

Unmet Need for Equipment to Help With Bathing and Toileting Among Older US Adults

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IMPORTANCE Home modification through seemingly mundane equipment, such as grab bars and shower seats, mitigates injury, dependence, and reduced quality of life in older adults coping with increasing disability. However, whether these interventions are underused in the US is unclear.

OBJECTIVE To estimate how many older adults who need equipment to help with bathing and toileting do not have it, describe factors associated with not having equipment, and describe how many who did not initially have equipment acquired equipment over time.

DESIGN This observational cohort study of participants 65 years or older used secondary data from the 2015 to 2019 waves of the US National Health and Aging Trends Study. Participants included community-dwelling older adults who would unequivocally benefit from equipment, defined as those with poor physical performance or substantial difficulty bathing, toileting, transferring, or walking. Respondents were representative of the US population 65 years and older. Data were collected from May 2015 to October 2019 and analyzed from August 1, 2019, to February 24, 2021.

EXPOSURES Population characteristics (eg, age, sex, income, health conditions, and physical performance), environmental factors (eg, home ownership and living arrangement), and health behaviors (eg, prior knee and/or hip surgery).

MAIN OUTCOMES AND MEASURES Prevalence of any unmet need for equipment, defined as either needing bathing equipment (bath grab bars and shower seat) but having none or needing toileting equipment (toilet grab bars and raised toilet seat) but having none and the cumulative incidence of equipment acquisition during 4 years of follow-up.

RESULTS A total of 2614 participants representing 12 million US individuals would benefit from equipment. The mean (SD) age was 80.5 (8.2) years, and 1619 individuals (62%) were women. Of these, an estimated 5 million individuals (42%; 95% CI, 39%-44%) had an unmet need. After adjustment for age, sex, and race/ethnicity, unmet need was associated with younger age (49% if aged 65-74 years, 37% if aged 75-84 years, and 29% if aged ≥ 85 years; $P < .001$), having fewer health conditions (55% if none vs 39% if ≥ 3 ; $P = .002$), non-White race/ethnicity (40% if White vs 51% if Black, 54% if Hispanic, and 55% if other; $P < .001$), no recent hospitalization (46% vs 37% if hospitalized; $P = .001$), and no prior knee and/or hip fracture or surgery (46% vs 35% if prior fracture or surgery; $P < .001$). After 4 years of follow-up, 35% of those with bathing equipment needs and 52% of those with toileting equipment needs never received equipment.

CONCLUSIONS AND RELEVANCE This cohort study suggests that in the US, 42% of older adults with impairments that would make bathing or toileting difficult lack equipment to assist. This situation is a missed opportunity to help 5 million individuals live independently and safely.

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In contrast with engineered T cells and regenerative stem cell therapy, home modification through equipment, such as grab bars and shower chairs, seems mundane. However, these low-technology interventions meaningfully reduce injury, enable independence, preserve dignity, and improve quality of life in older people with irreversible disability for complex multifactorial reasons.¹ Disability is caused by a mismatch between an individual's capabilities and the demands of their environment.² The right equipment reduces that mismatch. Equipment users report increased independence and feeling safer.³⁻⁶ As part of multifactorial interventions in randomized clinical trials, home modifications reduce falls—the leading cause of injury in older adults and a major driver of use of health care resources—by 19% and dependence by 30%.⁷⁻⁹ In cost-effectiveness analyses, the benefits of equipment are estimated to be 6 times the cost, with greater value if targeted at older adults with previous falls.^{10,11} The World Health Organization thus recommends home modification to reduce injury, stress, and isolation among older persons.¹²

However, despite favorable feedback from recipients, evidence supporting their use, and support from international guidelines, these simple and low-cost interventions may be overlooked, even though they help to meet basic human needs for older persons. The extent to which this occurs in the US is unclear. A prior national estimate¹³ found most older adults have at least 1 bathing or toileting device, but equipment may be disproportionately missing among older people with functional limitations—in other words, those who need them most.¹⁴ Regional studies suggest that this may be the case.¹⁵ For example, only 50% of older adults reporting bathing disabilities had bath grab bars and shower seats.¹⁶ Many may be needlessly struggling to bathe and toilet when tools are available to help. Moreover, unaddressed need for equipment may result in increased Medicare costs through preventable injury and excess caregiver burden.¹⁷

To better understand whether there is a missed opportunity to help older adults live independently via a cost-effective intervention, we sought to describe how many older adults who need equipment in the US do not have it. We used nationally representative data to describe (1) how many older adults in the US need bathing and toileting equipment; (2) the prevalence of no equipment in these older adults, which we call *unmet need*; (3) population, environmental, and health behavior characteristics associated with unmet need; and (4) how many individuals with unmet need at baseline received equipment during 4 years of follow-up.

