

# Retail Pharmacy Policy to End the Sale of Tobacco Products: What Is the Impact on Disparity in Neighborhood Density of Tobacco Outlets?

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## Abstract

**Background:** Population-level research on the implications of retail pharmacy policies to end the sale of tobacco products is scant, and the impact of such policies on racial/ethnic and socioeconomic disparities across neighborhoods in access to tobacco products remains unexplored.

**Methods:** We investigated the association between neighborhood sociodemographic characteristics and tobacco retail density in Rhode Island (RI;  $N = 240$  census tracts). We also investigated whether the CVS Health ( $N = 60$ ) policy to end the sale of tobacco products reduces the disparity in the density of tobacco retail across neighborhoods, and we conducted a prospective policy analysis to determine whether a similar policy change in all pharmacies in RI ( $N = 135$ ) would reduce the disparity in tobacco retail density.

**Results:** The results revealed statistically significant associations between neighborhood sociodemographic characteristics

and tobacco retail outlet density across RI neighborhoods. The results when excluding the CVS Health locations, as well as all pharmacies as tobacco retailers, revealed no change in the pattern for this association.

**Conclusions:** The results of this study suggest that while a commendable tobacco control policy, the CVS Health policy appears to have no impact on the neighborhood racial/ethnic and socioeconomic disparities in the density of tobacco retailers in RI. Prospective policy analyses showed no impact on this disparity even if all other pharmacies in the state adopted a similar policy.

**Impact:** Policy efforts aimed at reducing the disparity in access to tobacco products should focus on reducing the density of tobacco outlets in poor and racial/ethnic neighborhoods. *Cancer Epidemiol Biomarkers Prev*; 25(9); 1305–10. ©2016 AACR.

## Introduction

The implementation of "supply-side" tobacco control policy (e.g., restricting supply and availability) through pharmacies has been gaining traction recently in the United States (1, 2). In 2010, the American Pharmacy Association issued a policy statement urging all pharmacies to discontinue the sale of tobacco products (3). The announcement by Rhode Island-based CVS Health (formerly CVS Caremark) that it will no longer sell cigarettes or tobacco-related products at its approximately 7,600 pharmacy stores nationwide (4) starting in September 2014 sparked considerable discussion (5–9). Yet, the potential impact of the CVS Health policy action on smoking behavior as well as what this action means for other pharmacy retailers selling tobacco products remains unclear (10). In addition, the potential impact of

this policy on racial/ethnic and socioeconomic disparities in access to tobacco products remains unexplored.

Cigarette smoking is the leading cause of preventable deaths in the United States and imposes a high morbidity burden (11, 12). While studies have found that African Americans and Hispanics smoke less than Whites and multiracial groups (13), research shows efforts by tobacco companies target low-income and minority neighborhoods (14–16). The neighborhood retail environment has been shown to impact food- (17–19), alcohol- (20–22), and tobacco- (23–25) related behaviors of residents, and low-income and racial/ethnic minority neighborhoods contain fewer healthy food choices (26–28) and have a higher density of alcohol (29–31) and tobacco (14, 32–35) outlets than higher-income neighborhoods. Recent studies have found a positive association between retail tobacco outlet density and smoking initiation (36) and prevalence (37), as well as the reduced likelihood of cessation (38). A recent report from The Institute of Medicine (IOM) suggests that the retail environment "be designed to effectuate the public health goals of discouraging tobacco use and reducing the numbers of people with tobacco-related diseases" (39) and that state governments and public health agencies address the density of tobacco retailers by focusing on where such retailers are located (40).

Given that supply-side tobacco control policies focused on the retail environment are only recently being implemented, little data exist on the impact of such policies on tobacco access and smoking behavior. Preliminary data from a CVS Health study in two cities with policies that eliminated the sale of tobacco products in retail pharmacies (Boston and

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San Francisco) revealed a statistically significant reduction in the mean number of tobacco purchasers following the policy change (41). In addition, evidence from alcohol research suggests that a reduction in the density of alcohol outlets in an area reduces consumption (39, 42, 43).

The positive association between tobacco retail density and neighborhood sociodemographic characteristics such as low socioeconomic status (SES) and percentage of African American/Black and Hispanic residents has been reported for the entire United States (44) and at the state level [New York (45), New Jersey (46), and Iowa (34, 47)]. These studies suggest that policies aimed at reducing the availability of and access to cigarettes (i.e., the density of tobacco retailers) across neighborhoods might also reduce racial/ethnic and socioeconomic disparities in cigarette access across neighborhoods. However, it is unknown if the policy of pharmacies to end the sale of tobacco products would reduce tobacco retail density across neighborhoods. To our knowledge, no study has been conducted evaluating the potential impact on the socioeconomic and racial/ethnic disparities in the density of tobacco retail outlets across neighborhoods when pharmacy retailers end the sale of tobacco products.

