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Tobacco Retailer Proximity and Density and Nicotine Dependence Among Smokers With Serious Mental Illness

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Abstract

Objectives—We examined the density and proximity of tobacco retailers and associations with smoking behavior and mental health in a diverse sample of 1061 smokers with serious mental illness (SMI) residing in the San Francisco Bay Area of California.

Methods—Participants' addresses were geocoded and linked with retailer licensing data to determine the distance between participants' residence and the nearest retailer (proximity) and the number of retailers within 500-meter and 1-kilometer service areas (density).

Results—More than half of the sample lived within 250 meters of a tobacco retailer. A median of 3 retailers were within 500 meters of participants' residences, and a median of 12 were within 1 kilometer. Among smokers with SMI, tobacco retailer densities were 2-fold greater than for the general population and were associated with poorer mental health, greater nicotine dependence, and lower self-efficacy for quitting.

Conclusions—Our findings provide further evidence of the tobacco retail environment as a potential vector contributing to tobacco-related disparities among individuals with SMI and suggest that this group may benefit from progressive environmental protections that restrict tobacco retail licenses and reduce aggressive point-of-sale marketing.

Tobacco use among people with serious mental illness (SMI) is common and has serious health and financial costs.[1] Nationally, individuals with psychiatric or addictive disorders

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Contributors

K. C. Young-Wolff led the analyses, the interpretation of the results, and the writing of the article. L. Henriksen assisted with the study conceptualization, the interpretation of findings, and the writing of the article. K. Delucchi assisted with the analyses and the writing of the article. J. J. Prochaska originated and supervised the study and assisted with interpreting and writing up the results.

Human Participant Protection

This research was approved by the institutional review boards of the study hospitals and universities. All participants provided written informed consent.

consume 44% to 46% of cigarettes purchased and are more likely than those in the general population to be daily and heavy smokers.[2,3] In one study, it was estimated that smokers with SMI spend, on average, 27% of their income on tobacco.[4] Individuals with SMI suffer disproportionately from tobacco-related diseases and, as a group, have a 25-year premature mortality rate.[5] Increasingly, researchers and practitioners highlight the need for more targeted prevention and intervention strategies to reduce the burden of smoking-related diseases in this vulnerable group.[6,7]

Cigarette smoking among people with SMI reflects a complex interplay of genetic, neurobiological, cultural, and psychosocial factors.[6] Studies have examined shared genetic effects between smoking and SMI,[8–11] as well as associations with attention and cognition, stress and mood, and reductions in the side effects of psychotropic medications.[6] In addition to individual-level risk factors, a complete understanding of smoking disparities among individuals with SMI requires examination of “upstream” social determinants of health, including social, political, and economic contexts. Accordingly, research on the etiology and maintenance of cigarette use in this disproportionately affected group has increasingly focused on systemic factors outside of an individual’s control, such as tobacco industry targeting, reduced access to smoking cessation services, and tobacco control policies.[7,12] Notably, smokers with SMI are responsive to tobacco control policies that have been effective in the general population, such as smoking bans and cigarette tax increases.[13–16]

The built environment is another important social determinant of health that has the potential to affect smoking among people with SMI. In the general population, retail availability of tobacco, which includes the number of retailers per area or population (i.e., density) and the distance to the nearest retailer (i.e., proximity) from one’s home or school, is associated with earlier smoking initiation,[17,18] increased current smoking[19–22] and cigarette purchases,[23] and reduced smoking cessation over time.[24,25] Smokers who live in neighborhoods with higher densities of tobacco retailers have greater exposure to retail advertisements and promotions, which can obstruct quit attempts by increasing cues to smoke, provoking cravings, and triggering impulse purchases.[26–29] Smokers are price sensitive,[30,31] and the financial costs of smoking are lower in communities with more convenient tobacco access and reduced travel time to purchase.[22] Moreover, retailers and point-of-sale tobacco advertisements are more prevalent in socially and economically disadvantaged neighborhoods.[19,22,32–36]

The effects of increased tobacco availability may be particularly strong among smokers with SMI given that factors such as unreliable transportation and limited resources[37] in this population may lead to a greater reliance on readily obtainable consumer goods. Furthermore, people with SMI have been targeted by the tobacco industry,[12,38] and they may be especially sensitive to aggressive tobacco advertisements and promotions. Surprisingly, in spite of the public health relevance, to our knowledge no studies of the retail availability of tobacco have involved clinical samples of individuals with SMI.

Our goals in this study, which included a diverse sample of adults with SMI, were to characterize the proximity (roadway distance to the nearest retailer) and density (number of retailers per acre) of tobacco retailers within 500 meters and 1 kilometer of participants’

residences and to assess whether retail availability of tobacco is associated with severity of mental illness, nicotine dependence, and readiness to quit smoking. We also evaluated whether these associations vary according to gender.

