laws reduces the targeted behavior. The law was associated with a decrease in handheld calls across both methods and time periods examined, although only analyses using telematics data were statistically significant. The decrease in handheld calls in Arizona is consistent with the decreases found in prior evaluations of all-driver handheld phone bans (e.g., McCartt et al., 2003; Rudisill & Zhu, 2017). The patterns of change in handheld calls in Mesa-Scottsdale, Phoenix, and Tucson during 2021 roadside observations compared with 2019 were consistent with their prior local ordinances. Handheld phone calls decreased in Mesa-Scottsdale and Phoenix, which did not have prior all-driver handheld calling bans, but not in Tucson, which did. Tucson also had a markedly lower observed handheld calling rate than the other jurisdictions prior to the enactment of ARS 28-914, likely reflecting the city's previously existing ban on handheld calls.

The relationship between ARS 28-914 and cellphone manipulation was more complex. In the year following its effective date, observed cellphone manipulation and the percentage of time drivers spent manipulating cellphones decreased. However, by 2024, the percentage of time drivers manipulated phones increased in Arizona relative to trends in Nevada. Furthermore, changes in cellphone manipulation captured by telematics data during both periods were very small.

Differences between the long- and short-term evaluations of CMT customers in Arizona are consistent with work released by CMT that summarized experiences of eight states with recent handheld bans (CMT, 2023). Seven of the eight witnessed reductions in cellphone activity one week after bans were in place, but by 9 months to over a year after laws became effective, cellphone manipulation was higher than before the law was in place in four. It is important to note the current study's inclusion of a control group and the focus on relative differences in cellphone use among drivers in Arizona and Nevada as the analyses reported in (CMT, 2023) relied on the "pre–post study without control group" design. This latter method only considers cellphone use within each state before and after implementation and cannot account for trends in cellphone use unrelated to a law (e.g., recent national trends of increased cellphone manipulation and decreased handheld calling) (NCSA, 2024).

Past evaluations indicate that the act of passing a ban alone has been associated with lower observed cellphone use (McCartt et al., 2010). However, other factors such as efforts to publicize new laws and intention to enforce them may also influence evaluation outcomes. There are strong connections between high levels of publicized enforcement of traffic laws and compliance. NHTSA's *Click It or Ticket* model may be the best example of how informing the motoring public about the intention to ticket drivers leads to behavior change among the broader population that indicates the law is a general deterrent (Solomon et al., 2004). In the case of Arizona's comprehensive cellphone ban, its impact may have been hampered by the long period before the law became effective and the substantial nationwide reductions in police enforcement during the Covid-19 pandemic, which likely explain the decreasing statewide trends in enforcement in Table 9 (Nielson et al., 2022). The Arizona Department of Transportation's communication team won a 2021 Emmy for distracted driving public service campaign released in 2020 (https://azdot.gov/terrify), which suggests the state had more planned regarding the rollout of the state law before the events of the time likely led to a shift in priorities.

4.1 Limitations

Data collection for this study occurred after Arizona's law was signed in April 2019, and although the pre-test data was collected well before the January 1, 2021, effective date, public awareness of the law's passing may have influenced cellphone use. The existence of prior local ordinances limited the opportunity to evaluate how a strong cellphone law influences behavior of a population that shared the same conditions with regard to cellphone prohibitions prior to the state law. Limited information regarding enforcement levels of citywide ordinances before 2019 prevented more detailed exploration of how local bans may have moderated cellphone behavior. Several factors related to differences in sampling and measurement, such as low statistical power of the roadside observation data or a higher level of compliance among CMT's customers in Arizona relative to their base of drivers in Nevada, might reasonably explain differences in inferential testing between the roadside observation and telematics methodologies.

4.2 Conclusion

In sum, the current evaluation indicated that Arizona's cellphone law was associated with a decrease in likelihood that drivers in the state engaged in handheld phone calls after the law became effective over the short and long term and suggests there may be opportunities to improve compliance.

Increases in manipulation in association with a new law that bans drivers from holding an electronic device also suggests road safety professionals face a massive challenge: the draw to use a smartphone given its ever-increasing functionality and the manner in which it has revolutionized how people access and use information. Concentrated high publicity enforcement will likely be essential for maintaining compliance with the law. As shown in CMT (2023), states with recent bans, like Massachusetts, that initially saw manipulation increase after its ban became law saw reductions a year or more later, opposite the national trend. *Click It or Ticket*, implemented at least annually in most states for decades, is associated with very high seatbelt use. Conspicuous and well-publicized safety camera programs that provide sustained enforcement have been linked to reduced speeding, red light running, and crashes that cause injuries (Hu & Cicchino, 2017; Hu & McCartt, 2016; McCartt & Hu; 2014). Moving forward, some jurisdictions in the U.S. are using roadside feedback signs with cameras to detect and warn drivers of phone use (Washington Traffic Safety Commission, 2024). Dynamic signs that give feedback on vehicle speed are associated with significant speed reductions (Fisher et al., 2021). Such signs could be useful to augment and sustain public awareness in future distracted driving enforcement campaigns in the essence of *Click It or Ticket*.

