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## Disability levels and correlates among older mobile home dwellers, an NHATS analysis

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### Abstract

**Background**—Although remarkably understudied, manufactured or mobile homes are the housing choice for nearly 20 million Americans and little is known about the health of older persons living in mobile homes.

**Objective**—We sought to investigate disability levels and other health correlates among older adults living in mobile or manufactured homes compared to their counterparts living in other types of homes.

**Methods**—We sampled non-institutional adults aged 65 years or older ( $n = 7609$ ), of whom 344 lived in mobile homes, from the 2011 National Health and Aging Trends Study (NHATS).

**Results**—Respondents living in mobile homes (average age = 75.1 years; SD = 0.5) had lower education and income and medical insurance than older adults living in other types of community residence (average age = 77.5 years; SD = 0.2). They were more likely to smoke, have lung and heart disease, and report fair or poor general health status. Mobile home dwellers reported more difficulty or inability in performing the following activities of daily living when compared to their counterparts: stooping and kneeling (64.9% vs 60.8%,  $p = 0.007$ ), walking 6 blocks (46.5% vs 41.5%,  $p = 0.001$ ), walking 3 blocks (37.7% vs 33.5%,  $p = 0.002$ ), and climbing up to 20 stairs (39.2% vs 34.8%,  $p = 0.02$ ). Among those reporting disability, mobile home dwellers had fewer bathroom safety modifications.

**Conclusion**—There is higher prevalence of chronic conditions, functional and cognitive impairment in older mobile home dwellers compared to older adults living in other types of housing.

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## Keywords

Aging; Mobile home; Manufactured; Housing; Disability

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In 2050, in the United States, there is projected to be an estimated 120 percent increase in the numbers of older adults. This means one in five will be sixty five years or older.<sup>1</sup> As people age, their levels of both physical and cognitive functioning begin to decline. According to the National Institutes of Health (NIH), there was some evidence of a decline in disability rates among the oldest old (age 85 and above) beginning in 1999, but this decline ended or was reversed in the newest cohorts recently entering this age epoch.<sup>2</sup>

Although remarkably understudied,<sup>3</sup> manufactured or mobile homes are the housing choice for nearly 20 million Americans and constitute 10–20% of all new housing production.<sup>4</sup> In some years, more than 30% of the new homes sold have been mobile or manufactured homes.<sup>5</sup> Among older adults, housing choices are primarily driven by costs, in addition to personal tastes. Physical disabilities and related issues may also drive housing choices, but there is little research on the selection process.

Most older Americans live in housing deemed adequate but the literature does not offer much information about the adequacy of living in mobile homes at older age. There are a large number of anecdotal reports raising issues such as the small and overcrowded living space,<sup>6,7</sup> increased vulnerability to natural disasters,<sup>8–10</sup> under-regulation and uncertain policies regarding the ownership/rental and laws of modifying mobile homes.<sup>11–14</sup> The concentration of this type of housing in rural or suburban areas also may be associated with decreased access to health care and related services.<sup>15,16</sup> According to the American Housing Survey (AHS), almost all of residences designated as inadequate among persons 65 years and older were single-family detached units, most of which were mobile homes.<sup>17</sup> Inadequate housing can contribute to various infectious and chronic diseases and injuries that can exacerbate older adults' health.<sup>18</sup>

The purpose of this paper is to investigate disability levels and other health correlates among older adults living in mobile or manufactured homes, such as chronic conditions, functioning, and the prevalence of environmental modifications, and to contrast these residents with persons living in other types of community dwellings. Data from the 2011 National Health and Aging Trends Study (NHATS) were analyzed to highlight policy implications and future research recommendations.