The aims of the current study were to investigate the association between neighborhood sociodemographic characteristics and tobacco retail outlet density in the state of Rhode Island (RI) to determine whether racial/ethnic and socioeconomic disparities in tobacco retail density are present across RI neighborhoods. We hypothesized that there would be a positive association between the percentage of racial/ethnic minorities in a neighborhood and the density of tobacco retail outlets, as well as a positive association between neighborhood poverty and the density of tobacco retail outlets. Given the announcement by RI-based CVS Health to end the sale of tobacco products in its CVS stores, we also investigated whether this policy change would attenuate disparities in the density of tobacco retailers across neighborhoods. Finally, we conducted a prospective policy analysis to determine whether a policy change in which all pharmacies in RI ended the sale of tobacco products would reduce the racial/ethnic and socioeconomic disparities in tobacco retail density across RI neighborhoods.

## Materials and Methods

### Data

The unit of analysis in our study was the census tract based on the 2010 U.S. Census for the dependent variable (density of tobacco retailers) and independent variables (sociodemographic characteristics of the census tract). There are 241 census tracts in the state of RI; however, one tract with no residents but three tobacco outlets was dropped from the analysis. For the analysis presented here, 240 census tracts were used.

### Dependent variable

**Density of tobacco retailers.** Rhode Island General Law 44-20-8.1 directs the tax administrator to create and maintain an online listing of all entities holding a cigarette license in the state. This listing must be updated no fewer than six times a year. We used the list of retailers holding a cigarette license in the state that was last updated on May 18, 2015, to obtain names and addresses of tobacco retailers. Addresses were then geocoded using the commercial geocoding service TomTom Global Geocoder (<http://www.programmableweb.com/api/tomtom-geocoding>). There were 1,338 addresses obtained, of which 1,334 were successfully geocoded (99.7%). Of the four locations not geocoded, three

were assigned to out-of-state addresses and the fourth did not provide a valid address.

The density of tobacco retailers was measured as the number of licensed tobacco retailers per 10 km of roadway in the census tract (33, 34, 46). The selection of 10 km of roadway in the calculation of the density variable was based on previous tobacco density studies using the census tract as the level of analysis (33,34). Two additional density variables were calculated in the same manner: the first was density of tobacco outlets per 10 km of roadway in the census tract after removing CVS Health store locations, and the second was density of tobacco retailers per 10 km of roadway in the census tract after removing all pharmacies and drug stores (defined as any retailer whose name contained "drug," "pharmacy," or the name of a major drug store chain). All three of the density variables were non-normal, so a constant of one was added to all values (since some densities were 0), and they were then log-transformed for inclusion in regression models.

### Independent variables

**Census tract sociodemographic data.** Population data for the 240 census tracts in RI were obtained from the 2010 U.S. Census and the 2007–2011 American Community Survey (ACS) averages available from the U.S. Census Bureau. The Census and ACS variables used in this study included five variables: three socioeconomic variables: (i) median household income, (ii) percent of adults with a high school diploma or greater, and (iii) percent of families in poverty, and two demographic variables, (iv) percent Hispanic residents, and (v) percent African American/Black residents. All independent variables were included in models as continuous variables.

### Statistical analysis

Descriptive statistics (mean, SD, minimum, and maximum) were calculated for each dependent and independent variable. We then constructed five ordinary least squares (OLS) regression models with the log-transformed tobacco retailer density regressed on each of the census tract sociodemographic variables. Next, we constructed five OLS models using the density dependent variable with CVS Health locations removed, regressing the log-transformed tobacco retail outlet density variable on each of the census tract sociodemographic variables. Finally, the prospective policy analysis included the construction of five OLS models with the removal of all pharmacies in the calculation of the density of tobacco retailers dependent variable; as in the previous models, the log-transformed tobacco retail outlet density variable (with all pharmacies removed) was regressed on each of the census tract sociodemographic variables.

We used Moran's I to determine whether there was spatial clustering of tobacco density retailers beyond what would be expected at random. A Moran's I value close to 1 suggests spatial autocorrelation and that a spatial pattern should be considered in subsequent analyses (48, 49). We then used geographically weighted regression (GWR) to account for any spatial clustering. The GWR models used the same log-transformed outcomes and the five separate demographic predictors as the OLS models.

