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## Assessing the American Public's Preferences for Reforms to Teen Driving Licensure Systems: A Discrete Choice Experiment

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### Abstract

**OBJECTIVES:** To analyze factors influencing the American public's preferences for changes to teenage driver licensing requirements.

**METHODS:** We employed a discrete choice experiment (DCE) with 808 participants from NORC's AmeriSpeak panel to assess preferences for two existing elements (on-road testing and intermediate licensure period) and a new feature (driver monitoring with telematics during the intermediate licensure period) of licensing system. Multinomial and mixed logit models were used to estimate preference weights, marginal rates of substitution, and the relative importance of each attribute.

**RESULTS:** Among 730 respondents who completed all DCE choice tasks, we found robust support for changes to teenage driver licensing requirements, with preferences varying by individual characteristics. Respondents expressed a high baseline support for changes to teen driving licensure policies. They favored testing, prioritizing easy tests, and opposed prolonged driver monitoring and extended intermediate licensure periods. Baseline preference weights exhibited substantial heterogeneity, emphasizing the diversity of public preferences. The marginal rates of substitution revealed a preference for extended driver monitoring over an extended intermediate licensure period. An easy test was valued 2.85 times more than a hard one. The most influential attributes were the length of intermediate license period and testing requirements, with the former twice as important.

**CONCLUSIONS:** Our study found robust support for reforms to teenage driver licensing requirements, favoring easier on-road driving tests over an extended period of intermediate

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#### CONTRIBUTORS

EFD, JPM, and JPE conceived and designed the study and the DCE survey. All authors contributed to the design and acquisition of data. EDF analyzed and interpreted the data and wrote the first draft. All authors critically revised and approved the final version of the manuscript. EDF acts as the guarantor.

#### COMPETING INTERESTS

None declared

#### SUPPLEMENTAL MATERIAL

Supplemental Material – Assessing the American Public's Preferences for Reforms to Teen Driving Licensure Systems: A Discrete Choice Experiment.

licensure, and driver monitoring. Public preferences for licensing systems need to be balanced with the broader policy objectives including optimizing mobility and maximizing safety.

### Keywords

Discrete choice experiment; preferences; driving licensure; teenagers; policy; reform

## INTRODUCTION

Motor vehicle crashes persist as a leading cause of death for young people in the United States. In 2021 alone, 2,116 drivers aged 15–20 years died in traffic crashes, an 11-percent increase from 2020. [1] The increasing number of crashes involving teenage drivers necessitates a reassessment of the impact of driver licensing policies on the safety of teenagers. While graduated driver licensing (GDL) systems effectively reduce crash deaths for the 16–17-year-olds by delaying licensure and minimizing exposure to high-risk driving conditions, recent literature questions their impact on the safety of older teenagers and their potential to restrict the mobility of young people. [2–4] The COVID-19 pandemic's impact on driver testing and licensing policies provides a unique opportunity for reform, encouraging innovative approaches to testing and licensing procedures. [5, 6] During the pandemic, several US states – including Georgia, Maryland, Mississippi, North Carolina, and Wisconsin – temporarily suspended or modified their on-road driving test requirement, and others still maintain test waivers or modified testing protocols. Notably, these changes were made without public input due to the emergency conditions of the pandemic. Yet, as states continue to explore innovative approaches to driver licensing and testing, it will be vital to examine the public's support for different policies affecting teenage drivers. This study aims to identify factors, like individual characteristics and policy attributes, influencing public support and preferences for teen driver policies, using a discrete choice experiment (DCE) survey, to inform the design and implementation of teen licensure system reforms.

## METHODS

### Discrete choice experiment methodology

We used the DCE to understand Americans' preferences for hypothetical teen driving policies. DCEs describe policy alternatives according to their key characteristics, or attributes (e.g., testing requirement for driver's license), and levels of these attributes (e.g., no test, easy on-road test, or hard on-road test). Different levels of each attribute are combined to create choice alternatives. These alternatives are then combined to construct choice profiles (e.g., with two or more alternatives per profile) that are presented sequentially to respondents as choice scenarios. In each choice scenario, respondents are asked to state which of the presented alternatives they prefer. This gives an indication for participants' underlying preferences and enables analysts to estimate their relative preferences for and tradeoffs they are willing to make between attribute levels.

DCE methodology is rooted in the economic theory of utility maximization; it belongs to a family of preference-based survey methods rooted in multi-attribute valuation, specifically,

choice modeling. [7, 8] DCEs are increasingly used in health policy applications to elicit preferences for and tradeoffs between attribute levels of various healthcare resources. [9]

### Sampling frame and study participants

Our DCE was part of a national road safety survey conducted by the Johns Hopkins Center for Injury Research and Policy and fielded by the University of Chicago's National Opinion Research Center (NORC). We developed a dual-mode DCE survey (web- and phone-based, described below), programmed and fielded by NORC from May 4 to June 10, 2022, in both the English and Spanish languages, in 808 participants  $\geq 16$  years. This sample size was deemed sufficiently large to detect a change of 0.01 in preference weights at the 95% significance level, with an 80% statistical power. Participants were recruited from NORC's AmeriSpeak Panel, a probability-based panel of randomly sampled US households who participate in surveys, online via the AmeriSpeak App, or by phone. \*10+ NORC's sampling frame, representative of over 99% of US households, has been used in well-known studies, like the National Longitudinal Surveys of Youth. [10] The DCE was conducted as a special module of the larger road safety national survey. Participants in the DCE module were recruited from NORC's AmeriSpeak Panel, to be nationally representative of the U.S.  $\geq 16$ -year population, after applying survey weights. Participants comprised adults ( $\geq 18$ ), selected using 48 demographic strata for representativeness, and teens (16–17) randomly chosen from each household without overlapping with adults. Survey weights were developed for this sample, adjusting for selection probabilities, nonresponse, and population benchmarks, to produce nationally representative estimates from the DCE sample.

