



Using Zoning as a Public Health Tool to Reduce Alcohol Outlet Oversaturation, Promote Compliance, and Guide Future Enforcement: a Preliminary Analysis of Transform Baltimore

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Abstract Alcohol outlet oversaturation often exacerbates negative public health outcomes. Recently, Baltimore City passed an extensive zoning rewrite (“TransForm Baltimore”) that sought to give local government and residents a tool to reduce alcohol outlet oversaturation through land use regulation. The present investigation evaluated the outlet and neighborhood characteristics of stores impacted by two components of TransForm Baltimore: (1) a requirement that taverns licensed for on-premise consumption in addition to off-premise, carryout sales generate at least 50% of their business from on-premise sales, and (2) a requirement to close, repurpose, or relocate all package stores (i.e., off-premise alcohol outlets) that have been operating as “non-conforming” in residential zones since

1971. Research assistants visited every off-premise alcohol outlet in the city ($n = 685$) to complete an observational assessment. Approximately 77% ($n = 530$) of these off-premise alcohol outlets were open, including 292 taverns and 238 package stores. t tests and chi-square tests were used to compare neighborhood characteristics (neighborhood disadvantage, median household income, and racial segregation) of sham taverns (i.e., taverns with less than 50% space dedicated for on-premise sales that were primarily operating as a package store) and non-conforming package stores. Of the 292 taverns accessible during the study, the remainder were chronically closed ($n = 130$); 24 (8.2%) were deemed sham taverns. Sham taverns were more likely to be located in communities with more economic disadvantage and lower median household income (t test; $p < 0.05$). Compared to taverns, a lower proportion of sham taverns had visible dance floor space, patrons drinking, and menus available (chi-square test; $p < 0.001$). There were 80 residentially zoned, non-conforming alcohol outlets. These non-conforming alcohol outlets were disproportionately distributed in predominately poor and African American communities (t test; $p < 0.05$). As compared to conforming alcohol outlets, more non-conforming alcohol outlets sold sex paraphernalia and healthy foods (chi-square test; $p < 0.05$). With active enforcement, TransForm Baltimore offers the opportunity for local government and residents to improve public health and increase health equity in vulnerable and marginalized neighborhoods.

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Introduction

Approximately 600,000 outlets are licensed to sell alcohol in the USA. Although this works out to about 1 per 500 residents over 18 years of age, outlets are not distributed equally [1]. In alcohol control states where the state government controls wholesale or retail sales of alcohol, rates of alcohol outlets range from 1 store for every 2755 people in Florida to 1 store for every 11,111 people in South Dakota [2]. Even within-state comparisons show that the number and density of alcohol outlets vary considerably across communities. Generally, more alcohol outlets are found in economically depressed, predominately African American communities and create and exacerbate a variety of negative public health outcomes [3]. Because alcohol policy is a mix of federal, state, and local laws, city and county governments are often unable to wield total control over alcohol policy [4]. Local zoning ordinances that regulate land use, however, provide an opportunity for residents and local stakeholders to exert a significant influence on the alcohol landscape in their communities [4]. Explicitly, zoning legislation can give communities a tool to fight against oversaturation of alcohol outlets by limiting alcohol outlet density (AOD), as well as regulate the proximity of outlets to other outlets or places where people live, work, play, worship, or attend school. Zoning also provides an opportunity to address problem retailers who do not operate according to their license type; for instance, holding a tavern license but actually operating a package store where alcohol is primarily sold in sealed containers for off-premise consumption [5].

Negative Public Health Consequences of High Rates of Off-Premise Alcohol Outlet Density

Research suggests that the impact of alcohol outlets on communities varies somewhat based on whether alcohol is sold on-premise (where patrons purchase and consume alcohol in the same place, such as restaurants or bars) or off-premise (where patrons buy the alcohol in one location and drink it in another, such as liquor stores or package stores). High off-premise AOD is related to problematic drinking [6–8], especially for women [9, 10] and youth [11–13]; suicides [14]; increased injuries [15–17]; and increased alcohol-related motor vehicle collisions [14, 15, 18]. High off-premise AOD has an especially pronounced and consistent effect on the level

of community crime [15, 19–31]. For example, Branas and colleagues [19] found that the risk of being shot doubled in areas of high off-premise AOD and the risk of being fatally shot were four times greater compared to areas with lower off-premise AOD. Scholars theorize that these crimes cluster around off-premise outlets because these alcohol outlets signal social norms supporting increased violence and criminality [32, 33], social disorganization, and a lack of collective efficacy within the community [34]. Unlike bars and restaurants, off-premise alcohol outlets can sell alcoholic beverages in large quantities that can be consumed in uncontrolled environments, such as motor vehicles and parking lots, or at home [3]. In bars and restaurants, servers control consumption and can halt service to intoxicated patrons [35]. Conversely, the unrestrained environment around off-premise retailers may increase the risk of alcohol-related harms (e.g., interpersonal violence or crime) [35, 36]. Liquor stores may also act as a deterrent for other pro-social businesses such as day care centers or other retail outlets.

In addition to these indirect problems, off-premise alcohol outlets (and liquor stores in particular) sometimes become “bad actors,” directly inflicting social damage onto the communities they serve; this is especially true when there is little enforcement of existing laws [37]. For example, the operating characteristics of some outlets do not match existing license criteria, a problem being explored in this investigation [38]. Even when they are in compliance with current laws, the oversaturation of off-premise alcohol outlets still poses harm to the communities where they are located. To date, the most well studied of these direct harms associated with liquor stores is the selling of alcohol to teens and underage adults [39–42].

