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Home and Neighborhood Context of Falls Among Black and White Older Americans

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Abstract

Objectives: To examine social and physical environmental fall-risk factors in a nationally representative sample of community-living older adults overall and by racial group.

Methods: We used data from the 2015 and 2016 rounds of the National Health and Aging Trends Study ($n=5,581$) linked to census-tract measures from the American Community Survey. Recurrent falls are defined as 2+ self-reported falls over 12 months.

Results: Older adults with recurrent falls were more likely to have lower education, lower income, financial hardship, live in homes with disorder and disrepair and in neighborhoods without sidewalks, with high social deprivation, and in non-metropolitan counties. Home disrepair, lack of sidewalks, and residence in a non-metropolitan county were important fall risk-factors among White older adults only. Financial hardship was an important risk-factor among Black older adults.

Discussion: Environmental factors are associated with recurrent falls among older Americans and should be incorporated into fall-risk profiles and prevention efforts.

Keywords

falls; residence characteristics; environment; socioeconomic factors; African American; older adults

Falls are the leading cause of injuries in older adults (Centers for Disease Control and Prevention (CDC), 2017A; CDC, 2017B). Fall-related medical spending by public and private payers has been estimated to approach \$50 billion per year (Florence et al., 2018). There is strong evidence that fall risk is multifactorial and encompasses interrelated characteristics of health and function (e.g., sensory impairments, balance and gait problems)

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and the physical environment (e.g., trip hazards), and is mediated in part by behavioral characteristics (e.g., fear of falling) (World Health Organization, 2007; Ganz & Latham, 2020; Scheffer et al., 2008). Most injurious falls occur in or around older adults' homes (Schiller et al., 2007), but an emerging literature finds that fall risk is also affected by neighborhood characteristics such as walkability, and road safety (Chippendale & Boltz, 2015; Li et al., 2014).

Despite sustained research to assess and address fall risk, and evidence that home and neighborhood environmental characteristics are associated with falls (Letts et al., 2010; Massey, 2004), few studies describe environmental fall risk factors in national samples of older adults in the U.S. (Nicklett et al., 2017; Lee et al., 2019). A prior study of environmental predictors of falls found measures of the relationship between the individual and their environment ("person-environment fit") more consistently predicted falls than measures of environmental hazards alone (Iwarsson et al., 2009) –and, relatedly, the literature suggests aspects of an individual older adult's health and function should be considered when examining the role of the environment in falls (Letts et al., 2010). Prior studies of environmental fall risk factors have primarily focused on the physical environment (Letts et al., 2010). The social environment refers to factors related to collective human interactions and resource distribution, such as interpersonal relationships, socioeconomic position, and place-based social and economic characteristics (Lillie-Blanton & Laveist, 1996; Olvera Alvarez et al., 2018). The social environment has particular importance to quality of life and care for older adults with impaired function (Seeman, 2000). The social environment may affect fall-risk or risk-mitigation through a wide range of pathways, for example involving the presence or absence of instrumental support (e.g., assistance with mobility) and/or one's socioeconomic context (e.g., a home becomes hazardous because of lack of financial resources to maintain it) (Golant, 2008). However, social environmental predictors of falls have been less studied. Older adults who are women (Deandrea et al., 2010) and more socially isolated have been found at greater risk of falls (Petersen et al., 2020), though little is known about the association of falls with other social factors, such as wealth, or other indicators of social or economic position among U.S. older adults, nor whether social and physical environmental characteristics are differentially associated with falls by racial status.

Due to disadvantaged status in the US racial hierarchy (Bonilla-Silva, 1997) Black older Americans are at greater risk for health problems that contribute to fall risk (Berkman et al., 1993). Further, residential racial segregation, an example of structural racism, leads to Black older adults being more likely to live in neighborhoods with greater social deprivation and lower-valued homes; environmental conditions that are considered hazardous to health (Bailey et al., 2017). Despite greater exposure to fall risk factors, multiple studies have found Black older adults to be at lower, not higher, risk of falls compared to White older adults (Hanlon et al., 2002; Nicklett & Taylor, 2014; Sun et al., 2016). These surprising results have been interrogated to assess whether differences are explained by physical activity, disability, living arrangements, or fall location, but reasons for observed differences remain unclear (Kiely et al., 2015; Nicklett & Taylor, 2014; Sun et al., 2016). Examining differences in the relationships between environmental factors and falls between Black and White older adults has potential to contribute to a better understanding of environmental

contributions to falls as well as the intersecting topic of differences in fall rates between racial groups.

