Nicotine & Tobacco Research Advance Access published February 26, 2016

Tobacco cessation behaviors among older homeless adults: Results from the HOPE HOME Study

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Abstract

Introduction: Tobacco-attributable deaths contribute significantly to the increased mortality observed among homeless adults aged ≥ 50 years. Little is known about the epidemiology of tobacco use among older homeless individuals. This longitudinal cohort study examines smoking behaviors and factors associated with smoking cessation among homeless individuals aged ≥ 50 years.

Methods: We recruited a prospective cohort of 350 homeless individuals sampled from the community in Oakland, CA. At 6 months follow up, participants reported their cigarette quit attempts and 30-day abstinence. We used multivariable logistic regression to examine factors associated with making a quit attempt at follow-up, hypothesizing that heavier smokers would be less likely to make a quit attempt.

Results: Of the 272 ever smokers, 229 (84.2%) were current smokers (quit ratio 15.8). Among current smokers at enrollment who had a follow-up interview at 6 months, 43.6% (n=71) reported making a quit attempt during the follow-up. Of those who reported making a quit attempt, 14.3% (n=10) reported 30-day abstinence at follow-up. Among those who had reported making a quit attempt at follow-up, 22.5% had used nicotine replacement therapy (NRT). Staying in shelters (Adjusted Odds Ratio (AOR) 2.5, 95% CI 1.0-5.8) was associated with higher odds of making a quit attempt at follow-up. Higher cigarette consumption was associated with lower odds of making a quit attempt (AOR 0.9, 95% CI 0.8-0.9).

Conclusions: In this study of tobacco use in older homeless adults, rates of quit attempts were similar to that observed in the general population, but successful quitting was lower.

INTRODUCTION

Tobacco use in the general population has declined substantially in the past three decades, but rates remain high in certain populations. The prevalence of tobacco use in the homeless population is 3 to 4 times that of the general population.[1, 2] Among homeless adults, tobacco-related chronic diseases including heart disease, cancer and chronic obstructive pulmonary disease (COPD) are common and contribute significantly to the increased morbidity and mortality in this population.[3, 4] Among a clinic-based sample of homeless adults aged 50 and older, tobacco-attributable deaths accounted for 26% of the overall mortality and 54% of substance-related mortality.[5]

The health consequences of smoking occur disproportionately among older individuals because of the cumulative effects of long-term smoking.[6] Among older adults, tobacco-related chronic diseases, particularly COPD and coronary heart disease, are among the most common reasons for emergency health care services and preventable hospitalizations.[7] Current tobacco use contributes significantly to all-cause mortality among older adults, suggesting that tobacco cessation at any age is likely to significantly reduce tobacco-related morbidity and mortality.[8] In a nationally representative sample, older adults were less likely to quit smoking than younger adults because of reduced interest in quitting smoking, higher nicotine dependence, and lower support for smoke-free norms.[9] This highlights the need for tobacco cessation interventions that address tobacco-related beliefs and practices among older adults.

Over the past 2 decades, the median age of homeless adults increased from 37 years in 1990 [10] to almost 50 years in 2010.[11] Despite increased tobacco-related morbidity and mortality among older homeless adults, little is known about tobacco use and cessation behaviors in this population. Prior research on tobacco use in the homeless population has focused on younger

adults, where the average age of study participants in previous studies was less than 44 years.[1, 2, 12, 13] The high prevalence of tobacco use and the increased burden of tobacco-related chronic diseases with aging underscore a need for studies that characterize tobacco use and cessation behaviors among older homeless adults in order to develop tobacco control interventions that address the unique needs of this population.

We conducted a study of a cohort of homeless individuals aged 50 and older sampled from the community to examine rates of and factors associated with tobacco cessation. We hypothesized a priori that current smoking would be associated with symptoms of depression, substance use disorders, history of incarceration, and history of staying in shelters. [1, 2, 12, 13] We also hypothesized that persons who reported smoking heavily or having symptoms of depression at enrollment would be less likely to make a quit attempt at follow-up.

METHODS

Study participants and sampling

The HOPE HOME (Health Outcomes of People Experiencing Homelessness in Older Middle Age) Study is a longitudinal study of life course events, geriatric conditions, and their associations with health-related outcomes among older homeless adults. From July 2013 to June 2014, we enrolled a population-based sample [14] of 350 homeless adults aged 50 years and older from homeless encampments, recycling centers, overnight homeless shelters, and free and low-cost meal centers serving at least 3 meals a week in Oakland, California. Participants were eligible if they were English-speaking, aged 50 years and older, defined as homeless as outlined in the Homeless Emergency Assistance and Rapid Transition to Housing Act,[15] and able to provide informed consent, as determined by a teach-back method.[16] The University of California, San Francisco (UCSF) Institutional Review Board reviewed and approved all study protocols.