Oversaturation of Alcohol Outlets in African American Neighborhoods

Higher rates of AOD and greater residential proximity to AOD are generally found in poorer and predominately African American communities [3, 43–45]. As such, the disproportionate concentration of AOD in areas without the political, economic, and social capital to police bad actors [46–49] has the potential to increase economic and racial inequities and disparities in alcohol-related harms. The consequences of high AOD tend to be greater in more deprived areas than in affluent areas [50]. For example, an increase in on-premise AOD has

been associated with an increase in violence in both urban and rural low-income areas [23, 24, 44, 51]. This suggests that alcohol outlets are exacerbating public health problems in communities that are the least equipped to handle them [23, 24, 51–53].

Community Tools to Police Alcohol Outlets

According to the World Health Organization, legislative interventions to limit AOD are effective in reducing alcohol-related harms [54]. Local governments can regulate alcohol outlets through (1) licensing, (2) local legislation, and (3) zoning. Historically, zoning codes have been used to curb [54, 55] and limit access to products that contribute to negative public health outcomes [56]. Although multiple courts have ruled in favor of local municipalities using zoning codes to regulate AOD, the wide variation in state pre-emption laws makes generalizing advice from these circumstances nearly impossible [4]. Only a few studies evaluate the impact of local zoning on AOD, alcohol outlet–residence proximity, or related harms [1, 57]. In 1983, Los Angeles changed its zoning law to require conditional use permits for all new liquor stores to prevent bad actor and nuisance outlets. In 1992, following the conclusion of the Rodney King trial, 200 operating outlets in the South Central District were destroyed during civil unrest; many of these outlets were problematic liquor stores that had been grandfathered into the zoning code. This decrease in alcohol outlets led to a subsequent reduction in assaultive violence even after controlling for racial heterogeneity, percentage of young men in the census tract, poverty, and “damage level” of the 1992 civil unrest [58].

Alcohol Outlets and Zoning in Baltimore City

Our study city (Baltimore City) is 62.9% African American [59], in contrast to the overall population of Maryland, which is only 30.5% African American [60]. Baltimore City has a long history of racial segregation, with African Americans being chronically overconcentrated in east and west Baltimore City [59, 60]. Like many predominately African American urban centers, Baltimore City suffers a disproportionate number of public health concerns as compared to the rest of the state, including increased poverty and homicide rates [61]. These disparities are also present in intra-city comparisons. Baltimore neighborhoods with larger white

populations and higher median incomes typically have better public health outcomes than areas with higher minority populations and lower incomes. A city health report found a 20-year difference in average life expectancy between communities fewer than 5 miles apart [61]. African Americans in Baltimore City reported more health problems than white adults and were four times more likely to report unmet mental health needs than their white counterparts [61]. Given that Baltimore City and, more specifically, Baltimore’s predominately African American neighborhoods report significantly more public health challenges, the placement of off-premise alcohol outlets poses very real and enduring equity concerns.

In 1968 and 1971, Baltimore City took legislative action to reduce alcohol outlets and their associated harms. With 2318 outlets licensed to sell alcohol—or approximately 2.5 outlets per 1000 residents over 18—in 1968, the Baltimore City Liquor Board instituted a moratorium on new package store licenses until AOD dropped to 1.0 per 1000 residents over 18. The only exception was the tavern license (coded as “LBD7”) which allows for on-premise consumption in addition to off-premise, carryout sales. In 1971, Baltimore City found that “off-premise alcohol outlets... [are an] ... incompatible [land] use in residentially zoned districts” and undertook a zoning code rewrite. Off-premise outlets were barred from coming into residentially zoned areas. Despite the intentions of both legislative endeavors, Baltimore City’s alcohol outlet landscape has seen little practical change. Although the number of alcohol outlets has dropped significantly (2318 in 1968 to 1351 in 2015), the population has declined disproportionately more. As a result, AOD hovers at approximately 2.8 per 1000 residents over 18—nearly three times the 1968 goal. In addition, the 1971 zoning code rewrite grandfathered in existing off-premise outlets, including those located in residential neighborhoods, creating a class of off-premise outlets that were deemed “non-conforming.” This was done under the assumption that, over time, these stores would close or move to other areas of the city where they would not be out of compliance with zoning codes. More than 40 years later, however, most of these stores are still in operation in their original, non-conforming locations. Moreover, new retailers applied for and received the LBD7/tavern license when, in fact, they are running package stores, thereby circumventing the moratorium and capitalizing on the lack of enforcement and

oversight of new licensees. Some of these licenses would technically be non-conforming based on their business operations, if in fact they are operating as a package store with a tavern license, and located in a residentially zoned neighborhood.

Because of the enduring high AOD in Baltimore City and despite the 1968 moratorium and 1971 zoning code rewrite, the city decided additional policy was needed to reduce AOD and AOD-related harms. The Baltimore City Health Department created “Healthy Baltimore 2015,” citing a 15% reduction in AOD as one of its primary goals [62]. Baltimore City also approved the first zoning code rewrite in more than 40 years in December of 2016—known as TransForm Baltimore. The new code is a departure from the city’s previous zoning and, with adequate enforcement, has the potential to change the alcohol landscape of Baltimore City dramatically. If enforced, TransForm Baltimore will reduce the land available to alcohol outlets by 27% and render 98 package stores non-conforming, requiring them to close [63]. The three most pertinent policies for alcohol outlets are (1) 18-701, which requires all alcohol outlets that were labeled as non-conforming in 1971 to conform within 2 years; (2) 14-337, which requires taverns to have at least 50% of total average daily receipts from the sale of alcoholic beverages for on-premise consumption, and for at least 50% of the outlet’s public floor space to be devoted to on-premise consumption; and (3) 14-336, which requires all off-premise outlets to be at least 300 ft from all other off-premise alcohol outlets. Cumulatively, as illustrated in Hippensteel et al. [63] for off-premise outlets, the zoning code rewrite can reduce AOD, close down sham LBD7s (i.e., alcohol outlets designated as taverns but operating as package stores), and remove package stores from residential areas.

