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Homelessness, Cigarette Smoking, and Desire to Quit: Results from a U.S. National Study

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Abstract

Aims—We determined whether homelessness is associated with cigarette smoking independent of other socioeconomic measures and behavioral health factors, and whether homeless smokers differ from non-homeless smokers in their desire to quit.

Design, Setting, and Participants—We analyzed data from 2,678 adult respondents to the 2009 Health Center Patient Survey, a nationally representative cross-sectional survey of homeless and non-homeless individuals using U.S. federally-funded community health centers.

Measurements—We used multivariable logistic regression to examine the association between homelessness and (1) current cigarette smoking among all adults, and (2) past-year desire to quit among current smokers, adjusting for demographic, socioeconomic, and behavioral health characteristics.

Findings—Adults with any history of homelessness were more likely than never homeless respondents to be current smokers (57% vs. 27%, $p < 0.001$). In multivariable models, a history of homelessness was independently associated with current smoking (AOR 2.09; 95% CI 1.49–2.93), even after adjusting for age, sex, race, veteran status, insurance, education, employment, income, mental illness, and alcohol and drug abuse. Housing status was not significantly associated with past-year desire to stop smoking in unadjusted ($p = 0.26$) or adjusted ($p = 0.60$) analyses; 84% of currently homeless, 89% of formerly homeless, and 82% of never homeless smokers reported wanting to quit.

Conclusions—Among patients of U.S. health centers, a history of homelessness doubles the odds of being a current smoker independent of other socioeconomic factors and behavioral health conditions. However, homeless smokers do not differ from non-homeless smokers in their desire to quit and should be offered effective interventions.

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DECLARATIONS OF INTEREST

Conflicts of Interest: Dr. Baggett has received travel compensation from the non-profit Health Education Council Break Free Alliance as well as travel and speaking honoraria from the non-profit Canadian Mental Health Association – Ottawa, all for work related to addressing tobacco use in homeless and vulnerable populations. Dr. Lebrun-Harris has no potential conflicts to report. Dr. Rigotti has been an unpaid consultant on smoking cessation for Pfizer and Alere Wellbeing. She receives royalties from UpToDate for chapters on smoking cessation.

INTRODUCTION

An estimated 100 million people are homeless worldwide (1), including sizable numbers of individuals in North America (2, 3), Europe (4), and Australia (5). In the United States, 68-80% of homeless adults are current cigarette smokers (6-10), representing a considerable disparity in relation to the 19% prevalence in the general population (11). Similarly high rates of smoking have been reported for homeless individuals in other industrialized nations (12-16). Qualitative evidence from homeless smokers suggests that homelessness may impact both the uptake of smoking and the quantity of cigarette consumption (17). Homeless smokers frequently cite emotional reasons for smoking (18), and many view tobacco use as a means of coping with “all the pressures of being homeless” or as a reward for enduring the hardships of homelessness (17). The pervasiveness and social acceptability of smoking in the setting of homelessness may further reinforce this behavior and lessen the social pressure for quitting.

Despite the plausible mechanisms by which homelessness may influence tobacco use behavior, few data sources offer the ability to examine the correlation between homelessness and smoking while controlling for the confounding factors linked to both, such as low income, joblessness, low educational attainment, mental illness, and substance use disorders (19, 20). While homeless people generally have a disproportionate burden of these socioeconomic and behavioral health vulnerabilities, homelessness itself represents a distinct experience of displacement with uniquely devastating health consequences (21). Examining the independent association between homelessness and cigarette smoking would contribute to the body of evidence describing the adverse health outcomes of homeless people and clarify the need for interventions focusing not only on individual-level factors but also on the social contextual factors that contribute to tobacco use disparities in this population (22, 23).

Although conventional wisdom has suggested that attempting to modify smoking behavior in homeless patients is unrealistic (24), empirical studies have found that homeless smokers are interested in quitting (7, 25). In a single-city study, homeless smokers were less likely to be in preparation to quit but expressed an interest in smoking cessation programming that was not significantly different from non-homeless low-income smokers (18). However, questions remain at the clinical practice level about the relative importance and optimal timing of addressing smoking cessation in homeless smokers (26). Understanding the association between housing status and interest in quitting would provide guidance on these issues.

