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Statistical implications of using moving violations to determine crash responsibility in young driver crashes

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Abstract

Traditional methods for determining crash responsibility—most commonly moving violation citations—may not accurately characterize at-fault status among crash-involved drivers given that: (1) issuance may vary by factors that are independent of fault (e.g., driver age, gender), and (2) these methods do not capture driver behaviors that are not illegal but still indicative of fault. We examined the statistical implications of using moving violations to determine crash responsibility in young driver crashes by comparing it with a method based on crash-contributing driver actions. We selected all drivers in police-reported passenger-vehicle crashes (2010–2011) that involved a New Jersey driver <21 years old (79,485 drivers < age 21, 61,355 drivers ≥ age 21.) For each driver, crash responsibility was determined from the crash report using two alternative methods: (1) issuance of a moving violation citation; and (2) presence of a driver action (e.g., failure to yield, inattention). Overall, 18% of crash-involved drivers were issued a moving violation while 50% had a driver action. Only 32.2% of drivers with a driver action were cited for a moving violation. Further, the likelihood of being cited given the presence of a driver action was higher among certain driver subgroups—younger drivers, male drivers, and drivers in single-vehicle and more severe crashes. Specifically among young drivers, those driving at night, carrying peer passengers, and having a suspended or no license were more often cited. Conversely, fatally-

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injured drivers were almost never cited. We also demonstrated that using citation data may lead to statistical bias in the characterization of at-fault drivers and of quasi-induced exposure measures. Studies seeking to accurately determine crash responsibility should thoughtfully consider the potential sources of bias that may result from using legal culpability methods. For many studies, determining driver responsibility via the identification of driver actions may yield more accurate characterizations of at-fault drivers.

Keywords

adolescent driver; at-fault; citation; crash culpability; crash propensity; induced exposure; teen driver

1. Introduction

Determining crash responsibility is instrumental to understanding how driver behavior contributes to motor vehicle crash risk and for identifying high-risk driver subgroups. This is particularly relevant in the context of young drivers, as characterizing crash-contributing driver behaviors helps to target and improve interventions, policy, and other efforts to reduce the teen driver crash burden. Accurate determination of responsibility among crash-involved drivers is at the foundation for the selection and analyses of at-fault drivers. It is also a critical component of quasi-induced exposure methods. Studies utilizing this method commonly use non-responsible drivers in two-vehicle crashes to estimate relative driving exposure among subgroups in the absence of more detailed information (e.g., vehicle miles traveled), thus allowing estimates of relative crash involvement to be adjusted for driving exposure (Stamatiadis and Deacon 1997).

Traditionally, researchers analyzing large population-level crash databases have determined crash responsibility (also referred to as “crash culpability” or “fault”) based on legal culpability—that is the issuance of a citation or, more commonly, the issuance of a citation for a moving violation (DeYoung *et al.* 1997, Waller *et al.* 2001, Rice *et al.* 2003, Lardelli-Claret *et al.* 2011). However, such methods may not accurately characterize at-fault status among crash-involved drivers for several reasons. First, citation issuance may vary by driver characteristics that are independent of actual fault—for example, age, gender, license status, or injury status (DeYoung *et al.* 1997). Indeed, a recent study of Michigan crashes reported that citation issuance was associated with several factors, including the involvement of drugs and alcohol, driver gender and age, and injury severity (Jiang *et al.* 2012). Second, these methods likely do not capture the full range of crash-contributing driver behaviors given that drivers may operate their vehicles in ways that are not illegal but are still indicative of fault (af Wåhlberg and Dorn 2007, Brubacher *et al.* 2012). For example, a substantial number of young driver crashes are attributed to teens’ inattention and inadequate surveillance, behaviors that may not directly correspond to specific motor vehicle statutes (Curry *et al.* 2011, National Highway Traffic Safety Administration 2013). As af Wåhlberg and Dorn (2007) observed, most previous studies using crash responsibility methods do not fully detail their methods nor do they consider how alternative criteria may affect results.

Several researchers have endorsed using the presence of a hazardous or crash-contributing driver action rather than moving violations to determine crash responsibility (af Wåhlberg and Dorn 2007, Jiang and Lyles 2010). If recorded, this information would be readily available on the police crash report. While the exact definition and values of driver action data field(s) may vary among jurisdictions’ crash reports, in general these data may provide important information on crash contribution not adequately captured by citation data—providing a likely more valid method for determining crash responsibility in large population-level datasets. The overall objective of this study was to examine the statistical implications of using moving violation data to determine crash responsibility by comparing it with a method based on the presence of a driver action. Given our particular interest in young drivers, we focused our analysis on police-reported crashes that occurred in New Jersey (NJ) over a two-year period (2010–2011) involving NJ drivers under 21 years of age. Specifically, we aimed to: (1) assess the validity of using moving violations to determine whether a driver was responsible for his/her crash by comparing it with a method based on driver actions; (2) identify subgroups of drivers that may be over- or under-represented in samples of at-fault drivers when determination is based on moving violation data; and (3) evaluate the use of moving violations on quasi-induced exposure estimates of relative driving exposure (using non-responsible drivers) and relative crash involvement for age- and gender-specific subgroups.

