



Original investigation

Neighborhood Differences in Alternative Tobacco Product Availability and Advertising in New York City: Implications for Health Disparities

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Abstract

Introduction: Alternative tobacco products (ATPs), such as cigars, smokeless tobacco, and electronic nicotine delivery systems (ENDS), have a strong presence in the US retail environment amid declining cigarette consumption. This study documented the promotion of ATPs in tobacco retailers in New York City and examined associations with neighborhood demographics.

Methods: Data on product availability and advertising were collected from a stratified, random sample of tobacco retailers in 2017 ($n = 796$). Multilevel models estimated adjusted prevalence ratios (aPRs) for each outcome by neighborhood racial/ethnic composition and median household income.

Results: Nearly half (49.8%) of retailers carried 99-cent cigarillos, but availability was significantly greater in neighborhoods in the highest (vs. lowest) quartile for the percentage of Black residents [68.2%, aPR: 1.59 (1.19, 2.11)] and in the lowest (vs. highest) income quartile [67.3%, aPR: 1.56 (1.04, 2.35)]. Conversely, retailers in neighborhoods with the highest percentage of White residents were significantly more likely to carry ENDS [66.4%, aPR: 1.71 (1.11, 2.62)]. Advertisements for ENDS were less common in neighborhoods in the highest (vs. lowest) quartiles for the percentage of Black and Hispanic residents [20.3%, aPR: 0.64 (0.41, 0.99); 22.9%, aPR: 0.62 (0.40, 0.98)].

Conclusions: The marketing of inexpensive, combusted tobacco products disproportionately saturates low-income, minority communities, while potentially lower risk, noncombusted products are more accessible in largely White and higher income neighborhoods. This pattern may exacerbate tobacco-related inequities. Public health policies should prioritize reducing the appeal and affordability of the most harmful tobacco products to help reduce health disparities.

Implications: Although cigarette promotion at the point-of-sale is well documented in the literature, questions remain about the ways in which alternative tobacco products (ATPs) are marketed in communities. Importantly, these products fall on a continuum of harm, with combusted tobacco overwhelmingly responsible for tobacco-related death and disease. We found that retailers in minority and low-income communities were more likely to carry and advertise inexpensive ATPs such as cigarillos, while potentially less risky, noncombusted products such as smokeless tobacco and e-cigarettes were more accessible in higher income and predominantly White neighborhoods. Policies aligned with product risk may help reduce health disparities.

Introduction

The tobacco product marketplace in the United States is highly diverse. Although cigarettes are still the dominant form of tobacco consumed,¹ alternative tobacco products (ATPs), such as cigars, smokeless tobacco, and electronic nicotine delivery systems (ENDS), have a strong presence in the US retail environment. Indeed, amid declining cigarette sales over the past few decades,² consumption of cigars and smokeless tobacco grew markedly.^{3,4} In more recent years, ENDS have experienced exponential sales increases after entering store-based distribution channels.^{5,6} Epidemiological patterns reflect these marketplace trends. While the prevalence of current cigarette smoking has dropped to historic lows of 15% among adults and 8% among youth, current use of any tobacco product exceeds 20% for both groups.^{7,8} Moreover, polytobacco use (i.e., concurrent use of more than one tobacco product) is particularly common among youth and young adults. Nearly 10% of US high school students and 5% of young adults engage in polytobacco use.^{7,8} Among adult cigarette smokers, one in five concurrently uses an ATP.¹

Common to virtually every tobacco product on the market is the delivery of nicotine, a highly addictive chemical. Nicotine, however, is not the primary cause of illness and death from tobacco use.^{9,10} Rather, the inhalation of toxic smoke from combusted tobacco products exposes the user to carbon monoxide, tar, and over 7,000 chemicals; the combination of which is highly lethal.¹¹ Though certainly not risk-free, noncombusted products, such as smokeless tobacco and ENDS, decouple nicotine from its deadliest known delivery mechanism and are likely less harmful to users than combusted tobacco.^{12,13} In a comprehensive review of the health effects of ENDS, the National Academies of Sciences, Engineering, and Medicine concluded that completely substituting cigarettes with ENDS conclusively reduces exposure to many toxicants present in combusted tobacco and may result in reduced adverse health outcomes.¹³ Tobacco harm reduction as a strategy to curb the smoking epidemic is a heavily debated topic,¹⁰ but is beginning to gain recognition from leading US public health agencies.^{14,15} The US Centers for Disease Control and Prevention (CDC), for example, state on their website that “E-cigarettes have the potential to benefit adult smokers who are not pregnant if used as a complete substitute for regular cigarettes and other smoked tobacco products.”¹⁴

