

Review

A Scoping Review of Determinants of Drinking and Driving Behavior among Young Adult College Students in the US

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Abstract: College students are a primary population for risky alcohol use behaviors, with one of every eleven students grappling with severe alcohol-related issues. The objective of this scoping review was to synthesize the existing literature to identify factors influencing the prevalence of drinking and driving (DAD) behaviors among college students. A scoping review was conducted using Medline (PubMed), ERIC, The American Journal on Addictions, and the NCHA databases. Criteria for article selection included being published in English and focused on DAD behaviors among college students. Articles excluded from the review were systematic reviews and discussion pieces without empirical findings related to college DAD. Of the included studies (n = 23), most identified a range of factors as being influential in college students' DAD behavior including a family history of alcohol misuse, the use of other substances such as marijuana, age of initial alcohol consumption, place of residence, propensity for sensation seeking, affiliation with sorority/fraternity groups, and the perception of associated risks. Effective strategies may include education on the risks of combined alcohol and substance use, screening and brief interventions tailored to at-risk students, and the implementation of campus policies that promote responsible alcohol consumption and deter DAD.

Keywords: drinking and driving; DUI/DWI; risky driving; college students; determinants/factors



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1. Introduction

According to the National College Health Assessment (NCHA), in 2023, 69.3% of undergraduates consumed alcoholic beverages (beer, wine, liquor, etc.), 11.2% used alcohol moderately, 1.2% had high-risk use of alcohol, and 63.5% used alcohol in the last three months [1]. For more than a decade, drinking and driving (DAD) among college students has been a persistent and serious public health concern, as it frequently has severe health and behavioral consequences for drinkers, their families, and their college communities [2].

The prevalence of DAD has increased on college campuses, with over 80% of college students engaging in alcohol consumption to varying extents [3,4]. The prevalence of DAD incidents among college students and young adults in the United States (US) presents a complex and multifaceted public health challenge. This demographic, characterized by the transition from adolescence to adulthood, is particularly susceptible to engaging in risky behaviors [5], including operating a vehicle under the influence of alcohol [6]. The ramifications of such behaviors are profound, contributing significantly to morbidity, mortality, and broader societal costs [7,8]. Consequently, there is a pressing need to understand the determinants that underpin DAD to inform the development of targeted interventions and policies. DAD leads to many negative consequences, one of which is road traffic accidents (RTAs).

Globally, RTAs are the leading cause of death for children and young adults aged 5–29 years [9], and RTAs are the leading cause of death in the US for all people ages 1–54 years [10], signaling a need for a shift in the current child and young adult health agenda in the US, specifically. In 2021, the National Highway Traffic Safety Administration (NHTSA) estimated that about 42,939 fatalities were recorded via RTAs alone in the US [11]. In the US, the economic loss associated with RTAs is estimated to be 3% of its Gross National Product (GNP) [12]. Alcohol-related deaths on U.S. roads are estimated to account for between 3% and 35% of all RTA fatalities [9]. According to the NHTSA, about 10,000 motor vehicle fatalities involving drunk driving (if their blood alcohol level (BAC) is 0.08 g per deciliter or above) occur each year in the US, and drunk driving accounts for close to 30% of all traffic-related fatalities [13,14]. Despite the fact that the number of people who died in accidents involving drunk drivers dropped by 5.3% (10,710 to 10,142) between 2018 and 2019, alcohol use still remains one of the primary causes for RTAs in the US [15,16]. In 2021, 13,384 individuals died in alcohol-related driving traffic deaths, which was a 14% increase from 2020 [13].

1.1. Determinants of Drinking and Driving among College Students

The leading causes of death among college students in the US are accidents (48%), homicides (11%), and suicide (11%) [17,18]. According to the NIAAA [4], 1519 college students in the US ages 18–24 die from unintentional injuries—including RTA—annually. Recent studies show that during their college years, students tend to increase their drinking behavior and experience multiple alcohol-related consequences, including drunk driving [19]. According to recent data by the Brooks Law Group, 5623 college students in the US lost their lives due to RTA in a single year, and another 567,000 sustained RTA-related injuries [20]. College is believed to be the time when most young adults are allowed to live on their own and make their own decisions. Consuming alcohol during college years has evolved into a customary practice that students frequently perceive as an essential component of their higher education journey. Consequently, college campuses are a hotspot for drinking and driving. The 21–24 age group had the highest percentage of drunk drivers in fatal crashes in 2017 [19]. Each year, among college students aged 17–24, an estimated 3,360,000 drive under the influence of alcohol (DUI), and 1519 die from alcohol-related unintentional injuries, including RTAs [19].

1.2. Current Review

The objective of this review is to identify risk and protective factors for DAD behaviors among college students and young adults using the social ecological model (SEM) as a guiding framework [21]. These determinants are categorized into four primary domains: intrapersonal/psychological, interpersonal/social, environmental, and policy-related factors. Psychological determinants encompass individual-level characteristics such as attitudes, perceptions, and risk-taking propensities. Social determinants involve the influence of peers, family, and cultural norms. Environmental determinants include aspects such as campus culture, accessibility of alcohol, and transportation options. Lastly, policy-related determinants focus on the impact of legislation, enforcement strategies, and institutional policies on DAD behaviors.