To address these gaps in evidence, we analyzed data from a U.S. national survey of community health center patients to determine the association between homelessness history and 1) current cigarette smoking among all adults, and 2) past-year desire to quit among all current smokers. We hypothesized that adults with a history of homelessness would have higher odds of current smoking than never homeless individuals independent of other factors associated with smoking, but that homelessness would not be significantly associated with desire to quit among smokers.

METHODS

Setting and participants

We analyzed data from adult respondents to the 2009 Health Center Patient Survey, sponsored by the Health Resources and Services Administration (HRSA) and conducted by Research Triangle Institute (RTI) International. A 3-stage sampling design produced cross-sectional, nationally representative data on individuals served through the HRSA Health

Center Program (27). This program targets vulnerable and medically underserved patient populations through 4 funding streams established under Section 330 of the Public Health Service Act: the Community Health Center Program, the Health Care for the Homeless Program, the Migrant Health Center Program, and the Public Housing Primary Care Program (28, 29).

First-stage sampling units were health center grantees, stratified by funding stream, patient volume, census region, urban/rural location, and number of sites per grantee. Overall, 188 grantees were sampled with probability proportional to health center patient volume, with a 91% response rate. The second stage sampled up to 3 clinical sites per grantee, resulting in data from 432 sites with a 97% response rate. In the third stage, individual patients were sampled consecutively at each site, where trained field investigators administered computer-assisted personal interviews that lasted about 50 minutes. Of 8,275 patients initially identified by site receptionists, 5,965 (72%) agreed to participate. Of these, 1,323 (16%) were deemed ineligible on screening and another 80 (1%) did not complete the interviews, yielding a response rate of 55% among those initially identified and 98% among those who agreed to participate and were confirmed to be eligible. A total of 4,562 patient interviews were completed between September and December 2009. Upon interview completion, participants received \$25 in cash, gift card, or food voucher, as determined by the health center. Health Care for the Homeless grantees made comparably greater use of gift cards and food vouchers than other grantees. The RTI International institutional review board (IRB) approved the study, and local IRB or other committee approvals were also obtained for grantees that required them.

In keeping with the analytic precedent established by HRSA (30), the current study included data from patients served through the Health Care for the Homeless Program and the Community Health Center Program in order to achieve a more valid comparison between homeless and non-homeless low-income individuals. We excluded data from the Migrant Health Center Program and the Public Housing Primary Care Program because these programs serve unique subsets of patients whose characteristics merit separate analysis. We also excluded participants under the age of 18 years and 61 respondents with missing housing status. After these exclusions, the final sample size was 2,678 individuals, representing a weighted sample of 12.9 million adult health center patients nationally.

Dependent variables

The dependent variables were 1) current cigarette smoking and 2) desire to quit smoking in the past 12 months. We defined smoking status based on the following 2 questions: “Have you smoked 100 cigarettes in your entire life?” and, if yes, “Do you now smoke cigarettes every day, some days, or not at all?” Ever smokers were defined as individuals who had ever smoked 100 cigarettes, and current smokers were defined as ever smokers who currently smoke every day or some days (11). Among current smokers, we assessed past-year desire to quit with the following question: “During the past 12 months, have you wanted to stop smoking?”

Main independent variable

We defined homelessness based on the following question: “Do you or your family currently have your own place to live, such as a house, apartment, or room?” Respondents who answered no or who reported a transitional shelter, hotel, or motel as their usual residence were classified as currently homeless (30). Among currently housed participants, we determined past experiences of homelessness with the following question: “Have you or your family ever not had your own place to live, that is, not had your own place that you could stay at for 30 days or longer?” For the analysis of current cigarette smoking, we

examined the effect of having ever been homeless at any point, since smoking is a chronic behavior that may be influenced by experiences occurring over the lifespan. For the analysis of past-year interest in quitting, we distinguished between current and former homelessness since the dependent variable referenced a recent and discrete time frame and since clinicians often assume that homeless smokers would only be interested in quitting once their housing needs have been met.