Recognizing that combusted products are overwhelmingly responsible for the death and disease caused by tobacco use, the US Food and Drug Administration (FDA) recently introduced a comprehensive regulatory strategy to shift the trajectory of tobacco-related disease. Included in the plan is a rule that would lower nicotine in cigarettes—but not ATPs—to minimally or nonaddictive levels.¹⁵ FDA Commissioner Scott Gottlieb noted that nicotine “is delivered through products on a continuum of risk, and that in order to successfully address cigarette addiction, we must make it possible for current adult smokers who still seek nicotine to get it from alternative and less harmful sources.”¹⁵ Once the nicotine reduction policy for cigarettes goes into effect, access to noncombusted ATPs in local retailers may facilitate migration to lower risk nicotine products among smokers who are heavily addicted to nicotine and/or not ready to quit. Conversely, the promotion of combusted ATPs with regulatory advantages over cigarettes (e.g., small and mid-sized cigars)¹⁶ may offer equally risky cigarette alternatives for smokers that could offset progress toward a smoke-free society. To date, however, research on the promotion of tobacco at the point-of-sale has focused primarily on cigarettes.^{17,18}

Decades of studies on tobacco retailer density, point-of-sale advertising, and price promotions consistently demonstrate that cigarette

companies heavily market in neighborhoods that are low income and have high proportions of racial/ethnic minority residents.¹⁷ Point-of-sale marketing of cigars, products with health risks comparable with cigarettes,¹⁹ appears to follow similar patterns. Cantrell et al.²⁰ found that neighborhoods in Washington, DC with a higher percentage of African American residents had greater cigar availability, advertising, and lower cigar prices compared with other neighborhoods. Ribisl et al.²¹ reported similar findings for the availability of flavored cigars in a national sample of tobacco retailers. Emergent evidence, however, suggests that noncombusted products, such as smokeless tobacco and ENDS, are more heavily advertised in largely White neighborhoods.^{17,22–24} One limitation of existing research on ATP promotion at the point-of-sale is that these studies tend to focus on the marketing of a single product.^{20,22,24} Monitoring the accessibility of all major product categories and interpreting the findings in the context of the tobacco risk continuum are critical to assess public health implications. Indeed, as cigarette regulations continue to tighten, differences in the accessibility and marketing of ATPs with varying levels of risk may influence harm reduction behaviors and subsequent health disparities.

New York City (NYC) is an ideal setting in which to study tobacco retail, given its high retailer density and the heterogeneity and diversity of its many neighborhoods. Using in-person store audits, this study collected data from a representative sample of tobacco retailers in NYC to document the availability and advertising of cigarettes, cigars, smokeless tobacco, and ENDS at the point-of-sale. Analyses examined differences by store type and neighborhood demographics to investigate the potential relationship between ATP promotion and health disparities.

Methods

Retailer Selection

We obtained a list of all licensed tobacco retailers in NYC ($n = 8,291$) and their latitude and longitude coordinates from the NYC Open Data Portal in July 2017.²⁵ “Vape shops,” retailers that specialize in the sale of ENDS, were added to the list through a validated, systematic online search methodology ($n = 198$).²⁶ All retailer locations were then geocoded using Google Earth Pro, which has been used in other tobacco research studies^{27,28} and enabled the investigators to verify the accuracy of plotted locations using aerial and street view imagery. After importing the geocoded retailers into ArcGIS (v. 10.5.1), each point was joined to its underlying neighborhood tabulation area (NTA, $n = 188$). NTAs, city administrative boundaries used as the operational definition of “neighborhood” in this study, are aggregations of census tracts, have a minimum population of 15,000 residents, and often approximate boundaries of historical NYC neighborhoods (e.g., Upper West Side, Chinatown, Williamsburg). Using a stratified, random sampling approach, we randomly selected 10% of retailers from each residential NTA. A total of 879 licensed tobacco retailers were selected to visit for in-person audits (Figure 1).

