Nicotine and Tobacco Research, 2023, **25**, 28–35
https://doi.org/10.1093/ntr/ntac140
Advance access publication 3 June 2022
Original Investigation

Documenting the Impact Potential of a Menthol Cigarette Ban at Point-of-Sale: A Photograph-Based Analysis of the Presence and Placement of Menthol Versus Regular Cigarette Packs on the Shelves of Tobacco Retail Outlets in New York City

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Abstract

Introduction: To investigate the absolute and proportionate number of menthol versus regular cigarette packs displayed on the shelves inside tobacco retail outlets (TROs) across New York City (NYC).

Aims and Methods: Photographic surveillance methods were used to capture the presence and proportionate amount of all visible cigarette packs on the shelves inside $N = 160$ TROs. Statistical analyses examined the absolute and proportionate number of menthol packs in each TRO as a function of NYC borough, the local TRO environment, population smoking rates derived from the NYC Community Health Survey, and other demographic indicators from the American Community Survey.

Results: The total number of cigarette packs on the shelves of each TRO and the proportion of menthol packs varied significantly across TROs, averaging about one-quarter of all packs displayed ($M = 0.274$; SD = .15). Modeling results indicate that the proportion of menthol packs displayed was significantly greater in areas with elevated population smoking rates (odds ratio [OR] = 1.03, CI: 1.01–1.06) and density of TROs per 1000 residents (OR = 1.23; CI: 1.01–1.49), although these associations varied in complex ways with the proportion living under the federal poverty level and the proportion under age 18 years residing within each zip-code.

Conclusions: Results of this study demonstrate the utility of photograph-based TRO audit methods for objective, reliable documentation of the presence and proportionate amount of menthol versus other cigarette pack types on TRO shelves and highlight the need to account for sources of variation between small areas when examining the TRO product landscape and evaluating the effectiveness of regulatory actions against menthol.

Implications: This study describes use of a "hands-free" surveillance technique that offers valuable advantages over traditional retailer surveillance techniques. Comprehensive photographic surveillance data collection allows for more objective measurements of, in this case, the retail outlet's tobacco power wall, as multiple coders can review the same images and interrater reliability can be empirically tested. The results of this analysis highlight the need to account for local variation between small areas when examining TRO product landscapes and the effects of policy changes at the retailer level

Introduction

On June 22, 2009, the Family Smoking Prevention and Tobacco Control Act (FSPTCA) was signed into law, mandating that all tobacco products be sold from behind the counter and banning all characterizing flavors from being added to cigarettes.[1,2] Menthol flavors were exempted from the 2009 ban,[3] but the Food and Drug Administration (FDA) announced on April 29, 2021 intentions to pursue rulemaking that will ban menthol as a characterizing flavor in cigarettes,[4] and the draft rule is pending U.S. Office of Management and Budget review as of February 24, 2022.[5] Since about 30% of all tobacco products sold in the United States contain menthol, the enactment of a menthol ban will have implications for manufacturers, importers, distributors, wholesalers and retailers, and will likely face an array of legal, practical, and political barriers.[2] The US market is vulnerable to tobacco industry interference, such as direct-to-consumer messaging designed to assist menthol cigarette smokers transition to "replacement" products rather than quitting.[6,7] For example, the 2009 FSPTCA also banned cigarette products described as "light" or otherwise labeled as reduced harm, yet by replacing restricted wording with new coloring schemes (eg, blue and silver), the Tobacco Industry has nonetheless continued to convey similar messages of reduced harm to consumers.[8–11] Perhaps anticipating restrictions on menthol, some tobacco manufacturers are already marketing menthol cigarette packs that do not feature the word "menthol," nor traditionally green color schemes, and instead use other terms or colors to

Received: September 16, 2021. Revised: March 24, 2022. Accepted: June 1 2022.

