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Individuals' travel to alcohol outlets: The fallacy of the local bar

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Abstract

Introduction.—Studies relating alcohol outlet density around homes to alcohol consumption produce mixed results. One possible explanation is that people travel to outlets away from their homes. This study aims to characterise individuals' trips to outlets, describe these trip locations relative to other activities and estimate associations between alcohol outlet density and trips to outlets.

Methods.—This cross-sectional study used 2014–2018 household travel data from the Victoria Integrated Survey of Travel and Activity. We estimated the average change in the cumulative travel characteristics associated with each additional trip to bars and liquor stores, accounting for complex trips to multiple destinations. Logistic regression models estimated odds that individuals travelled to outlets in relation to outlet density in their home local government area (LGA).

Results.—Among 23,512 respondents, 378 (1.6%) travelled to any bar and 79 (0.3%) any liquor store the survey day. Bar trips added 8.2 km (95% CI 4.6, 11.8) and 18.1 minutes (95% CI 13.6, 22.6) to cumulative travel; 41% of attended bars were co-located in participants' home LGA. Greater bar and liquor store density within the home LGA were associated with overall trips to these outlet types.

Discussion and Conclusions.—Individuals travel beyond their residential area to bars, but travel to liquor stores closer to home. Bar and liquor store density within individuals' home LGA were associated with trips to outlets. Trips to local bars in near home comprised a minority of trips to bars in this sample. Studies of retail alcohol access should account for trips to bars away from home.

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Author Contribution

Each author certifies that their contribution to this work meets the standards of the International Committee of Medical Journal Editors.

Conflicts of Interest

None declared

INTRODUCTION

A seemingly simple question has perplexed alcohol researchers over recent decades—does having more retail alcohol outlets in a neighbourhood increase alcohol consumption for people who live and spend time there [1]? The question has firm theoretical and empirical foundations. Individuals' behaviour is affected by proximal environmental conditions [2], and most ecological studies find aggregate alcohol consumption [3,4] and alcohol-related harms (e.g., injuries [3,4] and liver disease [5–9]) to be greater in neighbourhoods with more outlets. However, researchers continue to report mixed findings for individual-level studies relating alcohol outlets to alcohol consumption. Many authors report overall positive associations between alcohol outlet density and consumption [10–13]; others report no association [14,15]. This paper explores one explanation for these mixed results: individuals might travel to alcohol outlets outside the neighbourhoods where they live and routinely spend time.

Measuring travel to alcohol outlets is methodologically challenging. The proportion of the population who obtain alcohol either for on-premise consumption at a bar or off-premise consumption from a liquor store is relatively small, so sample sizes must be large to achieve stable estimates. However, collecting detailed data about individuals' trips to specific alcohol outlets is burdensome for both researchers and participants. Commonly used methods for collecting travel data (e.g., travel diaries, interviews, questionnaires) are available, albeit impractical for large samples [16–18]. These obstacles mean that few empirical observations are available regarding the distance that individuals travel to access alcohol at retail establishments. Without this information, studies that examine individuals' exposure to alcohol outlets rely on educated guesses about how far away alcohol outlets must be to influence an individuals' alcohol consumption and risks for alcohol-related harm. These can vary, but authors typically assume that individuals access outlets near their place of residence, echoing colloquial notions of the "local bar" [19].

One underutilised solution for measuring travel to alcohol outlets at a population level is household travel surveys. Travel surveys, commonly used by transportation planners to capture representative information about the geographic movements of populations, typically include large samples recruited via careful sample frames and collect detailed trip-level information necessary to describe travel patterns over time (lengths of trips, modes of transportation, etc.) [16]. Household travel surveys can reveal exposures affecting health outcomes, both at home and in various daily visited locations (activity locations).

The aim of this study was to investigate individuals' travel to alcohol outlets using data from a household travel survey conducted in Victoria, Australia, reporting origin and destination locations with high spatial resolution. We addressed this aim through one descriptive and two analytic objectives. First, we described the distance, time and modes of travel for individuals' trips to alcohol outlets, accounting for the possibility that these could be part of complex trips involving multiple stops. Second, we examined whether the alcohol outlets to which individuals travelled were in the same neighbourhoods as other locations that they attend routinely (e.g., home, work). Lastly, we assessed statistical associations between individuals' exposure to alcohol outlets and their trips to alcohol outlets at multiple spatial

scales. We interpret results in the context that individual-level studies of exposure to alcohol outlets and alcohol consumption are generally mixed.

METHODS

Data and setting

For this cross-sectional study, we used data from 2014 to 2018 from the Victorian Integrated Survey of Travel and Activity (VISTA), a survey conducted annually by the Victorian State Government Department of Transport. Participants were residents of randomly selected households who lived in 32 local government areas (LGA) in the greater metropolitan area encompassing the major cities of Melbourne and Geelong. Included LGAs have a mean land area of 376 km^2 (SD 613) and mean population of 160,639 (SD 56,903) [20]. All members of selected households completed a single day, including timing and location for origins, destinations and travel modes. Department of Transport staff coded the survey data to produce trip-level, person-level and household-level datasets. These processed data are made publicly available [21]. Included participants were aged ≥18 years, travelled a cumulative distance <1000 km during the day, and began and ended the travel day at a place of accommodation (e.g., their home, someone else's home, or a hotel).