The current study aims to distinguish multiple characteristics of alcohol outlets and neighborhoods that will be most impacted by the zoning code rewrite, with a particular focus on outlets operating inconsistent with their current license type or non-conforming with existing zoning regulations. The study focuses on two of the three primary components of the TransForm Baltimore zoning rewrite because (1) the amortization period allowed 2 years from enactment (June 2019) before enforcement would be enacted and (2) a previously published report investigated the potential impact of the third component of the legislation, the 300-ft rule, which prohibited any new or relocated outlets from locating within 300 ft of an existing outlet [63].

Materials and Methods

Data Sources

Alcohol outlet data were obtained from the Board of Liquor License Commissioners for Baltimore City. These data contained the name, addresses, and license class of all alcohol outlets in Baltimore City. All alcohol outlets were geocoded using ArcMap 10.4.1 using a 100% minimum match score; all outlets that remained unmatched after the automatic match were manually geocoded. After manual matching, every outlet was matched.

The Board of Liquor License Commissioners for Baltimore City administers 12 alcohol license classes. The current study included four license classes permitted to sell alcohol for off-premise consumption. These license types represent the bulk of license types permitted for off-premise alcohol sales and include

1. Beer, Wine & Liquor Class A (LA) ($n = 218$): off-premise sale of package goods, no on-premise consumption. Open 6 days a week, from 6:00 a.m. to midnight. No Sunday sales except Sundays between Thanksgiving Day and New Year’s Day upon issuance of a special license for each of these Sundays.
2. Beer, Wine & Liquor Class A-2 (LA2) ($n = 12$): off-premise sale of package goods, no on-premise consumption. Open 6 days a week, from 9:00 a.m. to midnight. No Sunday sales except Sundays between Thanksgiving Day and New Year’s Day upon issuance of a special license for each Sunday. This category will be combined with the LA class and referred to as liquor stores.
3. Beer, Wine & Liquor Class BD-7 (LBD7) ($n = 422$): taverns licensed for on-premise consumption in addition to off-premise, carryout sales. Open 7 days a week, including Sundays, from 6:00 a.m. to 2:00 a.m.
4. Beer & Wine Only Class A (WA) ($n = 33$): off-premise sale of package goods, no on-premise consumption. Open 6 days a week, from 6:00 a.m. to midnight. No Sunday sales except Sundays between Thanksgiving Day and New Year’s Day upon issuance of a special license for each Sunday.

Arenas ($n = 3$), theaters ($n = 3$), and performance halls ($n = 3$) having one of the four class A or class B

designations do not reflect typical package stores; have limited hours of operation (typically during events); and primarily sell alcohol only during events for on-premise consumption. Restaurants (Beer & Wine/Beer, Wine & Liquor Class B), hotels/motels (Beer, Wine & Liquor Class B), and non-profit private clubs (Beer, Wine & Liquor Class C) only allow on-premise alcohol consumption. None of these license types were included in the TransForm Baltimore zoning code and are thus excluded from these analyses. Hereafter, the LBD7 license types will be referred to as *taverns* and the LA, LA-2, and WA license types will be referred to as *package stores*.

We obtained parcel data from the Baltimore City Department of Planning. These data contained all 223,900 parcels (as known as lots) in Baltimore City and their designation as either business, industrial, residence, open space, or office residence. The parcel type for each outlet was determined using a spatial join in ArcMap.

We used the 2010 Census Tract TIGER/Line shapefile to compute and spatialize community demographics for each of the 200 Baltimore City census tracts. These data were supplemented with tabular demographic data from the 2015 5-year American Community Survey (ACS) census tract-level data. These data were obtained from the US Census Bureau. Each alcohol outlet was assigned its corresponding census tract (herein referred to as neighborhood) from the 2010 US Census via a spatial join.

Observational data collection via field surveys took place in Baltimore City from June to August 2015. The goal was to identify characteristics of alcohol outlets related to compliance with local ordinances and identify possible targets for future policies to reduce the public health impact of alcohol outlets on communities.

Assessment Tool

The assessment tool was created from a review of existing observational tools [64–66] and preliminary observations of 50 package stores in Baltimore City. The assessment was divided into an exterior and interior assessment. The exterior assessment included advertisements related to alcohol and tobacco, whether the interior of the outlet was visible from the outside, and underage drinking enforcement signs (e.g., We Card). The interior assessment was a global assessment that included whether the store had plexiglass barriers, video

monitoring devices, underage drinking and admission signs, and other products sold in the outlet (e.g., candy, healthy food, drug paraphernalia).

Training and Procedures

Data collectors were hired as part of a summer research assistant (RA) traineeship. The program included eleven African American high school and college students and one Hispanic high school student. All of the RAs were Baltimore City residents.

Data collectors received 2 days of in-office training that included a review of the definitions for each item and a visual image of each item. Upon completion of the in-office training, RAs were taken into the field by a project supervisor and assigned one section of the assessment to complete. Sections were rotated among RAs until they completed each section twice. At the end of the field training day, data were entered, and a debrief session was conducted with each RA.

The RAs were divided into two teams of five that included at least one driver and two males. This 5-person configuration enabled each team to have a minimum of three people available to conduct fieldwork each day and ensured there was always a male with the group in the field to increase safety. Two groups of three to four trained RAs were fielded each day from June through mid-August. The teams traveled to the designated locations with data collection packets that included the name, address, location ID, and a Google Street View image of the establishment. When only three RAs were working, the driver conducted the exterior assessment. When four RAs were working, the driver did not participate in data collection, and one of the other three team members conducted the exterior assessment. The remaining two RAs entered the outlet as customers; one RA made a non-alcohol purchase attempt (e.g., chips, bottle of water) to legitimize their presence (and test compliance with an existing ordinance that prohibits any purchases in liquor stores from persons under age 18). The interior assessment was designed to take approximately 1 min. Each section of the assessment was completed by one rater and was operationalized to assess indicators above and below 3.5 ft (the standard height for products marketed to youth) [67]. While two RAs conducted the interior assessment, they completed different sections of the assessment (either the below 3.5 ft or 3.5 ft and above sections) based on their random assignment for the day.

