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E-Cigarettes in Baltimore Alcohol Outlets: Geographic and Demographic Correlates of Availability

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Abstract

There is limited research on e-cigarette availability despite increased use. E-cigarette availability within Baltimore alcohol outlets was analyzed for disparities among residential neighborhoods. Data were obtained via field surveys of alcohol outlets, then spatially merged with sociodemographic data. 18.8% of alcohol outlets had any e-cigarette availability. Regression models showed greater odds ratios for e-cigarette availability when cigarettes, cigars or hookah paraphernalia were sold, and lower odds ratios when alcohol outlets had an on-site consumption license. Outlets with e-cigarette availability were in predominantly lower-income, non-White neighborhoods. It is important to assess exposure of another potentially damaging substance among perpetually disadvantaged populations.

Keywords

e-cigarettes; alcohol outlets; racial/ethnic groups; income; census tract

Introduction

There has been a sharp rise in the presence of electronic cigarettes (“e-cigarettes”) since its introduction in the mid-2000s. Similarly, there has been a considerable increase in e-

cigarette research. Many studies have focused on the pharmacokinetics, specifically how nicotine is transferred from device to user.¹ Studies have also considered whether or not e-cigarettes are more or less harmful than traditional cigarettes, which still remains without a satisfactory determination.² Research has contemplated policy implications of e-cigarettes, including how to properly classify, regulate, and limit access to the products, and has brought attention to e-cigarette use and demographics, specifically for consumer impressions and youth use.³⁻¹⁴

Recent estimates show the highest prevalence of e-cigarette use among individuals ages 18–24 and 25–44 (21.6% and 16.6%, respectively), and surveys suggest that consumers perceive e-cigarettes to be a healthier alternative to traditional tobacco products and even a viable method for cessation of traditional, combustible tobacco products.¹⁵⁻¹⁶ Along with understanding e-cigarettes' mechanics, potential for harm or smoking cessation, and appeal to particular racial/ethnic and age groups, it is important to identify where e-cigarettes are physically available for purchase and consumption. Research shows that traditional tobacco products are more likely to be available and marketed in non-White and low-income neighborhoods, and significant health disparities exist among tobacco users.¹⁷⁻²⁰ For example, populations with a history of disadvantage in the United States – specifically Blacks and low-income people – experience adverse health outcomes due to cigarette smoking and tobacco use at disproportionately higher rates. The Centers for Disease Control and Prevention (CDC), the U.S. Department of Health and Human Services (HHS), and organizations such as the American Lung Association continue to report racial and socioeconomic disparities in tobacco-related health outcomes. While Blacks tend to initiate tobacco use later in life and smoke fewer cigarettes than Whites, Blacks are more likely to die from smoking-related diseases than Whites.²¹ Similarly, people with a lower income are more likely to suffer from smoking-related diseases than people with a higher income.²¹ Additionally, people with a lower income smoke more heavily than people with a higher income.²¹ While lower-income people and Blacks are as likely and more likely, respectively, to attempt quitting smoking than their socioeconomic and racial counterparts, both groups are less likely to succeed in quitting. Taxation of products, policies banning public use, stringent monitoring of youth access, and awareness/counter-advertising initiatives are major mechanisms that are used to reduce smoking and tobacco use. HHS currently has a national media campaign, “Tips from Former Smokers,” that highlights various people who deal with, have dealt with, or have died due to complications related to their tobacco use or exposure to tobacco use. Another HHS campaign, “The Real Cost,” focuses on health consequences associated with tobacco use by youth.²² The “truth” campaign, a nationwide anti-tobacco campaign funded and produced by the American Legacy Foundation, has recently aired commercials highlighting the disproportionate number of tobacco advertisements found in low-income, predominantly Black neighborhoods.²³ Additionally, many local and state municipalities have banned tobacco use in indoor and outdoor public areas and establishments such as restaurants, bars, and government buildings. Disparate health outcomes associated with tobacco use persist among Black and lower-income populations despite targeted anti-tobacco use campaigns, policies that have restricted tobacco use, and financial deterrents from tobacco use such as taxes.²⁴⁻²⁵ Therefore an important line of inquiry to consider is the availability and access to tobacco products. Ashe

and colleagues argued that the threshold needed to convince lawmakers to reduce availability and access to tobacco via “police power” is lower than that of alcohol.²⁶ However, many local and state municipalities are slow to utilize their full legislative ability to reduce tobacco outlet density despite evidence that constitutional challenges would not be a major issue, and despite evidence that shows reduction in tobacco outlet density does lead to reductions in smoking.^{27–31} Given this research, and while studies have investigated e-cigarette availability via the Internet, there are few published studies that have focused on physical e-cigarette availability and marketing.^{32–36}

