Associations between proposed local government liquor store size classifications and alcohol consumption in young adults

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Highlights

The number of warehouse-style discount liquor stores in Australia is increasing

One local government planning response is to classify and restrict stores by size

We tested whether liquor store size was associated with alcohol consumption

Number of stores was associated with alcohol intake, but not stores $>300\text{m}^2$ or $>600\text{m}^2$

Liquor store density and convenience appear key to alcohol intake in young people

Abstract

The prevalence of warehouse-style liquor stores has prompted alarm from local communities and public health advocates. To increase local government control over liquor stores, one proposed planning response is to distinguish between 'small' (i.e., $\leq 300\text{m}^2$) and 'large' (i.e., $>300\text{m}^2$) liquor stores. We mapped the size and location of liquor stores in Perth, Western Australia, and tested associations between liquor store exposure and alcohol consumption (grams ethanol/day) in young adults ($n=990$). The count of liquor stores of any size within 1,600m and 1,601-5,000m of home were significantly associated with increased alcohol intake, whereas larger stores (i.e., $>300\text{m}^2$ and $>600\text{m}^2$) were not associated with alcohol intake. Young adults' alcohol consumption appears to be impacted by liquor store density and convenience, rather than outlet size. However, the presence of multiple stores close to home increases market competition, driving alcohol prices down, and plausibly resulting in alcohol prices similar to those at liquor superstores.

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Introduction

A substantial body of research has implicated the presence and density of liquor licences in increased alcohol consumption [1-5] and community harm [6-9]. However, studies also suggest the type of liquor licence matters and outlets where people can purchase packaged alcohol are particularly problematic [5,10-12]. Packaged liquor sales account for about 80% of alcohol consumed in Australia [13]. This market dominance was reflected in a 44% increase in the number of outlets selling packaged alcohol between 2001 and 2011, compared with negligible growth in pub and nightclub licences over the same period [11]. In addition, larger warehouse-style discount liquor stores have increased in number [14-18] and overall market share [19].

The increasing prevalence of warehouse-style liquor stores (also known as booze barns, big-box liquor stores or liquor superstores) has prompted alarm from local communities and public health advocates [20,21]. The physical presence of these superstores, in combination with aggressive marketing practices and discounted alcohol, are thought to increase alcohol consumption, particularly amongst young people [20] who have less disposable income and may be more price sensitive [4]. Indeed, there is a well-established inverse relationship between alcohol price and consumption [22], and low priced alcohol, volume discounts and point of sale promotions have been linked with increased alcohol consumption in young people [23,24]. Questions are now being raised as to whether the larger volumes of alcohol sold by liquor superstores have broader implications for the local community. For example, a West Australian study found that for every additional 10,000 litres of pure alcohol sold by an off-site outlet, the risk of assaults in private residences increased by 26% [12].

There are now numerous examples of community, police and local government attempts to block the expansion of liquor superstores into local neighbourhoods, with varying success [12,21,25-27]. A recent analysis of Australian case law involving the judicial review of administrative decisions relating liquor licence applications found that most cases challenging liquor outlet decisions were brought by the major supermarket chains that dominate the market, and they were successful in over 70% of these cases [27]. Of the government stakeholders, local government most frequently had legal action brought against them [27].

In Australia, new liquor licences require development application approval from local government; followed by state government approval [27,28]. For local government agencies in Western Australia (WA), current zoning and licencing practices provide relatively few barriers to new liquor stores [28]. In response, the WA Local Government Association (WALGA) developed discretionary guidelines on local planning instruments and controls that could be amended to help local governments manage alcohol-related development [28]. The guidelines were released in 2015 and propose various strategies, including changing

liquor stores from a retail to a special/restricted land-use and, due to concerns about harms associated with liquor superstores, adding a size classification. This would enable local government to better control the location of new larger outlets (i.e., similar to the distinction between a shop and showroom/warehouse). The suggested changes to scheme definitions would introduce two scale classifications:

- Liquor store – *small* (premises with a net lettable area not exceeding 300m²); and
- Liquor store – *large* (premises with a net lettable area exceeding 300m²).

