



# Crash and traffic violation rates before and after licensure for novice California drivers subject to different driver licensing requirements

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## ABSTRACT

**Introduction:** How do crash and traffic violation rates for novice 16–17-year-old drivers change over the months before and after licensure under a graduated driver licensing (GDL) program relative to those for older novices who are not subject to GDL? **Method:** Plots and Poisson regression comparing overall rates and subtypes of crashes and traffic violations among California novice drivers ages 16 to 35 years over time before and after unsupervised licensure. **Results:** Majorities of 16-year-olds (57%) and 17-year-olds (73%) actually hold their learner permits longer than the required 6 months; majorities (67%–81%) of age 18 or older novices hold their learner permits less than 6 months. Crash rates of novice 16- and 17-year-olds—as well as most other age groups—are highest almost immediately after they are licensed to drive unsupervised, after which their rates decline quickly during their first year of licensure and at a slower rate for the second and third years. Novice 16- and 17-year-olds' traffic violation rates reach their zenith long after their total crash rates peak and decline, whereas violation rates for older novices peak during their first year of licensure. Over 70% of 16- and 17-year-old novices are crash-free for the first 3 years of licensure. **Conclusions:** While novice 16- and 17-year-olds' highest crash rates occur almost immediately after they are licensed, their peak traffic violation rates are delayed until around the time they turn age 18. Both pre-licensure crash rates and post-licensure crash peaks were more pronounced for some older age groups of novices than was the case for 16–17-year-olds. **Practical Applications:** Extending learner permit holding periods for 16–17-year-old novices appears consistent with their actual behavior; requiring older novices—particularly those ages 18 to 20—to hold permits for minimum periods may reduce their initial crash rates.

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## 1. Introduction

Supervised driving while on a learner permit is a relatively safe type of driving exposure that allows novices to gain driving experience under conditions of reduced risk (Mayhew, Simpson, & Pak, 2003; Williams, 2003; Williams, Preusser, Ferguson, & Ulmer, 1997). However, once novices are allowed to drive unsupervised their crashes increase radically—with crash rates per driver that are 3 to 7 times higher for at least the first 6 months of unsupervised driving (Lewis-Evans, 2010; Mayhew et al., 2003; VicRoads, 2008). These higher crash rates are likely due to increased driving exposure, but they also reflect errors made during the shift from co-driving under supervision to self-regulated solo driving (Forsyth, Maycock, & Sexton, 1995; Masten, Foss, & Marshall, 2011). Fortunately, the crash rates of newly licensed drivers decrease dramatically within the first months of licensure, after which the decline continues for years at a less steep rate; a learning curve that persists even among novices licensed under graduated driver licensing (GDL), which requires them to hold a learner permit for a minimum time and limits their exposure to high risk conditions (i.e., nighttime

driving and transporting young passengers) when they initially begin to drive independently (Lewis-Evans, 2010; Masten & Foss, 2010; Mayhew et al., 2003; Twisk & Stacey, 2007; VicRoads, 2008).

The types of driving errors that result in crashes during the initial months of independent licensure by teen novices—who comprise the majority of novice drivers—do not seem to be due to “youthfulness,” deliberate risk-taking, or overconfidence; rather they seem to reflect skill and understanding deficiencies associated with being inexperienced drivers (Braitman, Kirley, McCartt, & Chaudhary, 2008; Curry, Hafetz, Kallan, Winston, & Durbin, 2011; Curry, McDonald, Kandadai, Sommers, & Winston, 2013; Foss, Martell, Goodwin, & O'Brien, 2011; Irwin, 1996; McCartt, 2013; McKnight & McKnight, 2003). Although inexperience appears to initially be the most important factor for explaining the high crash rates of teen novices upon licensure, driver age is also an important factor given that their crash rates remain elevated relative to older novice drivers for years subsequent (Mayhew, 2007; Mayhew et al., 2003; McCartt, Mayhew, Braitman, Ferguson, & Simpson, 2009). Even with the same level of experience and driving exposure, younger novices tend to have higher crash rates than do older novices, with even just a 1-year increase in age at licensure being associated with having fewer crashes (Mayhew et al., 2003; Waller, Elliott, Shope, Raghunathan, & Little, 2001). However, older novices do appear

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to have higher traffic violation rates per driver—to some extent due to their greater driving exposure—which makes finding older age of licensure to be associated with fewer crashes even more remarkable (Ferdun, Coppin, & Peck, 1965; U.S. Department of Transportation & Federal Highway Administration, 2009; Waller et al., 2001). The youngest teen drivers—those ages 16 and 17 in California and most other U.S. states—typically have the highest crash rates due to their combination of both inexperience and young age (Ferdun et al., 1965; Williams, 2003).

While both inexperience and young age are important factors for elevating 16–17-year-old crash rates, their relative influences change as a function of time licensed (McCartt et al., 2009; McKnight & McKnight, 2003). After novice 16–17-year-olds master basic vehicle handling skills and also gain confidence driving without adult supervision during the initial months of licensure, inexperience would be expected to become less of a causal factor for their crashes (Waller, 2003; Waller et al., 2001). Perhaps their crash rates remain elevated relative to other age groups of drivers because they deliberately begin to test the limits of their driving abilities in order to optimize their skills and gain further mastery (Ericsson, Krampe, & Tesch-Römer, 1993). If so, this shift would be expected to be expressed as changes in the types of crashes in which 16–17-year-old drivers are involved and the types of traffic violations that they receive over the course of early licensure—with higher rates of inexperience-related crashes and violations during initial unsupervised driving, and higher rates of overconfidence-related crashes and violations subsequently (McKnight & McKnight, 2003; Waller et al., 2001).