Measures

A customized data collection form was developed to document store type; the availability of cigarettes, cigars, smokeless tobacco, and ENDS; as well as the presence of interior and exterior advertisements for each of these products. Store type was categorized as chain convenience store (e.g., 7-Eleven), nonchain convenience store (i.e., similar to chain convenience store in size and inventory but independently owned), drug store (both chain and independent), grocery store (i.e., specializes in fresh produce and other food items), *bodega*,

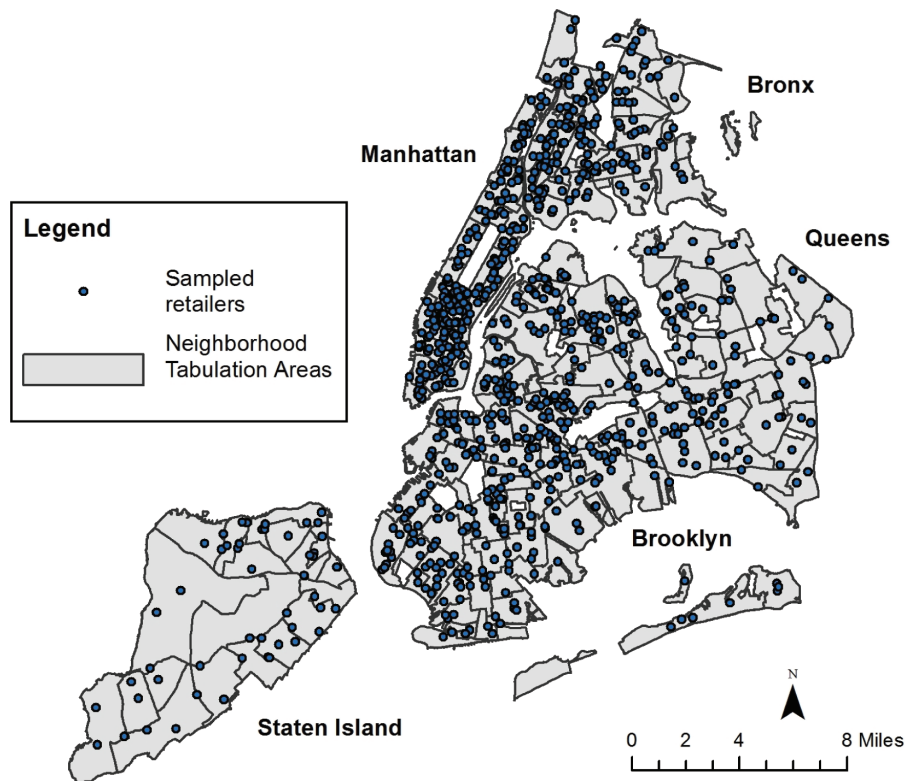


Figure 1. Sample of tobacco retailers selected for in-person audits ($n = 879$), New York City, 2017

or “other” (e.g., vape shops, smoke shops, delis, newsstands). *Bodegas* are small, neighborhood corner stores that sell inexpensive packaged goods such as candy, chips, lottery tickets, and miscellaneous household items and are considered quintessential local grocers in many NYC neighborhoods.²⁹

The following criteria were used to assess the availability and advertising of four major tobacco products: cigarettes, cigars, smokeless tobacco, and ENDS. Cigars included little cigars, cigarillos (i.e., mid-sized cigars), and large cigars; smokeless tobacco included moist snuff (often called “dip”), chewing tobacco, and snus (i.e., a form of smokeless tobacco that is placed between the gum and upper lip in teabag-like pouches); and ENDS included any type of electronic nicotine delivery system (e.g., e-cigarettes, vaporizers, “e-hookah” pens). We included a follow-up cigar question to document the availability of 99-cent cigarillos, easily the most inexpensive tobacco product sold in NYC at the time of data collection, and in our view, a problematic anomaly compared with the city’s otherwise strong tobacco pricing policies. If the product in question was not visible behind the counter, the data collector would ask the cashier if the product was available for purchase. An “advertisement” was defined as an industry-made sign featuring a tobacco company’s logo and/or an image of the product. Only advertisements that were clearly visible and larger than the size of a standard index card were counted. Smaller ads are burdensome for data collectors to locate, but more importantly, they may be less noticeable to individuals visiting the stores. A store was considered to advertise a product if it displayed at least one interior or exterior product advertisement.

Neighborhood Demographics

NYC demographic data at the census tract level were gathered using the US Census Bureau’s 2015 American Community Survey 5-year

estimates, and manually aggregated into their respective NTAs. The following variables were used in this study: proportion of residents that are non-Hispanic (NH) White, NH Black, and Hispanic (which together comprise 85% of the city’s population), and median household income (calculated as the average median household income of all census tracts in the NTA). NTAs were then divided into quartiles based on the distributions of each demographic variable. All sampled retailers were assigned the demographic quartile information for the NTAs in which they were located. Although NYC is highly diverse and has a sizable percentage of Asian residents (13%), this group was excluded from the analysis given the extremely wide range of the “high” quartile (i.e., 17%–70%).