We hypothesized that smokers with SMI would reside in neighborhoods with greater than average tobacco retailer density for their county area and that this neighborhood characteristic would be associated with greater severity of mental illness. Furthermore, we predicted that increased retail availability of tobacco would be associated with greater nicotine dependence and lower readiness to quit, regardless of severity of mental illness. We also examined gender differences given calls to assess such differences in tobacco control research, policy, and practice[39] and recent evidence that proximity to a tobacco retailer is associated with a lower likelihood of smoking cessation among men but not women who are moderate to heavy smokers.[24]

METHOD

We pooled secondary data derived from baseline interviews conducted with men and women, all current smokers with SMI, recruited as inpatients from psychiatric hospitals in the greater San Francisco Bay Area of California between 2006 and 2013 for 3 tobacco treatment clinical trials.[40,41] The recruitment sites were all short-stay (median length of stay of less than 7 days) acute care, psychiatric units with complete smoking bans in 2 academic hospitals, 1 community hospital, and 1 public hospital located in the counties of Alameda, San Francisco, and Santa Clara, California. Individuals were eligible to participate if they had no contraindications to nicotine replacement therapy (e.g., pregnancy), were not planning to move outside of the Bay Area during the 18-month study, and had the capacity to consent in English. Intention to quit smoking was not a requirement.

Of the 1115 smokers interviewed, 31 were not eligible for geocoding (12 were out of state, and 19 had only PO box addresses). Of the remaining 1084 smokers, 15 had insufficient address information. Home address coordinates were available for the remaining 1069 participants (98.6% match rate). Eight participants who self-identified as transgender were excluded because the sample size was not sufficient to allow separate evaluations for this group. The final sample included 1061 respondents.

Measures

We used the Fagerström Test for Nicotine Dependence[42] to measure degree of nicotine dependence on a scale ranging from 0 to 10. The Thoughts about Abstinence scale was used to assess self-efficacy; scores on this instrument range from 0 to 10, with higher scores indicating greater expected success with quitting smoking.[43] The Stages of Change Scale[44] assessed readiness to quit smoking with defined stages of precontemplation (not intending to quit smoking in the next 6 months), contemplation (intending to quit within 6 months), and preparation (planning to quit within 30 days with at least one 24-hour quit attempt in the past year). The Behavior Symptom Identification Scale (BASIS-24)[45] assessed substance abuse, depression, self-harm, psychosis, emotional lability, and interpersonal relationships on individual subscales. All responses were made on 5-point scales, with higher scores indicating more severe symptoms; in addition, a total weighted summary score was

computed. Past-month psychiatric diagnoses were assessed with the Mini-International Neuropsychiatric Interview.[46]

Spatial Data

We obtained tobacco retailer addresses in December 2010 from a state retailer-licensing database maintained by California's Board of Equalization. ESRI ArcGIS version 10.1 (ESRI, Redlands, CA) was used to geocode the latitudes and longitudes of addresses for licensed tobacco retailers and participants' residences (mapping rate: 96.3%). We used the distance traveled along a street network (500 m or 1 km), rather than using a circular buffer based on the straight-line (Euclidean) distance from each residence, to create person-centered service areas. Network-based service areas better captured the travel distance necessary to obtain tobacco products from retailers nearest to participants' residence.[47]

To determine density (i.e., retailers per acre), we used the standard ArcGIS Spatial Join tool to calculate the count of geocoded retailers within 500-meter and 1-kilometer service areas. Next, we calculated retailer density (density of tobacco retailers within 500 m and 1 km of participants' residences) by dividing the count of retailers by the geographic coverage area of each buffer. The ArcGIS Closest Facility tool was used to calculate the proximity of participants' residences to the closest retailer, allowing us to determine the shortest travel distance (in meters) along the street network. Distance was positively skewed, and scores from the top 1% of observations (10 individuals with distances ranging from 3318 m to 9482 m) were capped at the 99th percentile value (3096 m).

Neighborhood-Level Demographic Covariate

We used ArcGIS tools and data from the 2010 decennial census and 2010 American Community Survey to characterize the demography of the service areas of smokers with SMI. The service area demographics were a summary of the proportional attributes reported by the tracts wholly or partially within the area. Data were downloaded from American FactFinder, processed and imported into a geographic information system (GIS), and reviewed for accuracy. Neighborhood poverty (percentage of individuals living in poverty in each participant's 500 m service area) was used as a neighborhood-level covariate in all analyses.

Data Analyses

We initially characterized how retailer density near the residences of individuals with SMI in our sample compared with the density of tobacco retailers in the San Francisco Bay Area in general. Data on proximity and density of tobacco retailers are not available at the county level, so we used census data to calculate the average number of tobacco retailers per acre and population in Alameda and San Francisco counties (the counties from which 69% of our sample was recruited) as a comparison. Santa Clara County was not included in our comparison analysis because fewer than 3% of the participants (n = 27) resided there.

In the case of Alameda and San Francisco counties, we calculated the number of tobacco retailers per census tract (based on county population) weighted by the census population as follows: {[(number of retailers per acre per tract) × tract population]/total number of people

across tracts}. We compared this value with the average number of retailers per acre within 500-meter buffers of the residences of the subset of our participants who lived in these 2 counties. We used this 500-meter buffer because it is a more focused area than 1 kilometer.

Next, we conducted a series of multilevel regression analyses to test whether retail availability of tobacco was associated with severity of mental illness (according to the BASIS-24 scales) within our sample. In these analyses, we adjusted for participant gender, race (White or non-White), employment status, age, education, income, marital status, unstable living situation (i.e., living in current residence for less than 6 months), and past-month psychiatric diagnosis as well as for neighborhood poverty.