Travel survey variables

Department of Transport staff categorised trip origins and destinations by 10 place types (accommodation, education, errand, natural feature, recreation, shop, social place, transport feature, workplace and other). Each place type contained additional information describing place sub-types. To extract trips to retail alcohol outlets, we used 2 sub-types captured within social place ("pub or bar" and "nightclub") and 1 sub-type within shop place ("liquor store"). We separated these sub-types from their parent types, then combined the places representing locations that are typically licensed for on-premises alcohol consumption in Victoria (pubs, bars and nightclubs) into a single category that we called "bars". Previous research has combined these locations (pubs, bars and nightclubs)to assess the impact of alcohol outlet density on alcohol-related outcomes, focusing on primary alcohol consumption sites [22,23]. We coded trip origins and destinations using 12 places—the 2 retail places that are likely to be licensed for retail alcohol sales (bars and liquor stores) and the 10 Department of Transport types.

Other trip-level variables were the total trip distance (km), total trip duration (minutes), transport mode and geographic location. Transport mode was categorised according to the primary means of transport for a trip (e.g., vehicle driver, vehicle passenger, walking, public transit). LGA was the smallest spatial resolution available for trip origins and destinations. Unlike trip-level information, participants' home information included both LGA and postcode of residence.

Person- and household-level variables included were the participant's age, binary sex, weekly household income and the day of the week that the survey was conducted. For the *age* variable, we categorised specific age groups based on quartiles. For the original 12 *income* categories, we grouped income data into discrete categories based on the following

income ranges: “$0-$ - $299”, “$300-$ - $599”, “$600-$ - $999”, “$1000-$ - $1999”, and “$2000+”.

Alcohol outlet density

Individual-level alcohol outlet density was measured as the density of alcohol outlets per roadway kilometre within participants’ home LGA and home postcode. The Victorian Commission for Gambling and Liquor Regulation provides information for all businesses licensed to sell liquor in Victoria [24,25]. Available data include the license type and latitude-longitude coordinates. Our group has accessed and stored records from that source on June 30 for each year for the last several years, allowing us to create year-specific measures of alcohol outlet density across the extent of the state. We spatially joined alcohol outlets to LGAs and postcodes (geocoding rate = 99.9%), then categorised *bars* as outlets with general, late night general or late night on-premises licenses; and *liquor stores* as those with packaged or late night packaged licenses [26]. We calculated the count of bars and liquor stores per year for 2014 to 2018 within each LGA and postcode, then converted these values to densities per roadway kilometre using roadway network data from the Victoria Department of Environment, Land, Water and Planning.

Trip-level description

We enumerated trips that ended or began at bars, and liquor stores according to the available trip-level characteristics (distance, time, origin place, destination place and transport mode). We then compared the locations of LGAs where alcohol outlets were located to the LGAs where the participant lived, worked, and travelled for other purposes, with some trips being co-located in LGAs.

Individual-level description

We aggregated trip-level data within individuals as the cumulative travel distance and cumulative travel time for the day. We then aggregated places as counts because individuals could travel to multiple locations within the same place category during the day.

We specified linear regression models for cumulative travel distance and for cumulative travel time. Independent measures were counts of places. The parameter estimates for these models can be interpreted as the average change in the cumulative travel characteristics associated with each additional trip to a place, after accounting for complex trips to multiple destinations. Diagnostic tests included visual inspection of residual plots for heteroskedasticity and inspection of a ladder of powers to consider transformation of the dependent measures.

Statistical analyses for individuals’ trips to alcohol outlets

We aggregated the trip-level data measuring travel to alcohol outlets to the individual-level using dichotomous variables to indicate whether participants travelled to any bar and liquor store within and outside their home LGA during the study day. We then used logistic regression to estimate the likelihood of individuals visiting alcohol outlets, comparing travel within and outside their home LGA relative to alcohol outlet density in their home LGA and postcode. We used separate models to assess associations between the odds of traveling

to a bar relative to bar density and odds of traveling to a liquor store relative to liquor store density. We specified separate logistic regression models because densities for bars and liquor stores were moderately to highly correlated across LGAs and postcodes ($0.55< r<0.77$). All analyses controlled for sex, age and income and were conducted using R version 4.0.4 [27]. Since intraclass correlation coefficients measuring clustering of outcomes within LGAs and postcodes were low (bars: intraclass correlation coefficient <0.019), we elected not to control statistically for nesting of individuals within these spatial units.

We conducted additional sensitivity analyses. First, we addressed an important possible threat to internal validity: cohabitation, potentially violating the assumptions of unit independence. For these analyses examining the associations of trips within individuals' home LGA and alcohol outlet density within home LGA and postcode, we randomly selected one person from each household (Table S1, Supporting Information). Second, we performed separate analyses for the regions of Melbourne and Geelong to examine whether metropolitan areas produced different associations for the relationship between trips and alcohol outlet density.

RESULTS

There were 23,512 participants in the VISTA survey eligible for inclusion in this analysis. Median age was 46 years (SD = 18 years); 57% of the sample was male (Table 1). Median personal income per week was $600–999. Included participants were from 13,519 households, and the day of survey completion was approximately uniformly distributed. There was one participant aged 116, according to the household travel survey. While this value is implausibly high, no exclusionary criteria were applied to maintain the integrity of the dataset and analysis.