Data Collection Procedures

After several rounds of pilot testing and finalizing the data collection instrument, the research team received 10 hours of classroom-based training in the use of the assessment form and store auditing procedures. Training activities included examinations to assess data collectors’ ability to accurately identify and classify tobacco products and advertisements. Two days of supervised, practice field visits ensured that each member of the research team was adequately prepared before beginning data collection. Fulcrum, a cloud-based software application that builds customized, mobile data collection forms,³⁰ was used to create and deploy the final data collection instrument, which was pushed to the data collectors’ smartphones. All store visits, divided evenly between four members of the research team, were completed between July and October 2017. Ten percent of each data collectors’ assigned stores were randomly sampled and revisited by the principal investigator to assess interrater reliability. All variables examined in this study had Cohen’s kappa values exceeding 0.75 (range: 0.78–0.97) and were retained for

analyses. We were unable to analyze data on another major tobacco product category, hookah, due to low interrater reliability.

Statistical Analysis

SAS (v.9.4) was used for all analyses, which were completed in June 2018. Descriptive statistics characterized the sample of retailers, including the distribution of stores by type and NTA demographic quartiles for percent NH White, NH Black, Hispanic, and median household income. The prevalence of product availability and advertising for the four tobacco products under study were calculated overall, by store type, and among retailers in each demographic quartile. Given the clustered nature of the observations (i.e., retailers nested within NTAs), which may violate the independence assumption of standard regression, multilevel models were used to account for correlated outcomes. Specifically, generalized estimating equations (GEEs) were employed using PROC GENMOD with NTA specified as the subject in the REPEATED statement. PROC GENMOD's log-Poisson regression capabilities with robust error variances generated adjusted prevalence ratios (aPRs) for product availability and advertising, which are preferable to odds ratios when the outcome of interest is common.³¹ Columbia University Medical Center's Institutional Review Board approved this study as nonhuman subjects research.

Results

A total of 796 retailers were successfully surveyed, yielding a completion rate of 91%. Of the stores we were unable to audit, 25 did not sell tobacco and 58 were temporarily closed or permanently out of business. Table 1 describes the final sample of retailers. The majority of stores were *bodegas* (38.7%), followed by nonchain convenience stores (33.9%), drug stores (7.5%), and chain convenience stores (5.7%). Retailers were approximately evenly distributed across the NTA quartiles for each demographic variable.

Product Availability

Table 2 displays the prevalence of product availability and the adjusted prevalence ratios for each variable in the regression model (i.e., store type, neighborhood demographic quartiles), controlling for all covariates. Because cigarettes were available in nearly all retailers (96%), they are not presented in the table. Cigars, sold in 78.8% of stores overall, were significantly more likely to be available in neighborhoods in the highest quartile for the percentage of Black residents [86.5%, aPR: 1.17 (1.02, 1.35)] compared with the neighborhoods in the lowest quartile for Black residents (73%). This association intensified for the availability of 99-cent cigarillos. Compared with retailers in neighborhoods with the lowest percentage of Black residents (i.e., quartile 1), stores in largely Black neighborhoods (i.e., quartile 4) had a 60% greater probability of carrying inexpensive cigarillos after adjustment [35.5% vs. 68.2%, aPR: 1.59 (1.19, 2.11)]. Similar trends were observed for the proportion of Hispanic residents and median household income, such that stores in neighborhoods with a higher percentage of Hispanic residents and lower income had a significantly greater probability of carrying 99-cent cigarillos. Moreover, *bodegas* had a substantially higher prevalence of cigarillo availability (71.1%) compared with other types of retailers, controlling for neighborhood demographics.

Patterns of noncombusted product availability, however, notably differed. Smokeless tobacco was fairly uncommon across the city (18.2% of all retailers carried smokeless products), but was significantly more accessible in neighborhoods with the highest proportion of

Table 1. Descriptive Statistics of Visited Retailers ($n = 796$), New York City, 2017

	<i>n</i>	%
Level 1 (store characteristics)		
Store type		
Bodega	308	38.7
Nonchain convenience	270	33.9
Drug store	60	7.5
Chain convenience	45	5.7
Grocery store	40	5.0
Other	73	9.2
Level 2 (neighborhood demographics)		
Percent White, NH		
Q1 (0.5%–7.5%)	190	23.9
Q2 (7.5%–25.5%)	214	26.9
Q3 (25.5%–62.9%)	181	22.7
Q4 (62.9%–95.5%)	211	26.5
Percent Black, NH		
Q1 (0.1%–2.6%)	189	23.7
Q2 (2.6%–9.3%)	225	28.3
Q3 (9.3%–30.8%)	190	23.9
Q4 (30.8%–90.2%)	192	24.1
Hispanic		
Q1 (2.7%–11.2%)	197	24.8
Q2 (11.2%–20.1%)	188	23.6
Q3 (20.1%–39.9%)	188	23.6
Q4 (39.9%–88.0%)	223	28.0
Median household income		
Q1 (\$20,937–\$42,075)	223	28.0
Q2 (\$42,075–\$58,362)	206	25.9
Q3 (\$58,362–\$75,006)	168	21.1
Q4 (\$75,006–\$170,766)	199	25.0

