



Children's Safety  
Network



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August 23, 2021

2:00 p.m.- 3:00p.m. ET

# Teen Driving Safety: Recent Research and Implications for Prevention



# Moderator



**Sally Thigpen, MPA**

Health Scientist  
Division of Injury Prevention (DIP)  
Centers for Disease Control and Prevention

# Funding Sponsor

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# Technical Tips



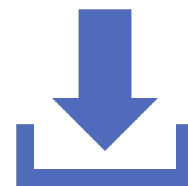
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This session is being recorded



# Speakers



**Dr. Barbara C. Banz, Ph.D**

Assistant Professor of Emergency Medicine  
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**Dr. Federico Vaca, MD, MPH**

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# NEUROSCIENCE OF DRIVING AND THE UNIQUE COMPLEXITIES OF TEEN DRIVING

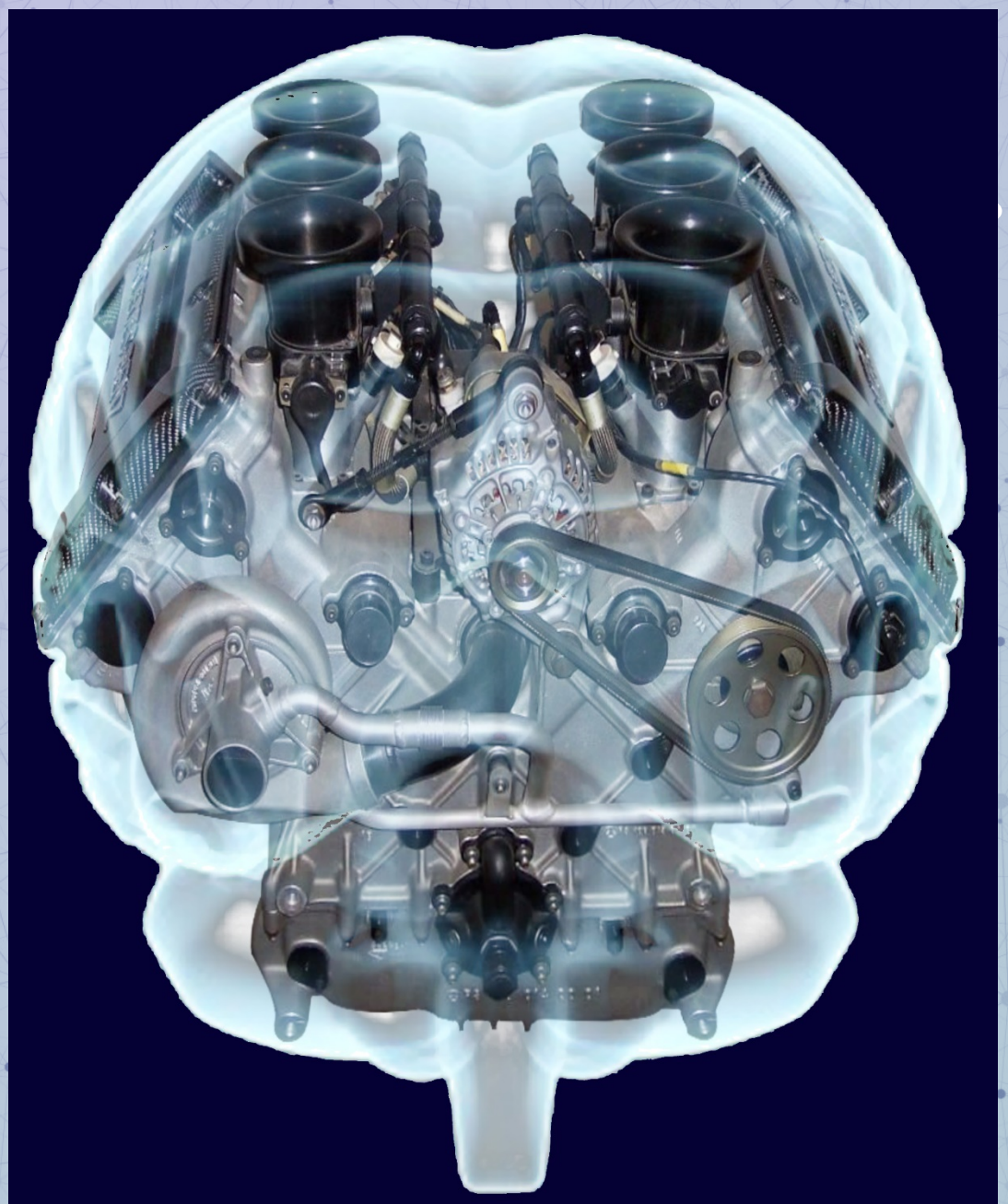
Barbara C. Banz, PhD

Assistant Professor, Dept Emergency Medicine  
Yale University School of Medicine



## Yale DrivSim Lab

Studying development, neural processing, and behavior  
to make young drivers safer sooner