5. REFERENCES

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6. APPENDIX

Likelihood of handheld cellphone use after Arizona's statewide ban became effective

Table A1. Likelihood of observing handheld cellphone behaviors associated with Arizona's law.

	Estimate	Std error	% change (lower CL, upper CL)	*p* value
Handheld phone calls				
Strengthened law	−0.0786	0.16	−7.39 (−32.76, 27.56)	0.64
Arizona vs. Nevada	0.9055	0.11	147.32 (99.01, 207.34)	<.0001
2021 vs. 2019	−0.0877	0.15	−8.40 (−31.62, 22.73)	0.56
Males vs. females	−0.1019	0.06	−9.69 (−19.84, 1.76)	0.09
Age 60-plus vs. less than 20	−1.0048	0.20	−63.39 (−75.05, −46.28)	<.0001
Age 20-59 vs. less than 20	0.2927	0.12	34.00 (6.09, 69.28)	0.01
Thursday vs. Monday	−0.1154	0.09	−10.90 (−25.02, 5.88)	0.19
Wednesday vs. Monday	−0.0807	0.08	−7.75 (−21.60, 8.56)	0.33
Tuesday vs. Monday	0.0374	0.08	3.81 (−12.01, 22.48)	0.66
Cellphone manipulation				
Strengthened law	−0.0846	0.14	−8.11 (−30.18, 20.91)	0.55
Arizona vs. Nevada	0.7059	0.09	102.57 (68.89, 142.93)	<.0001
2021 vs. 2019	−0.1822	0.13	−16.66 (−34.94, 6.76)	0.15
Males vs. females	−0.0382	0.05	−3.75 (−13.51, 7.10)	0.48
Age 60-plus vs. less than 20	−2.2837	0.22	−89.81 (−93.31, −84.47)	<.0001
Age 20-59 vs. less than 20	−0.3166	0.08	−27.14 (−38.15, −14.16)	0.0002
Thursday vs. Monday	0.0657	0.08	6.79 (−8.16, 24.16)	0.39
Wednesday vs. Monday	0.0096	0.07	0.96 (−12.64, 16.70)	0.90
Tuesday vs. Monday	−0.0553	0.08	−5.38 (−18.86, 10.34)	0.48
Holding a phone				
Strengthened law	0.0973	0.22	10.22 (−28.92, 70.92)	0.66
Arizona vs. Nevada	1.012	0.16	175.11 (100.25, 277.95)	<.0001
2021 vs. 2019	0.1546	0.21	16.72 (−22.28, 75.31)	0.46
Males vs. females	−0.0721	0.08	−6.96 (−20.24, 8.55)	0.36
Age 60-plus vs. less than 20	−1.5645	0.25	−79.08 (−87.15, −65.95)	<.0001
Age 20-59 vs. less than 20	−0.192	0.13	−17.47 (−35.49, 5.58)	0.13
Thursday vs. Monday	−0.3774	0.12	−31.44 (−45.29, −14.07)	0.00
Wednesday vs. Monday	−0.1784	0.10	−16.34 (−31.63, 2.38)	0.08
Tuesday vs. Monday	−0.098	0.11	−9.34 (−26.43, 11.74)	0.36
Combined handheld use				
Strengthened law	−0.0267	0.10	−2.63 (−19.29, 17.46)	0.78
Arizona vs. Nevada	0.83	0.07	129.33 (101.86, 160.52)	<.0001
2021 vs. 2019	−0.0897	0.09	−8.58 (−22.96, 8.48)	0.30
Males vs. females	−0.0673	0.04	−6.51 (−12.90, 0.34)	0.06
Age 60-plus vs. less than 20	−1.663	0.12	−81.04 (−85.08, −75.92)	<.0001
Age 20-59 vs. less than 20	−0.107	0.06	−10.15 (−20.11, 1.05)	0.07
Thursday vs. Monday	−0.0882	0.05	−8.44 (−17.25, 1.31)	0.09
Wednesday vs. Monday	−0.0643	0.05	−6.23 (−14.75, 3.16)	0.19
Tuesday vs. Monday	−0.0331	0.05	−3.26 (−12.38, 6.82)	0.51

Table A2. Full model results for the evaluation of telematics on likelihood of cellphone use associated with Arizona's state law from 2019 to 2021.