Given the rise of liquor superstores in Australia and the recommended local government planning response, the aim of this study was to test whether the distinction between ‘small’ and ‘large’ liquor stores was associated with alcohol consumption in young adults - a group typically more sensitive to the availability of cheap alcohol.

Methods

This study uses data from the WA Pregnancy Cohort (Raine) Study, a prospective cohort study that followed participants from gestation to early adulthood (described in detail elsewhere [29]). It focuses on participants in Perth, WA, and their self-reported alcohol intake (grams ethanol/day) at 22-years, collected using the self-administered Anti-Cancer Council of Victoria Food Frequency Questionnaire (ACCVFFQ) (2012-2014). The ACCVFFQ compares well with other validated measures [30], and the Raine cohort is representative of 22-year-olds living in WA [31]. Raine was approved by the ethics committees of the Princess Margaret Hospital for Children, King Edward Memorial Hospital for Women and the University of WA.

A new spatial data layer was created to capture the location and size of all liquor stores in metropolitan Perth. Briefly, this involved geocoding Department of Racing, Gaming and Liquor licence locations (2014) in ArcGIS; overlaying them with Landgate building footprint data; checking store locations with Nearmap and Google Streetview; amending building polygons to reflect the store extents; digitising polygons for locations without a building footprint; and computing the area (m²) of building footprint polygons. The footprint of stores within ‘big box’ shopping centres could not be accurately determined, as individual shop boundaries were subsumed within the centre footprint. However, validation with earlier retail floor area data (i.e., Land Use Employment Survey data from 2009) revealed that all (bar one) of these shopping centre liquor stores had a floor area $\leq 300\text{m}^2$ and therefore they were classified as $\leq 300\text{m}^2$.

Using the size layer, we generated three sets of variables: count of stores (any size); stores $>300\text{m}^2$ (i.e., WALGA recommendation); and stores $>600\text{m}^2$ (i.e., larger outlets). Counts were run for three road-network ‘donut’ distances around participants’ geo-coded home addresses: 0-1,600m (i.e., walkable distance), 1,601-5,000m (i.e., cycling distance), and 5,001-10,000m (i.e., driveable distance), in order to examine whether further stores had an equivalent impact on alcohol consumption. The 1,600m distance is frequently applied in built environment studies [3,4,32], and represents the maximum distance a participant could walk in about 15 minutes [33]. The larger 5,000m distance has been conceptualised

as a relatively easy cycling distance for most people [34] and the 10,000m distance was based on evidence that young adults would travel up to 10,000m to purchase alcohol [35].

Statistical analysis

Linear regression models examined associations between the count of (and presence of at least one) liquor stores (any size); stores >300m²; and stores >600m² within different distances from home and alcohol consumption. All models adjusted for gender, employment, education and relationship status. Results are presented as the estimated average increase in grams ethanol/day (and standard errors) per one standard deviation (SD) increase in the liquor store count variable or for yes versus no for the presence of at least one liquor store. For reference, one standard drink contains 10g of ethanol [36].

Results

The sample comprised slightly more females than males (Table 1). Most participants were in fulltime or part-time employment, had some higher education, and were single or in a relationship but not living together. The average daily alcohol consumption was 15.21 grams/day (i.e., 1.5 standard drinks/day).

On average, participants had 1.4 liquor stores within 1,600m of home (Table 2), but of these only 0.4 were >300m² and 0.1 were >600m². The number of stores between 1,600-5,000m of home ranged from 10.0 (any size) to 3.2 (>300m²) and 0.8 (>600m²), and between 5,001-10,000m there were 28.3 liquor stores (any size), 9.2 stores >300m² and 2.4 stores >600m². The average distance to a liquor store of any size was 1.65 km, but this increased to 2.59 km to reach a store >300m² and 4.76 km for a store >600m².

Associations between the liquor store exposure measures and alcohol consumption are outlined in Table 3. Whilst estimated associations were positive for all liquor store counts and negative for all distances to the closest store, the largest effect sizes and only statistically significant associations were for liquor stores (of any size) within 1,600m and between 1,601-5,000m of home. For instance, for every one SD increase in liquor stores within 1,600m, average alcohol consumption increased by 1.12 grams/day (i.e., 0.1 standard drinks/day or 0.8 standard drinks/week). Notably, liquor stores with larger floor areas (i.e., >300m² and >600m²) did not have larger effect sizes than stores of any size. We also tested the associations between having at least one store of each size within the buffer distances (Table 4). All estimated associations were positive, however none reached statistical significance.