Given this background, we undertook a longitudinal study to assess the contribution of home and neighborhood physical and social environmental factors to falls over the course of a 12-month period among older community-living adults in the US, overall and separately for Black and White participants. We draw on a unique nationally representative dataset with comprehensive information relating to the person and their home and neighborhood environment, linked to measures of county- and census tract-level characteristics. Together, these data sources encompass multiple domains and levels of socio-environmental health and well-being and are therefore uniquely suited to contribute new insight regarding the extent to which environmental factors account for fall risk in late life.

Methods

We draw on the 2015 (Round 5) and 2016 (Round 6) results of the National Health and Aging Trends Study (NHATS), a population-based survey of health and disability trends and trajectories among Medicare beneficiaries age 65 and older. NHATS fields annual in-person interviews with study participants or a proxy if the participant is unable to respond. The NHATS study design and procedures have been described previously (Kasper & Freedman, 2019). This study additionally draws on restricted data files of participants' geocoded place of residence, which we linked to characteristics at the census tract level from the American Community Survey (United States Census Bureau, 2020). As we focus on census-tract level metrics that approximate individuals' neighborhoods, we draw on 5-year estimates that span 2011 through 2015.

Participants

The sample for this study includes 7,070 NHATS participants who responded to the 2015 survey and lived in community settings: 1,264 participants who lived in residential care facilities or nursing homes were excluded. We further excluded 581 participants without information about their home environment in Round 5, and 908 participants who did not complete the follow-up 2016 interview [298 were deceased, 426 refused the survey, 184 did not complete the survey for other reasons], leaving a final unweighted sample of 5,581.

Measures

Falls.—In the follow-up round (2016) participants were asked, “In the last month have you fallen down?” Those responding “no” were asked, “In the last 12 months have you fallen down?” Participants responding affirmatively to either question were asked if they fell more than one time in the last 12 months, and provided a definition of “any fall, slip, or trip in which you lose your balance and land on the floor or ground or at a lower level.” Drawing from these items, we differentiated between participants who reported: 1 fall versus 2 falls, which we refer to as “recurrent falls”, our primary outcome. We focus on the outcome of recurrent falls (versus single falls), because they are strongly related to serious fall-related injuries, costs and mortality (Jennings et al., 2015). Further, while injury can result from any

one fall, risk factors for recurrent falls are more predictable and therefore potentially more amenable to prevention than a single isolated fall (Nevitt et al., 1989).

Personal Characteristics.—Gender, race, ethnicity, income, and educational attainment were self-reported. Income was categorized by sample tertile (<\$26,000, \$26,001–\$60,000, and >\$60,001). Participants who reported they skipped a meal during the previous month because there was not enough food or money to buy food, or did not have enough money to pay for medical expenses, the rent or mortgage, or utility bills during the previous year, were classified as having financial hardship. Social isolation was measured using a multidomain typology previously developed within the NHATS dataset by Cudjoe and colleagues (Cudjoe et al., 2020). Participants received 1 point (total score range 0–4) for each of the following: living with 1 other person, talking to 2 people about important matters in the past year, attending religious services in the past month, and participating in other activities (clubs, classes, or other organized activities) in the past month. Participants were classified as follows: 0 severely socially isolated; 1 socially isolated; 2 socially integrated. We collapsed the socially isolated and severely socially isolated categories due to small cell sizes in subgroups of interest.

Health and Function Fall-Risk Factors.—The study focused on a list of established health and function fall-risk factors identified by an expert panel on falls prevention: age, muscle weakness, gait deficit, balance deficit, use of assistive device, visual impairment, arthritis, self-care disability, depressive symptoms, and cognitive impairment (American Geriatrics Society et al., 2001). Lower extremity function, including muscle strength, gait, and balance were assessed with the Short Physical Performance Battery (SPPB). Following Guralnik et al., we differentiated poor function (SPPB score 6) from moderate and high lower-extremity function (SPPB score 7) (Guralnik et al., 1995). We assigned a score of zero for 349 participants who were eligible for the SPPB tests but did not have a result recorded because they were unable to complete the test due to non-safety related reasons (Kasper et al., 2012). Self-care disability refers to receiving help in the last month with eating, bathing, toileting or dressing. Balance/coordination problems, assistive device use (i.e., cane, walker, wheelchair, or scooter), and visual impairment were self-reported. Arthritis refers to self-reported diagnosis by a medical provider. Symptoms of depression refer to cut-points of >3 on the Patient-Health Questionnaire-2 (PHQ-2) (Lowe et al., 2005). Dementia refers to a classification of *probable dementia*, derived from a composite measure based on self-reported physician diagnosis, performance measures, and proxy-reports of symptoms of dementia, as previously described (Kasper et al., 2013).