	Estimate	Std error	% change (lower CL, upper CL)	*p* value
% of trips with handheld calls				
Law	−0.1806	0.00	−16.52 (−16.55, −16.50)	<.0001
AZ vs. NV	0.3131	0.00	36.77 (36.72, 36.81)	<.0001
2021 vs. 2019–2020	0.2045	0.03	22.69 (22.43, 22.96)	<.0001
1-year increase in time	−0.0748	0.02	−7.21 (−7.21, −7.21)	0.00
Q1 (Jan–Mar) vs. Q4	−0.0483	0.01	−4.72 (6.26, −3.15)	<.0001
Q2 (Apr–Jun)	−0.0104	0.00	−1.03 (1.80, −0.25)	0.01
Q3 (Jul–Aug)	0.0016	0.00	0.16 0.86, 1.18)	0.72
Weekend vs. weekday	−0.2129	0.02	−19.18 (−221.52, −16.77)	<.0001
6 p.m.–8:59 p.m. vs. 7 a.m.–5:59 p.m.	−0.0294	0.01	−2.90 (4.01, −1.77)	<.0001
9 p.m.–6:59 a.m. vs. 7 a.m.–5:59 p.m.	−0.5606	0.01	−42.91 (−443.60, −42.22)	<.0001
% of trips with phone motion				
Law	0.0022	0.00	0.22 (0.07, 0.37)	0.004
AZ vs. NV	0.0339	0.00	3.45 (3.10, 3.80)	<.0001
2021 vs. 2019–2020	0.0291	0.02	2.95 (−1.07, 7.14)	0.15
1-year increase in time	0.0037	0.01	0.37 (−1.65, 2.42)	0.72
Q1 (Jan–Mar) vs. Q4	−0.0612	0.00	−5.94 (−6.35, −5.51)	<.0001
Q2 (Apr–Jun)	0.0026	0.01	0.26 (−0.92, 1.46)	0.66
Q3 (Jul–Aug)	0.0419	0.00	4.28 (3.78, 4.77)	<.0001
Weekend vs. weekday	−0.0352	0.00	−3.46 (−3.73, −3.18)	<.0001
6 p.m.–8:59 p.m. vs. 7 a.m.–5:59 p.m.	0.0881	0.01	9.21 (7.15, 11.30)	<.0001
9 p.m.–6:59 a.m. vs. 7 a.m.–5:59 p.m.	0.0505	0.03	5.18 (−1.11, 11.87)	0.11
% of trip time with handheld calls				
Law	−0.2423	0.00	−21.72 (−21.81, −21.64)	<.0001
AZ vs. NV	0.3347	0.00	40.78 (40.62, 40.92)	<.0001
2021 vs. 2019–2020	0.2345	0.05	26.72 (14.88, 39.78)	<.0001
1-year increase in time	−0.0745	0.04	−7.17 (−13.58, −0.28)	0.04
Q1 (Jan–Mar) vs. Q4	−0.0180	0.02	−1.81 (−5.06, 1.55)	0.29
Q2 (Apr–Jun)	−0.0167	0.01	−1.68 (−4.00, 0.70)	0.17
Q3 (Jul–Aug)	0.0038	0.01	0.38 (−2.02, 2.84)	0.76
Weekend vs. weekday	−0.3709	0.03	31.02 (−35.02, −26.76)	<.0001
6 p.m.–8:59 p.m. vs. 7 a.m.–5:59 p.m.	0.1080	0.01	11.28 (9.98,12.59)	<.0001
9 p.m.–6:59 a.m. vs. 7 a.m.–5:59 p.m.	−0.5907	0.03	44.73 (−48.02, −41.23)	<.0001
% of trip time with phone motion				
Law	−0.0013	0.00	−0.13 (−0.14, −0.11)	<0.001
AZ vs. NV	0.1042	0.00	10.98 (10.98, 10.99)	<.0001
2021 vs. 2019–2020	−0.0291	0.02	−2.87 (−3.05, −2.68)	0.06
1-year increase in time	0.0193	0.01	1.95 (1.95, 1.95)	0.10
Q1 (Jan–Mar) vs. Q4	−0.0584	0.01	−5.67 (−6.63, −4.70)	<.0001
Q2 (Apr–Jun)	0.0243	0.01	2.46 (0.06, 4.92)	0.04
Q3 (Jul–Aug)	0.0553	0.00	5.69 (4.97, 6.41)	<.0001
Weekend vs. weekday	−0.0219	0.01	−2.17 (−3.79, −0.51)	0.01
6 p.m.–8:59 p.m. vs. 7 a.m.–5:59 p.m.	0.1514	0.01	16.35 (14.32, 18.41)	<.0001
9 p.m.–6:59 a.m. vs. 7 a.m.–5:59 p.m.	−0.0935	0.01	−8.93 (−1.03, −7.80)	<.0001

Table A3. Full model results for the evaluation of telematics on likelihood of cellphone use associated with Arizona's state law from 2019 to 2024.