2. Material and methods

2.1 Study design

This analysis was part of a larger study examining crash- and citation-related outcomes among NJ teen drivers. A detailed description of study data is available elsewhere (Curry *et al.* 2013). Briefly, we conducted a hierarchical deterministic linkage to link all NJ drivers involved in a NJ police-reported crash from January 1, 2010 through December 31, 2011 to their corresponding record in the NJ licensing database. Over 98% of crash-involved NJ drivers matched to a unique record in the licensing database. We then ascertained the license status of each NJ driver on the date of their crash (i.e., learner's permit, intermediate or restricted license, full unrestricted license, suspended/unlicensed) using data on the start dates of the learner's permit and intermediate license, license transactions (to ascertain the date of full licensure), and dates of license suspension, restoration, and death (if applicable). For this analysis, we selected all police-reported crashes that involved a NJ driver under 21 years old and included all drivers (regardless of age) involved in those crashes. Hit-and-run crashes were excluded, as were crashes involving a pedestrian, pedalcyclist, or vehicle other than a passenger vehicle (e.g., bus, truck, motorcycle) (Jiang and Lyles 2010).

2.2 Variable definitions

Crash responsibility was determined for each driver using two alternative methods. For the first, drivers were determined to be responsible if issued a citation for one or more NJ moving violations by the responding police officer; we henceforth refer to this as the moving violation method. Citations for offenses that were not moving violations—such as unlicensed driving, no insurance or registration, and seat belt non-use—as well as citations for leaving the scene of an accident (New Jersey Statutes Annotated [NJSA] 39:4–129) were not included as they are not intended to indicate fault. The officer noted moving violations issued to each crash-involved driver in a qualitative field on the police crash report. We confirmed the complete list of NJ moving violations with a NJ law enforcement official, and systematically coded entries in this field to ascertain the specific statute(s) each driver violated, if applicable. For the second method, a driver was determined to be responsible if noted to have committed one or more driver actions that contributed to the crash; we henceforth refer to this as the driver action method. New Jersey's *Police Guide for Preparing Reports of Motor Vehicle Crashes* instructs the officer to determine the most prominent proximate factors (at least one per crash and up to two per driver) that contributed to the crash, regardless of whether a citation was issued (Rutgers University Police Technical Assistance Program 2009). Possible factors include driver actions, vehicle factors, and road/environmental factors. There are 14 specific driver actions listed on the NJ crash report—including unsafe speed, failure to obey traffic control device, failure to yield to vehicle/pedestrian, and inattention—as well as a designation for "other driver action" and a distinct code to indicate that no driver action occurred (New Jersey Department of Transportation 2006). Some of these driver actions are closely tied to specific moving violations while others (e.g., inattention) are not. Note that for both methods, any number of crash-involved drivers—including none—could have been determined to be responsible for the crash.

Other crash- and driver-specific variables were obtained from the crash report, including driver gender, number of vehicles involved in the crash (single- vs. multi-vehicle), moderate or greater injury (yes vs. no), and fatalities. For drivers under age 21, we also ascertained the presence of passengers (driving alone, driving only with peer passengers 14 – 20 years of age, driving with passengers of other age combinations) and time of the crash (5:00 am – 4:00 pm, 4:01 pm – 11:00pm, 11:01 pm – 4:59 am [restricted hours for young NJ drivers with permits and intermediate licenses]).

2.3 Statistical analysis

We estimated the frequency and proportion of drivers determined to be responsible for his/her crash using each of the two alternative methods and used chi-square tests to examine differences in citation issuance among those with a crash-contributing driver action. Although our data reflect the entire population of 2010–2011 police-reported passenger-vehicle crashes involving a young NJ driver, we desired to make inference to a more general population. Hence we adopted a superpopulation perspective by treating our data as a sample from an essentially infinite population of potential crashes, which allowed us to compute two-sided p-values and confidence intervals for comparisons of interest. To compare the likelihood of different driver subgroups being issued a moving violation given a crash-contributing action, we used predictive log-binomial models to directly estimate adjusted risk ratios (aRR) and 95% confidence intervals (CI). (Note that as the likelihood of issuance of moving violation is a relatively common event [i.e., risk > 0.10], odds ratios estimated via logistic regression would not be expected to approximate risk ratios [Rothman *et al.* 2008].)