Discussion

We tested associations between liquor store size and alcohol consumption in young adults to inform whether proposed local government liquor store size classifications might impact alcohol intake. We found positive significant associations between the number of liquor stores within closer proximity of home and alcohol consumption, but the observed positive associations between larger stores (i.e., >300m² and >600m²) and alcohol intake were weaker and non-significant. We also examined whether a single large store within different 'donut' distances was associated with alcohol consumption, as participants might travel

further to access a liquor superstore selling discounted alcohol [37]. However, none of the observed positive associations reached statistical significance.

Our findings align with availability theory, which suggests that increased numbers of liquor stores lowers the real cost of alcohol (i.e., the purchase and convenience cost), leading individuals to consume greater quantities of alcohol [38,39]. The presence of multiple stores increases market competition, driving alcohol prices down [39]; therefore having several stores near home could plausibly result in an area where alcohol prices are akin to larger outlets offering discounted liquor. Conveniently located stores were also more salient for our sample, despite other local evidence that 36% of young adults (18-29 years) would travel up to 10km to purchase discounted alcohol [35]. Furthermore, young adults tend to buy packaged alcohol more frequently than older cohorts [35], and it's plausible that our participants purchased alcohol locally, for more immediate consumption, rather than buying larger quantities, further afield, for later consumption.

While our results suggest that larger liquor stores may not impact alcohol consumption in young adults, it's important to note that the proposed >300m² threshold relates to the size of a convenience store in the Model Scheme Text [28] rather than a liquor superstore (note: the guideline acknowledges 300m² is arbitrary and may require further investigation by local governments). We investigated the size of two prominent discount liquor chains operating in Perth, and found stores had an average net lettable area of 1,412m² (range 861m²-2,087m²). However, by setting the scale definition for a 'large' liquor store at a size that equates to a convenience store, local governments can achieve the primary objective of the WALGA guidelines – greater control and discretion over alcohol-related development[28].

While previous studies have applied measures of 'size' (e.g., audits of shelf space) as a proxy for volume [40,41], this study is unique in its measurement of the building footprint and exploration of the potential impact of size classifications on alcohol intake. There are, however, several limitations. First, our sample comprised young adults and results may not be generalizable to other populations. Second, we do not have information on whether participants purchased and consumed alcohol locally. Third, size classifications were based on recommended planning scheme text changes, not the actual size of liquor superstores. We tested larger stores (i.e., >600m²) but not >1,000m² (i.e., a size that better equates to a superstore) due to limited numbers in metropolitan Perth (n=21). Future research could examine liquor superstores and alcohol-related harms in larger cities with greater superstore numbers. Further, our methodology for measuring liquor store size could not be applied to licences selling alcohol for on-premise consumption *and* take-away sales as both functions are usually subsumed in the same footprint/roofline. Finally, although we have a relatively large sample size (n=990) and our study had 85% power to detect a β coefficient of 1.5 (representing increase in alcohol consumption (grams/day) for a one SD increase in liquor store count) it had less than 50% power to detect a β coefficient of 1.0 or less so true effects of this magnitude cannot be ruled out by this study.

Conclusion

The increased prevalence and market dominance of warehouse-style liquor stores selling discounted liquor has prompted community alarm [20]. One proposed planning response to better manage alcohol-related land-uses involves changing the local government planning scheme text to classify and restrict the location of liquor stores based on their net lettable area. We tested whether these size classifications were associated with alcohol consumption in young adults, an age when alcohol intake is typically highest [42]. While our results suggest young adults' alcohol consumption relates more to proximate liquor store density and convenience, it is plausible that size restrictions could have a greater impact on alcohol consumption in older cohorts, or protect against other alcohol-related community harms.