	Estimate	Std error	% change (lower CL, upper CL)	*p* value
% of trips with handheld calls				
Law	−0.2374	0.00	−21.13 (−21.27, −20.99)	<.0001
AZ vs. NV	0.3175	0.00	37.37 (37.27, 37.47)	<.0001
2021–2024 vs. 2019–2020	0.0871	0.04	9.10 (1.86, 16.87)	0.01
1-year increase in time	0.0319	0.01	3.24 (0.87, 5.66)	0.01
Q1 (Jan–Mar) vs. Q4	−0.0409	0.00	−4.01 (−4.48, 3.54)	<.0001
Q2 (Apr–Jun)	−0.0287	0.00	−2.83 (−3.65, 2.01)	<.0001
Q3 (Jul–Sep)	−0.0080	0.00	−0.80 (−1.58, 0.00)	0.05
Weekend vs. weekday	−0.2118	0.01	−19.09 (−21.05, −17.09)	<.0001
6 p.m.–8:59 p.m. vs. 7 a.m.–5:59 p.m.	−0.0280	0.00	−2.76 (−3.65, 1.85)	<.0001
9 p.m.–6:59 a.m. vs. 7 a.m.–5:59 p.m.	−0.5318	0.01	−41.25 (−41.84, 40.64)	<.0001
% of trips with phone motion				
Law	0.0333	0.00	3.39 (3.39, 3.40)	<.0001
AZ vs. NV	0.0262	0.00	2.65 (2.35, 2.96)	<.0001
2021–2024 vs. 2019–2020	0.0004	0.02	0.04 (−4.64, 4.95)	0.99
1-year increase in time	0.0138	0.01	1.39 (0.13, 2.66)	0.03
Q1 (Jan–Mar) vs. Q4	−0.0391	0.01	3.83 (−5.11, 2.56)	<.0001
Q2 (Apr–Jun)	0.0038	0.01	0.38 (−0.78, 1.56)	0.52
Q3 (Jul–Aug)	0.0447	0.00	4.57 (3.96, 5.18)	<.0001
Weekend vs. weekday	−0.0382	0.00	−3.75 (−4.06, −3.43)	<.0001
6 p.m.–8:59 p.m. vs. 7 a.m.–5:59 p.m.	0.0887	0.00	9.28 (8.51, 10.04)	<.0001
9 p.m.–6:59 a.m. vs. 7 a.m.–5:59 p.m.	0.0945	0.03	9.91 (4.23, 15.89)	0.00
% of trip time with handheld calls				
Law	−0.3051	0.00	−26.30 (−26.50, −26.10)	<.0001
AZ vs. NV	0.3339	0.00	39.64 (39.4, 39.86)	<.0001
2021–2024 vs. 2019–2020	0.0855	0.04	8.93 (1.40, 17.01)	0.02
1–year increase in time	0.0623	0.01	6.43 (3.81, 9.11)	<.0001
Q1 (Jan–Mar) vs. Q4	−0.0379	0.00	−3.72 (−3.82, −3.60)	<.0001
Q2 (Apr−Jun)	−0.0410	0.01	−4.02 (−5.57, −2.43)	<.0001
Q3 (Jul–Aug)	−0.0055	0.01	−0.55 (−2.76, 1.72)	0.63
Weekend vs. weekday	−0.3729	0.03	−31.13 (−34.84, −27.20)	<.0001
6–8:59 p.m. vs. 7 a.m.–5:59 p.m.	0.0929	0.01	9.74 (8.67, 10.82)	<.0001
9 p.m.–6:59 a.m. vs. 7 a.m.–5:59 p.m.	−0.5757	0.03	43.77 (−47.13, −40.19)	<.0001
% of trip time with phone motion				
Law	0.0170	0.00	1.71 (1.66, 1.76)	<.0001
AZ vs. NV	0.1067	0.00	11.26 (11.24, 11.28)	<.0001
2021–2024 vs. 2019–2020	−0.0146	0.02	−1.45 (−4.34, 1.54)	0.34
1-year increase in time	0.0158	0.01	1.59 (0.44, 2.76)	0.01
Q1 (Jan–Mar) vs. Q4	−0.0479	0.01	−4.68 (−6.00, −3.34)	<.0001
Q2 (Apr–Jun)	0.0151	0.01	1.52 (−0.05, 3.12)	0.06
Q3 (Jul–Aug)	0.0553	0.00	5.69 (5.31, 6.07)	<.0001
Weekend vs. weekday	−0.0216	0.01	−2.14 (−3.29, −0.97)	0.00
6–8:59 p.m. vs. 7 a.m.–5:59 p.m.	0.1442	0.01	15.51 (13.34, 17.74)	<.0001
9 p.m.–6:59 a.m. vs. 7 a.m.–5:59 p.m.	−0.0833	0.01	−7.79 (−10.01, −5.94)	<.0001