# Teen Driver Motor Vehicle Crashes

- Motor vehicle crashes are the **leading** cause of death for youth.
- First-year drivers are **4.5x** as likely to be in fatal motor vehicle crash
- Public health concern:
  - Injuries outnumber fatalities 100 to 1





# Teen Driver Behaviors

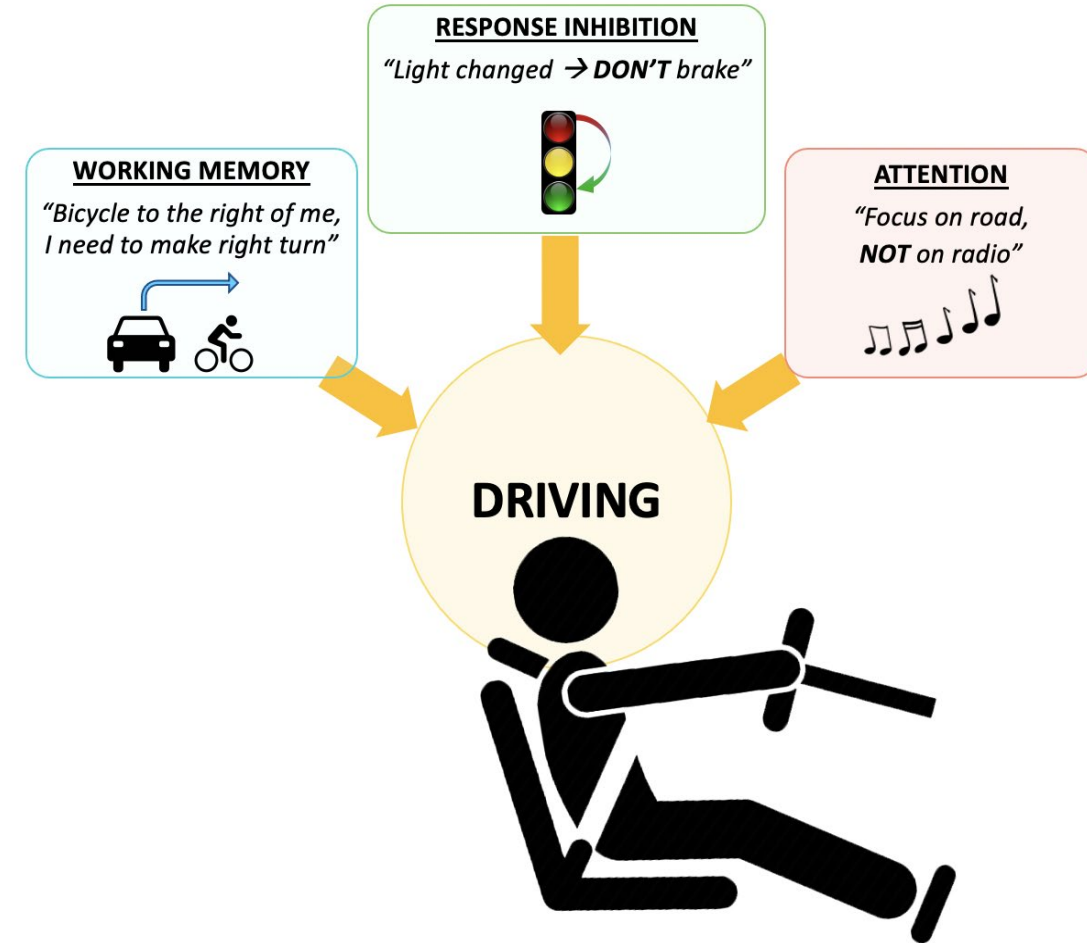
- Inexperience
  - “Rules of the Road”
  - Dangerous driving environments
- Vehicle control
  - Overcorrections in steering
  - Tailgating
- Seat belts





