

# Driving behaviors and related factors on emerging adults: a narrative review

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Received: 5 July 2023 / Accepted: 25 September 2023

Published online: 02 October 2023

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## Abstract

Recent studies have linked driving licensure, delay in driving licensure, and driving exposure to alcohol and drug use, parental monitoring, and peer influence. Early licensure and increased driving exposure were linked to higher alcohol and drug use, while parental monitoring knowledge may be associated with lower use. Health, education, and employment also may be affected, with early licensure and increased driving exposure linked to better outcomes. To reduce use among emerging adults, parents must equip them with effective prevention knowledge and be mindful of driving exposure and delay. Investing in programs to promote licensure and driving may help emerging adults obtain better health and prosperity, although the potential advantages of driving privileges must be balanced against earlier and greater driving exposure to alcohol and drug use.

**Keywords** Emerging adults · Driving privileges · Substance use · Peer influence · Health outcomes

## 1 Introduction

Transportation is a vital structural facet of society, communities, and people's lives [1]. At the individual level, the word transportation is an image of someone driving a car or truck [1]. Cars are a crucial element of American's daily life [2]. There were 228.2 million licensed drivers in the United States in 2020 [3]. Emerging adult drivers, persons 15 to 20 years old operating a vehicle, accounted for 11.6 million (5.1%) of all licensed drivers in 2020 [3].

For many emerging adults, obtaining a driver's license is seen as a rite of passage into adulthood. Driving is an essential process of growing up and entering adulthood, and it has become an established aspect of emerging adults' maturation and socialization process [4]. Learning to drive is an important rite of passage, particularly in the United States, where limited public transportation in many areas can mean that the ability to drive is a key to independence [4]. Time to licensure varies among those who obtained a driver's license as an emerging adult. Many emerging adults get their driver's licenses when they reach state-legal driving age. However, some choose to delay in driving licensure (DDL). A nationally representative US emerging adult cohort study has shown that DDL was widespread among emerging adult drivers [5]. Nearly 70% of eligible adolescents who reach state-legal driving age delayed at least one year prior to obtaining their licenses during 2010–2017 [5]. Besides DDL, the extent of emerging adult exposure to driving after licensure (driving frequency and miles driven) may differ. Nevertheless, for emerging adult drivers, a certain level of driving exposure and experience to learn how to drive is necessary before they become safe drivers [6].

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Previous research speculates that social media may allow youth to connect to friends digitally and decrease the need for in-person connection, thus reducing the need for a driver's license to travel for connection [7]. Some researchers also speculate that the built environment (e.g., living in a highly walkable environment to commute between home and school/work) [8], graduated driving licensing policy (e.g., mandated supervised practice driving hours with adult supervision before getting an independent license) [9], and economic burdens (e.g., not being able to afford the cost and maintenance of a vehicle) [10, 11] as possible reasons for the increased numbers of emerging adults that DDL. Other possible explanations for DDL that have been explored include sociodemographic variables like race/ethnicity (e.g., African Americans vs. White) [10], family structure [e.g., living with a single parent vs. both biological parents] [12], and family affluence (e.g., low vs. high) [13–15]. While previous research has investigated sociodemographic variables, including minority race/ethnicity, socioeconomic status, urbanicity, and parental monitoring knowledge associated with DDL [5], the current knowledge base still has a limited understanding of sociodemographic variables associated with driving licensure (having licensure vs. no licensure) and driving exposure (driving frequency and miles driven). More comprehensive studies of sociodemographic variables are needed to assess their associations with driving licensure and driving exposure.

The advantages and disadvantages of emerging adults having a driver's license continue to be debated. Families can benefit from emerging adult drivers who can transport themselves to school and run errands. From a developmental perspective, driving licensure may have potential benefits for emerging adult outcomes, specifically on health, education, and employment, which would allow them to flourish in early adulthood. Previous studies indicate that driving facilitated greater adolescent independence and mobility, thus allowing them to access important health, education, and employment opportunities [16–20]. Evidence suggests that youth with consistent access to vehicle are more likely to access healthcare services than those with limited access to transportation [21, 22]. A cross-sectional study found that emerging adult drivers had higher average weekly salaries and demonstrated greater academic performance than non-drivers [23]. However, having a driver's license can increase the likelihood of alcohol and drug use [24] and associated motor vehicle crash risks [25] among emerging adults. The potential advantages of early licensure (i.e., within state-specific legal eligibility) must be balanced against the relatively earlier and greater driving exposure to risky behaviors (e.g., alcohol and drug use [24]) and related motor vehicle crash risk [25]. However, prospective associations of driving licensure (having licensure vs. no licensure), DDL (no delay in driving licensure vs. delay in driving licensure) and driving exposure (driving frequency and miles driven) with early adult health, education, and employment have not been fully assessed.

While obtaining a driver's license and driving are typically seen as important developmental milestones that can bring numerous advantages to the life course of emerging adults, it has been suggested that licensure and engaging in driving may increase risk of crashing and resulting in injury, which can have a negative impact on physical, mental, and social development [4]. For emerging adult drivers, the current literature base primarily focuses on transportation risks, including crash-related injury, disability, death, and harm to others [26–29]. There is limited study investigating the association between driving licensure, DDL, and driving exposure with nontraffic health risks (e.g., alcohol and drug use). Potential nontraffic health risks may coexist during emerging adulthood. When emerging adults are licensed and exposed to driving, they have more opportunities for participating in nontraffic risk behaviors (e.g., alcohol and drug use) and interacting with peers who engage in such nontraffic risk behaviors (e.g., peer alcohol and drug use) [10]. Previous research found that obtaining a driver's license may increase the frequency of alcohol and drug use among long-term licensed emerging adult drivers [30]. However, the research on driving licensure, DDL, and what extent to which driving exposure to driving after licensure (driving frequency and miles driven) are associated with alcohol and drug use and peer alcohol and drug use is limited.

Further, parents have important roles to play concerning their novice emerging adult drivers who are licensed and introduced to driving. For example, parents may influence whether their emerging adults are ready to test for a learner's permit, how long and what type of supervised practice driving they will receive, whether they are prepared to test for an independent license, and whether they are allowed to access a vehicle, and what their driving privileges are after getting an independent license [31, 32]. However, the actual role of driving licensure, delay in driving licensure, and driving exposure on parental monitoring knowledge have yet to be fully investigated. Although some studies have been conducted on the subject, the findings are inconsistent [33, 34]. One research shows that parental monitoring knowledge is lower when emerging adults obtain their licenses at an earlier age, suggesting that there is a link between driving licensure and parental monitoring knowledge [33]. On the other hand, other research shows that parental monitoring knowledge is higher when emerging adults obtain their licenses at an earlier age, providing contradictory evidence to the previous study [34]. This discrepancy indicates that further research is needed to determine the association between driving licensure, delay in driving licensure, and driving exposure on parental monitoring knowledge.

In summary, the current knowledge base shows limited investigation into driving licensure (having licensure vs. no licensure), DDL (no delay in driving licensure vs. delay in driving licensure) and driving exposure after licensure (driving frequency and miles driven) effects on alcohol and drug use, parent monitoring knowledge, peer alcohol and drug use, and early adult health, education, and employment. The need for this narrative literature review is that the potential advantages of having licensure, no delay in driving licensure, and more driving exposure on health, education, and employment must be balanced against the relatively earlier and greater driving exposure to alcohol and drug use. This review may provide guidance on how to reduce the risk of alcohol and drug use and promote positive health outcomes among emerging adults when they have earlier licensure, no delay, and more driving exposure. The purpose of this review is to assess the associations of driving licensure, DDL, and driving exposure after licensure with alcohol and drug use, parent monitoring knowledge, peer alcohol and drug use, and health, education, and employment in emerging adulthood. The identified key questions for the review topic are to:

Question 1: How are driving licensure status (having licensure vs. no licensure) and driving exposure (driving frequency and miles driven) in emerging adulthood associated with sociodemographic variables?

Question 2: How are driving licensure status (having licensure vs. no licensure), DDL (no delay in driving licensure vs. delay in driving licensure), and driving exposure (driving frequency and miles driven) associated with alcohol drinking, binge drinking, and drug use trajectory classes in emerging adulthood?

Question 3: How are driving licensure status (having licensure vs. no licensure), DDL (no delay in driving licensure vs. delay in driving licensure), and driving exposure (driving frequency and miles driven) associated with parental monitoring knowledge and peer alcohol and drug use in emerging adulthood?

Question 4: How are driving licensure status (having licensure vs. no licensure), DDL (no delay in driving licensure vs. delay in driving licensure), and driving exposure (driving frequency and miles driven) associated with their health, education, and employment four years after high school?

## 2 Methods

This narrative literature review searched for qualitative and quantitative studies on the association of driving licensure, delay in driving licensure, and driving exposure with alcohol and drug use, parental monitoring knowledge, peer alcohol and drug use, and health, education, and employment of emerging adults. This narrative review was carried out over a period of one year from December 2021 to December 2022 by a single investigator.

### 2.1 Search strategy

Data for this narrative review was collected through a comprehensive search of five academic databases to capture published or otherwise publicly accessible information relevant to driving licensure, delay in driving licensure, and driving exposure with alcohol and drug use, parental monitoring knowledge, peer alcohol and drug use, and health, education, and employment of emerging adults. The five databases searched were PubMed, Google Scholar, PsycINFO, Web of Science, and Scopus. The keyword search was based on combinations of the following: "driving licensure" OR "delay in driving licensure" OR "driving exposure" AND "alcohol use" OR "drug use" OR "substance use" OR "substance abuse" OR "substance misuse" AND "parental monitoring" OR "monitoring by parents" OR "parental supervision" OR "parental control" OR "monitoring by family members" OR "family supervision" OR "emerging adulthood" OR "emerging adulthood stage" OR "transition period" OR "adult transition" OR "transition to adulthood." These databases were chosen because they cover international research and have indexed and abstracted studies on the topic of interest.