## Results

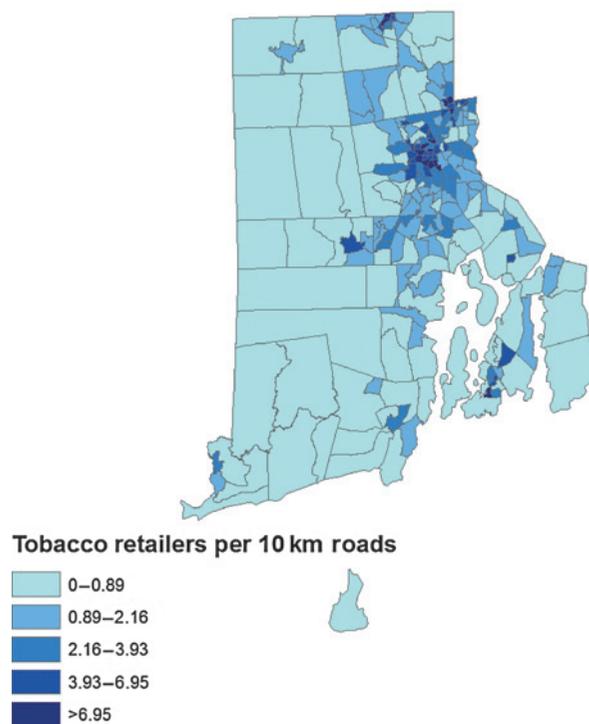
The number of tobacco outlets per 10 km of roadway within RI census tracts ranged from 0 to 11.83 (see Table 1; see density map in Fig. 1). The average km of roadway within the census tracts in RI

**Table 1.** Descriptive statistics by census tracts in RI

Total # of census tracts: 240	Mean	SD	Range	
			Min	Max
Dependent variable				
Tobacco outlets per 10 km of roadway	2.25	2.42	0	11.83
Independent variables				
% African American/Black (of total pop)	11.97	17.2	0	74.6
% Hispanic (of total pop)	7.52	9.2	0	48.4
% HS grad or higher	83.73	11.64	48.2	100
% Families in poverty	10.02	11.59	0	70
Median household income (\$)	58,453	22,733	1,148	144,792

was 45.13 km, and there was a negative statistically significant association between population density per square km and roadway length ( $r = -0.56$ ;  $P < 0.001$ ). The percent of African American/Black or Hispanic residents in the census tracts ranged from zero to 74.6% African American/Black and from zero to 48.4% Hispanic (see Table 1). There were 60 CVS stores with a license to sell tobacco in RI (4.5% of the total number of tobacco retailers in the state), and a total of 135 pharmacies in RI were tobacco retailers (10% of all tobacco retailers; see Table 2). We also found a positive statistically significant association between population densities per square km and the count of tobacco retailers per 10 km of roadway within the census tract ( $r = 0.26$ ;  $P < 0.001$ ), but a negative non-statistically significant association between population density per square km and the count of pharmacies per 10 km of roadway within the census tract ( $r = -0.04$ ;  $P = 0.651$ ).

The results of the first set of OLS regression models revealed a statistically significant association between neighborhood socio-demographic characteristics and tobacco retail outlet density

**Figure 1.** Tobacco retailer outlet density (stores per 10 km of roadway).

(see Table 3). In particular, as the tobacco retail outlet density of a neighborhood increases the household income and educational attainment of the neighborhood decreases; in addition, as the percentages of African Americans/Blacks, Hispanics, and families living in poverty increases in neighborhoods, so did the tobacco retail outlet density (see Table 3). The results of the five OLS regression models excluding the CVS Health locations as well as the models excluding all pharmacies as tobacco retailers revealed the same pattern for the association between neighborhood sociodemographic characteristics and tobacco retail outlet density as the first set of OLS models (see Tables 4 and 5), with regression coefficients similar to the original models. The Moran's I value for census tract density of tobacco retailers was 0.26, with a  $P$  value  $< 0.0001$ , suggesting some spatial patterning in the outcome. The GWR models revealed similar results to the OLS regression models (data not shown).