## Methods

### Data source

The NHATS is a nationally representative cohort study designed to investigate multiple aspects of functioning and disability in later life. Supported by the National Institute on Aging of the US National Institutes of Health, in-person interviews are used to collect detailed information from Medicare beneficiaries ages 65 years and older living in the contiguous United States.<sup>19</sup> Medicare is available to 97% of all older adults in the United States. In 2011, a stratified, multistage sampling design was used to enroll 8245 participants

into the study. The baseline response rate was 71% (8245/11,637).<sup>20</sup> The Johns Hopkins University Institutional Review Board approved the study protocol. Trained survey research staff interviewed study participants in their homes. This analysis was limited to community-dwelling residents; 468 (5.7%) nursing home residents were excluded. The final analytic sample size was 7,609, of whom 344 respondents were mobile home dwellers. Additional information on NHATS is available at: (<http://www.nhats.org/>).

### Definitions and variable creation

The baseline interview, from which the data in this report are drawn, included questions about types of housing classified into mobile home/trailer or any other types of residence (free standing detached house, single house but attached to others, multi-unit building, and other) yielding a study sample of 344 mobile home dwellers, and 7265 other community dwellers.

Demographic variables included date of birth, gender, race/ethnicity, and educational attainment. Economic status was represented by annual household income, car/vehicle ownership and residence ownership. Individuals were asked about their employment status and whether health limits their ability to work. They were designated as living alone if no other person resided in the household and if the interviewee reported that he or she was married but not residing together with the spouse. Body mass index (BMI) was calculated with the formula weight in kilograms divided by the square of height in meters. Respondents were asked if they have seen a doctor, or have been hospitalized in the past year. Medical insurance coverage questions included Medicaid, Medicare part D, “Medigap” insurance policies, and non-governmental long term care insurance. Health problems surveyed included history of falls in the past year or pain that limited daily activities. A number of chronic conditions were queried, including hypertension, diabetes, cancer, lung disease, heart disease, stroke, arthritis, and dementia/Alzheimer's disease. Self-rated health status was classified as excellent or very good, good, or fair or poor.

The NHATS disability framework<sup>21</sup> was used to assess disability using a mix of self-report and performance-based capacity measures that have been validated.<sup>22,23</sup> The NHATS disability framework<sup>21,24</sup> is a blend of Nagi's widely used model and the more recent language and perspective of the World Health Organization's International Classification of Functioning, Health, and Disability. Functional status was assessed using six basic self-report measures that assess physical capacity of the upper and lower extremities which were used in prior studies including the Women's Health and Aging Study (WHAS) and the Health and Retirement Survey—walking 3 blocks, getting in and out of chair, dressing, getting in and out of bed, bathing and toileting—and four basic Instrumental Activities of Daily Living (IADLs)—using the telephone, shopping for groceries, making hot meals, and managing money. Physical capacity was assessed for the upper extremities by asking if there was difficulty or inability to reach overhead or put a heavy book on a shelf, open a sealed jar, or using fingers to grasp small objects. Similar assessments for lower extremity function included difficulty or inability to walk 6 blocks, climb 20 stairs, lift or carry 20 lbs and bend down or get down on one's knees and get back up. The use of mobility devices such as a cane, walker, wheelchair, or scooter were sought.

A disability score was created by counting the number of activities that a respondent had difficulty in performing: the six self-report measures assessing functional capacity and the IADLs. If they reported having difficulty or inability to do 1–3 of these activities, then the disability score was defined as *moderate*, and if they reported difficulty or inability to do more than 4 activities, then the disability score was defined as *severe*. For this analysis, those who had a moderate or severe disability score were identified as *disabled*.

Sensory impairment was assessed through asking if there was difficulty hearing despite using a hearing aid, seeing despite using glasses/contacts/vision aids. The ability to speak and swallow or chew food were also queried.

Cognitive assessment included self-rated memory (excellent, very good, good, fair/poor), whether there were any changes in thinking or memory that interfere with daily activities more than once a week, measures of orientation (date/day of the week, naming the President), a noun recall task, and the clock-drawing test. The word recall test included asking the respondent to remember a list of ten words verbalized by the interviewer. Scoring was one point for each word remembered immediately after the list has been read by the interviewer (immediate recall); the participant as asked to recall the same words after a few minutes, scoring one point for each word (delayed recall). The clock-drawing test was administered by asking the study participant to draw a clock on a piece of paper and set the hands to show 10 past 11 over a 2-min time frame. Two to 5 points were given for a moderately accurate depiction, 1 for a severely distorted image, and 0 if the image drawn was not recognizable as a clock.