Trip-level description

Table 2 shows characteristics of participants' trips to bars (n=378) and liquor stores (n=79). Trips *to* bars had a mean distance of 10.2 km (SD=16.5 km) and a mean duration of 25.7 minutes (SD=26.2 minutes); trips *from* bars had a mean distance of 10.8 km (SD=17.0) and a mean duration of 24.8 minutes (SD=22.7 minutes). Trips to and from liquor stores were shorter and quicker than trips to and from bars. The most common origins for trips to bars were accommodation (64%) and workplace (11%); the most common origins for trips to liquor stores were accommodation (42%) and shops (28%). Transport mode as vehicle driver was most common for trips to bars (43%) and liquor stores (76%).

Figure 1 displays co-location within LGAs of homes, workplaces and other attended places for trips to bars and liquor stores. In total, 47% of trips to bars were to outlets located in unique LGAs that the participant did not travel to for any other purpose, and 41% were to a bar located in the same LGA as the participant's home. Trips to liquor stores comprised 20% of unique LGAs and 68% within the same LGA as the participant's home.

Individual-level description

Aggregated at the individual level, the median cumulative travel distance on the survey day was 24.2 km (range: 0 to 746), and median travel time was 70.0 minutes (range: 2 to 610). Participants travelled to bars between 0 and 4 times and liquor stores 0 to 2 times (Table 1).

Results of the linear regression models in Figure 2 show that, after controlling for travel to multiple destinations throughout the day, each additional trip to a bar was associated with an increase of 8 km in the cumulative travel distance (b=8.2; 95% confidence interval [CI] 4.6, 11.8). Trips to liquor stores were not significantly associated with increased cumulative travel distance (b=4.7; 95%CI −3.6, 12.9). For cumulative travel time, each additional trip to a bar was associated with an increase of 18 minutes (b=18.1; 95% CI 13.6, 22.6) and trips to liquor stores were not associated with increased cumulative travel time (b=8.9; 95% CI −1.4, 19.1). Table S1 presents the coefficients for all linear regression models. We note that the independent measures were counts of destinations visited on the study day, with models including an intercept term, allowing for negative associations. For example, the estimated travel distance for someone who made only two trips to school, with no other trips, is the linear combination of the constant term (b= = 13.7; 95% CI 12.6, 14.7) and twice the association for education (b=- = −0.9; 95% CI −1.7,-, −0.1), resulting in an estimate of 12.0 km (95% CI 10.5, 13.5).

Statistical analytic results

Table 3 presents the parameter estimates for models relating alcohol outlet density to the odds that individuals completed a trip to an outlet within their home LGA, controlling for individual-level characteristics gender, age and personal income. An increase of one bar per 100 roadway kilometres in the home LGA was associated with trips to bars within the home LGA (odds ratio [OR] 1.029; 95% CI 1.022, 1.038). Liquor store density within the home LGA was associated with increased odds of traveling to liquor stores within the home LGA (OR 1.155; 95% CI 1.099,1.215). Similar associations were observed for outlet densities in the home postcode. Results of the sensitivity analyses examining one person per household resembled the main findings (Table S2, Supporting Information). The analyses examining Geelong alone contained far too few participants to produce stable estimates (n=1100) but analyses from Melbourne produced similar results as the main analyses (n=22,402).

Table 4 presents the parameter estimates for logistic regression models relating alcohol outlet density to the odds that individuals completed a trip to an outlet outside their home LGA, controlling for individual-level characteristics. An increase of one bar per 100 roadway kilometres in the home LGA was not significantly associated with trips to bars outside the home LGA (OR 1.003; 95% CI 0.992, 1.014). Liquor store density was also not significantly associated with increased odds of traveling to liquor stores outside the home LGA (OR 1.036; 95% CI 0.932, 1.153).

DISCUSSION

This study of one-day trip paths for 23,512 individuals in Melbourne, Australia, identifies that individuals travel well beyond their immediate residential area to access on-premise

alcohol outlets. Travel to distal alcohol outlets could contribute to mixed results for individual-level studies of exposure to alcohol outlets and alcohol consumption.

The first study aim was to describe individuals' travel to alcohol outlets. We found one-way trips to bars had a mean distance of 10.2 km and took 25.7 minutes, but these trips added only 8.2 km and 18.1 minutes to the cumulative travel distance over the full day. The difference between one-way trip distance and cumulative trip distance was more substantial for liquor stores (0.8 km difference) than bars (2 km difference). We found one-way trips to liquor stores had a mean distance of 5.5 km and took 12.2 minutes, but these trips added only 4.7 km and 8.9 minutes to the cumulative travel distance over the full day. The attenuation occurs because trips to liquor stores are commonly part of complex trips involving multiple stops. While few studies have explored this topic, one smaller study (n=831) found that distance and affordability are key in alcohol purchase decisions [28]. People might travel farther for unique bar attributes [28,29], but proximity influences liquor store purchases. Our results concord with prior findings, in that there are differences in the distance people are willing to travel to an alcohol outlet (i.e., "alcohol access") [30,31]. The observation that individuals combine trips to liquor stores with trips to other shops is partly a function of the liquor licensing regime in Victoria—which requires that liquor sales occupy separate retail space compared to other items [32]—and partly a reflection that alcohol is generally considered a non-durable good that consumers purchase routinely [33].