### Development of the DCE

**Questionnaire:** We followed recommended guidelines to design and implement the DCE. [7, 8, 11–16] We developed web- and phone interviews in English and Spanish to assess preferences for three attributes of teen driving licensing systems. We included three attributes, each with three levels: testing requirements for driver's license (no test, easy on-road test, or hard on-road test), driver monitoring with telematics during the intermediate licensure period – where teens can drive on their own but with restrictions on nighttime driving and passenger numbers (no monitoring, monitoring for 6 months, or monitoring for 12 months), and the duration of restricted licensure before full driving privileges (12 months, 18 months, or 24 months). Driver monitoring systems can measure behaviors such as distraction, speeding, hard braking and impairment. These systems can be included as original components in the vehicle or connected to the vehicle through aftermarket devices like dedicated dash mounted devices or linked to personal smartphones. Monitoring systems can be combined with feedback where drivers receive a rating on their overall driving performance or provide driver behavior to a third party such as the vehicle manufacturer or an insurance company. [17] These attributes were chosen as considered important attributes of teen driving licensure systems, based on insight from prior literature and the authors' expertise in the road safety space (table 1). [11–13]

We created choice alternatives by combining different attribute levels and then formed choice scenarios by pairing these alternatives. A complete representation of attribute combinations would require examining 27 ( $3 \times 3 \times 3$ ) scenarios. To avoid overburdening

respondents, we used an efficient fractional factorial design to generate 7 choice scenarios, maximizing D-efficiency with zero priors on the coefficients. [12, 15] We included an “opt-out” alternative (i.e., “I would prefer neither of these options”) in each choice scenario to reflect the fact that individuals may refuse both active choice alternatives. Thus, each choice scenario included 3 choice alternatives, including two unlabeled alternatives (i.e., “Option A” and “Option B”), and one “opt-out” option. We constructed the DCE choice scenarios in SAS, Version 9.4. [12, 15, 18] To minimize bias, we randomized the questions so that duplicated questions did not appear consecutively. Examples of choice tasks are depicted in online supplemental figure 4. The survey also included questions about respondents’ characteristics (table 2).

**Pilot test:** We piloted the survey with 22 respondents to ensure its relevance and clarity. The pilot revealed that the DCE question needed clarification and shortening to maximize participation.

**Ethical approval:** Informed consent was required of each participant and all study procedures were approved by the Johns Hopkins University Institutional Review Board (IRB #12644).

### Statistical analyses

We used multinomial logit (MNL) and mixed logit (MIXL) models to estimate preferences for different levels of attributes of teen driver licensure policy.

$$\Pr(Y_{n,t} = i \mid X_{n,t}, Z_{n,j,t}) = \frac{\exp\{U(Y_{n,i,t})\}}{\sum_{j=1}^J \exp\{U(Y_{n,j,t})\}} \quad (1)$$

where:

$$U(Y_{n,i,t}) = \beta_{n,Opt-in} + \beta_{n,HardTest}HardTest_{n,i,t} + \beta_{n,EasyTest}EasyTest_{n,i,t} + \beta_{n,LicensurePeriod}LicensurePeriod_{n,i,t} + \beta_{n,MonitoringPeriod}MonitoringPeriod_{n,i,t} + \gamma_n Z_{n,i,t} + \epsilon_{n,i,t} \quad (2)$$

In equation 2,  $\epsilon_{n,i,t}$  is assumed to be independently and identically distributed (iid) extreme value type I for the MNL model and can have any distribution for the MIXL model. Here, we assumed  $\epsilon_{n,i,t}$  to be multivariate normal. The coefficients estimate the effects of policy attributes and individual characteristics on the choice probability. The MIXL model also accounts for repeated choices by the same respondent, allowing estimation of respondent-level random coefficients to capture preference heterogeneity. [19]

**Marginal rates of substitution and relative importance of attributes** We calculated the marginal rates of substitution (MRS) between attribute levels, indicating how much of one attribute respondents are willing to trade for another. It is the ratio of the mean preference weights of the compared attribute levels:

$$E(WTP_{kr}) = -E(\beta_k)/E(\beta_r) \quad (3)$$

where  $\beta_r$  denotes the estimated mean preference weight for the reference attribute level.

Confidence intervals (95%) were estimated using the method of Krinsky and Robb (1986, 1990). [20–23]

We also calculated the average relative importance of attributes given by respondents as the ratio of each attribute's part-worth utility range to the sum of all ranges, multiplied by 100:

$$ARI_i = 100 \times \frac{(\overline{U}_i - \underline{U}_i)}{\sum_{j=1}^J (\overline{U}_j - \underline{U}_j)} \quad (4)$$

where  $\overline{U}_i = \max\{\beta_{i,k}Z_{i,k}, \forall k \in K_i\}$  and  $\underline{U}_i = \min\{\beta_{i,k}Z_{i,k}, \forall k \in K_i\}$  denote, respectively, the largest and smallest utility level of attribute  $i$  where  $Z_{i,k}$  is the  $k^{\text{th}}$  attribute level of the  $i$ -th attribute ( $k \in K_i$ , with  $K_i$  denoting the number of attribute levels of attribute  $i$ ),  $\beta_{i,k}$  is the coefficient of attribute level  $Z_{i,k}$ , and  $\min\{\beta_{i,k}Z_{i,k}, \forall k \in K_i\} = 0$  when an attribute is continuous rather than discrete, and  $\beta_{i,k} = 1$  when  $Z_{i,k}$  is the reference level for the attribute. [15, 24–26] To characterize uncertainty in the attribute importance metric, we conducted bootstrap sampling with  $N=50$  sampled values and  $R=500$  replications. Values for the coefficients were drawn from a multivariate normal distribution, using the mean and variance-covariance matrices from the MNL and MIXL models.