### 2.2 Study selection and extraction

In order to explore the topic of driving licensure, delay in driving licensure, and driving exposure associated with alcohol and drug use, parental monitoring knowledge, peer alcohol and drug use, and health, education, and employment of emerging adults, a narrative review was conducted. This narrative review included studies published in English between 1990 and 2023. The search was conducted through a range of integrated sources including academic search engines, bibliographical databases, and other open access sources. The first step of the data extraction process involved identifying potentially relevant studies by title and abstract. All studies were then assessed for eligibility according to pre-specified criteria before being included in the review. These criteria included: (1) studies published in English; (2) studies focusing

on emerging adults between the ages of 17–25; (3) studies conducted within the last 30 years; and (4) studies exploring the topic of driving licensure, delay in driving licensure, and driving exposure associated with alcohol and drug use, parental monitoring, knowledge, peer alcohol and drug use, and health, education, and employment of emerging adults. Data from the included studies were extracted into Microsoft Excel and analyzed according to the research aims of the review. The extracted data included information regarding study design, study year, participants' characteristics, and key findings pertaining to the review topic.

### 2.3 Quality assessment

In order to ensure that all of the appropriate studies were included, the search terms were kept broad, and the exclusion criteria was kept as narrow as possible. All studies used in this review were evaluated for quality. The quality of study methods was assessed according to the Quality Assessment Criteria for Quantitative Studies guidelines developed by the Centre for Reviews and Dissemination [35].

## 3 Discussion

### 3.1 Licensure and driving as a pivotal point in emerging adulthood

#### 3.1.1 Emerging adulthood

Emerging adulthood, spanning from late teens to the mid-twenties (approximately 18–25 years old) [36], is an essential transitional phase in which adolescents finish their primary and secondary education and begin to pursue full-time employment, enter marriage, and become parents [36, 37]. Most emerging adults, unlike young adults in their thirties, have yet to establish long-term commitments in both their relationships and careers [36, 37]. During emerging adulthood, most emerging adults also start to learn to drive and get driver's licenses. For many emerging adults, driving is seen as a pivotal moment in the transition between childhood and adulthood. Gaining a driver's license is a crucial milestone, particularly in the United States, where numerous regions lack sufficient public transportation options, highlighting the significance of driving as a key component toward achieving personal freedom and autonomy [4]. Relying on others for transportation could have adverse consequences for emerging adults, such as missing out on social engagements and job prospects. Additionally, there is a heightened risk when hitching rides with inexperienced drivers who lack substantial drive experience. Enabling emerging adults to obtain their driver's license offers them independence and the ability to exert greater control over their destinations, companions, and duration of travel.

#### 3.1.2 Driving licensure process

In the 1990s, states introduced laws known as Graduated Driver Licensing (GDL) laws. The GDL laws have been formulated at the state level with the deliberate aim of safely and progressively assimilating young drivers who are new to the road into the driving community. The GDL program offers young drivers the opportunity to safely gain driving experience before being granted full driving privileges. The GDL programs and restrictions vary from state to state [38, 39]. Typically, GDL programs encompass three distinct phases that young drivers must progress through: obtaining a learner's permit, obtaining an intermediate license, and eventually obtaining a full privilege or unrestricted license. During the learner stage, emerging adults are required to have a licensed adult driver company them while driving [9]. Emerging adult drivers with learner's permits are obligated to complete a designated number of supervised driving practice hours as determined by the policy [9]. Additionally, emerging adults are initially prohibited from driving during late-night hours [9]. An intermediate stage of licensure limits unsupervised driving in high-risk situations [40]. Under the intermediate stage of licensure, there are typically two common restrictions that young drivers face: limitations on driving at night and restrictions on having other emerging adult passengers in the vehicle [40]. Emerging adult drivers with a full independent license can drive independently, and previous restrictions like nighttime driving and driving with emerging adult passengers are lifted. The legal driving age varies among the various states in the U.S., with the minimum age for a permit ranging from 14 to 17 years. For an independent license, the ages can often range from 16.5 to 18 years [41]. Further, the time taken to obtain a full independent driver's license in emerging adulthood varies significantly. Many emerging adults who reach the age at which they are legally able to drive often obtain a driver's license right away; however, others opt

to postpone the process and defer getting their driver's license, delay in driving licensure (DDL). A nationally representative study of young US cohorts conducted between 2010 and 2017 showed that DDL is widespread, with nearly 70% of eligible adolescents choosing to delay obtaining their licensure by at least a year [5]. It is widely acknowledged that driving at a younger age increases the risk of crashing [25], and while DDL may reduce the risk of crashes due to lack of exposure [42], crash risk and crash frequency remain elevated when young adults start driving without prior instruction on novice driver safety and accompanied practice [31, 43]. Additionally, the frequency and miles driven by emerging adults after licensure may differ significantly, although a certain level of driving exposure is necessary for emerging adults to become safe drivers [6].

### 3.1.3 Driving exposure

The percentage of emerging adults with primary access to their own car is notably high; 70% of students in grades 9 through 11 who have the ability to drive on their own reported having the exclusive use of a vehicle [44]. Previous studies have shown that parents provide access to a car among their emerging adults; 3 of 4 emerging adults thought their parents would like them to have their vehicles [45]. The correlation between parents' willingness to grant earlier driving privileges to a newly licensed emerging adult and having access to a car has been explored, such as letting them drive at night and with one passenger after three months [45, 46]. Further, emerging adults will appreciate increased access to a vehicle, as it will help them meet the growing demand for them to be responsible for additional family duties (such as chauffeuring siblings to school and carrying out errands) and being able to travel to and from work efficiently [47]. Additionally, with proper training and supervision of a licensed adult driver in GDL programs, driving provides a pathway that helps emerging adults become more autonomous emerging adults who rely less on parents with more opportunities to connect with peers outside home and school. Despite the fact that all emerging adults are expected to acquire a driving license, the extent to which they are exposed to driving after licensure, including the frequency and total miles driven, may vary. The existing literature is deficient in elucidating the effects of adolescent driving following licensure on their alcohol and substance use, their parents' supervision practices, the alcohol and substance use of their peers, and early adult health, education, and employment outcomes.

### 3.1.4 Risky driving

Motor-vehicle collisions are the most common form of unintended injuries and fatalities among youth aged 5–23 [48], especially concerning oncoming adult drivers operating their vehicles after dark [49–51]. In 2015, data indicated that out of all those fatally injured aged 15–20, a startling 21% had a BAC of 0.08 g/dL or greater, despite state-determined zero-tolerance laws which defined the underage group (< 21 years) as having a BAC between 0.00 and 0.02 g/dl [52]. In 2018, a reported 21% of youths aged 20 years old stated that they had been a passenger in a car with a driver impaired by alcohol [53]. In 2008, estimates showed that 52–55% of US and Canadian high school students reported having at least once ridden with a driver aged 21 years/o or more while impaired [54]. Further, a 2008 study found that between 21 and 33% of US and Canadian high school students indicated that they had, at least once, been in a vehicle with an impaired peer driver [54].

While inexperience accounts for crashes early in licensure, risky driving contributes to crashes throughout emerging adulthood [55, 56]. Driving under more dangerous circumstances, like at night or during inclement weather; driving rapidly, aggressively, carelessly, unlawfully, or while distracted; and being under the influence of drugs and/or alcohol are all characteristics of risky driving. This is especially concerning given that the use of illicit substances and alcohol is particularly prevalent during emerging adulthood [57], and alcohol plays a major role in fatal collisions amongst emerging adults [56].

The shaping of these hazardous driving habits involves a variety of factors—ranging from the physical, such as binge drinking and unlawful drug usage, to the political and cultural, e.g., the legislated drinking age and parental monitoring practice [58]. These risky driving behaviors among young novice drivers all too frequently result in injury and fatal crashes that ultimately compromise emerging adult health. Despite national traffic safety policies (e.g., Graduated Driver Licensing programs [59]) and laws (e.g., minimum drinking-age laws [60]) having been implemented to prevent risky driving behaviors, emerging adult driver fatal crashes still remain unacceptably high [61–63].

Previous studies also have shown that risky driving behaviors among the young population are associated with individual and contextual factors [64, 65] and linked to later health care opportunities [66]. At an individual level, emerging

adults who drink and neglect to use restraint systems (vehicle safety devices or features activated in the event of a collision or abrupt stop designed to protect the driver and passengers) are engaging in unsafe driving behaviors [67, 68]. Further, sleep duration (i.e., sleep deprivation) [69], mental health status (i.e., mental disorder) [70], drug use [71], and alcohol drinking [71] contribute to risky driving. At a broader contextual level, lacking parental supervised practice [66, 72], drunk and marijuana-smoking peer [73], undesirable parenting practice [46], and parenting desire to have their youth drink alcohol (parents encouraging their youth to drink at home or in social settings, or even buying alcohol for their youth, driven by the idea that drinking alcohol is an acceptable part of the maturing process, or to make it easier for their youth to fit in socially) [73] can also contribute to risky driving. These individual and contextual factors could result in elevated levels of risky driving. Engaging in risky driving behaviors has the potential to impair autonomy and consequently hinder prospects of improved well-being in the short-term and long-term, as well as reduce opportunities for education and employment. Risky driving has been associated with increased risk of motor vehicle crashes, which can lead to physical and psychological injuries, disabilities, and even death [74]. These physical and psychological injuries can lead to impairments in independence, as well as impairments in educational and employment opportunities [74]. Additionally, risky driving can lead to increased likelihood of legal sanctions, such as fines, license suspensions, and possible imprisonment, which can further impede educational and employment opportunities [74].