Study procedures

The study included an enrollment visit and a follow-up visit at 6 months. Study interviews took place at a community-based site. After determining eligibility, study staff administered an in-depth structured enrollment interview and collected extensive contact information from participants. We asked participants to check in with study staff in person or by telephone each month. If participants missed 2 or more check-in visits, study staff reached out to participants using their contact information. From January 2014 to January 2015, we conducted 6-month follow-up visits with each of the participants who completed an enrollment interview. We gave participants gift cards to a major retailer for their participation: $5 for the screening interview, $20 for the enrollment interview, $5 for each month check-in, and $15 for the follow-up interview.

Smoking variables

We used previously validated questions on tobacco use [17] at the enrollment and 6-month follow-up interviews. We asked participants whether they had ever smoked 100 cigarettes in their lifetime, and classified those who did as ever smokers. We classified ever smokers who reported smoking "every day or some days" as current smokers, and those who reported "not smoking at all" as former smokers. We asked current daily smokers to report the number of cigarettes smoked daily. For current non-daily smokers, we estimated average daily cigarette consumption based on self-reported numbers of cigarettes smoked on smoking days in the past 30 days. Participants reported how soon they had smoked their first cigarette after waking, which we dichotomized as greater or less than 30 minutes. We asked current smokers about their intentions to quit smoking (never expect to quit, may quit but not in the next 6 months, expect to quit within the next 6 months, and expect to quit within the next month). We asked current

smokers to report whether they had stopped smoking for one day or longer in the past 6 months because they were trying to quit smoking. We asked participants who responded affirmatively to making a quit attempt to report the length of their last quit attempt. We defined reporting a quit attempt in the past 6-months at the follow-up visit as the primary outcome variable. We determined the proportion of participants who were abstinent for 30 days and 90 days at the 6-month study visit [18] using self-reported information on the length of the last quit attempt.

At the 6-month follow-up visit, we obtained additional information from participants on their quitting behaviors.[19] If participants reported having made a quit attempt during the past 6 months, we asked them to report the medications, strategies, and support system they had used during their last quit attempt. Participants reported whether they had used nicotine replacement therapy and/or any of the U.S. Food and Drug Administration (FDA)-approved medications for smoking cessation during their last quit attempt. Participants reported whether they had used other strategies to quit smoking including gradually cutting back on cigarettes, switching to smokeless tobacco, other combustible tobacco (e.g. cigars or light cigarettes), or electronic cigarettes, or giving up cigarettes all at once. Participants self-reported their use of a telephone quit line, group or one-on-one smoking cessation counseling, hypnosis or acupuncture, and other internet or family-based support for smoking cessation. Participants also reported whether they had received advice to quit cigarette smoking from their health care provider in the past 6 months, and whether they had acted on the advice to quit smoking.

Covariates

Participants self-reported age, gender and race/ethnicity (White, Black/African American, Latino, Mixed, or Other) at the enrollment visit. At the enrollment and follow-up interviews, participants reported whether they had spent any time in jail or prison in the past 6 months. At

both visits, we gathered residential history of every place that the individual had stayed, by using a six-month follow-back residential calendar.[20] We categorized participants as having stayed in shelters if they reported staying in a homeless shelter for single adults or families during the past 6 months.[21] We used questions derived from the World Health Organization's (WHO) Alcohol, Smoking, and Substance Involvement Screening Test (ASSIST) [22] to assess use of cannabis, cocaine, amphetamines, and opioids. We dichotomized the severity of substance use as low (score < 4) versus moderate to high risk (score ≥ 4).[22] We administered the WHO's Alcohol Use Disorders Identification Test (AUDIT) [23] with a shortened timeframe of the previous 6 months to assess risk and severity of alcohol use disorders. We categorized AUDIT scores of 8 or more as indicative of hazardous and harmful alcohol use or an alcohol disorder.[23] To assess the prevalence of depressive symptomatology or significant distress, we administered the Center for Epidemiologic Studies Depression Scale (CES-D).[24] We used a standard threshold score of 16 or more to categorize depressive symptomatology or significant distress.[25, 26]

Statistical analysis

We described sample characteristics and reported smoking and quitting behaviors from the enrollment interview using means for continuous variables and proportions for categorical variables. We examined bivariate associations between ever smokers (current and former smokers) and never smokers at enrollment. Using multivariable logistic regression, we examined factors associated with making a quit attempt at enrollment, adjusting for age, sex, race/ethnicity, and residential history (i.e. shelter or prison/jail stay) in the 6 months prior to enrollment. We examined the following self-reported quitting behaviors at 6-months follow-up among current smokers who completed both the enrollment and 6-month follow-up interviews: quit attempt for at least 1 day during the 6-month follow-up, and 30-day and 90-day abstinence among those who

had made a quit attempt. We examined the use of all FDA-approved medications and other strategies for smoking cessation during the last quit attempt at 6-month follow-up, and their association with abstinence. Using multivariable logistic regression, we examined factors that were predictive of a quit attempt at follow-up among current smokers who completed both the enrollment and follow-up interviews. We included in the model all covariates that achieved a significance of <0.1 in bivariate analysis. We included variables on demographics, depression, and smoking from the enrollment visit, and residential history (i.e. jail or prison stay and staying in shelters) in the past 6 months from the 6-month follow-up visit. We conducted these analyses using Stata, version 11.