Bodega = small, neighborhood corner stores that sell inexpensive packaged goods such as candy, chips, lottery tickets, and miscellaneous household items. Nonchain convenience = similar to chain convenience stores in size and inventory but independently-owned. Other = vape shops, smoke shops, delis, newsstands, and dollar stores. Neighborhood = NYC's NTAs, divided into quartiles. NH = non-Hispanic.

White residents (i.e., quartile 4) compared with neighborhoods in the lowest quartile for the percentage of White residents [32.7% vs. 3.2%, aPR: 3.28 (1.24, 8.65)]. Retailers in the highest income neighborhoods were also more likely to carry smokeless tobacco products (36.2%). ENDS, available in nearly half of NYC retailers (45.7%), had a greater probability of being sold in neighborhoods that were predominantly White versus neighborhoods with the lowest percentage of White residents [66.4% vs. 24.2%, aPR: 1.71 (1.11, 2.62)]. Adjusting for covariates, the probability of ENDS availability was lowest in NTAs in the highest quartile for percentage of Black residents [28.7%, aPR: 0.71 (0.51, 0.98)]. Both smokeless tobacco and ENDS were most commonly sold in nonchain convenience stores and drug stores.

Product Advertising

Cigarettes were the most commonly advertised product, with ads present in half of all retailers (51.1%, Table 3). These ads were most prevalent in nonchain convenience stores (86.7%) and drug stores (68.3%), but no significant differences were observed by neighborhood demographic characteristics after controlling for other factors. Cigars and ENDS were advertised at similar rates across the city (21.2% and 27.4%, respectively), but the probability of product advertising differed based on neighborhood racial/ethnic makeup.

Table 2. Tobacco Product Availability^a by Store Type and Neighborhood Demographics in NYC Retailers (*n* = 796), 2017