Home Environment Characteristics.—Living arrangement was categorized as lives alone, lives with spouse, or lives with others who are not a spouse. NHATS interviewer observations of conditions inside and outside of the home were used to assess other features of the home environment. Following the results of a factor analysis by Samuel and colleagues (Samuel et al., 2015), we grouped the observations into three categories and constructed binary measures to differentiate the presence of features of the physical environment: *home disorder* refers to broken furniture or lamps, flooring in need of repair, tripping hazards, clutter, peeling or flaking paint, or evidence of pests; *exterior*

home disrepair refers to broken or boarded up windows, crumbling foundation, missing bricks or siding, roof problems, or uneven walking surfaces or broken steps; and *street disorder* refers to litter, graffiti, or vacant houses. A binary measure was constructed for continuous sidewalks, based on interviewer-reported observation of the presence or absence of continuous sidewalks in both directions in front of the home. Accessibility modifications refers to a binary measure indicating the presence of 2 of four modifications that are frequently recommended by clinicians to promote function and reduce falls and relatively low-cost and easy to install (Meucci et al., 2016): grab bar for the shower or bath; seat for the shower or bath; grab bars around the toilet; and raised toilet or seat.

Neighborhood Environment Characteristics.—Community social cohesion was measured based on responses to three questions about how well people in the community know each other, are willing to help each other, and can be trusted; higher scores reflect greater cohesion. As in prior work, scores were dichotomized, with scores below the 10th percentile representing low cohesion (Latham & Clarke, 2018). Finally, the 2015 Social Deprivation Index (SDI) measures seven area-level characteristics of social and economic deprivation at the census-tract level, drawing from the American Community Survey (Butler et al., 2013; Robert Graham Center, n.d.). Scores of the SDI range from 0 to 100, with higher values corresponding to greater area-level deprivation. We categorized the social deprivation of participants' census tracts as low (<43.9) or high (≥ 43.9) based on the median SDI score of the analytic sample. Urbanity/rurality was indicated by whether participants lived in a metropolitan or non-metropolitan county based on designation by the U.S. Office of Management and Budget (Office of Management and Budget, 2013).

Data analysis

First we comparatively examined the distribution of older adults reporting no or one fall versus two or more falls in the 12 months preceding the 2016 interview across personal, health and function, home, and neighborhood factors using chi-square tests to assess statistical significance. Next, we constructed a series of logistic regression models to assess the strength of association between personal, home, and neighborhood characteristics and recurrent falls. We first constructed simple (unadjusted) models for each factor. Next, to evaluate the contribution of environmental factors to falls in addition to established health and function fall-risk factors, we constructed multivariable regression models to assess whether each factor was associated with falls after accounting for health and function. Finally, we repeated the logistic regression analyses described above, stratified by race. In this analysis we contrasted White vs Black because of the small cell sizes for the Hispanic and other (i.e., American Indian, Asian, Native, Hawaiian, Pacific Islander) race and ethnicity categories. Data was analyzed in Stata version 14 (StataCorp, 2015). Reported estimates are weighted with 2016 survey weights to account for nonresponse, oversampling of subgroups (oldest old and Black non-Hispanic persons), incomplete interviews, and replenishment of the original sample (DeMatteis et al., 2017; Kasper & Freedman, 2019). Alpha of < .05 indicated statistical significance. An Institutional Review Board approved this study.

Results

An estimated 4.6 million community-living older adults (13.4%) experienced recurrent falls during 2016 (Table 1). Relative to older adults who experienced no or one fall, older adults who experienced recurrent falls were older, more socioeconomically vulnerable, and had worse health and function, but no differences were observed by race. In stratified analyses by race, Black recurrent fallers were more socioeconomically vulnerable than White recurrent fallers: they were more likely to have less than high school education (31.0% versus 14.7%; $P<.01$), annual household income of less than \$26,000 (58.0% versus 35.2%; $P<.01$), and to report financial hardship (30.4% versus 10.5%; $P<.01$). They were also more likely to have poor lower-extremity function (64.0% versus 42.9%; $P<.01$).

