# COVID-19 Has Strengthened the Relationship Between Alcohol Consumption and Domestic Violence

Aaron Chalfin[1], Shooshan Danagoulian[2], and Monica Deza[3]

[1]Department of Criminology, University of Pennsylvania
[2]Department of Economics, Wayne State University
[3]Department of Economics, City University of New York – Hunter College

May 7, 2021

**Abstract**

**Objective:** Recent scholarship documents a marked increase in domestic violence since the onset of the COVID-19 pandemic. This study evaluates an important mechanism behind the increase in domestic violence during the COVID- 19 pandemic: an increase in the *riskiness* of alcohol consumption.

**Data and Methods:** We combine 911 call data with high-resolution microdata on visits to bars and liquor stores in Detroit from January 2019 - July 2020. Using daily zip code measures, we conduct regression analysis of violence-related emergency calls on visits to alcohol outlets.

**Results:** We find that the strength of the relationship between domestic violence and visits to liquor stores more than doubled from 0.02 to 0.06 starting in March 2020, with little evidence with respect to non-domestic assaults.

**Conclusion:** Our study provides evidence that stay-at-home orders changed the relationship between alcohol and domestic violence, in that it is alcohol consumption *at home* that is a driver of domestic violence.

**Policy Implications:** As stay-at-home orders remain an effective containment tool of SARS-COV2, alcohol consumption at home must explicitly addressed to forestall an epidemic of domestic violence.

*Keywords*: Alcohol consumption, domestic violence

# 1 Introduction

The statistics on domestic violence are grim: 1 in every 4 women in the United States will experience violence at the hands of an intimate partner during her lifetime (1). The consequences of domestic violence include not only the shorter-term physical injuries (2; 3; 4; 5) and mental harms (6; 7; 8) that are the immediate consequences of abuse, but also longer-term medical issues such as chronic pain (9), depression (10), sexually-transmitted diseases (11), and post-traumatic stress disorder (12). Given that approximately half of all domestic violence occurs in households where children under the age of 12 are present, domestic violence imposes a terrible burden, not only on the victim of the abuse, but also on children who witness it (13). Sadly, this burden compounds itself generation after generation, becoming an engine for the intergenerational transmission of violence (14).

The COVID-19 pandemic and its many accompanying disruptions to economic and social life have changed the world both unexpectedly and dramatically. Consistent with the expectations of many observers (15), recent scholarship has documented a notable increase in domestic violence since March 2020 in the US as well as in a number of other countries (16; 17; 18; 19). In this paper, we build upon this literature and provide novel evidence for an important mechanism through which lockdowns have affected household violence; we argue that during the COVID-19 pandemic, consumption of alcohol has become more risky, as the venue of consumption has shifted into homes, leading to increased intra-personal conflict.

The relationship between alcohol and violence is well documented. Alcohol use is implicated in approximately 50 percent of all violent crimes and sexual assaults in industrialized nations (20) and a large literature in public health, criminology and economics establishes a correlational and, more recently, a causal link between problematic drinking and violence

(21; 22; 23; 24). Owing to its effects on aggression and the ease with which it can change the nature of routine activities among members of the same household, alcohol consumption has been linked, in particular, to violence between family members, especially intimate partners (25; 26; 27; 28; 29).

By making it more difficult to drink in bars or restaurants, the COVID-19 pandemic has pushed alcohol consumption into residential settings (30). To the extent that residential and non-residential alcohol consumption are differentially conducive to violence — especially domestic violence — the pandemic provides an unfortunate but unique opportunity to better understand the extent to which *venue* of alcohol consumption differentially affects violence. We test this hypothesis by merging public microdata on 911 calls for police service in Detroit, MI, with newly available–and remarkably detailed–geo-location data that allows us to measure daily visits to bars and liquor stores. We study whether Michigan's March 2020 stay-at-home order — which led to a dramatic reduction in drinking at bars and restaurants — changed the relationship between alcohol purchases and community violence. Consistent with prior research, during the pre-pandemic period, we observe a positive relationship between visits to both bars and liquor stores and general violence. After the onset of the COVID-19 pandemic and the subsequent stay-at-home order issued by Michigan Governor Gretchen Whitmer, there is evidence that the relationship between alcohol consumption and violence — especially domestic violence — strengthens considerably. This effect is especially large for visits to liquor stores which account for the majority of alcohol purchases in the post-pandemic period and is even stronger when we flexibly account for temporal spillovers from alcohol purchases. We find considerably more limited evidence for a change in the relationship between alcohol purchases and non-domestic assaults, which is consistent

with the idea that alcohol consumption at home has a particularly close nexus to domestic violence.

# 2 Data and Methods

## 2.1 Data

### 2.1.1 Customer Visit Data

We measure the number of visits to establishments that sell alcohol using data from SafeGraph's *Patterns* platform, which organizes location data for commercial points of interest (POIs). The SafeGraph data consists of high-resolution cellular device location data that link tracked mobile devices to specific commercial establishments in space and time. The data combine information on more than 4 million POIs in the US with visit patterns collected by SafeGraph using location tracking apps. The data contain information on POI location name, address, North American Industry Classification System (NAICS) code, brand association, and business descriptor categories as well as the volume of daily visits to each establishment. We restrict the data to visits to POIs within Detroit determined by zip code. Using NAICS codes, we further restrict the data to POI visits associated with sale or service of alcohol. These include grocery stores (NAICS 445110, 445120, 445210, 445220, 445230, 44591, 445292)[1]; bars and restaurants with an explicit focus on alcoholic beverages (NAICS 722410, 722511)[2]; full service restaurants excluding bars (NAICS 722511); and beer, wine, and liquor stores (NAICS 445310, henceforth liquor stores).

[1]Full-line grocery stores in Michigan may be licensed to sell all alcohol. Our definition of grocery extends beyond full-line grocery stores, including specialty stores that may carry alcohol as well.

[2]Because NAICS 722410 only includes establishments that serve alcohol but no food, we extended the definition of bars to include full-line restaurants with the following terms in their business descriptor categories: "Bar or Pub", "Cocktail", "Sports Bar", "Dive Bar", "Brewery".

