



# The association between neighborhood racial composition and menthol cigarette pricing in Boston, MA

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## ABSTRACT

**Objectives:** To examine the relationship between neighborhood demographics and pack prices of four brands of mentholated and non-mentholated cigarettes in Boston, Massachusetts.

**Methods:** Using tobacco pricing survey data collected July 2015 to June 2016, we examined cigarette prices in tobacco retailers ( $n = 689$ ) located in block groups ( $n = 325$ ) of Boston. Multilevel models examined both the association of menthol and non-menthol cigarette prices, and the percentage of retailers selling cigarettes below established minimum price in relation to neighborhood demographics.

**Results:** Each 10 percentage point increase in the proportion of black residents per block group was associated with a price decrease of 3 cents for menthol cigarettes ( $p < 0.01$ ). Each 10 percentage point increase in the proportion of black residents per block group was associated with a 19 percentage point increase in proportion of retailers selling menthol cigarettes  $\geq 25$  cents below minimum price ( $p < 0.01$ ).

**Conclusion:** Mentholated cigarettes were priced significantly lower in neighborhoods of color in Boston. Strengthened pricing laws, with consideration given to menthol products in the retail environment, may be needed to address environmental contributors to smoking disparities.

## 1. Introduction

Tobacco industry documents reveal deliberate marketing strategies employed by the industry to promote menthol cigarettes to black residents in their neighborhood stores (Gardiner, 2004; Anderson, 2011). Neighborhoods of color have more tobacco retailers and more advertising of tobacco products, both on storefronts and inside stores compared to neighborhoods with mostly white residents (Primack et al., 2007; Lee et al., 2015). Advertisements for mentholated tobacco products are more common in areas with greater proportions of black and low-income residents (Laws et al., 2002; Seidenberg et al., 2010; Henriksen et al., 2012).

Accordingly, this targeted advertising of menthol cigarettes to and in communities of color, particular black communities, has led to increased use of menthol cigarettes among both black adults and black youth. Prior research shows that point-of-sale marketing in the retail environment is positively associated with youth initiation of cigarettes (Henriksen et al., 2010; Portnoy et al., 2014; Robertson et al., 2016). In national survey data (2012–2014), approximately 85% of black smokers aged 12 years or older smoked menthol cigarettes in the past month compared to 29% of white smokers (Villanti et al., 2016). Newport cigarettes, a brand which is almost exclusively mentholated, are the most popular cigarette brand among both black youth and black

adult smokers (Caraballo and Asman, 2011; Perks et al., 2018).

Higher menthol use rates, especially among black people, is concerning as menthol cigarettes are more addictive and harder to quit than non-menthol cigarettes (Gundersen et al., 2009; Smith et al., 2014; Fagan et al., 2015). Although blacks tend to smoke at the same rates as whites, black smokers are less successful at quitting and disproportionately suffer from smoking-attributable death and disease (Trinidad et al., 2011; Benowitz et al., 1998).

While several studies have shown a greater proportion of menthol advertising in the tobacco retail environment in low-income neighborhoods and neighborhoods of color, few studies have examined menthol cigarette pricing in these neighborhoods. The tobacco industry uses various tactics to reduce the price of their products, as lower prices are known to encourage smoking initiation among youths and adults (Henriksen et al., 2010; Portnoy et al., 2014; Robertson et al., 2016). Existing studies on the association between menthol price and racial make-up have shown varying results. A study of a sample of Minneapolis convenience stores found that menthol cigarette price was not associated with proportions of non-white and youth residents, and the price of discounted non-menthol cigarette brands decreased with higher proportion of residents of color (Toomey et al., 2009). A study of a sample of California school neighborhoods found lower prices for Newport cigarettes in school neighborhoods with more black students

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(Henriksen et al., 2012). Similarly, a study of tobacco retail outlets in school neighborhoods of Washington D.C. also found that price of Newport cigarettes decreased as non-white neighborhood composition increased (Cantrell et al., 2015).

