Published in final edited form as:

Res Aging. 2018 February ; 40(2): 103–130. doi:10.1177/0164027516681165.

Understanding socio-environmental contributors to racial and ethnic disparities in disability among older Americans

Allison B. Brenner¹ and Philippa J. Clarke¹

¹Survey Research Center at the Institute for Social Research, University of Michigan, Ann Arbor, MI, USA

Abstract

Objectives—Racial/ethnic disparities in disability in older adults are well documented. Yet, our understanding of the mechanisms through which they are developed and maintained is limited. Using a general disablement framework, we examined the role of physical impairment and socioeconomic factors for racial/ethnic disparities in difficulty with self-care activities of daily living (ADL), and the modifying role of the indoor home environment among older Americans.

Methods—Data come from a nationally representative sample of 5,640 Americans (age 65+) in the National Health and Aging Trends Study (2012). Due to known gender differences in disability disparities, negative binomial regression models were specified separately for men and women.

Results—Blacks and Hispanics reported more difficulty with ADL than Whites. Men and women who lived in homes with more clutter had a higher rate of ADL difficulty than those in homes without any clutter, but this did not account for the racial/ethnic disparities in disability. Racial/ethnic differences were fully explained by differences in physical impairment for men, but not for women. Socioeconomic factors and health conditions accounted for any remaining disparities for Black women, but differences in disability remained between Hispanic and White women at similar levels of impairment.

Conclusions—Attention to both individual and environmental factors is necessary to fully understand and address persistent race/ethnic disparities in disability in older Americans.

Keywords

disability; living environment; racial/ethnic disparities; intersectionality; activities of daily living; older age

Approximately 20–30% of Americans over the age of 70 have some degree of physical disability (Fried, Ferrucci, Darer, Williamson, & Anderson, 2004), which can result in dependency, institutionalization and high rates of health care utilization (Fried & Guralnik, 1997; Schneider & Guralnik, 1990). Researchers have also documented large racial/ethnic disparities in disability, with minorities experiencing higher rates of and more severe disability than Whites (Dunlop, Song, Manheim, Daviglus, & Chang, 2007; Mendes de

Leon, Barnes, Bienias, Skarupski, & Evans, 2005; Schoeni, Martin, Andreski, & Freedman, 2005). Although the prevalence of disability has declined for many Americans over the past two decades (Seeman, Merkin, Crimmins, & Karlamangla, 2010), the non-Hispanic White/minority gap in disability has not narrowed (Schoeni, et al., 2005). Black and Hispanic Americans have a markedly higher prevalence and incidence of mobility and self-care disability than Whites (Bowen, 2009; Dunlop, et al., 2007; Mendes de Leon, et al., 2005; Warner & Brown, 2011). Despite these large racial/ethnic disparities in disability, our understanding of the mechanisms through which they develop and are maintained is limited.

Racial/ethnic disparities in disability are a major public health concern. Disparities in disability result in disproportionate economic and social strains (e.g., caregiving burden) on minority families and communities (Pinquart & Sörensen, 2005), and thus amplify existing financial and social inequities, which may contribute to continuing health disparities. Second, as the prevalence of chronic conditions and obesity increases, coupled with aging of the population, disability will become an increasingly consequential driver of racial/ethnic health disparities and racial/ethnic differences in mortality (Lubitz, Cai, Kramarow, & Lentzner, 2003).

Numerous studies have tried to identify the factors driving the race/ethnic differences in disability, focusing primarily on individual factors such as socioeconomic status (SES), health behaviors and chronic conditions (Bowen, 2009; Kington & Smith, 1997; Latham, 2012, 2014; Thorpe et al., 2011). SES has been investigated as the primary causal mechanism through which racial/ethnic disparities in disability are generated (S. Haas & Rohlfen, 2010; Kelley-Moore & Ferraro, 2004). Although SES is strongly associated with gradients in disability at all levels of income (Minkler, Fuller-Thomson, & Guralnik, 2006), and may account for differences in physical functioning, it does not fully account for racial/ethnic disparities in disability (Bowen, 2009; Fuller-Thomson, Nuru-Jeter, Minkler, & Guralnik, 2009). In addition SES may differentially explain race/ethnic disparities among men versus women, although reasons for the failure of SES to fully account for disparities in women are not known (Mendes de Leon, et al., 2005; Warner & Brown, 2011).

Researchers have also examined the contribution of health behaviors and chronic conditions to racial/ethnic disparities in disability. Behavioral risk factors such as smoking, physical activity, and body mass index are established predictors of disability (Fried & Guralnik, 1997), but there is little evidence that they account for the racial/ethnic disparities in disability (S. A. Haas, Krueger, & Rohlfen, 2012; Latham, 2014). Similarly, although SES and wealth are strong predictors of chronic conditions (Kington & Smith, 1997), excess chronic health conditions among Blacks and Hispanics also fail to fully account for the racial/ethnic gap in disability (de Leon et al., 1997; S. A. Haas, et al., 2012; Warner & Brown, 2011).

Given the large disparities in disability that are not fully explained by individual socioeconomic factors, health status, or health behaviors, research that further probes the factors driving the racial/ethnic patterning in disability is warranted. Researchers have speculated that the failure of SES and health factors to account for race/ethnic disparities in disability are multifaceted, including a function of how SES and health status are measured;

selective survival; or limitations in statistical approach (Kelley-Moore & Ferraro, 2004). However, given the analytical sophistication employed, the thorough measurement of SES and use of longitudinal data (de Leon, et al., 1997; Kelley-Moore & Ferraro, 2004; Latham, 2014; Mendes de Leon, et al., 2005; Warner & Brown, 2011), it is unlikely that these analytical limitations are fully responsible for the null results. Instead, other unmeasured factors at the socio-environmental level that to date have not been thoroughly studied, may contribute to race/ethnic disparities in disability. These unmeasured factors may also help explain the gender differences in associations between SES and physical health, and race/ethnic disparities in disability that have been found previously (de Leon, et al., 1997; Warner & Brown, 2011; Zsembik, Peek, & Peek, 2000).

Models of disablement, such as the Disablement Process (Verbrugge & Jette, 1994), the Nagi Framework (Nagi, 1965), and others (Freedman, 2009; Organization, 2001), emphasize the complex interplay between environmental and individual factors in the pathway between pathology, physical impairment, functional limitations and disability. These models define disability as a function of impairments and functional limitations, but emphasize that it is also influenced by interactions between the physical and social environment, and factors intrinsic to the individual like behaviors and psychological. Thus, research addressing the causes of racial/ethnic disparities in disability should consider the interplay of functional capacity, personal factors and the environment.