Unless specified otherwise, all estimates are based on a survey-weighted sample. All statistical analyses were conducted in the R programming language. [27]

### Patient and public involvement

This study did not involve patients. As noted above, the survey instrument was pilot tested with 22 respondents to ensure its relevance and clarity.

## RESULTS

### Sample characteristics

Of the 808 respondents who participated in the survey, 730 participants completed all DCE choice tasks (figure 1 and table 2). Unweighted sample mean age was 31.2 years (standard deviation [SD], 15.0 years), including 30.7% teenagers (16–17 years), and consisted predominantly of females (62.4%), non-Hispanic Whites (56.8%) with less than a high school degree (50.0%). Unsurprisingly, the majority of participants were not married (67.7%) and were not in the labor force (45.2%). The majority of respondents (51.9%) resided in a household earning less than \$60,000. The median household size was 5 persons (interquartile range [IQR], 3.00,6.00). The median number of household members younger than 18 years was 2 (IQR, 1.00,3.00). Respondents resided predominantly in metropolitan

areas (81.9%) and in the South (35.4%), Midwest (26.5%) and West (21.5%). Survey-weighted estimates are also provided in table 2 and are largely qualitatively consistent with the unweighted estimates.

### Preferences for policy attributes

Survey-weighted average preference weights (unexponentiated) for the attribute levels are reported in table 3 and depicted in supplemental figure 1.

They indicate correct parameter signs in both MNL and MIXL models. Key results are presented and interpreted for the MIXL models (Model 3 and Model 4), based on goodness of fit statistics (McFadden pseudo-R-squared, Akaike and Bayesian information criteria). [14, 28] They indicate a significantly high baseline support for changes to teen driving licensure policies (Model 3: 1.98; 95% CI, 1.64–2.33; Model 4: 5.61, 95% CI, 3.27–7.95). Baseline support for the policy change varied significantly by certain socioeconomic and sociodemographic characteristics. For example, likelihood of support was negatively associated with being women, identifying as other or multiple race and ethnicity, having completed a bachelor's or equivalent degree, living in a household with income \$60,000 or more, residing in the Midwest or South, or in a metropolitan area. In contrast, identifying as Hispanic or non-Hispanic Asian, or not being in the labor force were associated with greater likelihoods of support for a policy change.

Preferences were stronger for testing over no testing, (easy test: 0.88; 95% CI 0.68,1.07; hard test: 0.31; 95% CI 0.09,0.52), suggesting that the public perceived testing as a “good”. There was distaste for an extended driver monitoring period (–0.26; 95% CI: –0.47,–0.04 for each additional year) or longer intermediate licensure periods (–0.89; 95% CI: –1.15,–0.63 for each year), suggesting that extended monitoring and longer intermediate licensure periods are perceived by the public as “bads”.

Baseline preference weights for policy change were substantially heterogeneous based on the magnitude and statistical insignificance of the standard deviations and varied by certain individual characteristics like sex, race/ethnicity, education, marital status, income, and geography, but not age, noticeably.

### Marginal rates of substitution

Table 4 shows the marginal rates of substitution between attribute levels.

These are also illustrated in online supplemental figure 2 as a heat map, with darker colors indicating larger magnitudes: navy for substitutions between two “goods” or two “bads” and red for substitutions between a “good” and a “bad”. They consistently suggest that the substitution rates are larger between 1) the length of the extended driver monitoring and intermediate licensure periods, 2) the length of the monitoring period and easy tests, 3) hard test and length of the intermediate licensure period, and 4) hard test and easy test. Based on Model 4, the public was willing to give up at least 3.46 years (95% CI: –5.81,–1.11) in intermediate licensure period for a year reduction in monitoring period. They were willing to give up support for an easy test requirement if this reduced the duration of the monitoring period by at least 3.41 years (95% CI: 0.25,6.57). Similarly, the public was willing to give

up support for a hard test requirement for a reduction of at least 2.90 years (0.28,5.51) in licensure period; support for an easy test was 2.85 times (95% CI: -4.57,-1.13) that for a hard test.

### Relative importance of attributes

The length of the intermediate licensure period, followed by testing requirements, were the most important attributes in Americans' decisions about a teen driving licensure systems, among the set of attributes included in this study (table 5 and online supplemental figure 3).

The length of the intermediate licensure period was nearly twice as important as testing requirement (60.5% vs 30.8%), which itself was over three-folds as important as the length of the extended driver monitoring period (30.8% vs 8.6%).

## DISCUSSION

This study aimed to elicit Americans' preferences for different attribute levels of hypothetical teen driving licensure policies in the US. The study involved a subset of NORC panelists participating in a large national survey on road safety. After applying survey weights to their records for national representativeness of the sample we found evidence of strong baseline support for teen driving licensure policy changes, that was heterogeneous across individuals, albeit variable only by selected demographics. The public expressed stronger preferences for on-road testing (easy test, followed by hard test) over no testing but disliked longer extended driver monitoring and intermediate licensure periods. Marginal rates of substitution indicated higher rates for the monitoring and intermediate licensure periods or easy test, as well as for hard test and intermediate licensure period or easy test. The public perceived each additional year of monitoring to be equivalent to 3.46 years of extended intermediate licensure. They valued an easy test requirement to be worth at least 3.4 years reduction in the intermediate licensure duration, and a hard test to be worth at least 2.9 years less of the intermediate licensure duration. An easy test was considered 2.85 times as worth as a hard test. The length of the intermediate licensure period, followed by testing requirements, were the most important attributes in Americans' decisions regarding teen driving licensure policies. The intermediate licensure period was nearly twice as important as testing requirement and more than six times as important as extended monitoring time.