	Cigars		99-cent cigarillos		Smokeless tobacco		ENDS	
	%	aPR (95% CI)	%	aPR (95% CI)	%	aPR (95% CI)	%	aPR (95% CI)
Level 1 (store characteristics)								
Store type								
Bodega	85.4	1.00 (ref)	71.1	1.00 (ref)	6.5	1.00 (ref)	31.8	1.00 (ref)
Nonchain convenience	84.4	1.04 (0.90, 1.19)	51.5	0.41 (0.24, 0.71)	60.0	5.16 (3.06, 8.70)	77.8	1.77 (1.39, 2.24)
Drug store	73.3	0.89 (0.75, 1.06)	1.7	0.03 (0.01, 0.22)	40.0	3.04 (1.80, 5.12)	81.7	1.84 (1.45, 2.34)
Chain convenience	45.0	0.53 (0.38, 0.76)	22.2	0.42 (0.25, 0.68)	5.0	0.50 (0.12, 2.11)	35.0	0.80 (0.53, 1.21)
Grocery store	81.1	0.98 (0.91, 1.06)	25.0	0.91 (0.77, 1.06)	20.7	1.85 (1.16, 2.96)	45.6	1.05 (0.84, 1.31)
Other	61.6	0.77 (0.63, 0.94)	23.3	0.51 (0.36, 0.72)	21.9	1.42 (0.78, 2.59)	61.6	1.30 (0.99, 1.72)
Level 2 (neighborhood demographics)								
Percent White, NH								
Q1 (0.5%–7.5%)	84.2	1.00 (ref)	67.9	1.00 (ref)	3.2	1.00 (ref)	24.2	1.00 (ref)
Q2 (7.5%–25.5%)	80.8	1.00 (0.91, 1.09)	60.8	1.01 (0.87, 1.17)	14.5	3.20 (1.38, 7.41)	37.9	1.37 (1.00, 1.87)
Q3 (25.5%–62.9%)	78.5	1.03 (0.90, 1.18)	45.3	1.00 (0.78, 1.28)	21.6	2.71 (1.09, 6.74)	53.6	1.50 (1.08, 2.09)
Q4 (62.9%–95.5%)	72.0	1.12 (0.93, 1.36)	26.1	1.21 (0.81, 1.79)	32.7	3.28 (1.24, 8.65)	66.4	1.71 (1.11, 2.62)
Percent Black, NH								
Q1 (0.1%–2.6%)	73.0	1.00 (ref)	35.5	1.00 (ref)	23.8	1.00 (ref)	58.7	1.00 (ref)
Q2 (2.6%–9.3%)	73.3	1.02 (0.91, 1.15)	33.3	1.07 (0.81, 1.42)	31.1	1.14 (0.82, 1.57)	57.8	0.95 (0.82, 1.10)
Q3 (9.3%–30.8%)	83.2	1.15 (1.00, 1.31)	64.7	1.36 (1.00, 1.85)	10.0	0.80 (0.45, 1.42)	35.8	1.02 (0.79, 1.31)
Q4 (30.8%–90.2%)	86.5	1.17 (1.02, 1.35)	68.2	1.59 (1.19, 2.11)	5.7	0.56 (0.30, 1.04)	28.7	0.71 (0.51, 0.98)
Hispanic								
Q1 (2.7%–11.2%)	71.1	1.00 (ref)	26.4	1.00 (ref)	27.9	1.00 (ref)	58.4	1.00 (ref)
Q2 (11.2%–20.1%)	81.4	1.15 (1.02, 1.30)	49.5	1.48 (1.13, 1.94)	16.0	0.85 (0.59, 1.24)	51.1	1.04 (0.87, 1.25)
Q3 (20.1%–39.9%)	82.5	1.13 (0.99, 1.30)	54.3	1.52 (1.15, 2.01)	22.3	1.73 (1.03, 2.91)	47.9	1.02 (0.78, 1.33)
Q4 (39.9%–88.0%)	80.3	1.07 (0.92, 1.25)	66.8	1.54 (1.14, 2.08)	8.1	1.20 (0.59, 2.43)	28.3	0.75 (0.53, 1.05)
Median household income								
Q1 (\$20,937–\$42,075)	83.9	1.05 (0.89, 1.25)	67.3	1.56 (1.04, 2.35)	7.2	0.44 (0.23, 0.86)	29.6	0.91 (0.66, 1.25)
Q2 (\$42,075–\$58,362)	80.6	1.06 (0.91, 1.25)	56.8	1.65 (1.12, 2.42)	12.6	0.48 (0.28, 0.80)	40.8	1.01 (0.76, 1.34)
Q3 (\$58,362–\$75,006)	78.6	1.01 (0.88, 1.17)	50.6	1.48 (1.04, 2.11)	18.5	0.61 (0.38, 0.97)	51.2	1.09 (0.88, 1.35)
Q4 (\$75,006–\$170,766)	71.4	1.00 (ref)	22.1	1.00 (ref)	36.2	1.00 (ref)	64.3	1.00 (ref)
Overall	78.8		49.8		18.2		45.7	

Note: Boldface indicates statistical significance ($p < .05$).

Cigars = little cigars, cigarillos, and/or large cigars; Smokeless tobacco = moist snuff, chewing tobacco, and/or snus; ENDS = electronic nicotine delivery systems; aPR = adjusted prevalence ratio; Bodega = small, neighborhood corner stores that sell inexpensive packaged goods such as candy, chips, lottery tickets, and miscellaneous household items; Non-chain convenience = similar to chain convenience stores in size and inventory but independently owned; Other = vape shops, smoke shops, delis, newsstands, and dollar stores; Neighborhood = NYC's Neighborhood Tabulation Areas (NTAs), divided into quartiles; NH = non-Hispanic.

^aCigarettes were universally available and thus not presented here.

Cigar advertisements, for example, were more common in largely Black neighborhoods compared with neighborhoods in the lowest quartile for the percentage of Black residents [31.3% vs. 19.6%, aPR: 1.91 (1.06, 3.45)]. Conversely, retailers in predominantly Black neighborhoods were least likely to advertise ENDS [20.3%, aPR: 0.63 (0.41, 0.99)]. The probability of ENDS advertising was also significantly lower in largely Hispanic NTAs (i.e., quartile 4, 22.9%). Only store type was predictive of smokeless tobacco advertising, such that nonchain convenience stores were more likely to advertise compared with bodegas [6.64 (2.99, 14.75)]. Notably, drug stores did not advertise any ATP, with the exception of infrequent ENDS advertising (6.8%).