Subsequently, we examined whether retail availability of tobacco was associated with nicotine dependence, self-efficacy, and stage of change (precontemplation, contemplation, or preparation). In these multilevel regression analyses, we similarly adjusted for gender, race, employment status, age, education, income, marital status, unstable living situation, past-month psychiatric diagnosis, and neighborhood poverty. We included severity of mental illness as a covariate in the models to assess the possibility that associations with retailer density were better accounted for by associations with psychiatric severity. To do so, we entered scores from the BASIS-24 scales found to be significantly associated with retail availability in the previous analyses. Finally, we tested whether the associations between retail availability of tobacco and each outcome of interest varied according to gender, adding interactions between gender and retail availability of tobacco into each regression equation.

Regression analyses were conducted separately for retailer density and distance to nearest retailer. To account for the clustering of participants within census tracts (the number of participants per tract ranged from 1 to 21), we used generalized estimating equations in SAS[48] in conducting multilevel regression analyses. Retailer density was rescaled in all of the regression analyses to represent number of retailers per 5 acres.

RESULTS

The study sample was diverse with respect to gender and ethnicity, education, socioeconomic status, and psychiatric diagnosis (Table 1). Women were more likely than men to be non-White, to be married, and to not intend to quit smoking in the next 6 months. They also had greater self-efficacy with respect to quitting and exhibited more emotional lability, depression, and overall functional difficulties. Finally, they had lower substance abuse scores on the BASIS-24 and were less likely to be unstably housed (Ps < .05 for all comparisons; Table 1).

Density

There were a median of 3 retailers (interquartile range [IQR] = 0–7) within 500 meters of participants' residences and a median of 12 retailers (IQR = 4–25) within 1 kilometer. Our subset of smokers with SMI in San Francisco and Alameda counties lived in service areas with a mean tobacco retailer density per acre that was 2.2 times higher (mean = 0.085; 95% confidence interval [CI] = 0.080, 0.090) than the population-weighted number of retailers per acre in census tracts in these counties (0.039), although the median (0.044) was only

1.13 time greater. Figure 1 provides a visual depiction of the tobacco retail environment within a well-defined (47 square miles) study area; it can be seen that participants resided across San Francisco County rather than clustering around the hospitals from which they were recruited.

Univariate regressions indicated that male gender (B = 2.40; $P = .02$); older age (B = 2.81; $P = .006$); being unemployed (B = 2.17; $P = .03$); being divorced, widowed, or separated (B = 2.15; $P = .03$) or never having been married (B = 2.14; $P = .03$; vs married or cohabiting); neighborhood poverty (B = 4.67; $P < .001$); and having a diagnosis of major depression (vs psychotic disorder; B = 2.33; $P = .03$) were associated with greater tobacco retailer densities within 500 meters of participants' residences. Univariate associations were similar for tobacco retailer densities within 1 kilometer.

Multilevel regression analyses adjusting for individual demographic characteristics, psychiatric diagnosis, and neighborhood poverty indicated that higher retailer density within 500 meters of participants' residences was associated with increased psychotic symptoms (B = 2.84; $P = .005$), risk of self-harm (B = 2.59; $P = .01$), and interpersonal problems (B = 2.02; $P = .04$). Similarly, higher retailer density within 1 kilometer was related to increased psychotic symptoms (B= 2.53; $P = .01$) and risk of self-harm (B = 2.11; $P = .03$). Moderation analyses indicated significant gender differences in the association between higher retailer density within 1 kilometer and risk of self-harm (B = −2 .3 1 ; $P = .02$); greater tobacco retailer density was associated with significantly increased reports of self-harm among men ($r = 0.17$; $P < .001$) but not among women ($r = 0.04$; $P = .44$).

Tables 2 and 3 show the results of multilevel analyses assessing the associations of retailer density with nicotine dependence, self-efficacy, and stage of change. Higher retailer density within both 500 meters and 1 kilometer of participants' residences was associated with greater nicotine dependence, lower self-efficacy with respect to quitting, and a greater likelihood of being in the precontemplation stage than in the contemplation stage. Retailer density within 1 kilometer, but not 500 meters, also was related to being in the preparation as opposed to the precontemplation stage. These associations did not vary significantly according to gender.

In addition to retailer density, male gender, lower income, unstable housing, being never married older age, fewer years of education, and having a psychotic disorder were associated with greater nicotine dependence; being non-White and older and living in a neighborhood with greater poverty were associated with greater self-efficacy; and being younger, never married, divorced, separated, or widowed, and having a psychotic disorder were associated with an increased likelihood of being in the precontemplation stage. In terms of severity of mental illness, interpersonal problems and self-harm (but not psychotic symptoms) were associated with lower self-efficacy.