### Strengths and limitations

**Strengths:** This study is a pioneering exploration of public preferences for teenage driver licensing policies, utilizing DCE methodology for the first time in this context. While previous studies over a decade ago assessed preferences using standard responses, [29–31] this study goes beyond to identify the relative importance of various policy options (e.g., easy vs hard on-road tests) and additional attributes like driver monitoring technologies. Importantly, the policy attributes were calibrated to those of existing or otherwise considered policies. Several states are considering changes to their licensing systems, such as driver monitoring using telematics during the intermediate licensure period. Washington State's 2023 Senate Bill 5583 [32] initially included a provision for the Department of Licensing to mandate driver monitoring technology for certain young and high-risk drivers. This

approach falls within a performance-based licensing and testing system that could be applied to drivers across the life course. [33]

Our application of DCE in assessing public preferences for and quantifying the relative importance of various attributes of teen driving licensure systems in the US is also innovative. DCE studies related to road safety for teenagers are scarce and largely focused on behaviors like texting while driving, [34] and on eliciting young people's mobility preferences, [34–36] highlighting the uniqueness of our approach. In assessing the public's preferences for alternative teen driving licensure policies, our study fills a critical gap by providing the necessary evidence to guide the design and implementation tactics to maximize public support for reforms to teen driving licensure systems nationwide.

**Limitations and mitigating strategies:** This study has several limitations. First, respondents might not have expressed their true preferences. While checks and alerts could mitigate this, our design aimed to address this by removing dominant alternatives and forcing tradeoffs. Additionally, prior studies using the AmeriSpeak panel show respondents, ensuring high-quality responses. [37] Second, our DCE did not include all relevant attributes, like financial costs, which might influence public preferences on teen driver licensure. This omission could affect the accuracy of our findings. We used insights from prior studies and our team's expertise to address this, but future studies should include a more comprehensive set of attributes for broader representation. Third, we only estimated the main effects of policy attributes and how baseline preferences varied by individual characteristics, without examining how attribute preference weights varied by respondent characteristics. While this analysis could be informative, it might lead to overfitting and compromise simplicity. Fourth, we did not explore the reasons behind differences in specific attribute preferences, which would require a more complex design. Previous research links taste variations to sociological, psychological, and biological factors, [38] as well as different aspects of choice behavior. [39] Future studies should investigate these mechanisms. Despite these limitations, our study provides credible estimates of the public's tradeoffs between considered attributes and their levels, and the relative importance of these attributes in decision-making.

### Interpretation and implications of findings for policy, practice, and research

These results highlight public preferences for teen driving licensure reforms. Respondents favored easy tests and shorter monitoring and intermediate licensure periods, emphasizing the public's commitment to safe driving. Research indicates that teen crashes stem from inexperience and risk-taking rather than ignorance of road rules. [40] An effective driving test aligning with scientific evidence could enhance teen driver safety. Aversion to extended licensing and monitoring periods may reflect concerns about limiting teen mobility or privacy. While GDL provides safety benefits, extended monitoring and intermediate driving licensure periods may burden license-seekers. Striking a balance between public preferences and broader policy goals is crucial. Policymakers should consider these preferences, to optimize mobility and maximize safety. Our findings can therefore guide effective communication, resource allocation, and continuous policy adjustments based on evolving preferences and circumstances.

## CONCLUSIONS

Our study revealed strong support for teen driving licensure reforms, with heterogeneous preferences tied to demographics. The public favored testing, especially easy tests, opposed an extended intermediate licensure and driver monitoring periods. The substantial population-level preference heterogeneity underscores the need for tailored policies. Key decision-shaping attributes were the length of the intermediate licensure period and testing requirements, with the former outweighing the latter and the duration of the monitoring period. Policymakers should balance public preferences, adapting reforms to community needs. Continuous feedback mechanisms are also essential for effective, responsive policy implementation.

## Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

## ACKNOWLEDGEMENTS

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Researchers from The Johns Hopkins Center for Injury Research and Policy, including JPM and JPE, were involved in the design, and provided critical reviews of the survey instruments. However, the funding source had no role in the conduct of the analyses.

## DATA AVAILABILITY STATEMENT

Data are available on reasonable request. Data are available on reasonable request from the corresponding author.

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## HIGHLIGHTS

### **What is already known about this topic**

Prior studies from over a decade ago assessed preferences in mobility using standard responses, finding a high level of parental support for comprehensive teen licensing policies that reduce teenage crash involvement, but offering little to no insight into the preferences for and tradeoffs parents are willing to make between specific attribute levels of these policies, and the relative importance of these attributes.

### **What this study adds**

Through the innovative application of DCE methodology within the realm of teen driving, our study improves upon prior preference elicitation studies by quantifying preferences for and tradeoffs in teen driving licensure policies, as well as the relative importance of various policy options (e.g., easy vs hard on-road tests) and additional attributes like driver monitoring technologies.

### **How this study might affect research, practice, or policy**

As states consider modifications to the driver testing and licensing systems, an understanding of public preferences for different elements of the process could inform education and implementation efforts.