The home is the most immediate physical environment in which basic self-care activities are carried out. Disablement models identify the environment, including the home environment, as an important context for intervention to reduce disability (Wahl, Fänge, Oswald, Gitlin, & Iwarsson, 2009). Theories of aging indicate that people spend more time in their homes as they grow older due to physical barriers, social ties to their homes, and the desire to age in place (Iwarsson et al., 2007). For the aging and disabled population, however, the home environment can also present a significant barrier to independence and safety such as increased falls and fear of falling (Gitlin, 2003; Wahl, et al., 2009), social isolation, loneliness and decreased self-esteem (Iwarsson, et al., 2007). In addition, there is evidence that improving home environments is associated with higher functional ability outcomes (Szanton et al., 2015; Wahl, et al., 2009). Differences in the home environment and associations between the home environment and functioning by gender and race/ethnicity have not been well studied, but researchers found that elderly minorities and women were more likely to encounter problems in their home environment (Gitlin, 2001). Coupled with the documented lower levels of physical capacity and greater disability for non-White elderly adults (CITE), the home environment could potentially be differentially associated with disability by race/ethnicity. However, researchers have not examined the contribution of the home environment to racial/ethnic disparities in disability.

Few researchers have considered the complex interplay between multiple factors in the disablement process in the context of racial/ethnic disparities in disability. Kelley-Moore and Ferraro (Kelley-Moore & Ferraro, 2004) examined a more comprehensive model of disability in which they examined Black/ White differences in disability trajectories over time, and contributions of SES and morbidity to disparities in the disability gap. They were able to account for the Black-White disparities in disability trajectories, yet few of the

predictors were associated with changes in disability over time and they were not able to fully account for racial disparities in baseline disability. Although this research included a more comprehensive set of factors integral to the disablement process, they did not examine contributions of the environment. Based on theory that posits that physical impairment interacts with the environment to influence functioning and disability (CITE), we test interactions between physical impairment and the home environment, and between physical impairment and race/ethnicity. Although race/ethnicity is often conceptualized as a demographic factor, we apply a social perspective and consider the influence of race/ethnicity on social and environmental exposures across the life course that likely influence racial and ethnic differences in disability (CITE). Theoretically-driven research with attention to the both individual and environmental factors is needed to fully understand the sources of racial/ethnic disparities in physical disability among older adults in the United States.

In this research we strive to increase the understanding of the factors driving racial/ethnic disparities in disability by integrating individual measures of impairment and functioning with measures of the home environment. The extent to which home environments vary by race/ethnicity (N. Gitlin, 2001; Tabbarah, Mihelic, & Crimmins, 2001) may account for the unexplained differences in disability prevalence by race/ethnicity. For example, researchers found that 20% of older Blacks compared to 14% of older Whites reported discrepancies between their current home environment and their needs (Tabbarah, et al., 2001). Moreover, we use a measure of disability that more closely maps to the activities that take place within the home environment, and is reflective of interactions between levels of functioning and the social and physical environment. At a fundamental level, basic self-care is an essential requirement for well-being and survival. Yet, the structure of the home environment may lead to differences in levels of independence in daily activities. A recent intervention aimed at reducing home environmental barriers for older, disabled adults, succeeded at reducing ADLs in almost 80% of the enrolled adults (Szanton, et al., 2015). The brief and inexpensive intervention included simple home improvements to achieve functional goals. Results from this project suggest that even relatively basic, inexpensive repairs in the home environment can result in substantial improvements in functioning among older adults.

The objectives of this research are to: 1) examine the racial/ethnic patterning of disability in a nationally representative sample of older Americans, and 2) explore the association of physical, socioeconomic, and home environmental factors with disability, including the extent to which they explain any racial/ethnic patterning of disability. We examine these models separately for men and women based on the evidence that suggests that the risk factors and consequences of disability vary by gender (Atchley & Scala, 1998; Penning & Strain, 1994). Given the documented racial/ethnic disparities in physical impairment, and the relationship between physical impairment and disability, we expect that physical impairment will largely account for any disparity in disability, although these relationships may vary by gender. We also hypothesize that socioeconomic factors and the indoor home environment, including interactions between physical impairment and the home environment, will explain some of the remaining racial/ethnic differences in disability for men and women.

METHODS

Data and measures

Data come from the National Health and Aging Trends Study (NHATS), a nationally representative longitudinal study of the health and well-being of 8,245 Medicare recipients ages 65 and older. Black and the oldest adults were oversampled. Details of the sampling strategy and design are found elsewhere (Montaquila, Freedman, & Kasper, 2012). NHATS was designed to assess disability within a broad framework that includes the family, home and neighborhood environment, and society more generally. In-person interviews were used to collect data on disability, physical capacity and sociodemographics. Information related to the home environment was collected via interviewer observations. The first round of NHATS occurred in 2011, with annual follow-ups. For this study we used data from the second round of NHATS (2012), which included interviewer observations of conditions inside and outside participants' homes. The response rate for round 2, conditional on round 1 was 85.6% for participants who completed a sample person interview. In our analysis we focus on the 5,640 community-living participants, excluding 473 in nursing homes or assisted living.

Disability was measured by self-reported difficulty with activities of daily living (ADL). Our ADL measure was adapted from Freedman et al. (Freedman et al., 2011), and includes six activities: eating, dressing, toileting, bathing/washing, getting around inside, and transferring. A dichotomous indicator of disability was created based on a previous framework that categorizes individuals into five disability groups including: fully able, successful accommodation, reductions in activities, difficulty, and needs assistance. "Fully able" and "successful accommodation" were collapsed to represent independence in daily activities with or without using devices, while "reduced activities", "difficulty" and "assistance" were collapsed to represent at least some degree of difficulty or inability to complete daily activities without assistance (scored as 0/1 on a binary indicator for each of the ADL activities, respectively). The six ADL items were then summed to create a final ADL score for each individual ranging from 0–6, where higher values denote more disability.