Confounders

The association between homelessness and smoking may be confounded by a number of demographic, socioeconomic, and behavioral health characteristics. We selected these confounders based on both scientific evidence and *a priori* hypotheses. Demographic variables included self-reported age (18-34, 35-49, >50 years), sex (male/female), race/ethnicity (categorized as white non-Hispanic, black non-Hispanic, other non-Hispanic, or Hispanic), veteran status, and health insurance status. Measures of socioeconomic status included self-reported education (less than high school diploma, high school diploma or GED, or more than high school diploma), employment status (currently working for pay vs. not), and annual income (categorized as <100% of the federal poverty level [FPL], 100-200% FPL, or >200% FPL).

Behavioral health characteristics included mental illness, problem alcohol use, and problem drug use. We defined mental illness as having any of the following: 1) a score of ≥ 13 on the 6-item Kessler (K6) scale of psychological distress (31), 2) a self-reported lifetime history of depression, generalized anxiety, or panic disorder, or 3) self-reported receipt of any mental health treatment or counseling in the past year, including treatment with medication, group/individual counseling with a mental health provider (e.g., social worker, psychologist, psychiatrist, psychiatric nurse, other mental health professional), or inpatient treatment. We defined an alcohol use problem as the presence of self-reported binge drinking of ≥ 5 drinks on at least one occasion in the past year (32), or having a score of ≥ 7 on the Alcohol, Smoking and Substance Involvement Screening Test (ASSIST) (33). We defined a drug problem as having a self-reported lifetime history of injection drug use, or having an ASSIST score of ≥ 7 for any of the following substances: marijuana, cocaine, amphetamines, inhalants, hallucinogens, opioids (non-medical use), sedatives (non-medical use), or other substances (33).

Analysis

We used Chi square tests to compare the demographic characteristics, socioeconomic indicators, behavioral health histories, and current smoking status of participants with and without a history of homelessness. Since current smoking status reflects a dynamic byproduct of smoking uptake and smoking cessation, we performed descriptive analyses using the Chi square test to compare the percentage of ever smokers (i.e. smoking uptake) between respondents with and without a history of homelessness, as well as the quit ratio (i.e. smoking cessation) between ever smokers with and without a history of homelessness. We calculated the quit ratio by dividing the number of former smokers by the number of ever smokers (34).

We then conducted staged logistic regression analyses to model the association between homelessness history and current cigarette smoking while sequentially adjusting for demographic, socioeconomic, and behavioral health covariates. We assessed for effect modification by testing interactions between homelessness history and mental illness, alcohol abuse, and drug abuse. Additionally, we conducted subanalyses of individuals with any history of homelessness to examine whether chronic homelessness (current episode ≥ 1 year in duration or ≥ 4 lifetime episodes (35, 36)) or being currently (vs. formerly) homeless

conferred additional risk of smoking, after controlling for the same group of demographic, socioeconomic, and behavioral health covariates.

Among current smokers, we examined the unadjusted association between housing status and past-year desire to quit using the Chi square test. We then used multivariable logistic regression to examine this association after adjusting for demographic, socioeconomic, and behavioral health covariates.

We conducted all analyses using the survey (“svy”) commands in Stata version 12.0 (College Station, TX) to account for the complex sampling design. We specified variables identifying sampling strata and clusters, and we used Taylor series linearization for design-based variance estimation. Our analyses incorporated sampling weights developed by RTI International to produce valid estimates for the target population of health center users nationally. The final weight for each participant was the product of 8 components, including selection probability and non-response adjustment at each sampling stage as well as patient-level post-stratification adjustment using demographic counts from the 2008 Uniform Data System of health centers.

Missing data

Individuals with missing data for smoking status (n=9) were excluded from analyses involving this variable. No current smokers were missing data for the desire to quit variable. There was generally minimal (<1%) missing data for the independent variables. The exception to this was the income variable, for which 16.4% of respondents had missing data. To minimize missing data bias, we performed multiple imputations (MI) using chained equations to generate model-based estimates for missing data values based on other variables used in the analyses (37). Sensitivity analyses using a complete case approach, a missing indicator method for income, and simple imputation methods for income generated nearly identical results in comparison to the MI approach. Because of the robust validity of MI techniques (38), we report the findings of our regression analyses based on multiply-imputed data. Our descriptive and unadjusted analyses are based on non-imputed data.