The second study aim was to examine whether individuals' chosen alcohol outlets were in the same neighbourhoods as their homes, workplaces and other destinations. We used LGAs to represent neighbourhoods, which are much larger geographic areas than are used in most published studies that relate individuals' exposure to alcohol outlets and alcohol consumption. Despite the potential for bias in detecting co-location, many trips were to unique neighbourhoods. Almost half the observed trips to bars (47%) and one-fifth of liquor store trips (23%) were outside individuals' LGAs. This corroborates other studies that have examined associations of alcohol outlet density with alcohol consumption using measures of activity spaces (i.e., convex hull polygons, standard deviational ellipses, etc.) [34,35], which are the "set of spatial locations visited by an individual over a given period." [36] These studies, by Freisthler et al. [34] and Morrison et al. [37], find that measures incorporating activity space information, like activity location measures (places individuals frequent) and activity path-based measures (places individuals frequent and paths between each of those places) do not necessarily relate to residence-based measures, like outlet density in a census tract. Implications of this study are important for research on the impact of the alcohol environment on consumption. If a significant percentage of trips to bars are located outside of an individual's "neighbourhood", limiting studies to only the alcohol environment of where they live or work may miss their true exposure and ultimately their risk of alcohol consumption.

The third study aim was to examine associations between alcohol outlet density and *trips* to alcohol outlets within and outside of the home LGA. One extrinsic and mutable environmental feature that could theoretically affect individuals' alcohol consumption is the availability of alcohol through retail outlets. Alcohol availability can be separated into four dimensions —*physical* (prevalence of retail establishments that sell alcohol like bars

and liquor stores), social (prevalence of alcohol in social environments), *economic* (cost relative to income) and *subjective* (perceived access) [38]. Retail alcohol outlet density is generally used as the measurement technique for the four availability dimensions listed above. Much of the evidence examining the relationship between alcohol outlet density and alcohol consumption does not explicitly isolate the type of alcohol availability under study, potentially pointing to *another* reason for mixed findings. Epidemiologically, these four dimensions of alcohol availability act as multiple correlated exposures, each with separate paths to alcohol access (mediator) and to alcohol consumption (outcome). Given the mixed results from individual-level studies, further research into the specific pathways linking outlet density and consumption is needed to clarify the overall impact. For example, distance to alcohol outlets may mediate the relationship between outlet density and trips to alcohol outlets; that is, high outlet density could shorten the distance to alcohol outlets, consequently increasing trips and opportunities for consumption. Future research examining distance to alcohol outlets may elucidate yet *another* component pathway in relationship between outlet density and consumption. Our primary focus was on exploring the broader relationship between outlet density and trips to alcohol outlets. Thus, the third aim found significant associations between individuals' exposure to alcohol outlets and their *physical access* to alcohol outlets within their home, isolating one of the multiple theoretical pathways by which exposure to alcohol outlets affects alcohol consumption for individuals.

This study did not find the same significant associations between alcohol outlet density in individuals' home LGAs or postcodes and visits to outlets outside their home LGA. However, it is crucial to note that over half of bar visits are outside the home LGA. While local alcohol outlet densities affect local trips to alcohol outlets, additional research is necessary to understand the factors influencing trips to outlets outside of the home LGA if density is not a significant predictor.

There are several limitations to this study. First, VISTA contains no alcohol purchase or consumption information for individuals when traveling to retail alcohol outlets. Second, we cannot confirm that the destination outlets were licensed for on-premise or off-premise alcohol sales. Third, the VISTA data capture individuals' travel over just one day. The alcohol outlets to which they travelled may be located within LGAs that they frequented on other days, and studies using activity location-based or activity path-based approaches may capture these neighbourhoods as being within the individuals' activity space. However, the trip-level data allows identification of dedicated trips to specific locations, so these data are arguably a better fit for testing direct access to alcohol outlets than data that measure exposure to alcohol outlets over longer periods (e.g., weeks, months).

Studies examining associations between individuals' exposure to retail alcohol outlets and the volume and pattern of their alcohol consumption often have mixed results. This study identifies one explanation for this puzzling finding—trips to the "local bar" may be the exception, not the norm. Further, in sync with other literature, we find alcohol outlet density to be associated with trips to alcohol outlets, thus emphasising one possible pathway toward alcohol consumption. Refining the scientific methods for measuring exposure to alcohol outlets and alcohol consumption is a research priority because the retail alcohol environment is a modifiable exposure, and alcohol consumption takes a considerable toll on public health.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