Physical impairment was objectively assessed using the Short Physical Performance Battery (SPPB) (Vasunilashorn et al., 2009b), a reliable measure of lower extremity functioning that is predictive of mobility, disability and mortality. The SPPB assesses gait speed over a 3 meter walk, standing balance, and time to rise rapidly from a chair. NHATS used an established scoring approach, which is described in more detail elsewhere (Guralnik et al., 1994). The physical capacity score that ranges from 0–12, with higher scores reflecting higher functioning. In a validation study of the SPPB (Vasunilashorn et al., 2009a), a score of 10 was found to increase the risk of developing mobility difficulty fourfold, and a score of 7 or less was found to increase the risk of incident mobility difficulty by 32 times that of an individual with the highest SPPB score. For our purposes, we created a physical impairment measure by reverse coding the SPPB score where higher values correspond to more impairment. We use the suggested clinically relevant levels of physical capacity (reverse coded) for the purposes of graphical presentation in our results. Approximately 13% of the

analytic sample contained missing data on SPPB so we used multiple imputations to impute SPPB scores.

Educational attainment was assessed in round 1 by nine categories ranging from “no schooling completed” to “Master’s, professional or doctoral” and the categories were collapsed into: less than high school, high school graduate/equivalent, and beyond high school. Marital status was collapsed into: married/living with partner (reference category) separated/divorced, widowed and never married. Total family income from all income and assets was assessed at baseline. Participants who were not able to give a dollar amount for total income were prompted using five bracketed ranges of total income from which to choose (13% of the sample). NHATS conducted an imputation using cylindrical hot deck imputation methods to create five imputed values for total income (31% of the sample) (Montaquila Jill, Freedman Vicki A., and Kasper, Judith D. 2012). A median over the five imputed datasets was computed for individuals with missing income data. Due to a highly skewed distribution, a natural log transformation of income was used in analyses.

A measure of disrepair inside the home was created by taking a sum of several interviewer observations including the presence of: flooring disrepair, broken furniture and trip hazards. The indoor disrepair measure ranges from 0–3 with higher values corresponding to more disrepair. Clutter was also assessed by interviewer observation of the room in which the interview was conducted and in other rooms in the home. An average of the two items was taken and responses were collapsed into no clutter (no on both items) or clutter.

Due to the sensitive nature of birthdate information in NHATS, age at the time of the interview was only available in six 5-year age categories, which were collapsed: 65–75, 75–84 and 85+. Race/ethnicity variable was self-reported at baseline on primary race and ethnicity, and collapsed into White, not Hispanic; Black, not Hispanic; Hispanic; Other, non-Hispanic. Chronic disease was included as a control for multiple comorbid conditions. Participants were asked to report whether a doctor diagnosed them with any of nine chronic conditions in the past year (e.g., heart disease, , stroke). A sum of chronic diseases was created, ranging from 0–8.

Statistical Analysis

Due to well-documented gender differences in disability (Murtagh & Hubert, 2004) we conducted gender stratified analyses of racial/ethnic disparities in ADL. ADL difficulty ranged from 0–6 with a highly skewed distribution so we used negative binomial models to examine racial/ethnic disparities in the number of ADL difficulties. All coefficients and 95% confidence intervals were exponentiated and reported as rate ratios. First, we determined whether race/ethnicity was associated with ADL difficulty separately for men and women (Model 1). Next, we added physical impairment to determine the contribution of impairment to any racial/ethnic disparities present in ADL difficulty (Model 2). Demographic, socioeconomic and health factors were then included (Model 3) and interactions between physical impairment and the indoor home environment were added (Model 4). Finally, we added an interaction between physical impairment and race/ethnicity (Model 5) to determine whether the effects of physical impairment on ADL difficulty varied by race/ethnicity due to other unmeasured factors varying by race.

All models included participants with non-missing data on ADL difficulty and all covariates, which is over 90% of the community-living participants resulting in 2,059 men and 2,835 women with complete data. Participants dropped from the analysis were more likely to be male and non-White. All analyses were adjusted for sampling weights (Montaquila, Freedman, Spillman, & Kasper, 2014) using survey estimation commands in Stata (StataCorp, 2015), to account for unequal probabilities of selection. Due to the substantial amount of missing data for the SPPB, we performed a multiple imputation. A total of 15 multivariate multiple imputations were performed using chained equations (MICE)(White, Royston, & Wood, 2011). Predictive mean matching was used to impute physical capacity (SPPB), to adequately account for the truncated distributions (White, et al., 2011).

RESULTS

Study sample characteristics are presented in Table 1. On average, participants had a relatively low level of difficulty with ADL (mean=0.77) and women reported more difficulty than men ($p<0.001$, Table 1). Average physical impairment for the full sample fell below the recommended clinical level corresponding to an increased risk of mobility disability (mean=3.75), with women experiencing more impairment than men ($p<0.001$). Women had lower income, were less educated, less likely to be married and had more chronic diseases than men. Approximately 11% of the sample had homes characterized as having indoor disrepair and 27% of the homes contained at least some clutter, with women living in homes with more disrepair than men. The association between race and ADL difficulty varied by gender so results are reported separately for men and women (p -value for interaction <0.01).

Men

First we examined racial/ethnic differences in disability (Table 2, Model 1). Black and Hispanic men experienced higher rates of ADL difficulty than White men (Rate ratio (RR) Black men = 1.55, 95% Confidence Interval (CI) [1.22, 2.39]; RR Hispanic men = 1.59, 95% CI [1.05, 1.47]). The disparities were fully explained by differences in physical impairment (Model 2); a one unit increase in impairment was associated with a 28% higher risk of difficulty performing daily activities (95% CI [1.25, 1.31]). Higher income was protective against ADL difficulty in all men, and higher chronic disease burden was associated with more ADL difficulty (Model 3, Table 2). Model 4 includes an interaction term between the home environment and physical impairment, to determine whether the indoor home environment moderated the association between physical impairment and disability. The interaction term between indoor disrepair and impairment was not significant so we omitted it from the model. The presence of clutter inside the home moderated the association of physical impairment on ADL difficulty, but men who lived in a home with clutter had higher rates of ADL difficulty at all levels of impairment, which is also indicative of a significant main effect of clutter on ADL difficulty (RR=1.68, 95% CI [1.21, 2.34]) for zero impairment). As the level of physical impairment increased, the presence of clutter had an even larger effect on disability (Figure 1).

