Accident Analysis and Prevention 50 (2013) 330–335

Contents lists available at SciVerse ScienceDirect

Accident Analysis and Prevention

journal homepage: www.elsevier.com/locate/aap

Supervised hours requirements in graduated driver licensing: Effectiveness and parental awareness

Natalie P. O'Brien[a,*], Robert D. Foss[a], Arthur H. Goodwin[a], Scott V. Masten[b]

[a] University of North Carolina, Highway Safety Research Center, 730 Martin Luther King Jr. Blvd, Suite 300/CB 3430, Chapel Hill, NC 27599-3430, USA
[b] California Department of Motor Vehicles, Research and Development Branch, Sacramento, CA, USA

ARTICLE INFO

Article history:
Received 30 September 2011
Received in revised form 24 April 2012
Accepted 2 May 2012

Keywords:
Teenagers
Young drivers
Supervised driving requirements
Teenage driving restrictions
Graduated driver licensing (GDL)

ABSTRACT

Most states require teens to complete a certain number of hours of supervised driving practice to obtain a license to drive unsupervised. Although widely implemented, the effect of requiring supervised practice is largely unknown. Using auto-regressive integrated moving average (ARIMA) interrupted time-series analysis, we found no change in fatal and injury crash involvement of 16–17-year-old drivers in Minnesota following enactment of a 30 h supervised driving requirement. To supplement and provide insight into these findings, we conducted telephone interviews with parents of newly licensed teenage drivers in five states with varying amounts of required supervised driving, including Minnesota. Interviews revealed awareness of supervised driving requirements was limited. Only a third of parents (32%) overall could correctly identify the number of hours their state required. In Minnesota only 15% of parents could identify the amount of supervised driving their teen was required to complete. Awareness of the number of hours required was substantially higher (55%) in Maryland. Unlike the other states, Maryland requires submission of a driving log detailing the hours of supervised driving. The findings suggest states need to develop more effective mechanisms to ensure parents are aware of supervised hours requirements.

1. Introduction

To reduce crashes and fatalities among young drivers, all states in the U.S. have adopted three tier graduated driver licensing (GDL) systems, which include learner, intermediate and full-privilege license stages (Foss, 2007; Waller, 2003; Williams, 1999). An important component of GDL is the extended learner stage because it provides an opportunity for novice drivers to accumulate valuable driving experience in relatively safe, but realistic, driving conditions. To encourage practice, most states require teens to complete a certain number of hours of supervised driving to obtain an intermediate license. As of July 2011, 46 states and the District of Columbia required a specific amount of supervised driving during the learner stage, most commonly 50 h (IIHS, 2011).

Although supervised hours requirements are widely implemented, no study has directly examined their independent effect on teen driver safety. Baker et al. (2006) examined whether the various elements of GDL programs across the United States were associated with reductions in fatal crashes among 16-year-old drivers. They reported that the combination of a mandatory learner permit period of at least 3 months with at least a 30 h supervised driving requirement was associated with an 18% lower fatal crash rate. Whether this result was due to the mandatory learner period, the requirement for a minimum amount of supervision, or the combination of the two was not determined. A more recent cross-sectional time-series comparison of fatal crashes throughout the U.S. found that state requirements for differing amounts of supervised driving were not associated with fatal crash involvement of 16- and 17-year-old drivers (Masten et al., 2011).

Both of these studies were limited by their focus on only fatal crashes. Even though fatal crashes appear to be similarly responsive to the overall effects of graduated licensing systems as less serious crashes, they represent an extremely small proportion of all young driver crashes. In addition, these studies relied on cross-sectional analyses. Although complex statistical models can be used to adjust for confounding factors thought to influence crashes, such adjustments are subject to measurement limitations, especially in multi-state studies of highly complex licensing systems. For example, although statistical models can incorporate the varying ages at which states allow young drivers to obtain licenses, they cannot account for the fact that many teenagers do not begin driving at the minimum age allowed. Hauer (2010) discusses other, more fundamental, problems with efforts to estimate effects of interventions using regression analyses. Therefore, a study is needed that

* Corresponding author. Tel.: +1 919 962 2485; fax: +1 919 962 8710.
E-mail addresses: obrien@hsrc.unc.edu (N.P. O'Brien), rob_foss@unc.edu (R.D. Foss), arthur_goodwin@unc.edu (A.H. Goodwin), smasten@dmv.ca.gov (S.V. Masten).

0001-4575/$ – see front matter © 2012 Elsevier Ltd. All rights reserved.
http://dx.doi.org/10.1016/j.aap.2012.05.007

examines the specific effects of an hours requirement across time within a state that has changed the variable of interest – required hours of supervised driving practice – without making other changes to their young driver licensing system.

The present study is an initial effort to address this need. In order to do this, we first conducted a time-series analysis of crash rates in Minnesota, which implemented a supervised hours requirement in the absence of any other changes to the licensing system – allowing us to examine the independent effect of the supervised driving hours requirement. Second, we conducted telephone interviews with parents of newly licensed teenage drivers in five states with varying supervised driving requirements to examine parents' awareness of, and behaviors in response to, these requirements, as well as perceptions of how and whether these requirements are enforced by driver licensing agencies.