The homes of older adults who reported recurrent falls were more likely to exhibit disorder and disrepair while being less likely to be located by continuous sidewalks or in metropolitan areas (Table 2). In analyses stratified by race, recurrent fallers who were Black were less likely than Whites to live alone (26.4% versus 28.9%; $P<.01$), but their environments were characterized by indicators of lower socioeconomic position. Black recurrent fallers were more likely to live in homes characterized by disorder (45.7% vs 30.7%; $P<.01$) and neighborhoods characterized by street disorder (14.8% vs 8.1%; $P=.02$) and high social deprivation (84.6% vs 48.7%; $P<.01$).

Home and neighborhood characteristics remained associated with recurrent falls after adjusting for older adults' health and function (Table 3). Specifically, home disrepair (aOR: 1.25, 95% CI: 1.00, 1.56), lack of continuous sidewalks (aOR: 1.27, 95% CI: 1.03, 1.56), and residence in a Non-Metropolitan county (aOR: 1.40, 95% CI: 1.11, 1.77) were associated with elevated risk of recurrent falls. Older adults who were Black (aOR: 0.59, 95% CI: 0.45, 0.78) and Hispanic (aOR: 0.57, 95% CI: 0.39, 0.85) were less likely to experience recurrent falls relative to those who were White. Other personal characteristics relating to gender, educational attainment, income, and financial hardship were not associated with recurrent falls after adjusting for health and function.

In stratified analyses by race—personal, home, and neighborhood factors were associated with recurrent falls among White older adults (Table 4)—though only three factors remained significant after accounting for health and function risk factors: home disrepair (aOR: 1.36, 95% CI: 1.04, 1.77), lack of continuous sidewalks (aOR: 1.27, 95% CI: 1.00, 1.60), and residence in a non-metropolitan county (aOR: 1.37, 95% CI: 1.08, 1.74). In contrast none of the personal, home, or neighborhood characteristics were associated with recurrent falls among Black older adults, with the exception of financial hardship (aOR: 1.82, 95% CI: 1.04, 3.18) and street disorder, which was inversely associated with recurrent falls (aOR: 0.48, 95% CI: 0.29, 0.79).

Discussion

This national study finds that characteristics of older adults' personal, home, and neighborhood environments are associated with recurrent falls. Social environmental factors associated with falls include personal education and income and neighborhood social

deprivation, while aspects of the physical environment that were associated with falls include home disrepair, lack of sidewalks, and residing in a non-metropolitan county. Importantly, we find that the relevance of environmental features to recurrent falls were attenuated among Black older adults, for whom financial hardship and, counterintuitively the absence of street disorder, were the only factors associated with recurrent falls. Our study confirms the importance of the home and neighborhood to fall risk in older adults and speaks to the centrality of social determinants of health, including racial status, in understanding fall risk factors.

This is the first study to jointly assess a comprehensive set of personal, home and neighborhood environmental predictors of recurrent falls among a nationally representative sample of older Americans. By identifying features of the social and physical environments that are associated with recurrent falls, we elucidate the potential of less well-understood avenues of fall prevention efforts. Despite associations with health and function (Berkman et al., 1993) and the physical environment (Bailey et al., 2017), socioeconomic indicators have had little study or intervention in the US for fall prevention though they have been found to contribute to falls in other countries (Gill et al., 2005; Kim et al., 2020). In this study, financial hardship stands out as a risk factor for its association with falls in both Black and White older adults. A large body of literature demonstrates the health benefits and return on investment of attending to basic human needs (Samuel et al., 2017): our study suggests that such factors may also be relevant to preventing falls by ameliorating financial hardship. The home and neighborhood have long been understood as important to late-life health and well-being (Lawton & Nehemow, 1973), but fall prevention efforts and interventional research have been heavily weighted towards individual-level clinical interventions that ignore or give cursory attention to environmental context (Comment, 2020; Tinetti & Kumar, 2010). Our findings suggest that environmentally-directed interventions that modify features of the home (IMPAQ International, 2019; Szanton et al., 2019) and neighborhood (Seskin & McCann, 2012) hold promise not only for the promotion of healthy aging but for fall prevention (Lawton, 1974). These interventions should be viewed as long term health investments, though some may be cost saving in the short term (IMPAQ International, 2019), especially if implemented at scale (Carande-Kulis et al., 2015).