Proximity

The median distance to the nearest tobacco retailer was 247 meters (IQR = 115–527). Older age (B = –3.92; $P < .001$), non-White race (B = –4.7; $P < .001$), neighborhood poverty (B = –9.5; $P < .001$), and an unstable living situation (B = –2.16; $P = .03$) were associated with

living in closer proximity to a tobacco retailer. Multilevel regressions indicated that distance to the nearest tobacco retailer was not associated with severity of mental illness (according to BASIS-24 subscale scores) or with nicotine dependence, self-efficacy, or stage of change (*P*s > .05). However, moderation analyses demonstrated gender differences in the association between retailer proximity and nicotine dependence (B = 2.76; *P* = .01), such that living closer to a tobacco retailer was associated with greater nicotine dependence among men (*r* = –0.12; *P*<.01) but not women (*r* = 0.03; *P*=.45).

DISCUSSION

We characterized the retail availability of tobacco in neighborhoods of smokers with SMI and assessed whether retail availability was associated with nicotine dependence in this vulnerable group. Our results indicated that, relative to the average San Francisco Bay Area resident, adult smokers with SMI clustered in neighborhoods with 2-fold greater tobacco retailer densities. After control for neighborhood poverty level and participants' demographic characteristics and primary psychiatric diagnosis, greater density of tobacco retailers was significantly associated with poorer psychosocial functioning (psychosis, self-harm, and interpersonal problems).

Furthermore, in multivariable models examining nicotine dependence and readiness to change and controlling for neighborhood poverty level, demographic characteristics, primary psychiatric diagnosis, and severity of mental illness, higher tobacco retailer density was significantly associated with greater nicotine dependence and lower readiness to quit. Notably, the relative magnitude of the effect of retailer density on nicotine dependence and readiness to quit was large and stronger than the effect of severity of mental illness.

Taken together, these findings have implications for intervention, prevention, and social policies. Point-of-sale promotions are designed to cue smoking and trigger relapse,[49] and recent evidence indicates that people are more likely to smoke, and smoke more heavily, after exposure to retail displays of tobacco, even when they do not purchase cigarettes.[50] Tobacco retailers in California display an average of 20 cigarette marketing materials,[51] and 90% have contracts with tobacco companies or participate in incentive programs requiring that advertisements be strategically placed inside the store.[52]

Our results suggest that greater access to tobacco retailers may contribute to or exacerbate smoking among individuals with SMI.[12,38] Furthermore, prior research conducted with the general population indicates that easy access to tobacco retailers may increase smoking urges during a quit attempt and is a risk factor for relapse,[25,26,53,54] representing a barrier to cessation that could contribute to the high prevalence of smoking observed among people with SMI.

Our findings indicate that individuals with SMI have diminished expectations that they can quit smoking successfully when they live in neighborhoods with greater tobacco retailer densities. Self-efficacy is a powerful determinant of motivation to adopt health-promoting practices and change unhealthy behaviors,[55,56] and substance abuse treatment studies provide considerable evidence that high self-efficacy predicts quitting smoking,[57,58] as well

as greater latency to relapse and greater posttreatment abstinence.[59] Among people with SMI, low abstinence self-efficacy (defined as perceived ability to cope with difficulties without using substances) is associated with significantly higher substance use.[60] It is possible that greater density of tobacco retailers contributes to the belief that smoking cessation may not be achievable by increasing exposure to point-of-sale advertisements, increasing opportunities for impulse purchases, and leading to repeated failures to abstain from purchasing.

The fact that greater tobacco retailer density was associated with poorer psychosocial functioning suggests that high-density areas may be characterized by other conditions (e.g., low social capital, high deprivation and social disorganization) that produce poor mental health outcomes. Tobacco retailer density may be symptomatic of these conditions, or, along the lines of broken window theory,[61] tobacco retailer density may even play a direct norm-setting or signaling role that contributes to further social disorganization. Notably, the associations between retail availability of tobacco and smoking intentions and self-efficacy were significant in models that included psychiatric diagnosis and indices of mental health severity, indicating that our findings are robust regardless of the types of psychiatric problems experienced. The associations observed here have implications for future experimental and longitudinal research.

Notably, greater density of tobacco retailers was more strongly associated with nicotine dependence and readiness to change than living in close proximity to a retailer. Zoning policies applied to alcohol retailers have been successful in reducing alcohol-related harm,[62,63] and state and local zoning ordinances that restrict the number of tobacco retailers in a community may have a positive health impact on vulnerable populations. By quantifying the association between retail availability of tobacco and nicotine dependence among smokers with SMI, this study is a critical first step in building the evidence base to inform future retail reduction efforts as a plausible strategy to promote smoking cessation in this priority population.

Our findings support the Institute of Medicine's recommendation that state governments develop, implement, and test the potential benefits of tobacco retailer regulations[64] and can be used to aid the development of tobacco control policies that promote equal opportunities for good health by reducing abundant access to tobacco retailers among vulnerable populations. Furthermore, researchers have called for stronger partnerships between tobacco control programs and mental health organizations in the United States,[65] and our study is an initial step toward informing these important collaborations.

Gender Differences

Although researchers have recently called for including study of gender differences in tobacco control research, policy, and practice,[39] few studies have investigated whether the association between retail availability of tobacco and smoking outcomes varies according to gender. In a large study of Finnish smokers,[24] living closer to tobacco retailers predicted a decreased likelihood of smoking cessation among men, but not women, who were moderate to heavy smokers. Similarly, in our large, diverse sample of smokers with SMI, living in closer proximity to a tobacco retailer was associated with greater nicotine dependence

among men but not women. Furthermore, men who lived in areas with a greater density of tobacco retailers had more severe indicators of self-harm than women.