2. Methods

2.1. Crash rates in Minnesota

The original intent of the study was to identify multiple states that met the following criteria: (1) the state changed the number of hours of required supervised driving practice without making changes to other GDL components, and (2) crash data for the state were available in the state data system (SDS). The SDS is a collection of state crash data files from thirty-two participating states maintained by the National Highway Traffic Safety Administration (NHTSA, 2011). The SDS makes relatively uniform state crash data available to researchers for analysis. Five states met the first criterion: Arizona, Maine, Minnesota, Rhode Island and Utah. However, of these five states, only Minnesota data were available from SDS for sufficient periods before and after their 30 h supervised driving requirement was implemented. In February 1997 Minnesota implemented a 6-month learner permit phase (no mandatory learner permit was required prior to this date). A new provision was added in January of 1999, requiring teen drivers to obtain a minimum of 30 h supervised driving during the learner stage.

Counts of driver crash involvements in serious (A injury) and fatal (K injury) crashes in cars, trucks/pickups, vans/minivans, and SUVs were obtained for 1994–2002 in Minnesota. The crash counts were stratified by month and age group (i.e., 16, 17, and 25–39). Single-year-of-age population estimates were obtained from the U.S. Census Bureau and monthly estimates were interpolated between the annual July estimates to calculate age-group-specific monthly per capita crash involvement rates.

Fatal and serious injury (F/I) crash rates were analyzed using auto-regressive integrated moving average (ARIMA) interrupted time series analysis (Brockwell and Davis, 2002). Analyses were conducted using the SCA time series and forecasting system, a specialized time-series analysis software package (SCA, 2006). Although ARIMA analyses implicitly control for pre-existing secular trends in crash rates, we used crash rates of young adult drivers (ages 25–39) as a covariate to control for other state-specific factors that affect all drivers (weather, enforcement programs and publicity, economic conditions, etc.). In addition, because young drivers are more sensitive than adults to gasoline prices (Morrisey and Grabowski, 2011), we included the monthly price of unleaded regular gasoline as an additional covariate (U.S. Energy Information Administration, 2012). The monthly teen crash rates were statistically adjusted for trends and seasonal variation before the effects of the intervention were examined (Liu, 2006). The crash rates were then natural-log-transformed to stabilize series variability and simplify interpretation of the results. With this transformation the intervention parameter (ω) can be used to calculate the adjusted monthly percentage change in the post-intervention series, relative to the pre-intervention series, using the formula $100 \times (e^{\omega} - 1)$ (McCleary and Hay, 1980; McDowall et al., 1980). The final model was selected to best represent the monthly crash data series, based on the pre-intervention data points, using auto-correlation and partial-auto-correlation functions of the series residuals (see Brockwell and Davis, 2002, for further information on techniques for model identification).

2.2. Parent interviews

Approximately 100 parents were interviewed in each of five states with varying supervised driving requirements (total $N = 510$): Maryland, Minnesota, Ohio, South Carolina and Washington. Each state required a 6-month learner permit and had a similar minimum driving age. Table 1 summarizes the supervised driving requirements in effect in these states at the time the interviews were conducted. All five states required 10 h of the mandated supervised driving to be completed at night. Additionally, all five required parents to sign a form stating the teen had obtained the required amount of supervised driving practice. However, only Maryland required submission of a driving log detailing the hours of supervised driving completed by the teen.

Telephone interviews were conducted by a professional survey research organization with extensive experience doing transportation-related surveys. Households were sampled randomly from a list of households likely to have one or more teenagers ages 15–17 (provided by Survey Sampling, Inc.). Screening questions ensured the household included a teenager who: (1) was either 16 or 17 years old (15, 16 or 17 in South Carolina); (2) had a license to drive unsupervised, but had held this license for no more than 12 months. To ensure the respondent was familiar with the teen's driving experience during the learner stage, the interviewer asked to speak with the person who conducted most of the teen's supervision. The overall cooperation rate among qualifying households was 40%. State-specific rates were 58% in Minnesota, 48% in Ohio, 46% in Maryland, 39% in Washington and 27% in South Carolina.

Sixty-three percent (63%) of interviews were conducted with mothers, 36% with fathers and 1% with grandparents. Relationship of respondent to teens did not significantly differ across states. Respondents were most likely to describe the area where they lived as a medium size town (40%), followed by a small town (27%), rural (18%) or large city (14%). Parents in Maryland and Washington were more likely to report living in medium size town or large city compared to parents living in Minnesota or Ohio ($\chi^2 = 35.94$, df = 12, $p < .001$). The mean age of teens whose parents were interviewed was 16.61 years and 54% were males. These varied slightly, but not meaningfully across states.

The interview consisted of 38 questions focusing on parents' awareness and behaviors in response to the supervised driving requirements in their state. Specific questions examined: (1) awareness of supervised driving requirements, including required number of hours practice and further prescriptions for those hours (e.g., for nighttime driving); (2) how and whether parents kept track of their teen's driving practice; and (3) perceptions about enforcement of supervised driving requirements by licensing agencies.

3. Results

3.1. Crash data

From 1994 through 2002 in Minnesota, there were 1688 16-year-old driver involvements in fatal and serious injury crashes ($M = 15.63$/month), 1780 17-year-old crash involvements ($M = 16.84$) and 13,186 25–39-year-old crash involvements