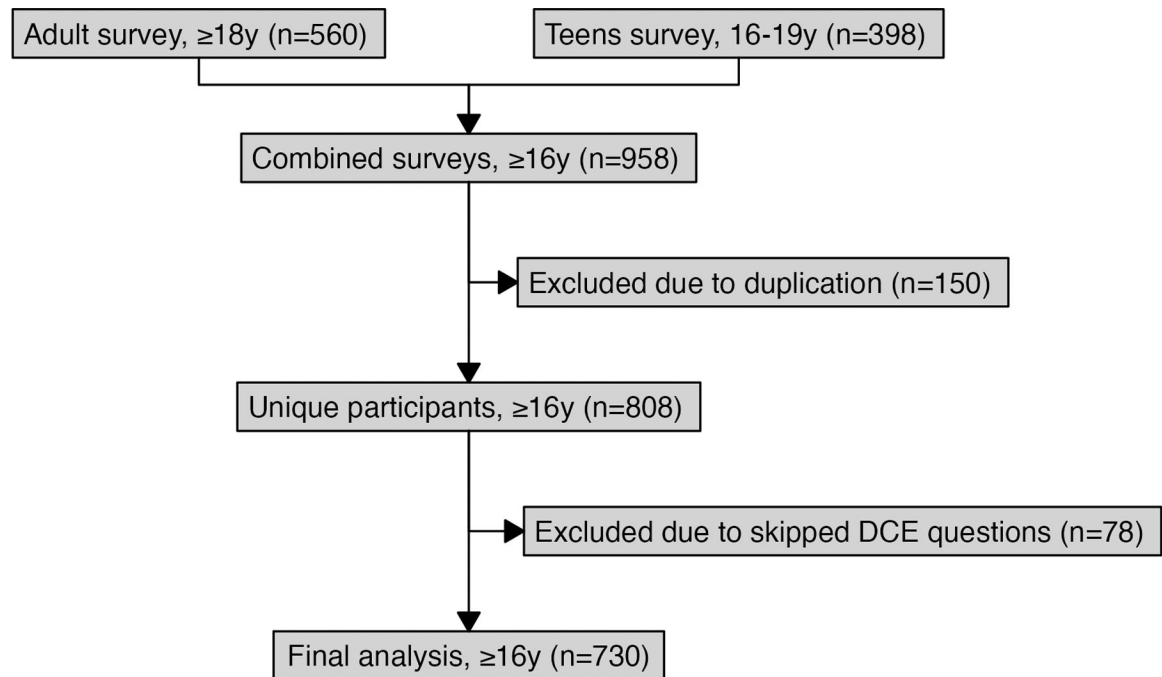


**Figure 1. Sample selection**

**Abbreviations:** y, year; DCE, discrete choice experiment; NORC, National Opinion Research Center.

**Notes:** All counts are unweighted. Initial sample consisted of n=808 unique respondents ≥16 years, recruited from NORC's AmeriSpeak Panel, who consented to participate in the DCE survey (web-based interview, n=806; telephone interview, n=2) programmed and fielded by NORC from May 4 to June 10, 2022, in both the English and Spanish languages. The final analytic sample comprised n=730 unique participants (web-based interview, n=728, telephone interview, n=2) who completed all DCE choice tasks.

**Table 1.**

Attributes and attribute levels of the policies

| Attributes                                                                                                                                                                                                                                                                                                                                                                                               | Levels                                                                                                                                                                                                                     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Testing</b><br>Testing requirement and difficulty, relative to current practice. Currently, almost all states use an easy test where almost everybody passes on their first try.                                                                                                                                                                                                                      | <ul style="list-style-type: none"> <li>• No test</li> <li>• Easy test</li> <li>• Hard test</li> </ul>                                                                                                                      |
| <b>Waiting Period Before Full License</b><br>After passing the driving test teenagers are now allowed to drive on their own. Most states now have 1 year of nighttime restrictions (for example, no driving after 9 PM) and passenger restrictions (for example, no carrying any passengers except members of your family). States could extend this to 2 years of nighttime and passenger restrictions. | <ul style="list-style-type: none"> <li>• 1 year of nighttime and passenger restrictions</li> <li>• 1.5 years of nighttime and passenger restrictions</li> <li>• 2 years of nighttime and passenger restrictions</li> </ul> |
| <b>Driver Monitoring</b><br>Monitoring to detect speeding and distracted driving, and report violations to the licensing agency                                                                                                                                                                                                                                                                          | <ul style="list-style-type: none"> <li>• No years of driver monitoring</li> <li>• 1 year of driver monitoring</li> <li>• 2 years of driver monitoring</li> </ul>                                                           |

**Table 2.**

Baseline characteristics of respondents who participated in the teen driving DCE survey

| Variables                                       | Unweighted        | Weighted          |
|-------------------------------------------------|-------------------|-------------------|
| N                                               | 808               | –                 |
| Age, y, mean (SD)                               | 31.17 (15.00)     | 26.92 (14.37)     |
| <b>Age group, y (%)</b>                         |                   |                   |
| <18                                             | 30.7              | 31.1              |
| 18–29                                           | 19.9              | 36.5              |
| 30–44                                           | 25.1              | 14.7              |
| 45–59                                           | 22.6              | 16.1              |
| ≥60                                             | 1.6               | 1.5               |
| <b>Female (%)</b>                               | 62.4              | 50.3              |
| <b>Race and ethnicity (%)</b>                   |                   |                   |
| Non-Hispanic White                              | 56.8              | 54.1              |
| Hispanic                                        | 20.0              | 22.3              |
| Non-Hispanic Black                              | 14.0              | 13.2              |
| Non-Hispanic Asian                              | 4.3               | 6.6               |
| Non-Hispanic Multiple                           | 3.7               | 2.5               |
| Non-Hispanic Other                              | 1.1               | 1.2               |
| <b>Education (%)</b>                            |                   |                   |
| Less than high school                           | 50.0              | 62.4              |
| High school graduate or equivalent              | 27.8              | 23.2              |
| Bachelor's degree or equivalent                 | 13.1              | 8.0               |
| Post-graduate or professional degree            | 9.0               | 6.4               |
| <b>Married (%)</b>                              | 32.3              | 23.0              |
| <b>Employment status (%)</b>                    |                   |                   |
| Unemployed                                      | 9.0               | 11.2              |
| Employed                                        | 45.8              | 40.7              |
| Not in the labor force                          | 45.2              | 48.1              |
| <b>Household income, \$ (%)</b>                 |                   |                   |
| <30,000                                         | 24.4              | 24.8              |
| 30,000–59,999                                   | 27.5              | 26.7              |
| 60,000–99,999                                   | 20.4              | 17.0              |
| ≥100,000                                        | 27.7              | 31.4              |
| <b>Household size, median [IQR]</b>             | 5.00 [3.00, 6.00] | 5.00 [3.00, 6.00] |
| <b>Number of children &lt;18y, median [IQR]</b> | 2.00 [1.00, 3.00] | 2.00 [1.00, 3.00] |
| <b>Region (%)</b>                               |                   |                   |
| Northeast                                       | 16.6              | 19.1              |
| Midwest                                         | 26.5              | 20.9              |
| South                                           | 35.4              | 36.3              |