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References

1. Livingston, M., A.-M. Laslett, and P. Dietze, *Individual and community correlates of young people's high-risk drinking in Victoria, Australia*. Drug and Alcohol Dependence, 2008. **98**(3): p. 241-248.
2. Kavanagh, A.M., et al., *Access to alcohol outlets and harmful alcohol consumption: a multi-level study in Melbourne, Australia*. Addiction, 2011. **106**(10): p. 1772-1779.
3. Pereira, G., et al., *Access to Alcohol Outlets, Alcohol Consumption and Mental Health*. PLoS ONE, 2013. **8**(1): p. e53461.
4. Foster, S., et al., *Liquor landscapes: Does access to alcohol outlets influence alcohol consumption in young adults?* Health & Place, 2017. **45**: p. 17-23.
5. Connor, J.L., et al., *Alcohol outlet density, levels of drinking and alcohol-related harm in New Zealand: a national study*. Journal of Epidemiology and Community Health, 2011. **65**(10): p. 841-846.
6. Bryden, A., et al., *A systematic review of the influence on alcohol use of community level availability and marketing of alcohol*. Health & Place, 2012. **18**(2): p. 349-357.
7. Popova, S., et al., *Hours and Days of Sale and Density of Alcohol Outlets: Impacts on Alcohol Consumption and Damage: A Systematic Review*. Alcohol and Alcoholism, 2009. **44**(5): p. 500-516.
8. Gmel, G., J. Holmes, and J. Studer, *Are alcohol outlet densities strongly associated with alcohol-related outcomes? A critical review of recent evidence*. Drug and Alcohol Review, 2016. **35**: p. 40-54.
9. Campbell, C.A., et al., *The Effectiveness of Limiting Alcohol Outlet Density As a Means of Reducing Excessive Alcohol Consumption and Alcohol-Related Harms*. American Journal of Preventive Medicine, 2009. **37**(6): p. 556-569.
10. Kypri, K., et al., *Alcohol outlet density and university student drinking: a national study*. Addiction, 2008. **103**(7): p. 1131-1138.
11. Livingston, M., *To reduce alcohol-related harm we need to look beyond pubs and nightclubs*. Drug and Alcohol Review, 2013. **32**(2): p. 113-114.
12. Liang, W. and T. Chikritzhs, *Revealing the link between licensed outlets and violence: Counting venues versus measuring alcohol availability*. Drug and Alcohol Review, 2011. **30**(5): p. 524-535.
13. Howard, S., R. Gordon, and S. Jones, *Australian alcohol policy 2001-2013 and implications for public health*. BMC Public Health, 2014. **14**(1): p. 848.
14. Livingston, M., *Packaged liquor in Victoria: 2001 to 2016*. 2017, Foundation for Alcohol Research and Education. : Canberra.
15. Emerson, D., *Govt on collision course with Coles, Woolies over bottle shops*, in *Perth Now*. 2018, The Sunday Times: Perth.
16. Moodie, C., *A bottle of wine cheaper than a coffee: WA Government to push back against the spread of liquor barns*, in *ABC News*. 2018, ABC News: Perth.
17. Waters, S., *Booze breakthrough*, in *Melville Times*. 2013, Community News: Perth.
18. WA Local Government Association, Drug and Alcohol Office, and P. Context, *Local Government Town Planning Guideline for Alcohol Outlets*. 2014: Perth, Western Australia.
19. Roy Morgan Research, *The Australian alcohol retail market in review*. 2017, Roy Morgan Research,.
20. Howat, P., C. Binns, and J. Jancey, *Booze barns: fuelling hazardous drinking in Australia?* Health Promotion Journal of Australia, 2013. **24**: p. 85-86.
21. Williams, P., *Big-box liquor stores threaten knockout punch for locals*, in *The West Australian*. 2013: Perth.