Gender differences in purchasing behaviors are one possible explanation for stronger associations between retail availability of tobacco and smoking outcomes for men than women. Women are more likely to shop at grocery stores, whereas men are more likely to shop at convenience stores.[66] The tobacco industry has capitalized on this knowledge by enhancing tobacco visibility in supermarkets to specifically target women.[67] Nevertheless, supermarkets represent less than a third of all tobacco sales[68] and display the fewest marketing materials (e.g., signs, displays) of any type of tobacco retailer.[51] If men are more likely to visit all other types of tobacco retailers, they may be more influenced by retailer density (i.e., they may be more likely to make impulse cigarette purchases wherever cigarettes are sold).

Furthermore, in our bivariable analyses (Table 1), women were more likely than men to be in the precontemplation stage (i.e., not planning to quit in the next 6 months), and there is some evidence that smokers who are not considering quitting are more likely to purchase on the basis of price, to plan purchases ahead, and to purchase in bulk,[69] whereas those who are planning to cut down or quit in the near future are more likely to make unplanned purchases at convenience stores and other convenience retailers.[70] Although additional research is needed to understand the mechanisms underlying the gender differences we found, our results reiterate the need for future studies to examine gender-specific associations between disparities in access to tobacco and smoking outcomes.

Limitations and Strengths

Our study should be interpreted in the context of several limitations. First, participants were smokers with SMI who were recruited from acute inpatient psychiatric units in the San Francisco Bay Area and enrolled in a clinical trial. Our findings may not generalize to other locations or the overall population of adult smokers with SMI. However, intention to quit smoking was not a requirement for participation in this study, and only a minority of the participants were intending to quit in the next 30 days. Furthermore, inclusion and exclusion criteria were minimal to allow for maximum generalizability. Most outcomes were self-reported on measures with demonstrated validity, but recall bias is possible.

Data on substance abuse and mental health and information on participants' addresses were gathered during baseline interviews conducted between 2006 and 2013; thus, in the case of some of these data, there is not exact overlap with census neighborhood data (from 2010) or retailer licensing information (from 2009–2010). However, the potential impact of this limitation on our findings is likely to be small. The study did not assess car ownership, the proximity of retailers to participants' workplaces (only 22% of the participants were employed), usual travel routes, or where participants purchased tobacco; future studies might explore such factors.

Because our study was cross sectional, we cannot determine the causal nature of the associations between tobacco retailers and participants' attitudes and smoking behaviors. Future research is needed to determine the longitudinal impact of the retail environment on

smoking cessation and relapse among individuals with SMI. Finally, tract-level demographic data were based on a spatial geometry that did not line up with the study service area polygons. To assign demographics, we used a GIS tool to estimate the population of a given area by assuming an equal distribution of attributes within tracts.

Our study also involved a number of key strengths. The sample was large and diverse. Alameda, Santa Clara, and San Francisco counties range in size from 825 863 residents (San Francisco) to 1 837 504 residents (Santa Clara). In addition, only 33% to 41% of the residents of these counties are non-Hispanic White, with 9% to 12% below the poverty level.[71] Participants were recruited from 4 different types of hospitals (academic, community, public, or county); recruitment rates exceeded 70%, and home address coordinates were available for 95% of the sample. Furthermore, spatial analysis of clinical trial data derived from smokers with SMI, in combination with tobacco retailer data, represents an innovative approach to characterizing contextual influences on relapse and quit attempts.

Other researchers are encouraged to include consideration of GIS analyses in their clinical trial data protocols to inform future studies investigating how the retail environment relates to smoking behaviors among disadvantaged groups. Given restrictions involving use of patients' health information, researchers need to anticipate institutional review board approval for geocoding address data. Additional protection from incidental disclosure can be maintained by randomly shifting geocoded addresses up to 500 feet or by obtaining the nearest street intersection rather than a residential address.[72]

Conclusions

Individuals with SMI are a priority population for tobacco control given their high smoking prevalence and the challenges they face in quitting. Our findings indicate that greater retail availability of tobacco was significantly associated with greater nicotine dependence, lowered readiness to quit, and poorer mental health in a large, diverse sample of smokers with SMI. The findings regarding nicotine dependence were stronger for men than for women. These cross-sectional data support further investigation of the tobacco retail environment as a potential vector contributing to tobacco-related disparities among individuals with SMI. Furthermore, people with SMI may benefit from progressive environmental protections that restrict the number and location of tobacco retailers and reduce aggressive point-of-sale marketing. Longitudinal data or natural experiments are needed to test whether restricting the number of tobacco retailers supports cessation efforts in this priority population.