RESULTS

Respondent characteristics

Overall, 62% of respondents were female and 73% were under age 50 (Table 1). Forty-two percent were white, 27% were Hispanic, and 22% were black. Over 40% had less than a high school diploma, more than half earned <100% FPL, and nearly two-thirds were not currently working for pay. Almost 60% of participants had a history of mental health problems, over 20% had an alcohol use problem, and about 5% had a drug use problem. Thirty-five percent of respondents had no behavioral health comorbidities.

Homelessness history

Of all adult respondents, 4% were currently homeless and 11% were formerly homeless. In unadjusted analyses, participants with a history of homelessness were more likely to be older ($p<0.001$), male ($p=0.04$), non-Hispanic ($p=0.009$), and a veteran ($p=0.02$), as compared to participants without a history of homelessness. Ever homeless respondents were less likely to be currently employed ($p=0.003$) and more likely to have an income <100% FPL ($p=0.001$). Mental health problems ($p<0.001$), alcohol use problems ($p=0.01$), and drug use problems ($p<0.001$) were significantly more common among persons with a history of homelessness. Eleven percent of ever homeless respondents had no behavioral health comorbidities, compared with 40% among never homeless respondents ($p<0.001$).

Cigarette smoking

Overall, 31.2% of respondents were current cigarette smokers (Table 1). In unadjusted analyses, individuals with a history of homelessness had a substantially higher prevalence of current smoking than never homeless persons (57.3% vs. 26.7%, $p<0.001$). Seventy-four percent of respondents with a history of homelessness were ever smokers, as compared to 43.5% among those without a history of homelessness ($p<0.001$). Among ever smokers, 23.0% of those with a history of homelessness were former smokers, while 38.5% of those without a history of homelessness were former smokers ($p=0.004$).

Table 2 shows the results of staged logistic regression models examining the association between homelessness history and current smoking. Controlling for demographic characteristics modestly reduced the odds ratio for this association, from 3.68 (95% confidence interval [CI] 2.60-5.20) to 3.28 (95% CI 2.38-4.52). Adding socioeconomic variables to the model further reduced the odds ratio to 2.96 (95% CI 2.22-3.94). The addition of model covariates adjusting for mental illness, alcohol use problems, and drug use problems resulted in a final adjusted odds ratio of 2.09 (95% CI 1.49-2.93). Interaction terms between homelessness history and mental illness ($p=0.18$), alcohol abuse ($p=0.85$), and drug abuse ($p=0.27$) were all non-significant and not included in the final model.

In multivariable subanalyses confined to individuals with a history of homelessness, being currently homeless (adjusted odds ratio [AOR] 0.79, 95% CI 0.33-1.89) or having a history of chronic homelessness (AOR 1.15, 95% CI 0.68-1.96) was not significantly associated with current cigarette smoking.

Desire to quit smoking

Of current smokers, 83.1% reported that they wanted to quit in the past 12 months. Currently homeless, formerly homeless, and never homeless respondents did not significantly differ in their past-year desire to stop smoking (84.3% vs. 88.5% vs. 81.6%, $p=0.26$ for general association; see Figure). Adjusting for demographic characteristics, socioeconomic measures, mental illness, and substance abuse history in multivariable models did not alter this conclusion ($p=0.60$); currently homeless smokers (AOR 0.91, 95% CI 0.43-1.96) and formerly homeless smokers (AOR 1.34, 95% CI 0.58-3.08) remained similar to never homeless smokers in their desire to quit.

DISCUSSION

In a diverse nationwide sample of health center patients in the United States, a history of homelessness was associated with current cigarette smoking even after controlling for important confounders known to influence tobacco use behavior. Despite having a quit ratio less than half of that seen in the U.S. general population (34), homeless smokers did not differ from non-homeless smokers in their past-year desire to quit. This study adds to a body of literature highlighting the influence of social circumstances on cigarette smoking (39), complements studies detailing the association between homelessness and other addictive behaviors (20, 40-45), extends the findings of a Department of Veterans Affairs study that reported an association between homelessness and nicotine dependence (46), and reinforces prior evidence that homeless smokers are interested in quitting (7, 18, 25).