## Discussion

To better align its health-promoting business activities with the products it sells (4), RI-based CVS Health implemented a supply-side tobacco control policy by banning tobacco sales in its stores. The current study sought to examine the potential impact of this policy on racial/ethnic and socioeconomic disparities in the density of tobacco outlets across neighborhoods in RI. Similar to previous studies in New Jersey (47), New York (46), and Iowa (48) investigating the association between the sociodemographic characteristics of neighborhoods and tobacco retail outlet density, our results showed that as the density of tobacco retail outlets increases in neighborhoods, so did the percentage of African American/Black and Hispanic residents, as well as the percentage of residents living in poverty; we also found that as the number of tobacco retail outlets increases the neighborhood socioeconomic status (median income and educational attainment in the census tract) decreases. Our results suggest a racial/ethnic and socioeconomic disparity in tobacco access across neighborhoods in the state of RI, with a greater density of tobacco retailers in neighborhoods with more African American/Black and Hispanic residents and in neighborhoods with lower household incomes and more families in poverty. While studies at the state level have observed a similar trend, one study at the city level found no association between tobacco outlet density and neighborhood sociodemographic characteristics for neighborhoods in Boston (50).

Tobacco control policies have been shown to be important contributors to changing the social profile of cigarette smoking (51). Thus, not surprisingly, the CVS Health policy to end tobacco sales was supported by more than 25 public health and medical organizations (10). While the CVS policy to end the sale of all tobacco products is a commendable population health policy, our

**Table 2.** Tobacco retailers in RI

	N (%)
CVS stores	60 (4.5%)
All pharmacies (including CVS stores)	135 (10.1%)
All other tobacco retailers	1,199
Total tobacco retailers	1,334 (100%)

results highlight the distinction between population health policy and population health disparities policy. Specifically, our results show that the CVS Health policy to end the sale of tobacco products appears to have no impact on the racial/ethnic and socioeconomic disparities in the density of tobacco retail outlets across neighborhoods, and our results suggest that even if all other pharmacies in RI adopted a similar policy, these disparities would persist. These findings are likely due to both the locations of CVS Health stores and other pharmacies and their relatively small number in RI (CVS Health locations make up less than 5% of all tobacco retailers in the state). The negative association between population density per square km and the count of pharmacies suggests that in Rhode Island, the small numbers of pharmacies are more likely to be located in less dense neighborhoods.

From a health equity perspective, it is important to be explicit when a policy is aimed to reduce the burden of a disease (or reduce a risk factor for a disease) for the entire population and when a policy is aimed at reducing the disparity in that disease or risk factor (52). The CVS Health policy to end the sale of tobacco products is a monumental supply-side tobacco control policy. Importantly, it should be noted that the CVS Health policy has not been put forth explicitly as an effort to eliminate disparities in access to tobacco products; but rather as an attempt to address the incongruence between pharmacies primarily selling products intended to benefit health and also participating in the sale of products that are unquestionably known to be detrimental to health. Nevertheless, Graham suggests that tobacco control policies should be situated within their social context and warns that policy implementation will likely not yield uniform impacts across social groups (51). Therefore, although the CVS Health policy may reduce the number of overall tobacco outlets, in RI that reduction is not evenly distributed throughout the state and appears to have less of an impact on tobacco retail density at the neighborhood level as the percentages of African American/Black, Hispanic, and low-socioeconomic residents increases.

There are a few weaknesses related to our study. First, our analysis strategy investigating the potential impact of the CVS Health policy and the prospective policy analysis for all pharmacies in RI assumed removal without substitution. That is, we

**Table 3.** OLS regression analysis of tobacco retailer density on sociodemographic characteristics of census tracts in RI, including all pharmacies

Individual predictor models N = 240 tracts	Density of tobacco outlets		
	Beta estimate	95% CI	R-squared
Median household income (per \$10,000 increase)	-0.198	(-0.222 to -0.173)	0.51
% High school education or greater	-0.038	(-0.043 to -0.033)	0.49
% Hispanic	0.036	(0.029-0.044)	0.28
% African American/Black	0.023	(0.020-0.027)	0.41
% Families in poverty	0.033	(0.028-0.039)	0.38

**Table 4.** OLS regression analysis of tobacco retailer density on sociodemographic characteristics of census tracts in RI, excluding CVS pharmacies