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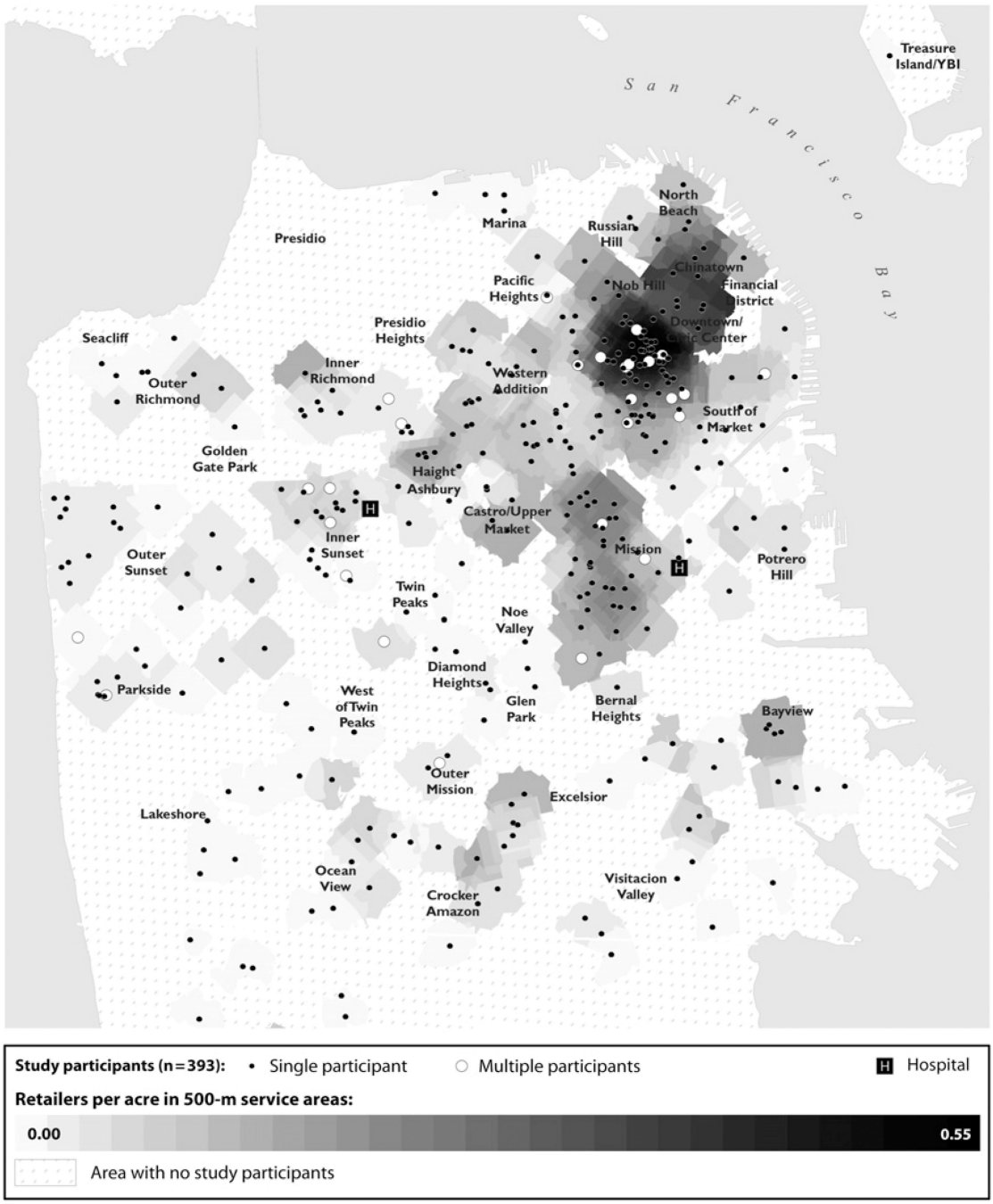

FIGURE 1.

Tobacco retailer densities near individuals with serious mental illness: San Francisco, CA.

TABLE 1

Sample Characteristics, by Gender: Smokers With Serious Mental Illness; San Francisco Bay Area, CA; 2006–2013

Characteristic	Full Sample (n = 1061), %, Mean (SD), or Median (IQR)	Men (n = 565), %, Mean (SD), or Median (IQR)	Women (n = 496), %, Mean (SD), or Median (IQR)	*P*
Demographic characteristics				
Non-White	47.1	43.9	50.6	.03
Marital status				< .001
Never married	57.7	67.5	46.5	
Divorced/separated/widowed	26.4	21.2	32.3	
Married/living with partner	15.9	11.3	21.2	
Employment status				.36
Unemployed	59.2	61.2	57.0	
Employed	22.2	21.5	23.0	
Retired/student/homemaker	18.6	17.3	20.0	
Annual individual income, $				.7
< 10 000	48.4	46.9	50.1	
<10 000–20 999	32.6	33.7	31.4	
21 000–40 999	8.4	8.0	8.7	
> 41 000	10.6	11.4	9.8	
Age, y	39.2 (13.4)	38.9 (13.3)	39.6 (13.6)	.38
Education, y	13.6 (3.0)	13.4 (3.1)	13.8 (3.0)	.051
Unstable housing situation,	33.4	38.0	28.2	< .001
Neighborhood poverty[a]	15.4	15.4	15.3	.36
Clinical characteristics				
BASIS-24 subscale score				
Depression	2.5 (1.0)	2.4 (1.1)	2.7 (1.0)	< .001
Interpersonal relationships	1.9 (1.1)	1.9 (1.0)	1.8 (1.1)	.32
Self-harm	1.5 (1.4)	1.5 (1.3)	1.6 (1.4)	.17
Emotional lability	2.1 (1.2)	1.9 (1.1)	2.2 (1.2)	< .001
Psychosis	1.2 (1.2)	1.3 (1.2)	1.2 (1.2)	.22
Substance abuse	1.3 (1.1)	1.4 (1.2)	1.1 (1.1)	< .001
Summary score	2.0 (0.8)	2.0 (0.8)	2.1 (0.8)	.001
Psychiatric diagnosis				.35
Unipolar depression	32.0	32.3	31.5	
Bipolar depression	28.3	26.1	30.8	
Psychotic disorder	26.0	27.6	24.2	
Other	13.7	14.0	13.5	
Tobacco characteristics				
Nicotine dependence score	4.8 (2.3)	4.9 (2.3)	4.6 (2.3)	.06
Self-efficacy score	5.9 (3.0)	5.7 (2.0)	6.2 (3.0)	.01
Stage of change				.03