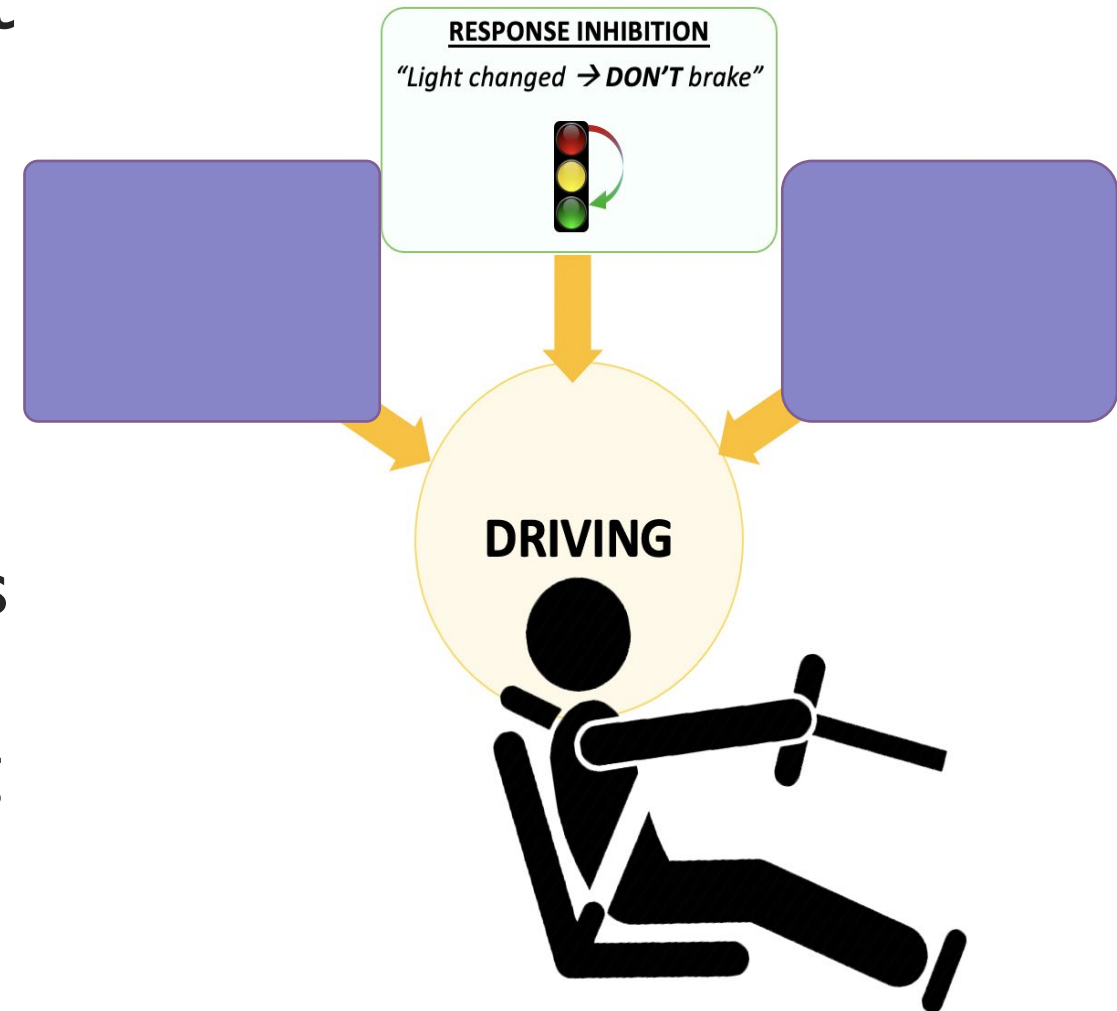
# Teen Driving: Unique Complications

- Highly complex behavior
  - Motor skills
  - Cognitive faculties
- Prefrontal cortex development
  - Mid 20s
  - Cognitive development
  - Naturally occurring imbalance
- Response inhibition, working memory, attention (Walshe, et al., 2017)