Race-stratified associations of personal, home, and neighborhood characteristics with falls have not been reported in other studies (Kiely et al., 2015; Nicklett & Taylor, 2014; Sun et al., 2016), but are necessary to understand the full range of factors contributing to falls in older Americans. Importantly, the Black older adults in this study had more exposure to multiple social and physical environmental risk factors, including low education, low income, financial hardship, home disorder, street disorder, and neighborhood deprivation, but lower rates of living in a non-metropolitan county (Supplemental Table 1). Apparent differences in fall-risk factors for White and Black older adults may be due to “structural” confounding—whereby, due to social stratification, characteristics between groups are sorted unevenly in a way that complicates between-group comparisons (Oakes & John, 2017). The distinctions that emerge in environmental predictors of falls between racial groups nevertheless advance our understanding of how social context affects fall risk. Reports of risk factors and intervention effects stratified by race in future studies may identify, among other possibilities, imitable behaviors that contribute to lower-than-expected

rates of falls among Black older adults, or to the contrary assess whether lower-than-expected rates are related to restricted participation and activity as older Black Americans have been found to have lower average levels of physical activity (Watson et al., 2016) and lower odds of participating in commonly valued activities than older White Americans (Latham & Clarke, 2018).

The social context of falls has received limited attention though its study has promise for innovative assessment and prevention strategies (Kelsey et al., 2012). Li et al. found older adults living in socioeconomically disadvantaged neighborhoods were more likely to walk for utilitarian versus recreational purposes and experienced a higher rate of falling on sidewalks, streets, and curbs after accounting for other risk factors (Li et al., 2014). Satariano et al. identified a fall-risk typology that suggested frail older adults may limit outdoor activities and be more susceptible to indoor falls due to poor neighborhood safety and walkability (Satariano et al., 2017). Our findings extend this line of inquiry by examining associations between socioeconomic status and racial status with falls in a national sample, which is important given the regional diversity of sociopolitical climates in the US that differentially affect health (Baicker et al., 2005).

Knowledge of how social and physical environmental context relates to fall risk, along with advances in the documentation of social determinants of health across clinical care settings and social service organizations, has potential to facilitate novel prevention strategies. The Centers for Medicare and Medicaid Services Social Needs Screening Tool evaluates housing instability, along with other social determinants of health, but does not evaluate the quality of the home or neighborhood environment. The Social Interventions Research and Evaluation Network's (SIREN) Gravity Project is developing tools to enable sharing of information related to the social determinants of health across clinical (e.g., primary care, hospitals) and social service providers (Gravity Project Team, 2019). In recognition of the centrality of housing to health, the SIREN Gravity Project selected housing stability and adequacy as topic areas for inclusion in the initial project phase. Our study suggests the potential value of broadening such efforts to include measures of home disorder and disrepair and neighborhood characteristics, such as presence of sidewalks. In a future scenario, housing and neighborhood environmental characteristics that are relevant to falls could be screened for and documented in the electronic health record and, along with personal socioeconomic and health information, used to generate fall-risk profiles, scores, and prevention recommendations.

Study Strengths and Limitations

This is an observational study that relies on participant reports of falls using a one-year recall period. The survey does not include information on fall location or assess whether the fall resulted in injury or medical treatment. Additionally, features of the home and neighborhood physical environment were not measured with a validated instrument; a common shortcoming of studies of environmental fall-risk that limits interpretation of results and comparisons across studies (Letts et al., 2010). The use of census tract, an administrative geography, to represent the neighborhood, may not validly measure the bounds of what participants consider to be their community. The use of the administrative geography

metropolitan/non-metropolitan status to measure rurality/urbanity, is similarly inexact, though understanding the contribution of rurality/urbanity is an addition to the literature. Strengths of this study are inclusion of a representative sample of community-dwelling Medicare beneficiaries in the United States, the prospective design, and stratification of analyses by racial status—an indicator of social status closely tied to health as well as home and neighborhood environment.

Conclusions

Our findings indicate social and physical characteristics of the home and neighborhood are risk factors for recurrent falls among older Americans. To prevent falls, the current paradigm of individually-directed, biomedically-focused assessments and interventions should be expanded to incorporate the social and physical environmental context and home and community-based interventions. These approaches also lend themselves for use to monitor and inform population-level fall-prevention efforts.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1.

