RESEARCH ARTICLE

City-based action to reduce harmful alcohol use: review of reviews [version 1; referees: 1 approved]

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Abstract

Background: The World Health Organization global strategy on alcohol called for municipal policies to reduce the harmful use of alcohol. Yet, there is limited evidence that documents the impact of city-level alcohol policies.

Methods: Review of reviews for all years to July 2017. Searches on OVID Medline, Healthstar, Embase, PsycINFO, AMED, Social Work Abstracts, CAB Abstracts, Mental Measurements Yearbook, Health and Psychosocial Instruments, International Pharmaceutical Abstracts, International Political Science Abstracts, NASW Clinical Register, and Epub Ahead of Print databases. All reviews that address adults, without language or date restrictions resulting from combining the terms (“review” or “literature review” or “review literature” or “data pooling” or “comparative study” or “systematic review” or “meta-analysis” or “pooled analysis”), and “alcohol”, and “intervention” and (“municipal” or “city” or “community”).

Results: Five relevant reviews were identified. Studies in the reviews were all from high income countries and focussed on the acute consequences of drinking, usually with one target intervention, commonly bars, media, or drink-driving. No studies in the reviews reported the impact of comprehensive city-based action. One community cluster randomized controlled trial in Australia, published after the reviews, failed to find convincing evidence of an impact of community-based interventions in reducing adult harmful use of alcohol.

Conclusions: To date, with one exception, the impact of adult-oriented comprehensive community and municipal action to reduce the harmful use of alcohol has not been studied. The one exception failed to find a convincing effect. We conclude with recommendations for closing this evidence gap.
Introduction
In response to the 2011 United Nations declaration on non-communicable diseases (NCDs) (United Nations General Assembly, 2011; United Nations, 2014), the World Health Organization proposed a target to reduce the harmful use of alcohol by 10% between the years 2010 and 2025 (World Health Organization, 2014a), based on three possible indicators, adult per capita alcohol consumption, prevalence of heavy episodic drinking, and measures of alcohol-related morbidity and mortality (World Health Organization, 2014b).

The bulk of alcohol-related severe health problems, including mortality, occurs in middle age (Office for National Statistics, 2015), and, it is amongst this age group that policy and programme interventions are likely to bring the greatest health and productivity gains (Organisation for Economic Co-operation and Development, 2015). Heavy drinkers are responsible for the majority all alcohol-related harm (Rehm et al., 2013). It is also amongst this group, compared with lighter drinkers, that disproportionately greater health gains can be made for the same absolute reduction in alcohol consumption (Rehm & Roerecke, 2013). Thus, if alcohol policy is to be most efficient in reducing the harmful use of alcohol, it should preferentially address adult drinkers, and, in particular, those who drink heavily.

Driving the NCD alcohol target are WHO’s Global Strategy to reduce the harmful use of alcohol (World Health Organization, 2010), and WHO’s three ‘best buys’ (World Economic Forum & World Health Organization, 2011; World Health Organization, 2013). One of the ten target areas within the global strategy is community action, with a specific call to: “strengthen capacity of local authorities to encourage and coordinate concerted community action by supporting and promoting the development of municipal policies to reduce harmful use of alcohol, as well as their capacity to enhance partnerships and networks of community institutions and nongovernmental Organizations” (World Health Organization, 2010).

Cities are a potentially important setting and jurisdictional level for reducing NCDs (De Leeuw et al., 2015; Farrington et al., 2015). There is a range of evidence-based interventions that fall within municipal jurisdictional responsibility and which could be implemented at city level to reduce the harmful use of alcohol (Anderson & Baumberg, 2006; Anderson et al., 2009; Anderson et al., 2012; Burton et al., 2017; Fitzgerald et al., 2016; Martineau et al., 2013). Despite a long history of calls for city-based policies and action plans (Mathrani & Anderson, 1998; Ritson, 1995; World Health Organization, 1998), and an equally long history of research endeavour (Giesbrecht et al., 1990), a systematic review of the impact of alcohol policies, undertaken prior to the launch of the WHO global strategy, was unable to include community actions within its cost-effectiveness estimates, due to insufficient evidence of impact (Anderson et al., 2009).

Spurred by a target of a global beer producer to reduce the harmful use of alcohol by 10% over the five-year period 2016–2020 in pilot cities in at least nine different middle- and high-income countries (ABInBev, 2016), we have undertaken a review of reviews to investigate the potential impact of city-based action to reduce the harmful use of alcohol. In our review, we have focused on reviews that summarize the literature of comprehensive community and municipal action, often based on a municipal comprehensive strategy and action plan, as put forward by the World Health Organization (Anderson, 1991; Ritson, 1995). Because we anticipated very few such reviews, we have supplemented our findings with an overview of what could be implemented within a comprehensive municipal strategy to reduce the harmful use of alcohol, based on the published evidence base (Anderson & Baumberg, 2006; Anderson et al., 2009; Anderson et al., 2012; Burton et al., 2017; Fitzgerald et al., 2016; Martineau et al., 2013).

Methods
During July 2017, we conducted a systematic literature search on OVID Medline, Healthstar, Embase, PsycINFO, AMED, Social Work Abstracts, CAB Abstracts, Mental Measurements Yearbook, Health and Psychosocial Instruments, International Pharmaceutical Abstracts, International Political Science Abstracts, NASW Clinical Register, and Epub Ahead of Print databases to identify reviews that addressed community and municipal alcohol interventions. With no language or date restrictions, the search used the following combination of terms: (“review” or “literature review” or “review literature” or “data pooling” or “comparative study” or “systematic review” or “meta-analysis” or “pooled analysis”), and “alcohol” and “intervention” and (“municipal” or “city” or “community”), supplemented with hand searches of included reviews.

Our inclusion criteria were reviews and overviews (whether or not systematic) that discussed the implementation of comprehensive policies and programmes to reduce the harmful use of alcohol at the community or municipal level. We excluded reviews of specific alcohol policy interventions, for example restrictions on hours and days of sale, that may or may not have been part of a city action plan. Two authors (OSMH and PA) independently reviewed titles and abstracts for selecting papers for full text review and selecting papers to include. Discrepancies, which only related to whether or not the publication addressed comprehensive approaches, were resolved with discussion. The result of the search, analysed during July 2017, is summarized in Figure 1. As only five relevant reviews were identified, three of which were by the same author, we did not attempt to analyze them for their quality, but rather describe their methods and findings.

Results
Only five relevant reviews were identified (Giesbrecht et al., 2014; Giesbrecht & Greenfield, 2003; Giesbrecht & Hayden, 2006; Gorman & Speer, 1996; Toomey & Lenk, 2001). Three included the same first author, and the most recent publication (Giesbrecht et al., 2014) included all publications of, and reached similar conclusions to, the previous four reviews. None of the reviews were systematic and none adhered to standard guidelines. Subsequent to the publication dates of the reviews, our search identified one further large randomized study of the effectiveness of community action (Shakeshaft et al., 2014).
Of the 23 individual studies mentioned in the 2014 review (Giesbrecht et al., 2014), twelve included adults, mostly with a focus on younger adults. Six were from North America, two were from Nordic countries, and four were from Australia/New Zealand. Four of the 12 studies targeted bars, three media campaigns, two drink-driving, one overall access, one a specific location (a beach), and one primary health care-based brief advice programmes. No studies reported comprehensive community or municipal interventions. The four bar studies found an effect in reducing violence, which tapered off over time. The three media studies found no impact. The two drink-driving studies led to reduced alcohol-involved traffic crashes. The access and location study led to reductions in the harmful use of alcohol, but the brief advice initiative did not.

The large study, outside of the reviews, was a randomized trial comprising 20 communities in Australia that each had populations of 5,000–20,000 inhabitants (Shakeshaft et al., 2014). Communities were pair-matched, and one member of each pair was randomly allocated to the experimental group. Thirteen interventions were implemented in the experimental communities from 2005 to 2009: community engagement; general practitioner training in...
alcohol screening and brief intervention (SBI); feedback to key stakeholders; media campaign; workplace policies/practices training; school-based intervention; general practitioner feedback on their prescribing of alcohol medications; community pharmacy-based SBI; web-based SBI; Aboriginal Community Controlled Health Services support for SBI; Good Sports program for sports clubs; identifying and targeting high-risk weekends; and hospital emergency department–based SBI. The study failed to detect an impact of the interventions in reducing the harmful use of alcohol in routine data, but found a significant reduction of average alcohol use in surveys. Unfortunately, the study appeared under powered for the routine data, and had low response rates to measurement surveys. The community interventions were not able to be fully comprehensive and were not able to include a range of potentially impactful interventions, including sales taxes and restrictions on availability. Further, no process evaluation was reported; thus, whether or not the included interventions were implemented as planned, or the extent to which they were implemented is not reported.

One of the five reviews that we identified included a summary of feasible intervention options at the local and municipal level (Giesbrecht & Haydon, 2006). We have included and expanded on these in Table 1, adding an overview of the evidence base (Anderson & Baumberg, 2006; Anderson et al., 2009; Anderson et al., 2012; Burton et al., 2017; Fitzgerald et al., 2016; Martineau et al., 2013), with implementation illustrations at the city level. Dependent on jurisdictional responsibilities, city-level interventions that might have a meaningful contribution to reducing the harmful use of alcohol include sales taxes, restrictions on density of outlets and days and hours of sale, drink-drive restrictions, and scale-up of individual level advice and treatment programmes.

| Policy measure | Evidence of impact | Opportunity for city implementation |
|----------------|--------------------|------------------------------------|
| **Pricing policies** |                     |                                    |
| Alcohol taxes | Effective | Systematic reviews and meta-analyses find that increases in the price and taxation of alcohol reduce consumption and alcohol-related harm for all groups of drinkers, and in high, middle and low-income countries (Anderson et al., 2009; Dhalwani, 2011; Elder et al., 2010; Fogarty, 2008; Gallet, 2007; Sorpaïsarit et al., 2013; Wagenaar et al., 2009; Wagenaar et al., 2010; Xu & Chaloupka, 2011). | Many cities have opportunity to set alcohol beverage sales taxes, which can bring in municipal revenues (KPMG LLP, 2016). |
| **Access policies** |                     |                                    |
| Outlet density | Effective | Systematic reviews (Bryden et al., 2012; Campbell et al., 2009; Gmel et al., 2016; Holmes et al., 2014; Livingston et al., 2007; Popova et al., 2009) and individual studies (Fone et al., 2016; Morrison et al., 2016; Richardson et al., 2015) find that greater alcohol outlet density is associated with increased alcohol consumption and harms, including injuries, violence and crime. | Licensing of alcohol sales outlets allows local governments to control where alcohol is sold to the public, with restrictions on density related to less crime (de Vocht et al., 2016). |
| Days and hours of sale | Effective | Systematic reviews find that days and hours of sale are related to alcohol consumption and harms (Hahn et al., 2010; Middleton et al., 2010; Wilkinson et al., 2016). Individual studies find that restrictions on hours of sale reduce harm (Duailibi et al., 2007; Kypri et al., 2014; Rosow & Norström, 2011). | Licensing of alcohol sales outlets allows local governments to control when alcohol is sold to the public, with restrictions on hours of sale related to less harm (de Vocht et al., 2016; Wittman, 2016a; Wittman, 2016b). |
| **Bar policies** |                     |                                    |
| Training of bar staff, responsible serving practices, security staff in bars and safety-oriented design of the premise | Mixed effectiveness | A systematic review found limited impact unless backed-up by police enforcement and licence inspectors (Ker & Chinnock, 2008). | Drinking environments can be foci of alcohol-related harms (Hughes & Bellis, 2012). Ongoing enforcement is the required ingredient to reduce harm in drinking environments (Brännström et al., 2016; Florence et al., 2011; Månström et al., 2007; Wallin et al., 2001; Warpenius et al., 2010; Trolldal et al., 2013). |
| **Advertising policies** |                     |                                    |
| Volume of advertising | Effective | Systematic reviews find associations between volume of advertising exposure and alcohol-related consumption and harm (Bryden et al., 2012; Booth et al., 2008; Gallet, 2007; Stautz et al., 2016). | Cities have the opportunity of restricting advertising, including billboards, in the public places that they own or through the public services, such as transportation, that they provide (Fullwood et al., 2016; Swensen, 2016). |
### Drink-drive restrictions

| Intervention | Effectiveness | Evidence | Notes |
|--------------|---------------|----------|-------|
| Sobriety checkpoints and unrestrictive (random) breath testing | Effective | Systematic reviews and meta-analyses find that both introducing and expanding sobriety checkpoints and random breath testing result in reduced alcohol-related injuries and fatalities (Bergen et al., 2014; Erke et al., 2009; Shults et al., 2001), enhanced with mass-media campaigns (Elder et al., 2004; Yadav & Kobayashi, 2015). | Cities have the opportunity to step-up sobriety checkpoints and random breath testing (Voas, 2008). |
| Designated driver campaigns | Ineffective | A systematic review did not find evidence for designated driver programmes in reducing the prevalence of people drink driving or being a passenger with a drink driver (Ditter et al., 2005) | Whist a seemingly attractive approach, there is insufficient evidence to warrant widespread investment in designated driver campaigns. |

### Screening, advice and treatment

| Intervention | Effectiveness | Evidence | Notes |
|--------------|---------------|----------|-------|
| Digital interventions | Effective | A systematic review found that digital interventions were just as effective as face-to-face interventions in reducing alcohol consumption and related harm (Beyer et al., 2015; Kaner et al., 2015). | Off-the-shelf applications can be deployed at city level (Crane et al., 2015; Garrett et al., 2015), enhanced with context awareness and use of ecological momentary assessments (Freisthler et al., 2014; Morgenstern et al., 2014; Wray et al., 2014). |
| Primary health care | Effective | Systematic reviews and meta-analyses find a positive impact of screening and brief advice programmes on alcohol consumption, mortality, morbidity, alcohol-related injuries, alcohol-related social consequences, healthcare resource use and laboratory indicators of harmful alcohol use (O’Donnell et al., 2014). There is stronger evidence of effectiveness for primary health care-based screening and brief advice programmes than for emergency care (Nilsson et al., 2008), general hospital settings (McQueen et al., 2011), obstetric or antenatal care (Doggett et al., 2005), and pharmacy settings (Brown et al., 2016). Systematic reviews and meta-analyses find that implementation strategies are effective in increasing the volume of primary health care screening and brief advice activity (Anderson et al., 2004; Keuthorst et al., 2015). | Tailored screening and brief advice programmes embedded within community and municipal action are more likely to be scaled-up (Anderson et al., 2017; Heather 2006). |
| Workplace | Largely ineffective | Systematic reviews of workplace-based programmes (Webb et al., 2009) and workplace-based screening and brief advice programmes find little evidence for reducing consumption and harm (Schulte et al., 2014). | Although business cases are made for workplace-based programmes (Martinic, 2015), the evidence appears insufficient to justify a city-based investment. |
| Secondary health care | Effective | Systematic reviews find that psycho-social (Magill & Ray, 2009; Smedslund et al., 2011; The British Psychological Society & The Royal College of Psychiatrists, 2011) and pharmacological therapies (Rösner et al., 2010a; Rösner et al., 2010b; The British Psychological Society & The Royal College of Psychiatrists, 2011) are effective in treating heavy drinking. | Treatment services can be embedded within comprehensive care pathways (NICE, 2016) at the city level. |

### Education and information

| Intervention | Effectiveness | Evidence | Notes |
|--------------|---------------|----------|-------|
| School-based programmes | Ineffective | Systematic reviews find that reported benefits are seen only in the short term and are often not replicated (Foxcroft & Tsirtsadadze, 2011; Strom et al., 2014) | Whilst a popular intervention, and a necessary part of school education, investment in school-based education programmes should be proportionate, given the evidence for lack of effectiveness. |
| Public information campaigns | Ineffective | Systematic reviews find evidence of little or no sustained impact of public education campaigns in changing drinking behaviour (Martineau et al., 2013), with the exception of drink driving (Elder et al., 2004). | Media campaigns should focus on changing behaviour in relation to existing programmes, such as drink driving (Yadav & Kobayashi, 2015), rather than acting in isolation, where there is evidence of ineffectiveness. |
| Changing social norms | Limited evidence | Overviews suggest that alcohol-related social norms can be changed by campaigns, particularly when related to behaviour changes (Miller & Prentice, 2016). | Social norms campaigns should focus on topics that are the subject of behaviour change programmes, such as drink driving (Parkins et al., 2010). |
| Product reformulation | Limited evidence | A systematic review indicates the theoretical likelihood that reductions in the average alcohol content of beverages would reduce alcohol-related harm (Rehm et al., 2016). | Cities could set limits on beverage container sizes (Jones-Webb et al., 2011; McKee et al., 2012). |
(Organisation for Economic Co-operation and Development, 2015).