suggest the menthol taste.[12,13] This follows the precedent set in the lead-up to the 2017 Canadian ban on menthol, which tobacco companies met with "replacement" menthol packaging and filter colors.[14–16]

Regulating tobacco products at the point-of-sale remains a cornerstone of comprehensive tobacco control,[17–20] yet at present, there is an almost complete lack of information about how aggressively the tobacco industry is promoting new packaging for menthol cigarettes on store shelves, or the degree that replacement products are already competing for shelf-space with traditional menthol and other non-menthol cigarette packs. Great progress has been made by the PhenX Tobacco Vector Environment projects,[21,22] and the NCI State and Community Tobacco Control project,[23] which has produced standardized tobacco retail outlet (TRO) audit tools such as the STARS,[24] to monitor both advertising and product placement. However, these tools are not designed to comprehensively inventory all cigarette products on display, nor offer an objective gauge of the proportionate ratio of menthol to regular flavored cigarette packs.[16,18] As a result, it is difficult to estimate the impact of a menthol ban on store shelves, whether to expect a differential impact of a ban within communities that have been targeted by menthol product marketing for decades and how retailers in those communities may be affected. This study examines these issues.

In this article, a field-validated photographic surveillance approach[25,26] was used to document the absolute and proportionate amount of menthol versus regular cigarette packs observed on the shelves of $N = 160$ New York City (NYC) independent (non-franchise) TROs. Outcomes included the number of forward-facing menthol cigarette packs visible on TRO shelves or other power displays, the total number of non-menthol cigarette packs displayed, and the marginal proportion of menthol to non-menthol cigarette packs, which yields a rough metric of the promotional placement priority allotted to each product category.[17] Analyses account for the relationship between neighborhood characteristics and retailer displays of traditional menthol packs and explore the promotional shelf-space dedicated to menthol versus non-menthol packs and the degree to which menthol packs that are not traditionally packaged might affect the implementation and enforcement of a ban on menthol packs. We conclude with a discussion of the challenges and opportunities for reliably capturing accurate shelf-pack counts of point-of-sale tobacco products, including the strengths and limitations of the present data collection methods and interpretive approach.

Methods

Tobacco Retail Outlet Selection

Twenty-seven subway stops were randomly selected from a sampling frame of all subway stops within four of the five boroughs of NYC ($N = 424$; excluding Staten Island). The total number of subway stops is 472, and there were 7745 unique TROs in NYC in 2015. We did a random draw of stops to reach our borough quota, then used google maps to determine if they were in commercial areas. If they were not, we substituted another stop until we reached our quota.

Sampling tobacco retailers near subway stops allowed for a systematic capture of retailers in trafficked areas most convenient to the majority of city residents and where zoning restrictions permit retail stores.[27,28] To ensure sufficient power for borough-wide analyses, it was determined that a minimum of 150 TROs would need to be included in the sample. The 2016 NYC Department of Consumer Affairs registry of licensed TROs was then used to select 10 independent TROs that were within a 10-min walk of each stop. Chain retailers, for which cigarette pack shelving proportions, are generally fixed at the state or regional level (eg, Rite Aid or Walgreens), were excluded. Each TRO was visited once.

Tobacco Retail Outlet Image Data

Passively collected, comprehensive photographic surveillance was used to capture the presence and placement of all visible tobacco products on the shelves of each TRO. These methods have previously been validated for the rapid, accurate identification of tobacco products displayed for sale within TROs.[25,26] Research assistants were trained in the use of discreet glasses equipped with high-definition cameras (*PivotHead*). During data collection, which took place in the second half of 2016, one field surveyor entered each TRO and stood in front of the store counter, directly in front of any power-walls, and remained motionless for about 5 s, allowing the camera glasses to capture successive images without blurring. As part of the data collection protocol, field surveyors walked through the entire store, capturing additional images with the glasses and different views of the power wall to make sure that all visible cigarette packages were captured in photographs.