22. Wagenaar, A., M. Salois, and K. Komro, *Effects of beverage alcohol price and tax levels on drinking: A meta-analysis of 1003 estimates from 112 studies*. *Addiction*, 2009. **104**: p. 179-190.
23. Jones, S. and K. Smith, *The effect of point of sale promotions on the alcohol purchasing behaviour of young people in metropolitan, regional and rural Australia*. *Journal of Youth Studies*, 2011. **14**: p. 885-900.
24. Kuo, M., et al., *The marketing of alcohol to college students: The role of low prices and special promotions*. *American Journal of Preventive Medicine*, 2003. **25**(3): p. 204-211.
25. Brown, T., *Strengthening community input in liquor outlet approvals*, in *Stemming the tide of alcohol: Liquor licensing and the public interest*, E. Manton, et al., Editors. 2014, Foundation for Alcohol Research in collaboration with The University of Melbourne: Canberra.
26. Manton, E., *Effectiveness of public interest arguments in recent case law*, in *Stemming the tide of alcohol: Liquor licensing and the public interest*, E. Manton, et al., Editors. 2014, Foundation for Alcohol Research in collaboration with The University of Melbourne: Canberra.
27. Muhunthan, J., et al., *Judicial intervention in alcohol regulation: an empirical legal analysis*. *Australian and New Zealand Journal of Public Health*, 2017.
28. WA Local Government Association, *Local Government Town Planning Guideline for Alcohol Outlets*. 2013: Subiaco.
29. Newnham, J.P., et al., *Effects of frequent ultrasound during pregnancy: a randomised controlled trial*. *The Lancet*, 1993. **342**(8876): p. 887-891.
30. Hodge, A., et al., *The Anti Cancer Council of Victoria FFQ: relative validity of nutrient intakes compared with weighed food records in young to middle-aged women in a study of iron supplementation*. *Australian and New Zealand Journal of Public Health*, 2000. **24**(6): p. 576-583.
31. Straker, L., et al., *Cohort Profile: The Western Australian Pregnancy Cohort (Raine) Study-Generation 2*. *International Journal of Epidemiology*, 2017. **46**(5): p. 1384-1385j.
32. Giles-Corti, B., et al., *The influence of urban design on neighbourhood walking following residential relocation: Longitudinal results from the RESIDE study*. *Social Science & Medicine*, 2013. **77**(0): p. 20-30.
33. Foster, S., et al., *Neighbourhood correlates of sitting time for Australian adults in new suburbs. Results from RESIDE*. *Environment and Behavior*, 2015. **47**(8): p. 902-922.
34. Australian Government Department of Infrastructure and Transport, *Walking, Riding and Access to Public Transport: Supporting active travel in Australian communities - Ministerial Statement*, Department of Infrastructure and Transport, Editor. 2013, Commonwealth of Australia: Canberra.
35. Drug and Alcohol Office, *Cheap drinks*. 2011, Government of Western Australia: Perth.
36. NHMRC, *Australian Guidelines to reduce health risks from drinking alcohol* NHMRC, Editor. 2009, Commonwealth of Australia: Canberra.
37. Hobday, M., et al., *Distance travelled to purchase alcohol and the mediating effect of price*. *Public Health*, 2017. **144**: p. 48-56.
38. Stockwell, T. and P. Gruenewald, *Controls on physical availability of alcohol*, in *The Essential Handbook of Treatment and Prevention of Alcohol Problems*, N. Heather and T. Stockwell, Editors. 2004, Wiley and Sons.: Chichester.
39. Livingston, M., *Alcohol outlet density and harm: Comparing the impacts on violence and chronic harms*. *Drug and Alcohol Review*, 2011. **30**(5): p. 515-523.
40. Morrison, C., et al., *Relating off-premises alcohol outlet density to intentional and unintentional injuries*. *Addiction*, 2016. **111**(1): p. 56-64.
41. Bluthenthal, R.N., et al., *Alcohol Availability and Neighborhood Characteristics in Los Angeles, California and Southern Louisiana*. *Journal of Urban Health*, 2008. **85**(2): p. 191-205.

42. Australian Institute of Health and Welfare, *Australia's health 2014*, in *Australia's health series no. 14*. 2014, AIHW: Canberra.