As such, this scoping review explores and delineates determinants of DAD, offering a comprehensive synthesis of the current state of knowledge and identifying gaps for future research endeavors. We seek to provide not only a snapshot of the current landscape but also to identify trends and emerging issues that warrant further investigation. This review also recognizes the dynamic and evolving nature of DAD behaviors, influenced by changing societal trends and technological advancements. By providing a detailed and nuanced understanding of these determinants, this review lays the groundwork for future research and serves as a cornerstone for the development of targeted interventions and policies aimed at reducing the prevalence and consequences of this hazardous behavior. Through a collaborative and concerted effort, it is anticipated that the findings of this review

will contribute significantly to the enhancement of public health and safety within this vulnerable population. Implications of this review aim to inform key stakeholders including policymakers, educational institutions, and public health professionals in developing comprehensive, evidence-based strategies to address and mitigate DAD among college students and young adults.

2. Materials and Methods

2.1. Search Strategy

A scoping review was conducted to assess the key objectives. The choice to employ this style of review was based on its capacity to address comprehensive inquiries and accommodate a variety of research approaches, making it well-suited for the purpose of mapping evidence and pinpointing areas where further research is needed. A scoping review is not time-consuming. We searched five databases for studies published in English over the period of 2008–2022: Medline (PubMed), The American Journal on Addictions, the NCHA databases, the CDC, and SAMHSA databases. The search strategy consisted of combined keywords using Boolean operators and subject headings representing the three concepts of our research. The following terms were used to generate a search: Driving after Drinking, Driving under the influence, Risky driving, determinants/factors, and college students. Studies were considered for inclusion if the population under investigation was US college students ages 17–24 years, examining drinking and driving as the outcome of interest. Studies were excluded if the population under investigation was not college students or if the study was published in a non-peer-reviewed outlet or presented qualitative results.

2.2. Article Screening and Data Collection

All records, following the removal of duplicates, underwent two stages of screening: screening of titles/abstracts and full-text screening. The abstracts and titles were reviewed using the inclusion criterion above by the lead author. If any doubt was raised about the abstracts, the articles were included for the full-text review. All full-text articles were reviewed independently by two reviewers to confirm whether they met the inclusion criteria. If any discrepancies arose, they were resolved by the third reviewer. Two reviewers piloted the data extraction method and completed data extraction for all included articles. The data were extracted and inputted into a Microsoft Excel spreadsheet. A PRISMA flow diagram was prepared on consensus between the three reviewers (Figure 1).

We consulted PRISMA guidelines for data extraction and synthesis [22]. The first author and two co-authors abstracted author names, year of publication, study design (randomized control trial, cross-sectional, longitudinal, prospective), thematic domains, and salient findings. We structured the Section 3 and associated tables using the SEM as a framework. As such, the determinants of DAD were presented within the following thematic domains: intrapersonal/psychological (male, age of first drink, binge drinking), interpersonal/social (family history of alcohol use, peer pressure or the influence of friends and social groups such as fraternities or sororities demographic differences), environmental (type of residence), and policy related (legal drinking age, i.e., 21+).

