

Risk Factors for Falls in Older Adults Experiencing Homelessness: Results from the HOPE HOME Cohort Study

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BACKGROUND: More than half of homeless adults are of age ≥ 50 years. Falls are a common cause of morbidity in older adults in the general population. Risk factors for falls in the general population include poor health, alcohol use, and exposure to unsafe environments. Homeless adults aged ≥ 50 have a high prevalence of known risk factors and face additional potential risks.

OBJECTIVES: To examine the prevalence of and risk of falling in a cohort of older homeless adults.

DESIGN: Longitudinal cohort study with participant interviews every 6 months for 3 years; data were analyzed using generalized estimating equations (GEEs).

PARTICIPANTS: Three hundred fifty adults aged ≥ 50 , homeless at study entry, recruited via population-based sampling.

MEASURES: The dependent variable is any falls in prior 6 months; independent variables include individual (i.e., illness, behaviors) and social/environmental (i.e., social support, experiencing violence, living unsheltered) factors.

RESULTS: Over three quarters of participants were men (77.1%) and Black (79.7%). The median age was 58 (IQR 54, 61). At baseline, one third (33.7%) reported a fall in the prior 6 months. At follow-up visits, 23.1% to 31.2% of participants reported having fallen. In GEE models, individual risk factors (non-Black race, being a women, older age, functional impairment, urinary incontinence, history of stroke, and use of assistive devices, opioid, and marijuana) were associated with increased odds of falls. Environmental and social factors (spending any nights unsheltered (adjusted odds ratio (AOR) = 1.42, CI = 1.10–1.83) and experiencing physical assault (AOR = 1.67, CI = 1.18–2.37) were also associated.

CONCLUSIONS: Older homeless adults fall frequently. Likely contributors include having a high prevalence of conditions that increase the risk of falls, compounded by heightened exposure to unsafe environments. Fall prevention in this population should target those at highest risk and address modifiable environmental conditions. Providing shelter or housing and addressing substance use could reduce morbidity from falls in homeless older adults.

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INTRODUCTION

In the USA, over half a million people experience homelessness each night¹. The proportion of single homeless adults over age 50 is increasing¹. Homeless adults aged 50 and over experience a higher prevalence of geriatric conditions (e.g., falls, urinary incontinence, and functional, sensory, and cognitive impairments) than adults 20 years older in the general population^{2,3}.

In the general population, falls are prevalent, occurring in approximately one third of adults aged 65 or older^{4,5}. Falls are associated with adverse outcomes including restricted mobility, deconditioning, and loss of independence^{6,7}. In the USA, medical costs due to fatal and non-fatal falls are approximately \$50 billion a year⁵. Individual risk factors for falls include medical problems (e.g., stroke, depression, functional and cognitive impairment), health-related behaviors (e.g., tobacco or alcohol use)^{8–11}, and social factors (e.g., lack of social support). Environmental triggers are factors external to the individual that heighten the risk of slipping or tripping. These include surface- (e.g., uneven exteriors, obstructive ground-level objects), ambient- (e.g., poor lighting), and weather-related conditions^{12,13}.

Falls result from an interaction between an individual's underlying vulnerabilities and their exposure to environmental conditions^{8,14}. People experiencing homelessness have a high prevalence of factors known to be associated with falls in the general population, including chronic diseases, functional impairment, and alcohol and opioid use problems^{2,15}. Homeless older adults have a high prevalence of other factors that could be associated with falls, such as substance use and heightened exposure to physical violence^{15,16}.

People who are homeless live in a variety of environments, including homeless shelters and unsheltered spaces that expose them to environmental hazards and violence. In each of these settings, homeless individuals have limited control over

their environment, especially when living in unsheltered environments.

We examined the prevalence of and risk factors for falls in a longitudinal cohort of adults aged 50 and older who were homeless at study entry. We hypothesized that homeless adults would have a high prevalence of falls and high exposure to environmental hazards. We hypothesized that factors known to be associated with falls in the general population would be associated with falls in our cohort. We further hypothesized that several factors that are plausibly related, but have not been studied (use of marijuana and stimulants, exposure to physical assault, and uncontrolled environments), would be associated.