Previous studies examining menthol pricing have typically focused on the retail environment surrounding schools, however, these studies do not examine menthol pricing in the broader neighborhood environment where black youth and black adults live, work, and play. This paper extends previous research by examining the association between mean price of menthol cigarettes (Newport) and racial composition on the census block group-level in Boston, Massachusetts. Similar to other areas featured in previous studies, Boston is a large urban city with a history of racial red-lining that led to racial segregation, forcing blacks and other people of color into certain neighborhoods (Massachusetts Metropolitan Area Planning Council, 2011). An unanticipated consequence of a long history of housing and socioeconomic segregation is the ease by which the tobacco industry can target people of color where they live. Previously, three studies conducted in the city of Boston observed more tobacco retailers and greater storefront advertising for menthol cigarettes in predominately black and Latino neighborhoods (Laws et al., 2002; Seidenberg et al., 2010; Pucci et al., 1998).

This study also examines racial composition and its association with the percent of tobacco retailers selling Newport menthol cigarettes substantially ( $> = \$0.25$ ) below the brand's minimum price as established by the Massachusetts Department of Revenue under the state's minimum price law ("Established Minimum Price"). While mean pricing is subject to the influence of extreme pricing by a few retailers, examining the proportion of retailers selling substantially below the Established Minimum Price (EMP) sheds light on the prevalence of the discounting practice and its relationship with a neighborhood's racial composition.

## 2. Methods

### 2.1. Sample

Massachusetts state laws require tobacco retailers to obtain a license in order to sell tobacco products. As a result, the Massachusetts Tobacco Cessation and Prevention program (MTCP) is able to obtain a list of all active tobacco retailers in Massachusetts. Municipal Board of Health programs funded by MTCP and a service vendor, John Snow Research & Training Institute, Inc. (JSI), conducted in-person pricing surveys of tobacco retailers across the state, including Boston. This study examines pricing survey data collected in Boston over the state fiscal year 2016 (July 1st, 2015–June 30, 2016). Of the 784 retailers with active licenses in Boston at the time, 689 retailers were successfully surveyed, representing 88% of Boston's total. Reasons for non-completion includes retailer closing, retailer not found, retailer not selling tobacco at time of visit, or retailer refusal.

Pricing surveys contain questions on availability and pricing of several tobacco products, including four major cigarette brands: Marlboro Red, Newport Green, Camel Filters and Pall Mall Red. Newport Green is a designated mentholated brand and classified as menthol while Marlboro, Camel and Pall Mall have been classified as non-menthol in this study. Surveys also collect information on individual retailer name, address, if the retailer is part of a chain or independently-owned and retail store type (e.g., gas station, convenience store, grocery store). While cigarette prices could be captured on the survey as a pre-tax or with-tax value, all prices were converted into pre-tax values during data cleaning to ensure uniformity of price across brands. JSI compared observed cigarette prices to the EMP for each brand to ascertain the number of retailers selling below minimum price and the monetary amount being sold below minimum price for each product.

### 2.2. Independent variables

Block group-level demographic data was obtained for Boston from the 5-Year (2011–2015) American Community Survey (ACS), including race, ethnicity, age, income, and education. The main independent variables of interest were racial/ethnic make-up of block groups in Boston: % black and % Latino. The percent of black and Latino residents were important to include as independent predictors due to tobacco industry marketing of menthol cigarettes to people of color and prior studies indicating an association between cigarette prices and the percent of non-white residents. Covariates on the block group level included: gender (% female), age (% youth under 18 years old), median household income, education (% with a 4-year college degree or higher) and population density (the number of residents per square mile). Demographics were checked for collinearity prior to being included in the model. Tobacco retail density (number of tobacco retailers per 1000 individuals) and proportion of independent retailers per block group were included as additional covariates in the model using pricing survey data.

Due to neighborhood variations in demographic make-up and socioeconomic conditions, the block group level of analysis examines variation that may be obscured within seemingly homogeneous neighborhoods. Boston contains a total of 560 block groups and the sample of tobacco retailers examined in this study were located in 325 block groups. About 40% of block groups in Boston (235) were not included in this sample because there were no tobacco retailers in that block group or retailers were unable to be surveyed.