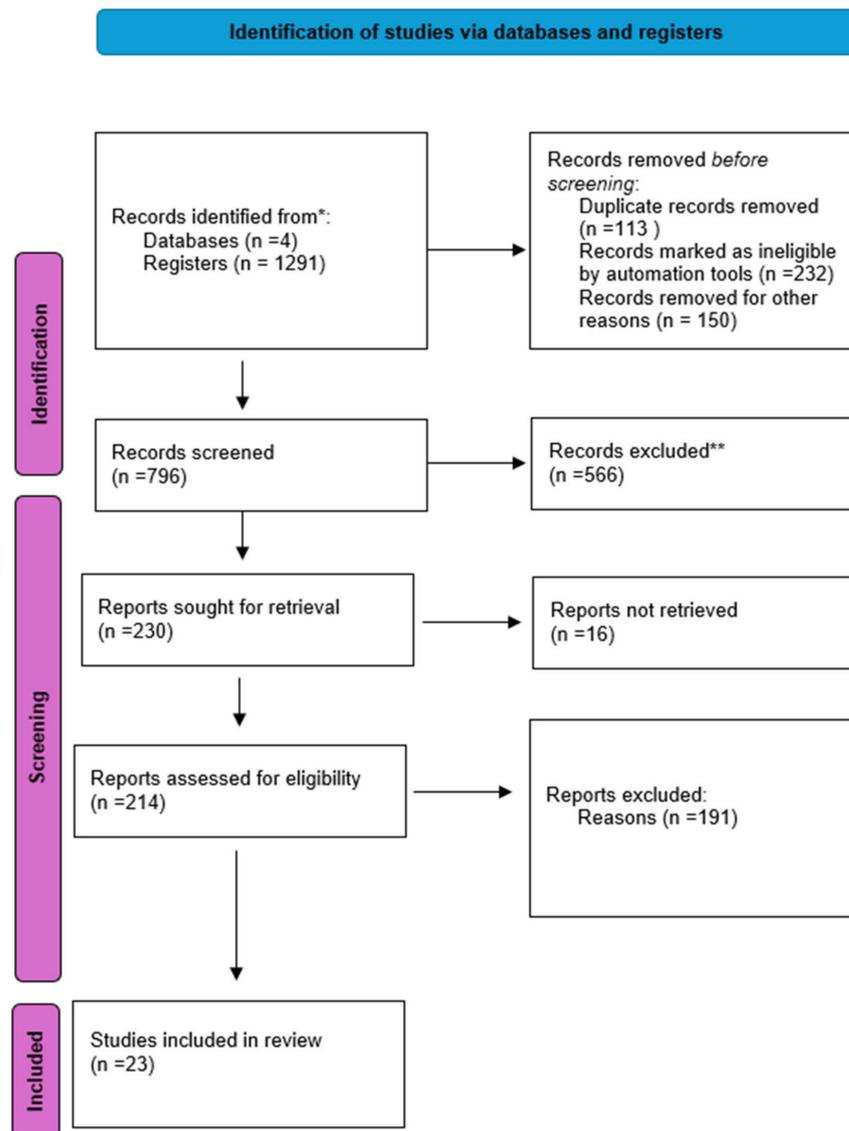


Figure 1. Search strategy using PRISMA diagram. * represents the number of studies we included at the beginning of the review whereas; ** represents the number of studies we excluded after screening the studies after removing all duplicates.

3. Results

Following a systematic literature search, a total of twenty-three (n = 23) studies from a variety of geographical contexts across the US were included in the final literature review. The majority of the studies found were cross-sectional studies, accounting for 43.5% (n = 10), 30.4% (n = 7) of the studies were randomized control studies, 17.4% (n = 4) were longitudinal studies, and 8.7% (n = 2) were prospective studies. Multiple studies showed that for the majority of the participants, DAD is a result of turning 21 (the legal age for drinking). Caldeira noted that young people are more likely to participate in DAD when they turn 21 years. Fairlie stated that being 21 influences or encourages individuals to participate in DAD. Table 1 presents the description of the study population, study design, determinants, and the salient findings from each study. To understand the determinants of DAD among college students, it is helpful to break down the influences into four main categories using the SEM [21] as a guiding framework: intrapersonal/psychological, interpersonal/social, environmental, and policy-related. The Section 3 is structured by the level of influence on the DAD behaviors of college students.

Table 1. Description of studies, population, study design, thematic domain, and salient findings in order of first author (N = 23).

Author, Year	Sample Population	Study Design	Thematic Domain	Salient Findings
Arria et al., 2011 [23]	N = 1194	Prospective Study	Environmental Interpersonal/Social	Half of the drugged drivers' were DAD. Both drugged and drunk driving were independently associated with an increased risk of alcohol consumption.
Arria et al., 2016 [24]	N = 1000	Longitudinal study	Intrapersonal/Psychological Interpersonal/Social Environmental	More than half (57%) consumed energy drinks (EDs) at least once during the past year. Among ED consumers, 71% drank alcohol mixed with energy drinks (AmEDs) and 85% drank EDs alone; many (56%) engaged in both styles of ED consumption, while others specialized in one or the other (29%) or drank EDs alone exclusively, while 15% drank AmEDs exclusively. After accounting for other risk factors, ED consumption was associated with drunk driving frequency in 2 ways. First, a direct path existed from ED frequency (without alcohol) to drunk driving frequency. Second, an indirect path existed from AmED frequency through alcohol quantity to drunk driving frequency.
Amlung et al., 2016 [25]	N = 134	Cross-sectional study	Policy	Drunk drivers were more likely to be males ($p < 0.001$) but did not differ from their passengers in terms of age or drinking behavior ($p > 0.05$).
Bastien et al., 2019 [26]	N = 114,816	Longitudinal study	Interpersonal/Social	Self-reported difficulties sleeping, insomnia symptoms, and insufficient sleep are associated with DAD. This relationship is stronger among student athletes than non-student athletes.
Caldeira et al., 2017 [27]	N = 1243	Longitudinal study	Interpersonal/Social	Yearly prevalence increased at age 21 for DWI (24.3%) and 19.1%. DAD increased significantly during college. Marijuana mostly facilitates DAD.
Fairlie et al., 2010 [28]	N = 330	Cross-sectional study	Intrapersonal/Psychological Policy Interpersonal/Social	Higher levels of weekly alcohol use, being aged 21 or older, and perceived difficulty in obtaining alternative transportation were associated with a greater likelihood of DAD. In addition, perceived likelihood of drinking and driving-related consequences was associated with a lower likelihood of drinking and driving. Knowledge of the 0.08% per se and zero tolerance laws did not predict alcohol-impaired driving.
Fromme et al., 2010 [29]	N = 1817	Longitudinal study	Policy	Drinking and driving showed a 72% relative increase in the 2 weeks after turning 21.
Hultgren et al., 2021 [30]	N = 367	Cross-sectional study	Environmental	Of the 147 students reporting alcohol use, 4.6% reported at least one occasion of driving under the influence, and 7.4% reported at least riding with an impaired driver. <i>t</i> -test results showed no differences by age; $p = 0.50$.