| Variables                           | Unweighted | Weighted |
|-------------------------------------|------------|----------|
| West                                | 21.5       | 23.7     |
| <b>Metropolitan area (%)</b>        | 81.9       | 81.5     |
| <b>Web-based survey (%)</b>         | 99.8       | 99.3     |
| <b>English language survey (%)</b>  | 98.4       | 98.4     |
| <b>Skipped any DCE question (%)</b> | 9.7        | 9.5      |

**Abbreviations:** DCE, discrete choice experiment; y, year; SD, standard deviation; IQR, interquartile range; NORC, National Opinion Research Center.

**Notes:** Unweighted column represents the distributions based on the crude sample. Weighted column represents survey-weighted estimates, using study-specific final weights, to adjust for selection probabilities, nonresponse, and population benchmarks, and produce nationally representative estimates. Initial sample consisted of n=808 unique respondents ≥16 years, recruited from NORC's AmeriSpeak Panel, who consented to participate in the DCE survey (web-based interview, n=806; telephone interview, n=2) programmed and fielded by NORC from May 4 to June 10, 2022, in both the English and Spanish languages.

**Table 3.**  
Americans' preferences for changes to teen driving licensure systems

| Variables                                | Multinomial Logit Models   |                         | Mixed Logit Models         |                         |
|------------------------------------------|----------------------------|-------------------------|----------------------------|-------------------------|
|                                          | Model 1                    | Model 2                 | Model 3                    | Model 4                 |
|                                          | Mean (95% CI)              | Mean (95% CI)           | Mean (95% CI)              | Mean (95% CI)           |
| <b>Random Parameters</b>                 |                            |                         |                            |                         |
| Opt-in ASC (ref. No support for policy)  | 0.56 ***<br>(0.46,0.65)    | 1.13 *** (0.69,1.57)    | 1.98 *** (1.64,2.33)       | 5.61 *** (3.27,7.95)    |
| Testing (ref. No test)                   |                            |                         |                            |                         |
| Easy test                                | 0.53 ***<br>(0.40,0.66)    | 0.53 *** (0.40,0.67)    | 0.84 *** (0.64,1.03)       | 0.88 *** (0.68,1.07)    |
| Hard test                                | 0.27 ***<br>(0.14,0.40)    | 0.27 *** (0.13,0.40)    | 0.34 *** (0.13,0.55)       | 0.31 *** (0.09,0.52)    |
| Extended monitoring period, y            | -0.11 (-0.24,0.02)         | -0.11 (-0.24,0.02)      | -0.28 **<br>(-0.49,-0.07)  | -0.26 * (-0.47,-0.04)   |
| Intermediate licensure period, y         | -0.56 ***<br>(-0.74,-0.38) | -0.56 *** (-0.74,-0.38) | -1.01 ***<br>(-1.28,-0.74) | -0.89 *** (-1.15,-0.63) |
| <b>Interactions with the Opt-in ASC</b>  |                            |                         |                            |                         |
| Age                                      |                            | 0.00 (-0.01,0.01)       |                            | -0.01 (-0.05,0.03)      |
| Female (ref. Male)                       |                            | -0.17 * (-0.30,-0.04)   |                            | -0.19 (-0.78,0.40)      |
| Race/ethnicity (ref. Non-Hispanic White) |                            |                         |                            |                         |
| Non-Hispanic Black                       |                            | -0.24 ** (-0.41,-0.06)  |                            | 0.01 (-0.72,0.74)       |
| Hispanic                                 |                            | -0.05 (-0.27,0.17)      |                            | 1.29 ** (0.51,2.08)     |
| Non-Hispanic Asian                       |                            | 0.35 * (0.05,0.66)      |                            | 0.81 (-1.09,2.70)       |
| Non-Hispanic Other/Multiple races        |                            | -0.37 * (-0.69,-0.04)   |                            | -1.05 (-2.34,0.24)      |
| Education (ref. Less than high school)   |                            |                         |                            |                         |
| Highschool graduate or equivalent        |                            | 0.34 ** (0.08,0.59)     |                            | 0.75 (-0.48,1.98)       |
| Bachelor's degree or equivalent          |                            | -0.18 (-0.53,0.17)      |                            | 0.06 (-1.70,1.82)       |
| Post-graduate or professional degree     |                            | 0.30 (-0.11,0.70)       |                            | 1.92 * (0.22,3.62)      |
| Married (ref. Not married)               |                            | -0.14 (-0.38,0.10)      |                            | -1.28 * (-2.36,-0.20)   |
| Employed Status (ref. Unemployed)        |                            |                         |                            |                         |
| Employed                                 |                            | -0.09 (-0.32,0.14)      |                            | 0.21 (-0.75,1.17)       |
| Not in the labor force                   |                            | 0.20+ (-0.03,0.42)      |                            | 0.59 (-0.59,1.77)       |
| Household Income, \$ (ref. <30,000)      |                            |                         |                            |                         |
| 30,000–59,999                            |                            | 0.07 (-0.12,0.26)       |                            | -0.22 (-0.92,0.48)      |
| 60,000–99,999                            |                            | -0.67 *** (-0.86,-0.47) |                            | -1.40 *** (-2.16,-0.64) |
| ≥100,000                                 |                            | -0.09 (-0.29,0.11)      |                            | 0.18 (-0.60,0.96)       |
| Household size                           |                            | -0.02 (-0.07,0.04)      |                            | -0.01 (-0.26,0.25)      |
| Number of children <18 y                 |                            | 0.01 (-0.04,0.07)       |                            | -0.04 (-0.24,0.17)      |
| Region, (ref. Northeast)                 |                            |                         |                            |                         |