### 2.3. Outcome variables

There were two primary outcome variables examined on the block group level: mean cigarette price per pack for menthol and non-menthol brands and the percent of retailers selling menthol and non-menthol cigarette brands for 25 cents or more below Established Minimum Price (EMP). Regulations passed pursuant to Massachusetts's minimum price law establish a formula that incorporates a mark-up to the manufacturer's invoice price and an assumed cost of doing business to determine the minimum price of all individual cigarette brands sold in Massachusetts. Since this base price is subject to periodic adjustment by the Department of Revenue, the EMP is prone to frequent variation by a few cents. In this paper, an amount below 25 cents or more was therefore used to capture only the retailers selling substantially below the EMP and excluded retailers who may unintentionally sell marginally below the EMP due to the periodic changes in the formula.

Retailer addresses were geocoded and mapped on the block group level, using ArcGIS (v.9.3.1, ERSI, 2009). Cigarette pricing data from retailers was linked to the 2011–2015 ACS data using a spatial join. For each block group with tobacco retailers, the mean cigarette price per pack was calculated individually for all four brands. The mean cigarette price per pack was calculated as the average price of that brand among all retailers that sell that brand in that block group. Additionally, the percent of retailers selling 25 cents or more below EMP was calculated for each block group with retailers selling any of the four brands 25 cents or more below EMP minimum price in the numerator and all surveyed retailers were contained in the denominator.