RESULTS

Among the 350 participants, the mean age was 58.1 years (SD 5.3), 77.1% were male, and 79.7% were African American (Table 1). In bivariate analysis, current smokers were more likely than former or never smokers to have met criteria for moderate to high-risk substance use (cannabis, cocaine and opioids) and problem drinking during the past 6 months.

Smoking behaviors at the enrollment interview among ever smokers

Among the 272 ever smokers, 229 (84.2%) were current smokers (Table 2). The average daily cigarette consumption among current smokers was 8.3 cigarettes per day, and 39.4% reported smoking cigarettes within 30 minutes of waking. The majority of the participants reported an intention to quit smoking. Of the current smokers, 40.2% reported making a quit attempt for at least 1 day in the past 6 months. In adjusted analysis, having stayed in a shelter in the 6 months prior to enrollment was associated with increased odds of making a quit attempt during that time (Adjusted odds ratio 1.7, 95% CI 1.1-2.9).

Smoking cessation attempts and 30-day and 90-day abstinence reported at the 6-months follow-up interview

Of the 229 current smokers at enrollment, 163 (73.4% among survivors; 7 deaths and 54 missed visits) completed the 6-month follow-up interview. Smokers (78.5%) were slightly less likely than non-smokers (85.8%) to follow-up at the 6-month follow-up interview ($p<0.03$). Of the 163 current smokers who completed both the enrollment and 6-month follow-up interviews, 77 (47.2%) reported having received advice to quit smoking from a healthcare provider at the 6-month follow-up, and of those 28 (36.4%) reported having acted on the advice to quit smoking.

Of the 163 smokers, 71 (43.6%) had made a quit attempt lasting for at least 1 day in the 6 months since the enrollment interview. Of the 71 participants who had made a quit attempt, 10 (14.3%) reported achieving 30-day abstinence and 3 (4.3%) reported achieving 90-day abstinence. The majority of current smokers (92.9%) who had made a quit attempt during follow-up relapsed back to smoking at the time of the follow-up survey.

Of the 71 participants who had made a quit attempt at follow-up, 16 (22.5%) used nicotine replacement therapy during the last quit attempt (Supplementary table). One-fourth (28.2%, n=20) of the participants who attempted to quit smoking gradually cut back on cigarettes, and two-thirds (66.2%, n=47) gave up cigarettes all at once. A minority of participants (< 10%) switched to other forms of combustible tobacco, smokeless tobacco, or electronic nicotine delivery devices during their last quit attempt. Use of nicotine replacement or FDA-approved cessation medications was not associated with 30-day or 90-day abstinence at follow-up.

Factors associated with making a quit attempt during follow up

In adjusted multivariable analysis, increased cigarette consumption (AOR 0.9, 95% CI 0.8-0.9) was associated with lower odds of making a quit attempt at 6-month follow-up (Table 3). Staying in shelters (AOR 2.5, 95% CI 1.0-5.8) and having made a previous quit attempt (AOR 2.4, 95% CI 1.0-5.5) were associated with higher odds of making a quit attempt at follow-up. Persons who demonstrated depressive symptomatology or significant distress based on a CESD score ≥16 compared to those with scores <16 had higher odds of making a quit attempt at follow-up (AOR 3.6, 95% CI 1.5-8.9). In post-hoc bivariate analysis, participants who had a CESD score ≥16 (54.2%) compared to those who had a score < 16 (41.0%) had a non-significantly higher likelihood of having received a health professional's advice to quit smoking (p=0.09).

DISCUSSION

In this cohort of older homeless adults, the prevalence of current smoking (65%) was at least 3 times higher than similarly aged members of the general population. The quit attempt and 30-day and 90-day abstinence rates were similar to that observed among older adults from a nationally representative sample of the general population.[27] However the quit ratio (former/ever smoker), an indicator of successful quitting, was at least 3 times lower than the national average.[28] Findings from our study confirm previous research that homeless adults are interested in quitting smoking,[29, 30] but are less successful compared to those who are not homeless.

Contrary to our hypothesis, staying in shelters or meeting criteria for depressive symptomatology or significant distress on the CES-D scale (CESD score ≥16) was not associated with current smoking. Given that the more than half the participants reported a shelter stay or depressive symptomatology, these characteristics may not have differentiated smokers and non-smokers in our study sample. Persons who reported a jail or prison stay in the past 6 months at

enrollment had a non-significantly higher likelihood of being a smoker than those without a history of incarceration. Consistent with our hypothesis and previous studies,[1, 12, 31, 32] use of illicit substances and alcohol use were associated with current smoking among participants in our study. Comorbid substance use disorders pose significant challenges to smoking cessation because the use of illicit substances may provide social cues to smoking and augment the pleasurable effects of nicotine.[33] Given these findings, there is mounting evidence for the integration of treatment for nicotine dependence with that of substance use treatment. [1, 12, 31, 34] A meta-analysis showed that treating nicotine addiction during substance use treatment may enhance short-term smoking cessation and lead to prolonged abstinence from alcohol and other illicit substances.[34]