Consistent with our expectations and with the scientific literature, we found that certain socioeconomic characteristics and behavioral health comorbidities were strongly linked to both homelessness and cigarette smoking. Prior evidence has documented the excess risk of smoking associated with low income (11, 47, 48), low educational attainment (11, 48-52), unemployment (53, 54), mental illness (55-58), and alcohol and drug use disorders (59-63). However, the high prevalence of cigarette smoking among homeless individuals was not

fully explained by their disproportionate burden of these traits. A few studies have highlighted the association between tobacco use and certain housing situations, such as living in public housing (64) or renting rather than owning (58, 65-67). Our study complements these findings in demonstrating the sizable association between ever experiencing a lack of housing and smoking cigarettes, underscoring the importance of social context in fueling tobacco-related health disparities (22, 23). The high prevalence of wanting to quit among homeless smokers implies that most find their tobacco use undesirable, justifying the need for comprehensive tobacco control programming directed toward this population. Our findings suggest that intervention strategies should address not only the individual-level comorbidities of homeless smokers but also the various contextual promoters of smoking that are intrinsic to homelessness, including the social and interpersonal functions of smoking (17), the pervasive culture of tobacco use (17), and the structural barriers to accessing health care services (68) and smoking cessation therapies (26).

We were unable to infer causality in interpreting the association between homelessness and smoking in this cross-sectional study. A similar problem has been noted in other studies of substance abuse among homeless individuals, and competing perspectives have emerged in examining whether these addictive behaviors are predominantly a cause or consequence of homelessness. The “social adaptation” perspective has posited that substance abuse is frequently triggered or intensified by the stressors of homelessness and socialization into a subculture where drug and alcohol use are more acceptable (69-71). In contrast, a “social selection” perspective has suggested that substance abuse contributes to the development of homelessness through the gradual erosion of an individual’s social and financial resources (71).

While qualitative evidence from homeless smokers thematically supports a role for “social adaptation” in explaining the high prevalence of smoking among homeless individuals (17), certain counterpoints to this theory bear mentioning. First, homeless smokers in this study reported first experiencing homelessness at a mean age of 27 years, which is 12-13 years older than the average age of smoking initiation reported in prior studies of homeless smokers (18, 25). This suggests that homelessness is unlikely to play a role in promoting first cigarette use among the majority of homeless smokers, although it might still contribute to other pathways of social adaptation, such as facilitating relapse among former smokers or reinforcing tobacco use among current smokers, in turn making quitting more difficult. Next, we found that a history of chronic homelessness did not further elevate the risk of being a current smoker, arguing against a traditional dose-response relationship. An alternative explanation is that homelessness might represent a threshold experience of deprivation beyond which the duration and intensity contribute relatively little to additional variability in the associated behavior. Further, formerly homeless persons were no less likely than currently homeless persons to be current smokers. This raises the possibility that the link between homelessness and smoking may involve mechanisms that have a long-lasting effect on health behavior. The psychological trauma of experiencing homelessness (72) may be one such mechanism. Another mechanism might involve the development of nicotine dependence, which perpetuates smoking behavior long after the initial social triggers for smoking have been removed.

The possibility of residual confounding by unmeasured variables also limits causal inference. However, such variables would have to exhibit a strong confounding effect to negate the relatively large association between homelessness history and smoking that we documented here. Other important limitations include the self-reported nature of the data, introducing the potential for social desirability and recall biases. Finally, the survey was conducted among individuals who used federally supported health centers in the U.S., so the

results may not be generalizable to adults who do not use such services. Certain findings suggest that this clinic-based survey may have captured a subset of homeless people with fewer adverse health behaviors, since the reported prevalence of cigarette smoking among homeless participants was lower than that reported in prior U.S. studies (6-10) and the quit ratio among homeless ever smokers was higher than has been previously reported for this population (6). This may have downwardly biased the observed association between homelessness and smoking, while potentially overestimating homeless smokers' interest in quitting.