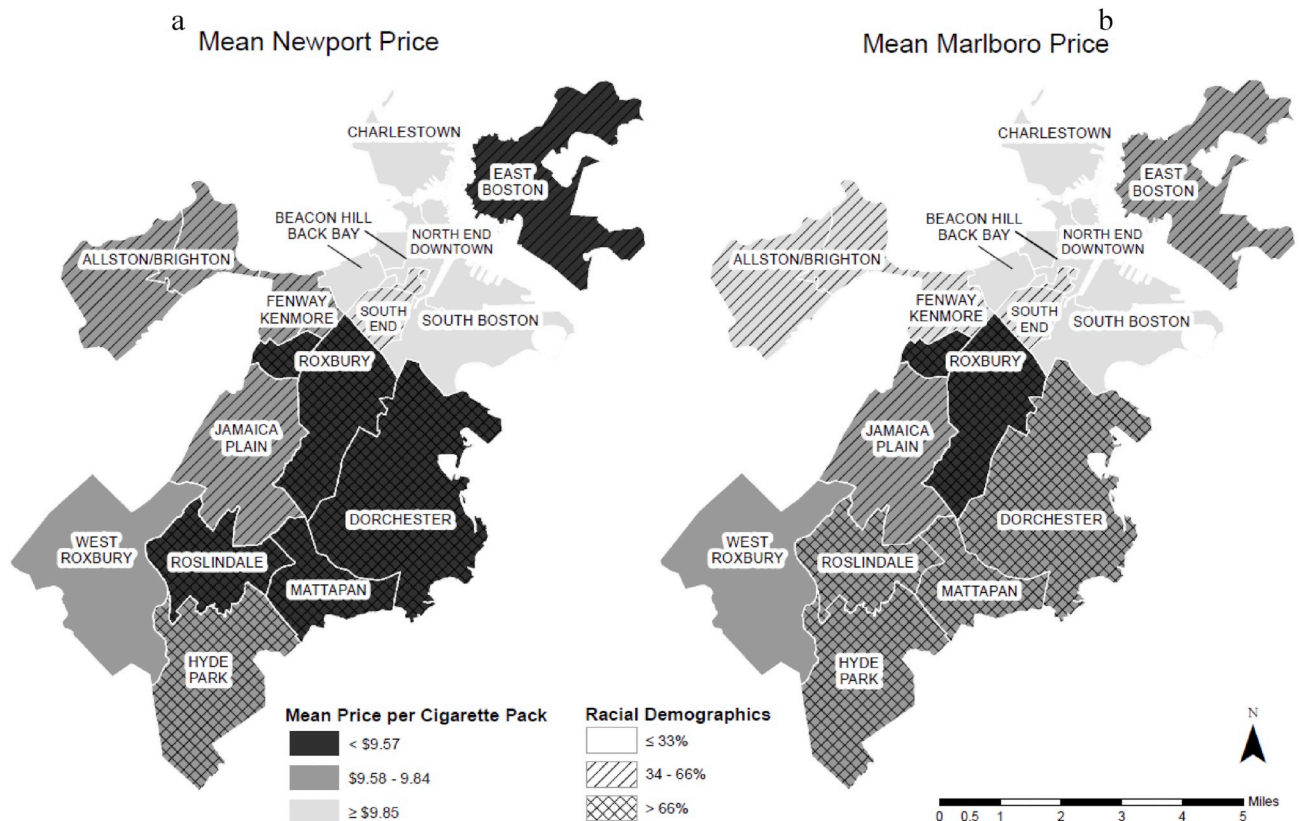
### 2.4. Analysis

Generalized linear mixed models (GLMM) with a normal distribution were used to examine the relationship between neighborhood demographics and mean price per pack of menthol and non-menthol cigarettes on a block group level. GLMM models with a negative binomial distribution and random effects were used to examine the relationship between neighborhood demographics and the percent of retailers selling menthol and non-menthol cigarettes 25 cents or more below minimum price. Estimates of the variance of Pearson residuals were

**Table 1**  
Select characteristics of Boston neighborhood block group clusters.<sup>a</sup>

Block Groups (N)	Demographic Characteristics				Retail Environment Characteristics						
	Retailers (N)	Black (%)	Latino (%)	Median Income (\$)	Independent Retailers (%)	Convenience stores and gas mini-marts (%)	Retail Density	Newport Price (\$)	Marlboro Price (\$)	Retailers selling 25 cents or more below minimum price (%)	
<b>Boston</b>	545	689	23%	18%	\$64,889	49%	60%	1.39	\$9.64	\$9.75	28%
<b>By Neighborhood:</b>											
Allston/Brighton	60	56	5%	12%	52,209	43%	71%	1.22	9.72	9.86	19%
Beacon Hill/Back Bay	22	21	2%	6%	100,431	31%	58%	0.82	10.23	10.30	4%
Charlestown	16	13	9%	11%	89,294	41%	54%	0.97	9.88	9.92	13%
Dorchester	102	134	42%	14%	54,395	62%	64%	1.50	9.53	9.66	39%
Downtown/North End	23	76	3%	8%	105,476	55%	44%	3.40	9.91	9.90	16%
East Boston	31	64	3%	55%	52,813	65%	59%	1.91	9.52	9.60	33%
Fenway Kenmore	44	23	6%	13%	42,850	32%	67%	1.05	9.84	9.97	20%
Hyde Park	29	30	43%	23%	67,451	45%	65%	1.25	9.58	9.70	30%
Jamaica Plain	32	27	10%	22%	86,375	33%	68%	0.87	9.59	9.73	27%
Mattapan	17	14	76%	18%	43,378	24%	61%	0.82	9.54	9.63	39%
Roslindale	29	35	20%	25%	74,885	59%	56%	1.38	9.56	9.66	33%
Roxbury	66	92	52%	25%	33,261	53%	51%	1.60	9.34	9.53	42%
South Boston	35	43	5%	10%	81,334	38%	56%	1.53	9.85	9.89	16%
South End/Chinatown	26	40	10%	13%	82,678	69%	60%	1.31	9.85	9.92	21%
West Roxbury	13	20	5%	7%	89,704	33%	65%	0.90	9.75	9.82	15%

<sup>a</sup> - Demographic data is from the 2011–2015 American Community Survey; Retail Environment data is from the FY16 Pricing Survey; Analysis was conducted on a block group level; Demographic data and retail environment data is presented on the neighborhood level for ease of understanding.



**Fig. 1.** Mean price of mentholated Newport Green cigarettes and non-mentholated Marlboro Red cigarettes in Boston neighborhoods, Fiscal Year 2016

produced and compared to 1.0 in order to ensure appropriate distributions were chosen for the model (Dickey, 2014).