The majority of the items captured on the interior assessment were plainly visible (e.g., candy or chips). The RAs asked employees for items, like menus, that may have been present but not readily visible because they were kept behind the counter or bar. In cases where the bar was not accessible by minors (e.g., the venue required an ID to enter the bar portion of the venue), one of two project supervisors, both of whom were over age 21, completed the interior assessments.

Detailed safety protocols required remaining on public property, having a male present, having team members entering every alcohol outlet together, at least one person to carry a cell phone in case of emergency, being aware of surroundings, leaving immediately if either team member felt uncomfortable, and explaining the reason for the visit if asked (e.g., “we are working on a project to identify community needs for improving health”).

Data were entered on paper forms in the RA’s vehicle immediately after exiting the outlet (packets were not taken inside the outlet). While 2 RAs conducted the interior assessment, they completed different sections of the assessment. To that end, no multiple assessments of the same sections were completed. Datasheets included the venue identification number on each page to ensure each section of the assessment could be linked to the same venue. Data forms were stapled in the field and assembled. Data from each booklet were double entered by different data entry personnel within 1 day of being collected and checked for accuracy. Discrepancies were resolved by comparing entries in the assessment booklet with inconsistent data.

Measures

Two policies will be assessed in this investigation from *TransForm Baltimore*. Described below, these include Zoning Policy 14-337 to remediate sham taverns, and Zoning Policy 18-701 to redress non-conforming outlets previously grandfathered in after the 1971 zoning code.

Sham Taverns (Zoning Policy 14-337)

The new zoning code requires that at least 50% of all sales from all licensed taverns to come from on-premise sales, and for at least 50% of the floor space to be devoted to on-premise consumption. Trained RAs recorded whether the bar portion of the establishment could be accessed, and estimated the percentage of

public floor space devoted to on-premise consumption, the same standard as the zoning code. A variable denoting “sham taverns” was constructed based on whether the percentage of public floor space for on-premise consumption was below 50%.

Our assessment of the bar/taverns included 16 items: is the bar/restaurant open?, does the venue appear to be a BD7?, were you able to gain access?, does the bar/restaurant have a separate entrance?, are there multiple entrances?, are any patrons smoking?, is there separation of retail/dining space?, is there space for on-premise consumption?, are there slot machines?, is a server present?, is a security officer present?, is a bartender present?, is there an obvious dance floor?, are patrons drinking?, are there intoxicated patrons?, and is there a menu available? All items have dichotomous responses (yes or no). These items were used for an exploratory factor analysis (EFA; patrons smoking excluded, prevalence < 5%). Two items—on multiple entrances and the presence of slot machines—consistently had low factor loadings (< 0.4) and were removed from the factor analysis. Eight items consistently loaded together: is the bar/restaurant open?, does the venue appear to be a BD7?, were you able to gain access?, is there space for on-premise consumption?, is a server present?, is a bartender present?, is there an obvious dance floor?, and are patrons drinking? The EFA had acceptable fit indices (RMSEA = 0.062, CFI/TFI = 0.99, SRMR = 0.092); the factor loadings were all statistically significant and ranged from 0.507 to 0.984. Cronbach’s alpha (assessing internal consistency reliability) for the scale was 0.777. A scale was created using the factor loadings, and the mean score was 5.0 (SD 1.6, range 0.0–6.5). Higher scores indicated the presence of more characteristics of a tavern.

Non-conforming Outlets (Zoning Policy 18-701)

According to the Board of Liquor License Commissioners for Baltimore City, 263 package stores were actively licensed in Baltimore City during the study period. We used the spatial join tool in ArcGIS with the zoning shapefile from the Baltimore City Department of Planning to determine zoning areas for each package store. The zoning shapefile included five zoning areas: (1) business, (2) industrial, (3) office residence, (4) open space, and (5) residence. The spatial join allowed us to determine the zoning area of each of the alcohol outlets, as in Hippensteel et al. [63], which

allowed us to confirm the accuracy of our procedure. Package stores located inside a residentially zoned parcel were labeled non-conforming.

Neighborhood Characteristics

We calculated the neighborhood disadvantage score using census tract-level items from the 2015 5-year American Community Survey. The elements used to create the index include the percentages of (a) adults ≥ 25 years with a college degree, (b) owner-occupied housing, (c) households with incomes below the federal poverty threshold, and (d) female-headed households with children. We used the formula of Ross and Mirowsky [68] to generate the index: $\{[(c/10 + d/10) - (a/10 + b/10)]/4\}$ (percentages entered as whole numbers, not decimals). Each 1-unit increase in the neighborhood disadvantage score is equivalent to a rise of 10 percentage points for each component item of the index [67]. The total score has a possible range from -5 to $+5$, where -5 is very low/little disadvantage and $+5$ is very severe disadvantage.

We analyzed the level of African American versus white segregation in Baltimore City census tracts, as measured by the Index of Concentration at the Extremes (ICE). To obtain ICE values, we subtracted the number of African Americans from the number of white individuals in a census tract and then divided by the entire population of the tract. These data were obtained from the 2015 5-year ACS. The values range from -1 to 1 , where -1 is predominately African American and 1 is predominately white. Whereas other measures of community-level racial segregation only give information about whether segregation exists, the ICE measure quantifies the polarization by the group. For example, with the Index of Dissimilarity, communities that are 100% African American are scored identically to communities that are 100% white, even though segregation in these two communities likely acts in very different ways [69]. Lastly, we obtained the median household income for each census tract from the 2015 5-year American Community Survey.

Data Analysis

T tests and chi-square tests were used to compare neighborhood characteristics (neighborhood disadvantage, median household income, racial

segregation) of sham taverns versus all other taverns and non-conforming versus conforming alcohol outlets.