Methods

Data Sources

We completed an observational cohort study of secondary data from the National Health and Aging Trends Study (NHATS) from May 2015 to October 2019, selecting participants with bathing and toileting equipment needs among a nationally represented cohort of Medicare beneficiaries 65 years and older and examining how many did not get equipment based on annual follow-up interviews through 2019. Interviewers meet annu-

Key Points

Question How many older adults who need equipment to help with bathing and toileting do not have it?

Findings In this nationally representative cohort study of 2614 adults 65 years or older, an estimated 42% of individuals who expressed or demonstrated diminished capability to bathe or toilet independently lacked grab bars or seats to help. This percentage represents 5 million individuals in the US with unmet need for equipment.

Meaning These findings suggest that low-cost and beneficial assistive devices to support injury prevention, independence, and quality of life for older adults are being underused, and better clinical assessment for and better provision of these aids are needed.

ally with participants in person to ask about health, function, living environment, and finances and to conduct an objective assessment of physical performance. The cohort was replenished in 2015. We used data from the 2015 wave to determine the prevalence of unmet need. We used data from the 2016 to 2019 waves to determine the incidence of equipment acquisition among those with unmet need in 2015. Our protocol was reviewed by the institutional review board at the University of California, San Francisco, and deemed non-human subjects research that did not require informed consent. This study followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guideline.

Study Participants

We selected community-dwelling participants (eg, not in a retirement home or institutional facility) who needed adaptive bathing or toileting equipment in 2015. We focused on either bathing equipment or toileting equipment owing to the high prevalence of conditions that require their use, ease of installation, and low cost relative to other equipment such as ramps or stair lifts.¹³

The “person-environment fit” theory recognizes that disability arises when an environment is not fit to a person's capabilities.^{14,15} A corollary is that an individual's capabilities determine the immediate need for adaptive equipment. For example, shower grab bars to prevent slipping and falling on a wet floor are mostly unnecessary for older persons with robust balance but are increasingly necessary for those with difficulties balancing, such as those with multiple falls in the past year. To identify persons in need of equipment, we therefore developed deficit-based criteria, selecting people based on diminished capability for whom most clinicians believe equipment would unquestionably improve quality of life (**Box**).

To do this, we examined inclusion criteria in articles identified in a systematic review of home modification.¹⁸ Criteria were heterogeneous, with many based on clinician referral. We therefore assembled an interdisciplinary panel including a nurse, physical therapist, occupational therapist, geriatrician (K.C.), and facilitator (K.L.) with experience in home care and equipment assessment to identify useful measures within NHATS for characterizing (1) need for bathing equipment and

Box. Inclusion Criteria for Study Using Measures From the National Health and Aging Trends Study to Examine Unmet Need for Equipment in the US

Definition of Needing Bathing Equipment^a

Reports showering or bathing with a lot of difficulty
 Reports ≥ 2 falls in the past 12 months
 Reports use of a walker or more (eg, wheelchair or scooter) indoors
 Reports holding onto walls most times or every time when walking indoors
 Reports mobilizing indoors with a lot of difficulty
 Reports getting out of bed with a lot of difficulty
 Unable to semitandem stand^b

Definition of Needing Toileting Equipment^a

Reports toileting with a lot of difficulty
 Reports use of a walker or more (eg, wheelchair or scooter) indoors
 Reports mobilizing indoors with a lot of difficulty
 Reports getting out of bed with a lot of difficulty
 Unable to complete a single-chair stand^b

^a Includes any of the following.

^b Criterion was measured on objective assessment.