Environmental modifications to the residences were queried, including the presence of a ramp at the residence's entrance, a bath seat for shower or tub, a raised toilet seat, grab bars next to the toilet, grab bars in the shower, and a bathroom medical emergency call alarm system.

### Statistical analysis

Analytic files for NHATS 2011 Round 1 data provided processed data items and sampling weights that reproduce those alive and eligible for NHATS during the fieldwork period, which began in May 2011. We compared derived variables with raw questionnaire data before they were used in the analysis. Outcomes of interest included the association of mobile home residence (versus all other residences) with disability status and mobile home residence with environmental modifications among those identified as disabled.

Frequencies and percentages in Table 1 were not adjusted for any other covariates. Table 2 was adjusted for age and gender. Both income and education are important confounders that we have not adjusted for because of missing data in the mobile homes group. This particular type of housing is believed to attract households with lower income and educational attainment. *p*-Values were generated using univariate logistic methods and missing values were omitted from the analyses. Frequencies and percentages in Table 3 are weighted results adjusted for categorical age, gender, race, categorical education and categorical income after assessing for possible interactions between our outcome variables and any of these variables using logistic regression. The adjusted odds ratios (OR) and 95% confidence intervals (95%

CI) were generated with logistic methods for sample surveys using Taylor series linearization. Stratum and cluster variables were provided by NHATS. The SAS Domain statement was used for subgroup analyses, adjusting for complex sample design. Two-sided tests with a  $p$ -value  $\leq 0.05$  was considered statistically significant. All analyses were performed using SAS version 9.3 (SAS Institute Inc, Cary, NC).

## Results

Table 1 shows the characteristics of the analytical study population. 4.17% of the analytic cohort lived in a mobile home or trailer. The 344 mobile home dwellers were relatively younger than the rest of the cohort (average age: 75.1 (SD = 0.5) vs 77.5 years (SD = 0.2),  $p = 0.0001$ ). They were mostly white (84%), had less educational attainment and lower income compared to their counterparts in other types of residence. Most mobile home dwellers owned their residences (80% vs 73% of other resident dwellers) and 83% of them owned a car, truck or van vs 75% for others. Nine percent of mobile home residents were employed compared to 12% of others. They were less likely to have been hospitalized in the past year and had a significantly higher proportion of smoking cigarettes (30% vs 15%,  $p = 0.0001$ ). Mobile home residents had less Medigap coverage (51% vs 58%,  $p = 0.017$ ) and non-governmental long term care insurance (10% vs 17%,  $p = 0.001$ ). They had more Medicaid and Medicare part D coverage than the rest of the cohort. A report of falling once in the last year was present in 19% of mobile home dwellers compared to 17% in others. They were significantly more likely to report fair or poor health status (35% vs 29%,  $p = 0.036$ ). Reports of a history of hypertension, cancer and diabetes were similar in both mobile home and other residence dwellers, but lung disease (24% vs 15%,  $p = 0.0001$ ), heart disease (24% vs 18%,  $p = 0.01$ ) and arthritis (61% vs 56%,  $p = 0.04$ ) histories were reported more frequently in mobile home dwellers.

Physical and cognitive differences were explored in the two populations (Table 2). Mobile home dwellers reported higher prevalence rates for a range of disabilities such as difficulty or inability in performing the following activities: getting down on knees (65% vs 61%,  $p = 0.007$ ), walking 6 blocks (47% vs 41.5%,  $p = 0.001$ ), walking 3 blocks (38% vs 34%,  $p = 0.002$ ) and climbing up to 20 stairs (39% vs 35%,  $p = 0.02$ ). 26% of mobile home dwellers reported an incorrect date and day of the week compared to 24% of other type of residence dwellers ( $p = 0.05$ ). Mean word recall test scores were lower in mobile home dwellers compared to dwellers of other type of residences (37 vs 41%;  $p = 0.007$ ), and 17% did not know the correct name of the president of the United States compared to 12% in the contrast group ( $p = 0.01$ ).