In conclusion, a history of homelessness is independently associated with cigarette smoking, but homeless smokers do not differ from other smokers in their desire to quit. This study adds to a body of literature highlighting the adverse health risks associated with being homeless and further dispels the notion that homeless smokers do not consider cessation a priority. Our findings support the need for smoking cessation interventions targeting this highly vulnerable group of people.

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Table 1

Characteristics of the study sample by homelessness history.

	All (n=2678)		Ever homeless (n=974)		Never Homeless (n=1704)		P value *
	Weighted % (SE)	N	Weighted % (SE)	N	Weighted % (SE)	N	(Ever vs. Never Homeless)
Demographic							
Age, years							0.0002
18-34	39.2 (3.0)	673	24.2 (3.8)	208	41.7 (3.2)	465	
35-49	33.9 (2.1)	943	47.1 (4.4)	418	31.6 (2.1)	525	
50+	27.0 (2.5)	1065	28.7 (2.9)	348	26.7 (2.7)	714	
Sex							0.0434
Female	62.2 (3.0)	1699	46.3 (4.1)	509	63.6 (3.3)	1234	
Male	37.8 (3.0)	979	53.7 (4.6)	465	36.4 (3.3)	470	
Race/Ethnicity							0.0089
Hispanic	27.4 (3.8)	788	14.6 (2.8)	169	29.6 (4.4)	619	
White, non-Hispanic	42.4 (3.9)	977	47.2 (4.7)	387	41.6 (4.3)	590	
Black, non-Hispanic	21.6 (3.9)	679	25.5 (4.5)	298	21.0 (4.2)	381	
Other, non-Hispanic	8.5 (1.2)	234	12.8 (2.8)	120	7.8 (1.3)	114	
Veteran							0.0192
Yes	4.1 (0.8)	147	7.4 (2.3)	82	3.5 (0.8)	65	
No	95.9 (0.8)	2528	92.6 (2.3)	890	96.5 (0.8)	1638	
Health insurance							0.7024
Yes	60.6 (3.3)	1608	58.4 (6.1)	549	61.0 (3.6)	1059	
No	39.4 (3.3)	1065	41.6 (6.1)	423	39.0 (3.6)	642	
Socioeconomic							
Education							0.6065
More than HS diploma	29.0 (2.4)	775	32.0 (4.0)	274	28.4 (2.4)	501	
HS Diploma/GED	30.2 (2.4)	739	30.5 (3.3)	291	30.1 (2.7)	448	
Less than HS diploma	40.9 (2.7)	1156	37.5 (5.3)	406	41.4 (2.8)	750	
Current Employment							0.0026
Working for pay	36.2 (3.2)	689	21.6 (3.8)	125	38.7 (3.6)	564	
Not working for pay	63.8 (3.2)	1981	78.4 (3.8)	844	61.3 (3.6)	1137	
Income, %FPL							0.0005
> 200% FPL	16.9 (2.2)	268	13.1 (4.1)	50	17.6 (2.4)	218	
100-200% FPL	32.0 (2.5)	597	16.3 (3.2)	122	35.0 (2.6)	475	
< 100% FPL	51.1 (2.5)	1373	70.5 (4.0)	691	47.4 (2.7)	682	
Behavioral Health							
Mental illness							<0.0001
Yes	59.0 (3.3)	1789	83.2 (2.7)	778	54.9 (3.6)	1011	
No	41.0 (3.3)	866	16.8 (2.7)	188	45.1 (3.6)	678	
Alcohol use problem							0.0136
Yes	21.1 (2.5)	682	29.0 (4.0)	367	19.7 (2.6)	315	

	All (n=2678)		Ever homeless (n=974)		Never Homeless (n=1704)		P value *
	Weighted % (SE)	N	Weighted % (SE)	N	Weighted % (SE)	N	(Ever vs. Never Homeless)
No	78.9 (2.5)	1996	71.0 (4.0)	607	80.3 (2.6)	1389	
Drug use problem							<0.0001
Yes	4.7 (0.9)	273	18.5 (3.9)	222	2.4 (0.6)	51	
No	95.3 (0.9)	2405	81.5 (3.9)	751	97.6 (0.6)	1653	
Outcome							
Current cigarette smoking							<0.0001
Yes	31.2 (2.4)	1029	57.3 (3.7)	595	26.7 (2.3)	434	
No	68.8 (2.4)	1640	42.7 (3.7)	375	73.3 (2.3)	1265	

Data source: 2009 Health Center Patient Survey

Note: Percentages are weighted to reflect U.S. health center users nationally using sampling weights provided by RTI International. Counts are unweighted.