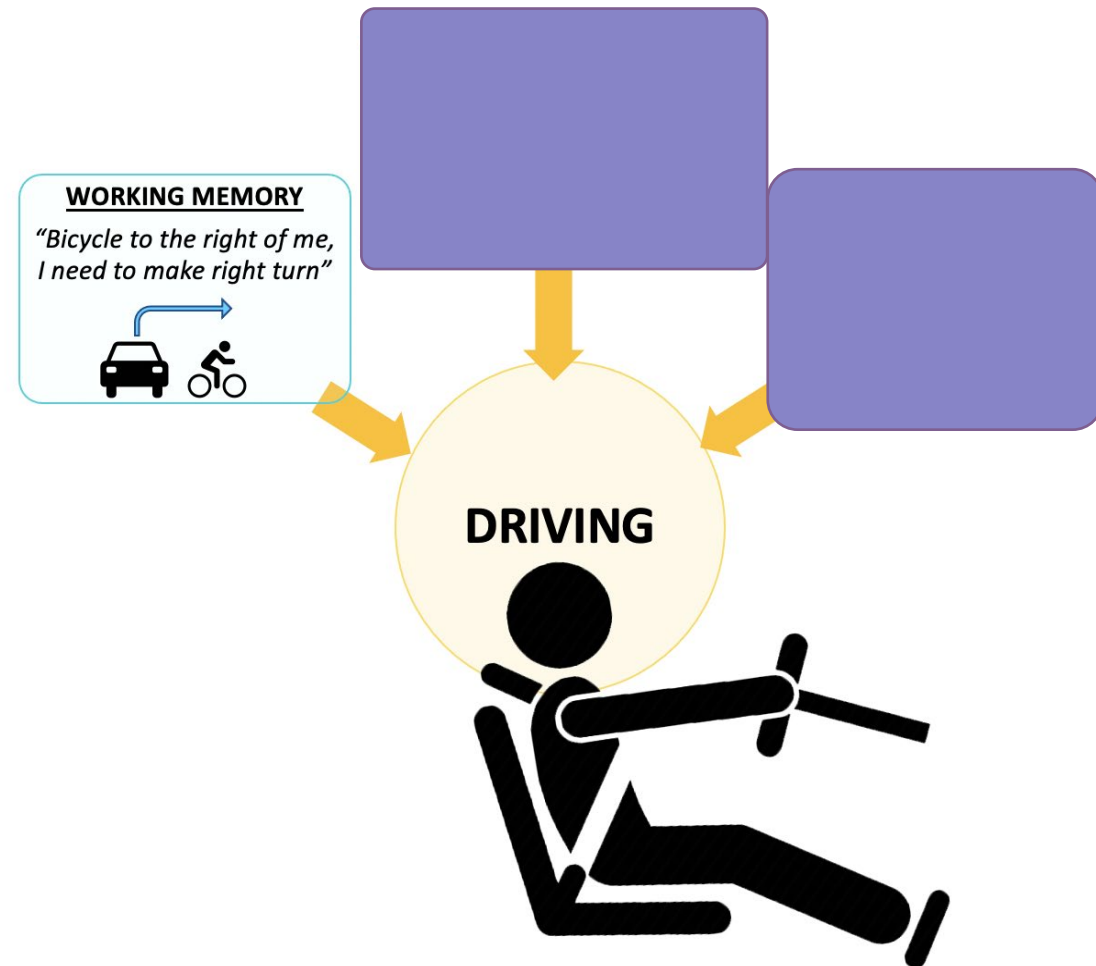
# Response Inhibition & Youth Driving

- Response Inhibition: Stop dominant response
- Simulated driving
  - Speeding, turning with oncoming traffic, more MVCs, slower response to hazards
- Riskier real-world driving behaviors
  - Traffic violation tickets, ticketed speeding, lane maintenance, speeding with peer passengers



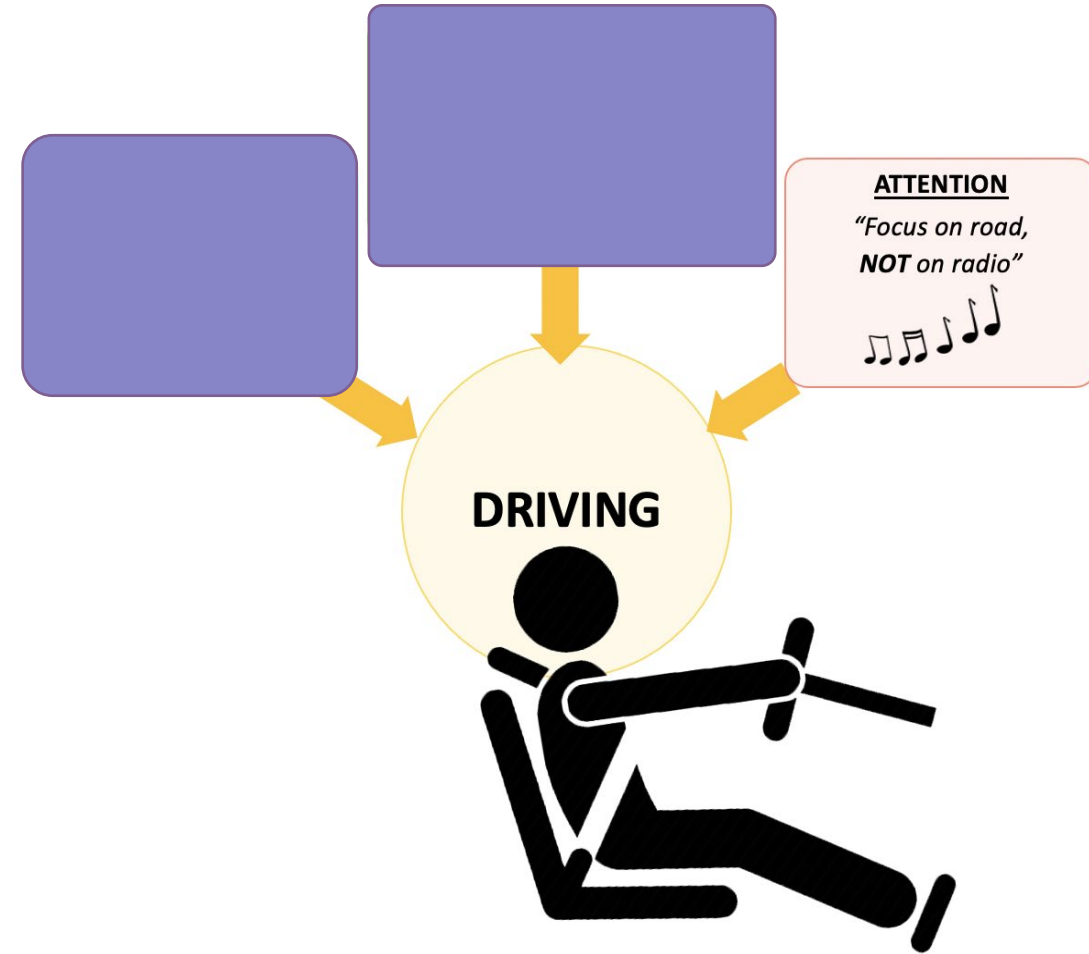
# Working Memory & Youth Driving

- Working Memory: Hold and manipulate
- Simulation studies
  - Lane maintenance, vehicle control
- Report of riskier driving profiles



# Attention & Youth Driving

- Attention: focus on info needed to achieve goal
- Distracted driving is a major public health concern
  - 9 deaths per day
  - +1000 injuries per day
- Driving environment is getting more complex.