Characteristic	Full Sample (n = 1061), %, Mean (SD), or Median (IQR)	Men (n = 565), %, Mean (SD), or Median (IQR)	Women (n = 496), %, Mean (SD), or Median (IQR)	*P*
Precontemplation	30.9	27.2	34.2	
Contemplation	46.3	50.3	42.8	
Preparation	22.8	22.5	23.0	
Tobacco retail availability				
No. of retailers within 500 m	3 (0, 7)	3 (0, 9)	3 (0, 6)	.14
No. of retailers within 1 km	12 (4, 25)	13.5 (4, 30)	12 (4, 21)	.14
Density within 500 m[b]	0.03 (0.00, 0.06)	0.03 (0.00, 0.08)	0.02 (0.00, 0.05)	.13
Density within 1 km[b]	0.03 (0.01, 0.05)	0.03 (0.01, 0.06)	0.03 (0.01, 0.04)	.2
Distance to nearest retailer, m	247 (115, 527)	242 (104, 521)	252.5 (124, 543)	.5

Note. BASIS-24 = Behavior Symptom Identification Scale; IQR = interquartile range.

[a]Percentage of individuals living in poverty within 1 km of participant's residence.

[b]Number of tobacco retailers per acre.

TABLE 2

Results from Multiple Regression Analyses Predicting Severity of Nicotine Dependence and Self-Efficacy: Smokers With Serious Mental Illness; San Francisco Bay Area, CA; 2006–2013

	500 m		1km	
Variable	**B**	**P**	**B**	**P**
Nicotine dependence				
Male	2.16	.03	2.19	.03
Non-White	−1.58	.11	−1.58	.11
Marital status				
Never married	2.06	.03	2.03	.04
Divorced/separated/widowed	1.31	.19	1.29	.2
Married/living with partner (Ref)	…		…	
Employment status				
Unemployed	1.75	.08	1.72	.08
Employed	−0.16	.88	−0.13	.89
Retired/homemaker (Ref)	…		…	
Income	−2.24	.03	−2.28	.02
Age	4.37	< .001	4.43	< .001
Education	−3.3	.001	−3.32	.001
Unstable housing situation	−2.09	.04	−2.07	.04
Neighborhood poverty	−0.04	.97	−0.06	.95
Psychiatric diagnosis				
Unipolar depression	−1.43	.15	−1.43	.15
Bipolar depression	−0.92	.36	−0.88	.38
Other	−2.07	.04	−2.02	.04
Psychotic disorder (Ref)	…		…	
Severity of mental illness score[a]				
Interpersonal problems	0.28	.78	0.31	.75
Self-harm	0.49	.62	0.52	.6
Psychotic symptoms	1.80	.07	1.81	.07
Retailer density	3.00	.003	2.50	.01
Self-efficacy				
Male	−1.74	.08	−1.73	.08
Non-White	2.72	.01	2.72	.01
Marital status				
Never married	0.60	.54	0.60	.55
Divorced/separated/widowed	1.52	.13	1.52	.13
Married/living with partner (Ref)	…		…	
Employment status				
Unemployed	1.05	.3	1.08	.28
Employed	1.76	.08	1.73	.08
Retired/homemaker (Ref)	…		…	

	500 m		1km	
Variable	**B**	**P**	**B**	**P**
Income	−1.05	.29	−1.01	.31
Age	2.28	.02	2.26	.02
Education	−0.69	.49	0.66	.51
Unstable housing situation	0.24	.81	0.23	.82
Neighborhood poverty	2.01	.04	2.23	.03
Psychiatric diagnosis				
Unipolar depression	1.49	.14	1.52	.13
Bipolar depression	0.78	.43	0.74	.46
Other	0.52	.6	0.50	.62
Psychotic disorder (Ref)	…		…	
Severity of mental illness score[a]				
Interpersonal problems	−2.03	.04	−2.04	.04
Self-harm	−2.08	.04	−2.09	.04
Psychotic symptoms	1.73	.08	1.74	.08
Retailer density	−2.08	.04	−2.33	.02

Note. 500 m and 1 km represent retailer densities.