The odds that mobile home residents had a ramp at the entrance to their dwelling was higher in those reported disability (OR = 2.1,  $p = 0.001$ ) than among those living in other circumstances. However, mobile home dwellers with disability were less likely to have a bath seat for shower tub (OR = 0.8,  $p = 0.31$ ), raised toilet seat (OR = 0.7,  $p = 0.16$ ), grab bars next to the toilet (OR = 0.4,  $p = 0.0004$ ), grab bars in the shower (OR = 0.5,  $p = 0.004$ ) and a bathroom medical emergency call alarm system (OR = 0.9,  $p = 0.76$ ) (Table 3). Among mobile home dwellers, white respondents who lived in mobile homes and had moderate to severe disability were more likely to have environmental modifications done to

their mobile homes than minorities (grab bars in shower: 52% white, 14% black,  $p < 0.015$ ; bath seat: 50% white, 14% black,  $p = 0.016$ ).

The NHATS survey queried whether the mobile homes were part of a retirement community or senior housing community, and if ancillary services were offered (hot meals, help with medications, help with bathing or dressing, laundry service for linens or clothing, housekeeping, a van or shuttle to stores or events like concerts, organized social events and activities, or recreational facilities like swimming pools, game rooms or tennis courts). Only two out of the 344 mobile home residents endorsed any of these services or facilities.

## Discussion

In some states, mobile homes make up to 20% of the total housing stock.<sup>25</sup> According to the Manufactured Housing Institute, young families and seniors tend to populate the majority of mobile home parks.<sup>26</sup> In 2011 the AHS reported that up to 6.7% of American adults 65 years or older lived in mobile homes.<sup>27</sup> While only 4% of our study cohort lived in mobile homes, some of this could be due to regional variation in these rates. Despite the relative importance of this housing type, especially in rural America, very little is known about the issues that affect the health of its household residents and how it relates to housing type. To our knowledge, this is the first nationally representative sample of older mobile home residents to examine disability and health in a comprehensive way, in order to characterize the magnitude of relevant clinical and public health issues.

While there is demographic variation among older adults living in mobile homes, overall such dwellers reported less educational attainment, income, and health insurance elements than others in the NHATS community-dwelling cohort. There has been a reported negative social stigma associating living in a mobile home with low socio-economic status,<sup>16,28,29</sup> which may have implications for obtaining requisite health and social services. However, more recently, in some states, mobile homes have been seen as part of retirement communities that attract older adults, as they offer an affordable housing option in an environment where ancillary support services such as a common club house, hot meals, and laundry service are offered.<sup>30</sup> However, almost no mobile home residents in our analysis reported such amenities. It is possible that these residents use mobile homes for other than their primary residences. Despite being a few years younger than their counterparts living in other types of dwellings, mobile home dwellers 65 years and older in this study had more prevalent chronic medical conditions, including heart and lung disease and arthritis. Some of the occurrence of these conditions may be attributed to higher smoking histories and to lesser levels of medical care. Smoking in midlife and late adulthood is a strong predictor of subsequent disabling chronic conditions among older persons,<sup>16</sup> and thus there may be value in targeting tobacco control programs to this population. Additionally, very little research has been performed on whether the age and design of mobile homes pose increased health risks per se on their older occupants or exacerbate existing conditions. In geographic areas with more extreme temperatures, older mobile homes could have greater levels of disrepair, causing such issues as water seepage and mold growth, which could compromise health,<sup>31</sup> especially in children.<sup>32</sup> However, little is known about the impact on older persons.