While the SafeGraph data allow us to identify foot traffic to alcohol outlets with remarkable granularity, they are subject to three important limitations. First, we are unable to track every cellular phone in the United States. While this could potentially lead to selection bias, we note that SafeGraph's internal research has found that the sample of users is representative of the US population at the census block group level.[3] Second, these data do not constitute a comprehensive count of visits to a particular POI, as they are not based on the universe of cellular devices, nor do they capture visits by individuals without cellular devices. To address this limitation, our analysis focuses on *changes* in the volume of visits, rather than the number of visits. Finally, visits to alcohol outlets do not allow us to observe the amount of alcohol purchased or when it was consumed. While this is a notable limitation, our estimates — which relate violence to the number of visits to alcohol outlets — nevertheless constitute *prima facie* evidence that violence is sensitive to the timing and location of alcohol purchases. We further note that if there is imperfect correspondence between the visit data and alcohol consumption, and as long as the errors are uncorrelated with community violence, this generates a conservative bias in our "reduced form" estimates.

### 2.1.2 911 Call Data

We measure violence known to law enforcement using 911 call data from the City of Detroit Open Data Portal. The 911 calls for service dataset compiles all emergency calls requiring law enforcement response as well as officer-initiated calls for service in the City of Detroit. Between January 1, 2019 and June 10, 2020 there were 1,471,211 calls for emergency service. For each call, we observe the responding agency, zip code of incident, information about

[3] More detail on SafeGraph analysis can be found at:
https://www.safegraph.com/blog/what-about-bias-in-the-safegraph-dataset.

the agency (precinct, responding unit), date of incident, information about response to the incident (time on scene, total response time, total time, travel time, intake time), and information regarding the nature of the call (call code number, call description). We use a combination of call code numbers and call descriptions to identify which assault calls can be attributed to domestic violence and which cannot. We define non-domestic assault as either felonious assault [4] or assault and battery [5]. We define domestic violence as calls concerning inter-partner and intra-household violence, including child or adult abuse with or without a weapon, with or without a report.[6] We sum domestic violence calls and assaults to the uniquely identified zip code, year, month, and day. Our analysis is based on 26 zip codes tracked across 552 days, totalling 14,352 zip code observations per day between January 1, 2019 and July 4, 2020.

### 2.1.3 Descriptive Analysis

**Figure 1** presents unadjusted trends in domestic assault (Panel A) and non-domestic assault (Panel B) along with the liquor store share of visits to outlets that sell alcohol. Both panels provide evidence of substantial seasonal variation in violence, with both domestic and non-domestic assaults peaking in the summer months and reaching their lowest points between November and March. While non-domestic assaults increased in summer 2020 to levels comparable to those in summer 2019, domestic assaults are noticeably higher in summer 2020. In accordance with emerging literature on this topic (16; 17), the figure thus provides suggestive evidence that, unlike general forms of violence, domestic violence has increased during the pandemic, even after taking seasonal trends into account.

[4] Call code numbers 343010, 343020, 343040
[5] Call code numbers 347010, 347020, 347021, 347040
[6] Call code numbers 393010, 393030, 395010, 395030, 396010, 396030, 397010, 397030.

The figure also suggests that the sources of alcohol consumption have changed markedly. Prior to the onset of the pandemic the relative share of visits to liquor stores was remarkably stable, at approximately 30%. As stay-at-home orders closed bars and restaurants, liquor stores became the main venue of alcohol sales. By May 2020, liquor stores accounted for over 70% of all visits to alcohol outlets. Taken together, the two series suggest that domestic violence might be particularly sensitive to venue of alcohol consumption.

Next, in **Table 1**, we present summary statistics for our zip-code-by-date-level analytic dataset. We report descriptive statistics for the entire city (Panel A) as well as for zip codes with a higher than median number of 911 calls for violence (Panel B) and a lower than median number of 911 calls for violence (Panel C). With respect to pre-pandemic visits, we observe 235 daily visits to restaurants, 99 daily visits to food stores, 90 daily visits to bars, and 35 daily visits to liquor stores in an average zip code. As the SafeGraph data allow us to observe only a fraction of all visits, these numbers do not have a direct interpretation. However, ratios and trends are highly instructive. In the pre-pandemic period, there were 2.5 visits to bars for every visit to a liquor store. Since the onset of the pandemic, the ratios have reversed. In the post-March 2020 period, there has been a notable decline in the number of visits to alcohol outlets. However, while visits to bars have declined by more than 80 percent, visits to liquor stores have declined by around one third. These declines are consistent with an overall decline in consumer activity, as evidenced from large declines in the number of customer visits to restaurants and food outlets. In subsequent analyses, we control for visits to restaurants and food outlets in order to account for the large secular decline in economic activity that has been brought about by the pandemic.

## 2.2 Empirical Methods

We study the effect of community-level alcohol sales on violence using natural variation in the measured number of visits to alcohol outlets. We focus, in particular, on two types of alcohol outlets: bars and liquor stores and two types of violence: domestic violence and no-domestic assaults. In order to estimate the proportional change in violence with respect to visits to alcohol outlets, we estimate Poisson regression models in which the count of 911 calls made in a zip code on a date is $Y_{it}$. In (1), $Y_{it} \sim \text{Poisson}(\gamma_{it})$, is regressed on the number of measured visits to each type of alcohol establishment. In order to account for changing behavior introduced by stay-at-home orders, we interact the number of measured visits for each type of alcohol establishment with an indicator for the post-March 10 period. We define the post-COVID period flexibly, dividing it into a March 10-May 25 period, when the stay-at-home was in effect, and a May 26-June 10 period, when the order was lifted. In practice, our empirical estimates focus on the stay-at-home period.

$$\begin{aligned} log(\gamma_{it}) = \alpha + \sum_{j=1}^{4} \xi^j [ln(VISITS)_{it}^j] + \\ + \sum_{j=1}^{4} \beta^j [ln(VISITS)_{it}^j \times POST_{it}] + \\ + \rho X_{it-1} + \lambda_i + \delta_t \end{aligned} \tag{1}$$