Despite the potential risks of young drivers engaging in risky driving behaviors such as driving while drinking, thrill-seeking, not wearing a seatbelt, and using a smartphone while driving [28, 29, 75], there has been limited research on how driving licensure, delay in driving licensure, and driving exposure may influence alcohol and drug use, peer alcohol and drug use, and parental monitoring knowledge in emerging adulthood. Additionally, there is limited research on how driving licensure, delay in driving licensure, and driving exposure may be associated with their later health, education, and employment.

### 3.1.5 Factors associated with driving licensure status, DDL, and driving exposure

Studies suggest that access to social media might enable young adults to interact with their peers without leaving home, which may reduce the necessity to obtain a driver's license to travel for socializing [7]. A study on the built environment (for instance, the potential benefits of living in an area with many places to walk to) has been conducted by researchers [8], graduated driver licensing regulations (for instance, mandatory driving hours with adult supervision) [9], and financial restrictions (e.g., not having enough money to pay for the price and upkeep of a car) [10, 11] as possible reasons for the elevated levels of emerging adults that are postponing obtaining a driver's license. Specifically, research showed that high levels of walkability [8], an increased requirement of driving practice hours with parental assistance [9], and lack of ability to manage the expenditure and upkeep of a vehicle [10, 11] are potentially contributing factors to the rising numbers of emerging adults with DDL. Other several causes have been suggested to explain why emerging adults might postpone getting their driver's license, such as race (for instance, African Americans vs. Whites) [10], residing with one or both parents [12], parental endorsement of licensure until emerging adults are perceived "prepared" [42], family financial standing (i.e., low or high) [13–15], the absence of a vehicle [15], parents being unavailable to help them [15], alternate means of transportation conveniently available [15], and time management problems [15]. Specifically, African Americans vs. Whites [10], living with a single parent vs both biological parents [12], low vs. high family affluence [13–15], a longer waiting time for parent's approval until emerging adults are "read" [42], parent unavailability [15], and availability to get around without a car [15] are associated with the increased numbers of emerging adults that DDL.

While previous research has explored sociodemographic variables for emerging adults that DDL [5], little is known about sociodemographic variables associated with driving licensure (having licensure vs. no licensure) and driving exposure to driving after licensure (driving frequency and miles driven). Further investigations encompassing sociodemographic factors should be conducted to evaluate their links to driving licensure and driving experience.

### 3.1.6 Potential roles of driving licensure status, DDL, and driving exposure associated with alcohol and drug use

Research has indicated that having a driver's license may be associated with heightened consumption of alcohol, cigarettes, and marijuana among those who are in the process of becoming adult drivers [30]. The findings of an investigation showed that the immediate consequence of licensing novice drivers is that they have more unfavorable views toward driving while intoxicated and lower alcohol consumption levels [30]. Recent license holders exhibited heightened awareness of the risks related to driving while under the influence of alcohol [30]. However, driving while impaired by alcohol increased among those with more extensive driving experience (more driving frequency and miles driven) [30]. The

current knowledge base still lacks an understanding of how driving licensure (having licensure vs. no licensure), DDL (no delay in driving licensure vs. delay in driving licensure), and driving exposure (driving frequency and miles driven) impact alcohol and drug use in emerging adult drivers.

### **3.1.7 Potential roles of driving licensure status, DDL, and driving exposure associated with parental monitoring knowledge**

Before emerging adults are allowed to independently drive or travel in a vehicle, parents may control travel decisions and activities that involve the use of a vehicle [4]. Once emerging adult drivers complete the Graduate Driver Licensing (GDL) program, they are able to drive in an extended environment that may be outside of direct parental monitoring. This offers a newfound sense of freedom and independence but also may result in activities or decisions that lack protective parental monitoring, such as underage drinking or drug use. More comprehensive studies of driving licensure (having licensure vs. no licensure), DDL (no delay in driving licensure vs. delay in driving licensure) and driving exposure (driving frequency and miles driven) are needed to examine their associations with parental monitoring.

### **3.1.8 Potential roles of driving licensure status, DDL, and driving exposure associated with peer alcohol and drug use**

The way that peers use alcohol and drugs could have an effect, either risk-inducing or protective, when emerging adults come across drinking and doping within their social circle. Perceptions of the use of alcohol and drugs by peers is known to have a correlation to augmented smoking among emerging adults [76]. Further, access to a vehicle, typically provided by parents or peers, offers emerging adults the opportunity to break away from parental oversight in their home environment and search for an alternate setting that may increase their potential for alcohol and drug usage [4]. Specifically, emerging adults with a driving license and driving more often can meet with friends outside/away from their homes, and independence and responsibility over personal activities can substantially increase. However, the current knowledge base has not thoroughly investigated the effect of driving licensure (having licensure vs. no licensure), DDL (no delay in driving licensure vs. delay in driving licensure), and driving exposure (driving frequency and miles driven) on the changes in peer alcohol and drug use among emerging adult drivers.

### **3.1.9 Potential roles of driving licensure status, DDL, and driving exposure associated with health, education, and employment**

Driving licensure has potential benefits for emerging adult outcomes that allow them to flourish in early adulthood. Driving licensure and driving facilitated greater adolescent independence and allowed them to enhance health, education, and employment opportunities [16–20]. For example, evidence suggests that participants with consistent vehicle access were more likely to access healthcare services compared to those with barriers to access to transportation [21, 22]. The outcomes of a single cross-sectional study determined that emerging adult drivers had greater weekly earnings, along with superior academic performance in comparison to their non-driving counterparts [23]. Studies investigating the possible links between holding a driver's license and exposure to driving with adult health, education, and employment at an early age are lacking in the existing body of knowledge. It is essential to gain a better understanding of the quantifiable impacts that driving licensure (having licensure vs. no licensure), delay in driving licensure (no delay in driving licensure vs. delay in driving licensure) and driving exposure (driving frequency and miles driven) might have on early adult self-reported overall physical health, education, and employment.

## **3.2 Emerging adulthood as a context for substance use**

The prevalence of substance use, including drinking alcohol and using drugs, is highest in emerging adulthood, at 49% among those aged 19–20 and 72% among those aged 27 [77]. Research conducted by monitoring the Future study revealed the most common occurrences of daily use, binge drinking, and daily inebriation also occurred during this life stage [78]. Emerging adults who partake in substance use may be more likely to experience adverse situations such as death, injury, academic dishonesty, squabbling, and sexual harassment [79]. Survey data from 119 public and private college students revealed that binge drinking was correlated to eightfold elevated odds of getting hurt or injured and 17-fold greater odds of missing classes, sevenfold greater chance of engaging in impulsive sexual activity, and eightfold greater opportunities of arrest [80]. Furthermore, substance use has been associated with fatalities amongst emerging adults, with unintentional drug poisoning contributing to 59% of such deaths in 1999 and 76% in 2005 [81].

Emerging adulthood is an essential period characterized by peak prevalence of substance use, and it also affects later physical, mental, and social growth in adulthood [81–83]. Analysis highlights this period of life as one marked by speedy changes in the social atmosphere, providing enhanced independence and decreased social control than adolescence [81, 84–86]. By the completion of this period, emerging adults generally have accomplished the developmental tasks of adulthood, beginning their journey into the roles and obligations of being an adult, such as binding relationships, marriage, family duties, finish schooling, career commencement, and money management. It has been discovered that successful transition into adult roles is generally connected with diminishing substance use [81]. However, for certain emerging adults, failure to achieve the developmental objectives during the move into adult roles leads to drug abuse issues, dependence on drugs, monetary instability, incapability to create healthy links, and declining mental health [81]. Thus, successful transition into adulthood roles can have long-term positive outcomes for early adult health and well-being, which is why substance abuse is a critical element in the formation of substance use prevention strategies for emerging adults [81].

Access to substance use may be greatly increased among emerging adults who have driving licenses with greater independence and mobility. The extent of exposure to driving after licensure (more driving frequencies and miles driven) may allow emerging adults to access substances in an extended environment (a space far from home or a private space provided by a vehicle). However, there is limited study investigating how driving licensure (having licensure vs. no licensure), DDL (delay in driving licensure vs. no delay in driving licensure), and the extent of driving exposure to driving (driving frequency and miles driven) may associate with substance use in emerging adulthood.

### 3.2.1 Alcohol use

The prevalence of alcohol consumption (any alcohol consumption is defined as the ingestion of an alcoholic beverage such as a can of beer, a glass of wine, a wine cooler, a shot of distilled spirits, or a mixed drink containing distilled spirits—excluding minimal intakes of just a taste or two) increases during high school [87] and reaches its peak among 18- to 25-year-olds [88, 89]. A 2013 report predicted that approximately 39.2% of high school seniors, 78% of 18 to 21-year-olds, and 86% of those aged 22 to 26 occasionally indulged in alcohol consumption in the previous 30 days [90]. More recent study is showing changes in alcohol use. For example, the 2021 Youth Risk Behavior Survey (YRBS) conducted by the CDC shows that drinking (30-day) among high school students now exceeds drinking levels among male students [91]. The frequent occurrence of alcohol consumption among teenage and young adult populations can have detrimental effects on both physical and mental health of young people [92]. As an illustration, heavy drinking is a major factor in college student injuries and composes more than half of adolescent traumatic brain injuries [93]. The likelihood of hospitalization due to accidents and injuries is considerably increased among emerging adults who consume alcohol [94]. Approximately 80 percent of fatalities due to homicide, suicides, and unintentional harm in adolescents have been linked to drinking alcohol [95]. Further, less alcohol use in adolescence contributes to better school attachment and higher grades, while an early start and higher amounts of alcohol consumption contribute to more absenteeism and lower grades [96]. Additionally, emerging adults with alcohol drinking are more likely to offend others, including verbal and physical offenses, and be violence victims [97]. Studies suggest that alcohol consumption might be a contributing factor in the encouragement of aggressive reactions, as it has been connected to impairments in certain psychological and physiological systems that can result in offensive verbal and physical conduct towards others [98].