To our knowledge, the effect of mobile homes or other general types of housing on the onset or progression of disability has not been systematically studied. We found that respondents living in mobile homes, despite being younger than their counterparts in other community housing types, had higher prevalence rates for functional disability as well as lower cognitive scores on selected test items. The difficulty or inability to perform basic ADLs, particularly those related to ambulation, was demonstrated. While this finding is derived from cross-sectional data, if further corroborated, this finding could be of value to both clinicians evaluating and managing disability among older person, and to public health professionals concerned with housing quality and appropriate rehabilitation. Recent studies have linked poor health characteristics and functioning to both elevated rates of indoor falls and subsequent disability.<sup>33</sup> Noting the presence and quality of mobile homes environments among patients may improve disability evaluations. Mobile homes are usually smaller, and may exacerbate disability risk or progression because of crowded living spaces and tripping hazards.<sup>34</sup> Prognostic models have been developed from individual data sources linking health and function to life expectancy and other health outcomes, but none has included housing.<sup>35,36</sup>

In this study, despite mobile home residents having a lower mean age than those in other types of housing, the prevalence of reported disability was higher. Because these data are cross-sectional, it is not possible to determine the pathway to this situation. It is possible that mobile home residence promotes new or existing disabilities, but it is also possible that this association is confounded by the lower socio-economic status or other related factors among mobile home dwellers. However, older adults may have unique needs for special housing accommodations<sup>37-39</sup> to which living in this type of housing may be insensitive. If such structures are poorly constructed and do not meet exterior or interior safety standards or tailored structural modifications, mobile homes may pose additional health risks such as increased vulnerability to environmental hazards and disasters,<sup>8</sup> especially because disasters can disproportionately affect older adults and their health.<sup>40</sup> Researchers generally agree that in older homes, and in those that have not been well designed for persons with disabilities, home modifications can be used to address hazardous areas that could increase fall risk. Home modification refers to the converting or adapting of environments to make every day activities of daily living easier, increase comfort and reduce the number of accidents.<sup>41</sup> Also, lack of bathroom modifications may pose hazards to older adults with disabilities.<sup>42</sup> We found that many of the mobile home residents with difficulty or inability in doing basic life functions did not have necessary modifications done to their mobile homes, such as grab bars next to the toilet or in the shower. However, it is important to note that such deficiencies were also present in other housing types.

There is growing evidence that adequate evidence-based environmental modifications in housing can improve the quality of older adults' lives and reduce risk of hospitalization, especially for those with physical or cognitive disabilities.<sup>43-46</sup> For instance, optimal living space modifications for patients with dementia include installing grab rails in tub, shower and near toilet, replacing stairs with ramp, and raising toilet seats or commodes to a higher level.<sup>47</sup> One hurdle that deters mobile home residents from making environmental changes that are more hospitable to persons with disability is that regulations regarding such modifications are often confusing and vary from one governmental jurisdiction to another.

Also, there may be varying restrictions based on whether the resident owns or rents the mobile home. There is a frequent classification of mobile homes as personal property and not real property, so they are taxable, and they are not governed by the Real Estate Settlement Procedures Act.<sup>34</sup> This act was administered by the Consumer Financial protection bureau and helps facilitate installation of home modifications and links consumers to appropriate providers, a privilege mobile home dwellers may not have. In most instances, manufactured housing is treated like automobiles and bound by the use of certificates of title. State laws and codes vary with respect to mobile home alteration and modifications; some require permits and inspection before installing any modification. Under fair housing act regulations, and depending on the different states' housing laws, installing modifications such as grab bars, has special guidelines and needs specific permits in case of mobile homes which is not the case in other types of community-dwelling types of housing.<sup>48,49</sup> Mobile homes have more restrictions and lack a universal federal law that regulates environmental modifications done to them that consider older adults needs.<sup>50</sup>

Cost is another important factor that affect installing environmental modifications as the range of home modifications is wide, ranging from low-cost adaptations such as removing hazards (e.g.: clutter and throw rugs) to more expensive renovations (e.g.: renovating rooms). According to American Association of Retired Persons, the major reason that people do not carry out home modifications is because of the cost involved.<sup>48</sup>

Also, it has been reported that consumers of manufactured housing are more likely to face predatory retailers and lenders due to variation in laws.<sup>34</sup> Although there were too few minority respondents in our mobile home sample for a thorough evaluation, they were more likely to be disabled and less likely to have environmental modifications done to their mobile homes. Under the Fair Housing Act, mobile home park owners and landlords are prohibited from discrimination against minority residents or individuals with disabilities.<sup>51,52</sup> Full enforcement of this act as well as the Americans with Disabilities Act could improve disability-related housing environments.