# Psychosocial Development



- Who is influencing?
  - Parent/family → Peer
- Behind the simulated wheel:
  - Narrower visual scan patterns
  - Riskier driving behavior
- Teens are more likely to end up in a fatal motor vehicle crash with a passenger.

# Teen Driving: Unique Concerns

## **ALCOHOL**

- Brain function
- Sober driving behaviors



## **CANNABIS**

- Brain function
- Legislation changes



# Future Unique Concerns

- COVID
  - Driver behaviors
    - Less driving → unpracticed
    - Riskier driving behaviors
  - Alcohol and Marijuana use remains a problem

**Another COVID-19 Fallout: Teens' Happy Hour With Parents**






# What can we do to help keep teens safe?







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to make young drivers safer sooner 



# Speakers



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# Factors Contributing to Delay in Driving Licensure Among Teens:

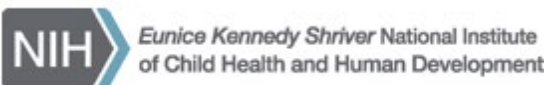
## *A Case for Bolstering GDL Policies*

*Federico E. Vaca, MD, MPH*

*Professor of Emergency Medicine*

# Thank You

- Co-Authors: Kaigang Li; Selam Tewahade; Xiang Gao; Katie Zagnoli; Haonan Wang; James C. Fell; Denise L. Haynie; Bruce G. Simons-Morton; Eduardo Romano
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# Licensure in the U.S.

- In **2019**, 228.7 million licensed driver
- 15 – 20y/o drivers = 12.0 million
  - 5.3% of all U.S. licensed drivers



# Young Driver Licensure

- In **2010**, 13 million licensed young drivers
  - Comparatively a 7.3% decrease (2010 – 2019)
    - U.S. population: 4.5% decrease in 15 – 20 y/o (2010 – 2019)

# U.S. Fatal Crashes

- In 2019, 36,096 killed in crashes
  - 10,142 alcohol-impaired-driving fatalities
    - 28 deaths/day
- 2,740,000 injured in crashes
- Young drivers made up 7.8% of ALL drivers involved in fatal crashes

# Young Driver Fatal Crashes

- In 2019, 3698 young drivers involved in a fatal crash and 1,603 young drivers killed
  - 205,000 young drivers injured
- 386 young driver fatal crash deaths were alcohol related (24% of all young driver deaths)
- 318 young drivers killed in alcohol-related crashes had a BAC of  $\geq 0.08$ 
  - **82%** of all young driver alcohol-related deaths
  - **60%** percent of young drivers who were drinking and killed in a crashes were unrestrained



# Graduated Driver Licensing

- GDL as early as 1987 Netherlands and then in 1996 Florida
- Studies of GDL have shown a 20 – 40% decrease in fatal crashes
  - Restrictions on nighttime driving and passengers in the vehicle –pivotal facets of the safety GDL offers
- Suggested safety limitations of GDL among vulnerable youth groups (Romano E, 2011)

# Delay in Driving Licensure (DDL) – “Why?”

- Comparatively a 9.9% decrease (2009 – 2018)
  - 13.3 million → 12.0 million – young drivers
- A few considerations for DDL from literature
  - Social media - easier to connect
  - GDL mandated supervised practice driving hours
  - Economics - vehicle cost and maintenance
  - Other demographic and social characteristics e.g., race/ethnicity, parental approval of licensure, parent unavailability

(Masten SV, 2011; Sivak M, 2012; Tefft BC, 2012; Shults RA, 2013; McDonald NC; 2016)

# Drilling Down Further in Factors that Contribute to DDL

Journal of Adolescent Health 68 (2021) 191–198



Original article

## Factors Contributing to Delay in Driving Licensure Among U.S. High School Students and Young Adults



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<sup>f</sup>Division of Intramural Population Health Research, Eunice Kennedy Shriver National Institute of Child Health and Human Development, Bethesda, Maryland

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Article history: Received November 8, 2019; Accepted May 1, 2020

Keywords: Delay in driving licensure; Young drivers; Disparities; Graduated driving licensure; Parent monitoring

### ABSTRACT

**Purpose:** More teens delay in driving licensure (DDL). It is conceivable they miss Graduated Driver Licensing (GDL) safety benefits. We assessed prevalence, disparities, and factors associated with DDL among emerging adults.