Lower cigarette consumption and prior quit attempts were associated with increased likelihood of a subsequent quit attempt at follow-up.[35, 36] Time to first cigarette after waking, a nicotine dependence measure predictive of smoking cessation,[37] was not associated with making a quit attempt in adjusted analysis. Concurrent use of other tobacco products, which is common among homeless adults,[38] may reduce reliance on cigarettes and may reduce the predictive validity of time to first cigarette after waking as a predictor of cigarette quit attempts.[39, 40] Contrary to our hypothesis and previous studies that have shown an association with depression and decreased quit attempts,[41] our results showed a higher likelihood of quit attempts among those who with depressive symptomatology (CESD score ≥16). In post-hoc analysis we found that persons with depressive symptomatology showed a non-statistically significant higher likelihood of having received advice from a healthcare provider to quit smoking, suggesting that these individuals may have been both more engaged in health care and more likely to receive advice to quit and/or other resources for smoking cessation. Staying in a shelter was associated

with an increased likelihood of a quit attempt. Shelters may provide a more stable environment than unsheltered environments to engage in smoking cessation. Shelters have smoke-free policies that may motivate individuals to make quit attempts.[2, 42] Few shelters offer on-site resources, but most provide referrals to community-based resources for smoking cessation.[43] These factors may also encourage quit attempts among homeless clients.

Previous research has shown that the majority of smokers who attempt to quit smoking relapse back to smoking,[18, 44] but the longer the duration of smoking abstinence, the higher the likelihood of successful quitting.[18] In a study of former smokers in the general population, only 12% of those who had abstained from smoking for less than 1 month at baseline were continuously abstinent from smoking at follow-up 1 year later; almost 50% had resumed smoking at follow-up.[18] Only 3 (4.3% of the participants who had made a quit attempt of 1 day or longer) participants reported sustained abstinence at 6 months follow-up. The results of this study highlight the difficulty of quitting smoking successfully, a task that is much more challenging when faced with the stress of material resource constraints and social disorganization common in homelessness.[45] Given that a significant proportion of the sample was engaged in quitting behaviors during the study interval, our findings highlight the need for more effective therapies that increase the rate of successful quitting among older homeless smokers.

Previous studies have identified limited access or poor adherence to smoking cessation aids, depression, lack of access to smoke-free homes, illicit substance use, and stress from social stressors as factors associated with relapse.[44, 46-48] Despite being socioeconomically disadvantaged, about one-fourth of the participants in the current study reported that they had used NRT or FDA-approved medications during the last quit attempt, a proportion that is similar to the general population.[27] Although a minority of our study population reported achieving 30-

day or 90-day abstinence, use of cessation medications was not associated with abstinence. We may have been underpowered to detect a meaningful difference in abstinence rates between those who did and did not use NRT, highlighting a need for studies that explore the efficacy of NRT for smoking cessation in this population. Other factors may influence the efficacy of NRT for smoking cessation in the homeless population including intensity of smoking,[49 50] use of concurrent tobacco products, frequency of use of NRT, and access to other treatments for cessation; these factors merit further exploration. Examining access to smoke-free living environments, identifying messages to convey smoking-related health effects, and identifying perceptions of current tobacco control strategies may provide additional insights into developing effective interventions for smoking cessation among this population.

Our study had several limitations. As in our previous work,[32, 42] we relied on self-reports of tobacco cessation behaviors, potentially leading to recall bias and over- or under-estimation of cessation rates. The lack of biomarker-verified measures of abstinence could result in potential inaccuracies in the estimates of prolonged abstinence. The slightly lower 6-month follow-up rate among smokers than non-smokers may have led to a potential differential misclassification bias in estimates of tobacco cessation at follow-up. While we were able to assess whether participants switched to other tobacco products for cigarette smoking cessation, we were unable to assess concurrent use of other tobacco products with cigarette smoking. We were unable to determine whether receipt of tobacco cessation services in homeless shelters could have influenced sheltered participants' decision to make a quit attempt. Our study sample that included predominantly African American participants may not be generalizable to other populations of older homeless adults across the U.S. However, given the increased tobacco-related disease

burden among African American smokers,[51] our study provides insight into smoking cessation behaviors that might guide intervention development for this population.

Despite these limitations, this is among the first studies on tobacco use and cessation to focus specifically on older homeless adults. The high prevalence of smoking and the low rates of successful quitting highlight numerous opportunities to intervene to increase quitting rates among this population. Among these, increasing access to smoke-free living environments and identifying effective cessation therapies will be critical to reducing tobacco-related disease burden among older homeless adults.

FUNDING

This study was funded by grants from the National Institute on Aging (NIA) at the National Institutes of Health (NIH) (K24AG046372 [Kushel], R01AG041860 [Ponath, Guzman]). Dr. Vijayaraghavan was supported by California Tobacco Related Disease Research Program grant 22XT-0020. These funding sources had no role in the preparation, review, or approval of the manuscript.