In (1), $VISITS_{it}^j$ is the daily number of measured visits in a given zip code to an establishment of type $j$. We include all establishments which serve alcohol – bars, liquor stores, restaurants, and grocery stores. Though restaurants and grocery stores are not primarily sources of alcohol sales, we include them for completeness. The post March 2020 period is identified using $POST_i t$ indicator and interacted with the visit terms separated by alcohol

outlet type. In practice, we separate the pandemic into two post-periods, $POST1_{it}$ and $POST2_{it}$, which are equal to one for the time periods between March 10-May 25 and May 26-July 5, 2020, respectively, and zero for pre-pandemic time periods. Accordingly, $e^{\xi^j}$ are the incidence rate ratios for the pre-pandemic period and $e^{\beta^j}$ are the incidence rate ratios for the stay-at-home period. These coefficients provide an estimate of the elasticity of violence with respect to visits to each type of establishment. In auxiliary models, we allow for temporal spillovers in the effect of alcohol consumption by including various lags for each of the visit variables.

In all models, we condition on $X_{it-1}$, the number of shootings in a given zip code in the previous day, a proxy for stress which may be induced by serious violence experienced recently. We include zip code fixed effects, $\lambda_i$, in order to absorb time-invariant characteristics across zip codes in Detroit and day-by-month fixed effects and year fixed effects, $\delta_t$, which account for daily variation in citywide crime trends. In practice, we utilize an additional innovation, allowing $\delta_t$ to vary according to whether a zip code's baseline number of 911 calls for violence is above or below the median. This innovation is notable in that it allows us to account for events, whether observable or not, which vary over time and and have differing effects on relatively poor and relatively affluent communities. For example, though the post-pandemic period coincides with the a number of protests associated with police killings of Black civilians, to the extent that such events have similar effects across similar neighborhoods, they are accounted for by the interacted fixed effects. In all models, standard errors are clustered at the zip code level to account for both heteroskedasticity and arbitrary serial correlation in the error terms for observations in the same geographic unit measured at different time periods (31).

# 3 Results

Our principal estimates are presented in **Table 2**. We report estimates from equation (1) for the entirety of Detroit (Panel A) as well as for zip codes with higher than median 911 call volumes (Panel B) and lower than median 911 call volumes (Panel C). In each panel, we present estimates separately for domestic and non-domestic assaults. We likewise present estimates separately for both the pre-pandemic period (the $\xi^j$ terms in equation 1) and the first part of the post-pandemic period (the $\beta^j$ terms in equation 1) for each of the four types of establishment: bars, liquor stores, restaurants, and food outlets.

With respect to domestic assaults, there is little evidence that domestic violence is related to either bar or liquor store visits prior to the COVID-19 pandemic. However, we observe that domestic violence calls rise with the number of visits to both bars and liquor stores in the post-pandemic period. In particular, the elasticity of domestic violence calls with respect to visits increases by approximately 0.049 for bars and 0.063 for liquor stores. While these level changes are modest, we note that they are reduced forms and do not account for temporal spillovers in alcohol consumption. The sub-city analysis indicates that the relationship between liquor store visits and domestic violence is particularly strong in low-crime zip codes, while the relationship between bar visits and domestic violence is particularly strong in high-crime zip codes. In contrast to domestic assaults, the relationship between visits to alcohol outlets and non-domestic assaults does not strengthen significantly in the post-pandemic period. As such, even though alcohol consumption may interact positively with pandemic-induced stress, this has not led to an increase in alcohol-induced violence more generally.

While we condition on a granular set of fixed effects, concerns about omitted variable

bias may remain. In order to test for the possibility that the effects we observe are part and parcel of broader trends in economic activity and the movement of people in a community, we consider whether domestic violence is impacted by visits to restaurants and food stores. As expected, we find little evidence of a positive relationship between restaurants or food outlets and violence, whether residential or non residential, pre- or post-pandemic.

Because alcohol purchased at a liquor store can be consumed for a period of time after its purchase, we next consider the lagged effect of visits to alcohol outlets. We run an auxiliary model in which we augment equation (1) to include the first and second lags of visits to each type of commercial outlet in each time period studied. These terms allow us to observe dynamic correlations between violence and alcohol purchases made in the prior two days. We present these results in **Table 3**. In the table, we present the cumulative effect of three consecutive days of visits by summing coefficients on concurrent and two lagged effects. The cumulative coefficients are presented for bars and liquor stores only. For bars, the estimates presented in Table 3 are twice as large as those in Table 2, offering evidence in favor of temporal spillovers. On the other hand, for liquor stores, the estimates in Table 3 are approximately 50% larger than those in Table 2, indicating that the elasticities reported in Table 2 are conservative estimates of the effect of alcohol consumption on domestic violence.

## 4 Discussion

In this research, we show that the relationship between visits to alcohol outlets and domestic violence — but not other forms of violence — has grown considerably stronger since March 2020. Our conclusions are based on newly-available data provided by SafeGraph that allow us to estimate daily changes to the number of visitors to establishments selling alcohol. Due

to the remarkable resolution of the data, we are able to construct a daily proxy for alcohol consumption in each community, a measure that researchers have long wished to use but which has, until recently, been impossible to collect due to technological limitations.

Why has alcohol consumption become riskier during the pandemic? We offer three reasons. First, the location of alcohol consumption changed markedly since stay-at-home orders took effect. Whereas liquor stores accounted for only 28 percent of visits to alcohol outlets in the pre-pandemic period, since March 2020 this proportion has more than doubled to nearly 60 percent. Second, the COVID-19 pandemic has led to job loss, economic hardship, and a great deal of stress as families struggle to cope with considerable disruptions to their daily lives. While it is easy to imagine that these factors have led to an increase in violence in the absence of alcohol, it also stands to reason that they have made alcohol consumption riskier. Finally, stay-at-home orders have mechanically increased the amount of time that people are spending at home (32). As such, the opportunity for problematic drinking to lead to family violence has increased. At the same time, we observe little evidence that the relationship between alcohol and other types of violence has changed since the COVID-19 pandemic. As such it appears as though the pandemic has caused a substitution of violence away from acquaintances and strangers and toward family members.