METHODS

Study Overview

We conducted a 3-year prospective cohort study of 350 homeless adults aged 50 and older, the Health Outcomes in People Experiencing Homelessness in Older Middle agE (HOPE HOME) study¹⁷. We interviewed participants at baseline and every 6 months for 3 years; at each interview, trained research staff administered a structured interview and conducted clinical assessments. The institutional review board of the University of California, San Francisco approved this study. The datasets we analyzed during the current study are available from the corresponding author on request.

Study Sample

Between July 2013 and June 2014, we recruited 350 adults aged 50 or older who were homeless at study entry. We recruited from all local shelters open to older adults ($n = 5$), all free and low-cost meal programs that served at least three meals a week ($n = 5$), one recycling center, and areas where adults slept unsheltered in Oakland, California (Fig. 1). To create a sample that best represented the target population, including the high number of people living unsheltered in Oakland, we randomly selected potential participants using sampling frames that included encampment sites, recycling centers, shelters, and meal programs¹⁸. We describe our methods in more detail elsewhere^{17–19}.]—>

Eligibility criteria included the following: (1) homeless according to the Homeless Emergency Assistance and Rapid Transition to Housing (HEARTH) Act definition that includes any person living unsheltered, staying in an emergency shelter, or facing eviction in the next 14 days; (2) age of 50 years or older; (3) English-speaking; and (4) able to provide informed consent as determined by a teach-back mechanism²⁰. Participants received \$25 for the screening and enrollment interview, \$5 for monthly check-ins, and \$15 for follow-up interviews.

Measures

Outcome Variable. Our primary outcome was self-reported falls in the prior 6 months, assessed at each study interview.

We defined falling as “a sudden, unintentional change in position from an upright posture coming to rest on the floor or ground.” For descriptive purposes, among participants who reported a fall, we asked how many times the participant fell and whether they sought medical treatment for their fall.

Independent Variables. Individual Risk Factors. We identified demographic risk factors as time-constant (assessed once at baseline) and other risk factors, health status, and health-related behaviors as time-varying (assessed at each visit).

We assessed age, gender, and race/ethnicity²¹. In our analyses, we dichotomized race as Black versus non-Black. Participants reported their highest educational attainment. We classified participants as having graduated from high school or earned a General Educational Development (GED) certificate versus no high school diploma/GED.

Health Status. Using modified questions from the National Health and Nutrition Examination Survey (NHANES), we asked participants whether a healthcare provider told them they had myocardial infarction, congestive heart failure, stroke, arthritis, diabetes, or chronic lung disease (chronic obstructive pulmonary disease or asthma); we included these as separate variables²². If a participant reported a medical condition at any time point, we considered them to have that condition in subsequent visits.

We assessed visual impairment using the Snellen test and defined visual impairment as corrected visual acuity $< 20/100$ ²³. We defined hearing impairment as self-reported difficulty hearing²⁴. To evaluate cognitive impairment, we used the Modified Mini-Mental State Examination (3MS). Those who scored below the 7th percentile (1.5 standard deviations below a reference cohort mean) or were unable to complete the assessment were defined as cognitively impaired²⁵.

We asked participants about their ability to complete activities of daily living (ADLs). We defined an ADL impairment as reporting difficulty with bathing, transferring, toileting, dressing, or eating²⁶. We assessed lower extremity function with the Short Physical Performance Battery (SPPB) test and classified those who scored ≤ 10 as having reduced physical performance²⁷. We assessed urinary incontinence in the past 6 months by asking participants whether they had “leaked urine, even a small amount.”²⁸

We measured height and weight and calculated body mass index (BMI), classifying a BMI ≥ 18 to < 25 as normal weight, 25 to < 30 as overweight, and ≥ 30 as obese. We used the Center for Epidemiologic Studies Depression Scale (CES-D) to assess depressive symptoms; we considered scores ≥ 22 as indicating depressive symptoms²⁹. We assessed pain by asking participants to score their average pain in the past week using a 10-point Likert scale. We categorized pain as mild (0–4), moderate (5–7), and severe (8–10)³⁰. We assessed whether participants used an assistive device—such as a cane, crutches, walker, wheelchair, or scooter—in the past 6 months.