This study has several strengths, including a large sample size, and nationally-representative study population. There are potential limitations that should be recognized. Except for the actual residence in a mobile home (respondents were interviewed in their homes), all of the variables utilized in this analysis were self-reported. Also, the data were cross-sectional, which in certain instances may not allow causal inferences.

## Conclusions

Meeting the housing needs of older adults is a public health priority for our aging community. From both clinical and public health perspectives, it is important to better understand the nature of mobile home environments in relation to the health of their dwellers, in order to promote independent living. Clinicians who attend to older mobile or manufactured housing residents must have a deeper understanding of the special issues involved in physical modifications of these residences and the barriers patients face in installing them. Further research is needed to understand the relationship between living in mobile homes and health and functioning to improve the experience of aging.



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**Table 1**  
**Respondent characteristics: 2011 NHATS community-dwelling residents (N = 7609)**

Demographic characteristics	Community residence		
	Mobile homes (n = 344) n (%)	Other residence (n = 7265) n (%)	Unadjusted p-value <sup>a</sup>
Age			0.017
65–69	85 (24.7)	1324 (18.2)	
70–74	80 (23.3)	1499 (20.6)	
75–79	63 (18.3)	1450 (20.0)	
80–85	58 (16.9)	1447 (19.9)	
86–89	37 (10.8)	916 (12.6)	
90+	21 (6.1)	629 (8.7)	
Gender (female)	190 (55.2)	4248 (58.5)	0.23
Race/ethnicity			<0.0001
White	290 (84.3)	4878 (67.1)	
Black	35 (10.2)	1616 (22.2)	
Hispanic/other	19 (5.5)	771 (10.6)	
Education			<0.0001
Less than high school	139 (40.4)	1908 (26.6)	
High school/equivalent	103 (29.9)	1966 (27.4)	
Some college	80 (23.3)	1738 (24.2)	
College graduate	22 (6.4)	1557 (21.7)	
Income (household dollars per year)			<0.0001
Less than 17,000	93 (41.5)	1389 (34.5)	
17,000–33,175	78 (34.8)	964 (24.0)	
33,176–63,079	41 (18.3)	900 (22.4)	
63,080+	12 (5.4)	770 (19.1)	
Residence ownership			<0.0001
Own	274 (80.1)	4985 (73.9)	
Rent	25 (7.3)	1086 (16.1)	
Owens a car/truck/van	283 (82.7)	5261 (74.9)	0.001
Employed	29 (8.5)	797 (11.8)	0.097
Living alone	111 (32.5)	2068 (29.8)	0.29
Health services			
Seen a doctor in last year	318 (92.4)	6797 (93.7)	0.34
Hospitalized in last year	67 (19.5)	1710 (23.6)	0.081
Health insurance			
Has “Medigap” insurance	171 (51.0)	4036 (57.7)	0.017
Covered by Medicaid	65 (19.3)	1108 (15.7)	0.073
Has Medicare Part D	224 (67.7)	4351 (62.9)	0.078