Inter-rater Reliability

To ensure cross-validation of image data, two to three independent raters coded photographs of each TRO to determine the total count and proportion of menthol cigarette packs on display. Menthol cigarette packages were defined as packages with a primarily green coloring scheme or packages with "menthol" legible on the box. A repository of common menthol cigarette pack images was used for training purposes. In the first step, two coders determined whether each retailer had photos that were usable; photos too dark or too blurry to code were excluded from the analysis. All 160 outlets were found to have usable images. In Step 2, independent raters each counted the total number of menthol cigarette packs and the total number of non-menthol flavored cigarette packs visible in the photographs associated with each TRO. The proportion of menthol in each TRO was calculated by taking the total number of menthol packages divided by the total number of all cigarette packages within each outlet. In Step 3, to identify and improve upon any coding discrepancies, the team reassessed TROs where the proportion of menthol varied between the two initial coders by more than 20%. For each of these outlets ($N = 34$ [21.3%] TROs), two coders reevaluated the proportion of menthol in each outlet, and for these recoded outlets, the updated coding was interpolated. Following Step 3, these coding procedures produced an average inter-rater agreement level of 99.8% (SD = .08), up from 96.2%, for an aggregated improvement of 3.6% over the initial set of pack count ratings. The observed standard deviation translates to a margin of error of about ±2-packs per TRO, although it should be noted that for 77.5% of TROs ($N = 126$) the observed inter-rater difference score was less than 1.0 pack. To assess coding reliability across the full set of TROs, an intra-class correlation coefficient (ICC) was also calculated and found to indicate a high degree of agreement within and between TROs (ICC = 0.87).

Demographics

Using American Community Survey Census data, we included the following covariates at the zip-code level: percentage of residents that were under 18 years old, the percentage living below the federal poverty level, percent of African Americans, and percent of foreign-born.

Cigarette Smoking Prevalence

Smoking prevalence at the zip-code level was calculated using the restricted use file of the NYC Community Health Survey 2009–2013 (n = 44 886). The CHS is fielded annually and is representative of NYC adults over the age of 18 years that monitors health behaviors, health care utilization and neighborhood risk factors, adapting many questions, including those regarding smoking behaviors, from the Behavioral Risk Factor Surveillance System. Applying survey weights provided by NYC DOHMH, we calculated the weighted prevalence of smoking in each zip-code (dichotomized as never or former versus current smoking).

Tobacco Retail Outlet Frequency and Density Per 1000 Residents

The TRO selection process produced an average of 40 TROs per borough (range 38–45), with an average of 4.7 TROs in each zip-code (N = 34) found to encompass one (1) or more of the TROs surveyed for the present analysis (range: 4.5–4.9). Using the geo-coded addresses of all licensed NYC TROs (2016), we calculated the density of TROs per 1000 population. Both TRO density and the number of TROs per zip code were included as covariates in the analyses.

Statistical Analysis Approach

Univariate statistics were used to characterize the absolute and proportionate number of menthol packs per TRO by borough, and bivariate statistics were used to evaluate whether the amount of menthol in a given TRO was associated with the smoking rate or other zip code demographics. GLM multivariable models were used to examine the absolute and proportionate number of menthol packs in models that adjusted for available neighborhood covariates and included interaction terms for the borough. The significance of model parameters was assessed by measuring the relative reduction in model fit produced by their removal. Hierarchically nested models were used to isolate the relative influence or "leverage" of each covariate, a process that was guided by the standard likelihood ratio test statistics that are presented in Table 1.