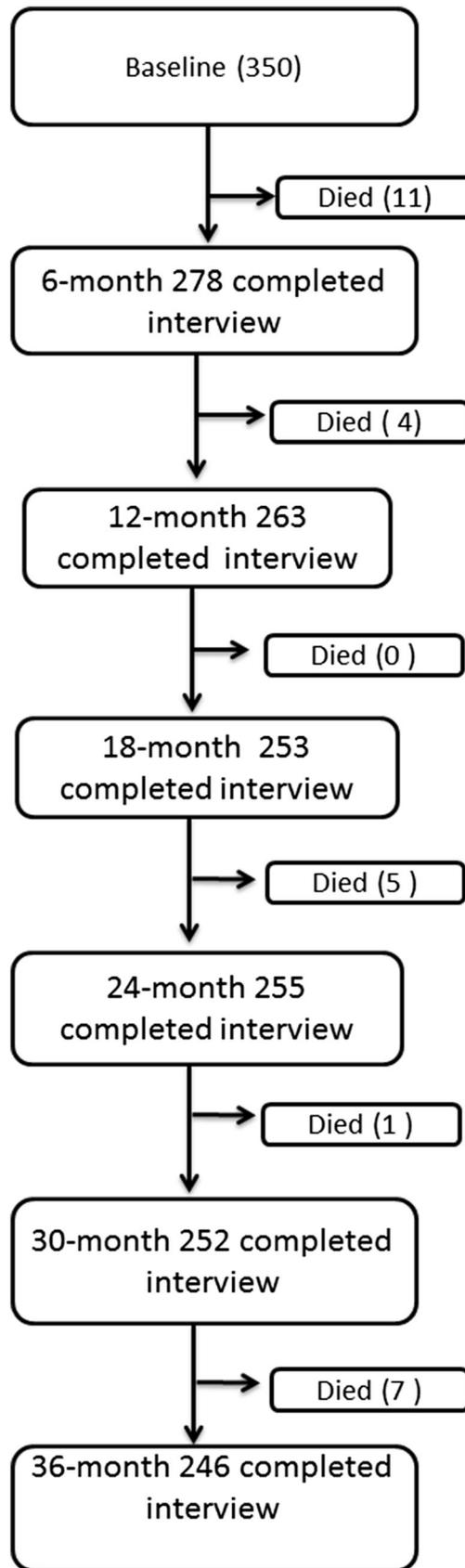


Fig. 1 HOPE HOME sample recruitment and follow-up sample sizes. The number of individuals enrolled at baseline and followed at 6-month intervals over the 36-month follow-up is shown. Deaths between each follow-up are noted.

Health-Related Behaviors. We classified smoking status using the California Tobacco Survey, categorizing participants as never, current, or former smokers³¹. We asked participants to report how much alcohol they drank and considered those who drank ≥ 6 drinks on one occasion monthly as heavy drinkers³². To assess illicit drug use (cocaine, amphetamines, opioids, and marijuana) in the last 6 months, we used the World Health Organization (WHO)'s Alcohol, Smoking and Substance Involvement Screening Test (ASSIST). We considered a score of ≥ 4 as indicative of moderate-to-severe use³³.

Social and Environmental Risk Factors. Social Support. We used a validated measure of social support, counting the number of people in whom the participant could confide (0, 1–5, or ≥ 6)^{34–36}.

Physical Assault. To assess physical assault, we asked participants: “in the past six months, have you experienced physical violence by another person using an object like a gun or a knife, or did anyone ever slap, hit, punch, kick, choke, or burn you?”³⁷

Residential Status. To assess exposure to environmental hazards at each visit, we used a residential follow-back calendar in which we asked participants to report each place they had stayed and the number of nights in each setting during the prior 6 months³⁸. We considered being unsheltered as indicative of the highest environmental exposure. We defined an unsheltered environment as sleeping outdoors or any place not meant for human habitation (e.g., transit terminal, abandoned building). We categorized participants as having spent any nights versus no nights in unsheltered settings¹⁶. In preliminary analyses, we evaluated nights unsheltered as a 3-level variable (0, 1–119, and 12–180 nights) and as a 6-level variable (0, 1–7, 8–30, 31–90, 91–120, and 121–180 nights). Neither alternative exhibited a dose-response effect. Therefore, we used a dichotomous measure of any nights unsheltered in our analysis.

Statistical Analyses

To identify risk factors for falls, we chose independent variables based on our hypotheses. We assessed bivariate associations between a priori independent variables and recent falls (i.e., one or more falls in the past 6 months) using generalized estimating equations (GEEs).