Abbreviations: HS, high school; GED, general equivalency degree; FPL, federal poverty level; SE, standard error

* P value for chi-square test of difference between ever and never homeless participants

Table 2

Staged logistic regression models assessing the association between homelessness history and current cigarette smoking, adjusting for important confounders.

	Model 1	Model 2	Model 3	Model 4
	OR (95% CI) N=2669	AOR (95% CI) N=2669	AOR (95% CI) N=2669	AOR (95% CI) N=2669
Main predictor				
Homeless				
Ever	3.68 (2.60-5.20)	3.28 (2.38-4.52)	2.96 (2.22-3.94)	2.09 (1.49-2.93)
Never	Ref	Ref	Ref	Ref
Demographic				
Age, years				
18-34		Ref	Ref	Ref
35-49		1.45 (1.02-2.05)	1.46 (1.04-2.11)	1.54 (1.06-2.22)
50+		0.71 (0.45-1.11)	0.68 (0.44-1.03)	0.72 (0.48-1.10)
Sex				
Male		Ref	Ref	Ref
Female		0.65 (0.42-0.99)	0.64 (0.43-0.95)	0.69 (0.47-0.997)
Race/ethnicity				
White, non-Hispanic		Ref	Ref	Ref
Black, non-Hispanic		0.33 (0.19-0.58)	0.30 (0.17-0.54)	0.39 (0.23-0.66)
Other, non-Hispanic		0.75 (0.41-1.38)	0.72 (0.38-1.37)	0.66 (0.34-1.27)
Hispanic		0.20 (0.10-0.38)	0.17 (0.09-0.34)	0.17 (0.09-0.32)
Veteran				
Yes		0.98 (0.39-2.46)	1.02 (0.40-2.61)	0.97 (0.40-2.32)
No		Ref	Ref	Ref
Health insurance				
Yes		Ref	Ref	Ref
No		1.11 (0.74-1.65)	1.13 (0.77-1.66)	1.17 (0.83-1.64)
Socioeconomic				
Education				
More than HS			Ref	Ref
HS diploma/GED			1.21 (0.80-1.84)	1.42 (0.94-2.15)
Less than HS diploma			1.56 (1.03-2.38)	1.84 (1.21-2.80)
Current Employment				
Working for pay			Ref	Ref
Not working for pay			1.44 (0.95-2.18)	1.31 (0.90-1.90)
Income, %FPL				
> 200% FPL			Ref	Ref
100-200% FPL			0.60 (0.25-1.44)	0.63 (0.27-1.47)
< 100% FPL			0.94 (0.49-1.79)	0.94 (0.50-1.78)
Behavioral Health				

	Model 1	Model 2	Model 3	Model 4
	OR (95% CI) N=2669	AOR (95% CI) N=2669	AOR (95% CI) N=2669	AOR (95% CI) N=2669
Mental illness				
Yes				1.85 (1.21-2.83)
No				Ref
Alcohol use problem				
Yes				2.37 (1.63-3.44)
No				Ref
Drug use problem				
Yes				4.43 (2.09-9.37)
No				Ref

Data source: 2009 Health Center Patient Survey

Analytic note: Logistic regression models accounted for the complex sampling design by specifying variables denoting sampling strata and clusters and by incorporating sampling weights reflecting selection probability, non-response adjustment, and post-stratification adjustment. Taylor series linearization was used for design-based variance estimation. Missing data values for income (16% missing) and other independent variables (<1% missing) were multiply imputed using chained equations. Interaction terms for homelessness history $\times$ mental illness ($p=0.18$), homelessness history $\times$ alcohol use problem ($p=0.85$), and homelessness history $\times$ drug use problem ($p=0.27$) were all non-significant and not included in the final model.

Abbreviations: HS, high school; GED, general equivalency degree; FPL, federal poverty level; OR, odds ratio; AOR, adjusted odds ratio; CI, confidence interval