Alcohol use in emerging adults has a developmental perspective [99]. As emerging adults develop, they look to gain greater independence from their parents, fostering a closer bond between them and their peers with a resulting strengthening of the latter's influence [99]. Previous research has determined that higher levels of alcohol consumption are reported among emerging adults with greater attendance at social events [100, 101]. Male university students are more likely than female university students to use alcohol for social reasons, such as to make new friends or to fit in with peers [102]. It is likely that this difference is due to societal expectations and norms around alcohol use, which may be more lenient for male students than female students [102]. Additionally, it could be due to the fact that male students may be more likely than female students to put themselves in social situations where alcohol is more readily available [102]. An examination of research on 16–20 year-olds indicates that there may be beneficial aspects of emerging adult alcohol consumption in terms of achieving certain developmental tasks, such as identity exploration and creating relationships with peers [103]. On the other hand, previous studies have indicated that strong connections exist between feelings of alienation, distress, and powerlessness and positive feelings surrounding the reckless consumption of alcohol among high school students [104].



The recent research revealed that no health benefits are derived from alcohol consumption among 15- to 39-year-olds; of the same demographic, 59.1% reported drinking more than one drink per day for women or greater than two drinks per day for men in 2020, and of those, 76.7% were male [105]. However, the risks of alcohol consumption differ by age and geographic location, especially for emerging male adults from 18 to 25 years/o [105].

The World Health Organization indicates that those aged 15–29 years are the heaviest drinkers and also suffer the most health-related issues due to alcohol use [106]. Specifically, the highest risks for alcohol consumption for emerging male adults from 18 to 25 years of age can be found in Europe and South Africa [106]. The lowest risks for alcohol consumption are typically found in individuals outside of the 18 to 25 age range in African and Asia [106]. The alcohol consumption rates among emerging male adults between 18 and 25 years old in the United States tend to fall between the highest risk European and South American countries and the lowest risk African and Asian countries, highlighting the need for special attention to alcohol consumption prevention strategies among emerging adults in the U.S. [107].

Findings of previous work have demonstrated a direct correlation between attending college and a rise in alcohol consumption [108]. Studies have revealed that the frequency of alcohol consumption heightens among emerging adults who attend college and separate from their families [108], as well as their counterparts that do not go on to higher education, but still move out of the family home [109]. Getting an independent driver's license may increase personal freedom and enable emerging adults to access alcohol outside the home. As emerging adults move out of their parent's homes, they often begin to frequent bars and nightclubs. Parental control over social events (e.g., going to bars and nightclubs) is absent. Drinking is sensitive to environmental factors such as decreased parental supervision, high sensation seeking, and increased personal freedom facilitated by driving [110]. One could reasonably expect that the frequency of driving to acquire alcohol would increase beyond the levels seen when the alcohol is purchased for home use. Despite numerous studies conducted, the impact of obtaining a driver's license, any delay in doing so, as well as the driving frequency and miles driven on alcohol consumption in emerging adults remains unclear.

### 3.2.2 Binge drinking

The National Institute of Alcohol Abuse and Alcoholism (NIAAA) [111] defines binge drinking as drinking four or more drinks for females or five or more for males in a two-hour period. Statistics suggest that 25% of high school students have engaged in binge drinking in the last month [112]. A research project headed by the National Institute on Alcohol Abuse and Alcoholism (NIAAA) revealed that approximately two-thirds of emerging adults (ages 18–25) admitted to consuming alcohol excessively during the preceding month [113]. Further, it has been observed that the incidences of binge drinking among adolescents usually begin near the end of their teenage years and can extend into early adulthood [114]. Binge drinking leads to an elevated risk for negative short-term consequences such as drunk driving, risky sexual behavior (i.e., unprotected sex), and illicit drug use [115], as well as long-term consequences such as comorbid psychiatric issues [116], academic failure [117], and neurocognitive impairments [118]. Starting early with binge drinking carries a considerable risk of developing an alcohol use disorder in adulthood [119].

Spikes in binge drinking among 18- to 24 years/o are possibly a function of developmental processes in this transitional period defined as emerging adulthood [82]. The phenomenon of binge drinking in emerging adulthood may be attributed to a wide range of factors, like an individual's genetic propensity towards alcohol, previous drinking experience during high school, college-based perceptions and attitudes regarding drinking, anticipated advantages and disadvantages of drinking, sanctions on underage drinking, parents' outlook towards alcohol consumption [109], involvement in Greek organizations or athletics, and the environmental availability and pricing of alcohol [120]. Additionally, the seeking of stimulating and exciting experiences, the pursuit of novel and intense sensorial gratification, is another reason that can explain why emerging adults are at higher risk of binge drinking [121]. Specifically, with less likelihood of being monitored by their parents and constrained by adult roles, emerging adults may be more likely to pursue novel and intense experiences than adolescents, either voluntarily or involuntarily [121].

Making the transition from high school to post-secondary education is an important milestone in life, and emerging adults with independent driving licenses may move away from home, which may increase independence and mobility to access alcohol outlets and put them at risk of binge drinking. Although the previous research investigated binge drinking trajectories across emerging adulthood [122], more research is needed to ascertain the impact of increased independence and mobility facilitated by independent driving licenses and exposure to driving after licensure on binge drinking initiated in emerging adulthood.

### 3.2.3 Drug use

In the late twentieth century, U.S. emerging adults reached unexpectedly high levels of drug use [123]. A research conducted by the National Institute on Drug Abuse discovered that roughly 14.4% of young adults in the 18–25 year old demographic admitted to utilizing illicit substances over the past month [124]. The proportion of illicit drug use among 12<sup>th</sup> graders has remained between 47 and 50% from 2011 to 2019 [123]. It has been found that emerging adults with prolonged drug use are displaying a wide variety of difficulties, such as decreased academic outcomes and unlawful behavior [125]. The use of drugs by adolescents can lead to decreased academic performance, increased absenteeism from both educational and extracurricular activities, and a greater likelihood of leaving school without graduating [125, 126]. Subsequently, research indicates that any drug use persistence in emerging adults can result in them being apprehended by law enforcement, charged by the juvenile justice system, and put through its intervention process [125]. Drug use and delinquent behavior are strongly linked, and these two behaviors may lead to adverse consequences, including participation in negative peer drug use [127, 128].

Emerging adult drug use may have various health-related consequences, ranging from car accident injuries to physical disabilities, disease, and even the possibility of an overdose [129]. Significantly disproportionate numbers of such people face an increased risk of death caused by suicide, homicide, accidents, and/or illnesses [129]. Moreover, their use of drugs is often accompanied by high-risk sexual behaviors that could potentially lead to HIV/AIDS or other sexually transmitted diseases [130]. All these examples emphasize the serious aftermath of drug use for those in emerging adulthood, including personal and family distress and even extra healthcare costs and potential loss of future productivity [131, 132].

Research has indicated that among emerging adults, there is a correlation between the presence of various mental health disorders, such as depression, and drug use [133]. Emerging adults who engage in drug use are at an elevated risk for conducting issues, depression, suicidal ideation, attempted suicide, suicide, and personality disorders than those who don't [134]. Taking marijuana, which is popular among a large portion of this demographic, has been demonstrated to have a negative effect on short term memory, learning ability, and psychomotor skills [135]. Additionally, drug use may disrupt one's drive and emotional developments [130]. On top of this, it has been noted that those who suffer from substance use disorders often are not accepted by their peers [130].

Parental influences in the home setting are integral to the socialization of drug usage among adolescent adults. The variances in parental behaviors concerning substance use are displayed through the patterns of drug use and ages of initiation in this group. Evidence has shown that emerging adults exposed to drug use and drinking by their custodians are more probable to begin using elements at an earlier age [136–138]. Research linking parental monitoring and drug use in adolescents also exists in emerging adulthood. Parental monitoring at a decreased rate has been linked to drug misuse among adolescents [139]. Investigating the environmental impacts may be of crucial importance when examining drug use patterns in young people as they transition away from their parents' households. Emerging adults who move out from home with a low level of parental monitoring may have an increased opportunity to access drugs.

Further, getting an independent driving license may facilitate access to drugs with greater independence and mobility in an extended environment (e.g., a space far from home or a private space provided by a vehicle). However, the current knowledge base lacks an understanding of how driving licensure (having licensure vs. no licensure), DDL (no delay in driving licensure vs. delay in driving licensure), and the extent of exposure to driving (driving frequency and miles driven) after licensure may associate with drug use in emerging adulthood.