We built our multivariable model by including variables with bivariate type 1 p values < 0.20 . If a categorical variable had more than two levels, we included all levels in our multivariable model if any type 1 p value was < 0.20 . We reduced the model using backward elimination retaining variables with

p values < 0.05 in our final multivariable model. We conducted our analysis in SAS 9.4 using complete case analysis and robust confidence intervals (SAS Institute Inc., Cary, NC, USA, 2017).

In a sensitivity analysis, we assessed whether we had underestimated the probability of falls due to incomplete follow-up or mortality. We examined the prevalence of falls among those (1) with complete follow-up, (2) who had died during follow-up, or (3) who had not died but had missed any study visits over the 36-month study period. We used GEE to examine whether those who had died or missed visits were more likely to have experienced a fall in the past 6 months than those with complete follow-up.

We included participants with a minimum of two visits. We used weighted linear regression with a second-order polynomial and zero intercept term to plot a trend line.

RESULTS

Participant Characteristics at Baseline

The median age was 58.0 (IQR 54.0, 61.0). Of the 350 participants, the majority were men (77.1%) and Black (79.7%). More than a quarter had less than a high school education (25.7%; Table 1). Over one quarter was obese (26.6%). The majority of participants reported current tobacco use (65.4%), and 11.2% reported heavy drinking. Almost one fifth was cognitively impaired (18.3%). The most prevalent substances with problematic use were cocaine (43.1%), marijuana (39.1%), and opioids (12.9%). Approximately one third of the cohort (32.5%) reported not having any confidants; 10.1% experienced physical assault, and 81.7% had spent a night unsheltered.

Fall Prevalence and Seeking Care for Falls

At baseline, over one third (33.7%) reported one or more falls in the past 6 months (Table 1). Of the 118 participants who reported falling at baseline, 28.0% reported 4 or more falls, 35.6% two to three falls, and 36.4% one fall. One third (33.1%) of participants who fell required medical treatment due to a fall.

During the 36-month study, 28 participants died. Of those who survived, 183 completed all six follow-up interviews; 72 completed 4–5 interviews, 32 completed 2–3 interviews, and 21 completed one follow-up interview. We found a higher mean number of falls at baseline among those who died during follow-up (mean 0.42; standard deviation (SD) 0.50) and those who had not died but had missed visits (mean 0.38; SD 0.49) than among those who completed follow-up (mean 0.30; SD 0.46).

Of the 350 participants, 218 (62.3%) reported one or more falls in at least one study visit, 107 (30.6%) reported falls in at least half of the visits, and 34 (9.7%) reported falls at all visits.

Table 1 Characteristics of Homeless Adults Aged 50 and Older With and Without Falls in the Past 6 Months at Baseline Interview (N=350)