Table 1. Cont.

Author, Year	Sample Population	Study Design	Thematic Domain	Salient Findings
Kenney et al., 2013 [31]	N = 2848	Cross-sectional study	Interpersonal/Social	Men were more likely to participate in DAD than women (p -value < 0.001). Students 21+ years were also more likely to participate in DAD than younger students (p -value < 0.001). Caucasians compared to non-Caucasians (p -value < 0.001) and students with a family history of alcohol abuse were also likely to participate in DAD compared with those without a family history alcohol abuse (p -value < 0.001).
Kim et al., 2008 [32]	N = 1130	Randomized control study	Interpersonal/Social	DAD was prevalent among college students in Hispanic-serving universities. Students living off-campus were more likely to participate in DAD (p -value < 0.01).
Kohn et al., 2014 [33]	N = 444	Longitudinal study	Interpersonal/Social	Self-reported drunk driving was more likely among males compared to females (p < 0.01).
LaBrie et al., 2011 [34]	N = 6000	Randomized control study	Intrapersonal/Psychological Interpersonal/Social	19.1% reported driving after consuming 3 or more drinks in the past 3 months. Fraternity or sorority and family history of alcohol abuse predicted DAD.
LaBrie et al., 2010 [35]	N = 3753	Randomized control study	Intrapersonal/Psychological Interpersonal/Social	35.0% of the participants had a history of alcohol abuse and were more likely to have drunk alcohol in the previous year (p < 0.001).
Martin et al., 2018 [36]	N = 1298	Cross-sectional study	Interpersonal/Social	98% of the students did not drink and drive, while 80.4% did not fall asleep; 81.7% read a text while driving and 75.3% sent a text while driving. Hazardous drinking was associated with drinking and driving and sending a text while driving (p < 0.001) and falling asleep (p < 0.001).
Quinn & Fromme, 2012 [37]	N = 1833	Randomized control study	Intrapersonal/Psychological	Participants were more likely to drive after drinking when they were objectively more intoxicated but perceived themselves to be less intoxicated. Prevalence of driving after drinking also increased in the 4th year of college from 26.6% in the first year to 32.7% in the 4th year.
Quinn & Fromme, 2012 [38]	N = 1350	Randomized control study	Intrapersonal/Psychological	Students, especially males, who began drinking early in life participated in DAD more. DAD was significant (p < 0.05).
Rothman et al., 2008 [39]	N = 1792	Cross-sectional study	Intrapersonal/Psychological	14% of the participants reported taking their first drink at age 14; 36% of the participants were drinkers with unhealthy alcohol use.
Teeters et al., 2014 [40]	N = 207	Randomized control study	Intrapersonal/Psychological	45% of the participants reported DAD in the past 6 months. Participants also reported consuming 16.07 drinks per week (SD = 13.48).
Teeters & Murphy, 2015 [41]	N = 419	Randomized control study	Intrapersonal/Psychological	56.5% participants reported DAD after 1–2 drinks, 29.1% reported DAD after 2–4 drinks and 13.1% reported DAD after 5 or more drinks.

Table 1. Cont.

Author, Year	Sample Population	Study Design	Thematic Domain	Salient Findings
Whitehill et al., 2014 [42]	N = 315	Cross-sectional study	Policy Environmental	52.6% ($p < 0.001$) of students drove after using marijuana. 86% ($p = 0.21$) of the participants rode as passengers with a marijuana-using driver. 65.1% of the participants drank alcohol, 14.7% of the participants participated in DAD ($p = 0.01$), and 32.2% ($p = 0.07\%$) reported riding with an alcohol-using driver.
Woolsey et al., 2015 [43]	N = 2015	Cross-sectional study	Intrapersonal/Psychological	Combined users of energy drinks and alcohol were more likely to (1) drive when they perceived they were over a Breath Alcohol Concentration (BAC) of 0.08% ($p < 0.001$), (2) drive despite knowing they had too much to drink to drive safely ($p < 0.001$), (3) be a passenger when they knew the driver had too much alcohol to drive safely ($p < 0.001$).
Zakletskaia, 2009 [44]	N = 1587	Cross-sectional study	Intrapersonal/Psychological	Sensation seeking remains a statistically significant independent predictor of alcohol-impaired driving behavior (OR = 1.52; CI = 1.19–1.94; $p < 0.001$). Older, Caucasians, sensation-seeking college students who engage in heavy episodic drinking, live off-campus, and go to bars are at highest risk for alcohol-impaired driving behaviors.
Zhang & Sloan, 2014 [45]	N = 1634	Cross-sectional study	Intrapersonal/Psychological Environmental	Depression increased the number of DAD events during the past year by 0.572. This decreased to 0.411 episodes/year after adding SES.