[a]From Behavior Symptom Identification Scale (BASIS-24) subscales.

TABLE 3

Results from Multiple Regression Analyses Predicting Stage of Change: Smokers With Serious Mental Illness; San Francisco Bay Area, CA; 2006–2013

	500 m		1 km	
Variable	**OR (95% CI)**	***P***	**OR (95% CI)**	***P***
Precontemplation vs contemplation				
Male	1.23 (0.89, 1.70)	.22	1.21 (0.87, 1.69)	.25
Non-White	1.13 (0.81, 1.56)	.48	1.12 (0.81, 1.58)	.46
Marital status				
Never married	0.62 (0.39, 0.97)	.02	0.62 (0.40, 0.99)	.04
Divorced/separated/widowed	0.62 (0.42, 0.91)	.01	0.62 (0.42, 0.91)	.02
Married/living with partner (Ref)	1.00		1.00	
Employment status				
Unemployed	0.76 (0.50, 1.17)	.22	0.76 (0.49, 1.17)	.21
Employed	0.98 (0.57, 1.68)	.94	0.99 (0.58, 1.71)	.98
Retired/homemaker (Ref)	1.00		1.00	
Income	1.02 (0.95, 1.10)	.56	1.02 (0.95, 1.10)	.6
Age	0.90 (0.92, 0.99)	.02	0.98 (0.97, 0.99)	.02
Education	1.01 (0.96, 1.06)	.76	1.01 (0.96, 1.06)	.81
Unstable housing situation	1.32 (0.95, 1.84)	.1	1.32 (0.95, 1.89)	.1
Neighborhood poverty	0.50 (0.07, 3.34)	.47	0.30 (0.04, 2.10)	.23
Psychiatric diagnosis				
Unipolar depression	0.53 (0.31, 0.89)	.02	0.52 (0.31, 0.89)	.02
Bipolar depression	0.58 (0.39, 0.87)	.01	0.57 (0.38, 0.85)	.01
Other	0.75 (0.49, 1.14)	.17	0.75 (0.49, 1.15)	.19
Psychotic disorder (Ref)	1.00		1.00	
Severity of mental illness score[a]				
Interpersonal problems	1.06 (0.91, 1.24)	.44	1.06 (0.91, 1.24)	.44
Self-harm	0.91 (0.80, 1.03)	.11	0.90 (0.80, 1.02)	.1
Psychotic symptoms	0.91 (0.79, 1.05)	.2	0.91 (0.79, 1.03)	.19
Retailer density	1.45 (1.03, 2.06)	.04	2.08 (1.31, 3.30)	.002
Precontemplation vs preparation				
Male	1.01 (0.67, 1.50)	.98	0.99 (0.66, 1.49)	.97
Non-White	1.01 (0.69, 1.49)	.94	1.03 (0.70, 1.51)	.9
Marital status				
Never married	0.97 (0.56, 1.71)	.93	0.98 (0.56, 1.51)	.95
Divorced/separated/widowed	0.72 (0.43, 1.22)	.22	0.74 (0.44, 1.24)	.25
Married/living with partner (Ref)	1.00		1.00	
Employment status				
Unemployed	0.83 (0.50, 1.40)	.49	0.82 (0.49, 1.34)	.44
Employed	0.73 (0.39, 1.35)	.31	0.73 (0.39, 1.35)	.31
Retired/homemaker (Ref)	1.00		1.00	

	500 m		1 km	
Variable	**OR (95% CI)**	***P***	**OR (95% CI)**	***P***
Income	1.07 (0.98, 1.18)	.12	1.07 (0.98, 1.18)	.13
Age	0.98 (0.96, 0.99)	.03	0.98 (0.96, 0.99)	.02
Education	0.97 (0.91, 1.04)	.36	0.97 (0.91, 1.03)	.31
Unstable housing situation	0.97 (0.66, 1.44)	.9	0.97 (0.66, 1.44)	.88
Neighborhood poverty	0.98 (0.06, 10.64)	.99	0.60 (0.05, 6.55)	.67
Psychiatric diagnosis				
Unipolar depression	0.70 (0.36, 1.35)	.29	0.69 (0.36, 1.35)	.28
Bipolar depression	0.71 (0.43, 1.17)	.18	0.69 (0.42, 1.14)	.15
Other	0.78 (0.47, 1.30)	.34	0.79 (0.48, 1.31)	.36
Psychotic disorder (Ref)	1.00		1.00	
Severity of mental illness score[a]				
Interpersonal problems	1.04 (0.89, 1.22)	.63	1.04 (0.89, 1.23)	.61
Self-harm	0.90 (0.78, 1.04)	.14	0.90 (0.70, 1.04)	.14
Psychotic symptoms	0.86 (0.71, 1.05)	.13	0.86 (0.71, 1.04)	.12
Retailer density	1.35 (0.96, 1.88)	.08	1.95 (1.14, 3.35)	.02

Note. CI = confidence interval; OR = odds ratio. 500 m and 1 km represent retailer densities.

[a]From Behavior Symptom Identification Scale (BASIS-24) subscales.