Characteristics	Total (N=350)	Experienced falls in past 6 months (N=118)	No falls in past 6 months (N=232)	p values
Individual risk factors				
Age (years), median (interquartile range)	58.0 (54.0, 61.0)	58.0 (54.0, 62.0)	57.5 (54.0, 61.0)	0.57
Men, N (%)	270 (77.1)	87 (73.7)	183 (78.9)	0.28
Race/ethnicity, N (%)				
Black	279 (79.7)	86 (72.9)	193 (83.2)	0.11
White	38 (10.9)	18 (15.3)	20 (8.6)	
Hispanic	16 (4.6)	8 (6.8)	8 (3.4)	
Other	17 (4.9)	6 (5.1)	11 (4.7)	
Less than high school diploma/General Education Development (GED), N (%)	90 (25.7)	37 (31.4)	53 (22.8)	0.09
Health status				
Myocardial infarction	32 (9.1)	15 (12.7)	17 (7.3)	0.10
Congestive heart failure	25 (7.1)	8 (6.8)	17 (7.3)	0.85
Stroke	39 (11.2)	25 (21.4)	14 (6.0)	<0.0001
Arthritis	156 (44.6)	59 (50.0)	97 (41.8)	0.15
Diabetes	50 (14.3)	18 (15.3)	32 (13.9)	0.72
Chronic lung disease	94 (26.9)	39 (33.1)	55 (23.7)	0.06
Visual impairment*	53 (15.9)	19 (17.1)	34 (15.2)	0.66
Hearing impairment	124 (35.6)	49 (41.9)	75 (32.5)	0.08
Cognitive impairment (3MS) [†]	64 (18.3)	20 (17.1)	44 (19.0)	0.67
≥ 1 ADL impairments	136 (38.9)	66 (55.9)	70 (30.2)	<0.0001
Physical performance (SPPB test score ≤ 10)	201 (58.4)	84 (73.0)	117 (51.1)	<0.0001
Urinary incontinence	167 (48.0)	71 (61.2)	96 (41.4)	0.0005
Body mass index, N (%)				
<25	149 (43.6)	52 (47.3)	97 (41.8)	0.56
25 to <30	102 (29.8)	29 (26.4)	73 (31.5)	
≥30	91 (26.6)	29 (26.4)	62 (26.7)	
Depressive symptoms; CES-D score ≥ 22, N (%)	133 (38.3)	55 (46.6)	78 (34.1)	0.02
Pain severity				
Mild	151 (43.4)	43 (36.8)	108 (46.8)	0.11
Moderate	60 (17.2)	19 (16.2)	41 (17.7)	
Severe	137 (39.4)	55 (47.0)	82 (35.5)	
Assistive device	102 (29.1)	50 (42.4)	52 (22.4)	0.0001
Health-related behaviors				
Smoking status, N (%)				
Non-smoker	78 (22.3)	59 (25.4)	19 (16.1)	0.10
Current smoker	229 (65.4)	148 (63.8)	81 (68.6)	
Former smoker	43 (12.3)	25 (10.8)	18 (15.3)	
Heavy drinking [‡]	39 (11.2)	13 (11.1)	26 (11.3)	0.97
Cocaine [§]	151 (43.1)	57 (48.3)	94 (40.5)	0.16
Amphetamines	28 (8.0)	10 (8.5)	18 (7.8)	0.82
Opioids	45 (12.9)	22 (18.6)	23 (9.9)	0.02
Marijuana	137 (39.1)	58 (49.2)	79 (34.1)	0.006
Environmental risk factors, N (%)				
Social support, N (%)				
0 confidants	113 (32.5)	38 (32.8)	75 (32.3)	0.02
1–5 confidants	205 (58.9)	75 (64.7)	130 (56.0)	
6+ confidants	30 (8.6)	3 (2.6)	27 (11.6)	
Physical assault, past 6 months	35 (10.1)	19 (16.2)	16 (7.0)	0.007
Any nights spent in unsheltered settings, past 6 months	286 (81.7)	101 (85.6)	185 (79.7)	0.18

ADL Activities of Daily Living, SPPB Short Physical Performance Battery, CES-D Center for Epidemiologic Studies Depression Scale

*Visual acuity < 20/100 using the Snellen test

[†]Cognitive impairment defined as a Modified Mini-Mental State Examination score < 7th percentile (i.e., 1.5 standard deviations below the demographically adjusted cohort mean)

[‡]Greater than or equal to 6 drinks on one occasion ≥ once monthly

[§]Moderate-to-severe illicit drug use for the past 6 months defined as a World Health Organization's Alcohol, Smoking and Substance Involvement Screening Test score for cocaine, amphetamines, opioids, and marijuana with a score of ≥ 4

Factors Associated with Falls

Those who reported falls at baseline had a higher prevalence of known risk factors for falls than those who had not fallen (Table 1). People with falls were significantly more likely to have less than a high school education, a history of stroke, difficulty with ADLs, mobility impairment, use of assistive device, increased urinary incontinence, and depressive symptoms. We found that those who fell were more likely to have

moderate-to-high risk opioid and marijuana use, fewer social confidants, have spent at least one night unsheltered, or experienced physical assault.

In models adjusted for key covariates, individual risk factors associated with significantly higher odds of falls included older age (adjusted odds ratio (AOR) 1.03, confidence interval (CI) 1.00–1.06), being a woman (AOR 1.45, 95% CI 1.02–2.04), having non-Black race (AOR 1.65, 95% CI 1.12–2.43),

having a history of stroke (AOR 2.17, 95% CI 1.42–3.32), reporting an ADL impairment (AOR 1.99, 95% CI 1.51–2.63), urinary incontinence (AOR 1.40, 95% CI 1.07–1.81), and use of an assistive device (AOR 1.86, 95% CI 1.39–2.50) (Table 2).

