

UC Davis

UC Davis Previously Published Works

Title

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

Permalink

<https://escholarship.org/uc/item/5g21t5mb>

Journal

Cancer Epidemiology, Biomarkers and Prevention, 25(9)

Authors

Tucker-Seeley, Reginald

Bezold, Carla

James, Peter

et al.

Publication Date

2016-09-01

DOI

10.1158/1055-9965.EPI-15-1234

Peer reviewed



# HHS Public Access

Author manuscript

*Cancer Epidemiol Biomarkers Prev.* Author manuscript; available in PMC 2017 September 01.

Published in final edited form as:

*Cancer Epidemiol Biomarkers Prev.* 2016 September ; 25(9): 1305–1310. doi:  
10.1158/1055-9965.EPI-15-1234.

## Retail pharmacy policy to end the sale of tobacco products: what is the impact on disparity in neighborhood density of tobacco outlets?

Reginald D. Tucker-Seeley<sup>1,2</sup>, Carla P. Bezold<sup>3</sup>, Peter James<sup>3,4</sup>, Melecia Miller<sup>1</sup>, and Sherrie F. Wallington<sup>5</sup>

<sup>1</sup>Center for Community Based Research, Dana-Farber Cancer Institute

<sup>2</sup>Department of Social and Behavioral Sciences, Harvard T.H. Chan School of Public Health

<sup>3</sup>Department of Epidemiology, Harvard T.H. Chan School of Public Health

<sup>4</sup>Department of Environmental Health, Harvard T.H. Chan School of Public Health

<sup>5</sup>Lombardi Comprehensive Cancer Center, Georgetown University Medical Center

### 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 if 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

---

**Corresponding Author:** Reginald D. Tucker-Seeley, Dana-Farber Cancer Institute, Center for Community Based Research, 450 Brookline Ave, LW 743, Boston, MA 02215, Phone: 617-582-8321, Fax: 617-394-2915, retucker@hsph.harvard.edu.

**Conflicts of interest:** Dr. Tucker-Seeley is a member of the Commission for Health Advocacy and Equity in Rhode Island

**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.

### Keywords

health disparities; tobacco control policy; neighborhood effects

---

## 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] Additionally, 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 U.S. and imposes a high morbidity burden.[11,12] While studies have found that African Americans and Hispanics smoke less than Whites and multi-racial 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 San Francisco) revealed a statistically significant reduction in the mean number of tobacco purchasers following the policy change.[41] Additionally, 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 U.S.[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 for the present study were to investigate the association between neighborhood sociodemographic characteristics and tobacco retail outlet density in the state of Rhode Island (RI) to determine if 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. Lastly, we conducted a prospective policy analysis to determine if 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 (<https://geocoder.tomtom.com/app/view/index>). 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.[34,48] 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—(1) median household income, (2) percent of adults with a high school diploma or greater, and (3) percent of families in poverty—and two demographic variables—(4) percent Hispanic residents, and (5) percent African American/Black residents. All independent variables were included in models as continuous variables.

### Statistical Analysis

Descriptive statistics (mean, standard deviation, 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. Lastly, 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 if 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. [49,50] 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 Figure 1). The average km of roadway within the census tracts in RI was 45.13 km, and there was a negative statistically significant

association between population density per square km and roadway length ( $r = -.56$ ;  $p < 0.001$ ). 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 ( $r = .26$ ;  $p < 0.001$ ), 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 ( $r = -.04$ ;  $p = 0.651$ ).

The results of the first set of OLS regression models revealed a statistically significant association between neighborhood sociodemographic characteristics and tobacco retail outlet density (see Table 3a). 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 3a). 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 3b and 3c), 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[51], RI-based CVS Health implemented a supply-side tobacco control policy by banning tobacco sales in its stores. The present 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[49] 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.[52]

Tobacco control policies have been shown to be important contributors to changing the social profile of cigarette smoking.[53] 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 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 number 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.[54] 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.[53] 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 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.[55] 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. Lastly, 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

Rhode Island is the smallest state in the U.S., with a population of 1.05 million and land covering approximately 1,033 square miles.[56] In RI, tobacco retail policy is developed at the local level, and each municipality determines the number and location of tobacco retailers to which it issues a tobacco retailer license. Potential policy solutions to reduce the density of tobacco outlets across neighborhoods include the following: ( 1) restrict the types of businesses that can sell tobacco, and (2) regulate where tobacco retailers can locate within a city.[57] 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.[58] Data from the Association for Convenience & Petroleum Retailing in 2010 suggest that across the U.S., cigarettes accounted for the largest share of sales inside convenience stores, at 35.9% of total sales.[59] Based on 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 Rhode Island 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.