Beyond developing a deeper understanding of the effects of the COVID-19 pandemic, this research contributes to the large literature that studies geo-spatial correlations between the location of alcohol outlets and violence (33; 34; 35; 36). By leveraging highly granular visit data and exploiting changes in the density of visits over time, we are able to draw stronger causal inferences about the relationship between alcohol outlets and community violence. Our estimates suggest that regardless of the COVID-19 pandemic, visits to bars

and liquor stores lead to increased violence, providing more credible evidence that prior evidence is not merely correlational.

This research likewise helps to deepen our understanding of the nature of domestic violence, suggesting that the venue of alcohol consumption, rather than merely the volume of alcohol consumed may be a principal driver of household violence. The idea that venue may be an important characteristic of alcohol consumption can be found in research on the minimum legal drinking age (23) and is likewise implicated in research that suggests that family violence is triggered by frustration such as that which is generated by an unexpected football loss (37). However, thus far, this has been mostly a topic of speculation and has been subject to little empirical testing. Our principle finding — that the relationship between alcohol purchases and domestic violence but not other forms of violence — has grown considerably stronger since the pandemic, is among the most direct evidence, to date, that venue matters.

## References


[1] Alhabib S, Nur U, Jones R. Domestic violence against women: Systematic review of prevalence studies. Journal of Family Violence. 2010;25(4):369–382.

[2] Le BT, Dierks EJ, Ueeck BA, Homer LD, Potter BF. Maxillofacial injuries associated with domestic violence. Journal of Oral and Maxillofacial Surgery. 2001;59(11):1277–1283.

[3] Plichta SB. Intimate partner violence and physical health consequences: Policy and practice implications. Journal of Interpersonal Violence. 2004;19(11):1296–1323.

[4] Sheridan DJ, Nash KR. Acute injury patterns of intimate partner violence victims. Trauma, Violence, & Abuse. 2007;8(3):281–289.

[5] Ellsberg M, Jansen HA, Heise L, Watts CH, Garcia-Moreno C, et al. Intimate partner violence and women's physical and mental health in the WHO multi-country study on women's health and domestic violence: an observational study. The Lancet. 2008;371(9619):1165–1172.

[6] Roberts GL, Lawrence JM, Williams GM, Raphael B. The impact of domestic violence on women's mental health. Australian and New Zealand Journal of Public Health. 1998;22(7):796–801.

[7] Tolman RM, Rosen D. Domestic violence in the lives of women receiving welfare: Mental health, substance dependence, and economic well-being. Violence against Women. 2001;7(2):141–158.

[8] Humphreys C, Thiara R. Mental health and domestic violence:'I call it symptoms of abuse'. The British Journal of Social Work. 2003;33(2):209–226.

[9] Wuest J, Merritt-Gray M, Ford-Gilboe M, Lent B, Varcoe C, Campbell JC. Chronic pain in women survivors of intimate partner violence. The Journal of Pain. 2008;9(11):1049–1057.

[10] Dienemann J, Boyle E, Baker D, Resnick W, Wiederhorn N, Campbell J. Intimate partner abuse among women diagnosed with depression. Issues in Mental Health Nursing. 2000;21(5):499–513.

[11] Martin SL, Matza LS, Kupper LL, Thomas JC, Daly M, Cloutier S. Domestic violence and sexually transmitted diseases: the experience of prenatal care patients. Public Health Reports. 1999;114(3):262.

[12] Jones L, Hughes M, Unterstaller U. Post-traumatic stress disorder (PTSD) in victims of domestic violence: A review of the research. Trauma, Violence, & Abuse. 2001;2(2):99–119.

[13] Holt S, Buckley H, Whelan S. The impact of exposure to domestic violence on children and young people: A review of the literature. Child abuse & Neglect. 2008;32(8):797–810.

[14] Simons RL, Wu Ci, Johnson C, Conger RD. A test of various perspectives on the intergenerational transmission of domestic violence. Criminology. 1995;33(1):141–172.

[15] Taub A. A New Covid-19 Crisis: Domestic Abuse Rises Worldwide. The New York Times. 2020;.

[16] Boserup B, McKenney M, Elkbuli A. Alarming Trends in US Domestic Violence During the COVID-19 Pandemic. The American Journal of Emergency Medicine. 2020;.

[17] Leslie E, Wilson R. Sheltering in place and domestic violence: Evidence from calls for service during COVID-19. Available at SSRN 3600646. 2020;.

[18] McCrary J, Sanga S. The Impact of Coronavirus Lockdown on Domestic Violence. SSRN Scholarly Paper ID 3612491 Rochester NY: Social Science Research Network. 2020;.

[19] Leslie E, Wilson R. Sheltering in Place and Domestic Violence: Evidence from Calls for Service during COVID-19. Journal of Public Economics. 2020;189.

[20] Heinz AJ, Beck A, Meyer-Lindenberg A, Sterzer P, Heinz A. Cognitive and neurobiological mechanisms of alcohol-related aggression. Nature Reviews Neuroscience. 2011;12(7):400–413.

[21] Carpenter C, Dobkin C. The effect of alcohol consumption on mortality: regression discontinuity evidence from the minimum drinking age. American Economic Journal: Applied Economics. 2009;1(1):164–82.

[22] Carpenter C, Dobkin C. The minimum legal drinking age and public health. Journal of Economic Perspectives. 2011;25(2):133–56.

[23] Chalfin A, Hansen B, Ryley R. The minimum legal drinking age and crime victimization. National Bureau of Economic Research; 2019.

[24] Kypri K, Davie G, McElduff P, Connor J, Langley J. Effects of lowering the minimum alcohol purchasing age on weekend assaults resulting in hospitalization in New Zealand. American Journal of Public Health. 2014;104(8):1396–1401.

[25] Bushman BJ. Effects of alcohol on human aggression. In: Recent Developments in Alcoholism. Springer; 2002. p. 227–243.

[26] Livingston M. The ecology of domestic violence: the role of alcohol outlet density. Geospatial Health. 2010;5(1):139–149.

[27] Markowitz S, Grossman M. Alcohol regulation and domestic violence towards children. Contemporary Economic Policy. 1998;16(3):309–320.