REFERENCES

1. Scribner R. Commentary on Halonen et al. (2013): Exposure to alcohol outlets and alcohol consumption-back to square one? Addiction. 2013;108:329–30. [PubMed: 23331882]
2. Diez Roux AV, Duncan DT, Kawachi I, editors. Foreword. In: Neighborhoods and Health [Internet]. Oxford University Press; 2018 [cited 16 September 2023]. p. 0. Available from: 10.1093/oso/9780190843496.002.0006
3. Campbell CA, Hahn RA, Elder R, Brewer R, Chattopadhyay S, Fielding J, et al. The effectiveness of limiting alcohol outlet density as a means of reducing excessive alcohol consumption and alcohol-related harms. Am J Prev Med. 2009;37:556–69. [PubMed: 19944925]
4. Popova S, Giesbrecht N, Bekmuradov D, Patra J. Hours and days of sale and density of alcohol outlets: Impacts on alcohol consumption and damage: A systematic review. Alcohol Alcohol. 2009;44:500–16. [PubMed: 19734159]
5. Smith DI. Effect on liver cirrhosis and traffic accident mortality of changing the number and type of alcohol outlets in Western Australia. Alcohol Clin Exp Res. 1989;13:190–5. [PubMed: 2658654]
6. Smith DI. Relationship between the number and type of alcohol outlets and mortality due to liver cirrhosis and traffic accidents. Drug Alcohol Rev. 1992;11:145–51. [PubMed: 16840269]
7. Theall KP, Scribner R, Cohen D, Bluthenthal RN, Schonlau M, Lynch S, et al. The neighborhood alcohol environment and alcohol-related morbidity. Alcohol Alcohol. 2009;44:491–9. [PubMed: 19671569]
8. Ventura-Cots M, Ballester-Ferré MP, Ravi S, Bataller R. Public health policies and alcohol-related liver disease. JHEP Rep. 2019;1:403–13. [PubMed: 32039391]
9. Zhao J, Stockwell T, Martin G, Macdonald S, Vallance K, Treno A, et al. The relationship between minimum alcohol prices, outlet densities and alcohol-attributable deaths in British Columbia, 2002–09. Addiction. 2013;108:1059–69. [PubMed: 23398533]
10. Foster S, Trapp G, Hooper P, Oddy WH, Wood L, Knuiman M. Liquor landscapes: Does access to alcohol outlets influence alcohol consumption in young adults? Health Place. 2017;45:17–23. [PubMed: 28258014]
11. Gruenewald PJ, Johnson FW, Treno AJ. Outlets, drinking and driving: a multilevel analysis of availability. J Stud Alcohol. 2002;63:460–8. [PubMed: 12160105]
12. Scribner RA, Cohen DA, Fisher W. Evidence of a structural effect for alcohol outlet density: A multilevel analysis. Alcohol Clin Exp Res. 2000;24:188–95. [PubMed: 10698371]
13. Truong KD, Sturm R. Alcohol outlets and problem drinking among adults in California. J Stud Alcohol Drugs. 2007;68:923–33. [PubMed: 17960311]
14. Gmel G, Holmes J, Studer J. Are alcohol outlet densities strongly associated with alcohol-related outcomes? A critical review of recent evidence. Drug Alcohol Rev. 2016;35:40–54. [PubMed: 26120778]
15. Picone G, MacDonald J, Sloan F, Platt A, Kertesz S. The effects of residential proximity to bars on alcohol consumption. Int J Health Care Finance Econ. 2010;10:347–67. [PubMed: 21076866]
16. Kelly P, Krenn P, Titze S, Stopher P, Foster C. Quantifying the difference between self-reported and global positioning systems-measured journey durations: A systematic review. Transp Rev. 2013;33:443–59.
17. Stopher P, Zhang Y, Armoogum J, Madre JL. National household travel surveys: The case for Australia. In: 34th Australasian Transport Research Forum (ATRF), Adelaide, South Australia. Citeseer; 2011.
18. Stopher PR, Greaves SP. Household travel surveys: Where are we going? Transp Res Part Policy Pract. 2007;41:367–81.