(2) need for toileting equipment (eMethods in the [Supplement](#)). We encouraged panelists to select characteristics that would unquestionably prompt an equipment recommendation (eg, reports a lot of difficulty bathing or showering) and avoid those that would only prompt consideration of further assessment for equipment (eg, reports some difficulty bathing or showering). Our criteria were thus designed conservatively, favoring specificity for needing equipment over sensitivity.

Participants from the 2015 wave were then included in our base analysis if they met any criteria for needing bathing equipment or toileting equipment. We did not exclude bedridden individuals requiring caregivers, because equipment may make caregiving easier. We developed less conservative criteria for sensitivity analysis using the characteristics that would prompt further assessment rather than a recommendation for equipment outright (eFigure 1 in the [Supplement](#)).

Outcome

Our primary outcome was any unmet need for equipment. Each year, participants were asked to respond with a yes or no to the following question: “Whether or not you use it, does your bathroom have (1) a grab bar in the shower or tub area, (2) a seat for the shower or tub, (3) a raised toilet or raised toilet seat, or (4) grab bars around the toilet?” Patients had unmet need if (1) they needed bathing equipment and had neither shower grab bars nor a bath seat or (2) they needed toileting equipment and had neither toilet grab bars nor a raised toilet seat. We counted only those with no equipment to specifically identify those whose needs were truly unaddressed. The specific presence of individual pieces of equipment (eg, grab bar, seat, or both) was a secondary outcome.

Covariates

We used the Andersen model of use of health services¹⁹ to guide selection of factors associated with outcome. Environmental factors included metropolitan status, home ownership, and living arrangement. Population characteristics included age, sex, race/ethnicity, marital status, educational level, number of persons in the social network, income, Medicaid coverage, dementia, number of health conditions, self-reported health, and performance on the NHATS Short Physical Performance Battery (possible scores range from 0 to 12, with higher scores indicating greater physical capability). Health behaviors included prior knee and/or hip surgery or fracture after 50 years of age, hospitalization in the prior year, and having a regular physician they saw in the last year.

Age was categorized into 3 levels: 65 to 74 years, 75 to 84 years, and 85 years or older. Marital status was categorized as married or living with a partner, separated or divorced, widowed, or never married. Educational level was categorized into less than high school, high school equivalent, or greater than high school. Income was imputed from survey responses and divided into 5 ranges defined by the Survey of Consumer Finances for 2007 adjusted to 2011 dollars.²⁰ Dementia was categorized as none, possible, or probable based on a validated algorithm using the NHATS cognitive interview.²¹

Missingness

We used multiple imputation with iterative chained equations by predictive mean matching to produce 5 imputed sets sampling 5 nearest neighbors using all eligibility criteria variables and variables associated with outcomes in the matching model. We report wherever data were missing for more than 5% of our cohort.

Statistical Analysis

Data were analyzed from August 1, 2019, to January 14, 2021. NHATS is a complex survey whose methods are described elsewhere.²² Medicare beneficiaries are sampled based on geographic and demographic strata, with oversampling of older persons and Black non-Hispanic persons. We calculated the prevalence of unmet need in 2015 in the cohort and subgroups defined by sociodemographic and clinical characteristics, accounting for complex survey design using weights from 2015.

We used bivariate logistic regression to produce unadjusted odds ratios of unmet need for factors associated with outcome. Results were then adjusted by age, sex, and race/ethnicity in multivariate logistic regression. We reported adjusted prevalence using marginal probabilities from adjusted regressions. A 2-sided $P \leq .05$ was considered statistically significant. No formal adjustment for multiple comparisons was performed. To further explore the association between age and unmet need in post hoc analysis, we repeated multivariate logistic regression adjusting for sex, race/ethnicity, function, and other variables significant in bivariate comparisons.

We conducted a sensitivity analysis to determine how prevalence of unmet need was associated with inclusion criteria. To provide more granular detail on equipment use in 2015, we determined the specific presence of grab bar equip-

ment, seating equipment, or both in those with bathing equipment needs and those with toileting equipment needs broken down by individual inclusion criteria.

To better understand how long participants went without needed equipment, we used follow-up data from 2016 to 2019 to determine the cumulative incidence of participants acquiring equipment using the Aalen-Johansen estimator, with death treated as a competing event.²³ Analyses were conducted in STATA/SE, version 16.0 (StataCorp LLC).