Results

Table 1 presents descriptive statistics for each NYC borough and modeling results describing the relationship between the zip code covariates and the proportion of menthol packs displayed within TROs and between boroughs. The right-most column presents the *deviance* associated with each bivariate parameter, which is the magnitude of reduction in model fit observed when each factor is individually removed from the "borough bivariate model," which is the reference model used to assess model fit below. The rows of Table 1 are ranked in descending order of influence, according to the deviance values. The proportion of respondents who identify as current smokers resulted in the largest degradation in model fit when compared with all other covariates in the study (LR chi^2 (4) = 47.4, p < .001). Other demographic characteristics varied widely across the 34 zip codes in which the TROs sampled were located: the proportion of the population identifying as Black ranged from .06% to 72%, the percent under the age of 18 years ranged from 6.9% to 28.9% and the foreign-born percent of population in zip codes ranged from 18% to 81%, yet these factors were found to exert a significantly smaller influence on the proportion of menthol packs observed in adjusted models (Table 1; LR chi^2(4) = 11.4–21.8).

Both the absolute number and local clustering of TROs within each borough (ie, TRO Count and Density) were key covariates of proportionate menthol shelf presence. The raw number and within zip-code density of TROs varied significantly across the 34 zip-codes included, with raw values averaging 1.21 TROs per 1000 population (SD = .58; Range = 0.59–4.26), which is somewhat greater than the aggregated TRO density for NYC. Figure 1 shows the location of the TROs, characterized by the percentage of menthol displayed and the density of TROs within each zip code. Hierarchical model comparison testing revealed that the inclusion of borough-specific interaction terms significantly improved model fit overall (Table 1), and that TRO density between the NYC boroughs was significantly associated with the proportion of menthol versus non-menthol packs (OR = 1.23; CI: 1.01–1.49; Table 1), although this relationship appears to be driven largely by variation within the boroughs of Queens and Manhattan.

Both the total number of cigarette packs on the shelves of each TRO and the proportion of menthol varied significantly across TROs, averaging just over one-quarter of all packs displayed (M = 0.274; SD = 0.15), or about 16.5 ± 17.8 menthol packs per TRO (Range 13.4–20.2; Table 1). The total number of cigarette packages on display ranged from 3 to 360 (M = 75.71, SD = 86.03).

The "borough bivariate" model, which includes bivariate parameters crossing all study covariates with each of the four boroughs, was confirmed to provide a significantly improved fit to the data over an unconditional means model assuming independence among all covariates (LR chi^2 (5) = 45.7, p < .001). Compared to TROs in Manhattan (M = 77.08; SD = 87.09), Brooklyn (81.68; SD = 94.04), and the Bronx (94.41; SD = 111.42; OR), TROs in Queens were observed to have a significantly *smaller* number of cigarette packs on display overall (53.29; SD = 36.78; z = −2.08, p = .04). The borough of Queens was also observed to have the smallest average number of menthol packs per TRO, but this difference was not significantly different (M = 13.4; SD = 9.9; z = −1.37, p = .17), and on average the proportionate placement of menthol versus non-menthol packs in Queens (0.271; SD = .12) was similar to that in other boroughs (0.274; SD = .15; z = 1.82, p = .07).

To clarify the direction and magnitude of significant effects that emerged, the body of Table 1 also includes adjusted odds ratios (ORs) for the relationship between each covariate and the proportion of menthol packs on display in each TRO. Overall, findings indicate that the proportion of menthol packs displayed was significantly associated with the population smoking prevalence in the TRO zip code (OR = 1.03, CI: 1.01–1.06), although this association was primarily driven by differences between Queens and the Bronx. The density of TROs per 1000 residents was positively associated with the proportion of menthol packs displayed, but this relationship

Table 1. NYC Zipcode-Based Covariates and Multiple Logistic Regression of Outcomes (Total Cigarette Packs, Total Packs of Menthol Cigarettes, and Percent Menthol) by Borough