19. Nicas J. I reported on my local bar. It was heart-wrenching. The New York Times [Internet]. 2020 Jun 11 [cited 22 November 2023]. Available from: https://www.nytimes.com/2020/06/11/insider/hatch-coronavirus-bar.html
20. Australian Bureau of Statistics. Data by Region, 2014–19 [Internet]. 2020 [cited 28 June 2023]. Available from: https://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/1410.02014-19?OpenDocument
21. Victoria Department of Transport and Planning. Information for survey participants [Internet]. 2023 [cited 30 January 2023]. Available from: https://dtp.vic.gov.au:443/about/data-and-research/vista/information-for-survey-participants
22. Livingston M. A longitudinal analysis of alcohol outlet density and assault. Alcohol Clin Exp Res. 2008;32:1074–9. [PubMed: 18445114]
23. Livingston M. Alcohol outlet density and assault: a spatial analysis. Addiction. 2008;103:619–28. [PubMed: 18339106]
24. ArcGIS [GIS Software]. Redlands, CA: Environmental Systems Research Institute, Inc.;
25. Victorian Commission for Gambling and Liquor Regulation [Internet]. 2016 [cited 20 October 2020]. Victorian liquor licences by location. Available from: https://www.vcglr.vic.gov.au/resources/data-and-research/liquor-data/liquor-licences-location
26. Morrison C, Gruenewald PJ, Ponicki WR. Socioeconomic determinants of exposure to alcohol outlets. J Stud Alcohol Drugs. 2015;76:439–46. [PubMed: 25978830]
27. R Core Team. R: A language and environment for statistical computing. Vienna, Austria; 2021. (R Foundation for Statistical Computing).
28. Hobday M, Lensvelt E, Gordon E, Liang W, Meuleners L, Chikritzhs T. Distance travelled to purchase alcohol and the mediating effect of price. Public Health. 2017;144:48–56. [PubMed: 28274384]
29. Gruenewald PJ. The spatial ecology of alcohol problems: niche theory and assortative drinking. Addiction. 2007;102:870–8. [PubMed: 17523980]
30. Hay GC, Whigham PA, Kypri K, Langley JD. Neighbourhood deprivation and access to alcohol outlets: A national study. Health Place. 2009;15:1086–93. [PubMed: 19540790]
31. Kerr WC, Ye Y, Greenfield TK. Changes in spirits purchasing behaviours after privatisation of government-controlled sales in Washington, USA. Drug Alcohol Rev. 2019;38:294–301. [PubMed: 30860305]
32. Australian Business Licence and Information Service. Packaged Liquor Licence - Victoria [Internet]. 2017 [cited 15 September 2023]. Available from: https://ablis.business.gov.au/
33. Black S, Cusbert T. Durable Goods and the Business Cycle | Bulletin – September 2010. Bulletin [Internet]. 2010 [cited 11 July 2023]; (September). Available from: http://www.rba.gov.au/publications/bulletin/2010/sep/2.html
34. Freisthler B, Kepple NJ, Wolf JP, Carson L. Activity spaces: assessing differences in alcohol exposures and alcohol use for parents. GeoJournal. 2019;2019:10.1007/s10708-019-10059-5.
35. Freisthler B, Wernekinck U. Examining how the geographic availability of alcohol within residential neighborhoods, activity spaces, and destination nodes is related to alcohol use by parents of young children. Drug Alcohol Depend. 2022;233:109352. [PubMed: 35176631]
36. Chaix B, Kestens Y, Perchoux C, Karusisi N, Merlo J, Labadi K. An interactive mapping tool to assess individual mobility patterns in neighborhood studies. Am J Prev Med. 2012;43:440–50. [PubMed: 22992364]
37. Morrison CN, Byrnes HF, Miller BA, Kaner E, Wiehe SE, Ponicki WR, et al. Assessing individuals' exposure to environmental conditions using residence-based measures, activity location-based measures, and activity path-based measures. Epidemiol Camb Mass. 2019;30:166–76.
38. Gruenewald PJ, Millar AB, Treno AJ. Alcohol availability and the ecology of drinking behavior. Alcohol Health Res World. 1993;17:39–45.

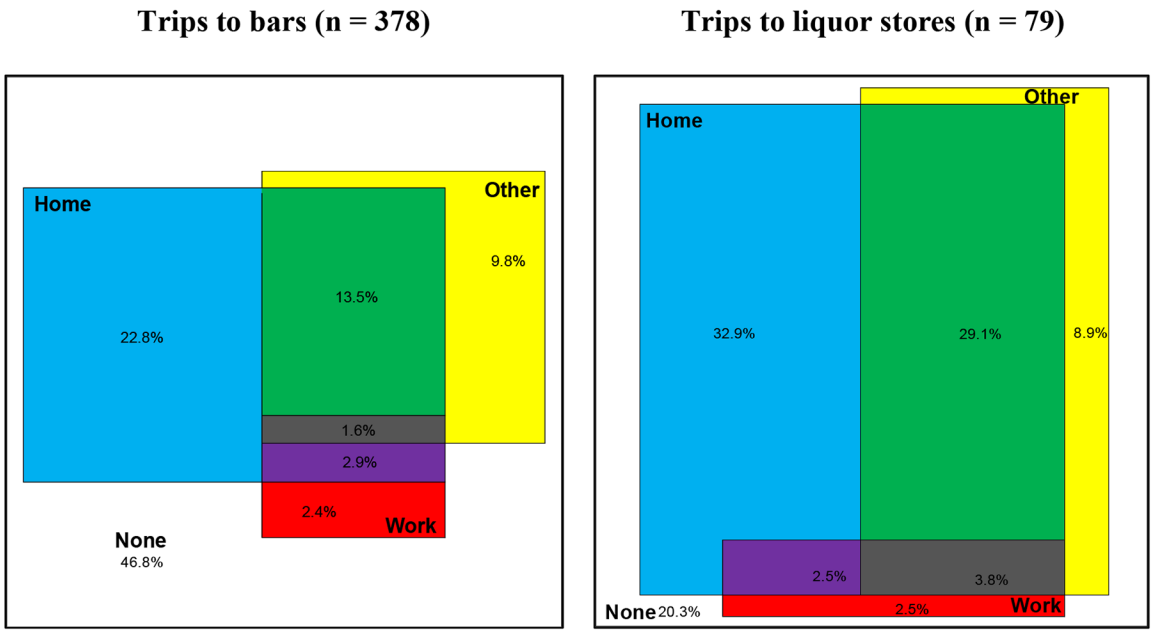

Figure 1.

Venn diagrams for the proportion of trips to bars (n = 378) and liquor stores (n = 79) that were co-located in local government areas with participants' home, workplace and other attended place.