Additionally, chi-square tests were used to assess differences in the bar portion of taverns among sham taverns and other taverns (see Table 1; e.g., bartender present, menus available). We also compared the presence of advertisements and the products available (yes/no) for sale in non-conforming and conforming outlets using chi-square tests (see Table 1 for items and descriptions).

Results

Observational assessments revealed that of the possible 691 alcohol licenses, 6 were duplicates, resulting in 685 unique alcohol outlets. Twenty-two percent of licensees ($n = 155$) were chronically closed (e.g., never open, abandoned, or in reconstruction), in part due to a significant but undetermined number of stores that were burned down in April 2015 following the social unrest surrounding the death of Freddie Gray. This resulted in 530 outlets with complete assessments, which included 292 taverns and 238 package stores. Venues were visited seven times by research assistants before they were deemed chronically closed at varying times of day and days of the week. Project supervisors made an additional three visits on Thursday, Friday, and Saturday evenings between 9 p.m. and 2 a.m. depending on the venue (e.g., clubs were visited later than bars or package stores) to ensure the establishment was not in operation during these peak times.

Sham Taverns

During data collection, 292 taverns (69.2%) (i.e., LBD7 license class) were open and available for assessment; the remaining 130 taverns (31%) were chronically closed (unable to access after seven visit attempts). Approximately 8% of open and accessible outlets had less than 50% of space dedicated to on-premise sales ($n = 24$; meeting our “sham taverns” designation), and an additional 11.3% of outlets ($n = 33$) had an estimated 50% on-premise consumption space. Sham taverns were located in census tracts with more disadvantage (Table 2; $p = 0.001$) and a lower median household income ($p = 0.001$) as compared to legitimate taverns with more than 50% on-

Table 1 Alcohol outlet observational assessment

LBD7 assessment (yes/no with exception of % of on-premise space)

Is the bar/restaurant portion of the alcohol outlet open?

Does it appear to be a BD7* (bar/tavern qualities)?

Are you able to gain access to the bar/restaurant portion of the alcohol outlet?

Is there a separate entrance for the bar/restaurant of the alcohol outlet?

Are there multiple entrances?

What is the percentage of on-premise space for alcohol consumption?

Is there a separation of the retail/dining space?

Is there a space for on-premise consumption?

Is there a server in the bar/restaurant?

Is there a security officer in the bar/restaurant?

Is there a bartender in the bar/restaurant?

Is there a dance floor space in the bar/restaurant?

Are there any patrons in the bar/restaurant drinking?

Are there any intoxicated patrons in the bar/restaurant? (Slurred speech, overly happy, impaired walking, belligerent, etc.)

Are there any patrons in the bar/restaurant smoking?

Is there a bar/restaurant menu available or a daily specials sign?

Liquor store assessment (yes/no)

Any signs related to underage drinking enforcement (i.e., We Card, Respect 21, etc.)?

Any signs prohibiting underage people from entering the alcohol outlet?

Any signs prohibiting underage people from purchasing merchandise (besides alcohol) from the alcohol outlet?

Are there any cigarettes advertisements visible?

Are there any alcohol advertisements visible?

Do they sell drug paraphernalia?

Do they sell pipes?

Do they sell hookah paraphernalia?

Do they sell E-cigarettes?

Do they sell bonges?

Do they sell synthetic cannabinoids?

Do they sell vaporizers?

Do they sell scales and/or small zipper bags?

Do they sell cigars (Dutch, blunts, etc.)

Do they sell flavored cigar papers?

Is healthy food or produce available for purchase?***

Does the alcohol outlet sell sex paraphernalia?

*BD7 defined as taverns licensed for on-premise consumption in addition to off-premise, carryout sales; open 7 days a week, including Sundays, from 6:00 a.m. to 2:00 a.m.

**Healthy foods were defined as produce including fresh fruits and vegetables

premise consumption space. The average ICE was -0.4 ($SD = 0.6$) for sham taverns compared to 0.2 ($SD = 0.6$) for other taverns ($p < 0.001$), indicating that sham taverns were in predominately African American census tracts (see Fig. 1).

None of the sham taverns had a security guard present, compared to 14.2% of outlets with greater than 50% floor space for on-premise consumption, although this did not reach statistical significance ($p = 0.053$). Sham taverns were less likely to have menus available (chi-square = 9.7, $p = 0.002$). A t test was used to evaluate differences in the 8-item tavern scale score for sham taverns versus other taverns. The tavern scale score for sham taverns (mean = 1.9, $SD = 0.5$) was lower compared to other taverns (mean = 5.3, $SD = 0.1$; mean difference = 3.4, $p < 0.001$). This difference indicates that sham taverns were less likely to have the qualities of a tavern (e.g., bartender present, space for on-premise consumption, menus available).

Non-conforming Package Stores

We identified and assessed 89 of the 98 package stores labeled as actively open and non-conforming by the Baltimore City Mayor's Office. The discrepancies for the remaining 9 package stores—based on data from the Board of Liquor License Commissioners for Baltimore City—included 1 package store licensed as a tavern, 3 listed as pending transfer, and 5 listed as inactive. Of the 89 package stores we assessed, 80 were located in residentially zoned locations, likely due to small area zoning changes between 1971 and 2016.

These non-conforming package stores were located in census tracts with lower median household incomes, greater community disadvantage, and more racial segregation compared to package stores not located in residential neighborhoods ($p < 0.05$; see Fig. 2). Full comparisons can be found in Table 3. A higher percentage of the beer and wine-only package stores (i.e., WA license class) were non-conforming as compared to package stores that also sold liquor (60.1% vs. 26.1%, respectively, $p < 0.001$). Non-conforming outlets were more likely to sell healthy foods and sex paraphernalia ($p < 0.05$). No differences existed between conforming and non-conforming outlets in the percentage of outlets that had alcohol or tobacco advertisements, drug paraphernalia, or tobacco products.