Fifteen neighborhoods of Boston were included in this analysis as a clustering variable in the model to account for clustering of block group characteristics. While Boston has a total of 23 designated

neighborhoods, 2 neighborhoods were excluded due to lack of retailer data (West End, Harbor Islands). Eight adjoining neighborhoods were combined to create four distinct neighborhoods due similarity in terms of neighborhood demographic characteristics. All covariates, including those that represent percents, were scaled so that a 1 unit increase

represents a 10 percentage point increase for ease of interpretation. Data was analyzed using SAS 9.3 (SAS Institute, Cary, NC).

### 3. Results

Table 1 describes select demographic and retailer characteristics of Boston neighborhoods included in this study on the block group level. While all block groups combined in Boston are, on average, 23% black, there is great variation between the racial make-up of Boston neighborhoods. For instance, an average of 76% of residents living in block groups within the neighborhood of Mattapan are black, compared to only 2% of residents living in block groups within the neighborhoods of Beacon Hill and Back Bay. Similarly, while all block groups combined are 18% Latino, block groups in East Boston are 55% Latino compared to block groups in Beacon Hill and Back Bay, which are 6% Latino. Income also varies between neighborhoods: for example, block groups in Roxbury had an average median income of \$33,261, nearly half of the Boston average of \$64,889 while the median income for Beacon Hill and Back Bay was \$100,431. In terms of retail environment characteristics, about half (49%) of all retailers on the block group level in Boston are independent retailers. Convenience stores and gas station mini-marts tend to make up the majority of retailers in Boston block groups (60%). Tobacco retail density was 1.35 for all Boston block groups, with the highest density in Downtown and North End (3.40) and lowest in Beacon Hill and Back Bay, as well as Mattapan (0.82). While 28% of retailers in all block groups were selling cigarettes 25 cents or more below the EMP, in Roxbury that number was 42% of retailers compared to only 4% of retailers in block groups in Beacon Hill and Back Bay.

Fig. 1 displays the average price of Marlboro and Newport menthol cigarettes, the two brands most widely available in Boston, and neighborhood racial make-up (% non-white). The average price per pack of Newport menthol cigarettes per block group was \$9.64 (SD = \$0.35, n = 671 retailers) in Boston overall. The average price per pack of Newport was lowest in block groups in the neighborhood of Roxbury at \$9.34 and highest in the neighborhoods of Beacon Hill and Back Bay at \$10.23. The average price per pack of Marlboro cigarettes per block group was \$9.75 (SD = \$0.34, n = 674 retailers) in Boston, however, the lowest average price per pack of Marlboro, similar to Newport, was seen in Roxbury (\$9.53) and the highest average price per pack of Marlboro cigarettes was again seen in Beacon Hill and Back Bay (\$10.30).

Racial make-up of a block group was associated with lower prices of menthol cigarettes (Table 2). After adjustment for block group demographic and retailer characteristics, each 10 percentage point increase in the percent of black residents in a block group was significantly

associated with a price decrease of 3 cents for Newport menthol cigarettes (95% CI: -0.05, -0.01, p = 0.02). In comparison, there was no association seen between any block group demographic characteristics, including race, and the price of non-menthol Marlboro or Camel cigarettes. Each 10 percentage point increase in the percent of black residents in a block group was significantly associated with a price increase of 6 cents for Pall Mall cigarettes (95% CI: 0.02, 0.09, p = 0.004).

Racial make-up of a block group was also a significant predictor of the percent of tobacco retailers selling menthol cigarettes 25 cents or more below EMP (Table 3). After adjustment for block group demographics and retailer characteristics, each 10 percentage point increase in the percent of black residents in a block group was significantly associated with a 19 percentage point increase in the percent of retailers selling Newport menthol cigarettes 25 cents or more below EMP (95% CI: 0.09, 0.29, p = 0.002). Furthermore, each 10 percentage point increase in the percent of Latino residents in a block group was significantly associated with a 13 percentage point increase in the percent of retailers selling Newport menthol cigarettes 25 cents or more below EMP (95% CI: 0.02, 0.24, p = 0.02). Racial make-up of block groups was not associated with retailers selling Marlboro, Camel or Pall Mall cigarettes 25 cents or more below EMP. The percent of independent retailers in a block group was significantly associated with retailers selling all four cigarette brands (Newport, Marlboro, Camel, Pall Mall) significantly below EMP.