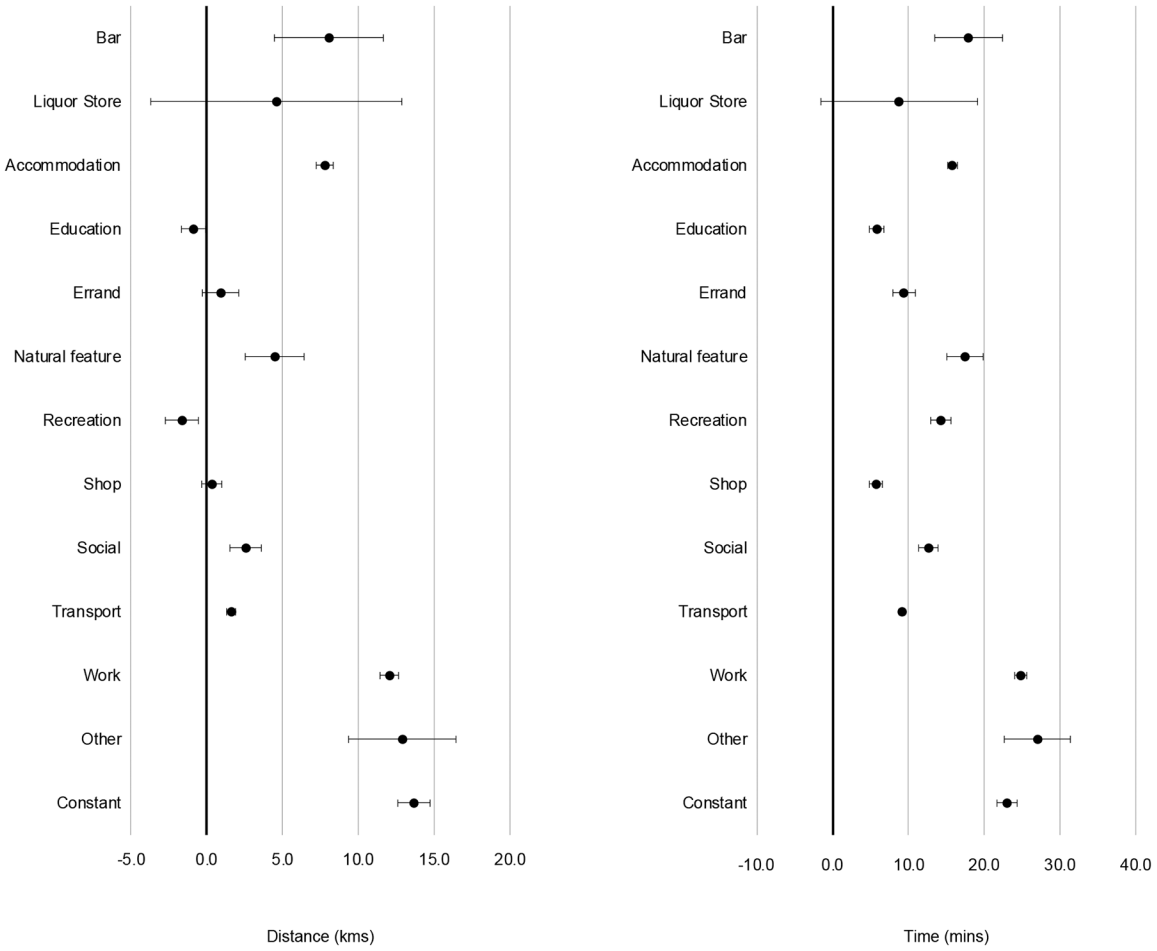

Figure 2.

Parameter estimates of linear regression for cumulative distance and time travelled in one day per increase in one trip to destinations; n = 23,512 individuals

Table 1.

Participant characteristics (n = 23,512)

	n	%	Median	Min	Max
Cumulative travel characteristics					
Distance (kms)			24.2	0	746
Time (mins)			70	2	610
Destinations (count)					
Bar			0	0	4
Liquor store			0	0	2
Accommodation			1	1	11
Education			0	0	8
Errand			0	0	5
Natural feature			0	0	4
Recreation			0	0	6
Shop			0	0	12
Social			0	0	6
Transport			0	0	16
Work			0	0	14
Other			0	0	3
Survey day					
Sunday	2700	11.5			
Monday	3561	15.2			
Tuesday	3629	15.4			
Wednesday	3655	15.6			
Thursday	3624	15.4			
Friday	3521	15.0			
Saturday	2822	12.0			
Demographic characteristics					
Male	13,404	57.0			
Age			46	18	116
Household income per week ($)			2100	0	12500

Table 2.