Women

In Model 1 (Table 3) we examined racial/ethnic differences in ADL difficulty for women, and found significant racial/ethnic differences in disability. Black and Hispanic women had more ADL difficulty than White women (RR for Black women = 1.89, 95% CI [1.62, 2.21]; RR for Hispanic women = 2.11, 95% CI [1.75, 2.53]). Then, to determine whether physical impairment explained the racial/ethnic disparities, we added impairment to the model (Model 2). Similar to men, impairment was a strong predictor of difficulty with ADL (RR=1.26, 95% CI [1.23, 1.28]). Unlike in men, racial/ethnic disparities in ADL difficulty among women were *not* explained by differences in physical impairment, although the effect on race/ethnicity was attenuated. Demographic covariates, and socioeconomic and health factors were next added to the model (Model 3). Including SES and chronic burden attenuated the risk ratio for Black (vs. White) women to non-significance, but the increased risk in disability for Hispanic women remained significant. Thus, educational attainment, income and chronic burden explained Black/White differences in ADL difficulty. For all women, higher income was associated with less ADL difficulty, and women with college compared to less than high school education had higher rates of ADL difficulty (Model 3). This is most likely a suppression effect because the association between college education and disability changes direction when chronic burden is added to the model. Greater chronic burden was associated with higher rates of ADL difficulty as expected.

We examined the interaction between the home environment and physical impairment on disability (Model 4), and found no evidence that the indoor home environment moderated associations between physical impairment and disability or racial/ethnic differences, so the interaction terms were removed from the model. We did find, that like in men, women who lived in homes with clutter had a higher rate of ADL difficulty than women in homes without any clutter (RR=1.21, 95% CI [1.05, 1.40]), although this had no effect on the racial/ethnic disparities in disability. Finally, we tested whether the association between physical impairment varied by race/ethnicity (Model 5), and found that this was, in fact, the case (Figure 2). Hispanic women with no physical impairment had higher rates of ADL difficulty than Whites, but there was no difference in ADL difficulty between Black and White women after accounting for SES and health. However, at higher levels of impairment, the Black/White difference in ADL difficulty increases. Although the Black/White disparity in disability was accounted for by SES and health, for Black women with higher levels of physical impairment the racial disparity remains.

DISCUSSION

Identifying individual and contextual factors that contribute to racial/ethnic disparities in disability has the potential to reduce the excess social and economic resources devoted to caring for older disabled individuals in minority communities. Mitigating racial/ethnic disparities in ADLs will lay a foundation for mitigating disparities in mortality. Using nationally representative data on older Americans, we found that racial/ethnic disparities in ADL difficulty were substantial, with Black and Hispanic Americans reporting more difficulty performing ADLs than Whites. The disparities were fully explained by physical

impairment in men, but among women, physical impairment did not explain the large racial/ethnic disparities in ADL difficulty.

Increased clutter in the home was associated with higher rates of disability, and associations of physical impairment and disability were stronger for men living in more cluttered environments. Although the home environment was an important risk factor for disability, it did not explain racial/ethnic disparities in disability for women. Accounting for income, education, and chronic burden eliminated the racial disparities for Black women, but did not explain the disparities for Hispanic women. Lastly, we found that for Black women with moderate to high levels of physical impairment, higher rates of disability remained even after accounting for other risk factors.

Our results confirm previous research that identifies strong racial and ethnic disparities in physical disability among older Americans (Fuller-Thomson, et al., 2009; Mendes de Leon, et al., 2005; Warner & Brown, 2011). We expand on this research by including measures of the indoor home environment, to determine whether the home context contributes to the racial/ethnic disparities beyond SES and health. Additionally, we considered models of racial/ethnic disabilities separately by gender, which may help identify the sources of the remaining unexplained disparities in disability for women.

In line with our hypotheses, differences in physical impairment were not responsible for racial/ethnic disparities in ADL difficulty for women despite explaining differences for men. Although the Black/White differences were fully explained by SES and health for women with no physical impairment, the racial disparity remained at moderate and high levels of impairment, suggesting that unmeasured factors are responsible for the disparity in Black women with worse physical functioning. Contrary to our hypotheses, clutter and disrepair were not responsible for racial/ethnic disparities in ADL difficulty among women. It is possible that for older Hispanic and lower functioning Black women, a lifetime of exposure to stressors results in more severe disability that is not evident for Black men. This is consistent with the weathering hypothesis, which posits accelerated aging and cumulative wear on the health of African American women, as they are exposed to multiple sources of social and economic inequality over the life course (Geronimus, 1992). Differences in disability for older non-White women may be attributable to a life history shaped by both their gender and race, as outlined in intersectionality theory (Schulz & Mullings, 2006). These results are in line with previous research (Fuller-Thomson, et al., 2009; Mendes de Leon, et al., 2005; Warner & Brown, 2011) finding greater disability for Black women compared to Black men or White women, which is not explained by SES.

While we found racial/ethnic differences in disability for women, they varied across levels of physical impairment. Although older Black women reported similar ADL difficulty to White women, a racial gap in disability increased with increasing physical impairment. Researchers have not yet examined reasons for differences in the effect of physical capacity on disability by race, but our results suggest that it is critical to begin to consider life course exposures that reflect the dual identity of being Black and female, which may contribute to higher rates of disability in Black women as they age. Black women hold two low-status positions that expose them to unique forms of oppression and discrimination over their life

course to influence their health later in life (Schulz & Mullings, 2006). Thus, racial/ethnic differences in disability for women may be established earlier in life, and not a function of more immediate factors like physical impairment or income. Researchers have found, for instance, that changes in disability are associated with a sense of mastery (Kempen, van Sonderen, & Ormel, 1999), and these psychological attributes may be related to earlier life experiences shaped by race/ethnicity and gender. Future research could include earlier life measures of stressors and discrimination, which may account for some of the racial/ethnic disparities in disability among older women.

We considered the home as a critical feature of the environment, which may interact with physical impairment to influence disability. We found that physical barriers in the form of clutter in the home are associated with difficulty performing basic daily tasks like dressing and bathing. Given the relative ease with which these barriers can be addressed to reduce disability, a simple intervention such as helping older adults remove clutter from their house is likely to be efficacious and effective. Our results suggest that home modifications might be most helpful to improve ADL disability for men with the highest degree of physical impairment.