## 3.3 Emerging adulthood as a context for the changes in protective and risk factors for alcohol and drug use

### 3.3.1 Parental monitoring knowledge

Parental monitoring has been widely identified as an element of authoritative parenting practices, which has been linked to various types of adolescent behaviors, such as tobacco use [140–142], alcohol use [143], and marijuana use [144]. Research has extensively explored the relationship between parental monitoring knowledge and alcohol use among adolescents. An example of this is how constructive parental monitoring may help guard against teenage drinking by reducing alcohol uptake or setting the expectation for no alcohol consumption [126]. Investigations have been conducted to analyze whether parental monitoring knowledge is still essential as adolescents mature into adulthood. One of such research endeavors discovered that when measured at age 10, being familiar with effective parental monitoring corresponded with a diminishing likelihood of being troubled with alcohol use disorders and dependence at 21 (OR 0.78,  $p < 0.05$ ) [145]. This association remains significant when the parental monitoring knowledge is extended from

10 to 16 y/o (OR 0.77,  $p < 0.05$ ) [145]. A cohort study on births additionally revealed a significant relationship between parental monitoring awareness in the age range of 10–12 and reducing the consumption of alcohol. At ages 18–22 was only observed in males (OR 0.43,  $p = 0.02$ ), but not in females (OR 0.51,  $p = 0.25$ ) [146]. It appears that parental monitoring knowledge among males has a long-term result of decreasing alcohol consumption, while there is not a notable connection between parental monitoring knowledge and alcohol consumption among females. This could be a result of males more often consuming alcohol than females and this causes the effects of parental monitoring knowledge to be more accentuated in male groups. Additionally, the link between positive parental monitoring knowledge and diminished emerging adult alcohol use has been found among college students as reported in [147]. Studies indicate a link between parental monitoring of their college-aged daughter's activities and a decrease in risky behaviors [148]. Specifically, research has linked parental monitoring to decreasing incidence of drug and alcohol consumption, sexual activity, and other types of misbehavior among college-aged women [149]. Furthermore, parental monitoring has been positively correlated with academic achievement [150]. Therefore, parental monitoring knowledge has been indicated as beneficial to college-aged female students due to its ability to act as a protective factor in their lives. Research has shown that parental monitoring knowledge can be used to reduce the risk of adolescents using drugs [151, 152]. The awareness of parental monitoring knowledge during high school may reduce the potential for marijuana use among college students, despite there being no connection established with those not attending college [108].

The transformation of becoming an adult may be enabling parents to have a greater period of time in which they can have an influence their maturing emerging adults [153]. Emerging adults gradually gain in their autonomy and grow in independence by fulfilling adult roles [153]. As opposed to adults, emerging adults do not view themselves or their parents as adults [36, 154]. Given the varied scenarios presented in emerging adulthood, it is not surprising that many parents struggle to find the balance between providing assistance to their children during this experimental and exploratory stage, while still allowing them to gain more autonomy by taking on adult roles [153, 155, 156]. Parent–child communication patterns naturally shift to promote mutuality during this period [153, 157]. For example, emerging adults increase their tendency to spend time outside their parents' home [158]. Accordingly, parents will decrease their reliance on direct supervision of their kids [159]. Further, emerging adults tend not to share their secrets with their parents compared to adolescents because of the awareness of increasing privacy [160]. Parental monitoring may take on various forms as an individual moves from childhood and adolescence, yet it could still be of critical importance. Therefore, the tendencies of both parental monitoring efforts and emerging adults' willingness to share the information with their parents may decrease throughout emerging adulthood, leading to a decrease in parental monitoring knowledge. Collectively, research suggests that greater independence through driving licensure, no delay in driving licensure, and increased driving exposure may be associated with parental monitoring knowledge.

### 3.3.2 Peer influence

Decision-making during emerging adulthood is largely impacted by both emotional and social influences, with peers playing a particularly significant role [161–163]. High levels of peer contact can be key features of “emerging adults” and they may even begin to take on the behavior of those they identify with [162, 164]. Emerging adults may take on risky activities to attain and retain a bond, abide by the standards of their companions, be welcomed by their peers, and feel connected to a collective [165, 166]. Therefore, risky behavior facilitated by peer influence becomes more frequent and risky when emerging adults hang out with their peers [167]. Previous research has found that the presence of peers will improve sensitivity to participating in risky behaviors because of the potential rewards recognized by their peer [168].

The period of emerging adulthood is considered a phase of exploration in regard to identify, including aspects of love, work, and worldviews [36]. Connecting with other individuals who share similar experiences can be an invaluable tool in the development of identity. Peers can leverage different methods for affecting change in their peers, including reinforcement, encouragement, pressure, and exhibiting behaviors that can be imitated or avoided. Additionally, peers can facilitate favorable conditions for participating in an activity or display malevolent behaviors such as bullying, vandalism, and sexual harassment [169]. The impact of peers on emerging adults can lead to greater exposure to cultural values and practices that may not always be in agreement with the norms of their family [170, 171]. For freshman college students who travel away from home, they are likely to be in close proximity to other peers their age from different areas, in comparison to the amount of contact they would regularly have with their parents. Many cultural myths and norms support the idea of engaging in risky behaviors like binge drinking. The research suggests that adolescents who have contacts who consume alcohol can be more likely to engage in binge drinking as they transition to adulthood, potentially increasing the likelihood of developing alcohol dependence [172]. Similarly, studies have revealed that the probability of

emerging adults reaching regular smoking levels by the age of 23 was proportionally higher (1.5 times moreover) if their peers had tobacco use habits during their 12th grade compared to emerging adults who did not have smoking peers in the 12th grade [173]. It is uncertain whether the use of marijuana by peers in adolescence is linked to marijuana consumption during emerging adulthood. A study has revealed that compared with those who had peers with no marijuana use between late adolescence and early adulthood, people with peers who took marijuana were at a 1.6 times higher risk of initiating marijuana use before the age of 26 after adjusting for parental influence and personality factors [174]. Studies done by other researchers were unable to prove a relationship between teen marijuana use and adult marijuana usage at a later stage, but did manifest a connection between teenage marijuana consumption and other illegal drug use during maturity [175]. Two research studies following participants over time explored the relationship between the alcohol usage of peers and the alcohol consumption of emerging adults in college. A two-wave longitudinal investigation assessing factors before and during college discovered that pro-drinking norms from peers precollege were linked to binge drinking at the end of the student's first semester [176]. Further, it has been observed that for those with close friends who are binge drinking, so-called emerging adults are more likely to report an increase in alcohol consumption in the 12 months after they leave high school, regardless of if they go on to college or not [177]. The level of pro-alcohol peer influence was notably increased among those who left home to attend college compared to either college students whose parents provided a home for them and those who did not attend college [177].

However, how the increased independence in emerging adults due to driving licensure (having licensure vs. no licensure), delay in driving licensure (no delay in driving licensure vs. delay in driving licensure), and driving exposure (driving frequency and miles driven) may associate with peer alcohol and drug use is still limited.

### **3.4 Licensure and driving in emerging adulthood as a transitional life stage associated with health, education, and employment in early adulthood**

Many emerging adults view driving as a transition between adolescence and adulthood, and it has become a fundamental part of the process of maturing and socializing. Particularly in the United States, where access to public transportation is often limited, getting a driver's license is a vital step to achieve independence [4]. The age at which emerging adults acquire a driver's license can vary. Many obtain it when they reach the legal driving age in their state, while others choose to delay driver licensure (DDL). A nationwide US cohort study has shown that DDL is common among emerging adult drivers, with nearly 70% of eligible adolescents waiting at least one year after reaching legal age before getting their license [5]. While the degree of driving exposure and experience after licensure may differ, it is essential for young drivers to have a certain level of exposure and practice in order to become safe drivers [6].

The debate around the advantages and disadvantages of emerging adults having a driver's license remains ongoing. Families may benefit from emerging adult drivers who are able to travel to school and complete errands independently. From a developmental standpoint, driving licensure may have positive effects on non-injury-related health, education, and employment outcomes for emerging adults, potentially allowing them to thrive in early adulthood. Previous research has indicated that driving helps to foster greater adolescent autonomy and mobility, thereby providing access to essential health, education, and employment opportunities [16–20]. Additionally, another cross-sectional study reported that emerging adult drivers had higher average weekly earnings and higher academic performance than non-drivers [23]. On the other hand, having a driver's license may also lead to increased risk of substance use and motor vehicle accidents [25]. When considering the prospect of early licensure (within legal requirements), it is essential to balance the potential benefits against the greater amount of exposure to risky behaviors (e.g., drug and alcohol use [24]) and the associated risk of car accidents [25] that emerging adults confront. To date, there has been no thorough examination of the prospective associations between driving licensure (having licensure vs. no licensure), delayed driving licensure (no delay vs. delay), and driving exposure (driving frequency and miles driven) with early adult health, education, and employment.

#### **3.4.1 Health**

It is of great importance for the nation's labor force, international competition, public safety, and national security that emerging adults become and stay healthy since they are the ones transitioning into adult tasks like parenting and contributing to the sound growth and prosperity of the next generation. Recent studies suggest that emerging adults aged 18–25 are facing concerning health issues, particularly in relation to approaches to health care and risky behaviors [178]. It has been seen that, when compared to adolescents, emerging adults are more inclined to partake in high-risk activities like smoking, consuming alcohol and taking drugs [179]. In addition, emerging adults are less likely to have insurance

or seek health care than any other age group [180]. As a result of these factors, emerging adults have an increased risk of long-term health issues such as diabetes, heart disease, and mental health problems [181]. Collectively, the current research has revealed that youth transitioning into adulthood appear to be in an unhealthy state. The concern over this issue has gained increasing focus from those working in the emerging adult health field, and various studies have revealed that unhealthiness does not discriminate across socio-economic or racial backgrounds [182, 183]. It has been noted that individuals in emerging adulthood generally demonstrate poorer health than those in their late twenties and thirties [182, 183]. For instance, research has shown that, as compared to adolescents and adults between 26 and 34 years of age, emerging adults between 18 and 25 are more predisposed to suffering fatal or nonfatal injury in motor vehicle crashes, in addition to experiencing related hospitalizations and emergency room visits [182, 183]. As emerging adults, adolescents are less likely to take part in such activities as eating breakfast, exercising and going for physical and dental checkups, but more likely to indulge in bingeing on fast food, engaging in activities that lead to acquiring Sexually Transmitted Infections, smoking cigarettes, using marijuana or other drugs and alcohol abuse [184]. Further, particularly worrying are the behavioral health implications among those in emerging adulthood. This age cohort is typically the onset of the most serious psychotic disorders [185]. Emerging adults are more prone to serious psychological distress and suicide attempts compared to individuals aged 25–34 [186].