## Acknowledgements

The authors thank Dr. Vaughan Rees for helpful comments on policy strategies and Dr. Glorian Sorensen for helpful comments on an early draft of the manuscript.

Financial support:

R.D. Tucker-Seeley was supported by an NCI K01 Career Development Grant (K01 CA169041) C.P. Bezold was supported by an NIH training grant (T32ES007069)

P. James was supported by the Harvard NHLBI Cardiovascular Epidemiology Training Grant (T32 HL098048)S.F. Wallington was supported by an NCI K01 Career Development Grant (K01 CA155417)

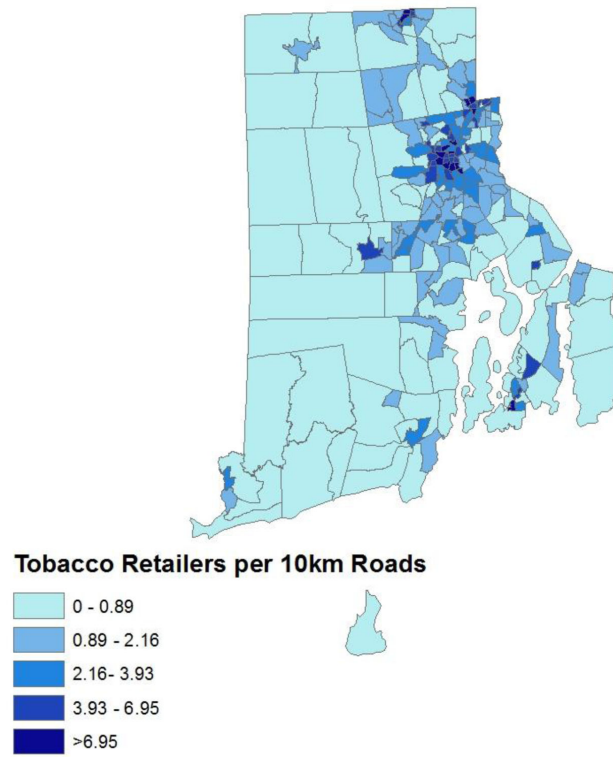


## Reference List

1. Kroon LA, Corelli RL, Roth AP, Hudmon KS. Public perceptions of the ban on tobacco sales in San Francisco pharmacies. *Tob Control*. 2013; 22:369–371. [PubMed: 23172399]
2. Hudmon KS, Fenlon CM, Corelli RL, Prokhorov AV, Schroeder SA. Tobacco sales in pharmacies: time to quit. *Tob Control*. 2006; 15:35–38. [PubMed: 16436403]
3. American Pharmacists Association. Report of the 2010 APhA House of Delegates: actions of the legislative body of the American Pharmacists Association. *J Am Pharm Assoc* (2003 ). 2010; 50:471–472. [PubMed: 20621862]
4. Brennan TA, Schroeder SA. Ending sales of tobacco products in pharmacies. *JAMA*. 2014; 19(311): 1105–1106. [PubMed: 24500655]
5. Brennan TA, Schroeder S. Ending the sale of cigarettes at US pharmacies--reply. *JAMA*. 2014; 312:560. [PubMed: 25096706]
6. Printz C. CVS, FDA aim to reduce tobacco use: The drugstore chain and the FDA step up antismoking efforts. *Cancer*. 2014; 120:1597–1598. [PubMed: 24844818]
7. Johnson SR. CVS decision to quit tobacco highlights its growing role as healthcare provider. *Mod Healthc*. 2014; 44:11.
8. Kolade VO. Ending the sale of cigarettes at US pharmacies. *JAMA*. 2014; 312:559–560. [PubMed: 25096704]
9. van der Deen FS, Pearson AL, Wilson N: Ending the sale of cigarettes at US pharmacies. *JAMA*. 2014; 312:559. [PubMed: 25096703]
10. American Lung Association. Open Letter to America's Retailers, Especially Those with Pharmacies From Leading Public Health and Medical Organizations. Feb 26.2014 <http://www.lung.org/get-involved/advocate/advocacy-documents/letter-to-retailers-tobacco-sales-02262014.pdf> Ref Type: Electronic Citation