Personal and Health and Function Characteristics of Community-Living Older Adults by Recurrent Fall Status

(Row %)	Overall Sample (n=5,581) n (Weighted %)			Recurrent Falls ^a (n= 749) n (Weighted %)		
	<2 Falls 4,755 (86.6%)	2 falls 826 (13.4%)	<i>P</i> ^b	White 612 (13.7%)	Black 137 (11.5%)	<i>P</i> ^b
Weighed Estimate	29.8 million	4.6 million		3.8 million	326,840	.083
Personal Characteristics						
Female	2760 (55.4)	486 (58.3)	.15	356 (58.2)	85 (64.3)	.33
Education						
Above HS	2501 (58.0)	400 (51.2)	<.01	334 (55.7)	48 (38.5)	<.01
HS	1274 (26.0)	229 (27.6)		179 (29.5)	40 (30.5)	
Below HS	980 (16.0)	197 (21.2)		99 (14.7)	49 (31.0)	
Income						
>\$60,001	1237 (32.7)	167 (23.2)	<.01	146 (25.6)	15 (13.7)	<.01
\$26,001–\$60,000	1571 (34.2)	270 (35.2)		231 (39.2)	32 (28.3)	
\$0–\$26,000	1947 (33.1)	389 (41.6)		235 (35.2)	90 (58.0)	
Financial Hardship	322 (6.4)	98 (12.7)	<.01	50 (10.5)	36 (30.4)	<.01
Race						
White	3318 (80.2)	612 (82.2)	.60	NA	NA	NA
Black	1020 (8.5)	137 (7.1)		NA	NA	
Hispanic	292 (7.7)	52 (6.9)		NA	NA	
Other	125 (3.7)	25 (3.9)		NA	NA	
Social Isolation ^{c,d}						
Integrated	3045 (63.6)	468 (59.1)	.07	370 (61.3)	72 (57.7)	.61
Isolated	1563 (36.4)	297 (40.9)		210 (38.7)	52 (42.3)	
Health and Function Characteristics						
Age						
65 to 74	1933 (59.6)	259 (48.2)	<.01	182 (47.4)	55 (59.3)	.06
75 to 84	1908 (30.7)	346 (35.8)		267 (36.9)	50 (29.7)	
>85	914 (9.7)	221 (16.0)		163 (15.7)	32 (11.1)	
Poor LE function	1402 (21.7)	442 (46.2)	<.01	294 (42.9)	97 (64.0)	<.01
Self-care disability	540 (8.8)	237 (25.9)	<.01	158 (23.8)	43 (27.1)	.53
Mobility device	1191 (18.2)	420 (43.9)	<.01	290 (41.9)	84 (52.2)	.11
Vision impairment	273 (4.7)	101 (11.6)	<.01	70 (10.8)	16 (11.4)	.90
Arthritis	2843 (54.0)	627 (75.0)	<.01	466 (75.5)	104 (73.5)	.68
Depression	1877 (37.0)	505 (62.5)	<.01	357 (61.3)	95 (72.2)	.07
Dementia	346 (4.4)	141 (12.7)	<.01	86 (10.6)	27 (12.8)	.54
Balance Problem	1255 (21.5)	531 (62.2)	<.01	400 (62.5)	85 (64.4)	.71

Data are from the National Health and Aging Trends Study.

Personal and health and function characteristics were measured at the time of the 2015 interview.

Recurrent fall status refers to 2+ falls in twelve months preceding 2016 interview.

HS = high school; LE = lower extremity.

^aBlack and White participants only included in these figures.

^b*P* values calculated using χ^2 tests.

^coverall sample <2 falls n=4,608 and overall sample 2 falls n=765 due to inapplicable responses from proxy respondents.

^dn=580 for White participants with 2 falls n=124 for Black participants with 2 falls due to inapplicable responses from proxy respondents.

Table 2.
Home and Neighborhood Characteristics of Community-Living Older Adults by Recurrent Fall Status