Table 2 Neighborhood and outlet characteristics comparing bar/taverns

	Sham taverns (<i>n</i> = 23), <i>N</i> (%)	Taverns (<i>n</i> = 268), <i>N</i> (%)	Chi-square (<i>p</i> value)
Bar/restaurant open	9 (39.1)	264 (98.5)	128.7 (<0.001)
Does the venue appear to be a BD7 (bar/tavern qualities) ^a	6 (26.1)	244 (91.0)	73.8 (<0.001)
Were you able to gain access	12 (52.2)	231 (86.2)	17.8 (<0.001)
Bar/restaurant have a separate entrance	74 (21.7)	69 (25.7)	0.2 (0.672)
Are there multiple entrances	2 (8.7)	82 (30.6)	4.9 (0.026)
Separation of retail/dining space	6 (26.1)	80 (29.9)	0.1 (0.704)
Server present	5 (21.7)	193 (72.0)	24.6 (<0.001)
Security officer present	0 (0.0)	38 (14.2)	3.8 (0.053)
Bartender present	6 (26.1)	228 (85.1)	46.8 (<0.001)
Obvious dance floor space	3 (13.0)	101 (37.7)	5.6 (0.018)
Patrons drinking	3 (13.0)	157 (58.6)	17.4 (<0.001)
Intoxicated patrons	21 (8.7)	2 (7.1)	0.8 (0.775)
Menu available	2 (8.7)	112 (41.8)	9.7 (0.002)
	Sham taverns, mean (SD)	Taverns, mean (SD)	Mean difference (<i>p</i> value)
Neighborhood disadvantage	0.1 (1.2)	-0.9 (1.7)	-1.0 (0.003)
Median household income (in \$1000s)	39.0 (15.1)	56.8 (26.7)	17.9 (0.001)
Index of Concentration at the Extremes-Race	-0.4 (0.6)	0.2 (0.6)	0.6 (<0.001)

^aTaverns licensed for on-premise consumption in addition to off-premise, carryout sales; open 7 days a week, including Sundays, from 6:00 a.m. to 2:00 a.m.

*Items bar/restaurant open through menu available are all present/absent (yes/no)

Discussion

This study revealed opportunities for zoning to be used as a tool for addressing neighborhood disparities related to alcohol outlet density and associated harms in Baltimore City. We found that package stores located in residential neighborhoods (non-conforming under the 1971 zoning code) and taverns out of compliance with their licensing designation (sham taverns) were predominately located in neighborhoods with higher proportions of African American residents and neighborhoods with higher levels of resource deprivation. These findings are supported by previous studies of alcohol outlet density, which found resource-deprived neighborhoods and predominately African American neighborhoods have significantly more liquor stores per capita than more affluent and mostly white communities [3, 36, 49]. Consequently, residents of these neighborhoods are disproportionately impacted by the negative health effects surrounding alcohol outlets.

Enforcement of zoning codes will be particularly impactful in resource-deprived neighborhoods where residents may lack the political, economic, and social capital to police bad actors [46–49]. Before Baltimore

City's zoning code rewrite, the system of monitoring alcohol outlets relied on the surrounding community to document and intervene on a case-by-case basis [70, 71]. These activities included collecting signatures, writing letters, filing timely paperwork, hiring lawyers, and attending hearings—activities that may be particularly difficult for marginalized communities with high alcohol outlet density. Off-premise alcohol outlet density is strongly associated with reduced social capital, suggesting that off-premise alcohol outlets may hinder the development of social capital in a neighborhood [10]. Consequently, the presence of alcohol outlets may impede the expansion of a positive underlying neighborhood social network, limiting the ability of a neighborhood to organize for the collective good.

Even when communities effectively organize to lodge complaints against alcohol outlets, business interests and lobbying efforts often supersede the will and desires of the community. More often than not, the alcohol outlets retain their existing license types by signing a non-binding Memorandum of Understanding (MOU) with the communities that lodge a complaint with local liquor boards in an attempt to