**Methods:** Data used were from all seven waves (W1–7) of the NEXT Generation Health Study (W1 in 10th grade [2009–2010]). The outcome variable was DDL (long-DDL [delayed >2 years], intermediate-DDL [delayed 1–2 years] versus no-DDL), defined as participants receiving driver licensure ≥ 1 year after initial eligibility. Independent variables included sex, urbanicity, race/ethnicity, family structure, parental education, family affluence, parental monitoring knowledge, parent perceived importance of alcohol nonuse, and social media use. Logistic regressions were conducted.

**Results:** Of 2,525 participants eligible for licensure, 887 (38.9%) reported intermediate-DDL and 1,078 (30.1%) long-DDL. Latinos (adjusted odds ratio [AOR] = 2.5 vs. whites) and those with lower affluence (AOR = 2.5 vs. high) had higher odds of intermediate-DDL. Latinos (AOR = 4.5 vs. whites), blacks (AOR = 2.3 vs. whites), those with single parent (AOR = 1.7 vs. both biological parents) whose parents' education was high school or less (AOR = 3.7 vs. bachelor+) and some college (AOR = 2.0 vs. bachelor+) levels, and those with lower affluence (AOR = 4.4 vs. high) had higher odds of long-DDL. Higher mother's monitoring knowledge (AOR = .6) was associated with lower odds of long-DDL, but not intermediate-DDL.

**Conclusions:** Some teens that DDL "age out" of protections afforded to them by GDL driver restrictions. Minority race/ethnicity, socioeconomic status, urbanicity, and parenting factors contribute to DDL. Further study of these factors and their individual/collective contributions to DDL is needed to understand potential unintended consequences of GDL, particularly in more vulnerable youth.

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### IMPLICATIONS AND CONTRIBUTION

Delay in driving licensure was widespread and nearly 70% of eligible adolescents delayed at least one year to obtain their licensure. This study identifies the variety of factors that contribute to teen delaying driving licensure that could potentially lead some vulnerable teens to miss GDL policy driver safety benefits.

**Conflicts of interest:** The authors have no conflicts of interest to declare.  
**Disclaimer:** The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

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E-mail address: kaigang.li@colostate.edu (K. Li).

- Objective:  
To assess the prevalence, differences/disparities, and factors associated with DDL among teens and young adults

Vaca FE, Li K, Tewahade S, Fell JC, Haynie DL, Simons-Morton BG, Romano E. Factors Contributing to Delay in Driving Licensure Among U.S. High School Students and Young Adults. J Adolesc Health. 2021 Jan;68(1):191-198.



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# Studying DDL in NEXT Gen Health Study

- 7 waves of the NEXT Generation Health Study
  - Nationally representative cohort of U.S. 10th grade students (16 y/o) - into emerging adulthood
  - Primary sampling units (PSU, school districts) from the nine U.S. Census divisions
- 2,785 cohort members participated in the study
- African-American participants were over sampled to provide more accurate population estimates and to provide an adequate sample to examine racial/ethnic differences



# DDL & Other Measures

- Delay in Driving Licensure (DDL): Any delay in licensure past the earliest time a participant is legally eligible for licensure
  - No-DDL
  - Intermediate-DDL [1-2 years]
  - Long-DDL [>2 years]
- Sex, urbanicity, race/ethnicity, family structure, parental education, family affluence, parental monitoring knowledge, perceived importance of alcohol non-use to parent, social media use

# Analysis

- Multinomial logistic regressions were conducted to assess the associations between DDL and the identified independent variables
- Bivariate association of the outcome variable with any of the independent variables was first examined and those that were associated with the outcome variable were included in adjusted models

# Summary of Main Findings

- 2,525 were eligible for licensure over 7 interview waves (female, 45.5%)
  - Intermediate-DDL: 887 (1-2 years (38.9%))
  - Long-DDL: 1,078 (>2 years (30.3%))
- Latino youth: 2.5 and 4.5 times greater odds of Intermediate and Long-DDL
- Non-Latino Black youth: 2.3 times greater odds of Long-DDL
- Those living in a single parent family had 1.7 times greater odds of Long-DDL

# Summary of Main Findings

- Those with parents' highest-level education of  $\leq$  high school or some college had a 3.7 and 2.0 times greater odds of Long-DDL
- Youth reporting low family affluence had a 2.5 and 4.4 times greater odds of Intermediate and Long-DDL
- Urban and suburban youth had 1.9 and 3.5 times greater odds of Long-DDL
- Those with a high mother's parental monitoring knowledge had a **lower odds** (AOR = 0.6) of Long-DDL

# Limitations

- Lack of exact date on which participants obtained their driver's license → calculated DDL
- School-based recruitment limits generalization
- Participant self-reports of parental monitoring knowledge
- Family affluence, a validated measure, is not to be equated as household income



# Implications of Findings & Questions

- Latino and Non-Latino Black teens are more likely to DDL
- Socioeconomic and parenting factors contribute to DDL
- Could those that DDL miss out on driver safety and crash prevention benefits of GDL in a meaningful way?
- Could extending GDL broaden the base of GDL's demonstrated safety benefits for young drivers who would otherwise DDL?