To examine whether determining crash responsibility via moving violations biases quasi-induced estimates of relative driving exposure and at-fault crash involvement, we further restricted data as required by quasi-induced exposure to the subset of "clean" two-vehicle crashes—that is, two-vehicle crashes in which one and only one driver was deemed responsible (Stamatiadis and Deacon 1997). We applied each of the two methods separately to select two samples of two-vehicle clean car crashes. The first included all two-vehicle crashes in which a citation for a moving violation was issued to one and only one driver, and the second included all two-vehicle crashes in which one and only one driver had a crash-contributing driver action. As previously shown (Stamatiadis and Deacon 1997, Lardelli-Claret *et al.* 2006), the relative accident involvement ratio for a specific group i ($RAIR_i$) is estimated as the proportion of all responsible drivers in two-vehicle clean crashes who were of type i divided by the proportion of all non-responsible drivers in two-vehicle clean crashes who were of type i. Comparison of RAIR's between two groups—such as drivers of type i and a reference type k—can be expressed as $RAIR_i/RAIR_k$, or equivalently, the odds of being responsible for two-vehicle crashes for type i drivers compared with the odds of being responsible for two-vehicle crashes for type k drivers ($OR_{i\ vs.k}$). This allows multivariate logistic regression methods to be used to estimate the OR for various driver subgroups after adjusting for other potential predictors. We constructed separate models for the sample of clean two-vehicle crashes selected via each method, estimated the adjusted odds ratio (aOR) for gender- and age-specific driver groups, and directly compared analogous aOR estimates for the two methods. All analyses were conducted in SAS Version

9.3 (SAS Institute Inc., Cary, NC). This study was reviewed and approved by our institution's Institutional Review Board.

3.0 Results

3.1 Analytic sample

A total of 154,137 drivers were involved in a police-reported crash involving a young NJ driver over the study period. Of these, 493 drivers (0.3%) were excluded because we were unable to interpret the qualitative citation data for at least one driver in their crash, and an additional 12,804 drivers (8.3%) in 5,838 crashes were excluded because the age or gender was missing for at least one driver in the crash. The final analytic sample included 140,840 drivers—79,485 (56.4%) who were under 21 years of age and 61,355 (43.6%) who were age 21 or older—involved in 73,144 crashes.

3.2 Concordance between the two methods

Overall, 17.7% (n=24,858) were issued a citation for a moving violation by the responding police officer, while half of all crash-involved drivers (n=70,695) were reported to have at least one crash-contributing driver action. Among young drivers, 23.2% were determined to be responsible for their crash when the moving violation method was employed—much lower than the 65.1% deemed responsible by the driver action method. Findings were also similar among subgroups of young drivers (e.g., males < 21 years old: 26.1% vs. 67.1%, respectively).

As shown in Table 1, when no driver action was present, few moving violations were issued. Only 3% of drivers without a driver action were cited for a moving violation, with *Careless Driving* (NJSA 39:4–97) (63% of these drivers) and *Failure to Yield (*NJSA 39:4–144) (17% of these drivers) being the most common citations issued. Conversely, only 32.2% (n= 22,734) of drivers with a driver action were cited for a moving violation. Of the 47,961 drivers with a driver action who were not issued a moving violation, 94% were not issued *any* citation. Further, the proportion of those with a driver action cited for a moving violation was higher for: single-vehicle crashes than multi-vehicle crashes (42.9% vs. 30.7%, P<0.01); younger drivers than older drivers (34.1% for ≤17 years old vs. 27.5% for 25- to 64-year-olds, P<0.01); males than females (34.8% vs. 29.0%, P<0.01); and injury crashes than crashes with no injury reported on the scene (44.5% vs. 27.8%, P<0.01) (Table 1). Of the 29 fatally-injured drivers who had a contributing driver action, 28 were not issued a moving violation. In contrast, the percent of drivers without a crash-contributing driver action who were nonetheless issued a moving violation was low for all driver subgroups (range: 2.6% to 4.2%).

For the 79,485 crash-involved young drivers, 65.1% (n=51,756) were reported to have at least one contributing driver action while 23.2% (n=18,399) were issued a citation for a moving violation (Table 2). Among young drivers with a contributing driver action, police more often issued violations to certain driver subgroups—males (37.2% vs. 29.8% for females, P<0.01), those who were unlicensed or had suspended licenses (42.1% vs. 33.2% for fully-licensed drivers, P<0.01), and drivers in single-vehicle crashes (42.9% vs. 32.1% for multi-vehicle crashes, P<0.01). Notably, although the difference was statistically significant, the likelihood of a violation was similar for young drivers with an intermediate (restricted) license and those with a full unrestricted license (34.3% vs. 33.2%, P<0.01). We further examined which factors were *independently* associated with the probability of being issued a moving violation (i.e., being found legally culpable) among young drivers with a driver action. After adjusting for other factors in log-binomial models, the probability of being issued a moving violation in the presence of a crash-contributing driver action was