### 4. Discussion

This study adds to existing research on menthol cigarette pricing in relation to race and place of residence. Consistent with prior studies, we found that Newport menthol cigarettes were priced significantly lower in block groups with a greater proportion of black residents (Henriksen et al., 2012; Cantrell et al., 2015). This relationship was not seen for Marlboro or Camel, as race was not a significant predictor of price for these non-mentholated brands. The growing body of evidence that demonstrates lower prices of menthol cigarettes in communities of color is concerning as black youth and adults are more likely to use menthol cigarettes, which are more addictive and harder to quit. Lower prices may contribute to disparities seen in menthol smoking rates among blacks, as populations of color are price sensitive to tobacco (Centers for Disease Control and Prevention (CDC), 1998; Farrelly et al., 2001). Lowering prices is one tactic that the tobacco industry uses to increase demand among price sensitive populations (Chaloupka, 1999; Rice et al., 2010). Prior studies provide evidence that blacks and Latinos are far more responsive to cigarette prices than whites (Farrelly et al.,

**Table 2**  
Association between mean price per cigarette pack and block group characteristics: Boston, FY2016

	Mean Newport Price - menthol (n = 671) <sup>a</sup>		Mean Marlboro Price - nonmenthol (n = 674) <sup>a</sup>		Mean Camel Price - nonmenthol (n = 555) <sup>a</sup>		Mean Pall Mall Price - nonmenthol (n = 483) <sup>a</sup>	
	Coef	95% CI	Coef	95% CI	Coef	95% CI	Coef	95% CI
<b>Block Group Demographics</b>								
% Black	<b>-0.03*</b>	-0.05, -0.01	-0.02	-0.04, 0.01	-0.01	-0.04, 0.03	<b>0.06**</b>	0.02, 0.09
% Latino	-0.02	-0.05, 0.01	-0.01	-0.04, 0.02	-0.01	-0.04, 0.04	-0.01	-0.06, 0.04
% Female	0.02	-0.03, 0.07	0.00	-0.05, 0.05	0.03	-0.04, 0.11	0.02	-0.07, 0.11
% Youth (Under 18)	-0.01	-0.07, 0.04	0.01	-0.05, 0.06	-0.03	-0.11, 0.05	-0.05	-0.14, 0.05
Median Income	0.78	0.33, 1.07	0.96	0.39, 2.36	0.63	0.18, 2.19	1.81	0.41, 8.05
% College Educated	0.02	-0.01, 0.05	0.03	0.00, 0.06	0.03	-0.01, 0.07	-0.01	-0.05, 0.05
Population Density	-0.21	-0.75, 0.34	-0.52	-1.07, 0.03	0.11	-0.68, 0.89	0.35	-0.61, 1.31
<b>Retail Environment Characteristics</b>								
Retail Density	0.21	0.00, 0.42	0.17	-0.04, 0.38	0.29	-0.01, 0.60	-0.16	-0.52, 0.20
% Independent Retailers	-0.01	-0.02, 0.01	-0.01	-0.02, 0.01	-0.01	-0.03, 0.01	0.01	-0.01, 0.03

Abbreviations: Coef. - coefficient; CI - confidence interval.

Boldface indicates statistical significance (\*p < 0.05, \*\*p < 0.01).

<sup>a</sup> - N's represent the number of tobacco retailers selling the specified cigarette brands.