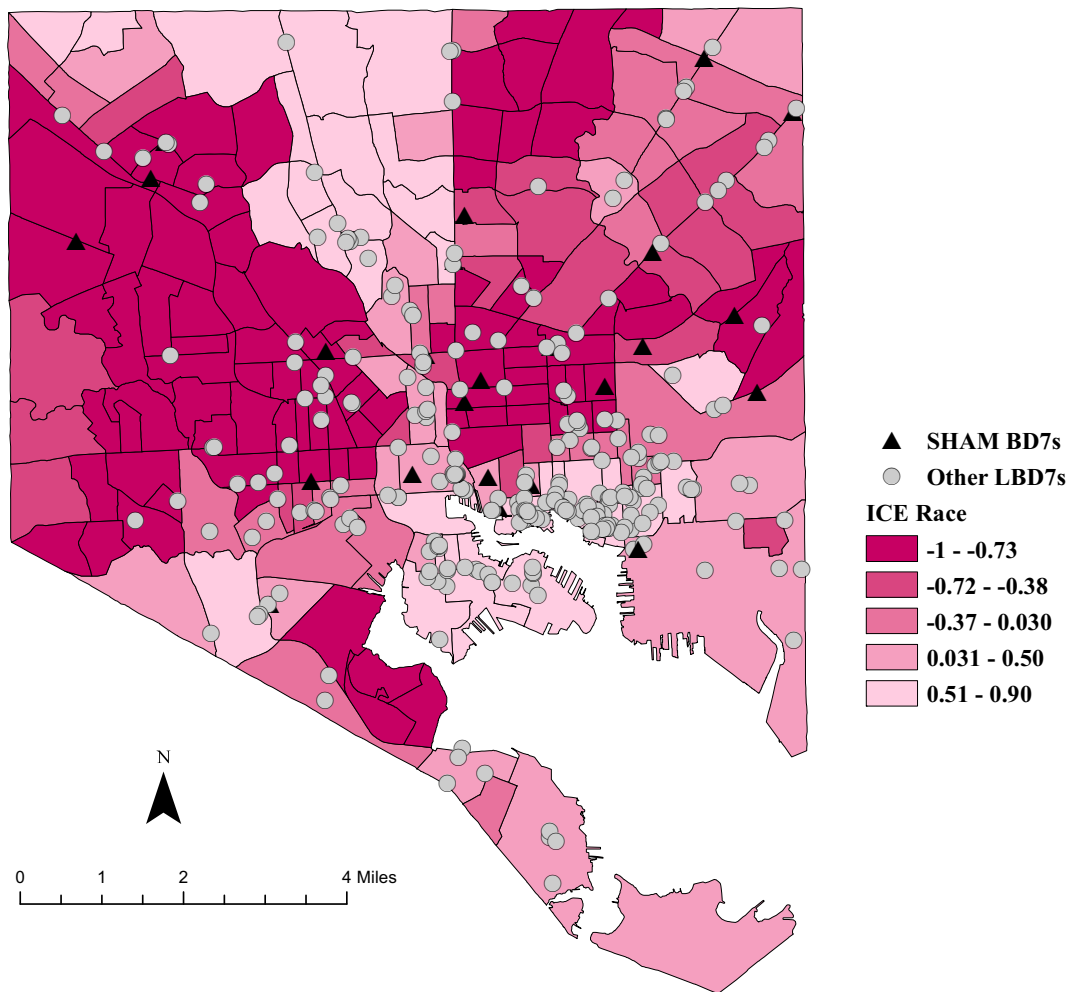


Fig. 1 Bar/taverns and racial segregation

remain in operation [70]. This observational study demonstrates that 8.2% of licensed taverns are able to operate outside the confines of their license class. If in fact these outlets are simply package stores, they will have to change their business model or close under the current legislation which also now deems them operating as non-conforming. Given the stronger relationship between off-premise alcohol outlets and social harms (as compared to on-premise licensees like restaurants), requiring sham taverns to conform operations to their on-premise license, repurpose, or close could reduce social harms. Overall, the zoning code rewrite may reduce the burden on communities obliged to self-police these bad actors.

On the other hand, we found that non-conforming package stores were more likely to sell healthy food. Package stores often serve as sources of food for

families that do not own cars or live in neighborhoods distant from supermarkets [72]. The reliance on package stores as a food source is disproportionately more likely in neighborhoods characterized by high resource deprivation and high concentrations of ethnic minorities [73]. A quarter of the non-conforming package stores are beer-wine-only license type, which tend to be smaller “mom and pop” grocery stores. While these stores are located illegally in residentially zoned neighborhoods, a statistically significant proportion of these stores also serve vital community needs, including increased healthy food access for residents. A more complex approach to the inclusion of and enforcement of TransForm Baltimore in the beer-wine-only licensees may be warranted.

This study also found a high proportion of chronically closed alcohol outlets (~22%). These outlets were

