

The Influence of Alcohol Outlet Proximity on Pedestrian Injury Incidence: Insights from Literature

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Introduction

Preventing roadway deaths and injuries due to motor vehicle crashes continues to be a prevailing public health challenge in the United States. Included in this challenge is improving the safety of pedestrians on street and road networks. Researchers and other professionals continue to develop best practices for ameliorating the outcomes of pedestrian crashes by conducting studies that examine why these crashes occur and what steps can be taken to prevent them in the future. To do this, many researchers have employed a systems approach to addressing pedestrian safety by acknowledging that the causal factors leading to a pedestrian crash are multifaceted. The systems approach can include an analysis of factors related to the operator of a motor vehicle involved in a crash, the pedestrian involved in crash, or the elements of the built environment and their potential association with the crash. Given the high incidence of alcohol-related traffic incidents on roadways (CDC, 2022), the potential association between the presence of alcohol outlets in neighborhoods and pedestrian injuries has garnered attention in the research literature. This research brief explores that relationship further by reviewing past work from the literature and developing key insights that should be considered in future research on this topic.

The Relationship Between Alcohol Use and Pedestrian Safety

Alcohol use can impair the motor function of a driver when operating a motor vehicle. To prevent this, U.S. states have codified into law statutes that prohibit operating a motor vehicle when a person has reached a certain blood alcohol content (BAC). The BAC limit has historically varied from state to state but now 49 of 50 U.S. states enforce a legal limit of 0.08 grams per deciliter (g/dL), except Utah where the BAC limit is 0.05 (Bieber, 2023). Given the immense potential harm that a vehicle operated by an impaired driver can cause, especially to pedestrians who are physically more vulnerable to serious injury in the event of a crash, drivers who are determined to be impaired are cited. Additionally, many states have laws prohibiting public intoxication which includes impaired walking (Justia, 2022). Furthermore, when the BAC of drivers are between the generally legal range of 0.01 g/dL and 0.07 g/dL, the ability to safely operate a motor vehicle can still be impaired (Fell & Voas, 2006). Understanding the behavioral patterns of impaired drivers or pedestrians must be understood in the context of the environmental influences: alcohol availability, land use, and roadway design.

Overview on Alcohol Outlet Proximity to Pedestrian Injury

There are several data challenges that present when considering the study of the relationship between alcohol use and pedestrian crash risk. Alcohol impairment is generally only recorded in the event of a police-reported crash. Thus, near collisions or unsafe conditions that do not result in an actual crash are often harder to link to alcohol usage given the lack of data regarding those conditions. Additionally, many crashes involving contact between a motor vehicle and a pedestrian that result in minor injury or less are not reported (Vissers et al., 2018). These challenges limit the methodological capabilities of researchers trying to explore this relationship. As a result, some studies have employed proxies for alcohol-impaired crashes to broaden understanding of BAC patterns amongst drivers and pedestrians. One proxy, which takes focus in this research brief, is the number of alcohol outlets in a geographic area. The relationship between this proxy and pedestrian safety is highlighted in Figure 1.