**Table 3**  
Percent of retailers selling  $\geq 25\text{¢}$  below minimum price in relation to block group characteristics: Boston, FY2016

	Percent of retailers selling Newport 25¢ or more below minimum price - menthol (n = 277) <sup>a</sup>		Percent of retailers selling Marlboro 25¢ or more below minimum price - nonmenthol (n = 236) <sup>a</sup>		Percent of retailers selling Camel 25¢ or more below minimum price - nonmenthol (n = 172) <sup>a</sup>		Percent of retailers selling Pall Mall 25¢ or more below minimum price - nonmenthol (n = 123) <sup>a</sup>	
	Coef	95% CI	Coef	95% CI	Coef	95% CI	Coef	95% CI
<b>Block Group Demographics</b>								
% Black	<b>0.19**</b>	0.09, 0.29	-0.01	-0.10, 0.08	0.01	-0.09, 0.11	0.03	-0.12, 0.19
% Latino	<b>0.13*</b>	0.02, 0.24	-0.02	-0.13, 0.09	-0.02	-0.15, 0.11	0.06	-0.13, 0.26
% Female	-0.16	-0.39, 0.07	-0.03	-0.24, 0.18	-0.23	-0.47, 0.01	-0.02	-0.41, 0.36
% Youth (Under 18)	-0.02	-0.26, 0.22	-0.01	-0.23, 0.22	0.05	-0.20, 0.31	-0.17	-0.60, 0.26
Median Income	1.30	0.89, 1.91	1.02	0.71, 1.46	0.94	0.64, 1.38	1.56	0.11, 3.03
% College Educated	-0.05	-0.17, 0.07	<b>-0.16**</b>	-0.27, -0.05	-0.02	-0.15, 0.10	<b>-0.21*</b>	-0.40, -0.02
Population Density	-2.00	-4.51, 0.51	1.10	-1.06, 3.26	-1.41	-3.93, 1.11	-2.47	-7.73, 2.80
<b>Retail Environment Characteristics</b>								
Retail Density	-0.18	-1.13, 0.77	0.14	-0.82, 1.09	0.16	-0.96, 1.28	0.31	-1.15, 1.79
% Independent Retailers	<b>0.19**</b>	0.13, 0.24	<b>0.07*</b>	0.01, 0.12	<b>0.11**</b>	0.05, 0.17	<b>0.15**</b>	0.05, 0.26

Abbreviations: Coef. - coefficient; CI - confidence interval.

Boldface indicates statistical significance (\*p < 0.05, \*\*p < 0.01).

<sup>a</sup> - N's represent the number of tobacco retailers selling the specified cigarette brands.

2001; DeCicca et al., 2000). One study among black and Latino smokers found that younger smokers (18–25) were substantially more price-responsive than older smokers (> 40 years). After controlling for income, education and other demographics, black and Latino smokers were more likely than white smokers to reduce or quit smoking in response to a price increase (Centers for Disease Control and Prevention (CDC), 1998). Both availability and price of tobacco products are associated with exposure, initiation and use (Henriksen et al., 2010; Portnoy et al., 2014; Robertson et al., 2016). As Newport menthol cigarettes are available nearly universally across retailers in Boston, a lower pricing strategy may be the primary mechanism the industry uses to attract and retain users to Newport menthol cigarettes in communities of color.

Another significant finding of this study was that the percent of retailers that sold Newport menthol cigarettes 25 cents or more below EMP was significantly higher in block groups with more black or Latino residents. This relationship was not seen for the other non-mentholated cigarettes brands: Marlboro, Camel and Pall Mall. To our knowledge, this is the first study to examine the relationship between cigarettes being sold significantly below EMP and racial make-up on a neighborhood level. Block groups in neighborhoods of color (e.g. Dorchester, Roxbury, Mattapan and Roslindale) contained the highest proportion of retailers selling Newport menthol cigarettes significantly below the EMP. This finding may represent a pattern of tobacco industry targeting where retailers located in neighborhoods of color are encouraged to sell Newport menthol cigarettes below minimum price, despite the EMP law in Massachusetts.