Covariate predictors [1]	*Brooklyn* Mean (SD) OR (95% CI)	*Bronx* Mean (SD) OR (95% CI)	*Manhattan* Mean (SD) OR (95% CI)	*Queens* Mean (SD) (REF)	Mean Covariate OR (*p*)*	Borough Bivariate OR (*p*)*	Covariate Deviance χ^2 (df)
% Smoker[2]	**15.4 (3.1)**	17.6 (3.8)	14.4 (2.4)	17.4 (5.9)			
OR (REF: Queens)	**0.90****	**0.41***	**1.04*****	(REF)	**0.98***	**1.03***	47.4 (4)
CI	(0.88; 0.93)	(0.39; 0.42)	(1.01; 1.07)		**(0.96; 1.00)**	**(1.01; 1.06)**	
TRO density[3]	1.0 (0.2)	1.2 (0.3)	1.4 (1.0)	1.2 (0.5)			
OR (REF: Queens)	**0.01*****	**0.04*****	1.04	(REF)	1.08	**1.23***	41.0 (4)
CI	(0.01; 0.01)	(0.04; 0.05)	(0.85; 1.27)		(0.92; 1.25)	**(1.01; 1.49)**	
TRO count[4]	85.7 (30.1)	73.6 (11.8)	51.5 (14.5)	58.8 (18.1)			
OR (REF: Queens)	**1.09*****	**1.49****	1.02	(REF)	**1.01***	**0.91***	31.4 (4)
CI	(1.09; 1.10)	(1.48; 1.50)	(1.01; 1.02)		**(1.00; 1.01)**	**(0.83; 0.99)**	
%<Age 18[5,]*	22.2 (3.2)	24.0 (3.4)	15.2 (4.4)	17.0 (3.2)			
OR (REF: Queens)	**0.72***	**43.33****	**1.20***	(REF)	1.02	1.02	21.8 (4)
CI	(0.66; 0.78)	(39.98; 46.95)	(1.11; 1.30)		(0.99; 1.05)	(0.97; 1.08)	
% Foreign born[5,]*	44.8 (12.2)	42.1 (7.0)	34.6 (13.8)	57.4 (12.5)			
OR (REF: Queens)	**1.09*****	**0.57*****	**1.08***	(REF)	**1.02***	**0.99***	20.3 (4)
CI	(1.08; 1.11)	(0.56; 0.58)	(1.06; 1.09)		**(1.01; 1.03)**	**(0.98; 1.00)**	
% Black[5]*	35.6 (29.3)	21.8 (11.7)	13.1 (15.2)	9.5 (18.0)			
OR (REF: Queens)	**0.98***	**1.13***	1	(REF)	1.00	1.00	14.6 (4)
CI	(0.97; 0.99)	(1.12; 1.14)	(0.99; 1.01)		(1.00; 1.01)	(1.00; 1.00)	
% FPL < 200[2,6,]*	57.2 (8.5)	59.8 (16.7)	36.1 (16.6)	43.6 (15.2)			
OR (REF: Queens)	0.99	**0.48****	**0.94***	(REF)	**0.99***	1.01	11.4 (4)
CI	(0.98; 1.01)	(0.48; 0.49)	(0.93; 0.96)		**(0.97; 1.00)**	(1.00; 1.02)	
Model outcomes					Mean Fitted BIC (df)	Borough Fitted BIC (df)	Model Deviance △ (df) χ^2 (df)
Total packs	81.7 (94.0)	94.4 (111.4)	77.1 (87.1)	53.3 (36.8)	75.71	75.71	
OR (REF: Queens)	28.40	41.12*	23.79	(REF)	1898.72	1924.17	10.07 (7)
CI	(−8.50; 65.29)	(4.48; 77.76)	(−13.11; 60.69)		9	16	*p* = .185
Menthol packs	17.6 (21.6)	20.2 (23.1)	15.3 (14.5)	13.4 (9.9)	16.48	16.48	
OR (REF: Queens)	4.15	6.75	1.89	(REF)	1402.704	1426.962	11.27 (7)
CI	(−3.55; 11.85)	(−0.89; 14.40)	(−5.81; 9.59)		9	16	*p* = .127
Menthol	27.97 (16.7)	30.08 (20.6)	24.41 (8.8)	27.09 (11.5)	22.7	22.7	
OR (REF: Queens)	0.81	0.81	0.74	(REF)	1281.24	1271.076	**45.69 (5)**
CI	(0.59; 1.13)	(0.57; 1.14)	(0.52; 1.04)		11	16	***p* < .001**