Table 1 Demographics of respondents (n=990)

	n	%	Ethanol grams/day Mean(SD)*
Gender			
Male	452	45.7	19.7(20.6)
Female	538	54.3	11.5(13.9)
Have children	42	4.3	10.9(16.0)
Fulltime or part-time job	883	89.2	16.1(18.4)
Study	465	47.0	14.9(17.7)
Highest education			
Secondary school (high school)	475	48.0	16.1(19.7)
TAFE, college	228	23.0	14.9(17.4)
University	262	26.5	13.2(14.5)
Other	25	2.5	18.4(19.7)
Relationship status			
Single and not in a relationship	429	43.3	15.7(19.4)
In a relationship but NOT living together	334	33.7	15.4(17.3)
In a relationship AND living together	207	20.9	13.1(15.2)
Married	20	2.0	10.6(18.3)

*One standard drink contains 10g of ethanol

Table 2 Number of liquor stores of different sizes (i.e., all stores, stores >300m² and stores >600m²) within different distances of participants' home address (n=990)

	Mean	SD	Min	Max	% with 1+ store
Count of liquor stores of any size					
Between 0-1,600m	1.41	1.47	0	8	66.9
Between 1,601-5,000m	9.98	9.02	0	40	83.7
Between 5,001-10,000m	28.34	21.72	0	74	84.1
Distance to closest of any size (km)	1.65	1.28	0.05	10.79	
Count of liquor stores >300m²					
Between 0-1,600m	0.42	0.76	0	4	29.8
Between 1,601-5,000m	3.20	3.65	0	17	76.0
Between 5,001-10,000m	9.21	7.70	0	26	82.6
Distance to closest store >300m ² (km)	2.59	2.10	0.05	19.74	
Count of liquor stores >600m²					
Between 0-1,600m	0.11	0.34	0	2	9.9
Between 1,601-5,000m	0.85	1.01	0	4	51.6
Between 5,001-10,000m	2.36	2.08	0	8	72.9
Distance to closest store >600m ² (km)	4.76	3.60	0.10	28.13	

Table 3 Number of liquor stores of different sizes (i.e., all stores, stores >300m² and stores >600m²) within different distances of participants' home address (n=990) and associations with daily alcohol consumption at 22 years

	β	95% LCI	95% UCI	p-value
Count of liquor stores of any size				
Between 0-1,600m	1.12	0.01	2.22	0.047*
Between 1,601-5,000m	1.20	0.08	2.32	0.035*
Between 5,001-10,000m	1.08	-0.05	2.20	0.060
Distance to closest of any size	-1.01	-2.19	0.18	0.095
Count of liquor stores >300m²				
Between 0-1,600m	0.54	-0.56	1.64	0.335
Between 1,601-5,000m	0.86	0.08	1.97	0.126
Between 5,001-10,000m	1.03	-0.05	2.15	0.072
Distance to closest store >300m ²	-0.86	-2.04	0.32	0.149
Count of liquor stores >600m²				
Between 0-1,600m	0.12	-0.97	1.22	0.824
Between 1,601-5,000m	0.27	-0.83	1.38	0.630
Between 5,001-10,000m	0.92	-0.19	2.03	0.105
Distance to closest store >600m ²	-0.04	-1.19	1.15	0.974

*p<0.05, **p<0.01. All models take into account gender, employment, education and relationship status. Estimate represents the change in alcohol consumption (grams/day) per 1 (SD) increase in exposure variable. One standard drink contains 10g of ethanol.

Table 4 Access to at least one liquor store of different sizes, within different distances of participants home address (n=990) and associations with daily alcohol consumption at 22 years

	β	95% LCI	95% UCI	p-value
Liquor store of any size				
Between 0-1,600m	1.68	-0.67	4.03	0.161
Between 1,601-5,000m	0.59	-2.40	3.58	0.698
Between 5,001-10,000m	0.30	-2.80	3.39	0.851
Liquor store >300m²				
Between 0-1,600m	0.26	-2.13	2.66	0.832
Between 1,601-5,000m	2.34	-0.24	4.92	0.075
Between 5,001-10,000m	0.19	-2.73	3.11	0.898
Liquor store >600m²				
Between 0-1,600m	0.03	-3.62	3.69	0.986
Between 1,601-5,000m	0.25	-1.95	2.45	0.823
Between 5,001-10,000m	0.93	-1.56	3.43	0.461

*p<0.05, **p<0.01. All models take into account gender, employment, education and relationship status. One standard drink contains 10g of ethanol.