Alcohol outlets are a prevalent and salient retail space for the purchase and consumption of not only alcohol products, but also processed foods, lottery tickets, and tobacco products such as cigarettes and cigarillos in Baltimore, Maryland.^{37–38} The abundance of alcohol outlets in Baltimore and the consequential widespread availability of alcohol and other products provides a practical analog for the availability of e-cigarettes in the city.^{39–40} Therefore, this study investigates the presence of e-cigarettes within licensed alcohol outlets in Baltimore. Additionally, we explore the sociodemographics – specifically, median household income and race/ethnicity profiles – of neighborhoods where alcohol outlets are located and examine the relationship between e-cigarette availability and the selling of other products within outlets. Influenced by the findings of previous research on relationships between sociodemographics and the availability of tobacco products, the hypothesis was that the availability of e-cigarettes within alcohol outlets would be greater in areas of Baltimore with a higher-than-average non-White population and a lower-than-average median household income.^{19–20}

Methods

Overview

This study was part of a larger study that sought to determine the adherence of Baltimore alcohol retail outlets to the requirements under alcohol outlet licenses administered by the Board of Liquor License Commissioners for Baltimore City (BLLC). Oversaturation of alcohol outlets has long been a public health challenge in Baltimore, and recent research has shown positive associations between outlet density and proximity to detrimental behavioral outcomes such as violent crime and substance use.^{37–40} This has catalyzed zoning reform initiatives and policy recommendations to reduce alcohol outlets and further prevent alcohol sales to youth, a highly vulnerable population.⁴¹ The larger study aimed to provide substantial evidence of pervasive fraudulent license use as well as failure to take established measures to prevent youth from obtaining alcohol and other prohibited products.

Data

Data on the location and license types of all establishments licensed to sell alcohol in Baltimore were obtained from the Board of Liquor License Commissioners for Baltimore City. There are 12 liquor license types administered by the BLLC.⁴² Observational data assessing alcohol outlets were obtained via field surveys in the summer of 2014 to determine if licensing requirements were adequately being fulfilled for the 667 alcohol licenses in the following three license classes:

1. Beer, Wine & Liquor Class A (LA): Off-sale package goods, no on-premises consumption – 6 days, 6:00 a.m.-Midnight. No Sunday sales except Sundays between Thanksgiving Day and New Year's Day upon issuance of a special license for each Sunday.
2. Beer, Wine & Liquor Class A-2 (LA2): Off-sale package goods – 6 days, 9:00 a.m.-Midnight. No Sunday sales except Sundays between Thanksgiving Day and New Year's Day upon issuance of a special license for each Sunday.
3. Beer, Wine & Liquor Class BD-7 (LBD7): Taverns for off-sale package goods and on-sale consumption – 7 days, 6:00 a.m.–2:00 a.m.

Assessment Tool

The tool for assessing the alcohol outlets was created from a review of existing observational tools and preliminary observations of 50 Baltimore packaged goods stores. The goal was to identify common characteristics of alcohol outlets related to licensing compliance or the lack thereof. The tool was divided into an assessment of the exterior and interior environment. The exterior assessment included alcohol and tobacco product advertisements, outside visibility of the interior environment, and signage cautioning against underage alcohol consumption. The interior assessment included whether the store had Plexiglas barriers, video monitoring devices, and signage cautioning against underage alcohol consumption. The interior assessment was further stratified to measure items above and below 3.5 feet from the floor – a line of demarcation for adult versus youth advertising.^{43–44} The above and below 3.5 feet assessment included identical items related to tobacco and drug paraphernalia divided into the following subcategories: smoking pipes (i.e., crack pipes), hookah paraphernalia, bong, synthetic cannabinoids, vaporizers, scales and small zipper bags, cigarettes and cigars, and flavored cigar papers (e.g., blunt wrappers); sex paraphernalia (e.g., condoms, sex enhancement supplements and pleasure pills), youth and minority-oriented alcohol and tobacco advertising, adherence to anti-smoking ordinances, business practices to prevent underage tobacco and alcohol purchases, and products being sold in the establishment including produce, candy, and chips.