The primary goal of this study was to describe how the monthly overall crash and traffic violation rates of novice 16–17-year-old drivers licensed under a GDL program change as a function of time; also presented are the rates for novice drivers age 18 and older who were not licensed under GDL (Williams, Tefft, & Grabowski, 2012). Because traffic violations are more common driving events than crashes, and because crashes that result from disobeying traffic laws often result in traffic violations, studying both outcomes together provides a more robust picture of the actual driving behavior of novices over the course of initial licensure than does studying only crashes (Gebers & Peck, 2003; McKnight & McKnight, 2003). Percentages of novice drivers by age who remained crash-free after 3 years of licensure are also presented to provide a normative context to help interpret their absolute crash risk.

Another goal of this study was to characterize how the types of traffic violations for which novice 16–17-year-old drivers licensed under a GDL program are convicted vary during the course of licensure. Specifically, the goal was to determine whether they initially tend to receive traffic violations for actions associated with inexperience and a lack of driving skill—such as violations for disobeying traffic signs/signals, making improper maneuvers, or failing to maintain proper lane position—whereas the traffic violations that they receive after gaining some independent driving experience tend to be more reflective of overconfidence and limit-testing—such as violations for speeding, disobeying license restrictions, using cell phones, being unbelted, and alcohol/drug-related driving (McKnight & McKnight, 2003; Waller et al., 2001). Again the rates for novice age 18 and older drivers who were not licensed under GDL are also presented for comparison purposes.

## 2. Method

### 2.1. The California licensure process

Novice drivers licensed at ages 16 or 17 are subject to the California GDL program, which is a three-stage specialized licensing system for persons under age 18. The GDL program includes a 6-month minimum learner permit holding period prior to licensure (Stage 1) during which young teens must drive under adult supervision for at least 50 h. To obtain this permit they must be at least age 15½, have completed a driver education course, and be enrolled in a behind-the-wheel driver training

course. After holding the learner permit for at least 6 months and completing driver training, they may obtain a provisional license (Stage 2) with which they are allowed to drive unsupervised; however, they are restricted from driving during 11 PM to 5 AM and from transporting any passenger younger than age 20. The provisional license period lasts for 12 months or until they turn age 18, after which they may drive under all conditions (Stage 3). Note that the passenger restriction only applied to the first 6 months of driving and the nighttime restriction start time was 12 AM for those licensed before January 1, 2006. All persons in the sample licensed at age 16 would be subject to one or both of the provisional licensing restrictions for 12 full months. Persons in the sample licensed at age 17 would only be subject to the provisional restrictions until they turned age 18; only about 60% of the 17-year-olds in the sample were subject to these restrictions for 6 months or longer. Hence, the crash and violation rates of 16-year-old drivers during their first year of unsupervised licensure are likely to be influenced more by the GDL provisional restrictions than are those of 17-year-old drivers.

Novice drivers licensed at ages 18 or older are not subject to the GDL program. They are also not required to complete driver education or driver training courses. Although they are issued learner permits valid for 12 months prior to licensure when they pass the written knowledge test, they are not required to hold the permits for a minimum length of time or practice a minimum number of hours with a supervisor before being allowed to take the on-road driving test. Furthermore, they are not subject to nighttime or passenger driving restrictions (i.e., provisional licensure) after they are licensed to drive unsupervised upon passing the driving test.

### 2.2. Data source and coding procedures

All persons who applied for and obtained a novice California non-commercial driver license at ages 16 or 17 from January 1, 2001 to December 31, 2007 were identified from the Provisional Licensing Database of the California Department of Motor Vehicles (DMV). For comparison purposes a 10% random sample of all persons ages 18 to 35 who obtained a novice California non-commercial driver license during this same time period was extracted from the typical licensing DMV database. This time period was chosen because the Provisional Licensing Database, which was used to identify large numbers of novice 16 and 17-year-old drivers, was not established until 2001. Furthermore, this time period resulted in a sample of drivers who all had at least 3-years of post-licensing driver records for comparison purposes. Drivers with evidence of licensure in a prior jurisdiction were excluded so that the sample consisted of novices with no prior unsupervised driving experience. Drivers who subsequently obtained commercial licenses were also excluded because original license data elements in DMV's database are overwritten for such drivers. The final sample of 1,709,342 novices was classified according to the age in years at which the drivers obtained their original California driver license into the following age groups: 16, 17, 18, 19, 20, 21–24, and 25–35 years-old.

Crash and traffic violation records for the sample were extracted from the California DMV database for the 3-year period following their dates of original license issuance. This database contains information on all motor vehicle crashes in California reported by law enforcement, insurance companies, and drivers. Crashes are required to be reported to the DMV if they involve an injury or death, or at least \$750 in property damage. In addition to total crashes, which include all injury severity levels and those involving only property damage, the crashes were also aggregated separately into those in which at least one person was killed or injured (fatal/injury crashes) and those in which the novice driver was specifically found to be at fault by law enforcement (at-fault crashes).

The DMV database also contains data on all court-reported traffic violations in California for which a driver is convicted, failed-to-appear, or had the citation dismissed after attending traffic violator school. These

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