3.1. Intrapersonal/Psychological

The majority of studies examining DAD among college students focused on intrapersonal/psychological factors ($n = 12$). Personal characteristics such as being over the legal drinking age (21 years or older) and being male increased the risk of DAD [25,27,33]. Several studies found a positive association between sensation seeking and DAD [37,38,40,41,44,45]. Finally, alcohol-specific behaviors such as age at first drink and risky drinking behaviors, like binge drinking, were associated with DAD [37,39,43]. Perceived risks and benefits ($n = 3$) were also positively/negatively associated with DAD [28,32,35]. One study also found direct and indirect associations between energy drink consumption and DAD through alcohol use quantity [24]. There was also a strong correlation between drugged driving and other substance use with DAD behaviors among college students [23,42].

3.2. Interpersonal/Social

Interpersonal or social determinants are related to the social environment and include the influence of relationships with others. This category encompasses how family, friends, peers, and broader social networks impact an individual’s behavior. Ten ($n = 10$) of the studies focused on the interpersonal/social factors. For this study, we found that family history of alcohol use, peer pressure, the influence of friends and social groups such as fraternities or sororities, and demographic differences have a strong association with driving after drinking among college students [23,24,26–28,31–34,36].

3.3. Environmental

Environmental determinants refer to the physical or organizational surroundings that can influence an individual’s behavior. This can range from the immediate physical environment to broader, community-level influences. In terms of DAD among college students, environmental factors include the type of residence, such as living on-campus in

dorms versus off-campus housing, the availability of alcohol on or near campus and campus culture, and the extent to which drinking is integrated into social events (which can affect exposure to drinking behaviors). Five studies ($n = 5$) focused on environmental-related factors [23,24,30,42,45].

3.4. Policy Related

Policy-related determinants include laws, regulations, policies, and procedures that can influence behaviors at the individual, institutional, community, or societal levels. These determinants can directly influence drinking and driving behaviors through legal drinking ages, which set the minimum age for alcohol consumption [25]. One longitudinal study revealed a strong association between turning 21 years old (legal drinking age in the U.S.) and drinking and driving [29]. A total of four studies focused on policy-related factors [25,28,29,42].

4. Discussion

Understanding the determinants of college students' DAD behavior is essential to reduce RTAs [46]. Our scoping review identified several determinants of DAD among college students in the US, across a range of studies from 2011 to 2021. The key determinants included alcohol use behaviors, Breath Alcohol Concentration (BrAC) levels, family history of drinking, substance use, and the age of first alcohol consumption. Notably, a significant proportion of students engaged in risky behaviors, with one study reporting that 19.1% of participants drove after consuming 3 or more drinks [34]. Additionally, the use of marijuana was associated with an increased likelihood of DUI, emphasizing the multifaceted nature of substance use and driving behaviors among college students [30,42].

The findings from our review align with the existing literature, which underscores the complexity of DAD behaviors among college students. Previous research has similarly highlighted the role of individual alcohol consumption patterns, substance use, and socio-demographic factors as key influences [30,34,39,47]. However, our review extends the current knowledge by providing a more recent synthesis of determinants, particularly emphasizing the emerging concern of combined substance use and its implications for driving behaviors. During college, young adults commonly engage in binge drinking (BD). Multiple research studies are ongoing that suggest that college students drink heavily [48]. According to the Centers for Disease Control and Prevention [49], in 2022, 1519 college students died in RTAs and more than 258,000 were rushed to emergency units for the treatment of either minor or major injuries. Seven young people die each day in RTAs in the U.S., and more than one hundred sustain injuries [49]. These studies have reported that drinking alcohol while driving can cause detrimental harm to college students, leading to RTAs. In general, these accidents may be preventable.

Theoretically, our findings support the notion that DAD behaviors among college students are influenced by a complex interplay of intrapersonal/psychological, interpersonal/social, environmental, and policy-related factors [50–53]. This underscores the need for multifaceted intervention strategies that address not only individual behaviors but also the broader social and environmental contexts in which these behaviors occur. Practically, the review suggests the importance of interventions targeted at college campuses, including education on the risks of combined alcohol and substance use, the implementation of screening and brief interventions for at-risk students, and the development of policies that reduce the availability of alcohol on and near campuses. Research has consistently shown that individuals scoring high on sensation-seeking scales are more likely to engage in a variety of risky behaviors, including substance use and risky driving practices [38,41,44]. The correlation is partly due to the allure of immediate gratification and the underestimation of the potential negative consequences associated with such actions. Several psychological mechanisms can explain why highly sensation-seeking people are more likely to drink and drive [54]. Moreover, the social context of college life, which often promotes alcohol

consumption and risk-taking behaviors, can exacerbate the inclination towards drinking and driving among sensation seekers [50].

Family use of alcohol significantly influences the development of drinking habits in younger family members. Research has consistently shown that children and adolescents who grow up in households where alcohol use is prevalent are more likely to start drinking at an earlier age [34,37,55,56]. Early initiation of alcohol use is a risk factor for developing patterns of heavy drinking and, subsequently, for DAD [57–59]. Moreover, when family members model risky alcohol-related behaviors, such as DAD, these actions may become normalized within the family context, leading to a higher likelihood of such behaviors being adopted by younger generations [60,61]. The norms and attitudes towards alcohol that are prevalent within a family environment also play a significant role in determining an individual's behavior related to drinking and driving. While genetics alone do not determine behavior, individuals with a family history of alcoholism may have a heightened biological risk of developing similar issues [62]. These genetic predispositions, combined with environmental factors such as family drinking patterns and attitudes, can contribute to the risk of DAD [19]. Understanding the influence of family alcohol use on the likelihood of DAD has significant implications for prevention and intervention strategies [59]. The role of family alcohol use in determining the likelihood of an individual engaging in DAD is influenced by a combination of genetic, behavioral, and environmental factors. Family-based interventions that focus on altering attitudes and norms about alcohol use, improving communication about the risks associated with DAD, and modeling responsible alcohol-related behaviors can be effective in reducing the incidence of DAD among family members.