Field Assessment Results

The 2014 field assessments revealed that of the 667 alcohol outlet licenses, six were dual licenses, resulting in 661 unique alcohol outlets. Nine additional outlets were removed due to exclusionary criteria (see Exclusions section below). Research assistants visited outlets up to seven times during various days and hours, and if necessary, project supervisors made an additional three visits on Thursday, Friday, and Saturday evenings between 9:00pm and 2:00am, depending on the venue (e.g., clubs typically have later hours of operation than bars or packaged goods stores) to ensure the establishment was not in operation during these peak times before determining they were chronically closed. As a result, assessments deemed 82 outlets closed (e.g., never open, abandoned, or in reconstruction) during the entire period of data collection, resulting in 570 valid alcohol outlets with interior and exterior assessments. LA (n = 204) and LA-2 (n = 12) license types were combined because of the small number of LA-2 licenses, similar days/times of sales (a 3-hour difference in opening time), and prohibition of on-premise consumption. LBD7s allow on-premise

consumption in addition to off-premise carryout sales including Sundays. For the purposes of this study, LBD7 outlets were categorized as on-premise.

Exclusions

The goal was to assess all establishments licensed to sell packaged goods, including establishments licensed to sell only beer and wine. 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) were not included in this study as these establishments only allow on-premise alcohol consumption and do not sell other products other than alcohol to onsite patrons. Arenas (n = 3), theaters (n = 3), and performance halls (n = 3) have one of the four Class A or Class B designations but were excluded from this study; these venues do not reflect the typical packaged goods store with limited hours of operation where alcohol is sold only during events for on-premise consumption.

Methods

Geocoding

U.S. census tracts were used as the geographical unit of analysis to explore the racial/ethnicity profiles and median household income in this study. Generally containing between 1,200 and 8,000 people with an optimal size of 4,000, they are considered a stable unit for analysis.⁴⁵ Race/ethnicity and median household income at the census tract level were obtained from the 2009–2013 American Community Survey (ACS).⁴⁶ The ACS is an annual national survey that collects vital household information from nearly 2 million addresses each year. Public Use Microdata Sample (PUMS) files provided datasets for academic use in 1-year, 3-year, and 5-year files; the dataset with five-year estimates (2009–2013) was used as it provides information for areas as small as census tracts and block groups.⁴⁷

The street addresses and ZIP codes of the alcohol outlets provided by the Board of Liquor License Commissioners for Baltimore City were geocoded with ArcGIS 10.2.2.⁴⁸ There are 200 census tracts in Baltimore City, but two were excluded due to lack of housing units. Additionally, no outlets with e-cigarette availability were located within either tract, and race/ethnicity and population data were not included in calculations.

Baltimore City has a population of 616,833 (not including census tracts 1003 and 2506), is 69.6% non-White (which includes Black, American Indian/Alaska Native, Asian, Hawaiian/Pacific Islander, Other, and 2+ Races), and has a median household income of \$41,385. Each address of the included alcohol outlets was geocoded via ArcMap and supplemented with Google Maps to manually match the unmatched licenses, yielding 100% matching of addresses (n = 570).

Analysis Plan

The basic descriptive statistic was the number of alcohol outlets with e-cigarette availability. The percentage was calculated using the number of alcohol outlets that met the inclusion criteria (n = 570). Outlets with e-cigarette availability above and below 3.5 feet from the ground were counted once.