(Row %)	Overall Sample (n=5,581) n (Weighted %)		Recurrent Falls ^a , Stratified by Race (n= 749) n (Weighted %)			
	< 2 Falls 4,755 (86.6%)	2 Falls 826 (13.4%)	<i>p</i> ^b	White 612 (13.7%)	Black 137 (11.5%)	<i>p</i> ^b
Home						
Lives with:						
Alone	1512 (27.8)	244 (27.7)	.08	193 (28.9)	36 (26.4)	<.01
Spouse	2394 (58.5)	401 (54.8)		322 (57.6)	48 (39.8)	
Others	849 (13.7)	181 (17.5)		97 (13.5)	53 (33.8)	
Home Disorder	1345 (26.8)	263 (31.3)	.04	179 (30.7)	61 (45.7)	<.01
Home Disrepair	693 (13.7)	147 (18.4)	<.01	112 (19.1)	24 (17.4)	.73
2 Home Modifications ^c	2069 (37.4)	452 (49.8)	<.01	349 (52.1)	68 (41.0)	.07
Street Disorder	540 (9.5)	88 (10.5)	.40	42 (8.1)	26 (14.8)	.02
No Continuous Sidewalks	2847 (59.6)	535 (64.2)	.03	427 (67.6)	66 (47.5)	<.01
Neighborhood						
Low Social Cohesion	283 (6.1)	59 (7.3)	.22	42 (7.3)	13 (11.2)	.23
High Social Deprivation	2736 (50.9)	470 (55.3)	.045	285 (48.7)	119 (84.6)	<.01
Non-Metropolitan County	900 (17.3)	194 (23.0)	.01	158 (24.4)	21 (10.7)	.02

Data are from the National Health and Aging Trends Study.

Personal and health and function characteristics were measured at the time of the 2015 interview.

^aRecurrent fall status refers to 2+ falls in twelve months preceding 2016 interview.

^b*P*-values calculated using χ^2 tests.

^cn =5,580

Table 3.

Odds of Recurrent Falls by Personal, Home and Neighborhood Characteristics (n=5,581)

	Unadjusted Odds	Adjusted Odds ^a
	OR (95% CI)	aOR (95% CI)
Personal		
Female Gender	1.12 (0.96, 1.32)	0.84 (0.69, 1.01)
Education		
Above High School	Reference	Reference
High School	1.20 (1.00, 1.45)	0.88 (0.71, 1.10)
Below High School	1.50 (1.23, 1.84)	0.83 (0.67, 1.03)
Income		
>\$60,001	Reference	Reference
\$26,001–\$60,000	1.45 (1.12, 1.87)	1.04 (0.79, 1.38)
\$0–\$26,000	1.77 (1.39, 2.25)	0.85 (0.64, 1.12)
Financial hardship	2.14 (1.60, 2.85)	1.28 (0.92, 1.77)
Race		
White	Reference	Reference
Black	0.82 (0.65, 1.03)	0.59 (0.45, 0.78)
Hispanic	0.87 (0.61, 1.26)	0.57 (0.39, 0.85)
Other	1.03 (0.55, 1.91)	0.94 (0.52, 1.70)
Social Isolation ^d		
Integrated	Reference	Reference
Isolated	1.21 (0.99, 1.49)	1.11 (0.90, 1.37)
Home Environment		
Lives with:		
Alone	Reference	Reference
Spouse	0.94 (0.74, 1.19)	1.22 (0.95, 1.57)
Others	1.29 (1.01, 1.65)	0.96 (0.72, 1.27)
Home Disorder	1.24 (1.01, 1.52)	0.96 (0.76, 1.21)
Home Disrepair	1.42 (1.18, 1.72)	1.25 (1.00, 1.56)
2 Accessibility Modifications ^b	1.66 (1.40, 1.97)	1.02 (0.83, 1.26)
Street Disorder	1.12 (0.85, 1.48)	0.82 (0.60, 1.12)
No Continuous Sidewalks	1.21 (1.02, 1.45)	1.27 (1.03, 1.56)
Neighborhood		
Low Social Cohesion	1.21 (0.89, 1.66)	0.84 (0.57, 1.24)
High Social Deprivation ^c	1.19 (1.00, 1.41)	0.91 (0.76, 1.08)
Non-Metropolitan County	1.43 (1.11, 1.84)	1.40 (1.11, 1.77)

Note. Data are from the National Health and Aging Trends Study.

Personal and health and function characteristics were measured at the time of the 2015 interview.

Recurrent fall status refers to 2+ falls in twelve months preceding 2016 interview.

OR=odds ratio; aOR=adjusted odds ratio; CI=confidence interval.

^aA separate logistic regression model for each characteristic was adjusted for established health and function fall-risk factors: age, lower extremity function, self-care disability, use of mobility device, vision impairment, arthritis, depression, dementia, and balance problems.

^b
n=5,580.

^cBased on the Social Deprivation Index using 2015 American Community Survey Data.

^d
n=5,373 due to inapplicable responses from proxy respondents.