22% higher for males than females (95% CI for aRR: 1.19, 1.25); 16% higher for unlicensed/suspended drivers compared with fully licensed drivers (1.06, 1.27); 23% higher for drivers in a single-vehicle crash (1.20, 1.27); 53% higher among drivers in an injury crash (1.50, 1.57); 10% higher for young drivers with peer passengers compared with driving alone (1.07, 1.13); and 22% higher among those who crashed 11:01pm – 4:59am compared with 5:00 am – 4:00 pm (1.17, 1.27). Conversely, drivers with a learner's permit were 14% less likely than those with a full license (0.76, 0.96) to be cited. Finally, the probability of citation was not related to age (independent of license status) (aRR=0.98; 95% CI: 0.95, 1.02) and was similar for young drivers with intermediate and full licenses (aRR=1.01, 95% CI: 0.99, 1.04).

In Table 3, we assessed issuance of moving violations by specific driver actions. The most commonly reported crash-contributing driver action was driver inattention (29.5% of all crash-involved drivers); less than one out of every three drivers who were reported to be inattentive were determined to be responsible when the moving violation method was used. The proportion of drivers issued a moving violation varied greatly, from 57.4% of those who failed to obey a traffic control device to 11.9% of those who improperly parked. The variation in these proportions with respect to age, gender, and license phase (among drivers <21 years of age) was similar to that described in Table 2 for all driver actions combined. For example, for the four most frequent driver actions, young male drivers had consistently higher rates of moving violations than similar-aged females and older drivers of both sexes (Figure 1). The proportion of young male drivers issued a citation for unsafe speed was higher than for young female drivers (51.5% vs. 39.0%, respectively) and older male drivers (41.1%), and substantially higher than for older female drivers (30.7%). Among young drivers, citations were considerably higher for suspended/unlicensed drivers than those with a learner's permit, intermediate license, or full license (Figure 2).

3.3 Statistical implications for studies utilizing crash responsibility methods

Among all drivers and the subpopulation of young drivers, certain subgroups represented a higher proportion of at-fault drivers when the moving violation method was used (Table 4). Among young drivers, those in severe crashes were overrepresented by 9.6 percentage points when moving violations were used to determine crash responsibility compared with when driver actions were used. There also may be overrepresentation, albeit to a lesser extent, of males (5.1 percentage points), those in single-vehicle crashes (3.9 percentage points), those driving with peer passengers (2.6 percentage points), and those in crashes during night hours (2.6 percentage points).

In examining implications on quasi-induced estimates, it is important to note that because such analyses are limited to clean two-vehicle crashes, the choice of method affects not only the distribution of responsible and non-responsible drivers *within* a crash but also which crashes are sampled for analysis. Of the 73,144 total crashes in this study, 55,818 (76.3%) were two-vehicle crashes. Eighty-nine percent (n=49,862) of all two-vehicle crashes were considered to be clean when the driver action method was used. Conversely, only 32% (n=17,801) were considered to be clean when using the moving violation method; in the majority of crashes, neither driver was issued a moving violation. Notably, virtually all (n=17,388) clean two-vehicle crashes using the moving violation method were also included in the crashes sampled using the driver action method.

The age distribution of non-responsible drivers selected via the two methods were modestly different (9.6% were ≤17 years old via the moving violation method vs. 8.8% via the driver action method), while the gender distribution was similar. (Note the substantial overlap of drivers in the two samples precluded conduct of formal significance testing). Regardless of which method was used, male drivers were estimated to have higher odds of being responsible for two-vehicle crashes (adjusted for other factors) compared with female drivers, and younger and older drivers were more likely than 25- to 64-year old drivers to be responsible for two-car crashes (Table 5). This is consistent with current literature (Williams and Shabanova 2003). However, while the magnitude of aOR estimates comparing males and females was only modestly (7.5%) higher when the moving violation method was used compared with driver action method (1.29 vs. 1.20), the aORs were considerably (20%) lower for the youngest and oldest age groups (relative to 25- to 64-year-old drivers) using the moving violation method compared with the driver action method.

4.0 Discussion

This study demonstrates that using moving violations to determine crash responsibility may severely underestimate the overall proportion of drivers responsible for their crash. In part, this reflects the under-issuance of citations for illegal driver actions that correspond to existing moving violation statutes, such as a failure to obey a traffic control device and unsafe speed. Moreover, it sheds light on the inability of citation data to appropriately capture driver actions that do not as clearly denote a violation of a specific NJ motor vehicle statute—including driver inattention, which was reported for over a quarter of all crash-involved drivers in the study population.