| Variables                               | Multinomial Logit Models |                         | Mixed Logit Models   |                         |
|-----------------------------------------|--------------------------|-------------------------|----------------------|-------------------------|
|                                         | Model 1                  | Model 2                 | Model 3              | Model 4                 |
|                                         | Mean (95% CI)            | Mean (95% CI)           | Mean (95% CI)        | Mean (95% CI)           |
| Midwest                                 |                          | -0.39 *** (-0.59,-0.19) |                      | -2.02 *** (-2.95,-1.09) |
| South                                   |                          | -0.27 ** (-0.46,-0.08)  |                      | -1.41 *** (-2.25,-0.57) |
| West                                    |                          | 0.01 (-0.20,0.21)       |                      | 0.51 (-0.35,1.37)       |
| Metro area (ref. Nonmetro area)         |                          | -0.11 (-0.29,0.06)      |                      | -2.17 *** (-2.82,-1.51) |
| <b>Preference heterogeneity (SD)</b>    |                          |                         |                      |                         |
| Opt-in ASC (ref. No support for policy) |                          |                         | 4.04 *** (3.63,4.45) | 4.29 *** (3.78,4.80)    |
| Testing (ref. No test)                  |                          |                         |                      |                         |
| Easy test                               |                          |                         | 1.44 *** (1.25,1.64) | 1.63 *** (1.42,1.84)    |
| Hard test                               |                          |                         | 0.68 *** (0.40,0.96) | 0.61 *** (0.34,0.87)    |
| Extended monitoring period, y           |                          |                         | 1.51 *** (1.29,1.73) | 1.52 *** (1.29,1.75)    |
| Intermediate licensure period, y        |                          |                         | 1.27 *** (0.99,1.55) | 0.98 *** (0.68,1.28)    |
| Observations                            | 5,110                    | 5,110                   | 5,110                | 5,110                   |
| Log-likelihood                          | -5,378                   | -5,283                  | -4,089               | -4,053                  |
| McFadden Pseudo R-squared               | 0.033                    | 0.05                    | 0.097                | 0.105                   |
| Wald Chi-squared                        | 366 ***                  | 554 ***                 | 876 ***              | 948 ***                 |
| Akaike information criterion (AIC)      | 10,765                   | 10,619                  | 8,198                | 8,168                   |
| Bayesian information criterion (BIC)    | 10,798                   | 10,789                  | 8,264                | 8,371                   |

**Abbreviations:** ASC, alternative-specific constant; SD, standard error; CI, confidence interval; NORC, National Opinion Research Center.

**Notes:** Standard errors in parenthesis; Statistical significance, +  $p < 0.1$ , \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ . Sample included  $n=730$  participants (web-based interview,  $n=728$ , telephone interview,  $n=2$ ) who completed all DCE choice tasks. Initial sample consisted of  $n=808$  unique respondents  $\geq 16$  years, recruited from NORC's AmeriSpeak Panel, who consented to participate in the DCE survey (web-based interview,  $n=806$ ; telephone interview,  $n=2$ ) programmed and fielded by NORC from May 4 to June 10, 2022, in both the English and Spanish languages. Models 1, 2, 3 and 4 refer, respectively, to the multinomial logit and mixed logit models, with and without the alternative-specific constants interacted with individual characteristics. All estimates are survey weighted, using study-specific final weights, to adjust for selection probabilities, nonresponse, and population benchmarks, and produce nationally representative estimates.