Joining fraternity and sorority groups is a significant aspect of college life for many students, offering a sense of community, networking opportunities, and social activities. However, these social organizations have also been linked to various behaviors and cultural practices, including increased alcohol consumption and, consequently, an elevated risk of DAD [63]. Fraternities and sororities are often associated with a robust social culture that heavily emphasizes alcohol consumption. Social events, parties, and initiation rituals frequently involve drinking, sometimes to excess, as a means of bonding and celebration [26,31,64]. This pervasive alcohol culture can normalize heavy drinking and make it an expected part of participating in fraternity/sorority life. Members may feel peer pressure to consume alcohol as a way to fit in or prove their loyalty to the group, thereby increasing their risk of engaging in risky behaviors, including DAD [36,65].

The residence of students, whether they live on or off campus or commute from home, plays a significant role in determining the likelihood of engaging in this risky behavior. Living on campus provides students with easy access to college social events, many of which may involve alcohol [19,32,33,51]. Colleges and universities often have strict policies regarding alcohol use on campuses, but these rules are often broken, leading to drinking sessions at parties and social events. The proximity to peers and the desire to fit in or succumb to peer pressure can significantly affect a student's decision to consume alcohol. However, having an on-campus residence might reduce the likelihood of DAD due to the short distances between the residence halls and a variety of services reducing the need for driving. Nonetheless, the culture of BD on campuses cannot be overlooked as a determinant that potentially escalates the risk of alcohol-related harm [19]. Students living off-campus are often less subject to university regulations and may have greater freedom to host and attend parties that involve alcohol. This independence can lead to increased alcohol consumption due to the lack of supervision and the increased availability of alcohol [66]. Furthermore, the need to drive home after social gatherings can increase the risk of DAD, especially in areas without public transport [67]. These findings underscore the need for targeted interventions addressing environmental factors and social norms surrounding alcohol consumption and driving behaviors in off-campus settings.

The legal drinking age is a contentious topic in many countries, with significant debate over its effectiveness in preventing alcohol misuse among young adults [19,68]. In the

US, the National Minimum Drinking Age Act of 1984, which mandated states to raise the legal drinking age to 21, was implemented with the aim of reducing alcohol-related accidents among young people. This legislation provides a valuable context to examine the relationship between the legal drinking age and college students' behaviors, particularly in terms of drinking and driving [68]. The legal drinking age can act as a barrier to legal access to alcohol, yet paradoxically, it may also contribute to the allure of underage drinking as a form of rebellion or a rite of passage among college students. Research indicates that the restriction can lead to risky drinking activities where alcohol is consumed in unregulated environments, often without supervision, leading to higher levels of consumption and riskier behaviors, including DAD [27,44,69].

The legal drinking age influences the culture around drinking on college campuses. In environments where most college students are below the legal drinking age, there can be the development of a BD culture. BD, defined as consuming five or more drinks for men and four or more for women within about two hours, is particularly dangerous as it significantly impairs judgment and increases the likelihood of risky behaviors, including the decision to drink and drive [19,70]. Studies have shown that college students, especially those who cannot legally purchase alcohol, may engage in BD during infrequent opportunities where alcohol is available, thereby increasing their risk of DUI [45,70]. By examining the relationship between the legal drinking age and risky behaviors such as binge drinking and DAD, these studies highlight the complexities of addressing alcohol-related harms in college environments.

In the diverse landscape of college campuses, the demographics of the student population—including age, gender, socioeconomic status, and cultural background—play a pivotal role in shaping behaviors and attitudes towards alcohol consumption and driving [51]. At the heart of the issue is the developmental stage of college students. Gender plays a crucial role in this dynamic as well. Studies have consistently shown that male college students are more likely to DAD compared to their female counterparts [71]. This discrepancy can be attributed to societal norms and gender roles that encourage or even glorify risk-taking behaviors among young men. Moreover, the tendency of men to consume alcohol in larger quantities further exacerbates the likelihood of driving under the influence (DUI) [25,32,72]. Socioeconomic status (SES) also influences drinking and driving behaviors among college students. Those from higher SES backgrounds may have more disposable income, enabling greater access to alcohol and social activities that include drinking. In contrast, students from lower SES backgrounds might engage in drinking and driving due to a lack of access to safer transportation options or as a coping mechanism for financial stress [73]. Together, our findings suggest that cultural background significantly impacts students' attitudes toward alcohol and driving, with international students facing unique challenges navigating legal frameworks and cultural norms regarding alcohol use and driving safety [71]. International students may face additional challenges, as they must navigate the discrepancies between the legal frameworks of their home countries and those of the college environment, and more work with this population is recommended.