Moderate-to-severe marijuana use (AOR 1.93, 95% CI 1.47–2.55) and moderate-to-severe opioid use (AOR 1.64, 95% CI 1.02–2.65) were associated with increased odds of falling. Experiencing physical assault (AOR 1.67, 95% CI 1.18–2.37) and spending any night unsheltered (AOR 1.42, 95% CI 1.10–1.83) in the last 6 months were as well.

In a sensitivity analysis, we found that those who had died during study follow-up (AOR 1.35, 95% CI 0.56–3.28) or

who survived to study follow-up but had missed visits (AOR 1.24, 95% CI 0.89–1.72) were more likely to experience falls.

DISCUSSION

In this longitudinal study of adults aged 50 and older who were homeless at study enrollment, we found a high prevalence of falls. Despite a median age of 58 years, study participants reported a prevalence of falls higher than older adults with a mean age of 78 in the general population³. Many participants fell repeatedly throughout the 3-year study period; over a third of the cohort reported falls in at least half of their study visits. We found an association between falls and several factors known to increase fall risk within the general population, including older age, gender, functional impairment, urinary incontinence, use of an assistive device, and stroke.

Our findings indicate that the increased risk of falls in homeless older adults results, in part, from a high prevalence of geriatric conditions (e.g., functional and urinary impairment) and substance use (e.g., problematic opioid use) known to increase fall risk². Some of these risk factors may be modifiable via physical and occupational therapy, although it is more difficult to intervene while someone is experiencing homelessness. As the average age of the homeless population continues to increase, the population will have increasing prevalence of geriatric risk factors³⁹.

We identified the following novel risk factors: using marijuana, experiencing physical assault, and spending time unsheltered that contributed to the high fall prevalence in our population. Both opioid use and marijuana use were associated with increased odds of falling. Opioid use is associated with increased fall risk among older adults in the general population^{40, 41}. However, despite research on marijuana use and injuries in community-dwelling older adults, little is known about how marijuana use impacts falls^{42–44}. Marijuana—like opioids—may increase falls by affecting the sensorium, inducing dizziness, confusion, and drowsiness^{42, 45}. We found a high prevalence of marijuana use among study participants. People born in the study's age cohort have had high prevalence of marijuana use their whole lives, including in older adulthood^{46–48}. As marijuana use among older adults increases, due to changes in legal status and cohort effects, there may be increased falls associated with its use.

Experiencing physical assault is common among older adults who are homeless¹⁶. Physical assault can increase fall risk directly (as a complication of assault), or indirectly, by causing injuries that enhance underlying individual vulnerabilities associated with falls¹⁶. Future research should evaluate the role of marijuana use and physical assault in falls among housed older adults to determine whether these risk factors are unique to older adults experiencing homelessness.

People who are unsheltered have increased exposure to unsafe environments, with minimal control. They may stay in isolated locations with uneven surfaces and physical

Table 2 Odds of Experiencing Falls in the Past 6 Months over 3 Years in the GEE Model Among Adults Aged ≥ 50 Years Who Were Homeless at Baseline 2013–2014

Variables	Unadjusted odds ratio (OR) (95% CI)*	Adjusted odds ratio (AOR) (95% CI)
Individual risk factors		
Age (continuous years)	1.03 (1.00–1.05)	1.03 (1.00–1.06)
Women	1.59 (1.11–2.27)	1.45 (1.02–2.04)
Non-Black	1.68 (1.15–2.45)	1.65 (1.12–2.43)
< High school diploma/ GED	1.37 (0.94–2.01)	–
Health status		
Myocardial infarction	2.15 (1.30–3.57)	–
Congestive heart failure	1.70 (0.98–2.94)	–
Stroke	3.36 (2.07–5.47)	2.17 (1.42–3.32)
Arthritis	1.44 (1.04–2.00)	–
Diabetes	0.74 (0.49–1.10)	–
Chronic lung disease	1.61 (1.16–2.24)	–
Hearing impairment	1.49 (1.07–2.08)	–
≥ 1 ADL impairments	3.06 (2.34–3.99)	1.99 (1.51–2.63)
Physical performance (SPPB test score ≤ 10)	1.82 (1.29–2.56)	–
Urinary incontinence	2.23 (1.71–2.91)	1.40 (1.07–1.81)
Depressive symptoms (CES-D score ≥ 22)	1.73 (1.31–2.28)	–
Pain severity		
Moderate	1.74 (1.26–2.40)	–
Severe	2.51 (1.83–3.44)	–
Assistive device	2.81 (2.11–3.75)	1.86 (1.39–2.50)
Health-related behaviors		
Current smoker	1.30 (0.96–1.77)	–
Heavy drinking [†]	1.63 (1.08–2.47)	–
Cocaine [‡]	1.36 (1.00–1.86)	–
Opioids	2.13 (1.35–3.36)	1.64 (1.02–2.65)
Marijuana	1.85 (1.40–2.42)	1.93 (1.47–2.55)
Environmental risk factors		
Social support		
1–5 confidants	1.11 (0.84–1.46)	–
≥ 6 confidants	0.65 (0.36–1.15)	–
Physical assault, past 6 months	2.28 (1.65–3.17)	1.67 (1.18–2.37)
Any nights spent in unsheltered settings, past 6 months	1.49 (1.16–1.91)	1.42 (1.10–1.83)