It is possible that the neighborhood environment, which was not considered in this study, may be associated with racial/ethnic disparities in disability in women. Researchers have identified multiple dimensions of the neighborhood that may influence disability including: socioeconomic status, traffic, noise, lighting, street connectivity, land use, and crime (Beard et al., 2009; Clarke, Ailshire, Bader, Morenoff, & House, 2008; Clarke & George, 2005; Freedman, Grafova, Schoeni, & Rogowski, 2008; Satariano et al., 2014). Although these factors have not been examined in relation to racial/ethnic disparities in disability, this would be important for future research given the strong racial/ethnic patterning of neighborhoods (Massey & Denton, 1993) and evidence that neighborhood context is associated with racial/ethnic disparities in health (King, Morenoff, & House, 2011; Morenoff et al., 2007). Additionally, neighborhood attributes such as residential segregation and socioeconomic disadvantage may better reflect chronic exposure to risks and access to resources over the life course that are related to the intersection of race/ethnicity and gender and also associated with late life disability.

This study was not without limitations, including the cross-sectional analysis. Our results cannot be interpreted as causal. However, given that measures of SES in an older population most likely reflect a state earlier in adulthood, we have increased confidence that the socioeconomic exposures preceded disablement. While we found that living in a more cluttered home was associated with greater risk of self-care disability, it is not possible to determine from our cross-sectional analysis whether clutter in the home results in more disability, or whether individuals with more disability are unable to care for their homes, resulting in more clutter (N. Gitlin, 2001). Additionally, our results may be biased by people who did not survive long enough to participate in the study. Survivor bias is likely given the older average age of our sample at baseline, would likely result in an underestimation of the racial/ethnic disparities in disability (Kelley-Moore & Ferraro, 2004). Similarly, study attrition may bias the results, as individuals with greater disability are more likely to drop out of the study. Although a variety of additional environmental, social, and

psychological factors may be associated with racial/ethnic disparities in disability, these factors were not available in the data, as NHATS includes limited psychosocial measures to assess stress, discrimination and coping.

One of the greatest attributes of the NHATS is the assessment of disability and disability-related factors. The measure of ADL difficulty we used extends beyond traditional measures of disability by incorporating mobility device usage and assistance from others (Freedman, et al., 2011). By using a more comprehensive measure of ADL, our results may represent a more accurate description of racial/ethnic disparities in disability. Other researchers have found, for instance that Blacks and Hispanics have higher rates of mobility device usage than Whites (Cornman & Freedman, 2008). These differences were accounted for by our measure of ADL difficulty, which suggests that racial/ethnic disparities in disability persist even after accounting for differences in device usage.

Our results suggest substantial differences in the factors that contribute to racial/ethnic disparities in disability for older women versus older men. This calls for developing models of disability that account for the different life experiences that are unique to not only women versus men, but to Black and Hispanic women more specifically. There is little evidence that we can mitigate racial/ethnic disparities in disability for women by addressing socioeconomic, medical, behavioral and home environmental causes. By applying an interdisciplinary perspective to disability moving forward, it may be possible to identify the causes for racial/ethnic disparities in disability for women, as well as factors on which we can intervene to reduce and eventually eliminate disparities in later life.

References

- Atchley RC, & Scala MA (1998). Long-range antecedents of functional capability in later life. *Journal of Aging and Health*, 10(1), 3–19. [PubMed: 10182415]
- Beard JR, Blaney S, Cerda M, Frye V, Lovasi GS, Ompad D, . . . Vlahov D (2009). Neighborhood characteristics and disability in older adults. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, 64B(2), 252–257. doi: 10.1093/geronb/gbn018
- Bowen ME (2009). Childhood socioeconomic status and racial differences in disability: evidence from the Health and Retirement Study (1998–2006). *Social Science & Medicine*, 69(3), 433–441. [PubMed: 19541400]
- Clarke P, Ailshire JA, Bader M, Morenoff JD, & House JS (2008). Mobility disability and the urban built environment. *American Journal of Epidemiology*, 168(5), 506–513. doi: 10.1093/aje/kwn185 [PubMed: 18667526]
- Clarke P, & George LK (2005). The role of the built environment in the Disablement Process. *American Journal of Public Health*, 95(11), 1933–1939. [PubMed: 16195520]
- Cornman JC, & Freedman VA (2008). Racial and ethnic disparities in mobility device use in late life. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, 63(1), S34–S41. doi: 10.1093/geronb/63.1.S34
- de Leon CFM, Beckett LA, Fillenbaum GG, Brock DB, Branch LG, Evans DA, & Berkman LF (1997). Black-white differences in risk of becoming disabled and recovering from disability in old age: a longitudinal analysis of two EPESE populations. *American Journal of Epidemiology*, 145(6), 488–497. doi: 10.1093/oxfordjournals.aje.a009136 [PubMed: 9063338]
- Dunlop DD, Song J, Manheim LM, Daviglus ML, & Chang RW (2007). Racial/ethnic differences in the development of disability among older adults. *American Journal of Public Health*, 97(12), 2209–2215. doi: 10.2105/AJPH.2006.106047 [PubMed: 17971548]