The included studies indicate a concerning prevalence of DAD among college students. The consequences of RTAs produce adverse economic and social issues for afflicted families and the community. Data derived from 1629 motor vehicle accidents showed that the accident frequency increases non-linearly in higher levels of traffic congestion; otherwise, there remained an approximately linear relationship between traffic volume and accident frequency at lower traffic volumes [74]. The traffic proportion (i.e., the percentage of cars traveling through the reported road section at any given moment) and traffic ratio (i.e., measures traffic percentage of distinct proportions of the recorded road section) determine the frequency of traffic accidents [11]. The earlier is defined as the percentage of cars traveling through the reported road section at any given moment. Additionally, the findings of Beck et al. (2018) and Martin et al. (2015) underscore the importance of rigorous screening and intervention programs tailored to college environments [47,75], particularly targeting students at risk of engaging in drinking and driving behaviors. By

integrating insights from these studies, intervention strategies can be developed to address not only the act of drinking and driving but also the underlying drinking behaviors and decision-making processes among college students. In contrast, the latter measures traffic percentages of distinct portions of the recorded road section. The larger the percentage of traffic, the greater the likelihood of an accident, and vice versa. In the study by Hultgren et al. (2021), a significant portion of the 147 students who responded admitted to alcohol use while driving [30]. LaBrie et al. (2011) further highlighted this issue [34], with 19.1% of participants reporting driving after consuming three or more drinks.

The studies utilized diverse theoretical frameworks and methodologies to explore the determinants of drinking and driving. Hultgren et al. (2021) conducted a cross-sectional study [30], gathering direct responses about alcohol use while driving. LaBrie et al. (2011) adopted a randomized control study design to explore the link between drinker classification, drinking history, and driving after drinking [34]. Polysubstance use—defined here as the sequential use of more than one substance—is particularly prevalent among college students [6]. This pattern of use can exacerbate the impairments associated with alcohol, leading to increased risk-taking behaviors, including DAD. For instance, the use of stimulants like marijuana alongside alcohol can mask the subjective feelings of intoxication, leading individuals to underestimate their impairment and increasing the likelihood of deciding to drive [30,42,76,77]. Similarly, the use of cannabis, which is increasingly common among college students, has been shown to impair judgment, motor coordination, and reaction time—factors that significantly contribute to DUI when combined with alcohol consumption [78].

Age of alcohol initiation is a critical factor that can profoundly affect an individual's future behavior, particularly concerning risky behaviors such as DAD [79,80]. Early initiation of alcohol consumption is associated with a myriad of potential problems, one of the most concerning being the increased likelihood of engaging in DAD [27,37,39,58,80]. The interplay of psychological and social factors further influences the relationship between substance use and DAD among college students [6]. Psychologically, the use of substances can alter perception, increase impulsivity, and diminish the capacity for risk assessment. These effects can make the idea of DAD more palatable or reduce the perceived severity of its potential consequences [23,42,57]. Socially, the college environment often fosters a culture where substance use is normalized, and risky behaviors are sometimes glorified [81]. Peer influence is a potent factor; students may engage in DAD not only as a result of their own substance use but also under the pressure or encouragement of their peers [82].

The findings from multiple studies collectively underscore the pervasive nature of risky alcohol-related driving behaviors among college students. Participants' perceptions of drunk driving [75], coupled with the prevalence of excessive alcohol consumption indicated by high Audit-C risk levels [47], highlight the urgent need for tailored interventions within college environments. Moreover, insights into self-reported behaviors related to alcohol use while driving emphasize the complex decision-making processes underlying such risky behaviors [30]. These studies collectively suggest that early initiation of alcohol use may serve as a predictor of later engagement in risky driving behaviors, underscoring the importance of early intervention strategies. Additionally, the significance of considering not only alcohol but also other substances in driving safety interventions highlights the need for comprehensive approaches to risk mitigation among college students that address drinking history and decision-making [30,34,39] and risky alcohol use behaviors and risk for DAD [47]. Overall, these findings contribute to a deeper understanding of the multifaceted factors influencing alcohol-related driving behaviors in college settings. They underscore the necessity of targeted interventions addressing not only individual behaviors but also broader social and environmental contexts within college environments to effectively reduce the prevalence of risky driving behaviors among students [31,34]. Beyond alcohol, the use of other substances, particularly marijuana, emerges as a significant factor influencing the likelihood of engaging in risky driving behaviors [23,43]. Although it is encouraging that some of the studies found that students were not intending to drive

following a drinking event, research indicates intoxicated individuals were willing to ride with an impaired driver, and future work is needed to reduce this behavior as well.