GED General Education Development, ADL Activities of Daily Living, SPPB Short Physical Performance Battery, CES-D Center for Epidemiologic Studies Depression Scale

*Only bivariate variables with any type 1 *p* values < 0.20 are shown, and these were entered in the starting multivariate model

[†]Greater than or equal to 6 drinks on one occasion \geq once monthly

[‡]Moderate-to-severe illicit drug use for the past 6 months defined as a World Health Organization's Alcohol, Smoking and Substance Involvement Screening Test score for cocaine, amphetamines, opioids, and marijuana with a score of ≥ 4

barriers, such as abandoned buildings, under bridges, or along highways. Unsheltered environments lack lighting or protection against environmental hazards. Avoiding falls requires intact executive function and physical agility to be able to process external stimuli and modify movements to remain upright⁴⁹. For older adults with vulnerabilities—such as those common among homeless older adults—small external triggers (e.g., rain, sidewalk debris, or uneven surfaces) may precipitate falls. Housed older adults are able to modify their behaviors to avoid high-risk environmental exposures that predispose them to falls. For example, they can decrease how often they walk outside on uneven surfaces or minimize their public transit use. In contrast, adults living in unsheltered settings have less ability to avoid high-risk environmental exposures⁵⁰.

Our finding that non-Black race was associated with increased falls is consistent with research in housed adults^{51, 52}. Homelessness is caused by an interaction between structural factors and individual risk factors. Because Black Americans face structural racism, Black Americans with less individual vulnerability (such as substance use and mental health disabilities) are at risk of homelessness. While we adjusted for these conditions, there may be unmeasured confounders that we were unable to account for^{1, 53}.

Limitations

Our study has several limitations. We rely on 6-month recall of falls. Other studies of falls in older adults use timeframes that range from monthly to biennial^{54, 55}. Participants without complete study follow-up had a higher prevalence of falls, indicating that our model may have underestimated the odds of experiencing falls. We did not ask about prescribed medications and could not report on the role of polypharmacy. We conducted the study in the San Francisco Bay Area, where 67% of people experiencing homelessness live unsheltered, compared to 5% in both New York and Boston⁵⁶. Studies in cities with lower proportions of unsheltered homelessness may report lower rates of falls. Among individuals who are unsheltered, there are a wide variety of environments that may affect fall risk. We did not have detailed data on the variety of environments in which unsheltered homeless people stayed and cannot assess the risk of these different exposures.

CONCLUSION

Older homeless adults have a high rate of falls, similar to those of adults 20 years older. The increased risk is due to a high prevalence of individual risk factors and environmental exposures. Identifying people at high risk of falls could allow targeted interventions, such as providing shelter, low-height accessible beds, counseling on marijuana and opioid use, and physical therapy. For older adults who live unsheltered, there are nascent efforts to have occupational therapists visit unsheltered settings to reduce fall risk by employing reflective tape

and anchoring unstable environmental elements^{57, 58}. Finally, reducing unsheltered homelessness—via either increased shelters or, ideally, increased long-term housing—could decrease the number of falls in this high-risk population.

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Compliance with Ethical Standards:

Conflict of Interest: The authors declare that they do not have a conflict of interest.

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