[28] Foran HM, O'Leary KD. Alcohol and intimate partner violence: A meta-analytic review. Clinical Psychology Review. 2008;28(7):1222–1234.

[29] Caetano R, Schafer J, Cunradi CB. Alcohol-related intimate partner violence among white, black, and Hispanic couples in the United States. Alcohol Research & Health. 2001;25(1):58.

[30] Usher K, Bhullar N, Durkin J, Gyamfi N, Jackson D. Family violence and COVID-19: Increased vulnerability and reduced options for support. International Journal of Mental Health Nursing. 2020;.

[31] Bertrand M, Duflo E, Mullainathan S. How much should we trust differences-in-differences estimates? The Quarterly Journal of Economics. 2004;119(1):249–275.

[32] Peterman A, Potts A, O'Donnell M, Thompson K, Shah N, Oertelt-Prigione S, et al. Pandemics and Violence Against Women and Children. Center for Global Development. 2019;Working Paper(528).

[33] Gruenewald PJ, Freisthler B, Remer L, LaScala EA, Treno A. Ecological models of alcohol outlets and violent assaults: crime potentials and geospatial analysis. Addiction. 2006;101(5):666–677.

[34] Franklin FA, II TAL, Webster DW, Pan WK. Alcohol outlets and violent crime in Washington DC. Western Journal of Emergency Medicine. 2010;11(3):283.

[35] Grubesic T, Pridemore W. Alcohol Outlets and Clusters of Violence. International Journal of Health Geographics. 2011;10(30).

[36] Roman CG, Reid SE. Assessing the relationship between alcohol outlets and domestic violence: routine activities and the neighborhood environment. Violence and Victims. 2012;27(5):811–828.

[37] Card D, Dahl GB. Family violence and football: The effect of unexpected emotional cues on violent behavior. The Quarterly Journal of Economics. 2011;126(1):103–143.

[38] Fantuzzo JW, Fusco RA. Children's direct exposure to types of domestic violence crime: A population-based investigation. Journal of Family Violence. 2007;22(7):543–552.

[39] Bair-Merritt MH, Shea Crowne S, Thompson DA, Sibinga E, Trent M, Campbell J. Why do women use intimate partner violence? A systematic review of women's motivations. Trauma, Violence, & Abuse. 2010;11(4):178–189.

[40] Huth-Bocks AC, Levendosky AA, Semel MA. The direct and indirect effects of domestic violence on young children's intellectual functioning. Journal of Family Violence. 2001;16(3):269–290.

[41] Koenen KC, Moffitt TE, Caspi A, Taylor A, Purcell S. Domestic violence is associated with environmental suppression of IQ in young children. Development and Psychopathology. 2003;15(2):297–311.

[42] Ybarra GJ, Wilkens SL, Lieberman AF. The influence of domestic violence on preschooler behavior and functioning. Journal of Family Violence. 2007;22(1):33–42.

[43] Enlow MB, Egeland B, Blood EA, Wright RO, Wright RJ. Interpersonal trauma exposure and cognitive development in children to age 8 years: a longitudinal study. Journal of Epidemiology & Community Health. 2012;66(11):1005–1010.

[44] Simons RL, Johnson C. An examination of competing explanations for the intergenerational transmission of domestic violence. In: International Handbook of Multigenerational Legacies of Trauma. Springer; 1998. p. 553–570.

[45] Ehrensaft MK, Cohen P, Brown J, Smailes E, Chen H, Johnson JG. Intergenerational transmission of partner violence: a 20-year prospective study. Journal of Consulting and Clinical Psychology. 2003;71(4):741.

[46] Currie J, Mueller-Smith M, Rossin-Slater M. Violence while in utero: The impact of assaults during pregnancy on birth outcomes. National Bureau of Economic Research; 2018.

[47] Mahmud M, Riley E. Household Response to an Extreme Shock: Evidence on the Immediate Impact of the Covid-19 Lockdown on Economic Outcomes and Well-being in Rural Uganda. Working Paper;.

[48] Aguero J. COVID-19 and The Rise of Intimate Partner Violence. Unpublished manuscript. 2020;.

[49] Silverio-Murillo A, De La Miyar B Jr. COVID-19, Domestic Violence, and Alcohol Consumption. Working Paper; 2020.

[50] Ravindran S, Shah M. Unintended consequences of lockdowns: Covid-19 and the shadow pandemic. National Bureau of Economic Research; 2020.

[51] Carpenter C, Dobkin C. The minimum legal drinking age and crime. The Review of Economics and Statistics. 2015;97(2):521–524.

[52] Gatley JM, Sanches M, Benny C, Wells S, Callaghan RC. The impact of drinking age laws on perpetration of sexual assault crimes in Canada, 2009–2013. Journal of Adolescent Health. 2017;61(1):24–31.

[53] Heaton P. Sunday liquor laws and crime. Journal of Public Economics. 2012;96(1-2):42–52.

[54] Anderson DM, Crost B, Rees DI. Wet laws, drinking establishments and violent crime. Economic Journal. 2017;128(611):1333–1366.

[55] Carpenter C. Heavy alcohol use and crime: evidence from underage drunk-driving laws. The Journal of Law and Economics. 2007;50(3):539–557.

[56] Cook PJ, Durrance CP. The virtuous tax: lifesaving and crime-prevention effects of the 1991 federal alcohol-tax increase. Journal of Health Economics. 2013;32(1):261–267.

[57] Carpenter C, Dobkin C. The minimum legal drinking age and morbidity in the United States. The Review of Economics and Statistics. 2017;99(1):95–104.

[58] Carpenter CS, Dobkin C, Warman C. The mechanisms of alcohol control. Journal of Human Resources. 2016;51(2):328–356.

[59] Lindo JM, Siminski P, Swensen ID. College party culture and sexual assault. American Economic Journal: Applied Economics. 2018;10(1):236–65.

[60] Markowitz S, Grossman M. The effects of beer taxes on physical child abuse. Journal of Health Economics. 2000;19(2):271–282.