Discussion

In NYC, there were observable neighborhood differences in the availability and promotion of ATPs with varying levels of risk. Tobacco retailers in neighborhoods with larger proportions of non-White residents and lower income levels were more likely to carry and advertise inexpensive, combusted products such as cigars and cigarillos,

while potentially less risky, noncombusted products such as smokeless tobacco and ENDS were more accessible in higher income and predominantly White neighborhoods. These findings may reflect consumer demand; that is, retailers might be more likely to carry and promote products that their customers currently use. According to national surveillance data, African Americans have the highest rates of cigar use and Whites have the highest rates of smokeless tobacco and ENDS use.⁸ Nonetheless, subgroups other than current users, such as susceptible nonusers, former users, and youth, are known to be influenced by product marketing at the point-of-sale and are important populations to consider.¹⁸ Although exposure to any type of tobacco promotion among these at-risk groups is concerning, the disproportionate marketing of the riskiest tobacco products in socially and economically disadvantaged communities is particularly troubling.

These findings may also have implications for product switching among smokers, who are increasingly transitioning to other forms of tobacco amid cigarette price increases and other restrictive policies.³² As NYC strengthens its restrictions on cigarettes (the minimum pack price is now \$13)³³ and FDA begins to implement its reduced nicotine strategy,¹⁵

Table 3. Tobacco Product Advertising by Store Type and Neighborhood Demographics in NYC Retailers (*n* = 796), 2017

	Cigarettes		Cigars		Smokeless tobacco		ENDS	
	%	aPR (95% CI)	%	aPR (95% CI)	%	aPR (95% CI)	%	aPR (95% CI)
Level 1 (store characteristics)								
Store type								
Bodega	50.0	1.00 (ref)	26.6	1.00 (ref)	3.3	1.00 (ref)	23.7	1.00 (ref)
Nonchain convenience	86.7	1.63 (1.35, 1.97)	40.0	1.75 (1.02, 3.01)	46.7	6.64 (2.99, 14.75)	62.2	2.10 (1.47, 3.00)
Drug store	68.3	1.40 (1.11, 1.75)	0.0	—	0.0	—	6.7	0.24 (0.09, 0.64)
Chain convenience	42.5	0.78 (0.54, 1.12)	10.0	0.42 (0.15, 1.17)	5.0	0.84 (0.18, 3.94)	15.0	0.55 (0.24, 1.23)
Grocery store	45.2	0.87 (0.71, 1.05)	20.4	0.85 (0.59, 1.24)	10.4	1.59 (0.74, 3.41)	29.6	1.03 (0.76, 1.40)
Other	46.6	0.96 (0.73, 1.26)	13.7	0.66 (0.32, 1.34)	13.7	1.56 (0.60, 4.05)	37.0	1.28 (0.83, 1.96)
Level 2 (neighborhood demographics)								
Percent white, NH								
Q1 (0.5%–7.5%)	47.9	1.00 (ref)	24.2	1.00 (ref)	1.1	1.00 (ref)	20.0	1.00 (ref)
Q2 (7.5%–25.5%)	52.3	1.03 (0.83, 1.28)	26.2	1.31 (0.87, 1.97)	7.0	3.74 (0.79, 17.66)	26.2	1.13 (0.76, 1.86)
Q3 (25.5%–62.9%)	51.4	0.94 (0.71, 1.25)	17.1	1.28 (0.72, 2.29)	11.6	3.31 (0.64, 17.20)	31.5	1.19 (0.76, 1.86)
Q4 (62.9%–95.5%)	52.6	1.02 (0.73, 1.43)	17.1	2.09 (0.95, 4.57)	15.6	3.54 (0.60, 20.78)	31.8	0.95 (0.53, 1.72)
Percent black, NH								
Q1 (0.1%–2.6%)	60.3	1.00 (ref)	19.6	1.00 (ref)	11.6	1.00 (ref)	35.5	1.00 (ref)
Q2 (2.6%–9.3%)	48.0	0.81 (0.66, 1.00)	12.9	0.73 (0.44, 1.21)	16.0	1.33 (0.75, 2.36)	31.1	0.95 (0.73, 1.23)
Q3 (9.3%–30.8%)	49.0	0.89 (0.71, 1.12)	22.6	1.26 (0.71, 2.23)	4.2	0.85 (0.35, 2.10)	22.1	0.79 (0.53, 1.17)
Q4 (30.8%–90.2%)	47.9	0.79 (0.60, 1.05)	31.3	1.91 (1.06, 3.45)	2.6	0.56 (0.18, 1.74)	20.3	0.64 (0.41, 0.99)
Hispanic								
Q1 (2.7%–11.2%)	50.8	1.00 (ref)	19.3	1.00 (ref)	12.2	1.00 (ref)	34.5	1.00 (ref)
Q2 (11.2%–20.1%)	54.8	1.12 (0.88, 1.42)	19.2	0.88 (0.53, 1.46)	10.6	1.04 (0.54, 2.02)	27.1	0.71 (0.51, 1.01)
Q3 (20.1%–39.9%)	51.6	0.98 (0.77, 1.27)	24.5	1.19 (0.69, 2.03)	11.7	1.57 (0.66, 3.72)	25.5	0.63 (0.42, 0.95)
Q4 (39.9%–88.0%)	48.0	0.98 (0.72, 1.34)	22.0	1.05 (0.56, 1.98)	2.2	0.51 (0.14, 1.84)	22.9	0.62 (0.40, 0.98)
Median household income								
Q1 (\$20,937–\$42,075)	46.2	1.02 (0.74, 1.42)	27.4	1.40 (0.71, 2.76)	2.7	0.42 (0.14, 1.31)	20.2	1.07 (0.65, 1.74)
Q2 (\$42,075–\$58,362)	53.9	1.16 (0.87, 1.53)	19.9	1.20 (0.62, 2.34)	6.8	0.64 (0.26, 1.55)	29.1	1.23 (0.77, 1.98)
Q3 (\$58,362–\$75,006)	57.7	1.26 (0.99, 1.61)	23.2	1.32 (0.72, 2.45)	10.7	0.72 (0.34, 1.53)	32.1	1.32 (0.88, 1.99)
Q4 (\$75,006–\$170,766)	48.2	1.00 (ref)	14.1	1.00 (ref)	16.6	1.00 (ref)	29.7	1.00 (ref)
Overall	51.1		21.2		8.9		27.4	