Results

Of 7070 community-dwelling older adults included in the NHATS in 2015, 2614 met criteria for needing bathing or toileting equipment (eFigure 2 in the [Supplement](#)). Baseline characteristics are available in [Table 1](#). Mean (SD) age was 80.5 (8.2) years, 995 participants (38%) were men, and 1619 (62%) were women. The cohort consisted of 1580 White individuals (60%), 666 Black individuals (25%), and 192 Hispanic individuals (7%). Participants predominantly lived in metropolitan areas (2089 [80%]), owned their own home (1690 [65%]), had no prior knee and/or hip surgery (1844 [71%]), and had no history of hospitalization in the past year (1768 [68%]) yet performed poorly on the Short Physical Performance Battery with a score ranging from 0 to 3 (1673 [64%]). Most participants (1411 [54%]) needed both bathing and toileting equipment. The most common criteria for needing equipment were self-reported inability to complete a single chair stand (1341 [51%]), inability to stand semitandem (1171 [45%]), 2 or more falls in the past year (979 [37%]), and use of a walker indoors (887 [34%]).

These 2614 individuals represent 12 million community-dwelling Medicare beneficiaries who would benefit from equipment. The breakdown of equipment is shown in [Figure 1](#) and eTable 1 in the [Supplement](#). A total of 4.6 million individuals needed only bathing equipment, 1.4 million needed only toileting equipment, and 5.9 million needed both. Among 10.6 million individuals who needed bathing equipment, 26% (95% CI, 24%-29%) had none, 33% (95% CI, 31%-36%) had either a grab bar or a shower seat, and 40% (95% CI, 38%-43%) had both. Among 7.4 million individuals who needed toileting equipment, 44% (95% CI, 40%-47%) had none, 32% (95% CI, 29%-35%) had either a grab bar or a raised toilet seat, and 24% (95% CI, 22%-26%) had both. In total, an estimated 5 million (42%; 95% CI, 39%-44%) individuals in the US had an unmet need for equipment (eg, had diminished capability to bathe or toilet independently but lacked grab bars or seats to help).

Individuals who already used a walker indoors were most likely to have some equipment, although only 59% (95% CI, 55%-64%) had both a bath seat and grab bars. In sensitivity analysis, less conservative criteria resulted in 4969 individuals warranting assessment for equipment. This sample had better baseline physical performance and a higher prevalence of unmet need for both bathing equipment (35% [95% CI, 33%-36%] vs 26% [95% CI, 24%-29%] in base analysis) and toileting equipment (47% [95% CI, 44%-50%] vs 44% [95% CI, 40%-47%]) (eTables 1 and 2 in the [Supplement](#)).

Table 1. Baseline Characteristics of Individuals With Bathing or Toileting Equipment Needs in 2015, Unweighted and Weighted to Be Nationally Representative^a

Characteristic	Respondents, No. (%)	National estimate, 1 million population (%)
Overall	2614 (100)	12.0 (100)
Age, y		
65 to 74	717 (27)	5.5 (46)
75 to 84	1019 (39)	4.0 (34)
≥85	878 (34)	2.4 (20)
Sex		
Male	995 (38)	5.0 (42)
Female	1619 (62)	7.0 (58)
Ethnicity		
White	1580 (60)	8.6 (72)
Black	666 (25)	1.2 (10)
Hispanic	192 (7)	1.0 (8)
Other ^b	176 (7)	1.1 (9)
Marital status		
Married or living with a partner	1029 (39)	5.7 (48)
Separated or divorced	375 (14)	1.9 (16)
Widowed	1095 (42)	3.8 (32)
Never married	115 (4)	0.5 (4)
Educational level		
Less than high school	817 (31)	3.1 (26)
High school	739 (28)	3.5 (30)
Beyond high school	1057 (40)	5.3 (45)
Metropolitan status	2089 (80)	9.7 (81)
Home ownership		
Own	1690 (65)	7.9 (66)
Rent	560 (21)	2.5 (21)
Other arrangement	364 (14)	1.5 (13)
Living arrangement		
Alone	869 (33)	3.6 (30)
With spouse/partner only	763 (29)	4.4 (37)
With spouse/partner and others	248 (9)	1.3 (11)
With others only	734 (28)	2.7 (23)
No. in social network ^c		
None	142 (5)	0.6 (5)
1	928 (35)	4.1 (35)
2	697 (27)	3.1 (26)
≥3	847 (32)	4.1 (34)
Income range ^d		
Lowest	1222 (47)	5.0 (42)
Lower	376 (14)	1.8 (15)
Middle	496 (19)	2.4 (20)
Higher	286 (11)	1.5 (12)
Highest	234 (9)	1.3 (11)
Medicaid coverage ^e	622 (24)	2.5 (21)
Dementia		
Probable	545 (21)	1.8 (15)
Possible	377 (14)	1.5 (13)
None	1692 (65)	8.6 (72)
No. of health conditions ^f		
None	236 (9)	1.1 (9)
1	690 (26)	3.3 (27)
2	801 (31)	3.7 (31)
≥3	887 (34)	3.8 (32)