[1]Presented in descending order of impact on model fit (left to right), evaluated versus likelihood ratio χ^2 (df). Confidence intervals are at 95% level.
[2]Data from the NYC Community Health Survey.
[3]TRO Density = number of TROs per 1000 population (outlet data from NYC Department of Consumer Affairs).
[4]TRO Count = total number of tobacco retail outlets in the surrounding zip code (outlet data from NYC Department of Consumer Affairs).
[5]Data from the American Community Survey.
[6]FPL < 200 = percent below 200% of the federal poverty level.
Significance levels: **p* < .05; ***p* < .01; ****p* < .001.
Bold values indicates odds ratio (OR) for the relationship between each covariate and the proportion of menthol packs on display in each TRO.

was significantly positive only within Queens, and to a lesser extent Manhattan. TRO density was less predictive within the Bronx and Brooklyn, where the overall frequency of TROs was nonetheless greater overall, and menthol proportions varied in complex ways with the proportion living under the federal poverty level, and the proportion under the age of 18 years residing within each zip code.

Discussion

Given that the US FDA is pursuing rulemaking to ban menthol as a characterizing flavor in cigarettes and cigars,[4,5] it is essential that the tobacco control community adopts an empirically driven approach to evaluation, standardizing efforts to identify barriers that are sure to be part of the process. The pattern of results observed here indicates that menthol cigarette packs currently constitute about one quarter of the shelf-space within NYC TROs (M = 0.274; SD = 0.15), or about 16.5 ± 17.8 menthol packs per TRO (Range 13.4–20.2). Retailer density was positively associated with a higher proportion of menthol, perhaps because of competition among retailers for patrons. A noteworthy advantage of the present approach is this ability to distinguish variation due to raw pack counts from variation due to the proportion of menthol versus other non-menthol alternatives. As other scholars have noted, there is a need for further research into tools used for tobacco product measurement.[29]

While previous literature has demonstrated the tobacco industry's marketing of menthol packs to African Americans and other minority groups,[6] this study finds the proportion of menthol cigarette packs displayed was only weakly associated with the percent African American or the percent foreign-born in each zip code. However, interaction terms revealed that this relationship varied by borough, such that compared to Queens, the proportion of menthol packs on TRO shelves in the Bronx was significantly associated with the population smoking rate and proportion living under the federal poverty level in the zipcode area around the TRO. It may be that our findings reflect that people travel from the neighborhoods in which they live to more commercial areas, reached by subways, weakening the relationship between residential characteristics and purchasing behaviors.

Notably, images captured by the *PivotHead* camera glasses allowed for reliable estimates of green menthol packs but were less useful in determining how many non-green menthol cigarette packs were being sold, largely because the non-green menthol packs often have packaging that blends in with non-menthol packs. A post hoc coding-sensitivity analysis indicated that the proportionate amount of menthol could be somewhat greater than our primary estimates suggest. A review of images from sub-selection of TROs (N = 10) revealed that the count of menthol packs with green packaging may have missed on average, an additional 5% of menthol packs resulting in an underestimation of the proportion of menthol on these retailers' shelves. Figure 2 shows examples of this packaging retrieved in this study: Camel's "Blue Crush" menthol cigarette packaging uses the words "regular → fresh" instead of menthol; Marlboro and Lucky Strike use blue instead of green packaging, and Salem uses silver. These data confirm that nontraditional menthol packs are already on the shelves,