11. U.S.Department of Health and Human Services. The Health Consequences of Smoking--50 Years of Progress: A Report of the Surgeon General. 2014U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prvention and Health Promotion, Office on Smoking and HealthAtlanta, GA Ref Type: Report
12. Centers for Disease Control and Prevention. Smoking-attributable mortality, years of potential life lost, and productivity losses--United States, 2000-2004. *MMWR Morb Mortal Wkly Rep*. 2008; 57:1226–1228. [PubMed: 19008791]
13. Jamal A, Homa DM, O'Connor E, Babb SD, Caraballo RS, Singh T, et al. Current Cigarette Smoking Among Adults - United States, 2005-2014. *MMWR Morb Mortal Wkly Rep*. 2015; 64:1233–1240. [PubMed: 26562061]
14. Laws MB, Whitman J, Bowser DM, Krech L. Tobacco availability and point of sale marketing in demographically contrasting districts of Massachusetts. *Tob Control*. 2002; 11(Suppl 2):ii71–3. ii71–ii73. [PubMed: 12034986]
15. Brown-Johnson CG, England LJ, Glantz SA, Ling PM. Tobacco industry marketing to low socioeconomic status women in the U.S.A. *Tob Control*. 2014; 23:e139–e146. [PubMed: 24449249]
16. Henriksen L. Comprehensive tobacco marketing restrictions: promotion, packaging, price and place. *Tob Control*. 2012; 21:147–153. [PubMed: 22345238]
17. Cannuscio CC, Tappe K, Hillier A, Bottenheim A, Karpyn A, Glanz K. Urban food environments and residents' shopping behaviors. *Am J Prev Med*. 2013; 45:606–614. [PubMed: 24139774]
18. Liese AD, Weis KE, Pluto D, Smith E, Lawson A. Food store types, availability, and cost of foods in a rural environment. *J Am Diet Assoc*. 2007; 107:1916–1923. [PubMed: 17964311]
19. D'Angelo H, Suratkar S, Song HJ, Stauffer E, Gittelsohn J. Access to food source and food source use are associated with healthy and unhealthy food-purchasing behaviours among low-income African-American adults in Baltimore City. *Public Health Nutr*. 2011; 14:1632–1639. [PubMed: 21450140]
20. Weitzman ER, Folkman A, Folkman MP, Wechsler H. The relationship of alcohol outlet density to heavy and frequent drinking and drinking-related problems among college students at eight universities. *Health Place*. 2003; 9:1–6. [PubMed: 12609468]