DECLARATION OF INTERESTS

None

ACKNOWLEDGMENTS

The authors gratefully acknowledge their colleagues Angela Allen, Pamela Olson, Nina Fiellin, Tauni Marin, and Kenneth Perez for their invaluable contributions to the HOPE HOME study. The authors also thank the staff at St. Mary's Center, and the HOPE HOME Community Advisory Board for their guidance and partnership.

REFERENCES

1. Baggett TP, Rigotti NA. Cigarette smoking and advice to quit in a national sample of homeless adults. *Am J Prev Med.* Aug 2010;**39**:164-172. doi: 10.1016/j.amepre.2010.03.024.
2. Businelle MS, Poonawalla IB, Kendzor DE, et al. Smoking policy change at a homeless shelter: Attitudes and effects. *Addict Behav* 2014;**40**:51-6. doi: 10.1016/j.addbeh.2014.08.013.
3. Hwang SW, Wilkins R, Tjepkema M., O'Campo P.J., Dunn J.R. Mortality among residents of shelters, rooming houses, and hotels in Canada: 11 year follow-up study. *BMJ* 2009;**339**:b4036. doi: 10.1136/bmj.b4036.
4. Baggett TP, Hwang SW, O'Connell JJ, et al. Mortality among homeless adults in Boston: shifts in causes of death over a 15-year period. *JAMA Intern Med* 2013;**173**:189-95. doi: 10.1001/jamainternmed.2013.1604.
5. Baggett TP, Chang Y, Singer DE, et al. Tobacco-, alcohol-, and drug-attributable deaths and their contribution to mortality disparities in a cohort of homeless adults in Boston. *Am J Public Health* 2015;**105**:1189-97. doi: 10.2105/AJPH.2014.302248.
6. LaCroix AZ, Omenn GS. Older adults and smoking. *Clin Geriatr Med* 1992;**8**:69-87.
7. Tran B., Falster M.O., Douglas K., Blyth F., Jorm L.R. Smoking and potentially preventable hospitalisation: The benefit of smoking cessation in older ages. *Drug Alcohol Depend* 2015;**150**:85-91. doi: 10.1016/j.drugalcdep.2015.02.028.
8. Gellert C, Schottker B, Brenner H. Smoking and all-cause mortality in older people: systematic review and meta-analysis. *Arch Intern Med* 2012;**172**:837-44. doi: 10.1001/archinternmed.2012.1397.
9. Messer K, Trinidad DR, Al-Delaimy W.K., Pierce J.P. Smoking cessation rates in the United States: a comparison of young adult and older smokers. *Am J Public Health* 2008;**98**:317-22. doi: 10.2105/AJPH.2007.112060.
10. Hahn JA, Kushel MB, Bangsberg D.R., Riley E., Moss A.R. BRIEF REPORT: the aging of the homeless population: fourteen-year trends in San Francisco. *J Gen Intern Med* 2006;**21**:775-8. doi: 10.1111/j.1525-1497.2006.00493.x
11. Culhane DP, Metraux S, Byrne T., Stino M., Bainbridge J. The age structure of contemporary homelessness: evidence and implications for public policy. *Analysis of Social issues and public policy* 2013;**13**:228-44. doi: 10.1111/asap.12004.
12. Okuyemi KS, Goldade K, Whembolua GL, et al. Smoking Characteristics and Comorbidities in the Power To Quit Randomized Clinical Trial for Homeless Smokers. *Nicotine Tob Res* 2013;**15**:22-8. doi: 10.1093/ntr/nts030.
13. Okuyemi KS, Caldwell AR, Thomas JL, et al. Homelessness and smoking cessation: insights from focus groups. *Nicotine Tob Res* 2006;**8**:287-96. doi: 10.1080/14622200500494971.
14. Burnam MA, Koegel P. Methodology for obtaining a representative sample fo homeless persons – The Los-Angeles Skid Row Study. *Eval Rev* 1988;**12**:117-52. doi: 10.1177/0193841X8801200202.
15. Burnam MA, Koegel P. Methodology for obtaining a representative sample fo homeless persons – The Los-Angeles Skid Row Study. *Eval Rev* 1988;**12**:117-52. doi: 10.1177/0193841X8801200202.

16. Carpenter WT, Gold JM, Lahti AC, et al. Decisional capacity for informed consent in schizophrenia research. Archives of General *Psychiatry* 2000;**57**:533-8. doi:10-1001/pubs.Arch Gen Psychiatry-ISSN-0003-990x-57-6-yoa9156.

17. Al-Delaimy WK, Edland S, Pierce JP, Mills AL, White MM. California Tobacco Survey (CTS): 2008.

18. Gilpin EA, Pierce JP, Farkas AJ. Duration of smoking abstinence and success in quitting. *J Natl Cancer Inst* 1997;**89**:572-6. doi: 10.1093/jnci/89.8.572.

19. US Department of Commerce, Census Bureau (2012). National Cancer Institute-sponsored Tobacco Use Supplement to the Current Population Survey (2010-11): http://appliedresearch.cancer.gov/tus-cps/.