[61] Thompson MP, Kingree JB. The roles of victim and perpetrator alcohol use in intimate partner violence outcomes. Journal of Interpersonal Violence. 2006;21(2):163–177.

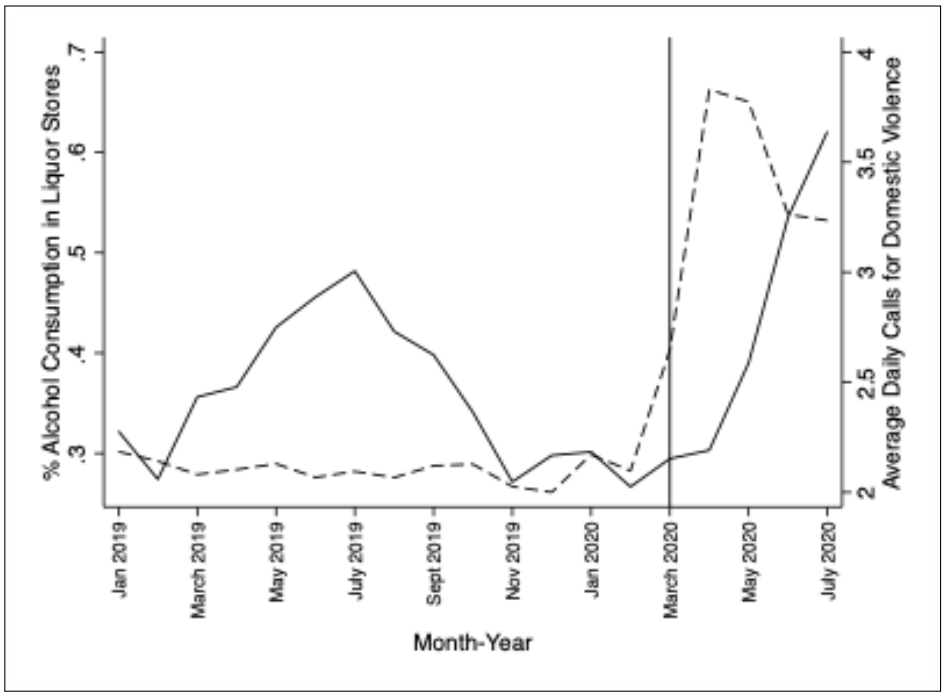
[62] Lechner WV, Laurene KR, Patel S, Anderson M, Grega C, Kenne DR. Changes in alcohol use as a function of psychological distress and social support following COVID-19 related University closings. Addictive Behaviors. 2020;110:106527.

[63] Pollard MS, Tucker JS, Green HD. Changes in Adult Alcohol Use and Consequences During the COVID-19 Pandemic in the US. JAMA Network Open. 2020;3(9):e2022942–e2022942.

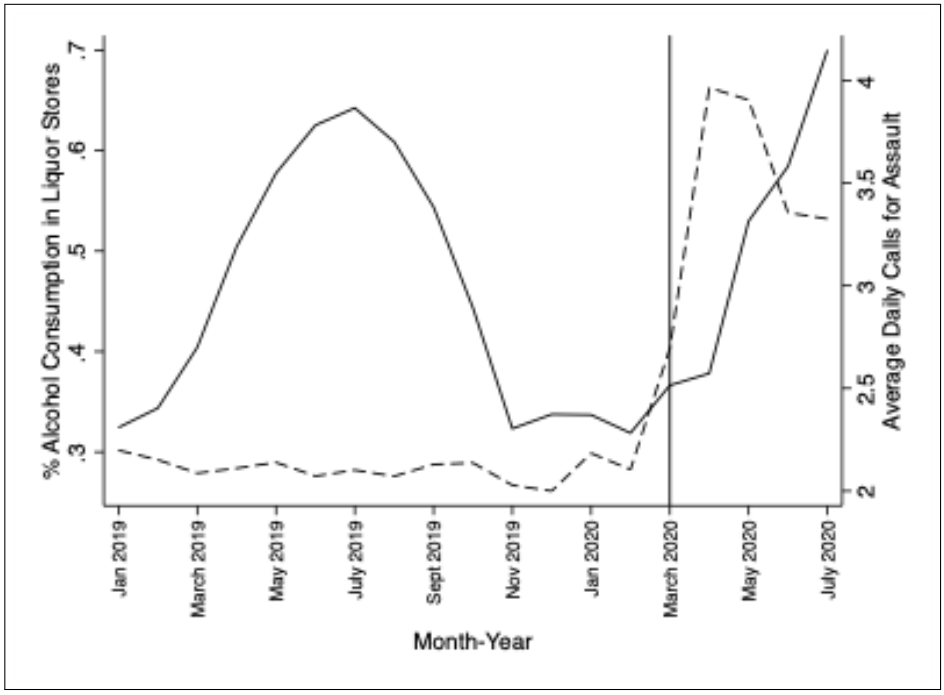
[64] Rodriguez LM, Litt DM, Stewart SH. Drinking to cope with the pandemic: The unique associations of COVID-19-related perceived threat and psychological distress to drinking behaviors in American men and women. Addictive Behaviors. 2020;110:106532.

[65] Kim JU, Majid A, Judge R, Crook P, Nathwani R, Selvapatt N, et al. Effect of COVID-19 lockdown on alcohol consumption in patients with pre-existing alcohol use disorder. The Lancet Gastroenterology & Hepatology. 2020;5(10):886–887.

[66] Rehm J, Kilian C, Ferreira-Borges C, Jernigan D, Monteiro M, Parry CD, et al. Alcohol use in times of the COVID 19: Implications for monitoring and policy. Drug and Alcohol Review. 2020;.




**(a)** Domestic Violence




**(b)** Assault

**Figure 1:** Liquor store share of visits to alcohol outlets and violence

Note: Figure plots the time-path of the liquor store share of visits to alcohol outlets (the dotted lines) against the daily number of emergency calls for domestic assaults (Panel a) and other assaults (Panel b). Source: SafeGraph Patterns Data, 2018-2020. City of Detroit Open Data Portal 911 Calls for Service, 2018-2020. 23,166 observations of 26 zip codes.