21. Bryden A, Roberts B, McKee M, Petticrew M. A systematic review of the influence on alcohol use of community level availability and marketing of alcohol. *Health Place*. 2012; 18:349–357. [PubMed: 22154843]
22. Campbell CA, Hahn RA, Elder R, Brewer R, Chattopadhyay S, Fielding J, et al. The effectiveness of limiting alcohol outlet density as a means of reducing excessive alcohol consumption and alcohol-related harms. *Am J Prev Med*. 2009; 37:556–569. [PubMed: 19944925]
23. Cantrell J, Anesetti-Rothermel A, Pearson JL, Xiao H, Vallone D, Kirchner TR. The Impact of the Tobacco Retail Outlet Environment on Adult Cessation and Differences by Neighborhood Poverty. *Addiction*. 2014:10.
24. Scully M, McCarthy M, Zacher M, Warne C, Wakefield M, White V. Density of tobacco retail outlets near schools and smoking behaviour among secondary school students. *Aust N Z J Public Health*. 2013; 37:574–578. [PubMed: 24892157]
25. Johns M, Sacks R, Rane M, Kansagra SM. Exposure to tobacco retail outlets and smoking initiation among New York City adolescents. *J Urban Health*. 2013; 90:1091–1101. [PubMed: 23700202]
26. Darmon N, Drewnowski A: Does social class predict diet quality? *Am J Clin Nutr*. 2008; 87:1107–1117. [PubMed: 18469226]
27. Cubbin C, Winkleby MA. Food availability, personal constraints, and community resources. *J Epidemiol Community Health*. 2007; 61:932. [PubMed: 17992774]
28. James P, Arcaya MC, Parker DM, Tucker-Seeley RD, Subramanian SV. Do minority and poor neighborhoods have higher access to fast-food restaurants in the United States? *Health Place*. 2014; 29:10–17. [PubMed: 24945103]
29. Romley JA, Cohen D, Ringel J, Sturm R. Alcohol and environmental justice: the density of liquor stores and bars in urban neighborhoods in the United States. *J Stud Alcohol Drugs*. 2007; 68:48–55. [PubMed: 17149517]
30. LaVeist TA, Wallace JM Jr. Health risk and inequitable distribution of liquor stores in African American neighborhood. *Soc Sci Med*. 2000; 51:613–617. [PubMed: 10868674]
31. Bluthenthal RN, Cohen DA, Farley TA, Scribner R, Beighley C, Schonlau M, et al. Alcohol availability and neighborhood characteristics in Los Angeles, California and southern Louisiana. *J Urban Health*. 2008; 85:191–205. [PubMed: 18228148]
32. Novak SP, Reardon SF, Raudenbush SW, Buka SL. Retail tobacco outlet density and youth cigarette smoking: a propensity-modeling approach. *Am J Public Health*. 2006; 96:670–676. [PubMed: 16507726]
33. Hyland A, Travers MJ, Cummings KM, Bauer J, Alford T, Wieczorek WF. Tobacco outlet density and demographics in Erie County, New York. *Am J Public Health*. 2003; 93:1075–1076. [PubMed: 12835184]
34. Schneider JE, Reid RJ, Peterson NA, Lowe JB, Hughey J. Tobacco outlet density and demographics at the tract level of analysis in Iowa: implications for environmentally based prevention initiatives. *Prev Sci*. 2005; 6:319–325. [PubMed: 16163568]
35. Reid RJ, Morton CM, Garcia-Reid P, Peterson NA, Yu D. Examining tobacco outlet concentration in New Jersey: does income and ethnicity matter? *J Ethn Subst Abuse*. 2013; 12:197–209. [PubMed: 23967882]
36. McCarthy WJ, Mistry R, Lu Y, Patel M, Zheng H, Dietsch B. Density of tobacco retailers near schools: effects on tobacco use among students. *Am J Public Health*. 2009; 99:2006–2013. [PubMed: 19820214]
37. Henriksen L, Feighery EC, Schleicher NC, Cowling DW, Kline RS, Fortmann SP. Is adolescent smoking related to the density and proximity of tobacco outlets and retail cigarette advertising near schools? *Prev Med*. 2008; 47:210–214. [PubMed: 18544462]
38. Reitzel LR, Cromley EK, Li Y, Cao Y, Dela MR, Mazas CA, et al. The effect of tobacco outlet density and proximity on smoking cessation. *Am J Public Health*. 2011; 101:315–320. [PubMed: 21164089]
39. Committee on Reducing Tobacco Use: Strategies BaC. Institute of Medicine. Ending the tobacco problem: a blueprint for the nation. National Academy of Sciences; Washington, DC: 2007.