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# Time to Licensure for Driving Among U.S. Teens

TRAFFIC INJURY PREVENTION  
2021, VOL. 22, NO. 6, 431-436  
<https://doi.org/10.1080/15389588.2021.1939871>



Check for updates

## Time to licensure for driving among U.S. teens: Survival analysis of interval-censored survey data

Federico E. Vaca<sup>a</sup>, Kaigang Li<sup>a,b,c</sup>, Xiang Gao<sup>b</sup>, Katie Zagnoli<sup>d</sup>, Haonan Wang<sup>d</sup>, Denise L. Haynie<sup>e</sup>, James C. Fell<sup>f</sup>, Bruce Simons-Morton<sup>g</sup> , and Eduardo Romano<sup>g</sup>

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### ABSTRACT

**Objective:** Novice drivers who delay in driving licensure may miss safety benefits of Graduate Driver Licensing (GDL) programs, potentially putting themselves at higher crash-risk. Time to licensure relates their access to independent transportation to potential future economic- and educational-related opportunities. The objective of this study was to explore time to licensure associations with teens' race/ethnicity and GDL restrictions.

**Methods:** Secondary analysis using all seven annual assessments of the NEXT Generation Health Study, a nationally representative longitudinal study starting with 10th grade ( $N=2785$ ; 2009–2010 school year). Data were collected in U.S. public/private schools, colleges, workplaces, and other settings. The outcome variable was interval-censored time to licensure (event = obtained driving licensure). Independent variables included race/ethnicity and state-specific GDL restrictions. Covariates included family affluence, parent education, nativity, sex, and urbanicity. Proportional hazards (PH) models were conducted for interval-censored survival analysis based on stepwise backward elimination for fitting multivariate models with consideration of complex survey features. In the PH models, a hazard ratio (HR) estimates a greater ( $>1$ ) or lesser ( $<1$ ) likelihood of licensure at all timepoints.

**Results:** Median time to licensure after reaching legal driving age for Latinos, African Americans, and Non-Latino Whites was 3.47, 2.90, and 0.41 years, respectively. Multivariate PH models showed that Latinos were 46% less likely ( $HR = 0.54$ , 95%CI: 0.35–0.72) and African Americans were 56% less likely ( $HR = 0.44$ , 95%CI: 0.32–0.56) to have obtained licensure at any time compared to Non-Latino Whites. Only learner minimum age GDL restriction was associated with time to licensure. Living in a state with a required learner driving minimum age of  $\geq 16$  years ( $HR = 0.57$ , 95%CI: 0.16–0.98) also corresponded with 43% lower likelihood of licensure at legal eligibility compared to living in other states with a required learner driving minimum age of  $<16$  years.

**Conclusions:** Latinos and African American teens obtained their license approximately three years after eligibility on average, and much later than Non-Latino Whites. Time to licensure likelihood was associated with race/ethnicity and required minimum age of learner permit, indicating important implications for teens of different racial/ethnic groups in relation to licensure, access to independent transportation, and exposure to GDL programs.

### ARTICLE HISTORY

Received 29 September 2020  
Accepted 3 June 2021

### KEY WORDS



Graduate driver licensing;  
novice drivers; time to  
licensure; survival analysis

### Introduction


Teens in the U.S. are at a high risk for serious nonfatal injury, disability, and death caused by motor vehicle crashes and motor-vehicle crashes are the leading cause of unintentional injury death for male and female youth aged 16–20 years (Webb 2018, February).

To reduce the overall risk of motor vehicle crashes among teens, Graduated Driver Licensing (GDL) programs were put in place to allow novice teen drivers to safely gain driving experience before obtaining full independent driving

privileges. Previous studies have indicated that comprehensive GDL programs are significantly associated with reducing fatal crash involvement by 20% to 40% among teen drivers (Shope 2007). Beginning in 1996, the adoption of GDL policies in all states began with the incorporation of additional novice driver requirements and restrictions during the learning period (Williams et al. 2016). In GDL policy practice, teen drivers are generally supervised by experienced licensed drivers, restricted in driving certain numbers of young passengers, mandated to log a policy-defined number

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Associate Editor Douglas Gabauer oversaw the review of this article.

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- Objective: To explore time to licensure associations with teens' race/ethnicity and GDL restrictions

Vaca FE, Li K, Gao X, Zagnoli K, Wang H, Haynie DL, Fell JC, Simons-Morton B, Romano E. Time to licensure for driving among U.S. teens: Survival analysis of interval-censored survey data. Traffic Inj Prev. 2021;22(6):431-436.

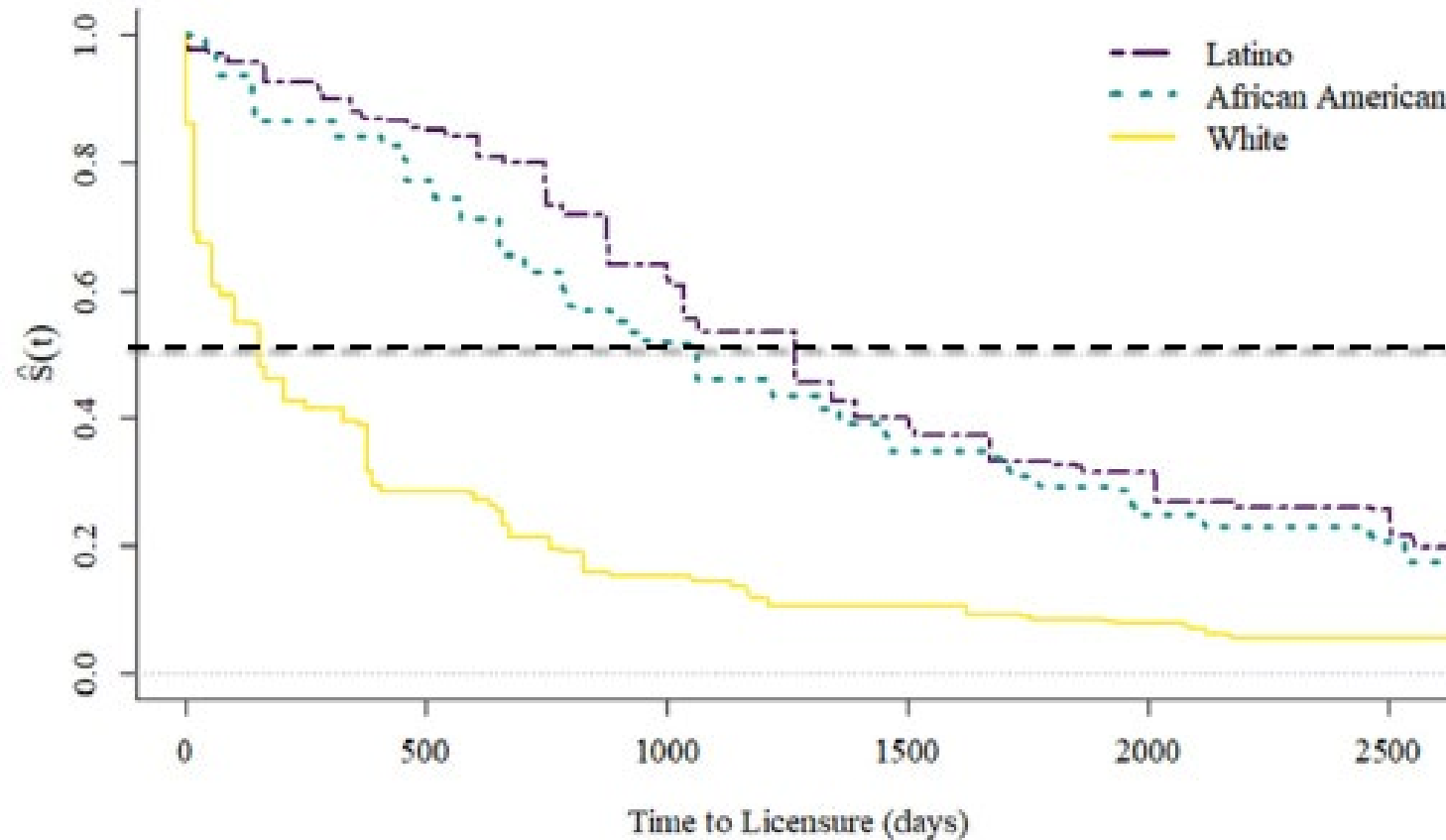


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# Survival Curves for Time to Licensure Among Latinos, African Americans, and Whites



*Note.* The straight horizontal dotted line indicates median time to licensure.  
NPMLE: the non-parametric maximum likelihood estimator.

# Study Conclusions

- On average, Latinos and African American teens obtained their license approximately three years after legal eligibility and much later than Non-Latino Whites
- Time to licensure likelihood was associated with race/ethnicity and required minimum age of learner permit, indicating important implications for teens of different racial/ethnic groups in relation to licensure, access to independent transportation, and exposure to GDL programs

# Clarifications & Next Step Considerations

- We don't imply that teens receive licensure at an earlier age simply to avoid DDL – more complexity here
- We don't explicitly aim to identify if earlier licensure promotes safe driving outcomes
- Our findings provide valuable information to the older novice driver-GDL discussion
- There is room to explore GDL modifications and bolstering parenting practices in the context reducing DDL so that teens don't “age out” of GDL driver safety facets



# Clarifications & Next Step Considerations

- More detailed examination of factors that contribute to DDL (e.g., cultural, family) could inform interventions focused on the safety of more vulnerable youth groups
- Future research should intentionally address the individual economic and safety impact that DDL may have on all adolescent and young adult novice drivers



# Questions and Answers



Please enter your questions in the Q & A pod

# Thank you!

Please fill out our evaluation: <https://www.surveymonkey.com/r/W7FPM5M>



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