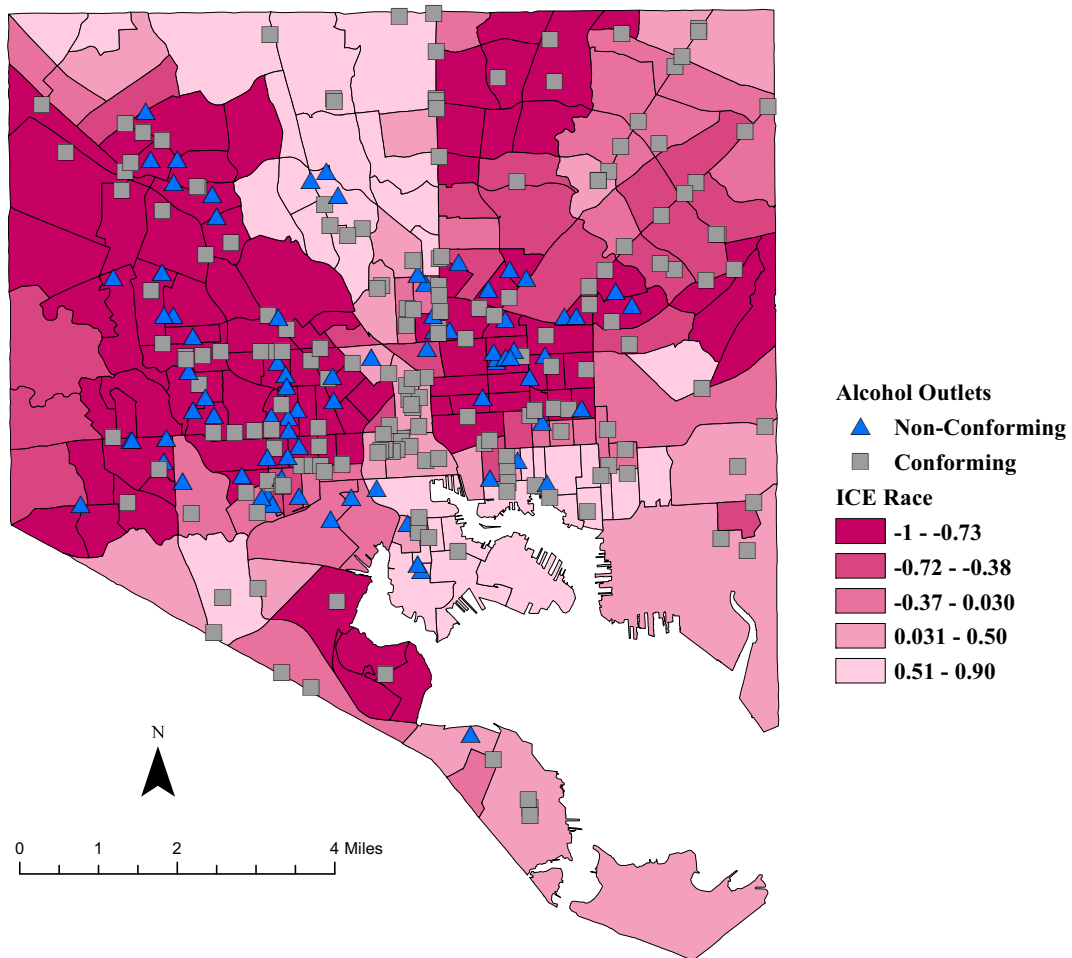


Fig. 2 Package stores and racial segregation

visited at least 7 times at different times of the day and on different days of the week. This is problematic for several reasons. First, studies examining the relationship between alcohol outlet density and adverse outcomes (e.g., violent crime, increased alcohol consumption) generally rely on administrative data. If the number of alcohol outlets (or density) is overestimated by administrative data, the relationship between the presence and density of alcohol outlets is underestimated and could skew AOD estimates in some neighborhoods. These chronically closed alcohol outlets also have the potential to reopen and worsen existing problems. To assess the extent of the problem and implement effective interventions, reliable and valid alcohol outlet data are needed, including future studies to verify which outlets are and are not actively in operation. An actionable target for future intervention is to sunset the licenses of outlets that

have been closed for an extended period of time (e.g., for more than a year).

A few limitations of this research merit discussion. First, this study was cross-sectional and does not provide a prediction for reductions in health effects related to closing alcohol outlets out of compliance with the existing and new zoning code. Second, sales data do not currently exist for licensed taverns, so that was beyond the scope of this investigation. We therefore relied on the observations of our RAs to determine the sham tavern designation based on visible floor space. Implementation of TransForm Baltimore should minimally include a requirement that taverns report annual sales for on-premise and off-premise consumptions as well as designated floor space for on-premise consumption. Third, while we made multiple attempts to visit every outlet, several were closed. Fourth, the census variables

Table 3 Neighborhood and outlet characteristics comparing non-conforming and conforming package stores

	Non-conforming outlets (<i>n</i> = 80), <i>N</i> (%)	Conforming outlets (<i>n</i> = 183), <i>N</i> (%)	Chi-square (<i>p</i> value)
License class			26.1 (<0.001)
LA/LA-2	60 (26.1)	170 (73.9)	
WA	20 (60.1)	13 (39.3)	
Cigarette advertisements	48 (68.6)	93 (55.4)	3.6 (0.059)
Alcohol advertisements	63 (90.0)	152 (90.5)	0.1 (0.910)
Drug paraphernalia	64 (91.4)	139 (82.7)	3.0 (0.085)
Pipes	6 (8.6)	30 (17.8)	3.3 (0.068)
Hookah paraphernalia	3 (4.3)	9 (5.4)	0.1 (0.731)
E-cigarettes	33 (47.1)	66 (39.3)	1.3 (0.262)
Bongs	1 (1.4)	1 (0.6)	0.4 (0.521)
Synthetic cannabinoids	0 (0.0)	1 (0.6)	0.4 (0.518)
Vaporizers	3 (4.3)	12 (7.1)	0.7 (0.409)
Scale/small zipper bags	3 (4.3)	2 (1.2)	2.3 (0.129)
Flavored cigars	48 (68.6)	106 (63.1)	0.6 (0.421)
Cigars	63 (90.0)	135 (80.4)	3.3 (0.070)
Healthy food	34 (48.6)	47 (28.0)	9.3 (0.002)
Sex paraphernalia	60 (85.7)	118 (70.2)	6.3 (0.012)
Candy	66 (94.3)	155 (92.3)	0.3 (0.581)
Chips	69 (98.6)	159 (94.6)	1.9 (0.169)
Other snacks	69 (98.6)	154 (91.7)	4.0 (0.046)
	Non-conforming outlets, mean (SD)	Conforming outlets, mean (SD)	Mean difference (<i>p</i> value)
Neighborhood disadvantage	0.7 (1.4)	0.0 (1.5)	−0.7 (0.001)
Median household income (in \$1000s)	36.1 (16.0)	42.5 (20.9)	6.4 (0.015)
Index of Concentration at the Extremes-Race	−0.6 (0.6)	−0.3 (0.6)	0.3 (<0.001)

*Items cigarette advertisements through other snacks are all present/absent (yes/no)

used in our analyses are at a larger geographic unit (i.e., census tract) than the zoning code and may generate greater heterogeneity in social and economic characteristics than smaller spatial areas. As a result, our study may underestimate the ecological impact on residents living in close proximity to non-conforming outlets. Fifth, this study does not explore if the specific products sold in a particular alcohol outlet impact alcohol-related harms and associated health outcomes in the community. Lastly, there is a broader limitation related to inconsistencies within and across states on how alcohol outlets are classified and licensed, which limits the generalizability of legislative and enforcement recommendations.

Future research will examine the longitudinal impact of zoning and other alcohol outlet reduction and regulation strategies on community health, including exploration of racial and economic variation in

alcohol outlet density and the impact of enforcement of the zoning code. In addition, more deliberate investigation is warranted to examine how product availability—specifically products not typically sold outside of African American communities—is linked to deleterious outcomes. Lastly, better consistency in alcohol outlet licensing would also facilitate within-state and cross-state comparisons and scaling-up of promising approaches.

This study demonstrates the need for TransForm Baltimore, a new zoning code that addresses non-conforming off-premise alcohol outlets. We found that problem alcohol outlets were predominately located in neighborhoods with higher proportions of African American residents and neighborhoods with higher levels of resource deprivation. Intentional language is needed in the zoning code to mandate

enforcement and equitable implementation of enforcement strategies that could, at least in part, be funded by dedicated enforcement dollars stemming from non-compliance penalties. With active enforcement, TransForm Baltimore offers the opportunity for the local government to reduce overall outlet density, address non-conforming retailers, and increase public health and equity in some of the most vulnerable and marginalized neighborhoods in Baltimore City.

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