Emerging adults demonstrate more of a propensity than adolescents for living away from home in terms of their social behaviors, and overall have a greater degree of freedom from their families and the constraints of healthy habits due to the reduced presence of parental control [187]. At the same time, contrasting with elders, younger adults are typically not engaged in the kind of jobs or familial duties that serve as a deterrent to hazardous activities. Additionally, due to the lack of access to reliable health services, some of the advantages of emerging adulthood in terms of health may be sacrificed when compared with earlier stages of life [184, 188]. Along with these health risk behaviors, emerging adults are more often seen adhering to physical activity guidelines than adults from other age levels; for instance, 30 percent of those aged 18–24 follow the guidelines, in comparison to 24 percent of those aged 25–44 and 18 percent aged 45–54 [189].

Besides behavioral risk factors, findings from past studies have indicated that low population density, remoteness, and the substantial gap between people's residences and health care centers are major contributors to the usage of health care services [16]. Having the means to cover these distances is key to having access to health care [16]. If transport is lacking, even a short journey to medical services can be a real challenge [16]. It is particularly imperative for health care recipients to have a vehicle to get them to a health care provider or facility in cases where distances are great, roads are of low quality, and public transportation is not a viable option [190, 191]. Distance and transportation often come up in discourse surrounding the use of medical services [192–195]. The outcomes of earlier research indicate that providing medical transportation to those with limited access to it might prove to be beneficial by leading to both cost-savings in health care and an improved quality of life [196]. Residents living away from access to medical services have expressed their concern about transportation as a major limitation which impedes their ability to obtain health care or participate in health programs [197, 198]. While the contribution of distance to medical services has been discussed, transportation should be discussed with acquiring a driver's license in terms of their early adult health.

Research has indicated that increased independence through personal transportation has the possibility to boost both short-term and long-term wellness [16, 17]. Moreover, the freedom associated with having a driver's license could improve access to healthcare for emerging adults. Specifically, those living in more rural locations, further from medical resources, may benefit from the ability to more easily visit healthcare professionals and care centers when necessary [16]. Furthermore, when emerging adults delayed in obtaining a license and then chose to pursue it later, beyond the period as stated by law, they may have an elevated danger of crashing, limiting their healthcare chances further [199, 200]. The current knowledge base is inadequate in understanding the effect of acquiring a driver's license, any lag in its acquisition, and the risks to health which may arise due to increased exposure to driving after obtaining the license as far as emerging adults are concerned. Previous investigations though did note that there was an uptick in health service utilization once a driver's license had been procured [21, 22]. Therefore, there is a need to further understand the measurable effects that driving licensure (having licensure vs. no licensure), DDL (no delay in driving licensure vs. delay in driving licensure), and the extent of exposure to driving after licensure (driving frequency and miles driven) might have on emerging adult health.

### 3.4.2 Education

Emerging adulthood allows for longer and more widespread participation in the postsecondary education [37]. Emerging adulthood has an extended period that can be used for post-high school education that prepares emerging adults

to contribute to the information and technology-based global economy [37]. Furthermore, emerging adults who come from higher economic backgrounds are more likely to benefit from increased educational opportunities. Having a higher level of educational attainment opens up more prospects and potential for success during emerging adulthood, and often leads to enhanced income and future occupational prospects [201].

Currently, the rate of American emerging adults in higher education is the highest it has ever been in the country's history [202]. In 1900, merely 4% of eighteen to twenty-one year olds went to college while in 1940, that number slightly rose to 16% [203]. A total of 3.1 million students graduated high school from the first nine months of 2020 with 63% of them being enrolled in college by October of the same year [204]. This further breaks down to 43% of them directly attending 4-year institutions while 20% moved directly into 2-year institutions [204]. Surprisingly enough, from 2009 to 2020 fall, the number of undergraduates has decreased by 9%, falling from 17.5 million to 15.9 million [204]. On the contrary, the amount of associate's degrees granted climbed 20% from 848,900 to a total of 1.0 million in 2019–2020 [204]. Finally, the number of bachelor's degrees given out increased 24% from 1.6 million to 2.0 million in 2019–2020 [204].

Studies have demonstrated a strong connection between an emerging adult's academic achievement and their family's socioeconomic status. For instance, studies have revealed that living in poverty, living in a household that does not have a parent who attained their high school diploma, and being in a single-parent home correlate with poor educational outcomes, such as low achievement scores, repeating a class, and dropping out [205, 206]. Furthermore, a lack of vehicle can present a challenge in terms of access to and success in school-level education [207–209]. Previous studies have shown the association between geography and education attainment [207–209]. Specifically, students who live in rural areas are more likely to reduce participation in extra-curricular activities [207–209]. An inquiry into having a reliable vehicle for students in further education found the consideration of transport throughout the student lifecycle to be an essential component of widening access to education opportunities amongst potential further education students [210]. Therefore, lacking a reliable vehicle to commute between home and school may be a barrier to participation in further education. However, there is no published study investigating the role of driving licensure in access to, or exclusion from, emerging adult education. Further, mobility enabled by driving licensure can improve educational opportunities like participation in extra-curricular activities [200]. Therefore, it may be a time of growth to access to educational opportunities but also of environmental vulnerability (home environment vs. an extended environment away from the home environment or provided by a private vehicle) [211–214]. Driving licensure allows emerging adults to change the environment by moving out of the home and facilitates greater emerging adult independence to access education opportunities [17]. However, the current knowledge base still lacks how driving licensure (having licensure vs. no licensure), DDL (no delay in driving licensure vs. delay in driving licensure), and driving exposure (driving frequency and miles driven) after licensure may associate with emerging adult education attainment.

### 3.4.3 Employment

The shift from schooling to employment is among the many modifications that transpire over emerging adulthood [203]. Emerging adults experience some period of freedom to explore dissimilar jobs during and post completion of tertiary education [203]. A few adolescents obtain their initial work experience as soon as they finish high school and work in part-time jobs in the tertiary sector [203]. During this juncture, their goal is often plainly to make money instead of constructing the footing for the future [203]. The passage into a secure job tends to be drawn out and this proposes chances to begin again when starting bids to enter the labor market are disappointing [215]. Notably, most emerging adults at last discover a fulfilling job, though the odds of acquiring a job increase in later emerging adulthood [203]. Furthermore, one of the main components of emerging adults making the move into employment is that it serves as a stage of personal identity exploration [203]. As Arnett declared, emerging adults become knowledgeable of themselves by deliberating dissimilar variants in the work [203]. The progression of persona formation essentially begins in adolescence but intensifies in emerging adulthood. Arnett also declared that for some students it's an actual quest for self-discovery to discover the job that suits their type best [203]. Through experimenting with various jobs, they come to recognize their potential and their occupational choices are directed by a search for the right match with their personality [203].

In 2021, approximately 88.06% of 20- to 24-year-old adults in the labor force did find success in their job search, which is higher than the rate of 91.64% among 25- to 29-year-olds in Organization for Economic Co-operation and Development (OECD) countries [216]. The choices made during adolescence have influential, long-term effects on future professions and career pathways. A range of recent studies investigated the effects of parenting on teens' career paths and uncovered parent's critical role in their young ones' career development [217]. In particular, higher attachment to mothers had a notable effect on career self-efficacy, which is a person's idea that they can achieve success in tasks related to making

career decisions, and this confidence impacted the adolescents' career ambition [218]. Father's influence on teenage job choices was also noted in that they had more chances of expressing their approval for the careers they were pursuing [219]. Studies revealed that skills, capabilities, and talents were the most influential factors in adolescents' selections, and fathers made the most significant contribution in the career decisions of their kids [220]. Ultimately, individuals' job selections in adulthood are rooted in their prior interactions and experiences in their early years [221, 222]. Examples include watching adults actively engage in occupation in their surrounding environments and parents' professional networks [223]. Additionally, during emerging adulthood, individuals often sought to experience the same activities as their peers in order to fulfill their need for connection [224]. Taking part in such endeavors could potentially redirect them towards particular professional paths. However, such influences imposed by parents and friends on career paths may be changed when emerging adults extend the environment by moving out of the home. Besides parents and peers, teachers may also exert an influence on emerging adult career choice. Early attention to students' skills and talents, particularly in regards to minority and under-represented students, has been recognized as an important factor in motivating them to pursue a career in Science, Technology, Engineering, and Mathematics (STEM) fields [225]. For many younger adults, they may prioritize the career their parents want for them, some may follow a vocation that aligns with their educational qualifications, a few may pursue their passion regardless of the potential remuneration, while others may opt for the career that could garner a higher salary [226]. The most important factor for students to enter the industry is salary, followed by lifestyle [227].