**Table 4.**  
Marginal rates of substitution between attribute levels of teen driving licensure systems

| Attribute Levels                              | Multinomial Logit Models |                         | Mixed Logit Models      |                        |
|-----------------------------------------------|--------------------------|-------------------------|-------------------------|------------------------|
|                                               | Model 1                  | Model 2                 | Model 3                 | Model 4                |
|                                               | Mean (95% CI)            | Mean (95% CI)           | Mean (95% CI)           | Mean (95% CI)          |
| <b>Reference Attribute Level: Easy test</b>   |                          |                         |                         |                        |
| Testing (ref. No test)                        |                          |                         |                         |                        |
| Easy test                                     | -                        | -                       | -                       | -                      |
| Hard test                                     | -0.50 *** (-0.69,-0.32)  | -0.50 *** (-0.69,-0.31) | -0.40 *** (-0.62,-0.19) | -0.35 ** (-0.56,-0.14) |
| Extended monitoring period, y                 | 0.21 (-0.07,0.48)        | 0.21 (-0.07,0.48)       | 0.33 * (0.05,0.61)      | 0.29 * (0.02,0.57)     |
| Intermediate licensure period, y              | 1.06 *** (0.53,1.59)     | 1.05 *** (0.52,1.58)    | 1.21 *** (0.69,1.72)    | 1.02 *** (0.56,1.47)   |
| <b>Reference Attribute Level: Hard test</b>   |                          |                         |                         |                        |
| Testing (ref. No test)                        |                          |                         |                         |                        |
| Easy test                                     | -1.98 *** (-2.73,-1.24)  | -2.00 *** (-2.76,-1.25) | -2.47 *** (-3.77,-1.17) | -2.85 ** (-4.57,-1.13) |
| Hard test                                     | -                        | -                       | -                       | -                      |
| Extended monitoring period, y                 | 0.41 (-0.21,1.03)        | 0.41 (-0.22,1.04)       | 0.81+ (-0.12,1.75)      | 0.84 (-0.23,1.90)      |
| Intermediate licensure period, y              | 2.09 ** (0.50,3.69)      | 2.10 * (0.49,3.72)      | 2.98 * (0.57,5.39)      | 2.90 * (0.28,5.51)     |
| <b>Reference Attribute Level: Monitoring</b>  |                          |                         |                         |                        |
| Testing (ref. No test)                        |                          |                         |                         |                        |
| Easy test                                     | 4.83 (-1.54,11.19)       | 4.84 (-1.57,11.25)      | 3.04 * (0.42,5.65)      | 3.41 * (0.25,6.57)     |
| Hard test                                     | 2.43 (-1.25,6.11)        | 2.42 (-1.26,6.09)       | 1.23+ (-0.19,2.65)      | 1.20 (-0.33,2.72)      |
| Extended monitoring period, y                 | -                        | -                       | -                       | -                      |
| Intermediate licensure period, y              | -5.09 * (-10.04,-0.14)   | -5.09 * (-10.04,-0.13)  | -3.67 ** (-5.92,-1.41)  | -3.46 ** (-5.81,-1.11) |
| <b>Reference Attribute Level: Wait period</b> |                          |                         |                         |                        |
| Testing (ref. No test)                        |                          |                         |                         |                        |
| Easy test                                     | 0.95 *** (0.47,1.42)     | 0.95 *** (0.47,1.43)    | 0.83 *** (0.47,1.18)    | 0.98 *** (0.54,1.42)   |
| Hard test                                     | 0.48 ** (0.11,0.84)      | 0.48 * (0.11,0.84)      | 0.34 * (0.06,0.61)      | 0.35 * (0.03,0.66)     |
| Extended monitoring period, y                 | -0.20 * (-0.39,-0.01)    | -0.20 * (-0.39,-0.01)   | -0.27 ** (-0.44,-0.11)  | -0.29 ** (-0.48,-0.09) |
| Intermediate licensure period, y              | -                        | -                       | -                       | -                      |

**Abbreviations:** CI, confidence interval; y, year; DCE, discrete choice experiment; NORC, National Opinion Research Center.

**Notes:** Standard errors in parenthesis; Statistical significance, + p < 0.1, \* p < 0.05, \*\* p < 0.01, \*\*\* p < 0.001. Sample included n=730 participants (web-based interview, n=728, telephone interview, n=2) who completed all DCE choice tasks. Initial sample consisted of n=808 unique respondents ≥16 years, recruited from NORC's AmeriSpeak Panel, who consented to participate in the DCE survey (web-based interview, n=806; telephone interview, n=2) programmed and fielded by NORC from May 4 to June 10, 2022, in both the English and Spanish languages. Models 1, 2, 3 and 4 refer, respectively, to the multinomial logit and mixed logit models, with and without the alternative-specific constants interacted with individual characteristics. All estimates are survey weighted, using study-specific final weights, to adjust for selection probabilities, nonresponse, and population benchmarks, and produce nationally representative estimates. Means and confidence intervals are from bootstraps.

**Table 5.**  
Relative importance of attributes of teen driving licensure systems

| Attributes                       | Multinomial Logit Models |                      | Mixed Logit Models   |                      |
|----------------------------------|--------------------------|----------------------|----------------------|----------------------|
|                                  | Model 1                  | Model 2              | Model 3              | Model 4              |
|                                  | Mean (95% CI)            | Mean (95% CI)        | Mean (95% CI)        | Mean (95% CI)        |
| Testing                          | 31.2 *** (29.5,33.0)     | 31.3 *** (29.6,33.1) | 26.3 *** (25.0,27.7) | 30.8 *** (29.3,32.4) |
| Extended monitoring period, y    | 6.0 *** (5.1,6.9)        | 6.0 *** (5.0,6.9)    | 9.5 *** (8.7,10.2)   | 8.6 *** (7.7,9.5)    |
| Intermediate licensure period, y | 62.8 *** (61.6,64.0)     | 62.7 *** (61.4,63.9) | 64.2 *** (63.1,65.4) | 60.5 *** (59.2,61.7) |

**Abbreviations:** MNL, multinomial logit; MIXL, mixed logit; CI, confidence interval; NORC, National Opinion Research Center.

**Notes:** The relative importance of each attribute  $i$  ( $ARI_i$ ) was calculated as  $ARI_i = 100 \times (\overline{U}_i - \underline{U}_i) / \sum_{j=1}^J (\overline{U}_j - \underline{U}_j)$ , where  $\overline{U}_i$  and  $\underline{U}_i$  denote, respectively, the largest and smallest utility level of attribute  $i$ . Bars represent the bootstrap means with  $N=50$  sampled values and  $R=500$  replications; 95% CIs are bootstrap confidence interval around the bootstrapped means. Values for the coefficients were sampled from a multivariate normal distribution, using the mean and variance-covariance matrices from the choice models (MNL and MIXL). Sample included  $n=730$  participants (web-based interview,  $n=728$ , telephone interview,  $n=2$ ) who completed all DCE choice tasks. Initial sample consisted of  $n=808$  unique respondents  $\geq 16$  years, recruited from NORC's AmeriSpeak Panel, who consented to participate in the DCE survey (web-based interview,  $n=806$ ; telephone interview,  $n=2$ ) programmed and fielded by NORC from May 4 to June 10, 2022, in both the English and Spanish languages. Models 1, 2, 3 and 4 refer, respectively, to the multinomial logit and mixed logit models, with and without the alternative-specific constants interacted with individual characteristics. All results are survey weighted. Statistical significance, +  $p < 0.1$ , \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ .