Date: October 18, 2017

Re: Agenda Item 17, Blue Agave Restaurant & Lounge 117 S. Butler St. Madison, WI

To: City of Madison, WI Alcohol License Review Committee (ALRC)

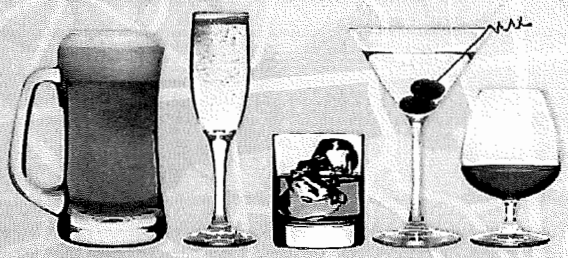
From: Jamie McCarville, Resident [redacted] Madison, WI

I appreciated the mailings from the Alderpersons and the ALRC about the restaurant/lounge at 117 S. Butler St. and I did attend both meetings. I am not opposed to a restaurant at that location. I am very opposed to a bar at that location. Our downtown neighborhoods are drowning in alcohol outlets and alcohol fueled crime and violence.

This street is a residential area not an entertainment district. My suggestions for the hours of operation are 10pm Sunday – Thursday nights and 12am on Friday-Saturday night, acoustic music, and a 10pm sidewalk closing. Most restaurants are closed by 11pm in Madison, and another recent alcohol license applicant the Hail Mary Pass has agreed to at 12am closing.

A new resource from the National Centers for Disease Control is available to help in alcohol license decision making. Called the 2017 Guide for Measuring Alcohol Outlet Density; web-link: https://www.cdc.gov/alcohol/pdfs/CDC-Guide-for-Measuring-Alcohol-Outlet-Density.pdf.

GUIDE FOR MEASURING ALCOHOL OUTLET DENSITY



U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

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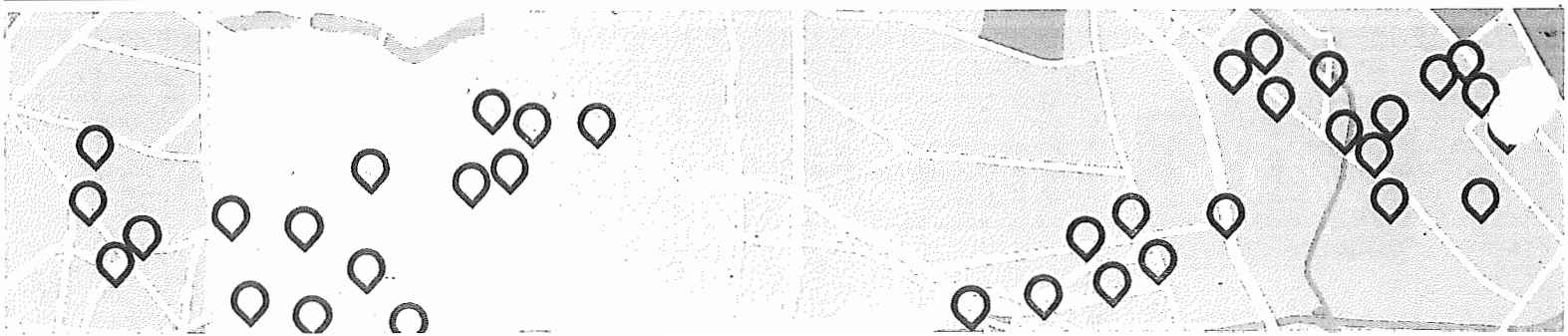

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Executive Summary

Excessive alcohol use is responsible for 88,000 deaths annually in the United States, including 1 in 10 deaths among working-age adults aged 20–64 years, costing the United States $249 billion in 2010, or $2.05 per drink. Binge drinking, or four or more drinks per occasion for women and five or more drinks per occasion for men, is responsible for more than half the deaths and three-quarters of the costs caused by excessive drinking. Yet, 9 in 10 adult excessive drinkers are not alcohol-dependent.

High alcohol outlet density, defined as a high concentration of retail alcohol outlets in a small area, is known to be an environmental risk factor for excessive drinking. To prevent excessive drinking, the Community Preventive Services Task Force recommends "limiting alcohol outlet density through the use of regulatory authority (e.g., licensing and zoning)," which is based on strong scientific evidence of intervention effectiveness.

Alcohol outlet density varies widely among states and communities. Therefore, public health surveillance is needed to assess alcohol outlet density and to guide the development of public health interventions for reducing alcohol outlet density. For example, a liquor control agency could use information about alcohol outlet density to limit the issuance of new alcohol licenses, or to increase enforcement of liquor laws in a particular area. Information about alcohol outlet density could also be used by local governments to develop zoning regulations to regulate alcohol outlet density. In addition, public health surveillance of alcohol outlet density can be used to evaluate the relationship between exposure to retail alcohol outlets and various alcohol-attributable harms, such as property damage and interpersonal violence, as well as to evaluate the effects of reducing alcohol outlet density on these harmful outcomes.

There are several steps for measuring alcohol outlet density, including defining the reason for measuring alcohol outlet density, the measurement area, and the type of measure that will be used. In addition, it is necessary to:

- Obtain data about licensed alcohol outlets in the area.
- Categorize retail alcohol outlets by type (e.g., on-premises or off-premises).
- Select the type(s) of alcohol outlet(s) that will be included in the assessment.
- Geocode the alcohol outlets in the measurement area (i.e., assign geographic coordinates [latitude and longitude] to the alcohol outlets).
- Calculate alcohol outlet density using the selected approach.

There are three main approaches for measuring alcohol outlet density:

1. Container-based.
2. Distance-based.
3. Spatial access-based.

Each approach has advantages and disadvantages that should be carefully considered when selecting a measurement strategy, while being mindful of how the results will be used. In addition, there are many community characteristics (e.g., whether a community is located in an urban or rural area) that should be considered when selecting an alcohol outlet density measurement strategy.

Any measurement of outlet density is better than none, *provided one is fully aware of the limitations of the measurement approach that is being used.* As one moves from container-based to distance-based to spatial access-based measures of alcohol outlet density, the completeness and specificity of the measures increase, as does the complexity of the measurement process and resource requirements. If the resources are available, distance or spatial access-based measures of alcohol outlet density offer many advantages over container-based measures because they are not constrained by existing geopolitical boundaries. In addition, distance or spatial access-based measures allow for the assessment of alcohol outlet clustering, which is known to be associated with an increased risk of excessive alcohol use and related harms, such as violent crime.

Based on a systematic review of scientific evidence on the effectiveness of regulating alcohol outlet density that was done for The Guide to Community Preventive Services (Community Guide), as well as other scientific studies, there is strong scientific evidence that regulating alcohol outlet density is one of the most effective strategies for reducing excessive alcohol consumption and related harms. Thus, assessing and monitoring alcohol outlet density are essential for public health agencies to help guide the development of strategies that regulate this environmental risk factor. In addition, developing and implementing other evidence-based strategies to prevent excessive alcohol use (e.g., the enforcement of liquor laws, such as the age 21 minimum legal drinking age) are needed.

Background

Excessive alcohol use is responsible for 88,000 deaths in the United States each year, including 1 in 10 deaths among working-age adults aged 20–64 years.[1] Excessive alcohol use is also associated with many health and social harms, including liver cirrhosis, certain cancers, unintentional injuries, violence, and fetal alcohol spectrum disorder.[2] Excessive drinking cost the United States $249 billion in 2010, a median of $3.5 billion per state.[3]

Binge drinking (i.e., ≥4 drinks per occasion for women; ≥5 drinks per occasion for men) is responsible for more than half the deaths and three-quarters of the costs caused by excessive drinking.[1,3] Yet, 9 in 10 adult excessive drinkers are not alcohol-dependent.[4] This underscores the importance of implementing effective community-based strategies for reducing excessive drinking beyond ensuring the availability of high-quality addiction treatment services for those who need them.

Excessive alcohol use is defined as binge drinking (4 or more drinks per occasion for women; 5 or more drinks per occasion for men); heavy drinking (8 or more drinks per week for women; 15 or more drinks per week for men); any alcohol consumption by those younger than age 21 years; or any alcohol consumption by pregnant women.

High alcohol outlet density as a public health problem

High alcohol outlet density, defined as having a high concentration of retail alcohol outlets in a small area, is an environmental risk factor for excessive drinking.[5] From a 2014 study assessing the effects of various state alcohol policies, researchers found that differences in alcohol outlet density and alcohol taxes accounted for about half of the overall effect that the alcohol policy environment had on binge drinking among adults.[6] In addition, high alcohol outlet density is associated with many social harms among neighborhoods in and around the alcohol outlets, such as disorderly conduct, noise, neighborhood disruption, public nuisance, and property damage.[5] High alcohol outlet density is also linked with many alcohol-attributable effects among neighborhoods further away from alcohol outlets, such as alcohol-impaired driving, pedestrian injuries, domestic violence, and child abuse and neglect.[5]

The Community Preventive Service Task Force recommendation on alcohol outlet density

The Guide to Community Preventive Services (Community Guide) systematically reviewed the scientific research (available as of October 2007) about the effectiveness of regulating alcohol outlet density as an intervention strategy for reducing excessive alcohol consumption and related harms.[5] The Community Preventive Services Task Force then recommended "limiting alcohol outlet density through the use of regulatory authority (e.g., licensing and zoning)" on the basis of strong scientific evidence of intervention effectiveness.[7]

The Community Guide review defined alcohol outlet density as "the number of physical locations in which alcoholic beverages are available for purchase either per area or per population."[5] This definition suggested the need to consider both the quantity and concentration of retail alcohol outlets within a particular geographic area. However, the studies included in the Community Guide review used a variety of different approaches to measure alcohol outlet density. Thus, the Community Guide did not advance a specific definition of high alcohol outlet density or specific approaches for measuring it.

Why measure alcohol outlet density?

There are many reasons to conduct public health surveillance of alcohol outlet density. First, alcohol outlet density varies substantially among states and communities. Much of this variation reflects known differences among state laws governing the physical availability of alcohol,[6,8,9] as well as the general trend toward the deregulation of alcohol sales.[10] Consequently, measuring alcohol outlet density at state and local levels is essential for guiding the development of prevention strategies for excessive alcohol use, such as those recommended by the Community Preventive Services Task Force. In addition, alcohol outlet density measures can complement other core public health surveillance measures of excessive alcohol use, as well as measures of alcohol policy. Thus, alcohol outlet density measures can provide a more complete picture of policy and environmental factors that can affect excessive alcohol use among states and communities.[11]

Second, identifying areas with high alcohol outlet density can help liquor control agencies determine whether to issue new alcohol licenses, reissue old ones, or increase enforcement of liquor laws in a particular area. Public health surveillance data that show where alcohol outlet density is increasing can also prompt new zoning controls or changes in the classification of retail alcohol outlets to help prevent future problems with high alcohol outlet density.

Third, surveillance data on alcohol outlet density can be used to evaluate the relationship between alcohol outlet density and various health and social harms among communities, such as violence, disorderly conduct, or property damage. Surveillance data can also be used to evaluate the effect of reducing alcohol outlet density on these harmful outcomes. For example, in a 2015 study, researchers found that a modest (3%) reduction in alcohol outlet density in the Buckhead neighborhood of Atlanta during 2003–2007 resulted in a two-fold greater relative decline in violent crime in this area compared with other areas of the city, where alcohol outlet density increased.[12] Evidence of harmful outcomes in an area with high alcohol outlet density can further guide the planning and implementation of evidence-based prevention strategies for excessive drinking, including strategies that are more outcome-specific (e.g., sobriety checkpoints to reduce alcohol-impaired driving).

Purpose of this document

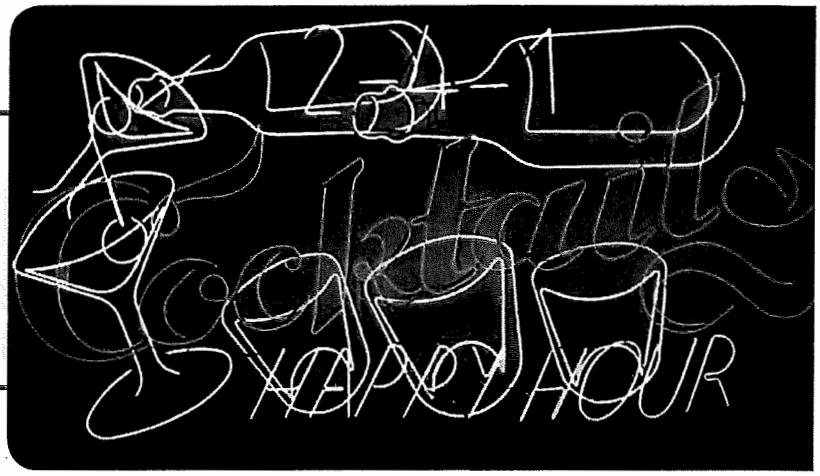
Recognizing that assessments of alcohol outlet density can help guide public health practices, the Excessive Alcohol Use Prevention Team (Alcohol Program) in the National Center for Chronic Disease Prevention and Health Promotion at the Centers for Disease Control and Prevention (CDC) convened a Workgroup on Measuring Alcohol Outlet Density in May 2011. The workgroup included a diverse group of epidemiologists, geographers, and experts in alcohol policy who work in federal, state, and local public health agencies, academic institutions, and private organizations. The workgroup discussed many conceptual issues related to the measurement of alcohol outlet density, including the pros and cons of various measurement strategies, and the steps for measuring alcohol outlet density at the state and local levels.

This CDC publication, *Guide for Measuring Alcohol Outlet Density*, summarizes some of the key points that were discussed during this meeting, along with more recent scientific information on the measurement of alcohol outlet density. Specifically, this guide describes the following:

- Key issues that need to considered before measuring alcohol outlet density.
- The steps involved in performing this public health surveillance activity.
- Various approaches to measuring alcohol outlet density and their pros and cons.
- Guidance from CDC for measuring alcohol outlet density.

The information in this guide can help state and local health departments measure this environmental risk factor, and thus, guide the regulation of alcohol outlet density at state and local levels.

Considerations in Measuring Alcohol Outlet Density



What is an alcohol outlet?

A retail alcohol outlet is a licensed establishment that sells alcoholic beverages. Alcohol outlets are of two general types: on-premises alcohol outlets, which sell alcohol for consumption on-site; and off-premises alcohol outlets, which sell alcohol for consumption elsewhere.

On-premises alcohol outlets

On-premises alcohol outlets include bars, clubs, producers (e.g., wineries, breweries), and restaurants. When measuring alcohol outlet density, it is important to assess the types of on-premises alcohol outlets because alcohol consumption and related harms can vary depending on the type and mix of alcohol outlets among states and communities. For example, adult binge drinkers who drink in bars tend to consume more drinks on average (i.e., have higher binge drinking intensity) than those who drink in restaurants or in other settings.[13] Thus, when measuring alcohol outlet density, one should differentiate between bars and restaurants whenever possible to more accurately assess the risk of alcohol-attributable harms.

The distinction between bars and restaurants is generally based on the following:

- Closing time: bars generally stay open past 11:00 p.m., whereas restaurants do not.
- Having a full kitchen: bars usually do not, whereas restaurants typically do.
- Percentage of total sales from alcohol: alcohol generally accounts for more than half of total sales in bars, but less than half of total sales in restaurants.[14]

However, these distinctions are complicated because many restaurants include bars that stay open past 11:00 p.m., even though food service may have been curtailed or discontinued. Such "barstaurants" can be challenging to classify without having specific information about the business operations of individual retailers. However, for measurement purposes, it may be advisable to consider these establishments as bars if they meet specified criteria, such as staying open after 11:00 p.m. and limiting food menu items.[14] Little information is available for how other types of outlets, such as private clubs or producers, should be handled in outlet density assessments, but these settings generally represent a small proportion of on-premises outlets.

Off-premises alcohol outlets

Off-premises alcohol outlets include liquor stores, big-box retailers, grocery stores, small convenience stores, gas stations, and pharmacies. Although all off-premises locations sell alcohol for consumption elsewhere, the regulation of off-premises locations varies among states and communities, and there can be substantial differences between off-premise alcohol outlets (e.g., differences in the volume of alcohol sold by individual retailers). For example, grocery stores are sometimes exempted from certain alcohol licensing restrictions, such as those restricting the placement of an alcohol outlet near a sensitive location (e.g., a school or church). In addition, big-box retailers or large grocery stores may sell several times the volume of alcohol sold by smaller retailers operating in the same general area, but still be classified as individual retail locations for licensing purposes. These and other differences between off-premise alcohol outlets can complicate the assessment and interpretation of off-premises alcohol outlet density and the planning of strategies to reduce high alcohol outlet density.

Combined alcohol outlets

Although retail alcohol outlets tend to focus on the sales of alcohol for consumption either on- or off-premises, some on-premises retail alcohol outlets may sell alcohol for consumption elsewhere, and some off-premises outlets may allow alcohol consumption on-premises. As such, there is not always a clear distinction between on- and off-premises retail alcohol outlets, which can pose particular challenges when assessing alcohol outlet density by the type of retail outlet. Nonetheless, in the absence of more specific information on the characteristics of individual retailers, the most practical approach is often to go with the classification of retailer type that is included in the alcohol licensure data.

Retailer characteristics and the measurement of alcohol outlet density

In addition to the differences between on- and off-premises alcohol outlets, there are other important differences in the characteristics of individual alcohol retailers that could influence the risk of excessive alcohol use and related harms. For example, as noted before, some retailers are larger, stay open longer, have a larger volume of alcohol sales, charge lower prices to increase alcohol sales, or have some combination of these characteristics. Furthermore, some alcohol outlets have been associated with a greater likelihood of excessive alcohol use and related harms, which is supported by the uneven distribution of the reported place of last drink by alcohol-impaired drivers.[15,16] Although there are no generally accepted methods to adjust for these specific differences in retailer characteristics, being aware of these differences and trying to account for them when measuring alcohol outlet density may help improve the precision of alcohol outlet density measures.

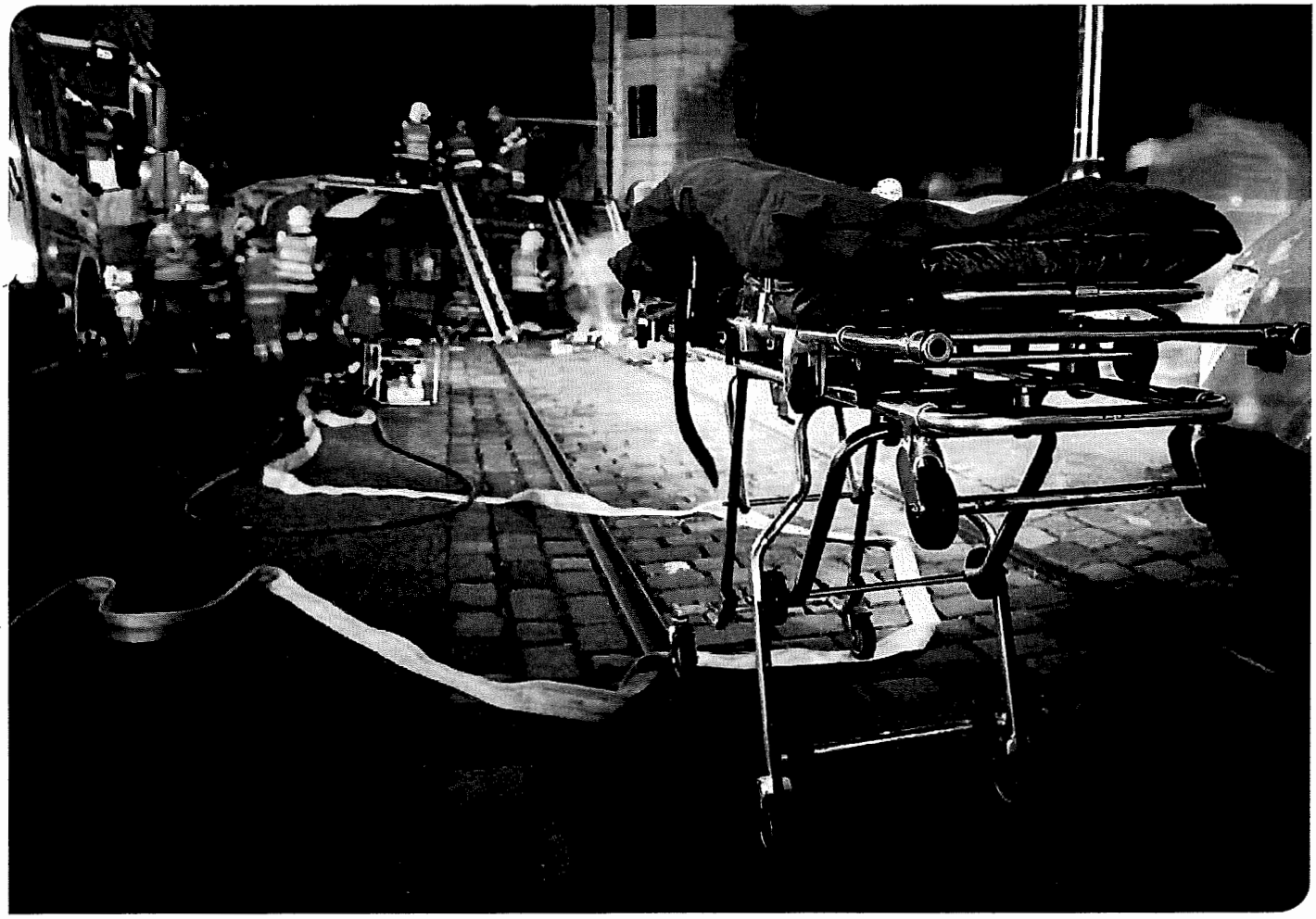
Although differences in the characteristics of alcohol retailers are important, on the basis of the Community Guide review on regulating alcohol outlet density, the number and concentration of retail alcohol outlets in a community is likely to affect excessive alcohol use and related harms more than differences in retailer characteristics. For example, a higher alcohol outlet density may lead to more aggressive alcohol marketing (e.g., potential price competition), as well as the aggregation of excessive drinkers in a limited geographic area, which can significantly increase the risk of harms.[5,17] Therefore, even if the specific characteristics of individual retailers cannot be fully assessed, public health surveillance of alcohol outlet density should be conducted.

Contextual factors

Community factors (e.g., socioeconomic, sociodemographic) can affect the type and mix of retail alcohol outlets located in a community. In one study, researchers found that alcohol outlets (including both on- and off-premises outlets) were concentrated among low-income areas.[18] In another study, researchers reported that a high density of off-premises alcohol outlets was associated with higher levels of poverty and with higher proportions of black and Latino people among urban census tracts.[19] However, another study found a high concentration of on-premises alcohol outlets among both high and low-income neighborhoods in Atlanta, suggesting that alcohol outlet density may be affected by other factors in addition to the household income of area residents.[12]

The effect that alcohol outlets have on excessive alcohol consumption and related harms could also be influenced by their location in communities, specifically whether alcohol outlets are permitted near populations with higher risks of excessive drinking. For example, high concentrations of alcohol outlets near schools, college communities, or military bases could encourage underage and binge drinking, particularly if alcohol outlets are clustered, which can lead to greater price competition and difficulty enforcing liquor laws (e.g., the age 21 minimum legal drinking age).

The size and type of communities where alcohol outlets are located (e.g., the degree of urbanicity) could also influence the effects that alcohol outlets have on excessive alcohol use and related harms, and thus the interpretation of alcohol outlet density measures. For example, a relatively low on-premises alcohol outlet density in a rural area may be associated with a higher risk of alcohol-related motor vehicle crashes, crash injuries, and deaths in crashes than a similar alcohol outlet density in an urban area, where travel distances and speed limits are lower. Furthermore, consumers' perceptions of the convenience costs involved in traveling farther to purchase alcohol may differ significantly based on whether the consumer lives in an urban or rural area. For example, a person living in a remote rural area may be much more willing to travel longer distances to purchase alcohol at retail alcohol outlets than their urban counterpart. However, even in rural areas, a person's willingness to travel may vary by road type and speed limit. All of these contextual elements should be considered when measuring alcohol outlet density.



Variability in the geographic distribution of alcohol outlets

People living in areas with high concentrations of retail alcohol outlets (i.e., clusters) are at higher risk of excessive drinking and related harms caused by the following:

- Increased access to alcohol.
- Price competition among alcohol outlets.
- Patronage by nonresidents (e.g., persons who travel to the cluster).
- The social aggregation of binge drinkers in a small geographic area.[5,17,20]

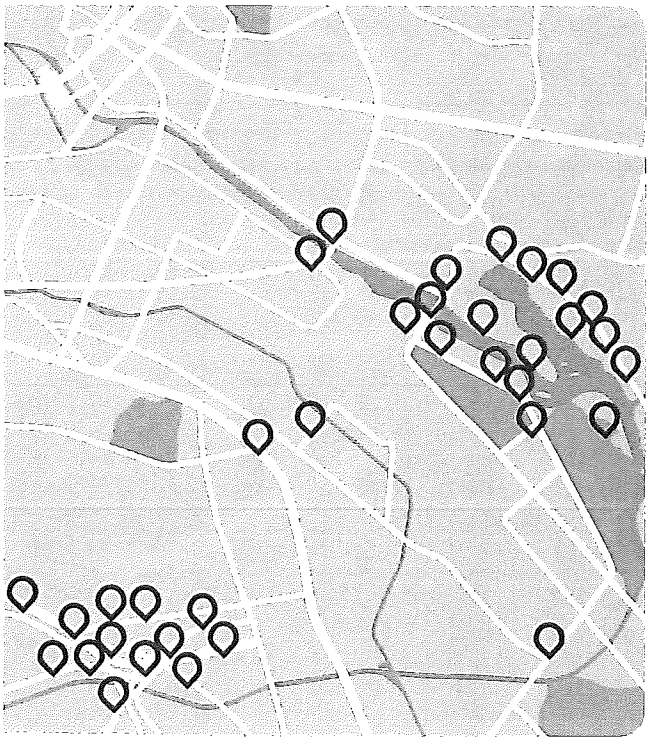
However, the identification of such clustering of retail outlets will depend, in part, on the approach used to measure alcohol outlet density.

For example, consider 2 counties, each measuring 100 square miles and populated by 500,000 residents and 50 alcohol outlets each. In County A, all 50 alcohol outlets are clustered within a city block; whereas in County B, the 50 alcohol outlets are distributed uniformly throughout the county. If alcohol outlet densities were measured per 1,000 persons or per 100 square miles, the calculated alcohol outlet densities in County A and County B would be identical. In short, neither of these two measurement strategies would allow for the identification of clustering. Thus, the ability to identify clusters is an important consideration when choosing among different measures. For further details, see the "Options for Measuring Alcohol Outlet Density" section.

There is no standard definition of a cluster of alcohol outlets, so choosing how to define a cluster is essential, including the number of outlets and the distances between them. Although there are many statistical tests that can be used to identify and define clusters, the issue is not merely statistical. For example, as mentioned earlier, the risk of excessive alcohol use and related harms associated with a particular cluster may be influenced by many contextual factors, such as the rurality of an area and the number and mix of bars, restaurants, and other alcohol retailers located within a particular area. Thus, the definition of a cluster should consider these and other contextual factors as well.

In this guide

The term cluster subjectively refers to areas with a high concentration of retail alcohol outlets within a small geographic area. It should not be confused with the statistical meaning of a cluster in the geography and epidemiology literature, where a cluster is often defined as a statistically significant increase in cases or events in a defined area that is unlikely to occur solely by random chance or a random geographic distribution.



Steps in the Measurement Process

1. Build a measurement team

Measuring alcohol outlet density often requires a team effort. Depending on the measure chosen, the team may need experts in geography and geographic information systems (GIS), statistics, epidemiology, policy, and information technology. If a state or local health department lacks these resources within their own organization, it may be possible to access them through an academic institution or private organization with expertise in spatial analysis. Furthermore, as geospatial analyses become more widespread to address a variety of population health issues (e.g., access to health care services), and as the technical resources needed to perform these analyses become more affordable, health agencies with limited capacity may be able to perform sophisticated analyses of alcohol outlet density or obtain assistance from others to do so.

2. Define the purpose for measuring density, the area and alcohol outlet types, and the measure to use

Defining the intended purpose of the density measure, the general area under consideration, and the types of alcohol outlets to be considered is critical. Such purposes might include the following:

- Reducing excessive alcohol consumption.
- Reducing consumption by groups at high risk (e.g., those under the legal drinking age).
- Reducing specific alcohol-attributable harms (e.g., sexual assaults).
- Identifying hot spots to target liquor law enforcement efforts.
- Managing the issuance of new alcohol licenses, particularly in cluster areas.
- Monitoring changes in alcohol outlet density over time.
- Assessing disparities in alcohol outlet density among communities.
- Conducting alcohol policy research, such as linking harms to alcohol outlet density.
- Evaluating policy and prevention efforts.
- A combination of these purposes.

For example, if a community is particularly concerned about the effect of alcohol outlet density on alcohol-impaired driving, which can occur far from the point of consumption, it may be reasonable to initially assess alcohol outlet density within a predefined geopolitical area (i.e., *within a container*, such as a county). However, if a community is particularly concerned about the impact of alcohol outlet density on violence or disorderly conduct, which are harms that tend to cluster nearer to the point of consumption, then a spatial access-based measure combined with a distance-based measure of alcohol outlet density may be needed to evaluate this relationship.

One must also consider the availability of resources and expertise to conduct the assessment; if they are scarce, then simpler approaches might be needed. A detailed discussion of the measurement approaches appears in the next section (Options for Measuring Alcohol Outlet Density).

Steps in measuring outlet density

1. **Build a measurement team.**
2. **Define the purpose for measuring density and select an approach.**
3. **Obtain and validate alcohol license data.**
4. **Categorize alcohol outlets by type.**
5. **Locate or geocode alcohol outlets.**
6. **Calculate alcohol outlet density.**

3. Obtain and validate alcohol license data

In general, obtain the most granular level of data available because one can always aggregate data to higher levels, whereas the reverse is not possible. For example, address-level data are preferable to census tract or ZIP Code data, which are preferable to county-level data only.

Sources of data

Obtaining data about licensed alcohol outlets can be challenging because alcohol retailer licensing procedures vary across states. Some states allow local licensing, and thus, data are available only from local authorities. Others have information only at the state level, and some have both state and local information. In addition, some states purge records annually, which may preclude assessment of trends in alcohol outlet density. Commercial sources of data about licensed alcohol vendors in the United States also exist. However, it is important to evaluate the validity of these data before using them to assess alcohol outlet density.

Validating data

Because licensing lists can vary in quality, additional data may be needed to obtain more specific and accurate information about retail alcohol outlets, such as operational status or closing times. Furthermore, up to 9% of licensed on-premises alcohol establishments may be closed or unlocatable.[14] Conversely, some establishments with licenses listed as pending or surrendered may actually be open.[14] In addition, licensing lists may contain incorrect addresses; alcohol outlets may have multiple licenses; and different alcohol outlets may be listed as having the same address, particularly if they are located in a property with multiple tenants (e.g., a strip mall). The definitions used to describe retail alcohol outlets or licenses may also be inaccurate (e.g., a bar might be licensed as a restaurant, or vice versa). Furthermore, some locations that only serve alcohol during special events (e.g., weddings, fund raisers) may be listed as retail alcohol outlets even though alcohol is only available at these sites for a limited time.

Validating alcohol licensure data can be labor-intensive and subject to issues of inter-rater reliability.[21] However, one might obtain assistance from community coalitions or other interested groups for completing this task. Whatever approach is used, it is important to ensure the accuracy of alcohol licensure data to calculate valid and useful estimates of alcohol outlet density.

Available data

As previously noted, some jurisdictions do not retain historical data about alcohol licenses beyond the current year. Therefore, assess whether historical data about alcohol licenses are available, particularly if there is an interest in assessing how alcohol outlet density has changed over time.

In addition, assess whether available data about alcohol licenses include details about the nature of the establishment (e.g., hours of operation, including food service after 11:00 pm, in the case of restaurants with liquor licenses).

4. Categorize alcohol outlets by type

The variety of alcohol licenses can make categorization challenging. One approach is to stratify alcohol outlets within a specific geographic area by whether alcohol consumption is allowed on-premises or off-premises (some may be mixed), and then subdivide these outlets on the basis of the types of alcoholic beverages sold. However, beer, wine, and liquor licenses are not mutually exclusive, and the specific beverage types that retailers can sell may vary by state, county, or both. For example, in some locations, retailers may be licensed to sell beer and wine, but not liquor, such as at a wine bar or a grocery store. In other locations, retailers may be licensed to sell all three beverage types (i.e., beer, wine, liquor) for consumption either on-premises or at another location. State liquor control agencies or city attorneys can often help clarify the type of liquor licenses that are available within their jurisdictions. Legal assistance for sorting out specific restrictions on the sale of alcoholic beverages may also be available through state public health agencies or community coalitions.

It may also be useful to collect information about the size of the retail alcohol outlets within a particular measurement area to more accurately assess alcohol availability and facilitate comparisons with other communities. However, this information may or may not be available from state alcohol licensing agencies. If not, it may still be possible to infer the size of an alcohol outlet from fire codes and maximum occupancy data, but the accuracy of these data sources is not clear. Thus, it may also be useful to first assess the relationship between the size of an alcohol outlet and alcohol sales to determine whether outlet size is a good indicator of alcohol availability.

5. Locate or geocode alcohol outlets

The geographic information needed to calculate alcohol outlet density varies depending on the type of measure being used. For measures that are less location-specific (e.g., some container-based measures, which are described in the next section), one may only need to know the ZIP Code or street address of an alcohol retailer to determine whether an alcohol outlet is inside or outside the boundary of a container (e.g., county line or census tract). However, measurement strategies that are more location-specific will generally require information about the exact location of an alcohol retailer, including its geographic coordinates, which will require the use of geocoding. Accurate street addresses, including ZIP Codes and proper street names, are needed to perform accurate geocoding for all alcohol retailers located in the area where the assessment is being performed.

Accurate geocoding may require the investment of additional resources to verify the location of retail alcohol outlets, including personnel who can call retailers or conduct site visits to verify their locations. Street addresses may also need to be re-entered into a database using a standard reporting format to make it easier to import the data into GIS software. In addition, the methods for evaluating the quality of street addresses and the procedures for manually geocoding addresses need to be specified by using a standard protocol. Fortunately, most GIS applications, such as ArcGIS (Esri, Redlands, California), provide detailed guidance on geocoding procedures, including the preparation and standardization of address information, which can facilitate the process.

6. Calculate alcohol outlet density

After completing the previous steps, calculate alcohol outlet density in the areas of interest. Assessing trends in alcohol outlet density can be particularly useful if historic data about alcohol licenses are available. This trend analysis can show the effect of previous changes in (a) state and local policies on the issuance of new licenses; and (b) the enforcement of liquor laws among current licensees on alcohol outlet density. In addition, when combined with historic data on alcohol attributable harms, this trend analysis can be used to assess the relationship between alcohol outlet density and alcohol-attributable harms (e.g., violence). These results can then be summarized in state and local reports, disseminated on websites and social media, and directly shared with community coalitions and policy makers to guide decisions about the prevention of excessive alcohol use and related harms.

Options for Measuring Alcohol Outlet Density

This guide describes the following three main approaches for measuring alcohol outlet density: (1) container-based; (2) distance-based; and (3) spatial access-based. Each approach has advantages and disadvantages, which should be carefully considered when selecting a measurement strategy.

The performance of various alcohol outlet density measurement strategies based on several key rating criteria is shown in Table 1. However, the relative importance of each rating criterion and the performance of various measurement strategies may vary somewhat by location and based on the intended purpose of the measurement activity. Therefore, consider these factors when deciding which measurement strategy to use.

Table 1. Performance of Various Alcohol Outlet Density Measures

	Measurement Strategy		
Rating Criterion	**Container-based**	**Distance-based**	**Spatial access-based**
Able to assess clustering	3	2	1
Able to assess directly exposed population	3	2	1
Suitable for evaluating harms	3	2	1
Addresses access potential (reflects convenience cost)	3	2	1
Low cost (personnel, equipment and data requirements)	1	2	3
Easy to calculate (simplicity)	1	2	3
Easy to communicate (understandability)	1	2	3

Note: 1 = best; 2 = intermediate; 3 = worst.

Container-based measures

Container-based measures of alcohol outlet density are calculated based on the number of alcohol outlets in a specified area. The containers can be (a) predefined geopolitical units (e.g., counties, districts, cities, census tracts, neighborhoods, ZIP Codes, or commercial zones), or geographic areas defined by specific features, such as roadways; or (b) user-defined (e.g., a 1-mile buffer zone area around a local neighborhood, a 5-mile driving distance, a 5-minute driving time from a local neighborhood) (Figure 1).

After defining the geographic area (container) where this measurement will be performed, there are two basic measures that are often used to assess alcohol outlet density: (1) a simple count of the number of alcohol outlets within the container; or (2) the rate of alcohol outlets (Figure 1). There are, in turn, three denominators commonly used to calculate the rate of alcohol outlets:

1. The total population living in the area (i.e., population-based).
2. The size of the area where the measurement is taking place (i.e., area-based).
3. The length of the roadway(s) where alcohol outlets are located (i.e., roadway mile-based).

These denominators help normalize the measure to allow for comparisons of alcohol outlet density among communities.

1. Population-based denominator

Alcohol outlet density can be calculated based on the number of alcohol outlets per population (e.g., per 1,000 residents). Although relatively easy to calculate, this measure is strongly affected by changes in the size of the population independent of the number of alcohol outlets in the measurement area (i.e., county, city, neighborhood). In fact, if the number of alcohol outlets in an area remains fairly constant over time, alcohol outlet density will be inversely related to changes in population size, even though alcohol availability may be largely unchanged.

Consider a situation where there are 10 alcohol outlets in a city of 1,000 people. In this case, the alcohol outlet density would be 0.01 (10 outlets/1,000 people). However, if the population in that city doubled, the alcohol outlet density would be 0.005 (10 outlets/2,000 people), a 50% decline. In this example, twice as many people now have access to the same number of outlets in that given area (i.e., the population level exposure has increased), although the density measure (number of alcohol outlets per 1,000 people) has decreased.

In many cases, the number of alcohol outlets in a community may change in response to changes in the size of the population (e.g., as a population grows, more alcohol retailers may open in response to perceived market demand). If *both* the number of alcohol outlets and the number of residents in an area increase, it may appear that the alcohol outlet density has remained constant, even though the physical availability of alcohol in the area has increased. Consider the same city described above whose alcohol outlet density was 0.01 (10 outlets/1,000 people). If both the population and the number of outlets in that city doubled (20 outlets/2,000 people), the population-based alcohol outlet density would be identical, despite the fact that there are 100% more alcohol outlets within the spatial confines of the city and 100% more people exposed to the alcohol outlets than before.

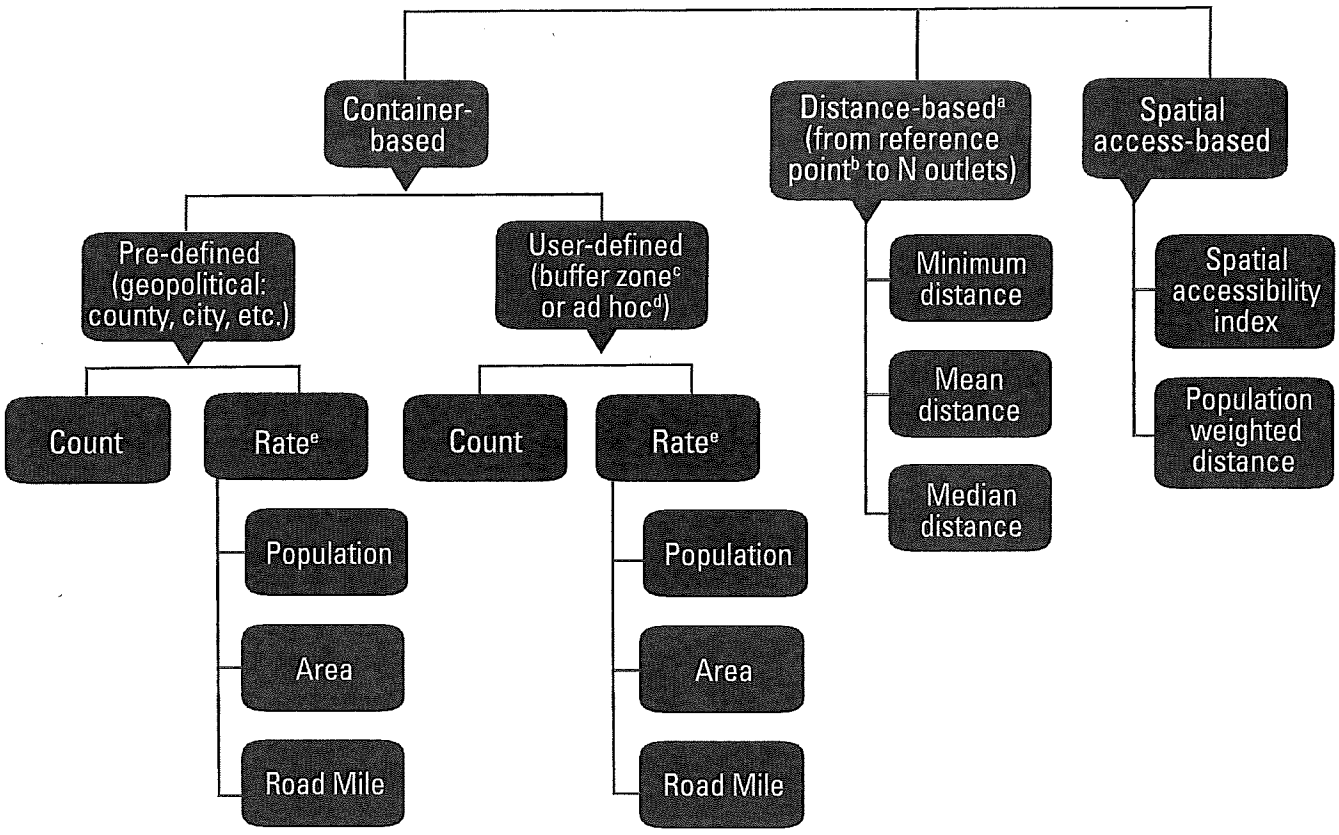
This inverse relationship between alcohol outlet density and changes in the size of the exposed population is one of the limitations of using a population-based measure to assess alcohol outlet density. In addition, using a population-based measure could lead to some erroneous conclusions about the relative availability of alcohol in more densely populated areas, particularly if the size of the resident population increases. Moreover, the use of the resident population as a denominator ignores the fact that alcohol outlets may attract customers who live outside the measurement area, thus making the resident population a less precise indicator of the actual population at risk of exposure to retail alcohol outlets. The dynamic nature of both the numerator and denominator also makes this measure of alcohol outlet density inherently less stable and a less reliable measure of alcohol availability among states and communities compared with other approaches.[22]

2. Area-based denominator

Alcohol outlet density can also be calculated based on the size of the area that is being studied. For example, assume that the city described previously has an area of 10 square miles. The alcohol outlet density in this case would be 10 outlets divided by 10 square miles, or 1.0, suggesting that retail outlets are equally accessible to residents living in the measurement area.

In contrast to population-based measures, area-based measures of alcohol outlet density are largely unaffected by changes in the resident population, provided the size of the measurement area remains constant over time. Thus, area-based measures are useful for assessing changes in alcohol outlet density. However, the independence of area-

Figure 1. Options for Measuring Alcohol Outlet Density



[a] Distance can be thought of as either "spatial distance" or "time." It can be determined through any of the following three approaches: (a) Euclidean or "crows' flight" distance; (b) street network or "Manhattan" distance; or (c) driving time, which accounts for street networks and traffic speeds. The user specifies the reference value(s) for the chosen approach (e.g., 1-mile Euclidean distance; 1-mile driving distance; or 5-minute driving time). The distance reflects the economic/convenience cost of access.

[b] Reference point can be any user-specified point, such as (a) a street address or point of interest (e.g., school, household); (b) geometric or population-weighted centroid (e.g., of a county, census tract, block group); or (c) other alcohol outlet.

[c] A user-defined buffer zone can be specified through any of the following three approaches: (a) Euclidean; (b) street network distance; or (c) driving time. The user specifies the values to be used for the chosen approach (e.g., 1-mile Euclidean distance; 1-mile driving distance; or 5-minutes driving time). In turn, these values define the container's shape and size.

[d] An ad-hoc container can be defined using standard geopolitical building blocks (e.g., groupings of census tracts or neighborhoods).

[e] Denominators for rates can be any of the following three choices: (a) population within each container; (b) total land area within each container; or (c) road miles within each container. "Container" can be either predefined or user-defined.

based measures of alcohol outlet density from the resident population living in the area also means that these measures are insensitive to changes in the population (e.g., increases or decreases in the size and characteristics of the resident population), which can be a disadvantage when measuring the population impact of alcohol outlet density over time.

When using an area-based measure, consider the effect that undeveloped land, park lands, vacant lots, industrial areas, and various natural features (e.g., lakes) could have on the measurement of alcohol outlet density. If these land areas are included in the calculation of alcohol outlet density, then they could reduce density estimates by spreading the number of alcohol outlets over a larger geographic area. This approach could then underestimate the actual concentration of alcohol outlets in the developed areas of the community, where they are located.

When using an area-based approach, alcohol outlet density will be inversely related to the size of the area being considered. Specifically, as boundaries increase, alcohol outlet density will decrease, but if boundaries decrease, alcohol outlet density will increase. Therefore one should, carefully consider the boundary that is used to define the measurement area because it can have a substantial effect on alcohol outlet density and on the identification of high density areas.

3. Roadway mile-based denominator

Alcohol outlet density can also be calculated per roadway mile, which has the advantage of not being subject to changes in population size, as are alcohol outlet density measures that use a population-based denominator. Alcohol outlets are more likely to be located along roadways, so assessing alcohol outlet density per roadway mile may be a more precise measure of the exposed area than other area-based measures, particularly those that include the entire land area (including lakes and other natural features) within the geographic boundary of a city or county. Furthermore, because there are fewer roads in parks, lakes, and undeveloped areas, there is less risk that such undeveloped areas will dilute the measure of alcohol outlet density. It is also possible to exclude roadways going through industrial areas so that the calculation of alcohol outlet density based on roadway miles is restricted to roadways in populated areas. Analysis can be further restricted to primary and secondary roadways that service commercial and residential areas, where retail alcohol outlets are more likely to be located.

Decisions required when using container-based measures

Several decisions need to be made when using a container-based approach to measure alcohol outlet density. If a predefined container is being used, then specifically define what the measurement area will be (e.g., city, county, Zip Code, census tract). If alcohol outlet density is being calculated based on land area or roadway-miles, then specify the area(s) that will be included or excluded from the denominator (e.g., parks, commercial area, undeveloped residential areas) and which roadways will or will not be included.

Predefined Containers

Strengths

- Simple to calculate.
- Low cost.

Limitations

- Cannot detect clustering.
- Border issues.
- Ignores size of directly exposed population.

If the container is being defined by the user, there are two general approaches to measuring alcohol outlet density: (1) Define a buffer zone around a reference point (e.g., a 5-mile distance around a school); or (2) Define a target area by using an ad hoc assembly of standard geopolitical building blocks (e.g., census tracts, neighborhoods). By definition, these approaches require users to make a priori decisions about the general area where alcohol outlet density will be assessed. When using the buffer zone, the measurement team will need to define (1) the reference point at the center of the buffer zone, and (2) the standard radius or network distance or travel time that will be used to define the boundaries. Before finalizing the radius, the team may also want to evaluate the effect of using different distances or times to define the boundary of the buffer zone.

General issues with container-based measures

One of the major limitations of container-based measures of alcohol outlet density is that alcohol outlets are generally not evenly distributed within a geographic area, such as a city or county. Thus, a measure of alcohol outlet density that lumps together all alcohol outlets within a particular geographic area will have the net effect of averaging the concentration of alcohol outlets across the entire population or area. This averaging may hide small-area variations in the concentration of alcohol outlets and reduce the likelihood of identifying high-density clusters of retail alcohol outlets, which are associated with an increased risk of excessive alcohol consumption and related harms.

Container-based measures also ignore border effects. For example, a dry county (i.e., a county where the sale of alcoholic beverages is prohibited) may not have any alcohol outlets within its borders, but there could be 50 alcohol outlets just across the border in a neighboring county. Nevertheless, these outlets would not be included as they are outside the container. In addition, container-based measures fail to account for heterogeneity in population density (i.e., the uneven distribution of residents within the area being studied), potentially resulting in differing exposures to alcohol outlets in subareas of the community. As a result, container-based measures of alcohol outlet density will tend to obscure differences in convenience costs (i.e., the amount of time and effort involved in obtaining alcohol) between different settings (e.g., rural, urban), which can be quite significant.

User-Defined Containers

Strengths

- Understandable.
- Flexible boundaries.
- Can be tailored to local areas.

Limitations

- Cannot detect clustering.
- Ignores size of directly exposed population.
- More complex to calculate.
- Choice of distance metric influential.
- May not align with geopolitical jurisdictions.

Distance-based measures

To calculate alcohol outlet density, another approach quantifies the distances between alcohol outlets—the distances between a standard reference point (e.g., household street address, sensitive location, such as a school) and surrounding alcohol outlets, or the distances between the geometric or population-weighted center (i.e., the centroid) of a small geographic unit (e.g., census block, census tract, ZIP Code) and surrounding alcohol outlets. In contrast to container-based measures, distance-based measures of alcohol outlet density are independent of geopolitical boundaries, such as census tract (neighborhood), or city or county borders. As such, distance-based measures can help communities assess the effect of adding or removing retail alcohol outlets based on the resulting concentration of these outlets within or around a particular local neighborhood, without being restricted by geopolitical boundaries.

However, because the number of alcohol outlets in the measurement area may be quite high, restricting the number of outlets included in the calculation of alcohol outlet density to reduce computational complexity may be advisable. The resulting minimum, median, or mean distances can then be used to generate a density value. To calculate a distance-based measure of alcohol outlet density, decide how distances will be measured. There are three common approaches for measuring the distance between two points or locations:

- Straight-line distance (i.e., Euclidean, or as the crow flies).
- Roadway or sidewalk (*network*) distance, also known as taxicab or Manhattan distances, to travel to outlets (i.e., the actual route people use).
- Roadway or sidewalk (*network*) travel times, which account for differential speed limits, one-way streets, turn restrictions, and alternative routing between the origin and destination.

Although there are pros and cons to each approach, distance-based estimates of alcohol outlet density can vary significantly depending on the approach used to measure distances, as well as the type of community (urban, suburban, or rural) where this measure is performed. This is particularly true among suburban areas.[23] In addition, although network travel times and roadway or sidewalk distances may provide the most accurate estimate of the effort involved in traveling from a specified point (e.g., a census block centroid) to an alcohol outlet, the calculation of these distance measures is more complex than simply measuring the straight-line distance between two points. However, the straight-line distance measure is a less accurate reflection of how people actually get to an outlet, as well as the *convenience costs* involved.

General issues with distance-based measures

One of the major advantages of distance-based measures is that they can be used to reflect the presence of clustering, which is associated with an increased risk of excessive alcohol use and related harms. However, it is important to specify how a cluster will be defined in a particular area, including the number (and type) of alcohol outlets required and the maximum distances between them. Ideally, this definition would be empirical, (i.e., guided by the actual number, spatial distribution, and concentration of retail alcohol outlets in that area), which involves geocoding the alcohol outlets in the area of interest, and then computing the distances between them (or from them to a reference point) to assess clustering by using geographic information system (GIS) software.

Distance-based measures

Strengths

- Can indicate clustering.
- Understandable.
- Independent of geopolitical boundaries.

Limitations

- Can be complex to calculate.
- Choice of distance metric influential.
- Ignores size of directly exposed population.

The definition of a cluster is ultimately a judgment call, which should be guided by contextual factors, including the spatial arrangement of alcohol outlets in a measurement area. For example, in one urban study, researchers spatially analyzed all on-premises retail alcohol outlets and found that more than 90% were within 0.1 mile of another outlet. By using this 0.1 mile buffer zone as a filter, they located all areas where 50 or more outlets were within 0.1 mile of each other and used this information as the criterion to define a cluster of high alcohol outlet density.[12]

Distance-based measures also help overcome some of the limitations of container-based measures, such as the need to calculate alcohol outlet density within predefined geographic boundaries, and the inability to account for the uneven distribution of alcohol outlets among communities. However, there are currently no standard methods for calculating distance-based measures of alcohol outlet density, and these methods may vary considerably by the type (urban, suburban, or rural) and size of the community where the assessment is performed. Furthermore, distance-based measures only account for the spatial proximity of retail alcohol outlets to one another or to a fixed point (e.g., a census block centroid). They do not consider contextual factors, such as the type of community where the outlets are located or the size of the population that is most directly at risk of exposure to these outlets (i.e., the residents living in or around the outlets). For example, a cluster of 10 alcohol outlets located 0.5 miles from each other in an urban neighborhood may be associated with a different risk of excessive drinking and related harms (e.g., alcohol-attributable motor vehicle crashes) than if this same cluster of alcohol outlets was located in a rural community.

Spatial access-based measures

Spatial access-based measures (also called spatial interaction or gravity-based measures) are based on the distances between a reference point (e.g., a census-block centroid) and a selected number of alcohol outlets.[24] There are two types of spatial access-based measures: (1) the spatial accessibility index and (2) the population-weighted distance.

Spatial access-based measures

Strengths

- Can include size of directly exposed population.
- Ease of access is addressed.
- Not restricted by borders.
- Can indicate clustering.

Limitations

- Complex to calculate.
- Resource intensive.
- Less intuitive.

Spatial accessibility index

The spatial accessibility index is a measure of the access a consumer has to a retail alcohol outlet relative to a particular reference point (e.g., a census block centroid) and to other retail alcohol outlets that are also located near a chosen reference point. This access is related to the distance between the alcohol outlet and the reference point and is also affected by the size of the alcohol outlets. However, since the size of alcohol outlets is often unknown, this factor is usually excluded from the calculation of spatial accessibility (i.e., given a value of one).

For example, if a census block centroid were used as the reference point, then a simplified spatial accessibility index could be calculated by using the sum of the inverse distances from a census block centroid to the nearest N alcohol outlets (with N being the number of alcohol outlets in the choice set). (Note: the distances can be Euclidean, Manhattan, or network travel times). Inverse distances are used to give alcohol outlets that are closer to the reference point more consideration in the calculation of the spatial accessibility index than those outlets that are located further away (i.e., alcohol outlets that are located a shorter distance from a reference point have higher potential alcohol outlet accessibility).

Steps in the calculation

The first step in calculating a spatial access-based measure of alcohol outlet density is to decide how many alcohol outlets will be used to assess exposure. Most measures use a number between 5 and 9 because cognitive studies have found that this is generally the maximum number of options that individuals are likely to consider when making choices or evaluating environmental conditions.[25] This number defines the size of the *alcohol outlet choice set*.

The second step is to select a reference point that will be used as the basis for assessing spatial access. As described in the previous section about distance-based measures, this point could be a household street address; a sensitive location, such as a school or church; another alcohol outlet; a census-block centroid; or some other reference point.

The third step is to calculate the *access potential* by measuring the inverse distance from the reference point to each of the outlets in the choice set, as described previously. The final step is to sum the access potentials for all alcohol outlets in the choice set to yield a spatial accessibility index.

Calculating inverse distances

Consider 3 outlets located 50 feet, 1,000 feet, and 2,000 feet from a reference point. The sum of the inverse distances is .02 (1/50) + .001 (1/1,000) + .0005 (1/2,000) = .0215. By comparison, consider 3 outlets located 50 feet, 100 feet, and 200 feet from a reference point in another area. The sum of the inverse distances is .02 (1/50) + .01 (1/100) + .005 (1/200) = .0350.

Thus, the shorter the distance between the alcohol outlets and a reference point, the higher the inverse sum of the distances, reflecting easier access and a higher alcohol outlet density. High values are consistent with clustering.

Population-weighted distance

In addition to assessing the spatial accessibility of retail alcohol outlets, consider the size of the population directly exposed to these outlets, particularly when comparing alcohol outlet density in various locations. For example, consider two different locations with only seven alcohol outlets at exactly the same distance from a reference point. Their calculated spatial accessibility indices would be identical. However, if one area had 1,000 people and the other area had 100,000 people, the implications for exposure would be quite different. This consideration has led to the use of the population-weighted distance, which is an extension of the spatial accessibility index that includes data about population size.[24]

It is particularly important to population-weight the spatial accessibility measures of alcohol outlet density for smaller geographic units (e.g., a census block) that will be included in the calculation of a spatial accessibility measure for a larger geographic unit (e.g., a county). This approach is important because a simple average of the spatial accessibility measures for smaller geographic units within a larger area could introduce biases unless populations are evenly distributed across all of the smaller geographic units within a larger one, which rarely happens. Thus, the population-weighted distance for a larger geographic unit is always between the minimum and maximum of the spatial access indices of its subgeographic units.

Adjusting for population

Consider a census tract with only two census blocks. If the spatial access indices are 0.1 and 0.2 and corresponding populations are 100 and 1,000, then the population-weighted distance for that census tract is [(100*0.1) + (1,000*0.2)]/(100+1,000) = 210/1,100 = 0.19.

If the populations were reversed, then the population-weighted distance for the census tract would be [(1,000*0.1) + (100*0.2)] / (1,000 + 100) = 120/1,100 = 0.11.

The population-weighted distance would be similarly calculated for a county with thousands of blocks.

Adjusting spatial accessibility indices for other factors

Spatial access-based measures can also incorporate other relevant factors into the calculation of alcohol outlet density, such as outlet size or volume of alcohol sales, if the data are available. This adjustment can yield more refined measures of alcohol outlet density that assess the number and concentration of alcohol outlets within an area, as well as consider this exposure in relation to other local factors, thus helping comparisons between alcohol outlet densities in different geographic areas. If a census block or unit is used as the base area, then the demographic characteristics of the population can be added as an adjustment.

General issues with spatial access-based measures

Similar to distance-based measures, spatial access-based measures avoid some of the major limitations of container-based measures, such as the need to calculate alcohol outlet density within predefined geographic boundaries and the inability to account for the uneven distribution of alcohol outlets among communities. In addition, spatial access-based measures can be weighted on the basis of the number of residents that live within the area, thus providing a better estimate of the population at risk of excessive drinking and related harms because of their physical proximity to retail alcohol outlets. Furthermore, spatial access-based measures of alcohol outlet density can be linked to spatial data about alcohol-attributable outcomes (e.g., violent crime) to assess the public health effects of higher densities over time. In addition, the impact of evidence-based strategies for preventing excessive alcohol use (e.g., regulation of alcohol outlet density, enforcement of liquor laws) on excessive alcohol consumption and related harms can be assessed.

However, spatial access-based measures also present some challenges. First, the computation of these measures requires technical expertise in geospatial analysis and access to GIS software. Second, the analyses can be methodologically complex and require many decisions, such as the size of the alcohol outlet choice set that will be used in the analysis.[24] Third, spatial access-based measures may be more resource-intensive to calculate than other measures because of the technical requirements. However, this cost may be reduced by sharing resources, (e.g., GIS software and technical expertise with other government programs). Lastly, spatial access-based measures are not as intuitive as the other approaches to calculating alcohol outlet density; therefore, they may be more challenging to communicate to nontechnical audiences.

Assessing the Relationship Between Alcohol Outlet Density and Alcohol-Attributable Harms

Considerations when assessing alcohol-attributable harms

Studies of the link between high alcohol outlet density and various harms related to excessive alcohol use are useful to policy makers and other interested groups because they can show the effects that changes to alcohol outlet density can have on health and social outcomes (e.g., alcohol-impaired driving crashes, violence, unintentional injuries, property damage, and quality of life issues). These assessments can also help policy makers determine the need for additional controls on alcohol outlet density to reduce the risk of alcohol-attributable harms in high-density areas.

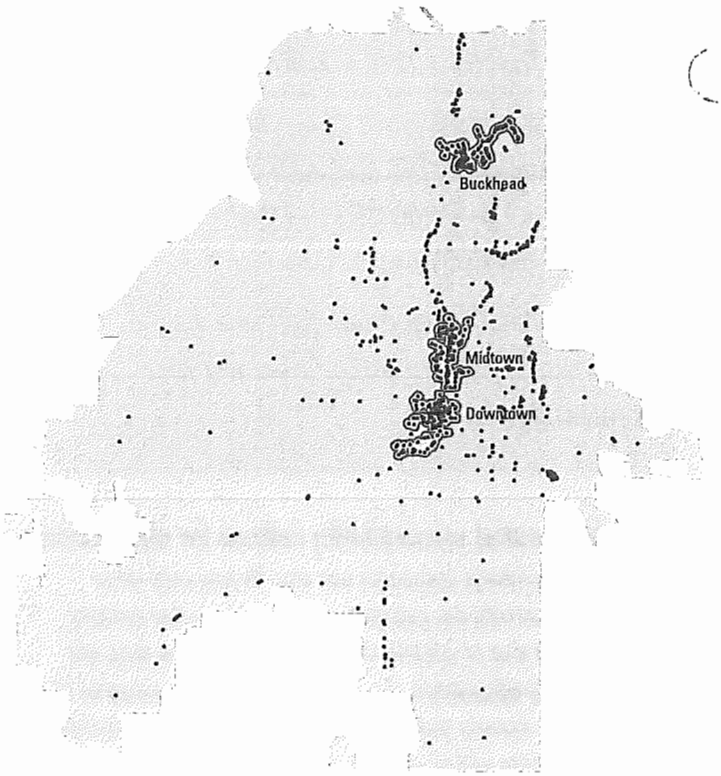
However, as previously noted, the spatial distribution of alcohol outlets and alcohol-attributable harms may be quite different depending on the specific harm that is being assessed (e.g., violent crime vs. alcohol-impaired driving), which can make the analysis of these relationships challenging, complex, and resource-intensive. Consider also adjusting measures of alcohol outlet density and alcohol-attributable harms based on the demographic characteristics of the populations that are directly exposed to these outlets, particularly if changes in alcohol outlet density and alcohol-attributable harms are being compared across areas over time. This point is important because, as previously noted, retail alcohol outlets are often located in low-income minority areas with high degrees of social disorganization, including high rates of illegal drug sales.[18,19]

Conversely, on-premises alcohol outlets may also cluster in high-income, urban areas.[12] Therefore, when assessing the relationship between alcohol outlet density and various health outcomes (e.g., violent crime), one should measure and control for these contextual factors, whenever possible, to improve the accuracy of these analyses.

Measuring alcohol outlet density and violent crime: a case study

A 2015 study combined a distance-based measure (to empirically identify clusters) with a spatial access-based measure to evaluate the effect of changes in alcohol outlet density on violent crime in the Buckhead neighborhood of Atlanta compared with two other areas in Atlanta (Midtown and Downtown) during 1997–2007.[12] The researchers first defined a high alcohol outlet density cluster as an area that contained 50 or more on-premises alcohol outlets within less than 0.10 miles from each other using a Euclidean distance measure (Figure 2).

Figure 2. On-Premises Alcohol Outlets and Cluster Zones in Atlanta, 1997–2007



Adapted from Zhang X, Hatcher B, Clarkson L. et al. Impact of changes in on-premise alcohol outlet density on violent crime in Atlanta, Georgia, 1997–2007. *Prev Chron Dis.* 2015;12:140317. doi: http://dx.doi.org/10.5888/pcd12.140317.

For each study year, all census blocks within each high alcohol outlet density cluster were identified, and the inverse of the distances from each census block centroid to the nearest seven alcohol outlets was summed for all the census blocks in a high alcohol outlet density cluster. A similar calculation was completed for the nearest seven violent crimes in the three areas to create an index for violent crime exposure. These indices were used to evaluate changes in exposure to on-premises alcohol outlets and violent crime during the preintervention period (1997–2002) and postintervention period (2003–2007).

The census block-based approach also allowed for the use of multiple regression to adjust for census-level demographics (e.g., age, sex, race/ethnicity, poverty) to better standardize the comparisons of the changes in indices. The researchers found that a modest (3%) reduction in on-premises alcohol outlet density in the Buckhead neighborhood of Atlanta during the intervention period (2003–2007) (Figure 3) resulted in a two-fold greater relative decline in exposure to violent crime (Figure 4) than in two other areas of Atlanta (Midtown and Downtown), where alcohol outlet density increased.[12]

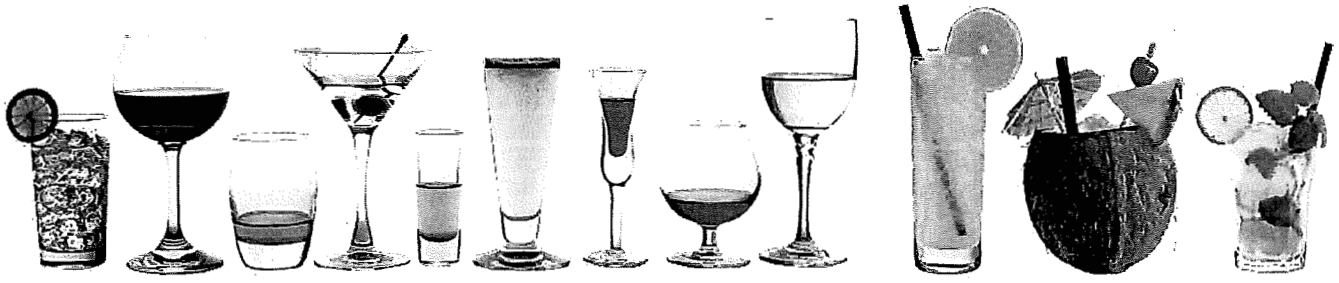
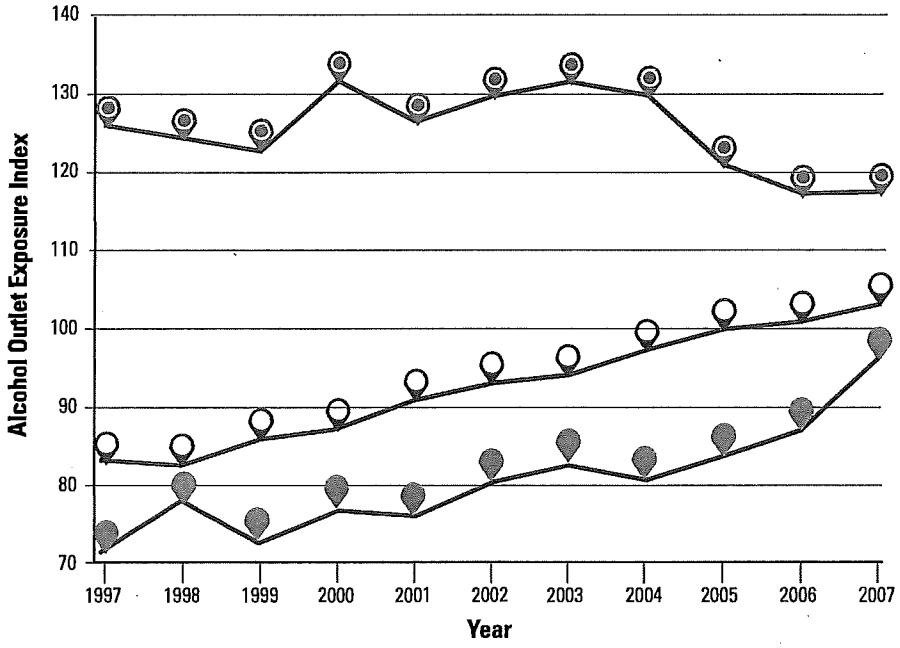
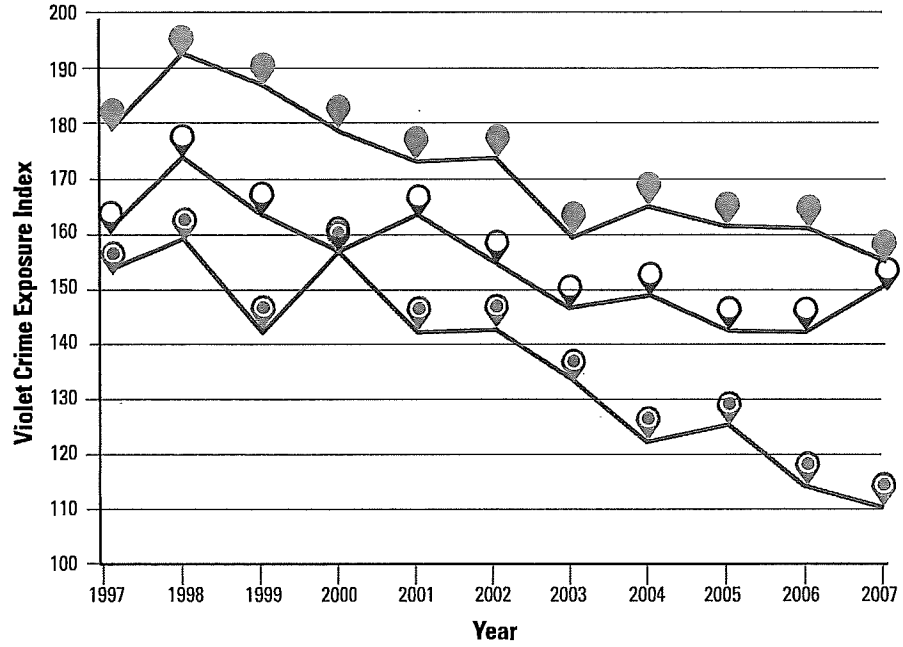


Figure 3. On-Premises Alcohol Outlet Density Indices by Atlanta Neighborhood, 1997–2007



Adapted from Zhang X, Hatcher B, Clarkson L, et al. Impact of changes in on-premise alcohol outlet density on violent crime in Atlanta, Georgia, 1997–2007. *Prev Chron Dis.* 2015;12:140317. doi: http://dx.doi.org/10.5888/pcd12.140317.

Figure 4. Violent Crime Exposure Indices by Atlanta Neighborhood, 1997–2007



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Summary and Conclusions

Monitoring environmental health hazards, such as high alcohol outlet density, is an essential public health function.[26] Accordingly, public health agencies should consider collecting and reporting alcohol outlet densities within their jurisdiction consistently to help guide the development of effective strategies for preventing excessive alcohol consumption and related harms. Towards this end, any measurement of alcohol outlet density is better than none, *as long as one is fully aware of the limitations of the measurement approach that is being used.*

Consider the pros and cons of different measurement strategies carefully, being mindful of how these data will be used. As one moves from container-based, to distance-based, to spatial access-based measures of alcohol outlet density, the completeness and specificity of the measures increase, along with the complexity and resource requirements. However, distance or spatial access-based measures of alcohol outlet density offer many advantages over predefined, container-based measures because they are not constrained by existing geopolitical boundaries. In addition, distance or spatial access-based measures allow for the assessment of alcohol outlet clustering, which is known to be associated with an increased risk of excessive alcohol use and related harms (e.g., violent crime). A spatial access-based measure can also be weighted to account for differences in the size of the resident population and, if a census-based unit is used, adjusted to account for other differences in the demographic characteristics (e.g., age, race, socioeconomic status) of the exposed population. This weighting can also allow for comparisons between small geographic areas with high alcohol outlet densities.

If resources are limited, and the goal is simply to get an overall estimate of exposure to retail alcohol outlets within a specified geographic area (e.g., a city or county), then a container-based approach (e.g., an assessment of the number of alcohol outlets per square mile) may be sufficient. However, container-based measures can also be significantly affected by changes in the resident population (e.g., increases or decreases in total population); changes in usable land area; availability of public transportation; and other factors, depending on the measure that is chosen. These factors can undermine the usefulness of these measures for assessing changes in alcohol outlet density over time. It is also not possible to adjust for small-area variations in population size and population characteristics. These limitations can make it difficult to compare alcohol outlet densities within a city, county, or state. Therefore, container-based approaches to measuring alcohol outlet density should only be used if no other option is available.

Standardized concepts and measurement strategies are needed to assess changes in alcohol outlet density over time, compare alcohol outlet densities in different areas, and provide a basis for assessing the relationship between alcohol outlet density and alcohol-attributable harms. Guidelines and criteria are also needed for defining the threshold values for an area with high alcohol outlet density. Additional research is needed to further describe the validity and reliability of various alcohol outlet density measurement strategies and the level of agreement between alcohol outlet density measures calculated by using different measurement strategies. Furthermore, assessing how the risk of alcohol-attributable harms varies based on the distance between alcohol outlets needs more study. Further research is also needed to examine whether there is a *tipping point* for alcohol outlet density beyond which the risk of alcohol-attributable harms increases substantially, and if so, whether this tipping point varies based on the sociodemographic characteristics of communities where retail alcohol outlets are located.

However, from the Community Guide review and other scientific studies, there is strong scientific evidence to support that regulating alcohol outlet density is one of the most effective strategies for reducing excessive alcohol consumption and related harms. Consequently, it is essential for public health agencies to assess alcohol outlet density to help guide the development of strategies to regulate this environmental risk factor, and to support the design and implementation of other evidence-based strategies for preventing excessive alcohol use and related harms.

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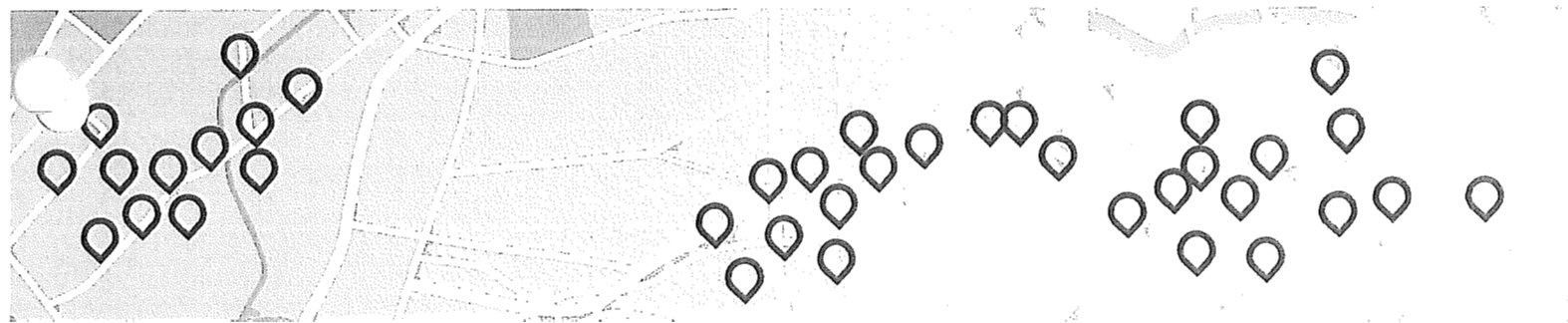
Notes



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