Having access to dependable personal transportation enables individuals to gain valuable freedom to pursue job opportunities. By owning a personal vehicle, someone is more likely to be able to cast a wider geographic net for job searches, accept job roles at distant locations, and display a better attendance record compared to if public transportation services had been relied on. Furthermore, proprietorship of a vehicle may lead to better performance in the workplace due to the added possibility of obtaining jobs at areas where there isn't public transportation and for occupations that demand irregular or non-standard hours. For instance, vehicle possession may extend job hunts to distant places, make employment accessible even in places with limited public transportation, and enable individuals to take employment that has inflexible timing that don't sync with the public transport timetables, which are often seen in entry-level positions. Besides, having dependable personal transportation can reduce the time and instances of being absent from work and shorten commuting time when compared to using public transportation facilities [228–230]. Areas with insufficient public transportation make it tough for those without cars or people with lower incomes to be able to move around, consequently limiting their access to employment opportunities. Accessing these workplaces where public transportation is limited is time-consuming and makes it impossible for low-income residents of urban neighborhoods. Thus, having dependable individual transportation is a critical component to enhancing employment prospects, especially for those who live in an urban neighborhood with low socioeconomic status. The current knowledge base is lacking on how emerging adult independence is facilitated by licensure (having licensure vs. no licensure), DDL (no delay in driving licensure vs. delay in driving licensure), and driving exposure after licensure (driving frequency and miles driven) that allows them to access employment opportunities far away from the home environment, which in turn may impact what extent they are employed like a number of hours per week/employed vs. not employed.

### 3.5 Hypothesized model

Previous studies have indicated that the behavior and developmental choices of emerging adults are influenced by two crucial contexts: their home environment and their extended environment [4]. Prior to obtaining their driver's license or official access to an automobile, the decisions made in the home environment take precedence. Afterward, however, emerging adult drivers become able to journey beyond the confines of home and encounter various places of reduced control over risk-taking behavior.

#### 3.5.1 Home environment

According to Bingham and Shope's figure entitled "Factors that Affect Emerging Adult Driving Behavior" [231], six domains—emerging adults, parents, peers, substance use, sociodemographic characteristics, and driving licensure and driving—have been identified under the home environment. The first domain, "Emerging Adults", looks at the maturity level of the driver and how they handle the responsibility of driving. In this case, it is important to take into consideration the driver's capability to self-regulate and make sound decisions, their approach to taking risks and their willingness to comply with the law. The second domain, "Parents", looks at the role of the parents and the effect they have on

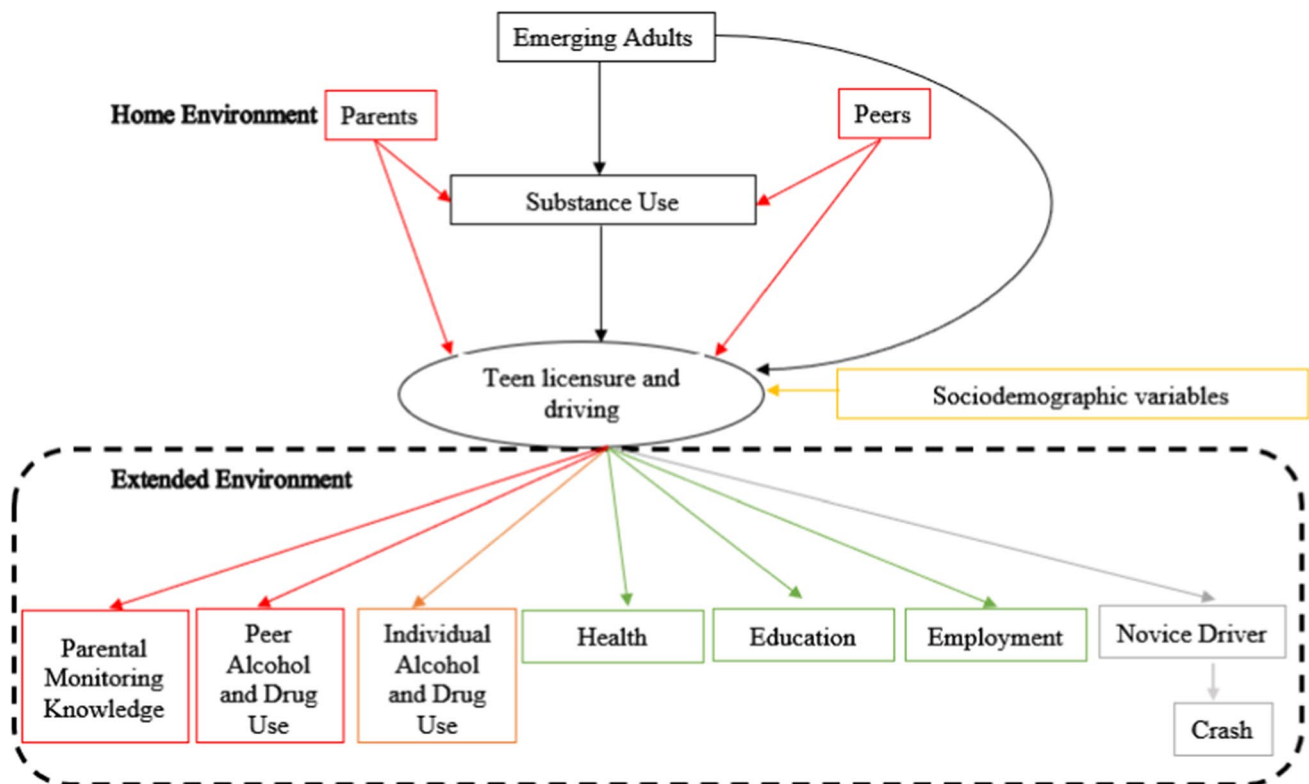
the emerging adult drivers. This includes the extent to which they are involved in monitoring emerging adults' driving, setting rules, and enforcing consequences. The third domain, "Peers", looks at the effect of emerging adults' friends and peers on the driver's behavior. This includes the peer pressure to take risks, drive dangerously, and ignore traffic laws. The fourth domain, "Substance Use", looks at the use of alcohol and other substances by emerging adult drivers and the impact this has on their behavior. The fifth domain, "Sociodemographic Characteristics", looks at the cultural, economic, and racial background of emerging adult drivers and how this affects their driving behavior. And finally, the sixth domain, "Emerging Adult Licensure and Driving", looks at how emerging adults' access to a driver's license and the opportunity to drive can affect their driving behavior. Overall, the figure provided by Bingham and Shope highlights the various factors that can influence the home environment of emerging adult drivers [231]. Each domain identified in the figure can have an effect on the driver's behavior and should be taken into consideration when attempting to understand the causes of driving accidents.

**3.5.1.1 Emerging adults** Emerging adulthood (roughly ages 18–25) is a critical transitional period when youth finish primary and secondary education and start to find a full-time job, get married, and be a parent [36, 37]. As opposed to those in their thirties, most emerging adults have yet to forge prolonged commitments in terms of relationships and work [36, 37]. During emerging adulthood, most emerging adults start to learn to drive and get driver's licenses. Many emerging adults view driving as a milestone in transitioning from adolescence to adulthood. Indeed, driving has become a fundamental part of maturation and socialization process [4], and is viewed as a crucial rite of passage, especially in the United States where the lack of public transportation in certain areas can necessitate the ability to drive for independence [4]. Emerging adults who lack access to a car may find themselves missing out on social and work opportunities, as well as potentially being exposed to increased risks due to relying on inexperienced drivers for transportation. By allowing emerging adults to drive, they can gain greater independence, as well as the ability to better decide where to go, with whom, and for how long.

**3.5.1.2 Parents** Most emerging adults just starting to learn to drive typically take practice runs with a parent in the car. Research indicates that the driving style of these new drivers tends to imitate their parent's driving style [45, 232, 233]. Parents have an integral role in teaching their emerging adult about driving [234], yet often are unaware of the dangers of novice drivers [235]. Parental exceptions are essential and can affect the driving of new drivers; those with involved, monitoring and supportive parents who hold high expectations and adopt a positive attitude usually demonstrate better driving behavior and exhibit less incidence of driving while impaired [236], crashes and offenses [46, 237–239]. Parents in states where the Graduated Driving Licensing program has been established are more likely to enforce more appropriate emerging adult driving limits [240, 241]. Research has indicated that parents who set limits on their emerging adults' early driving when they obtain their driver's license may be associated with a decreased likelihood of their offspring engaging in risky driving activities, incurring driving offenses, or getting in accidents [242]. More importantly, emerging adults' parents influence their alcohol and drug use in emerging adulthood [243]. Parents who are in the same household as their emerging adults often have the greatest opportunity to observe their activities and regulate their alcohol and drug consumption [243, 244].

**3.5.1.3 Peers** Beyond parents, peers can significantly influence emerging adults' driving [245]. Emerging adults prone to peer influence may be more inclined to admit offenses and crashes [246]. Additionally, emerging adults who have friends involved with early alcohol use are more likely to report offenses and crashes [238, 247]. Risky driving behaviors such as driving while under the influence of drugs or alcohol are more likely to be accepted and carried out by emerging adult drivers when exposed to similar practices of their peers [248]. The formation of large peer groups in the community, such as in schools, may lead to protective influences due to reflecting the accepted standards of the area [249]. Although access to a vehicle can provide an avenue for small affinity groups of emerging adults to travel to destinations further away, where they are more likely to participate in potentially hazardous activities (e.g. substance abuse) without parental supervision [250]. In such extended environments, substance use is relatively unrestrained. Peers with deviant behaviors may influence individuals to join in group risk-taking activities (i.e., substance use) that they have not participated in activities prior to this due to the limited choices available in their home town due to lack of mobility [251]. As Fig. 1 suggests, health risks for emerging adults involving substance use can be influenced by parents and peers. Peer influence on substance use has been viewed as a risk factor [252]. Interacting with affinity peers in smaller groups is more likely to have deviant attitudes, exert a negative influence and engage in risky behaviors compared to large groups at the community level [249].