DeYoung and others (DeYoung *et al.* 1997, af Wåhlberg and Dorn 2007, Jiang and Lyles 2010, Brubacher *et al.* 2012) have hypothesized that some groups may have a higher likelihood of being issued a citation based on certain characteristics or situations independent of responsibility—a “negative halo effect.” This was exemplified in a recent study by Jiang *et al.* (2012), who found that among drivers in clean two-vehicle crashes who did *not* commit a hazardous action, citations were more often issued to males than females, 16- to 25-year-old drivers than 26- to 64-year old drivers, and those that were drinking or had illegal drug use. The current study supports and uniquely extends this notion by observing this effect even among drivers who were confirmed to have contributed to their crash (i.e., had a crash-contributing action), as well as in additional driver subgroups. Specifically, the use of moving violations led to an overestimation of crash responsibility among certain driver subgroups (younger drivers, males, unlicensed or suspended licensed drivers, drivers in single-vehicle crashes, drivers in more severe crashes) relative to other groups, and a relative underestimation in others (fatally-injured drivers). As a result, these driver subgroups were over/underrepresented in samples of at-fault drivers determined using the moving violation method—in particular drivers involved in more serious crashes and male drivers. Our study also suggested implications for quasi-induced exposure studies. The sample of two-vehicle crashes was much smaller when moving violations were used, and we found some evidence of bias in quasi-induced exposure estimates and crash involvement ratios (and equivalent odds ratio) among age subgroups. The extent to which use of moving violations biases crash involvement ratios in a specific study will depend on its effect on the specific crashes selected and on the distributions of both responsible and non-responsible drivers.

In the current study, less than one quarter of young drivers were determined to be responsible for their crash via the moving violation method versus two-thirds via the driver action method. The latter method is consistent with the proportion of young drivers found to be at fault in studies with rigorous crash causation methodology. Previously, we reported that in a nationally-representative sample of serious crashes involving young drivers, crash investigators assigned the primary reason for the final pre-crash event to the young driver in 76% of all crashes and 62% of multi-vehicle crashes (Curry *et al.* 2011). Similarly, Braitman *et al.* (2008) conducted post-crash interviews with a sample of Connecticut young drivers and found 68% of young drivers involved in multi-vehicle crashes and 95% involved in single-vehicle crashes to be at fault when crash-contributing factors were ascertained from the crash report and interviews. Our finding of low rates of moving violations among young drivers with a driver action is also supported by Braitman's findings—of the young drivers determined to be at fault in that study, only 40% received a citation, while 30% received a written warning and 24% a verbal warning. In another study, af Wåhlberg and Dorn (2007) examined two samples of crash-involved bus drivers in Britain and Sweden and reported that a substantially lower proportion of drivers were deemed responsible when legal culpability methods were compared with crash causation methods. Conversely, Jiang *et al.* (2012) reported that, among clean two-vehicle crashes in Michigan in 2006, every driver with a reported hazardous action was issued a citation (Spearman correlation coefficient of 0.98). One notable difference between the Michigan and NJ crash report is that inattention—the most common crash-contributing action noted in NJ—is not specifically listed as a hazardous action on the Michigan crash report. However, the difference in findings also highlights the extent to which individual jurisdictions likely vary in their law enforcement practices and data collection and reporting processes.

Inaccurate completion of driver action fields is possible—especially given that recording some driver actions may depend on the driver's willingness to disclose behaviors. Furthermore, accuracy may vary by crash and driver demographic factors. This may result in misclassification of at-fault status using this method. However, there are indications that the NJ data are of relatively high quality. First, among the 70,145 drivers with no reported crash-contributing driver action, the responding officer reported an 'unknown' value for driver action for only 3% of drivers; for 90%, the officer actively indicated the absence of a driver action by selecting "None" (a vehicle and/or environmental contributing cause was reported for the remaining 7% of drivers). In addition, citations for moving violations were rarely issued in the absence of a reported driver action. Finally, New Jersey publishes a field guide to provide specific instructions to law enforcement to support systematic and accurate completion of data fields on the NJ Police Crash Investigation Report (Rutgers University Police Technical Assistance Program 2009). On the other hand, there are also indications that even a simple driver action method may underestimate the true proportion of responsible drivers—our estimate of 70% at-fault young drivers in single-vehicle crashes is lower than has been previously estimated (Williams and Shabanova 2003, Braitman *et al.* 2008). More recent studies have begun to explore more complex algorithms for determining crash responsibility using crash report information (Brubacher *et al.* 2012), and future work on this topic is warranted.

There are several other potential limitations of these analyses. Our findings reflect the experience of a single state and aspects relevant to this analysis—e.g., availability and nature of data fields on the crash report, range and nature of situational factors affecting citation issuance—may vary by jurisdiction. In addition, even when available, the exact nature of the driver action data collected on crash reports may differ between jurisdictions; for example, some jurisdictions may require that actions be noted when they contribute in some way to a crash, while others may require notation regardless of contribution. However, our assessment informs future studies in jurisdictions that have driver action and moving violation data available as well as in jurisdictions that have only moving violation data. As young driver crashes are of particular interest to us, we limited our analysis to police-reported crashes involving a young driver. Further, NJ young drivers were identified from NJ's licensing database, meaning that they must have entered the NJ licensing system during or prior to the study period. Although we suspect that similar patterns would be observed in other crashes (e.g., crashes not involving a young driver, crashes of young drivers who never entered the NJ licensing process), our results should be not be freely generalized to these other situations; future studies should be designed to address these questions.