- Freedman VA (2009). Adopting the ICF language for studying late-life disability: A field of dreams? *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences*, 64A(11), 1172–1174. doi: 10.1093/gerona/glp095
- Freedman VA, Grafova IB, Schoeni RF, & Rogowski J (2008). Neighborhoods and disability in later life. *Social Science & Medicine*, 66(11), 2253–2267. doi: 10.1016/j.socscimed.2008.01.013 [PubMed: 18329148]
- Freedman VA, Kasper JD, Cornman JC, Agree EM, Bandeen-Roche K, Mor V, . . . Wolf DA (2011). Validation of new measures of disability and functioning in the National Health and Aging Trends Study. *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences*, 66A(9), 1013–1021. doi: 10.1093/gerona/glr087
- Fried LP, Ferrucci L, Darer J, Williamson JD, & Anderson G (2004). Untangling the concepts of disability, frailty, and comorbidity: Implications for improved targeting and care. *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences*, 59(3), M255–M263. doi: 10.1093/gerona/59.3.M255
- Fried LP, & Guralnik JM (1997). Disability in older adults: Evidence regarding significance, etiology, and risk. *Journal of the American Geriatrics Society*, 45(1), 92–100. doi: 10.1111/j.1532-5415.1997.tb00986.x [PubMed: 8994496]
- Fuller-Thomson E, Nuru-Jeter A, Minkler M, & Guralnik JM (2009). Black-White disparities in disability among older Americans: Further untangling the role of race and socioeconomic status. *Journal of Aging and Health*, 21(5), 677–698. doi: 10.1177/0898264309338296 [PubMed: 19584411]
- Geronimus AT (1992). The weathering hypothesis and the health of African-American women and infants: evidence and speculations. *Ethnicity & disease*, 2(3), 207. [PubMed: 1467758]
- Gitlin LN (2003). Conducting Research on Home Environments: Lessons Learned and New Directions. *The Gerontologist*, 43(5), 628–637. doi: 10.1093/geront/43.5.628 [PubMed: 14570959]
- Guralnik JM, Simonsick EM, Ferrucci L, Glynn RJ, Berkman LF, Blazer DG, . . . Wallace RB (1994). A short physical performance battery assessing lower extremity function: association with self-reported disability and prediction of mortality and nursing home admission. *Journal of Gerontology*, 49(2), M85–M94. doi: 10.1093/geronj/49.2.M85 [PubMed: 8126356]
- Haas S, & Rohlfen L (2010). Life course determinants of racial and ethnic disparities in functional health trajectories. *Social Science & Medicine*, 70(2), 240–250. doi: 10.1016/j.socscimed.2009.10.003 [PubMed: 19857917]
- Haas SA, Krueger PM, & Rohlfen L (2012). Race/Ethnic and nativity disparities in later life physical performance: The role of health and socioeconomic status over the life course. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, 67B(2), 238–248. doi: 10.1093/geronb/gbr155
- Iwarsson S, Wahl H-W, Nygren C, Oswald F, Sixsmith A, Sixsmith J, . . . Tomsone S (2007). Importance of the Home Environment for Healthy Aging: Conceptual and Methodological Background of the European ENABLE-AGE Project. *The Gerontologist*, 47(1), 78–84. doi: 10.1093/geront/47.1.78 [PubMed: 17327543]
- Kelley-Moore JA, & Ferraro KF (2004). The black/white disability gap: persistent inequality in later life? *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, 59(1), S34–S43. doi: 10.1093/geronb/59.1.S34
- Kempen GI, van Sonderen E, & Ormel J (1999). The impact of psychological attributes on changes in disability among low-functioning older persons. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, 54(1), P23–P29. doi: 10.1093/geronb/54B.1.P23
- King KE, Morenoff JD, & House JS (2011). Neighborhood context and social disparities in cumulative biological risk factors. *Psychosomatic medicine*, 73(7), 572–579. doi: 10.1097/PSY.0b013e318227b062 [PubMed: 21862824]
- Kington RS, & Smith JP (1997). Socioeconomic status and racial and ethnic differences in functional status associated with chronic diseases. *American Journal of Public Health*, 87(5), 805–810. [PubMed: 9184510]

- Latham K (2012). Progressive and accelerated disability onset by race/ethnicity and education among late midlife and older adults. *Journal of Aging and Health*, 24(8), 1320–1345. doi: 10.1177/0898264312459345 [PubMed: 22982972]
- Latham K (2014). Racial and educational disparities in mobility limitation among older women: What is the role of modifiable risk factors? *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, 69(5), 772–783. doi: 10.1093/geronb/gbu028
- Lubitz J, Cai L, Kramarow E, & Lentzner H (2003). Health, life expectancy, and health care spending among the elderly. *New England Journal of Medicine*, 349(11), 1048–1055. doi: 10.1056/NEJMsa020614 [PubMed: 12968089]
- Massey DS, & Denton NA (1993). *American Apartheid: Segregation and the making of the underclass*. Cambridge, MA: Harvard University Press.
- Mendes de Leon CF, Barnes LL, Bienias JL, Skarupski KA, & Evans DA (2005). Racial disparities in disability: Recent evidence from self-reported and performance-based disability measures in a population-based study of older adults. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, 60(5), S263–S271. doi: 10.1093/geronb/60.5.S263
- Minkler M, Fuller-Thomson E, & Guralnik JM (2006). Gradient of disability across the socioeconomic spectrum in the United States. *New England Journal of Medicine*, 355(7), 695–703. doi: 10.1056/NEJMsa044316 [PubMed: 16914705]
- Montaquila J, Freedman VA, & Kasper JD (2012). *National Health and Aging Trends Study Round 1 Income Imputation*: Johns Hopkins University School of Public Health.
- Montaquila J, Freedman VA, Spillman BC, & Kasper JD (2014). *National Health and Aging Trends Study Development of Round 2 Survey Weights*. Baltimore: Johns Hopkins School of Public Health.
- Morenoff JD, House JS, Hansen BB, Williams DR, Kaplan GA, & Hunte HE (2007). Understanding social disparities in hypertension prevalence, awareness, treatment, and control: The role of neighborhood context. *Social Science & Medicine*, 65(9), 1853–1866. doi: 10.1016/j.socscimed.2007.05.038 [PubMed: 17640788]
- Murtagh KN, & Hubert HB (2004). Gender differences in physical disability among an elderly cohort. *American Journal of Public Health*, 94(8), 1406–1411. doi: 10.2105/AJPH.94.8.1406 [PubMed: 15284051]
- Gitlin N, M. W, Tomit Machiko, Marcus Sue M., Laura. (2001). Factors associated with home environmental problems among community-living older people. *Disability & Rehabilitation*, 23(17), 777–787. [PubMed: 11762880]
- Nagi SZ (1965).
- Organization, W. H. (2001). *International classification of functioning, disability and health: ICF*: World Health Organization.
- Penning MJ, & Strain LA (1994). Gender differences in disability, assistance, and subjective well-being in later life. *Journal of gerontology*, 49(4), S202–S208. [PubMed: 8014404]
- Pinquart M, & Sörensen S (2005). Ethnic Differences in Stressors, Resources, and Psychological Outcomes of Family Caregiving: A Meta-Analysis. *The Gerontologist*, 45(1), 90–106. doi: 10.1093/geront/45.1.90 [PubMed: 15695420]
- Satariano W, Kealey M, Hubbard A, Kurtovich E, Ivey S, Bayles M, . . . Prohaska T (2014). Mobility disability in older adults: At the intersection of people and places. *The Gerontologist*. doi: 10.1093/geront/gnu094
- Schneider EL, & Guralnik JM (1990). The aging of America: impact on health care costs. *JAMA*, 263(17), 2335–2340. doi: 10.1001/jama.1990.03440170057036 [PubMed: 2109105]
- Schoeni RF, Martin LG, Andreski PM, & Freedman VA (2005). Persistent and growing socioeconomic disparities in disability among the elderly: 1982–2002. *American Journal of Public Health*, 95(11), 2065–2070. doi: 10.2105/ajph.2004.048744 [PubMed: 16254235]
- Schulz AJ, & Mullings L (2006). *Gender, race, class, and health: Intersectional approaches*: Jossey-Bass San Francisco, CA.
- Seeman TE, Merkin SS, Crimmins EM, & Karlamangla AS (2010). Disability trends among older Americans: National health and nutrition examination surveys, 1988–1994 and 1999–2004.