(continued)

Table 1. Baseline Characteristics of Individuals With Bathing or Toileting Equipment Needs in 2015, Unweighted and Weighted to Be Nationally Representative^a (continued)

Characteristic	Respondents, No. (%)	National estimate, 1 million population (%)
Prior knee and/or hip fracture or surgery ^d	770 (29)	3.3 (28)
Hospitalized in last year	828 (32)	3.9 (33)
Has a regular physician they saw last year	2476 (95)	11.3 (94)
Self-reported health		
Excellent	134 (5)	0.7 (6)
Very good	447 (17)	2.2 (18)
Good	893 (34)	4.0 (34)
Fair	825 (32)	3.5 (29)
Poor	315 (12)	1.5 (13)
NHATS SPPB score ^h		
0-3	1673 (64)	6.7 (56)
4-6	554 (21)	2.9 (24)
7-9	275 (11)	1.6 (14)
10-12	112 (4)	0.8 (7)

Abbreviations: NHATS, National Health and Aging Trends Study; SPPB, Short Physical Performance Battery.

^a Percentages have been rounded and might not total 100.

^b Includes persons who reported their race/ethnicity as American Indian, Asian, Native Hawaiian, Pacific Islander, other, do not know, or more than 1 race/ethnicity.

^c Indicates individuals the respondent "talks to about important things," with missing results for 316 proxy survey respondents (12%) imputed to at least 1 person in respondent's social network.

^d Determined using the 2010 and 2013 Survey of Consumer Finances samples to create weighted distributions of individuals 65 years or older. Income quintiles for single households were defined as follows: highest, more than \$56 000; higher, \$36 000 to \$55 999; middle, \$22 000 to \$35 999; lower, \$18 000 to \$21 999; and lowest, less than \$18 000. Income quintiles for joint households were defined as follows: highest, more than \$109 000; higher, \$66 000 to \$108 999; middle, \$43 000 to \$65 999; lower, \$30 000 to \$42 999; and lowest, less than \$30 000.

^e Missing results were imputed for 198 respondents (8%).

^f Includes any history of heart disease, lung disease, diabetes, arthritis, stroke, or cancer.

^g Includes any history of knee or hip fracture or surgery occurring after age 50.

^h Calculated using NHATS cutoffs for the SPPB, with missing results imputed in 411 respondents (16%).

Significant factors associated with lack of equipment before and after adjustment in our base analysis are shown in **Table 2**. After adjustment, unmet need was associated with younger age (49% [95% CI, 44%-54%] if aged 65-74 years, 37% [95% CI, 33%-41%] if aged 75-84 years, and 29% [95% CI, 25%-33%] if aged ≥85 years; $P < .001$), having fewer health conditions (55% [95% CI, 47%-62%] if none vs 39% [95% CI, 35%-43%] if ≥3; $P = .002$), non-White race/ethnicity (40% [95% CI, 36%-44%] if White vs 51% [95% CI, 45%-56%] if Black, 54% [95% CI, 46%-62%] if Hispanic, and 55% [95% CI, 47%-64%] if other; $P < .001$), not having a regular physician (61% [95% CI, 53%-69%] vs 42% [95% CI, 39%-45%] if respondent had a regular physician; $P < .001$), no recent hospitalization (46% [95% CI, 43%-49%] vs 37% [95% CI, 32%-42%] if hospitalized; $P = .001$), and no prior knee and/or hip fracture or surgery (46% [95% CI, 43%-49%] vs 35% [95% CI, 29%-40%] if prior fracture or surgery; $P < .001$). Before adjustment, un-