5. Conclusions

This study sheds light on the limitations of determining fault among crash-involved drivers —and specifically young drivers—using moving violations. We demonstrate that—at least in crashes involving young drivers—using legal culpability methods to determine crash responsibility may substantially underestimate the percent of drivers who are responsible for their crash. Further, the likelihood of drivers being cited in the presence of a crash-contributing driver action varies among subgroups for many driver demographic and crash-related factors. The extent of these differences and resultant bias when applied in research studies is largely dependent on enforcement practices and procedures and thus likely to vary among jurisdictions. This underscores the importance for researchers to fully understand the implications of applying alternative criteria to their particular data source. Researchers conducting studies aiming to characterize at-fault young drivers or those utilizing quasi-induced exposure techniques must thoughtfully consider the potential for statistical bias that may occur if moving violation data are used to determine responsibility.

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Highlights

- We compared two methods of determining crash responsibility among NJ drivers.
- 50% of drivers had a crash-contributing driver action; 18% were issued a violation.
- Only 32% of drivers with a driver action were cited for a moving violation.
- The likelihood of being cited given a driver action varied among driver subgroups.
- Use of moving violations to determine responsibility may lead to biased estimates.

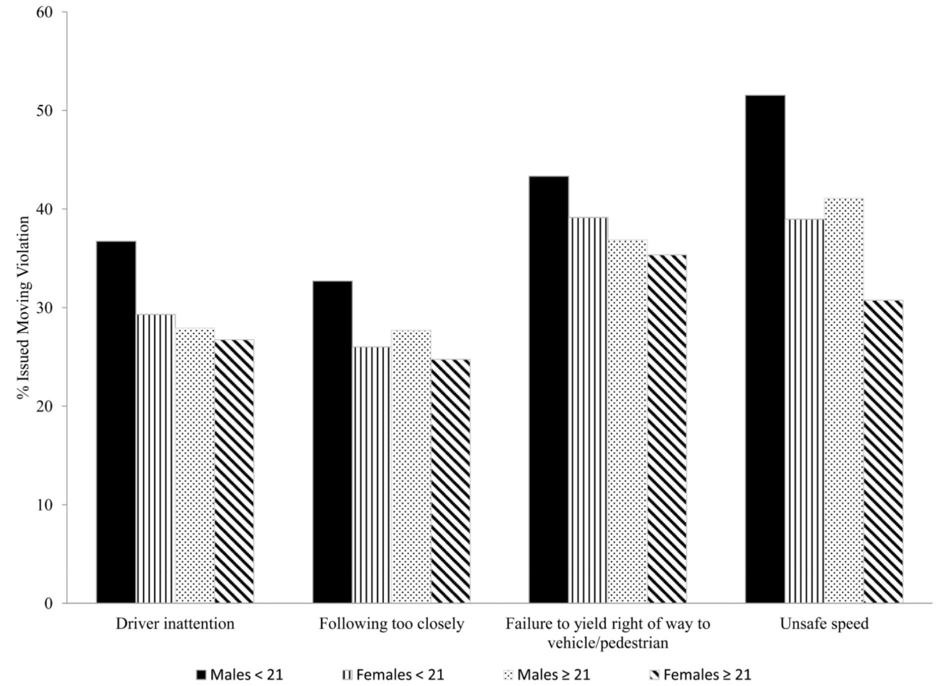

Figure 1.
Proportion of crash-involved drivers with a specific driver action who were issued a moving violation, by driver age and gender, New Jersey, 2010–2011.