Analysis of the survey data was conducted via a multivariate logistic regression, in which the outcome measure was any e-cigarette availability (either above or below 3.5 feet) within an alcohol outlet. To reflect the environments of the alcohol outlets surveyed, the covariates included in the model were outlet license type (LA/LA2 vs. LBD7) and the availability of the following products: smoking pipes, hookah paraphernalia, synthetic cannabinoids, vaporizers, cigarettes/cigars, flavored cigar papers, bongs, and scales/small zipper bags. Due to the low prevalence, bongs and scales/small zipper bags were removed from the final regression. All analyses were conducted in SPSS.⁴⁹

Results

Descriptive Statistics

Of the 570 valid alcohol outlets, 107 (18.8%) had e-cigarette availability on their premises; 36.6% (n = 79) of all off-premise outlets (LA/LA2) sold e-cigarettes, compared to 7.9% (n = 28) of on-premise outlets (LBD7) (Table 1). E-cigarettes were located within 84 out of 198 residential census tracts. Of the 84 tracts with e-cigarette availability, 64 contained one outlet, 17 contained two outlets, 2 contained three outlets, and 1 contained four outlets. The majority of e-cigarette availability among outlets (n = 92; 86.0%) was exclusively above the 3.5' line of advertising demarcation. Most alcohol outlets with e-cigarette availability (n = 63; 58.3%) were in census tracts with a higher non-White population percentage than the city-wide average of 69.6% (Figure 1). A similar pattern emerged when median household income was highlighted: most alcohol outlets with e-cigarette availability (n = 70; 65.4%) were located in neighborhoods with a lower median household income than the city-wide median of \$41,385 (Figure 2). E-cigarette availability was lower than the availability of traditional tobacco products: 78.2% of off-premise outlets sold cigarettes/cigars compared to 36.6% that sold e-cigarettes. Likewise, for on-premise outlets, there was a greater availability of tobacco products than that of e-cigarettes (22.6% vs. 7.9%).

Multivariate Logistic Regression

Compared to off-premise outlets, on-premise outlets are associated with lower odds of e-cigarette availability (AOR = 0.45, 95% CI: [0.26, 0.79]). Additionally, the logistic model shows greater odds of e-cigarette availability when either cigarettes or cigars (AOR = 12.39, 95% CI: [5.11, 30.02]) or hookah paraphernalia (AOR = 3.49, 95% CI: [1.32, 9.20]) were also sold in an alcohol outlet (Table 2).

Discussion

This exploratory study investigated the availability of e-cigarettes within alcohol outlets in Baltimore and demonstrated that overall availability was relatively sparse in comparison to the availability of cigarettes and other combustible tobacco products in the same retailers. Specifically, e-cigarettes were primarily found within off-premise outlets where patrons purchase alcoholic beverages and cannot consume them on the property. Among alcohol outlets with e-cigarette availability, nearly all were visible only at a height physically accessible to adults, while very few had e-cigarettes available at heights physically

accessible and visible for youth only or physically accessible and visible for both adults and youth.

Low income and urban non-White neighborhoods often have higher rates of tobacco and alcohol availability.^{19–20;50–51} Consistent with those previous studies, a similar pattern of e-cigarette availability within alcohol outlets was found. This is contrary to Rose et al., who found that e-cigarettes were more likely to be found in higher income and lower percent non-White neighborhoods; however, they evaluated a much greater availability than just liquor stores (gas stations, convenience marts, etc.).²² It is possible those results may reflect a greater availability of services such as supermarkets and pharmacies in higher income areas that also happen to sell e-cigarettes. Our findings suggest that within alcohol outlets, which are already found in higher concentrations within non-White and low-income neighborhoods, e-cigarettes are being sold as a complement, rather than a replacement, to existing tobacco and drug products.

There were limitations to this study. Notably, the decision was made to focus on basic descriptives via spatial mapping as opposed to spatial analyses due to the exploratory nature of the study. It is acknowledged that the hypothesis was due to the researchers' understanding of Baltimore's sociodemographic dynamics and that statistical methodology such as spatial regression does allow researchers to parse through multifaceted relationships such as the contextual interaction of race and socioeconomic status. However, it was determined that examining such an inherently complex relationship would be better suited for subsequent research influenced by the findings of this study. Additionally, it was also determined that this study would also focus on the relationship between established drug products and paraphernalia, including traditional tobacco products, and the availability of e-cigarettes within salient retail spaces, in this case alcohol outlets.