4.1. Implications for Research and Practice

The multifaceted nature of DAD, identified in our findings, underscores the need for comprehensive and targeted approaches that address individual behaviors, as well as broader social and environmental influences. First, given the prevalence of polysubstance use among college students, interventions should emphasize the dangers of combining alcohol with other substances, such as marijuana. Providing accurate information about the impairing effects of various substances on driving ability can help dispel misconceptions and encourage safer decision-making. Second, implementing screening programs to identify students at risk of engaging in DAD, followed by brief interventions tailored to their individual needs, can be effective in reducing risky behaviors. These interventions can provide personalized feedback on alcohol and substance use patterns, enhance risk perception, and promote safer alternatives to driving under the influence. Third, colleges and universities should consider implementing policies and advocating for community efforts that reduce the availability of alcohol on and near campuses, as well as enforce regulations regarding alcohol use at social events. Creating a campus environment that prioritizes safety and responsible alcohol consumption can help mitigate the influence of social norms that promote DAD.

4.2. Limitations of Existing Research

The small sample size used in this study was a constraint limiting the ability to generalize the findings to the broader population of college students. Again, studies like Hultgren et al. (2021) [30] are cross-sectional, which allow us to describe associations, but not conclude cause–effect relationships. This kind of study limits the ability to determine whether the identified determinants lead to drinking and driving or are associated with it. Beck et al. (2018) [76] also provide in-depth insights, which often limit the researcher’s ability to quantify the relationship between drinking and driving. Some of the studies relied on self-reported data, such as alcohol consumption, drinking and driving behaviors, binge drinking, or risk-taking behaviors, which are subject to social desirability and response bias. Individuals may underreport or misrepresent their alcohol consumption and driving behaviors due to social stigma or legal implications, leading to inaccuracies in the data. Finally, as the studies focus primarily on the US population, their conclusions may not extend to other demographic groups. Although the research targets college students, a group notably involved in drinking and driving, it does not encompass non-college-attending young adults who might also engage in these activities.

Building upon our findings, we offer the following recommendations for future research to address the identified gaps in the literature. First, future research should employ longitudinal designs to assess temporal relationships between determinants and DAD behaviors among college students. Longitudinal studies can provide insights into the developmental trajectories of risky behaviors and inform the timing of interventions for maximum effectiveness. Second, investigating the intersectionality of demographic factors, such as age, gender, socioeconomic status, and cultural background, with DAD behaviors can further our understanding of the contextual influences that shape at-risk alcohol behaviors, like DAD. An intersectional framework can inform more targeted and culturally sensitive interventions tailored to the diverse needs of college students. Finally, researchers are encouraged to implement rigorous evaluation studies when developing prevention and intervention strategies targeting DAD among college students. Comparative effectiveness research can identify the most promising approaches for reducing risky behaviors and inform broader evidence-based policies and programs.

In addition to the factors identified in this review, it is crucial to acknowledge the influence of external forces such as marketing strategies employed by the alcoholic beverage industry. The targeting of college-age populations through various channels, including

social media, significantly contributes to the normalization and glamorization of drinking behaviors. These marketing tactics often emphasize themes of socialization, fun, and attractiveness, thereby perpetuating the perception that alcohol consumption is integral to the college experience. Future research could employ social media content analysis techniques to examine the relationship between alcohol-related posts and subsequent instances of drunk driving among college students. By identifying patterns and themes in social media content, researchers may develop predictive models to anticipate risky behaviors, offering valuable insights for targeted interventions and prevention efforts. By recognizing the pervasive nature of external influences, interventions aimed at reducing drinking and driving behaviors can be more effectively tailored to address the multifaceted dynamics at play within the college environment.

4.3. Limitations of the Review

Publication bias may have played a role whereby studies with favorable results may have had a greater chance of publication and those with non-significant results have less chance. Furthermore, this review included only studies published in English, eliminating those published in other languages that may have met the inclusion criteria.

5. Conclusions

Our scoping review aimed to identify and synthesize the determinants of drinking and driving (DAD) among college students, with a particular focus on highlighting the most important risk factors. Through our analysis of studies conducted between 2011 and 2021, several key findings have emerged, shedding light on the multifaceted nature of DAD behaviors within this population. Individual alcohol consumption patterns are a significant risk factor for DAD among college students. Heavy episodic drinking, often characterized by binge drinking, was associated with an increased likelihood of engaging in risky driving behaviors. Polysubstance use, particularly the concurrent use of alcohol and marijuana, emerged as a concerning risk factor for DAD. The physiological effects of multiple substances can synergistically increase the likelihood of impaired driving and contribute to elevated rates of DAD among college students. The social context of college life, including peer pressure and the normalization of alcohol-related behaviors, significantly influences students' decisions to engage in DAD. Fraternity and sorority membership, in particular, were associated with increased alcohol consumption and elevated risk of DAD due to the pervasive alcohol culture within these social organizations. Lastly, family use of alcohol plays a crucial role in shaping drinking behaviors among college students, with early initiation of alcohol use and modeling of risky behaviors within the family environment contributing to increased susceptibility to DAD. Effective strategies may include education on the risks of combined alcohol and substance use, screening and brief interventions tailored to at-risk students, and the implementation of campus policies that promote responsible alcohol consumption and deter DAD. By acknowledging and addressing the complex interplay of individual and environmental factors, educators and policymakers can take a significant step toward reducing the incidence of drinking and driving on college campuses, thereby safeguarding the well-being of students and the broader community.

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