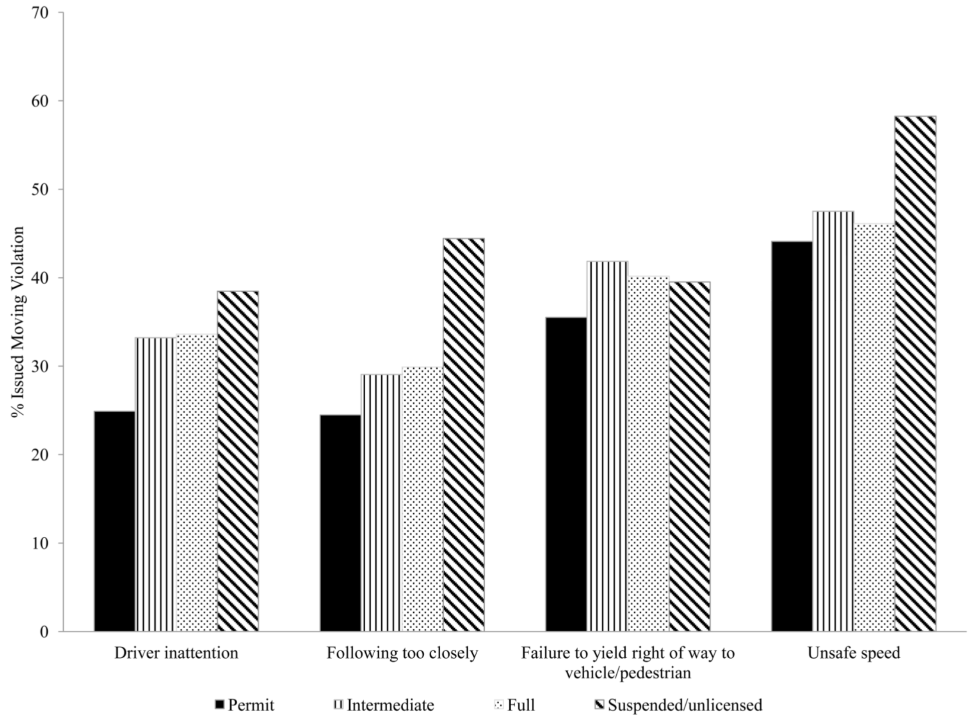

Figure 2.
Proportion of crash-involved drivers under 21 years of age with a specific driver action who were issued a moving violation, by license status, New Jersey, 2010–2011.

Table 1

Proportion of crash-involved drivers issued a citation for a moving violation, by presence of crash-contributing driver action (n=140,840), New Jersey, 2010–2011.

	Crash-Contributing Driver Action		No Crash-Contributing Driver Action	
	Overall	**Moving Violation (%)**	**Overall**	**Moving Violation (%)**
All drivers	70,695	32.2	70,145	3.0
Age (years)				
≤17	14,758	34.1	6,528	2.8
18–20	36,998	33.7	21,201	3.3
21–24	2,865	30.7	4,267	3.0
25–64	13,510	27.5	34,118	2.9
≥65	2,564	24.8	4,031	3.1
Gender				
Male	38,538	34.8	35,337	3.2
Female	32,157	29.0	34,808	2.9
Number of vehicles involved				
Single-vehicle	8,491	42.9	3,357	3.0
Multi-vehicle	62,204	30.7	66,788	3.0
Crash involved a moderate or greater severity injury				
Yes	18,542	44.5	19,388	4.2
No	52,153	27.8	50,757	2.6

Table 2

Proportion of crash-involved young drivers (under 21 years of age) issued a citation for a moving violation, by presence of crash-contributing driver action (n=79,485), New Jersey, 2010–2011.

	Crash-Contributing Driver Action		No Crash-Contributing Driver Action	
	Overall	Moving Violation (%)	Overall	Moving Violation (%)
All drivers	51,756	33.8	27,729	3.2
Gender				
Male	28,269	37.2	13,864	3.4
Female	23,487	29.8	13,865	3.0
License status[a]				
Permit	840	27.5	567	3.4
Intermediate (restricted)	27,350	34.3	12,645	3.1
Full (unrestricted)	22,677	33.2	14,004	3.3
Suspended/unlicensed	601	42.1	279	4.3
Number of vehicles involved				
Single-vehicle	8,491	42.9	3,357	3.0
Multi-vehicle	43,265	32.1	27,372	3.2
Crash involved a moderate or greater severity injury				
Yes	13,735	46.0	6,606	5.0
No	38,021	29.5	21,123	2.6
Passenger status				
Peer passengers only (14–20 years old)	12,094	37.5	6,483	3.6
Other passenger combination	4,373	31.4	3,398	2.7
Driving alone	34,911	32.9	17,621	3.1
Time of crash				
5:00am – 4:00pm	27,163	32.9	14,532	2.9
4:01pm – 11:00pm	21,324	33.2	11,404	3.0
11:01pm – 4:59am[b]	3,061	47.3	1,685	6.5

[a] 522 drivers were missing license status, including 517 out-of-state drivers and 5 NJ drivers with a missing license status.

[b] For this time category, ≈25% of all drivers who were issued a moving violation were issued a violation for *NJSA 39:4–50 Driving while intoxicated*, compared with <5% of drivers issued a moving violation in other time categories.

Table 3

Number and proportion of drivers issued a citation for a moving violation, by specific crash-contributing driver action (n=140,840), New Jersey, 2010–2011.