This study contributes to a limited literature on physical e-cigarette availability and illustrates the relationships with sociodemographics and availability of drug/tobacco products in a major urban U.S. city. In Baltimore, alcohol outlets are a primary location for many residents – including youth and those in lower-income neighborhoods – to purchase goods, alcohol or otherwise. As a result, they are establishments in which many residents are introduced to new products such as e-cigarettes, which due to acclimation could lead to curiosity and ultimately use of the product. With the growing but still limited knowledge of how e-cigarettes may affect health, there could be a potential hazard if availability grows within Baltimore alcohol outlets and exposure increases for populations who are potentially most disadvantaged by its consumption. In May 2016, the U.S. Food and Drug Administration (FDA) announced efforts to regulate e-cigarettes and other tobacco products in the same manner as traditional cigarettes and smokeless tobacco, including the restriction of purchase to individuals aged 18 years and older.⁵² This is an important step in limiting access to e-cigarettes at the point of purchase, particularly for minors, but additional policy may be needed to address product availability. Currently within the Maryland Business Regulation, Title 16 (Cigarettes) and Title 16.5 (Other Tobacco Products Licenses), there exists no language that provides a framework or restrictions on retailer locations as a condition for issuance of a cigarette or other tobacco product (OTP) license. Additionally, per the Baltimore City charter and zoning codes, there is no language that provides

guidelines for the physical location of businesses and retailers that sell cigarettes and OTP such as e-cigarettes.^{53–54}

In addition to the access to e-cigarettes through alcohol outlets, future studies should determine the extent of e-cigarette availability in other venues throughout Baltimore, including in convenience stores, shopping center kiosks, and “vape” shops, which have seen a sharp increase in popularity along with e-cigarettes.⁵⁵ Additionally, an investigation of e-cigarette sales among alcohol outlets and other establishments should be conducted to elucidate whether or not current e-cigarette availability is supported by consumer demand. Finally, research is inconsistent as to racial differences in e-cigarette use despite advertising that appears tailored towards younger White individuals.¹⁴ Giovenco and colleagues’ recent study provides evidence that e-cigarettes are not targeted at non-White consumers in regards to availability, showing that New Jersey census tracts with a higher proportion of non-Hispanic black residents had significantly lower odds of having a vape shop.⁵⁶ Therefore, further study is warranted to examine for potential racial differences in e-cigarette advertising influence.

This study successfully mapped the presence of e-cigarettes within Baltimore alcohol outlets and provides insight into substances and products that relate to its availability. Additionally, this study provides key findings for the genesis of future research of e-cigarettes’ impact on various sociodemographic populations, especially as more evidence is presented to elucidate our understanding of the pharmacokinetic effects of e-cigarette consumption on the human body.