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Table 4.

Odds of Recurrent Falls by Personal, Home and Neighborhood Characteristics, Stratified by Racial Status

	White (n=3930)		Black (n=1157)	
	Unadjusted Odds OR (95% CI)	Adjusted Odds ^a aOR (95% CI)	Unadjusted Odds OR (95% CI)	Adjusted Odds ^a aOR (95% CI)
Personal				
Female	1.14 (0.95, 1.36)	0.83 (0.68, 1.02)	1.09 (0.65, 1.82)	0.81 (0.48, 1.37)
Education				
Above High School	Reference	Reference	Reference	Reference
High School	1.23 (0.99, 1.52)	0.90 (0.69, 1.16)	1.34 (0.70, 2.56)	1.16 (0.61, 2.22)
Below High School	1.55 (1.21, 1.99)	0.90 (0.66, 1.23)	1.17 (0.75, 1.84)	0.83 (0.50, 1.39)
Income				
>\$60,001	Reference	Reference	Reference	Reference
\$26,001–\$60,000	1.59 (1.18, 2.14)	1.15 (0.83, 1.58)	0.97 (0.48, 1.95)	0.85 (0.37, 1.97)
\$0–\$26,000	1.97 (1.48, 2.63)	0.96 (0.68, 1.36)	0.93 (0.53, 1.65)	0.59 (0.29, 1.22)
Financial hardship	2.53 (1.81, 3.54)	1.40 (0.98, 2.01)	2.18 (1.21, 3.90)	1.82 (1.04, 3.18)
Social Isolation^{c,d}				
Integrated	Reference	Reference	Reference	Reference
Isolated	1.16 (0.95, 1.42)	1.05 (0.86, 1.30)	1.65 (0.93, 2.92)	1.58 (0.87, 2.88)
Home				
Lives with:				
Alone	Reference	Reference	Reference	Reference
Spouse	0.91 (0.70, 1.17)	1.17 (0.88, 1.55)	1.46 (0.76, 2.80)	1.62 (0.84, 3.14)
Others	1.30 (0.94, 1.79)	0.91 (0.65, 1.27)	1.37 (0.85, 2.21)	1.08 (0.64, 1.84)
Home Disorder	1.37 (1.08, 1.75)	1.06 (0.81, 1.39)	1.25 (0.84, 1.85)	0.98 (0.61, 1.57)
Home Disrepair	1.57 (1.27, 1.93)	1.36 (1.04, 1.77)	0.82 (0.45, 1.50)	0.86 (0.44, 1.69)
2 Modifications	1.72 (1.40, 2.11)	1.00 (0.78, 1.30)	1.23 (0.79, 1.91)	0.88 (0.52, 1.51)
Street Disorder	1.42 (0.97, 2.09)	1.12 (0.74, 1.69)	0.51 (0.30, 0.85)	0.48 (0.29, 0.79)
No Continuous Sidewalks	1.22 (1.01, 1.48)	1.27 (1.00, 1.60)	1.00 (0.68, 1.48)	0.90 (0.60, 1.33)
Neighborhood				
Low Social Cohesion	1.52 (1.04, 2.21)	1.00 (0.63, 1.59)	1.30 (0.71, 2.39)	1.22 (0.65, 2.29)

	White (n=3930)		Black (n=1157)	
	Unadjusted Odds	Adjusted Odds ^a	Unadjusted Odds	Adjusted Odds ^a
High Social Deprivation ^b	1.20 (0.99, 1.46)	0.97 (0.79, 1.19)	1.18 (0.58, 2.40)	1.12 (0.53, 2.34)
Non-Metropolitan County	1.37 (1.08, 1.74)	1.33 (1.07, 1.66)	0.95 (0.44, 2.05)	0.75 (0.28, 1.97)

Note. Data are from the National Health and Aging Trends Study. Personal and health and function characteristics were measured at the time of the 2015 interview. Recurrent fall status refers to 2+ falls in twelve months preceding 2016 interview. OR=odds ratio; aOR=adjusted odds ratio; CI=confidence interval.

^a A separate logistic regression model for each characteristic was adjusted for established health and function fall-risk factors: age, lower extremity function, self-care disability, use of mobility device, vision impairment, arthritis, depression, dementia, and balance problems.

^b Based on the Social Deprivation Index using 2015 American Community Survey Data

^c White participants n=3,832,

^d Black participants n=1,093 due to inapplicable responses from proxy respondents.