40. Center for Public Health Systems. Regulating pharmacy sales: Massachusetts. Innovative Point of Sale Policies :Case Study #2. 2014Washington University in St. LouisSt. Louis, MO Ref Type: Report
41. Brennan TA, Shrank WH, Sussman A, Purvis MC, Hartman T, Kymes SM, et al. The effect of a policy to eliminate sales of tobacco in pharmacies on the number of smokers in the region. *CVS Health*. 2014 Ref Type: Electronic Citation
42. Gruenewald PJ, Ponicki WR, Holder HD. The relationship of outlet densities to alcohol consumption: a time series cross-sectional analysis. *Alcohol Clin Exp Res*. 1993; 17:38–47. [PubMed: 8452207]
43. Treno AJ, Marzell M, Gruenewald PJ, Holder H. A review of alcohol and other drug control policy research. *J Stud Alcohol Drugs Suppl*. 2014; 75(Suppl 17):98–107. 98-107. [PubMed: 24565316]
44. Rodriguez D, Carlos HA, Adachi-Mejia AM, Berke EM, Sargent JD. Predictors of tobacco outlet density nationwide: a geographic analysis. *Tob Control*. 2013; 22:349–355. [PubMed: 22491038]
45. Loomis BR, Kim AE, Goetz JL, Juster HR. Density of tobacco retailers and its association with sociodemographic characteristics of communities across New York. *Public Health*. 2013; 127:333–338. [PubMed: 23515009]
46. Yu D, Peterson NA, Sheffer MA, Reid RJ, Schnieder JE. Tobacco outlet density and demographics: analysing the relationships with a spatial regression approach. *Public Health*. 2010; 124:412–416. [PubMed: 20541232]
47. Peterson NA, Lowe JB, Reid RJ. Tobacco outlet density, cigarette smoking prevalence, and demographics at the county level of analysis. *Subst Use Misuse*. 2005; 40:1627–1635. [PubMed: 16253931]
48. Hyland A, Travers MJ, Cummings KM, Bauer J, Alford T, Wieczorek WF. Tobacco outlet density and demographics in Erie County, New York. *Am J Public Health*. 2003; 93:1075–1076. [PubMed: 12835184]
49. Mayers RS, Wiggins LL, Fulghum FH, Peterson NA. Tobacco outlet density and demographics: a geographically weighted regression analysis. *Prev Sci*. 2012; 13:462–471. [PubMed: 22538505]
50. Fotheringham, AS.; Brunson, C.; Charlton, M. *Quantitative Geography*. Sage Publications; London: 2000.
51. Brennan TA, Schroeder SA. Ending sales of tobacco products in pharmacies. *JAMA*. 2014; 311(19):1105–1106. [PubMed: 24500655]
52. Duncan DT, Kawachi I, Melly SJ, Blossom J, Sorensen G, Williams DR. Demographic disparities in the tobacco retail environment in Boston: a citywide spatial analysis. *Public Health Rep*. 2014; 129:209–215. [PubMed: 24587559]
53. Graham H. Why social disparities matter for tobacco-control policy. *Am J Prev Med*. 2009; 37:S183–S184. [PubMed: 19591761]
54. Graham H. Social determinants and their unequal distribution: clarifying policy understandings. *Milbank Q*. 2004; 82:101–124. [PubMed: 15016245]
55. Chen X, Kwan MP. Contextual Uncertainties, Human Mobility, and Perceived Food Environment: The Uncertain Geographic Context Problem in Food Access Research. *Am J Public Health*. 2015; 105:1734–1737. [PubMed: 26180982]
56. United States Census Bureau. U.S. Census Bureau: State and County QuickFacts. 2015<http://quickfacts.census.gov/qfd/states/44000.html> Ref Type: Electronic Citation
57. Tobacco Control Legal Consortium. Location, Location, Location: Regulating Tobacco Retailer Locations for Public Health. Nov 2. Public Health Law Center at Mitchell Hamline School of LawSt. Paul, MN0014 Ref Type: Report
58. Chuang YC, Cubbin C, Ahn D, Winkleby MA. Effects of neighbourhood socioeconomic status and convenience store concentration on individual level smoking. *J Epidemiol Community Health*. 2005; 59:568–573. [PubMed: 15965140]
59. The Center for Tobacco Policy and Organizing; American Lung Association of California. Cigarettes Generate Big Revenue for Convenience Stores: Analysis of 2010 State of the Industry Report. 2012The Center for Tobacco Policy and OrganizingSacramento, CA Ref Type: Report



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

**Table 1**

Descriptive statistics by census tracts in RI

Total # of census tracts: 240	Range			
	Mean	SD	Min	Max
<i>Dependent Variable:</i>				
Tobacco outlets per 10 km of roadway	2.25	2.42	0	11.83
<i>Independent Variables:</i>				
% 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

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

**Table 2**

## Tobacco retailers in RI

	<b>N</b>	<b>Percent</b>
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

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

**Table 3**

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

<b>Individual Predictor Models</b>			
<b>N = 240 tracts</b>	<b>Density of Tobacco Outlets</b>		
	<i>Beta Estimate</i>	<i>95% CI</i>	<i>R-squared</i>
Median HH income (per \$10,000 increase)	-0.198	(-0.222, -0.173)	0.51
% HS education or greater	-0.038	(-0.043, -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

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

<b>Individual Predictor Models</b>			
<b>N = 240 tracts</b>	<b>Density without CVS</b>		
	<i>Beta Estimate</i>	<i>95% CI</i>	<i>R-squared</i>
Median HH income (per \$10,000 increase)	-0.200	(-0.221, -0.171)	0.50
% HS education or greater	-0.038	(-0.043, -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

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

<b>Individual Predictor Models</b>			
<b>N = 240 tracts</b>	<b>Density without all pharmacies</b>		
	<i>Beta Estimate</i>	<i>95% CI</i>	<i>R-squared</i>
Median HH income (per \$10,000 increase)	-0.195	(-0.219, -0.170)	0.51
% HS education or greater	-0.038	(-0.042, -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