Crash-Contributing Driver Action	No. of Drivers	% of All Crash-Involved Drivers With Specified Driver Action	% With Specified Driver Action Who Were Issued Moving Violation
Driver inattention	41,480	29.5	31.8
Following too closely[a]	9,862	7.0	28.9
Failure to yield right of way to vehicle/pedestrian[a]	9,596	6.8	39.5
Unsafe speed[a]	6,609	4.7	46.2
Backing unsafely[a]	3,265	2.3	16.9
Failure to obey traffic control device[a]	3,261	2.3	57.4
Improper lane change[a]	2,855	2.0	33.4
Other driver action	2,805	2.0	14.2
Improper turning[a]	2,788	2.0	40.3
Improper passing[a]	1,509	1.1	34.6
Failure to keep right[a]	726	0.5	52.5
Improper use/failure to use turn signal[a]	199	0.1	21.6
Wrong way[a]	116	0.1	50.0
Improper parking	101	0.1	11.9
Improper use/no lights	45	0.0	17.8

[a]Driver actions that denote one or more specific NJ moving violations.

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Table 4

Distribution of driver- and crash-related factors among at-fault drivers, overall and for drivers under 21 years of age, as determined using the moving violation (MV) and driver action (DA) methods, New Jersey, 2010–2011.

	All Drivers			Drivers Under 21 Years of Age		
	MV Method N=24,858 (%)	**DA Method N=70,695 (%)**	**Difference (MV-DA)**	**MV Method N=18,399 (%)**	**DA Method N=51,756 (%)**	**Difference (MV-DA)**
Age (years)						
≤17	21.0	20.9	0.1	28.4	28.5	−0.1
18–20	53.0	52.3	0.7	71.6	71.5	0.1
21–24	4.0	4.1	−0.1	N/A	N/A	
25–64	18.9	19.1	−0.2	N/A	N/A	
≥65	3.1	3.6	−0.5	N/A	N/A	
Gender						
Male	58.4	54.5	3.9	59.7	54.6	5.1
Female	41.6	45.5	−3.9	40.3	45.4	−5.1
License status						
Permit	N/A	N/A		1.4	1.6	−0.2
Intermediate (restricted)	N/A	N/A		53.4	53.1	0.3
Full (unrestricted)	N/A	N/A		43.7	44.1	−0.4
Suspended/unlicensed	N/A	N/A		1.5	1.2	0.3
Number of vehicles involved						
Single-vehicle	15.1	12.0	3.1	20.3	16.4	3.9
Multi-vehicle	84.9	88.0	−3.1	79.7	83.6	−3.9
Crash involved a moderate or greater severity injury						
Yes	36.5	26.2	10.3	36.1	26.5	9.6
No	63.5	73.8	−10.3	63.9	73.5	−9.6
Passenger status						
Peer passengers only (14–20 years old)	N/A	N/A		26.1	23.5	2.6
Other passenger combinations	N/A	N/A		8.0	8.5	−0.5
Driving alone	N/A	N/A		65.9	68.0	−2.1
Time of crash						

	All Drivers			**Drivers Under 21 Years of Age**		
	MV Method N=24,858 (%)	**DA Method N=70,695 (%)**	**Difference (MV-DA)**	**MV Method N=18,399 (%)**	**DA Method N=51,756 (%)**	**Difference (MV-DA)**
5:00am –4:00pm	51.5	53.1	−1.6	51.0	52.7	−1.7
4:01pm – 11:00pm	41.0	41.6	−0.6	40.5	41.4	−0.9
11:01pm – 4:59am	7.5	5.4	2.1	8.5	5.9	2.6

Abbreviations: DA, driver action; MV, moving violation.

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Table 5

Age and gender frequencies among responsible and non-responsible drivers involved in clean two-vehicle crashes and aOR (95% CI) for association between each factor and crash responsibility, as determined using the moving violation (MV) and driver action (DA) methods, New Jersey, 2010–2011.

	MV Method				DA Method			
	Responsible N=17,801 (%)	**Non-Responsible N=17,801 (%)**	**aOR**	**95% CI**	**Responsible N=49,862 (%)**	**Non-Responsible N=49,862 (%)**	**aOR**	**95% CI**
Age (years)								
≤17	20.3	9.6	5.11	4.77, 5.48	20.9	8.8	6.41	6.14, 6.69
18–20	51.1	28.0	4.36	4.14, 4.59	51.8	27.6	5.04	4.88, 5.20
21–24	4.3	6.6	1.56	1.42, 1.73	4.1	6.3	1.75	1.65, 1.86
25–64	20.7	49.7	Referent		19.2	51.3	Referent	
≥65	3.6	6.1	1.40	1.26, 1.56	4.0	6.1	1.76	1.65, 1.87
Gender								
Male	56.3	49.9	1.29	1.23, 1.35	53.5	49.4	1.20	1.17, 1.23
Female	43.7	50.1	Referent		46.5	50.6	Referent	

Abbreviations: aOR, adjusted odds ratio; CI, confidence interval; DA, driver action; MV, moving violation.