Demographic characteristics	Community residence		
	Mobile homes ( <i>n</i> = 344) <i>n</i> (%)	Other residence ( <i>n</i> = 7265) <i>n</i> (%)	Unadjusted <i>p</i> -value <sup>a</sup>
Non-governmental long term care insurance	30 (9.6)	1149 (16.9)	0.001
Health status			
Ever smoked regularly	217 (63.1)	3619 (49.9)	<0.0001
Smokes now	65 (30.0)	523 (14.5)	<0.0001
BMI <sup>b</sup>			0.32
<18.5	11 (3.3)	192 (2.7)	
<25.0	92 (27.5)	2123 (30.3)	
25.0–29.0	120 (35.9)	2627 (37.5)	
30.0 or greater	111 (33.2)	2056 (29.4)	
Falls in the last year			0.28
None	223 (64.8)	4992 (68.8)	
One	64 (18.6)	1230 (17.0)	
2 or more	57 (16.6)	1031 (14.2)	
Self-reported health in past month			0.036
Excellent/very good	115 (33.4)	2852 (39.3)	
Good	110 (32.0)	2316 (31.9)	
Fair/poor	119 (34.6)	2091 (28.8)	
Self-reported medical conditions			
Hypertension	226 (65.7)	4882 (67.3)	0.54
Diabetes	90 (26.2)	1835 (25.3)	0.71
Cancer	81 (23.5)	1872 (25.8)	0.35
Lung disease	81 (23.5)	1073 (14.8)	<0.0001
Heart disease	82 (23.8)	1329 (18.3)	0.011
Stroke	39 (11.3)	853 (11.8)	0.82
Arthritis	211 (61.3)	4037 (55.7)	0.040
Dementia/Alzheimer's disease	15 (4.4)	442 (6.1)	0.19

<sup>a</sup>Unadjusted Pearson chi-square *p*-value.

<sup>b</sup>BMI = body mass index.

**Table 2**  
**Limitations and disability among 2011 NHATS community-dwelling residents**

	Community residence			
	Mobile homes (n = 344)	Other residence (n = 7265)	Unadjusted p-value <sup>a</sup>	Adjusted p-value <sup>b</sup>
Limitations				
Health limits ability to work	29 (8.5)	513 (7.1)	0.33	0.31
Self-reported pain limiting activities			0.26	0.19
None	146 (42.4)	3352 (46.2)		
Pain not limiting activities	82 (23.8)	1743 (24.0)		
Pain limiting activities	116 (33.7)	2162 (29.8)		
Uses mobility devices vs no use				
Cane	66 (72.5)	1536 (68.9)	0.46	0.78
Walker	44 (48.4)	1102 (49.4)	0.85	0.62
Wheelchair	25 (27.5)	572 (25.6)	0.69	0.53
Scooter	10 (11.0)	186 (8.3)	0.34	0.68
Self-reported disability <sup>c</sup>			0.058	0.004
None	186 (54.7)	4168 (58.8)		
1–3	107 (31.5)	1820 (25.7)		
4–10	47 (13.8)	1097 (15.5)		
Any reported disability <sup>d</sup>	154 (45.3)	2917 (41.2)	0.13	0.003
Disability characteristics				
Inability/difficulty in performing physical tasks				
Reach overhead/put heavy book on shelf	59 (72.8)	1230 (66.2)	0.22	0.13
Using fingers to grasp small objects	24 (7.0)	439 (6.0)	0.47	0.26
Bend down/get down on knees, and back up	222 (64.9)	4390 (60.8)	0.13	0.007
Walking 6 blocks	158 (46.5)	2990 (41.5)	0.070	0.001
Walk up to 20 stairs	134 (39.2)	2499 (34.8)	0.10	0.002
Walking 3 blocks <sup>e</sup>	129 (37.7)	2427 (33.5)	0.11	0.002
Lift and carry 20 lbs	116 (34.0)	2635 (36.5)	0.35	0.71
Open a sealed jar	106 (31.0)	2236 (30.9)	0.98	0.27
Gets help/has difficulty in performing self-care activities (in the last month)				
Bathing <sup>e</sup>	27 (7.9)	668 (9.4)	0.35	0.84
Getting in and out of chair	26 (7.6)	568 (8.0)	0.79	0.68
Dressing <sup>e</sup>	24 (7.0)	548 (7.7)	0.64	0.93
Getting in and out of bed <sup>e</sup>	18 (5.3)	466 (6.5)	0.35	0.66
Using the toilet <sup>e</sup>	13 (3.8)	398 (5.6)	0.16	0.35
Needs help performing household activities				