20. Tsemberis S, McHugo G, Williams V, Hanrahan P, Stefancic A. Measuring homelessness and residential stability: The residential time-line follow-back inventory. *Journal of Community Psychology* 2007;**35**:29-42. doi: 10.1002/jcop.20132

21. Burt MR, United States. Interagency Council on the Homeless., Urban Institute. Homelessness : programs and the people they serve : findings of the National Survey of Homeless Assistance Providers and Clients : summary. Washington, DC: U.S. Dept. of Housing and Urban Development; 1999. xxii, 88 p. p. http://webarchive.urban.org/UploadedPDF/homelessness.pdf.

22. Humeniuk R, Henry-Edwards S, Ali R, Poznyak V, Monteiro M. The Alcohol, Smoking and Substance Involvement Screening Test (ASSIST): Manual for use in primary care. Geneva: World Health Organization, 2010. http://whqlibdoc.who.int/publications/2010/9789241599382_eng.pdf.

23. Babor TF, Higgins-Biddle JC, Saunders JB, Monteiro MG. The Alcohol Use Disorders Identification Test: Guidelines for Use in Primary Care. World Health Organization, 2001. http://whqlibdoc.who.int/hq/2001/who_msd_msb_01.6a.pdf.

24. Radloff L. The CES-D scale: a self-report depression scale for research in the general population. *Applied Psychological Measurement* 1977:385-401. doi: 10.1177/014662167700100306.

25. Wong YL. Measurement properties of the Center for Epidemiologic Studies-Depression Scale in a homeless population. *Psychological assessment* 2000;**12**:69-76. doi: 10.1037/1040-3590.12.1.69.

26. Weissman MM, Sholomskas D, Pottenger M, Prusoff BA, Locke BZ. Assessing depressive symptoms in five psychiatric populations: a validation study. *Am J Epidemiol* 1977;**106**:203-14.

27. Malarcher A, Dube S, Shaw L, Babb S, Kaufman R. Quitting smoking among adults -- United States, 2001-2010. MMWR - *Morbidity and Mortality Reports* 2011;**60**:1513-9. http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6044a2.htm.

28. Dube SR, Asman K, Malarcher A, Carabollo R. Cigarette Smoking Among Adults and Trends in Smoking Cessation --- United States, 2008. *MMWR - Morbidity and Mortality Reports* 2008;**58**:1227-32. http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5844a2.htm.

29. Baggett TP, Lebrun-Harris LA, Rigotti NA. Homelessness, cigarette smoking and desire to quit: results from a US national study. *Addiction* 2013;**108**:2009-18. doi: 10.1111/add.12292.

30. Connor SE, Cook RL, Herbert MI, Neal SM, Williams JT. Smoking cessation in a homeless population: there is a will, but is there a way? *J Gen Intern Med* 2002;**17**:369-72. doi: 10.1046/j.1525-1497.2002.10630.x.

31. Tsai J, Rosenheck. RA. Smoking among chronically homeless adults: prevalence and correlates. *Psychiatr Serv.* 2012;**63**:569-576. doi: 10.1176/appi.ps.201100398.

32. Vijayaraghavan M, Penko J, Vittinghoff E, Bangsberg DR, Miaskowski C, Kushel MB. Smoking Behaviors in a Community-Based Cohort of HIV-Infected Indigent Adults. *AIDS Behav* 2014;**18**:535-43. doi: 10.1007/s10461-013-0576-z.

33. Schroeder SA, Morris CD. Confronting a neglected epidemic: tobacco cessation for persons with mental illnesses and substance abuse problems. *Annu Rev Public Health.* 2010;**31:**297-314. doi: 10.1146/annurev.publhealth.012809.103701.

34. Prochaska JJ, Delucchi K, Hall SM. A meta-analysis of smoking cessation interventions with individuals in substance abuse treatment or recovery. *J Consult Clin Psychol.* 2004;**72**:1144-1156.

35. Farkas AJ. When does cigarette fading increase the likelihood of future cessation? *Ann Behav Med* 1999;**2**:71-6. doi: 10.1007/BF02895036. doi: 10.1007/BF02895036.

36. Farkas AJ, Pierce JP, Zhu SH, et al. Addiction versus stages of change models in predicting smoking cessation. Addiction. 1996;**91**;1271-80; discussion 81-92. doi: 10.1046/j.1360-0443.1996.91912713.x.

37. Kozlowski LT, Porter CQ, Orleans CT, Pope MA, Heatherton T. Predicting smoking cessation with self-reported measures of nicotine dependence: FTQ, FTND, and HSI. *Drug Alcohol Depend* 1994;**34**:211-6. doi:10.1016/0376-8716(94)90158-9

38. Kish DH, Reitzel LR, Kendzor DE, Okamoto H, Businelle MS. Characterizing Concurrent Tobacco Product Use Among Homeless Cigarette Smokers. *Nicotine Tob Res* 2014. doi: 10.1093/ntr/ntu230.

39. Wetter DW, McClure JB, de Moor C, et al. Concomitant use of cigarettes and smokeless tobacco: prevalence, correlates, and predictors of tobacco cessation. *Prev Med* 2002;**34**:638-48. doi:10.1006/pmed.2002.1032.