Individual predictor models N = 240 tracts	Density without CVS		
	Beta estimate	95% CI	R-squared
Median household income (per \$10,000 increase)	-0.200	(-0.221 to -0.171)	0.50
% High school education or greater	-0.038	(-0.043 to -0.033)	0.50
% Hispanic	0.037	(0.029-0.044)	0.29
% African American/Black	0.024	(0.020-0.027)	0.42
% Families in poverty	0.034	(0.028-0.039)	0.39

assumed the removal of CVS Health and all other pharmacies as tobacco retailers would not be replaced by other tobacco retailers. Second, census tracts might not be the physical configuration that best captures the pathway between neighborhood composition and access to tobacco products because consumers might travel outside the census tract of residence to purchase tobacco products. This problem highlights the uncertain geographic context problem (UGCP) in this type of ecological analysis, where UGCP refers to the inability to determine the precise geographic configuration of the physical factors that impact the phenomenon of interest (53). Therefore, future tobacco control research and policy should continue to explore the pathway between the presence of tobacco retail outlets and tobacco acquisition and use behaviors so that the factors that truly impact tobacco use decision-making can be explicated and more targeted interventions developed. Finally, given that in Rhode Island only 10% of the tobacco retailers are pharmacies, the generalization of our results to other states might be limited, and the impact of retail pharmacies ending the sale of tobacco products might have a different impact on disparities in other states, especially if those pharmacies are located in racial/ethnic minority and low SES neighborhoods. There are also several strengths to be noted in our study. First, to our knowledge, this is the first study to investigate the impact of the CVS Health policy to remove tobacco products from its stores across an entire state. Second, we not only investigated the impact of the CVS policy but also the potential impact of all pharmacies adopting such a policy on disparities in density at the state level.

## Conclusions and Policy Implications

RI is the smallest state in the United States, with a population of 1.05 million and land covering approximately 1,033 square miles (54). In RI, tobacco retail policy is developed at the local level, and each municipality determines the number and location of tobacco

**Table 5.** OLS regression analysis of tobacco retailer density on sociodemographic characteristics of census tracts in RI, excluding all pharmacies

Individual predictor models N = 240 tracts	Density without all pharmacies		
	Beta estimate	95% CI	R-squared
Median household income (per \$10,000 increase)	-0.195	(-0.219 to -0.170)	0.51
% High school education or greater	-0.038	(-0.042 to -0.033)	0.51
% Hispanic	0.037	(0.029-0.043)	0.29
% African American/Black	0.024	(0.020-0.027)	0.43
% Families in poverty	0.034	(0.029-0.039)	0.40

retailers to which it issues a tobacco retailer license. Potential policy solutions to reduce the density of tobacco outlets across neighborhoods include the following: (i) restrict the types of businesses that can sell tobacco, and (ii) regulate where tobacco retailers can locate within a city (55). In our evaluation of the density of all tobacco retailer types across the highest and lowest quintile for each of our independent variables (percent African American/Black residents, percent Hispanic residents, percent families living in poverty, and percent of adults with less than a high school diploma), food stores, including grocery and convenience stores, had the highest density (data not shown). Not surprisingly, convenience store density and distance have been found to be positively associated with smoking behavior of neighborhood residents (56). Data from the Association for Convenience & Petroleum Retailing in 2010 suggest that across the United States, cigarettes accounted for the largest share of sales inside convenience stores, at 35.9% of total sales (57). On the basis of these national data and the results of our study, possible policy actions to address disparities in the density of tobacco retail outlets across neighborhoods in RI might require a "retail agnostic" approach that focuses on reducing tobacco retail density regardless of retail type. Our results suggest that the density of tobacco retail outlets in racial/ethnic and low-socioeconomic neighborhoods is not necessarily because of pharmacies as tobacco retailers. Therefore, in addition to eliminating pharmacies as tobacco retail outlets in a population tobacco control policy, policy efforts in RI aimed at reducing the disparity in access to tobacco products should focus on reducing the overall density of tobacco outlets in poor and racial/ethnic neighborhoods by limiting the number of tobacco retailers in those neighborhoods.

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## Disclosure of Potential Conflicts of Interest

R.D. Tucker-Seeley is a member of the Rhode Island Commission for Health Advocacy and Equity. No potential conflicts of interest were disclosed by the other authors.

## Authors' Contributions

**Conception and design:** R.D. Tucker-Seeley  
**Development of methodology:** R.D. Tucker-Seeley, P. James  
**Acquisition of data (provided animals, acquired and managed patients, provided facilities, etc.):** R.D. Tucker-Seeley, C.P. Bezold, P. James  
**Analysis and interpretation of data (e.g., statistical analysis, biostatistics, computational analysis):** R.D. Tucker-Seeley, C.P. Bezold, P. James  
**Writing, review, and/or revision of the manuscript:** R.D. Tucker-Seeley, C.P. Bezold, P. James, M. Miller, S.F. Wallington  
**Administrative, technical, or material support (i.e., reporting or organizing data, constructing databases):** R.D. Tucker-Seeley, C.P. Bezold  
**Study supervision:** R.D. Tucker-Seeley

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