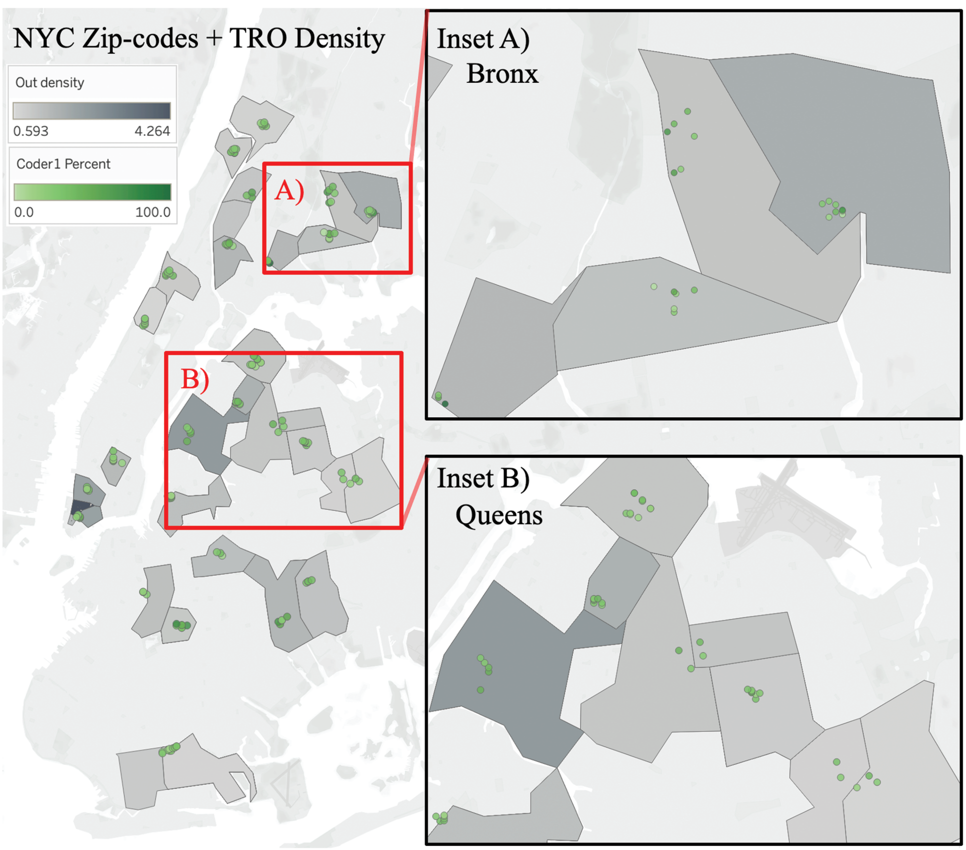

Figure 1. Tobacco retail outlet (N = 160) locations within NYC zip-code boundaries (N = 34).

Figure 2. Example of tobacco retail outlet image data highlighting presence of non-green menthol cigarettes.

even before a ban is enacted. Evidence from this study and others suggests that this type of packaging could pose barriers to the monitoring and enforcement of regulatory actions.[12–16]

This study has a number of notable limitations and strengths. First, our sampling frame only included TROs near subway stops, which by design correspond with commercialized areas, and serve a proportionately greater customer base than only those who are residents of the area. As a consequence, the demographic characteristics of the zip-codes, which are derived from residential households only, may differ from the characteristics of the consumers of the TROs. Furthermore, retailers in areas of the city not reachable by subway may be different from those that are, and reflect the preferences of residents more narrowly than those in more commercial areas.[10] Still, bus and subway lines are the principal means of transportation in the city, making subway stops a useful node for understanding commercial activities within neighborhoods. Second, NYC has among the highest cigarette taxes in the nation, as well as smoking rates that are lower than in the United States overall, limiting the generalizability of the results. Additionally, the data were gathered for this study in 2016 and thus cannot fully approximate the colors of all menthol cigarette packaging on shelves currently. Nonetheless, a major strength of this study is that it improves on current methods for monitoring power-walls and other promotional shelf-space inventory at TROs, given that standard audit tools are not designed to reliably capture the relative proportion of specific products on shelves. Point-of-sale photographs provide an evidence-based, historical record that can be repeatedly mined for evidence of evolving product placement practices, including compensatory tactics, both in response to and in anticipation of regulatory action against menthol flavorings.