Note: Boldface indicates statistical significance ($p < .05$);

Advertisement = industry-made sign larger than a standard index card featuring tobacco company's logo and/or an image of the product; Cigars = little cigars, cigarillos, and/or large cigars; Smokeless tobacco = moist snuff, chewing tobacco, and/or snus; ENDS = electronic nicotine delivery systems; aPR = adjusted prevalence ratio; Bodega = small, neighborhood corner stores that sell inexpensive packaged goods such as candy, chips, lottery tickets, and miscellaneous household items; Nonchain convenience = similar to chain convenience stores in size and inventory but independently-owned; Other = vape shops, smoke shops, delis, newsstands, and dollar stores; Neighborhood = NYC's NTAs, divided into quartiles; NH = non-Hispanic.

smokers who are not ready to quit may seek ATPs from local tobacco retailers. The observed geographic differences in ATP accessibility may exacerbate existing health inequities if disparity populations of smokers migrate to combusted ATPs as a cigarette alternative, while others engage in tobacco harm reduction by completely transitioning to a non-combusted product. Emerging evidence indicates that lower income and non-White cigarette smokers are less likely to switch to ENDS compared with other groups of smokers.^{34,35} This study suggests that the local tobacco retail environment may partly explain this phenomenon.

Several study limitations are noted. First, NTAs were used to designate city neighborhoods, but these administrative boundaries may not accurately represent residents' own conceptualizations of their neighborhoods. Similarly, the activity spaces of city residents are not confined to the neighborhoods in which they live; communities where people work and spend free time are also important when examining the intersection between "place" and health. Second, this study captured a cross-sectional snapshot of tobacco product availability and advertising in neighborhoods, but did not examine associations with tobacco use behaviors. Future studies should link this type of ecological data on the tobacco retail environment with geocoded survey data on tobacco use patterns, including product initiation and switching. Third, we did not assess advertising *volume* for each product category, which is known to be higher in low-income and minority

neighborhoods,^{17,36} and is associated with tobacco use.¹⁸ Finally, our findings regarding demographic and store-level predictors of product availability and advertising in NYC may not represent patterns in other geographic locations. Indeed, NYC has a uniquely strong suite of policy measures related to tobacco retail, including a "Tobacco 21" age-of-sale law, a ban on flavored tobacco (with the exception of ENDS), and high minimum pack prices for cigarettes. Given that these policies are not related to the primary outcome variables of interest and were not implemented during the data collection period, however, we do not believe they accounted for any between-neighborhood differences in our study.

As cigarette use continues to decline, use of alternative tobacco products remains prevalent among various subgroups. Importantly, these products fall on a continuum of harm, with combusted tobacco presenting the greatest health risks to users. This study found that the availability and promotion of inexpensive, combusted ATPs disproportionately saturate low-income, minority communities. While public health efforts should restrict point-of-sale marketing for all tobacco products, policies should prioritize reducing the appeal and affordability of combusted products that are overwhelmingly responsible for the death and disease caused by tobacco use. Risk-based regulation may be an effective tool to reduce persistent health disparities and achieve the greatest public health benefit.

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Declaration of Interests

The authors have no conflicts of interest.

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