**Fig. 1** Hypothesized model for emerging adult alcohol and drug use and health, education, and employment via driving licensure and driving derived from Bingham and Shope's [264]. Yellow color indicates the research question—*are emerging adult sociodemographic variables associated with driving licensure and driving exposure in emerging adulthood?* Orange color indicates the research question—*are driving licensure status, delay in driving licensure, and driving exposure trajectory classes associated with the trajectory classes of individual alcohol and drug use?* Red color indicates the research question—*are driving licensure status, delay in driving licensure, and driving exposure trajectory classes associated with peer alcohol and drug use and parental monitoring knowledge?* Green color indicates the research question—*are driving licensure status, delay in driving licensure, and driving exposure trajectory classes associated with their health, education, and employment four years after high school?*

**3.5.1.4 Substance use** Emerging adults who engage in the early use of alcohol, tobacco, and/or marijuana have been found to be at greater risk of taking part in risky driving behaviors, and have more occurrences of driving under the influence of alcohol [237–239, 247, 253, 254]. The home environment and the manner in which parents socialize their emerging adult children can have an impact on their substance use. Research has revealed a correlation between adult socialization that includes the consumption of alcohol and drugs and the initiation of substance use in these age groups at a younger age [136–138]. Nowadays, evidence is growing that indicates a connection between parental monitoring and the use of drugs among adolescents and young adults. Studies suggest that when the level of parental monitoring is low, this can lead to substance abuse problems among teenagers [139]. The environment may be of great importance in understanding substance use patterns when emerging adults move away from home. Emerging adults who move out from home and move into the dormitory or apartment where parental monitoring is absent may have an increased opportunity to access substances.

Shope and Bingham's model suggests that alcohol and drug use can influence driving licensure and driving in the home environment by creating a context of risk [4]. Specifically, alcohol and drug use can influence emerging adults' attitudes towards risky behavior, which can lead to greater risk-taking when driving. Additionally, parents may be less likely to allow emerging adults to drive if they are under the influence of alcohol or drugs, limiting their access to driving privileges. Finally, alcohol and drug use can also increase the likelihood of engaging in dangerous driving behaviors, such as speeding, which can increase the risk of an accident.

**3.5.1.5 Sociodemographic characteristics** Emerging adults may participate in different levels of reckless driving. Novice drivers, regardless of their age, tend to have more collisions when they are just starting to drive [255–257]. However, the age at which a driver obtains their license may affect their likelihood of getting into a crash [255–257]. Emerging adult

drivers who get driver's licenses early have more crashes [255–257]. Compared to female emerging adult drivers, male emerging adult drivers are more likely to be involved in fatal crashes [258], to partake in risky driving [259, 260], and to declare driving while impaired by alcohol [236]. The habit of risky driving behavior among emerging adult drivers is perhaps less prevalent in those who live in households with two biological parents compared to those with a single parent; this could be due to the increased ability of two parents to monitor and be involved in the behaviors of their emerging adult children [238, 239, 247].

Prior studies have established that social media platforms provide an opportunity for youth to stay in touch with friends digitally, consequently eliminating the requirement for in-person connection and therefore diminishing the necessity of a driver's license to get from place to place for interaction [7]. Inquiry has been done to ascertain how the built environment (e.g., having access to areas that are pleasant to walk in) [8], regulations regarding new drivers (e.g., legally requiring practice hours in a car with an adult) [9], and financial considerations (e.g., cost/maintenance of an automobile) [10, 11] may account for the greater amount of adolescents who postpone getting a license. Specifically, it was discovered that living in a highly pedestrian friendly area [8], having greater demands for supervised driving instruction by an adult [9], and not being able to cover the expense and upkeep of an automobile [10, 11] could lead to an uptick in the number of adolescents who postpone obtaining a driver's license.

Research suggests there are various causes for adult emerging generations to postpone obtaining a driver's license such as racial background (e.g. African Americans compared to White people) [10], living with parent(s) [12], family affluence (e.g., low vs. high) [13–15], parental approval of licensure (e.g., parent's approval until emerging adults are "ready") [42], parent unavailability [15], and availability to get around without a car [15]. Specifically, African Americans vs. Whites [10], living with a single parent vs both biological parents [12], low vs. high family affluence [13–15], longer waiting time for parent's approval until emerging adults are "read" [42], parent unavailability [15], and availability to get around without a car [15] associated with the increased numbers of youth that delay in driving licensure.

**3.5.1.6 Driving licensure and driving exposure** Driving licensure and driving exposure are bridging the extended environment where alcohol and drug use exists. Gaining a driver's license seemed to result in more long-term use of alcohol, cigarettes, and marijuana [30]. Studies have revealed that novice drivers who were licensed faced immediate effects such as having more negative perspectives on drinking and driving and a drop in alcohol consumption [30]. The growing number of newly-licensed drivers became increasingly aware of the risks of driving while under the influence of alcohol [30]. However, driving while impaired by alcohol increased among emerging adults with more extensive driving exposure (more driving frequencies and miles driven) [30].

### 3.5.2 Extended environment

Before being licensed and having access to a vehicle, all these home environment influences are dominant throughout adolescence [261]. However, once emerging adults can travel more frequently between the neighborhood and reach outside the home environment on their own, they are more likely to have access to locations where home environmental controls like parental monitoring on alcohol and drug use may be absent. Access to a vehicle may also be considered an extended environment where emerging adults can participate in risky behaviors like alcohol and drug use away from adult supervision [261]. This is suggested in Fig. 1, where, in the Extended Environment, the protective influence of parental monitoring knowledge is far away, even absent, and the influence of peer alcohol and drug use is increased.

The potential threat may exist in areas where access to alcohol and drug stores is increased. The chance for alcohol and drug use in automobiles and travel through risky areas resulted in the "non-crash risks" part of the equation with driver's licensure and experience contributing to it. Regarding alcohol and drug consumption, the private micro-environment of a vehicle can cause it to be a high-risk environment, even without leaving the home community with its absence of adult supervision. Driving in an automobile also provides an isolated atmosphere that can allow a small group of friends to indulge in alcohol or drugs, thereby intensifying peer pressure regarding alcohol and drug use.

The risk of crashes due to inexperienced drivers was increased by two factors: the need for a driving license and the level of driving exposure. In addition to the "non-crash risks" element, these are the two main causes of novice driving-related injuries. However, the current literature base has primarily investigated transportation risks, including crash-related injury, disability, death, harm to others, and impaired driving [26–29, 262].

Driving licensure and driving exposure may have potential benefits for emerging adult outcomes that allow them to flourish in early adulthood. Operating a vehicle can lead to increased autonomy among adolescents, providing them with the means to benefit from novel healthcare, educational, and career options [16–20]. For example, evidence suggests that

youth with consistent vehicle access are more likely to access healthcare services compared to those with barriers to access to transportation [21, 22]. A cross-sectional analysis indicated that emerging adult drivers earned higher weekly wages on average and exhibited better academic performance than their non-driving counterparts [23]. However, prospective associations of driving licensure and exposure to driving with early adult self-report overall physical health, education, and employment have not been fully assessed.

## 4 Summary

Licensure and driving may benefit emerging adults in health, education, and employment with greater independence and mobility. At the same time, having a driver's license and access to a car could potentially expose adolescents transitioning to becoming emerging adults to a variety of nontraffic risks, such as exposure to alcohol and drugs, negative peer influence, as well as inadequate parental monitoring. Further research is warranted to explore how these behaviors and consequences are linked with driving licensure and use.

To this point, studies on the driving behavior of those in their emerging adult years have mainly focused on crash injuries [263]. While much consideration has been dedicated to the potential dangers posed by road accidents, attributed to a combination of youth and risk-taking behaviors such as driving under the influence of drugs or alcohol [4], little attention has been shown to the effect of driving licensure (having licensure vs. no licensure), delay in driving licensure (no delay in driving licensure vs. delay in driving licensure), and driving exposure after licensure (driving frequency and miles driven) on the nontraffic risks (alcohol and drug use), protective (positive parental monitoring) and risk (negative peer alcohol and drug use) factors of alcohol and drug use, and emerging adult overall non-crash related health, education, and employment. Most studies included in this review are correlational studies. They may only indicate a potential cause-and-effect relationship, not definitively confirm it. Having said, the temporality and causality are yet to determine. Therefore, the future research is encouraged to examine the temporality and causality of driving licensure, delay in driving licensure, and exposure to driving after licensure on alcohol drinking, binge drinking, drug use, parental monitoring knowledge and peer alcohol and drug use, and emerging adult health, education, and employment.

Based on this literature review, it appears that if parents aim to reduce alcohol and drug use among emerging adults, they should provide them with useful information and be conscious of providing driving experience and delaying the acquisition of a driving license. Indeed, research has suggested that if emerging adults are able to get license early and have more driving access, this could potentially lead to better outcomes in health, education, and employment. As such, investing in initiatives to support the licensure and driving of emerging adults could very well help them attain greater health and prosperity.

**Acknowledgements** This narrative review is part of my dissertation, where I got my Ph.D. in Health and Exercise Science at Colorado State University, Summer 2023. Copyright by Xiang Gao 2023. All rights reserved. No funding is involved in this work.

**Author contributions** XG wrote the whole manuscript text and agreed to the submission.

**Data availability** Data for this narrative review was collected through a comprehensive search of five academic databases, including PubMed, Google Scholar, PsycINFO, Web of Science, and Scopus.

## Declarations

**Competing interests** I have no competing interests to be declared.

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