40. Messer K, Vijayaraghavan M, White MM, et al. Cigarette smoking cessation attempts among current US smokers who also use smokeless tobacco. *Addict Behav.* 2015;**51**:113-119. doi: 10.1016/j.addbeh.2015.06.045

41. Van der Meer RM, Willemsen MC, Smit F, Cuijpers P. Smoking cessation interventions for smokers with current or past depression. *Cochrane Database Syst Rev.* 2013;**8**:CD006102. doi: 10.1002/14651858.CD006102.pub2.

42. Vijayaraghavan M, Pierce JP. Interest in Smoking Cessation Related to a Smoke-Free Policy Among Homeless Adults. *J Community Health.* 2015 Aug;**40**:686-91. doi: 10.1007/s10900-014-9985-9.

43. Vijayaraghavan M, Hurst S, Pierce J. Implementing tobacco control programs in homeless shelters -- A mixed methods study. *Health Promot Pract.* 2015. [Epub ahead of print].

44. Garvey AJ, Bliss RE, Hitchcock JL, Heinold JW, Rosner B. Predictors of smoking relapse among self-quitters: a report from the Normative Aging Study. *Addict Behav.* 1992;**17**:367-77. doi:10.1016/0306-4603(92)90042-T.

45. Porter J, Houston L, Anderson RH, Maryman K. Addressing tobacco use in homeless populations: recommendations of an expert panel. *Health Promot Pract.* 2011;**12**:144S-51S. doi: 10.1177/1524839911414412.

46. Porter J, Houston L, Anderson RH, Maryman K. Addressing tobacco use in homeless populations: recommendations of an expert panel. *Health Promot Pract.* 2011;**12**:144S-51S. doi: 10.1177/1524839911414412.
47. Kassel JD, Stroud LR, Paronis CA. Smoking, stress, and negative affect: correlation, causation, and context across stages of smoking. *Psychol Bull* 2003;**129**:270-304. doi: 10.1037/0033-2909.129.2.270.
48. Mills AL, Messer K, Gilpin EA, Pierce JP. The effect of smoke-free homes on adult smoking behavior: a review. *Nicotine Tob Res.* Oct 2009;11(10):1131-1141.
49. Haas JS, Linder JA, Park ER, et al. Proactive Tobacco Cessation Outreach to Smokers of Low Socioeconomic Status: A Randomized Clinical Trial. *JAMA Intern Med* 2015;**175**:218-26. doi: 10.1001/jamainternmed.2014.6674.
50. Nguyen MA, Reitzel LR, Kendzor DE, Businelle MS. Perceived cessation treatment effectiveness, medication preferences, and barriers to quitting among light and moderate/heavy homeless smokers. *Drug Alcohol Depend.* 2015;**153**:341-5. doi: 10.1016/j.drugalcdep.2015.05.039
51. Centers for Disease Control and Prevention. Health disparities experienced by black or African Americans -- United States. *MMWR - Morbidity and Mortality Reports* 2005;**54**:1-3. http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5401a1.htm

Table 1: Sample characteristics at enrollment by smoking status (N = 350)

	Total N=350 N (%)	Current smokers N=229 N (%)[a]	Former smokers N=43 N (%)[a]	Never smokers N=78 N (%)[a]	P-value
Age (Mean, SD)	58.1 (5.3)	58.0 (5.1)	59.8 (5.9)	57.4 (5.0)	0.06
Male	270 (77.1)	180 (78.6)	28 (65.1)	62 (79.5)	0.1
Race/ethnicity					
White	38 (10.9)	24 (10.5)	6 (13.9)	8 (10.3)	0.09
Black/African American	279 (79.7)	189 (82.5)	34 (79.1)	56 (71.7)	
Latino	16 (4.6)	5 (2.2)	2 (4.7)	9 (11.5)	
Mixed	3 (0.9)	2 (0.9)	0 (0.0)	1 (1.3)	
Other	14 (4.0)	9 (3.9)	1 (2.3)	4 (5.1)	
Jail or prison stay in the past 6 months	37 (10.6)	30 (13.1)	4 (9.3)	3 (3.9)	0.07
Residential History					
Stayed in a homeless shelter [e]	190 (54.3)	120 (52.4)	26 (60.5)	44 (56.4)	0.6
Substance use					
Moderate to high risk cannabis use [b]	137 (39.1)	104 (45.4)	13 (30.2)	20 (25.6)	<0.004
Moderate to high risk cocaine use [b]	151 (43.1)	117 (51.1)	10 (23.3)	24 (30.8)	<0.001
Moderate to high risk amphetamine use [b]	28 (8.0)	22 (9.6)	4. (9.3)	2 (2.6)	0.1
Moderate to high risk opioid use [b]	45 (12.9)	37 (16.2)	4 (9.3)	4 (5.1)	<0.03
Alcohol use disorders					
AUDIT score (Mean, SD)	5.8 (8.2)	6.8 (8.2)	4 (8.5)	3.9 (7.4)	<0.008
Hazardous drinking in the past 6 months [c]	90 (25.8)	73 (32.0)	6 (13.9)	11 (14.1)	<0.001
Depression					
CESD score (Mean, SD)	19.0 (12.6)	19.7 (12.7)	17.3 (13.5)	18.1 (11.8)	0.4
Depressive symptomatology [d]	185 (53.3)	125 (55.3)	20 (46.5)	40 (51.3)	0.5