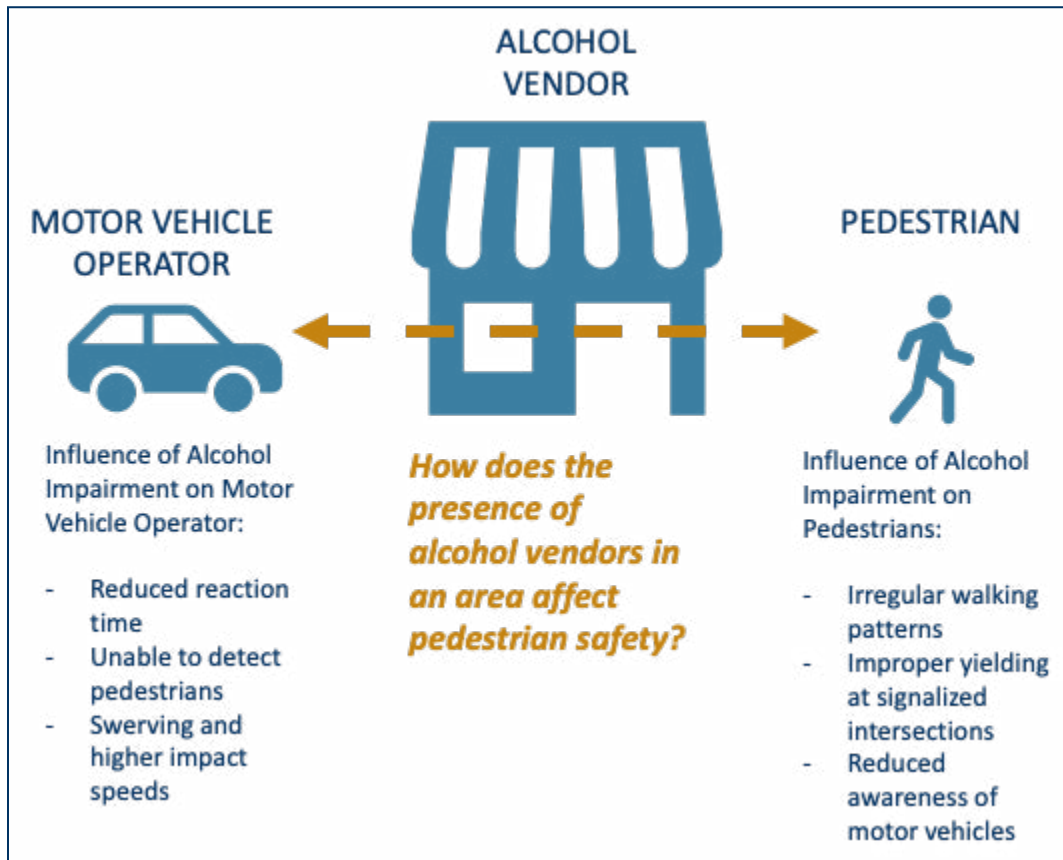


Figure 1: Relationship between Alcohol Vendor Presence and Pedestrian Safety

Proximity to alcohol outlets, referring to vendors and establishments permitted to sell alcohol, is employed as a gauge of alcohol access in the area. Alcohol vendors or establishments are those licensed to sell alcohol for use off-premises, such as warehouse stores and grocery outlets, or venues that provide alcohol for on-site consumption, such as bars and nightclubs. A small number of studies in recent years have addressed the factors related to pedestrian safety around alcohol outlets and establishments. For example, Nesoff et al. (2018) conducted a spatial analysis that investigated the connection between the risk of pedestrian injury and proximity to alcohol vendors while controlling for confounding variables using data from Baltimore City, Maryland. The analysis compared pedestrian injuries between 2014 and 2015

located in census tracts within the city with close proximity to alcohol vendors to the same metric in those tracts with less access to alcohol vendors. Using binomial regression, the researchers found that higher pedestrian injury incidence was associated with census tracts with more access to outlets selling alcohol either for off-premise or on-premise consumption. This work was primarily cross-sectional and the authors note that performing a longitudinal analysis could help further test the association. Another example is a study by Nesoff et al. (2019) which serves as an expansion of the work in Nesoff et al. (2018) and examined the impact of spatial proximity to alcohol outlets on the likelihood of pedestrian injury occurrence. The researchers use 2014 to 2015 injury records from emergency medical services based in Baltimore, Maryland as a case study. Conducting the spatial analysis at the census block group level, the researchers found that block groups with higher levels of alcohol outlets experienced higher relative risk of pedestrian injury. A number of adjustments were made to account for varying levels of trip traffic, population density, and income distributions across census blocks groups. Though these studies explored associations rather than causal effect, they provide important insights into the relationship between alcohol availability and pedestrian safety. Likewise, DiMaggio et al. (2016) tested the same relationship using New York City as a case study and found that the presence of at least one alcohol vendor in a census tract increased the risk of a pedestrian or bicyclist injury collision between 2001 and 2010. In summary, studies such as those by Nesoff et al. (2019), Nesoff et al. (2018), and DiMaggio et al. (2016) contribute methodologically by utilizing a wide array of datasets to systematically measure the relationships between alcohol sales and pedestrian safety and add to contextual understanding of traffic safety behavior.

Other studies do not assess the relationship between alcohol and pedestrian safety directly but can still provide insight into the relationship. For example, Stehr (2010) investigated the relationship between alcohol sale permissance on Sundays and fatalities stemming from vehicular crashes on highways over the period of 1990 to 2008. States in the U.S. have different policies regarding purchase of alcohol on Sundays; therefore, the research team employed the national Fatality Analysis Reporting System (FARS) (NHTSA, n.d.) to analyze how crash fatalities changed in response to respective policy enactments or repeals in states. Negative binomial regression on the crash counts from FARS revealed that easing of restrictions on Sunday alcohol purchases did not coincide with an increase in highway crash fatalities over the time period under consideration except in one state. Traffic fatalities of all kinds were included in the counts by the researcher. Though this analysis does not assess causality and is performed using statewide aggregate-level metrics which limits its generalizability to smaller project areas and pedestrian safety, it provides an important analysis that could be useful for developing a methodology to investigate the association between policy and pedestrian safety and can help generate discussion amongst both the research and legislative communities. Furthermore, focusing more microscopically on subsets of the statewide counts that involve pedestrian safety crashes only on arterials only may provide new insights that either confirm or conflict with the associations found by Stehr (2010) at the statewide level.

The location of alcohol outlets has been linked to sociodemographic factors such as race (Fliss et al., 2021) and income (Morrison et al., 2015), with the literature generally revealing that neighborhoods with persons who are lower income or members of historically disadvantaged racial groups have higher access to alcohol outlets (Scott et al., 2020; Morrison et al., 2016). Likewise, pedestrian injuries due to motor vehicle crashes have also been linked to socio-demographics (Sanders & Schneider, 2022). Further investigating the relationship between the presence of alcohol outlets and pedestrian safety outcomes has grounding in the literature and can be useful for examining the equity implications of traffic safety.

Next Steps for Research

A topic for further research may be to explore the existence of alcohol outlets on urban arterial types of roadways, and examining this in relation to pedestrian, bicycle, transit, and motor vehicle safety. Additional studies can also be conducted to examine the impact of this relationship in nighttime settings which present a plethora of unique safety challenges. Additionally, assessing how data can be collected to better test association between alcohol vendor proximity and pedestrian safety should also be given consideration by funders. With regard to equity, researchers should explore the relationship between the density of alcohol outlets in low-income communities and the disproportionate burden of pedestrian crashes in low-income communities.

Conclusions

The work exploring the relationship between the presence and density of alcohol outlets and establishments with pedestrian safety is still fairly limited and warrants further exploration given the high costs associated with injury and fatality resulting from pedestrian crashes. Land use and roadway environments are known to have an impact on pedestrian safety. Understanding the degree to which a concentrated presence of alcohol outlets and establishments in these roadway environments affects driver, bicycle, and pedestrian behavior - and the interaction between these modes - is important for developing equitable and targeted strategies and policies to improve the roadway environment to promote safe travel and to improve road user behavior.

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