Characteristics of trips to bars and liquor stores

	Bar (n = 378)				Liquor store (n = 79)			
	Inbound trip		Outbound trip		Inbound trip		Outbound trip	
Summary statistics	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Distance	10.2	16.5	10.8	17.0	5.5	7.2	3.8	4.7
Time	25.7	26.2	24.8	22.7	12.2	8.0	9.7	7.7
Place	n	%	n	%	n	%	n	%
Bar	12	3.2	12	3.2	0	0.0	2	2.5
Liquor store	2	0.5	0	0.0	0	0.0	0	0.0
Accommodation	242	64.0	293	77.5	33	41.8	61	77.2
Education	7	1.9	1	0.3	0	0.0	1	1.3
Errand	6	1.6	3	0.8	5	6.3	0	0.0
Natural feature	2	0.5	6	1.6	1	1.3	0	0.0
Recreation	9	2.4	10	2.7	4	5.1	0	0.0
Shop	26	6.9	31	8.2	22	27.9	14	17.7
Social	27	7.1	8	2.1	3	3.8	0	0.0
Transport	1	0.3	3	0.8	0	0.0	0	0.0
Work	43	11.4	11	2.9	11	13.9	1	1.3
Other	1	0.3	0	0.0	0	0.0	0	0.0
Mode of transport	n	%	n	%	n	%	n	%
Bicycle	0	0.0	0	0.0	0	0.0	0	0.0
Motorcycle	1	0.3	1	0.3	0	0.0	0	0.0
Other	4	1.1	3	0.8	0	0.0	0	0.0
Public bus	3	0.8	3	0.8	0	0.0	0	0.0
School bus	0	0.0	0	0.0	0	0.0	0	0.0
Taxi	5	1.3	16	4.3	1	1.3	1	1.3
Train	23	6.1	23	6.1	0	0.0	0	0.0
Tram	15	4.0	13	3.5	0	0.0	0	0.0
Vehicle driver	164	43.4	170	45.2	60	76.0	61	77.2
Vehicle passenger	93	24.6	88	23.4	11	13.9	13	16.5
Walking	70	18.5	59	15.7	7	8.9	4	5.1
Missing	0	0.0	2	0.5	0	0.0	0	0.0

Table 3.

Logistic regression models for the odds of visiting a bar or liquor store within the home LGA according to alcohol outlet density within the home LGA and home postcode; n=23,512

	Trips to bars				Trips to liquor stores			
	OR	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**
Alcohol outlet density (outlets per sq km)								
Bar density – Home LGA	1.029	1.022, 1.038						
Bar density – Home postcode			1.027	1.021, 1.033				
Liquor store density – Home LGA					1.155	1.099, 1.215		
Liquor store density – Home postcode							1.084	1.059, 1.109
Individual characteristics								
Male (reference: female)	1.176	0.836, 1.654	1.175	0.834, 1.657	1.345	0.761, 2.379	1.326	0.749, 2.350
Age								
Reference: 18–33 years								
34–45 years	0.653	0.393, 1.085	0.671	0.403, 1.118	0.963	0.455, 2.041	0.950	0.448, 2.015
46–58 years	0.893	0.551, 1.446	0.890	0.548, 1.446	0.496	0.188, 1.310	0.474	0.178, 1.263
59–116 years	1.183	0.771, 1.816	1.218	0.789, 1.881	1.582	0.767, 3.263	1.600	0.774, 3.308
Personal income (per week)								
Reference: $0–299								
$300–599	0.950	0.543, 1.660	0.950	0.543, 1.664	1.150	0.357, 3.700	1.141	0.354, 3.682
$600–999	1.141	0.675, 1.929	1.118	0.659, 1.897	1.950	0.672, 5.660	1.956	0.674, 5.682
$1000–1999	1.058	0.643, 1.740	1.071	0.650, 1.766	2.196	0.791, 6.094	2.285	0.818, 6.379
$2000+	1.082	0.579, 2.020	1.108	0.591, 2.075	2.972	1.014, 8.713	3.394	1.128, 10.214

Abbreviations: CI, confidence interval; LGA, local government area; OR, odds ratio.

Table 4.

Logistic regression models for the odds of visiting a bar or liquor store ***outside*** of the home LGA according to alcohol outlet density within the home LGA and home postcode; n=23,512

	Trips to bars				Trips to liquor stores			
	OR	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**
Alcohol outlet density (outlets per sq km)								
Bar density – Home LGA	1.003	0.992, 1.014						
Bar density – Home postcode			1.006	0.997, 1.015				
Liquor store density – Home LGA					1.036	0.932, 1.153		
Liquor store density – Home postcode							0.997	0.909, 1.094
Individual characteristics								
Male (reference: female)	1.332	0.996, 1.782	1.334	0.997, 1.784	2.332	0.940, 1.153	2.323	0.933, 5.787
Age								
Reference: 18–33 years								
34–45 years	0.718	0.474, 1.083	0.722	0.477, 1.092	0.748	0.167, 3.347	0.736	0.163, 3.333
46–58 years	0.929	0.622, 1.388	0.935	0.625, 1.398	2.328	0.725, 7.481	2.268	0.687, 7.491
59–116 years	1.160	0.796, 1.690	1.166	0.800, 1.700	2.418	0.756, 7.737	2.392	0.739, 7.740
Personal income (per week)								
Reference: $0–299								
$300–599	0.863	0.532, 1.400	0.863	0.532, 1.400	0.555	0.121, 2.548	0.553	0.121, 2.535
$600–999	0.947	0.589, 1.522	0.945	0.588, 1.519	1.361	0.429, 4.315	1.364	0.430, 4.325
$1000–1999	1.251	0.823, 1.904	1.248	0.818, 1.902	1.032	0.328, 3.245	1.045	0.329, 3.316
$2000+	1.289	0.763, 2.178	1.284	0.759, 2.171	0.807	0.187, 3.459	0.849	0.198, 3.647

Abbreviations: CI, confidence interval; LGA, local government area; OR, odds ratio.