- American Journal of Public Health, 100(1), 100–107. doi: 10.2105/AJPH.2008.157388 [PubMed: 19910350]
- StataCorp. (2015). Stata Statistical Software: Release 14. from College Station, TX
- Szanton SL, Wolff JL, Leff B, Roberts L, Thorpe RJ, Tanner EK, . . . Bishai D (2015). Preliminary Data from Community Aging in Place, Advancing Better Living for Elders, a Patient-Directed, Team-Based Intervention to Improve Physical Function and Decrease Nursing Home Utilization: The First 100 Individuals to Complete a Centers for Medicare and Medicaid Services Innovation Project. *Journal of the American Geriatrics Society*, 63(2), 371–374. doi: 10.1111/jgs.13245 [PubMed: 25644085]
- Tabbarah M, Mihelic A, & Crimmins EM (2001). Disability: the demographics of physical functioning and home environments of older Americans. *Journal of Architectural and Planning Research*, 183–193.
- Thorpe RJ, Koster A, Kritchevsky SB, Newman AB, Harris T, Ayonayon HN, . . . Study BC (2011). Race, socioeconomic resources, and late-life mobility and decline: Findings from the Health, Aging, and Body Composition Study. *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences*, 66A(10), 1114–1123. doi: 10.1093/gerona/qlr102
- Vasunilashorn S, Coppin AK, Patel KV, Lauretani F, Ferrucci L, Bandinelli S, & Guralnik JM (2009a). Use of the Short Physical Performance Battery Score to predict loss of ability to walk 400 meters: analysis from the InCHIANTI study. *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences*, gln022.
- Vasunilashorn S, Coppin AK, Patel KV, Lauretani F, Ferrucci L, Bandinelli S, & Guralnik JM (2009b). Use of the Short Physical Performance Battery Score to predict loss of ability to walk 400 meters: analysis from the InCHIANTI study. *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences*, 1–7. doi: 10.1093/gerona/gln022
- Verbrugge LM, & Jette AM (1994). The disablement process. *Social Science & Medicine*, 38(1), 1–14. doi: 10.1016/0277-9536(94)90294-1 [PubMed: 8146699]
- Wahl H-W, Fänge A, Oswald F, Gitlin LN, & Iwarsson S (2009). The home environment and disability-related outcomes in aging individuals: what is the empirical evidence? *The Gerontologist*, 49(3), 355–367. [PubMed: 19420315]
- Warner DF, & Brown TH (2011). Understanding how race/ethnicity and gender define age-trajectories of disability: An intersectionality approach. *Social Science & Medicine*, 72(8), 1236–1248. doi: 10.1016/j.socscimed.2011.02.034 [PubMed: 21470737]
- White IR, Royston P, & Wood AM (2011). Multiple imputation using chained equations: Issues and guidance for practice. *Statistics in Medicine*, 30(4), 377–399. doi: 10.1002/sim.4067 [PubMed: 21225900]
- Zsembik BA, Peek MK, & Peek CW (2000). Race and ethnic variation in the disablement process. *Journal of Aging and Health*, 12(2), 229–249. doi: 10.1177/089826430001200205 [PubMed: 11010698]

Figure 1.

Associations between physical impairment (short physical performance battery, SPPB) and difficulty with activities of daily living (ADL) by the presence of clutter inside the home, for men: National Health and Aging Trends Study, 2012. Predicted ADL scores for an average White man, age 65–74, married, with a high school education, an average number of chronic conditions, and no signs of physical disrepair inside the home are plotted for no impairment (SPPB = 0), a clinical cut point for a significantly increased risk for developing mobility difficulty (SPPB = 2), and at a clinically high level of impairment (SPPB = 5; Vasunilashorn et al., 2009). Results were similar for all men regardless of race.

Figure 2.

Associations between physical impairment and activities of daily living difficulty by race/ethnicity for women, National Health and Aging Trends Study (2012). Predicted values are plotted for an average woman, age 65–74, married, with a high school education, an average number of chronic conditions, and no signs of physical disrepair or clutter inside the home at no impairment (short physical performance battery, SPPB = 0), a clinical cut point for a significantly increased risk for developing mobility difficulty (SPPB = 2), and at a clinically high level of impairment (SPPB = 5; Vasunilashorn et al., 2009).

Table 1.

Mean (standard deviation) or percent of sample characteristics for the full sample, and for men and women separately (N=5640^a)^b

	Total	Men (N=2401)	Women (N=3239)	p-value ^c
ADL difficulty (Range 0–6)	0.77 (0.02)	0.66 (0.03)	0.86 (0.03)	<0.001
Male (%)	43.77			
Race/ethnicity (%)				
White	80.54	80.99	80.19	p>0.05
Black	8.39	7.54	9.07	
Hispanic	6.68	6.84	6.54	
Other	4.39	4.62	4.20	
Age (%)				
65–74	50.70	53.67	48.34	<0.05
75–84	36.59	36.14	36.95	
85+	12.70	10.19	14.71	
Marital status (%)				<0.05
Married	57.72	74.79	44.14	
Divorced	12.28	10.17	13.97	
Widowed	26.61	11.64	38.52	
Never married	3.38	3.40	3.37	
Physical impairment (0–12)	3.75 (0.07)	3.24 (0.09)	4.16 (0.09)	<0.05
Income (\$, 0–5,000,000) ^d	54,113.92 (3210.53)	68025.26 (6147.43)	43047.39 (3074.87)	<0.05
Education (%)				
< HS	21.10	20.91	21.24	<0.05
HS	53.29	46.54	58.66	
>= College	25.61	32.54	20.10	
Indoor disrepair present (%)	11.39	10.82	11.82	<0.05
Clutter present (%)	26.77	26.70	26.82	>0.05
Total number of chronic disease (0–9)	2.20 (0.02)	1.95 (0.03)	2.40 (0.03)	<0.05

^aMaximum sample size; variables contain missing values

^bMeans/proportions were generated using survey weights to be generalizable to the US population

^cp-value for male/female difference in means or proportions

^dContinuous income is highly skewed; natural log of income used in all models

Table 2.