**Table 1:** Summary Statistics

| | Pre-Pandemic | | Post-Pandemic | | |
|---|---|---|---|---|---|
| | Mean | St. Dev. | Mean | St. Dev. | Diff. |
| **A. Entire City** | | | | | |
| Bars | 89.63 | (244.66) | 17.49 | (44.95) | –72.140*** |
| Liquor Stores | 35.46 | (28.10) | 23.81 | (19.77) | –11.64*** |
| Restaurants | 235.05 | (329.71) | 97.52 | (106.48) | –137.52*** |
| Food Outlets | 99.41 | (208.52) | 58.90 | (59.83) | –40.51*** |
| **B. High-Crime Zip Codes** | | | | | |
| Bars | 23.01 | (29.10) | 9.33 | (13.06) | –13.67*** |
| Liquor Stores | 49.82 | (22.26) | 37.58 | (17.65) | –12.24*** |
| Restaurants | 170.49 | (199.69) | 110.29 | (117.64) | –60.19*** |
| Food Outlets | 113.35 | (277.19) | 72.23 | (56.22) | –41.11*** |
| **A. Low-Crime Zip Codes** | | | | | |
| Bars | 156.25 | (331.66) | 25.65 | (61.14) | –130.61*** |
| Liquor Stores | 21.11 | (25.91) | 10.05 | (9.58) | –11.05*** |
| Restaurants | 299.61 | (411.36) | 84.75 | (92.29) | –214.85*** |
| Food Outlets | 85.47 | (98.72) | 45.56 | (60.37) | –39.91*** |

Source: SafeGraph Patterns Data, 2019-2020. City of Detroit Open Data Portal 911 Calls for Service, 2019-2020. 14,256 observations of 26 zip codes.
Significance: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

**Table 2:** Main Estimates, Domestic and Non-Domestic Assaults

| | Bars | | Alcohol Outlets | | Restaurants | | Food Outlets | |
|---|---|---|---|---|---|---|---|---|
| | Main | Inter | Main | Inter | Main | Inter | Main | Inter |
| **A. Entire City** | | | | | | | | |
| Domestic assaults | -0.0067 | 0.0491*** | 0.0222 | 0.0635** | -0.0064 | -0.0742 | -0.0057 | -0.0257 |
| | ( 0.0151 ) | ( 0.0135 ) | ( 0.0213 ) | ( 0.0292 ) | ( 0.0156 ) | ( 0.0328 ) | ( 0.0202 ) | ( 0.0256 ) |
| Other assaults | 0.0343** | -0.0268 | 0.0675*** | 0.0390 | 0.0286 | -0.0216 | 0.0071 | -0.0054 |
| | ( 0.0141 ) | ( 0.0206 ) | ( 0.0237 ) | ( 0.0290 ) | ( 0.0200 ) | ( 0.0424 ) | ( 0.0220 ) | ( 0.0380 ) |
| **B. High-Crime Zip Codes** | | | | | | | | |
| Domestic assaults | -0.0067 | 0.0588*** | 0.0326 | 0.0426 | -0.0034 | -0.0755 | -0.0295* | -0.0119 |
| | ( 0.0197 ) | ( 0.0139 ) | ( 0.0239 ) | ( 0.0529 ) | ( 0.0155 ) | ( 0.0522 ) | ( 0.0176 ) | ( 0.0338 ) |
| Other assaults | 0.0161 | -0.0052 | 0.0866*** | -0.0292 | 0.0066 | 0.0424 | 0.0045 | -0.0249 |
| | ( 0.0132 ) | ( 0.0125 ) | ( 0.0304 ) | ( 0.0324 ) | ( 0.0124 ) | ( 0.0367 ) | ( 0.0166 ) | ( 0.0274 ) |
| **C. Low-Crime Zip Codes** | | | | | | | | |
| Domestic assaults | -0.0005 | -0.0077 | -0.0153 | 0.0808*** | -0.0305 | -0.0442 | 0.0374 | -0.0380 |
| | ( 0.0180 ) | ( 0.0382 ) | ( 0.0321 ) | ( 0.0292 ) | ( 0.0475 ) | ( 0.0394 ) | ( 0.0364 ) | ( 0.0393 ) |
| Other assaults | 0.0656** | -0.0972** | 0.0162 | 0.0399 | 0.0512 | -0.0079 | -0.0238 | 0.0034 |
| | ( 0.0288 ) | ( 0.0531 ) | ( 0.0182 ) | ( 0.0504 ) | ( 0.0587 ) | ( 0.0639 ) | ( 0.0675 ) | ( 0.0626 ) |

Source: SafeGraph Patterns Data, 2019-2020. City of Detroit Open Data Portal 911 Calls for Service, 2019-2020. 14,256 observations of 26 zip codes. Note: Estimates are from Poisson regressions of the daily count of 911 calls for assault in a zip code on the number of visits to bars, alcohol outlets, restaurants and food outlets in that zip code. Panel A includes data for all of Detroit during the January 2019-July 2020 period. Panel B includes zip codes where the number of domestic assault calls is above the median in the sample; Panel C includes zip codes where the number of domestic assault calls is below the median in the sample. In each model, we condition on zip code and year and month-day fixed effects; In Panel A, we allow the month-day fixed effects to vary according to whether a zip code is above or below the city's median crime rate. In all models, standard errors are clustered at the zip code level. Significance: * $p$ <0.1, ** $p < 0.05$, *** $p < 0.01$.