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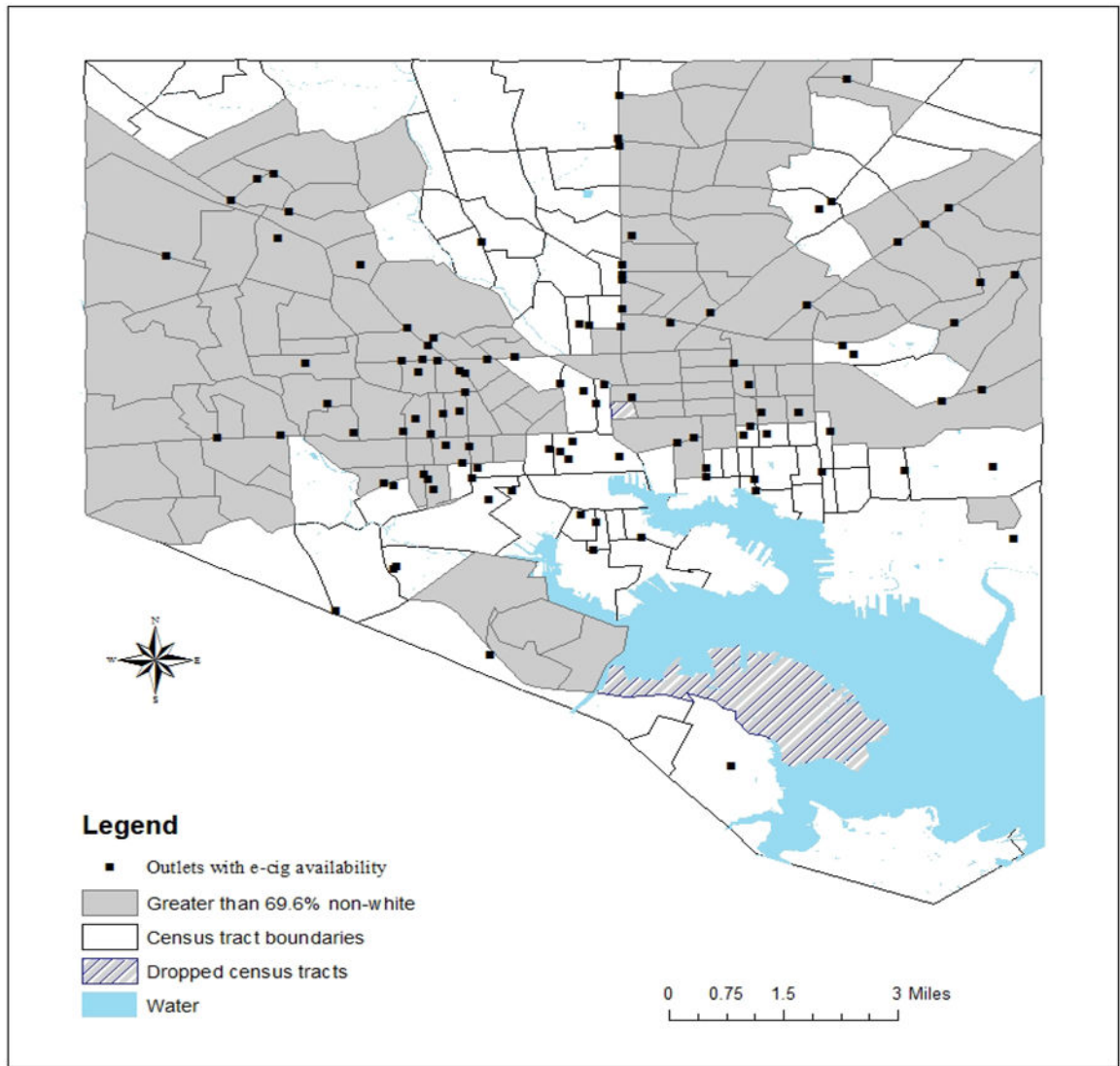
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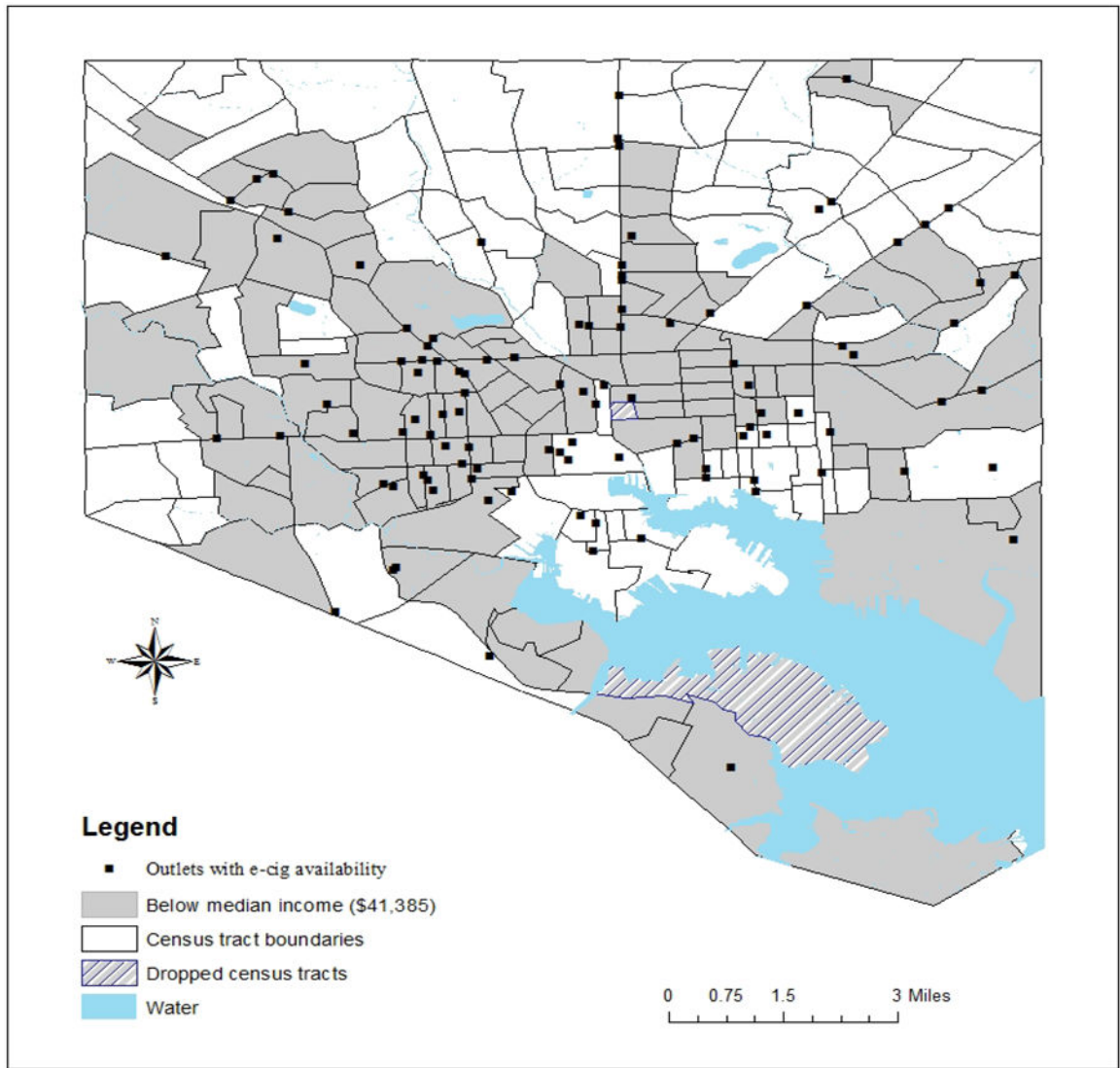
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Non-White Population: 69.6%