Conclusions

Comprehensive tobacco control laws remain one of the most important ways to improve the nation's health and reduce the huge costs of tobacco-related morbidity and mortality. Unfortunately, prevention efforts are counter-balanced by economic pressure on retailers to sell tobacco, including large amounts of tobacco industry spending on product packaging and promotion. Retailer compliance will remain an essential aspect of policy enforcement, and key for understanding the effects of policy changes at the retailer level.[30–32] The present findings suggest that TRO shelf-space photographs could provide researchers with an objective, replicable measure of the proportionate presence of menthol cigarette packs on TRO shelves, and thus a useful gauge of implementation effectiveness that can be assessed repeatedly over the course of the policy rulemaking, adoption, and enforcement process. When a product is deemed illegal by FDA, the manufacturer is issued a no tobacco sale order, which applies retroactively and must be equitably enforced within all TROs across the United States. A key advantage of the photo-based approach is that unobtrusive inspections can continue without the need to search for products in advance—instead, photos can be mined post hoc for products that survey-based inspection tools would not have known to include and sales data do not capture. Working with regulators and local government administrators in the future, municipalities may be able to efficiently detect and track the presence of products both before and after they are deemed illegal, which would improve equitable enforcement and compliance.

What This Paper Adds

1. This study describes use of a "hands-free" surveillance technique that is relatively new to the field of public health; nevertheless, it offers valuable advantages over traditional retailer surveillance techniques.[25] Comprehensive photographic surveillance data collection allows for more objective measurements of, in this case, the retail outlet's tobacco power wall, as multiple coders can review the same images and inter-rater reliability can be empirically tested.

2. Menthol cigarettes made up, on average, about one-quarter of all packs displayed in tobacco retailers across NYC. Contrary to previous findings, the percent black and percent foreign-born of the zip-codes of these retailers was only weakly associated with the proportion of menthol.
3. Menthol cigarette packs that do not have the traditional green packaging are present in many retailers' inventories, and may present challenges for regulatory agencies enforcing a ban on menthol.
4. The results of this analysis highlight the need to account for local variation between small areas when examining TRO product landscapes and the effects of policy changes at the retailer level.

Supplementary Material

A Contributorship Form detailing each author's specific involvement with this content, as well as any supplementary data, are available online at https://academic.oup.com/ntr.

Funding

Funding for this study was provided by NYCDOHMH, contract #80924, and National Institute on Drug Abuse, National Cancer Institute, and Office of Behavioral and Social Science Research, Point-of-Sale Tobacco, Exposure and Response project (NIH—R01DA034734).

Declaration of Interests

The authors have no competing interests to declare.

Authors' Contributions

T.R.K. and D.S. conceived of the study, supervised the procedures, and wrote the final manuscript. A.G. and A.V. supervised field data collection, contributed to reliability assessments, and contributed to writing the Methods and Results, as well as reviewing and editing of the manuscript. A.G., D.S., and T.R.K. processed the dataset and conducted the statistical analyses. All authors contributed to data interpretation and gave final approval of the version to be published.

Patient Consent for Publication

Not required.

Ethics Approval

This study received approval from the NYU Institutional Review Board IRB-FY2016-2202.

Acknowledgments

The authors would like to thank Lisette Alvarez, Rachael Levy, Janelle Pangoniban, Sofiya Andreyeva, Sally Sunyoung Park, Hannah Stein, Michael Kwan, Marguerite Ruzich, Megha Talur, Nasreen Islam, Nya Sarweh, and LaShawn Miller for their assistance with data collection and coordination of the project.

Data Availability

Data are available upon reasonable request. All data relevant to the project are included in this paper or uploaded as supplementary information.

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