	Community residence			
	Mobile homes ( <i>n</i> = 344)	Other residence ( <i>n</i> = 7265)	Unadjusted <i>p</i> -value <sup><i>a</i></sup>	Adjusted <i>p</i> -value <sup><i>b</i></sup>
Shopping for groceries <sup><i>e</i></sup>	71 (20.6)	1635 (23.0)	0.32	0.86
Managing money <sup><i>e</i></sup>	53 (15.4)	1183 (16.6)	0.56	0.75
Making hot meals <sup><i>e</i></sup>	46 (13.4)	1044 (14.7)	0.51	0.89
Managing medications <sup><i>e</i></sup>	45 (13.1)	909 (12.8)	0.86	0.30
Using telephone <sup><i>e</i></sup>	25 (7.3)	616 (8.7)	0.37	0.71
Difficulties with health or functioning				
Difficulty hearing despite using hearing aid	17 (5.0)	265 (3.7)	0.22	0.10
Difficulty seeing despite using glasses or contacts or vision aids	28 (8.3)	514 (7.1)	0.37	0.16
Difficulty swallowing or chewing food	47 (13.7)	693 (9.5)	0.012	0.006
Difficulty speaking or in making oneself understood	24 (7.0)	501 (6.9)	0.96	0.72
Cognitive assessments				
Self-rated memory			0.092	0.07
Excellent	45 (13.7)	819 (12.2)		
Very good	85 (25.9)	2125 (31.7)		
Good	134 (40.9)	2382 (35.6)		
Fair/Poor	64 (19.5)	1368 (20.4)		
Changes in thinking or memory interfere with daily activities (more than once a week)	60 (30.3)	1421 (37.9)	0.21	0.33
Date and day of week incorrect	89 (26.3)	1642 (23.5)	0.24	0.052
Word recall score (immediate and delayed)			0.33	0.007
Low (0–6)	135 (40.8)	2446 (36.5)		
Medium (7–9)	106 (32.0)	2102 (31.3)		
High (10–20)	90 (27.2)	2160 (32.2)		
Clock-drawing test score <sup><i>f</i></sup>			0.33	0.47
0–1	15 (4.6)	389 (5.9)		
2–5	311 (95.4)	6203 (94.1)		
Naming president (first and last names)			0.034	0.01
Correct	141 (82.9)	3760 (88.3)		
Incorrect	29 (17.1)	496 (11.7)		

<sup>*a*</sup> Unadjusted Pearson chi-square *p*-value.

<sup>*b*</sup> Cochran–Mantel–Haenszel (CMH) chi-square *p*-value adjusted for age and gender.

<sup>*c*</sup> The following 11 activities were used to compute the disability score: walking 3 blocks, getting in and out of bed, bathing, dressing, eating, using the toilet, preparing hot meals, shopping, money management, medication management and using the phone.<sup>23</sup>

<sup>*d*</sup> Responded unable/need help in at least one of the 11 activities.

<sup>*e*</sup> Activity used in the disability score.

<sup>f</sup>Clock drawing scores: 2–5 points for a moderately accurate depiction, 1 for severely distorted and 0 if not recognizable as a clock.

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**Table 3**  
**Weighted prevalence of home environmental modifications among the NHATS 2011 cohort reporting disability<sup>a</sup>**

	Community residence			Adjusted OR (95% CI) <sup>b</sup>
	Mobile homes	Other residence	<i>p</i> -Value <sup>a</sup>	
Reference = <i>do not have</i>				1.00
Ramp at entrance	187,578 (25.4)	1,661,228 (15.0)	0.001	2.1 (1.4–3.2)
Seat for shower tub	335,410 (45.4)	6,018,341 (54.7)	0.31	0.8 (0.6–1.2)
Raised toilet seat	219,584 (29.8)	4,362,295 (39.3)	0.16	0.7 (0.5–1.1)
Grab bars next to toilet	105,331 (14.3)	3,563,676 (32.2)	0.0004	0.4 (0.3–0.7)
Grab bar in shower	309,830 (42.0)	6,580,065 (59.7)	0.004	0.5 (0.4–0.8)
Bathroom medical emergency system	107,323 (14.5)	1,705,421 (17.4)	0.76	0.9 (0.6–1.5)

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