There is evidence to suggest that tobacco companies incentivize retailers, primarily independent retailers in low-income communities or communities of color, to engage in marketing and pricing strategies. For example, tobacco companies supervise and secure the placement of products and advertising in highly visible places in return for financial incentives, often times a lower price of products than competitors (Pollay, 2007). In one study of cigarette company incentive programs, findings showed that convenience stores and gas mini-marts were most likely to participate in these promotions, and 4 out of 5 retailers reported that the tobacco company supervised the location of marketing materials in their store (Feighery et al., 2004). This type of incentive program may also lead to lower menthol prices, as the study also found that there was a significant relationship between participation in the Lorillard incentive program and a 27 cent lower price of Newport menthol cigarettes than in stores that did not participate in such a program (Feighery et al., 2004). In Boston, convenience stores and gas station mini-marts make up a large proportion of retailers, who may be the intended audience of these types of industry-sponsored retailer promotions.

Menthol cigarettes have historically been targeted towards black youth and adults, who today have higher smoking rates of menthol cigarettes than any other racial group, and the prevalence of retailers selling menthol cigarettes below minimum price in their neighborhoods may further contribute to inequities in smoking rates and smoking-related death and disease. Due to the historic use of lower pricing strategies by the industry, retailers in these communities may be selling menthol cigarettes below minimum price because it has been incentivized to do so by the industry. Although the effect size seen in price is small, pricing of menthol cigarettes is only one dimension of the tobacco retail environment which also includes marketing and advertising of these products. Prior studies in the Boston area have demonstrated that predominately non-white neighborhoods have more menthol marketing and advertising, both on the outdoor storefront and inside the retailer space (Laws et al., 2002; Seidenberg et al., 2010; Pucci et al., 1998). Targeted advertising and lower prices, in conjunction with social norms, perpetuate an environment where menthol cigarette smoking is normalized in black communities.

There were limitations to note in this study. A cross-sectional design was used to examine cigarette pricing in one fiscal year in one large urban area in Massachusetts. While our sample is not representative of the state, similar results may be expected in other large urban areas in the United States, especially those with distinct neighborhoods made up of primarily people of color as a result of historical segregation. Only one mentholated brand of cigarettes (Newport) was examined in this study. This type of study should be repeated for other mentholated brands in order to capture whether the relationship between price and racial makeup also holds true for other menthol cigarettes. As Newport is typically an expensive menthol brand in Massachusetts, a stronger effect size may be observed for less expensive mentholated brands. Not every retailer in Boston was sampled. T-tests reveal that there was no significant difference in participation by chain or independent retailers in the pricing survey. For the most part, there were no significant differences in participation depending on where the retailer was located. However, retailers in Allston/Brighton were significantly less likely to participate in the survey than retailers in Dorchester, Downtown/North End, East Boston and the South End/Chinatown.

## 5. Conclusion

This study adds to a growing body of evidence that suggests the tobacco industry uses a targeted pricing strategy for menthol cigarettes in neighborhoods with primarily black residents. Lower prices, greater

advertisement of menthol cigarettes, and social norms in neighborhoods where black youth live, go to school and play may increase the attractiveness of these cigarettes and influence smoking experimentation and initiation among price-sensitive youth. Menthol smokers, who are more likely to be black and Latino, find it harder to quit compared to their white counterparts, even when smoking fewer cigarettes per day and black smokers are more likely to die from smoking-related diseases than whites, despite smoking less.

Minimum price laws alone are not sufficient to decrease use of mentholated tobacco products in the black community. Further policy action may be necessary to address possible “loopholes” of minimum price laws wherein tobacco manufacturers can promote trade discounts to retailers, and point-of-sale promotions, such as coupons or “buy one, get one free” purchases (McLaughlin et al., 2014). In order to mitigate the effect of lower pricing strategies used in communities of color, minimum price laws should include strong enforcement measures, such as regular inspections and fine-based violations, to ensure retailer and manufacturer compliance. Increasingly, communities around the country including San Francisco and Minneapolis, have enacted policies banning or restricting the sale of flavored tobacco products, including all menthol products, in recognition of the historic targeting of menthol products to specific populations. Policies that work to counteract the industry's discounting practices, with special consideration given to menthol products, would begin to address environmental sources of racial inequities in menthol smoking rates and ultimately reduce the avoidable smoking attributable death and disease in communities of color.

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## Conflicts of interest

The authors have no conflicts of interest to disclose.

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## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.healthplace.2019.102144>.

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