Rate ratios for racial and ethnic disparities in difficulty with activities of daily living as a function of individual factors and the home environment, Men (N=2059): U.S. National Health and Aging Trends Study (2012)^a

	Model 1: Racial/ ethnic differences in disability	Model 2: Physical impairment	Model 3: Socioeconomic and health factors	Model 4: Indoor home environment	Model 5: Impairment and race/ethnicity interactions
Race/ethnicity ^b					
Black	1.55 (1.22,2.39)	1.03 (0.83,1.26)	0.93 (0.76,1.13)	0.91 (0.75,1.11)	0.98 (0.67,1.44)
Hispanic	1.59 (1.05,1.47)	1.02 (0.72,1.46)	0.78 (0.53,1.16)	0.80 (0.56,1.15)	0.56 (0.29,1.09)
Other	0.93 (0.59,1.43)	0.95 (0.58,1.57)	0.74 (0.44,1.22)	0.73 (0.44,1.20)	0.98 (0.45,2.13)
Age ^c					
75 to 84	1.51 (1.22,1.87)	1.00 (0.83,1.20)	0.98 (0.81,1.18)	0.99 (0.82,1.19)	0.99 (0.82,1.19)
85+	2.82 (2.20,3.60)	1.20 (0.97,1.49)	1.29 (1.01,1.64)	1.30 (1.03,1.66)	1.30 (1.02,1.65)
Marital status ^d					
Divorced			0.81 (0.57,1.17)	0.79 (0.56,1.12)	0.80 (0.56,1.13)
Widowed			0.75 (0.58,0.97)	0.74 (0.57,0.96)	0.72 (0.55,0.94)
Never married			0.81 (0.50,1.31)	0.79 (0.48,1.29)	0.79 (0.48,1.28)
Physical impairment (SPPB)		1.28 (1.25,1.31)	1.24 (1.21,1.27)	1.26 (1.22,1.30)	1.24 (1.20,1.27)
Education ^d					
< HS			0.83 (0.67,1.02)	0.84 (0.68,1.03)	0.82 (0.67,1.01)
>= College			1.01 (0.79,1.31)	1.04 (0.80,1.34)	1.01 (0.78,1.31)
Income (ln)			0.78 (0.70,0.88)	0.79 (0.71,0.89)	0.79 (0.71,0.89)
Chronic disease			1.28 (1.21,1.35)	1.28 (1.21,1.36)	1.27 (1.20,1.35)
Indoor disrepair present				0.93 (0.74,1.15)	0.91 (0.72,1.14)
Indoor clutter present				1.68 (1.21,2.34)	1.29 (1.06,1.57)
Physical impairment (PI) × indoor clutter				0.95 (0.91,0.99)	
PI × race/ethnicity					
PI × Black					0.99 (0.94,1.04)
PI × Hispanic					1.05 (0.97,1.14)
PI × Other					0.94 (0.86,1.03)

^aRate ratios derived from exponentiating the coefficients from negative binomial regression models

^bReference group = White

^cReference group = Age 65–74

^dReference group = Married/Living with partner

^eReference group = Less than high school education

Table 3.

Rate ratios for racial and ethnic disparities in difficulty with activities of daily living as a function of individual factors and the home environment, Women (N=2,835). U.S. National Health and Aging Trends Study (2012) ^a

	Model 1: Racial/ ethnic differences in disability	Model 2: Physical impairment	Model 3: Socioeconomic and health factors	Model 4: Indoor home environment	Model 5: Impairment and race/ethnicity interactions ^e
Race ^b					
Black	1.89 (1.62,2.21)	1.24 (1.06,1.46)	1.16 (0.99,1.36)	1.15 (0.98,1.35)	1.64 (1.19,2.26)
Hispanic	2.11 (1.75,2.53)	1.36 (1.14,1.61)	1.27 (1.04,1.55)	1.28 (1.05,1.56)	1.58 (1.03,2.44)
Other	0.99 (0.68,1.44)	1.02 (0.65,1.61)	1.01 (0.63,1.63)	0.99 (0.63,1.58)	1.52 (0.78,2.94)
Age ^c					
75 to 84	1.71 (1.44,2.03)	0.98 (0.82,1.17)	0.98 (0.81,1.17)	0.98 (0.82,1.18)	0.98 (0.82,1.18)
85+	3.04 (2.58,3.58)	1.05 (0.88,1.26)	1.15 (0.94,1.40)	1.17 (0.95,1.43)	1.15 (0.94,1.41)
Married ^d					
Divorced			0.89 (0.73,1.08)	0.87 (0.71,1.05)	0.86 (0.71,1.05)
Widowed			0.85 (0.73,1.00)	0.84 (0.72,0.98)	0.84 (0.72,0.99)
Never married			0.86 (0.65,1.14)	0.85 (0.64,1.13)	0.86 (0.65,1.14)
Physical impairment (SPPB)		1.26 (1.23,1.28)	1.23 (1.20,1.26)	1.24 (1.21,1.27)	1.24 (1.21,1.27)
Education ^e					
High School			0.93 (0.82,1.07)	0.93 (0.81,1.06)	0.92 (0.80,1.06)
>= College			1.30 (1.06,1.60)	1.31 (1.07,1.61)	1.31 (1.07,1.60)
Income (ln)			0.92 (0.86,0.99)	0.93 (0.87,0.99)	0.92 (0.87,0.98)
Chronic disease			1.29 (1.24,1.36)	1.29 (1.24,1.35)	1.29 (1.24,1.35)
Indoor disrepair present				0.92 (0.72,1.18)	0.92 (0.71,1.19)
Indoor clutter present				1.21 (1.05,1.40)	1.20 (1.04,1.39)
PI × race/ethnicity					
PI × Black					0.95 (0.92,0.98)
PI × Hispanic					0.97 (0.92,1.02)
PI × Other					0.93 (0.85,1.02)

^a Rate ratios derived from exponentiating the coefficients from negative binomial regression models

^b Reference group = White

^c Reference group = Age 65–74

^d Reference group = Married/living with partner

^e Reference group = Less than high school education