Figure 1:
Alcohol Outlets with E-Cigarette Availability by Non-White Population Percentage,
Baltimore City, 2014



Median Household Income: \$41,385

Figure 2:
Alcohol Outlets with E-Cigarette Availability by Median Household Income, Baltimore City, 2014

Table 1:

E-Cigarette and Traditional Cigarette Availability in Baltimore Alcohol Outlets – Total and by License Type (LA/LA2 vs. LBD7)

| License Type | Total Number of Outlets | Number of Outlets with E-Cigarette Availability, n (%) | Number of Outlets with Traditional Cigarette Availability, n (%) |
|--------------|-------------------------|--|--|
| LA/LA2 | 216 | 79 (36.6) | 169 (78.2) |
| LBD7 | 354 | 28 (7.9) | 80 (22.6) |
| Total | 570 | 107 (18.8) | 249 (43.7) |

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Table 2:

Adjusted Odds Ratios of E-Cigarette Availability within Alcohol Outlets

| Exposure | Adjusted Odds Ratio | <i>p</i> | CI ¹ |
|---------------------------------------|--------------------------|------------------|----------------------|
| Outlet license type (LBD7 vs. LA/LA2) | 0.45 ² | 0.01 | [0.26, 0.79] |
| Smoking pipes | 0.53 | 0.48 | [0.09, 3.14] |
| Hookah paraphernalia | 3.49 | 0.01 | [1.32, 9.20] |
| Synthetic cannabinoids | 2.63 | 0.21 | [0.59, 11.69] |
| Vaporizers | 1.55 | 0.38 | [0.58, 4.12] |
| Cigarettes/Cigars | 12.39 | <0.001 | [5.11, 30.02] |
| Flavored cigar papers | 1.26 | 0.44 | [0.70, 2.25] |

¹Confidence interval²Bold denotes significance at *p* = 0.05