Discussion
Cities can be natural units for promoting health (de Leeuw et al., 2015; Farrington et al., 2015), including reducing the harmful use of alcohol (Mathrani & Anderson, 1998). Although not necessarily having the full jurisdictional responsibilities of national governments for all health policy issues, they often have greater flexibility and are an important site for innovative environmental measures that make healthier choices easier choices, shifting social norms in the process (Reeve et al., 2015). Cities are members of many networks, including Healthy Cities networks, which are natural vehicles for deployment to full scale globally.

This review has identified a suite of evidence-based policies and programmes that could, dependent on jurisdictional responsibilities, be implemented at the city level to reduce the harmful use of alcohol. Indeed, some of the studies identified by the reviews that focused on one particular programme area, for example enforcement of bar regulations, stepped up drink-driving activities, and strengthened access regulations, found some impacts in reducing the harmful use of alcohol. However, only one study evaluated a suite of interventions, and found no convincing evidence of impact. This study, though, was unable to include a range of potential impactful interventions (price and availability), and did not report implementation fidelity of the included interventions (Shakeshaft et al., 2012).

We have not been able to find evidence for the effective impact of comprehensive municipal action plans in reducing the harmful use of alcohol. There is, thus, dissonance between calls for action and evidence. This contrasts with other topic areas, such as smoking (Moreland-Russell et al., 2016; Perlman et al., 2016), obesity (Reeve et al., 2015; Sisnowski et al., 2016), and physical activity (Giles-Corti et al., 2016; Sallis et al., 2016a; Sallis et al., 2016b; Stevenson et al., 2016), where there is experience of coordinated city action and a supporting evidence base.

We conclude our paper by discussing how this dissonance might be reduced. First, there are needs for multi-city studies that test the impact of developed and implemented municipal action plans in reducing the harmful use of alcohol. To match the WHO target of a 10% reduction in the harmful use of alcohol over a 15-year time frame, recognizing the importance of addressing adults, and, in particular, heavy drinkers, the evidence base indicates that municipal action plans need to include, where jurisdictional authority allows, all of: sales taxes to increase the price of alcohol; reductions in the availability of alcohol through restrictions on outlet density and days and hours of sale; intensive implementation of drink drive restrictions through sobriety checkpoints and/or unrestricted (random) breath testing; and, widespread deployment and scale-up of health care based screening and brief advice and treatment programmes, see Table 1. Municipal action plans should not be based on public education or mass media programmes alone, as these have been found to be ineffective in reducing the harmful use of alcohol (Martineau et al., 2013).

Ideally, multi-city studies should be set up as randomized trials with control cities in different sites with sufficient sample size with respect to both cities and individuals within cities to test whether the municipal action plans work. While this may be difficult to realize, given that such randomized trials would have very high costs, and there are not many examples of sufficiently powered community trials in the literature, a different design in combining national aggregate and individual level data could be used to achieve better control (Gmel et al., 2004). Longitudinal individual level data could be collected by drawing representative samples from the adult population in the cities, with an oversampling of heavier drinkers. This would allow an analysis of how the city actions affect individual drinking trajectories, as recommended by a number of authors (Fitterer et al., 2015; Holmes et al., 2015). The evaluation should triangulate the individual cohort data with the aggregate-level data, and with other routinely collected data, such as alcohol-attributable hospitalizations (Shakeshaft et al., 2014) to test if the municipal actions lead to a reduction in the harmful use of alcohol. Wastewater-based epidemiology can be used to contrast alcohol consumption between implementation cities and comparator cities (Ryu et al., 2016). Logic models should be developed to undertake process evaluation (Moore et al., 2015) to ascertain implementation fidelity and to identify and empirically demonstrate effective best practices to reduce harmful consumption of alcohol that could be adopted for scale-up in other cities and countries (Barker et al., 2016).

Competing interests
JR, EJL and OSMH report no conflict of interest. PA has received fees from AB InBev Foundation.

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This is a relevant paper providing needed perspectives on interventions to reduce the harm caused by alcohol. It is presented as a review of reviews, but in fact it goes a bit beyond it, as the contents of table 1 are in themselves a valuable side-product.
I think the paper is acceptable to be indexed in its current form, and may be useful to many practitioners.

Is the work clearly and accurately presented and does it cite the current literature?
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Are all the source data underlying the results available to ensure full reproducibility?
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Are the conclusions drawn adequately supported by the results?
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