[a] Percentages are column percentages
[b] Proportion with WHO-ASSIST score ≥ 4
[c] Proportion with AUDIT score ≥ 8
[d] Proportion with CESD score ≥ 16

Table 2: Smoking characteristics among ever smokers at enrollment (N= 272)

	N (%)
Current smoker	229 (84.2)
Former smoker (quit ratio)	43 (15.8)
Smoking behaviors among current smokers at enrollment	
Average daily cigarette consumption (Mean, SD)	8.3 (6.3)
Time to first cigarette in the morning < 30 minutes	87 (39.4)
Intention to quit at baseline	
Never expect to quit	42 (18.9)
May quit but not in the next 6 months	88 (39.6)
Expect to quit within the next 6 months	58 (26.1)
Expect to quit within the next 1 month	34 (15.3)
Previous quit attempt for at least one day in the past 6 months [a]	109 (40.2)
Current smokers [b]	98 (89.9)
Recent former smokers [b,c]	11 (10.1)

[a] Among current and former smokers
[b] Percentage represents column percentage among those who had made a quit attempt in the past 6 months.
[c] Former smokers at enrollment who had quit smoking in the past 6 months

Table 3: Factors associated with making a quit attempt at 6-month follow-up (N=163)

	Quit attempt N=71 N (%)[a]	No quit attempt N=92 N (%)[a]	Unadjusted odds ratio (95% CI)	Adjusted odds ratio[e] (95% CI)
Age (Mean, SD)	58.6 (5.0)	57.6 (5.3)	1.0 (1.0-1.1)	1.1 (0.9-1.2)
Female (ref: Male)	16 (22.5)	21 (22.8)	1.0 (0.5-2.1)	1.3 (0.4-3.8)
Race/ethnicity				
White (ref: white)	4 (5.6)	7 (7.6)		--
Black/African American	63 (88.7)	76 (82.6)	1.5 (0.4-5.2)	0.5 (0.1-2.6)
Latino/Mixed/Other	4 (5.6)	9 (9.8)	0.8 (0.1-4.3)	0.1 (0.01-1.3)
Jail or prison stay in the past 6 months	3 (4.2)	16 (17.4)	0.7 (0.3-1.9)	0.4 (0.1-1.6)
Residential History				
Stayed at least one night in a homeless shelter (ref: did not have a shelter stay)	48 (67.6)	40 (44.9)	2.1 (1.1-4.2) *	2.5 (1.0-5.8) *
Substance use				
Moderate to high risk cannabis use [b]	27 (38.0)	43 (46.7)	0.7 (0.4-1.3)	--
Moderate to high risk cocaine use [b]	38 (53.5)	48 (52.2)	1.1 (0.6-1.9)	--
Moderate to high risk amphetamine use [b]	4 (5.6)	8 (8.8)	0.7 (0.2-2.2)	--
Moderate to high risk opioid use [b]	11 (15.5)	13 (14.1)	1.1 (0.5-2.7)	--
Alcohol use disorders				
AUDIT score (Mean, SD)	7.5 (8.6)	7.4 (8.5)	1.0 (0.9-1.0)	--
Hazardous drinking in the past 6 months [c]	26 (37.1)	33 (35.9)	1.1 (0.6-2.0)	--
Depression				
CESD score (Mean, SD)	22.4 (13.5)	15.6 (10.1)		--
Depressive symptomatology [d]	45 (65.2)	38 (41.3)	2.7 (1.4-5.1) **	3.6 (1.5-8.9) **
Cigarette smoking behaviors				
Cigarettes per day	6.6 (5.5)	9.6 (5.9)	0.9 (0.8-0.9) **	0.9 (0.8-0.9) *
Time to first cigarette after waking < 30 minutes	19 (28.9)	40 (44.4)	0.5 (0.3-0.9) *	1.1 (0.4-2.9)
Intention to quit at baseline				
Never expect to quit	6 (8.8)	19 (21.4)		--
May quit but not in the next 6 months	26 (38.2)	39 (43.8)		--
Expect to quit within the next 6 months	27 (39.7)	19 (21.4)		--
Expect to quit within the next 1 month	9 (13.2)	12 (13.5)		--
Any interest in quitting smoking (ref: never expect to quit)	62 (91.2)	70 (78.7)	2.8 (1.1-7.5) *	1.3 (0.4-4.3)
Made a quit attempt	43 (60.6)	31 (33.7)	3.0 (1.6-5.7) ***	2.4 (1.0-5.5) *

[a] Percentages are column percentages
[b] Proportion with WHO-ASSIST score ≥ 4
[c] Proportion with AUDIT score ≥ 8
[d] Proportion with CESD score ≥ 16
[e] Model includes variables that had a significance of <0.1 in bivariate analysis
* $p<0.05$, ** $p<0.005$