**Table 3:** Main Estimates, Domestic and Non-Domestic Assaults with Lagged Visits

| | Bars | Alcohol Outlets |
|---|---|---|
| | $\beta_j + \beta_{Lj} + \beta_{L2j}$ | $\beta_j + \beta_{Lj} + \beta_{L2j}$ |
| | (se) | (se) |
| | p-value | p-value |
| **A. Entire City** | | |
| Domestic Assaults | 0.1022*** | 0.0948* |
| | (0.0304) | (0.0573) |
| | 0.001 | 0.0980 |
| Non-Domestic Assaults | 0.0121 | 0.0498 |
| | (0.0256) | (0.0453) |
| | 0.635 | 0.271 |
| **B. High-Crime Zip Codes** | | |
| Domestic Assaults | 0.1211*** | 0.0789 |
| | (0.0378) | (0.0941) |
| | 0.001 | 0.402 |
| Non-Domestic Assaults | 0.0368** | -0.0142 |
| | (0.0162) | (0.0325) |
| | 0.024 | 0.664 |
| **C. Low-Crime Zip Codes** | | |
| Domestic Assaults | 0.0069 | 0.108 |
| | (0.0669) | (0.0799) |
| | 0.917 | 0.176 |
| Non-Domestic Assaults | -0.0442 | 0.0802 |
| | (0.0758) | (0.1036) |
| | 0.56 | 0.439 |

Source: SafeGraph Patterns Data, 2019-2020. City of Detroit Open Data Portal 911 Calls for Service, 2019-2020. 14,206 observations of 26 zip codes. Note: Estimates are from Poisson regressions of the daily count of 911 calls for assault in a zip code on the number of visits to bars, alcohol outlets, restaurants and food outlets in that zip code. Each model includes daily visits, visits interacted with indicator for March 10 - May 25 period, visits interacted with indicator for May 25 onward period; one day lag for visits and post-interacted visits to bars and alcohol outlets; and two day lag for visits and post-interacted visits to bars and alcohol outlets. Reported are the sum of coefficients for the March 10 - May 25 period for contemporaneous, one day lag, and two day lag effects. Panel A includes data for all of Detroit during the January 2019-July 2020 period. Panel B includes zip codes where the number of domestic assault calls is above the median in the sample; Panel C includes zip codes where the number of domestic assault calls is below the median in the sample. In each model, we condition on zip code and year and month-day fixed effects; In Panel A, we allow the month-day fixed effects to vary according to whether a zip code is above or below the city's median crime rate. In all models, standard errors are clustered at the zip code level. Significance: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

# ONLINE APPENDIX

# A Additional References

Recent literature on domestic violence: (38) (39) (40; 41; 42; 43) (44; 45; 46).

COVID-19 related studies of domestic violence elsewhere in the world: Uganda (47), Peru (48), Mexico (49), and India (50).

Research on consumption of alcohol and violence: (51; 52), (53), (54), (55), (56), (57), (58), (59)

Alcohol and domestic violence: (60; 36; 61). Trend in alcohol consumption in COVID-19: (62; 63; 64; 65; 66)

Trends in domestic violence and assault during COVID-19: (50; 49)

# B Additional Analyses

Appendix Table 1: Robustness of Estimates: Alternate Specification

| | Bars | | Alcohol Outlets | | Restaurants | | Food Outlets | |
|---|---|---|---|---|---|---|---|---|
| | Main | Inter | Main | Inter | Main | Inter | Main | Inter |
| **A. Domestic Assaults** | | | | | | | | |
| 2WFE Poisson | -0.0028 | 0.0465*** | 0.0142 | 0.0669** | -0.0070 | -0.0731 | -0.0052 | -0.0230 |
| | ( 0.0144 ) | ( 0.0143 ) | ( 0.0226 ) | ( 0.0271 ) | ( 0.0145 ) | ( 0.0328 ) | ( 0.0215 ) | ( 0.0256 ) |
| 2WFE OLS | -0.0050 | 0.0312*** | 0.0096 | 0.0171* | 0.0168 | -0.0194 | 0.0198 | -0.0304** |
| | ( 0.0109 ) | ( 0.0110 ) | ( 0.0163 ) | ( 0.0096 ) | ( 0.0116 ) | ( 0.0120 ) | ( 0.0179 ) | ( 0.0110 ) |
| 2WFE OLS | 0.0086 | 0.0283** | 0.0241 | 0.0143 | 0.0101 | -0.0092 | -0.0043 | -0.0276** |
| + Interactive FE | ( 0.0155 ) | ( 0.0120 ) | ( 0.0222 ) | ( 0.0099 ) | ( 0.0128 ) | ( 0.0099 ) | ( 0.0168 ) | ( 0.0123 ) |
| **B. Non-Domestic Assaults** | | | | | | | | |
| 2WFE Poisson | 0.0390** | -0.0271 | 0.0609*** | 0.0479 | 0.0311 | -0.0293 | 0.0040 | -0.0022 |
| | ( 0.0157 ) | ( 0.0217 ) | ( 0.0233 ) | ( 0.0298 ) | ( 0.0206 ) | ( 0.0438 ) | ( 0.0260 ) | ( 0.0397 ) |
| 2WFE OLS | 0.0393** | -0.0427* | 0.0361** | 0.0411** | 0.0411*** | -0.0039 | 0.0088 | -0.0169 |
| | ( 0.0155 ) | ( 0.0230 ) | ( 0.0172 ) | ( 0.0156 ) | ( 0.0137 ) | ( 0.0211 ) | ( 0.0248 ) | ( 0.0236 ) |
| 2WFE OLS | 0.0497* | -0.0437* | 0.0661** | 0.0346* | 0.435* | 0.0186 | -0.0037 | -0.0181 |
| + Interactive FE | ( 0.0250 ) | ( 0.0232 ) | ( 0.0291 ) | ( 0.0176 ) | ( 0.0247 ) | ( 0.0174 ) | ( 0.0344 ) | ( 0.0260 ) |

Source: SafeGraph Patterns Data, 2019-2020. City of Detroit Open Data Portal 911 Calls for Service, 2019-2020. Note: Estimates are from regressions of the daily count of 911 calls for domestic assault in a zip code on the number of visits to bars, alcohol outlets, restaurants and food outlets in that zip code. Specification 2WFE Poisson are estimates from Poisson regression with year, month-day, and zip code fixed effects. Specification 2WFE OLS are estimates of a linear regression with year, month-day, and zip code fixed effects. 2WFE OLS + Interactive FE are estimates from a linear regression with zip, year, and month-day fixed effects which vary by high- and low-crime zips. Includes data for all of Detroit during the January 2019-July 2020 period. In all models, standard errors are clustered at the zip code level. Significance: * $p$ <0.1, ** $p < 0.05$, *** $p < 0.01$.