met need was also associated with not being widowed (44% [95% CI, 39%-48%] if married, 48% [95% CI, 40%-55%] if separated or divorced, and 49% [95% CI, 38%-59%] if never married vs 34% [95% CI, 31%-38%] if widowed; $P = .001$) and living with others (42% [95% CI, 32%-47%] if living with partner only, 49% [95% CI, 41%-57%] if living with partner and others, and 45% [95% CI, 39%-50%] if living with others only vs 36% [95% CI, 32%-40%] if living alone; $P = .006$). Educational level, home ownership, metropolitan status, number of individuals in the social network, income, Medicaid coverage, dementia, self-reported health, and physical performance scores were not associated with unmet need.

To determine whether the association between younger age and unmet need was explained by less physical impairment in younger persons, we repeated our analysis adjusting for Short Physical Performance Battery score and other variables. Compared with older age, younger age (65-74 years) remained associated with unmet need (adjusted odds ratios, 0.6 [95% CI, 0.5-0.8] for those aged 75-84 years and 0.4 [95% CI, 0.3-0.6] in those ≥85 years) (eTables 3 and 4 in the **Supplement**).

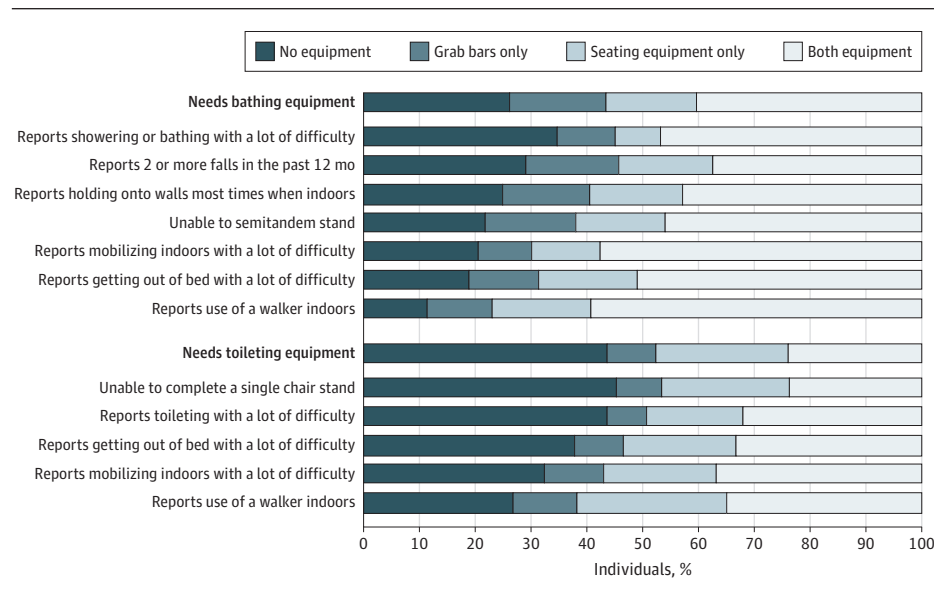
After 4 years of follow-up, 35% (95% CI, 30%-40%) of those with bathing equipment needs never received equipment: 8% (95% CI, 6%-11%) died without equipment and 27% (95% CI, 22%-31%) were alive without any equipment. Of those with toileting equipment needs, 52% (95% CI, 47%-57%) never got equipment: 17% (95% CI, 14%-21%) died without equipment and 35% (95% CI, 30%-39%) were alive without any equipment (**Figure 2** and eTable 5 in the **Supplement**).

Discussion

Disability is common with aging. Most of those who live past their eighth decade experience a prolonged period of disability in their last years of life,^{24,25} with difficulty bathing and toileting among the most common.²⁶ Our study examines the contribution of unaccommodating environments in producing disability; we found 42% of older persons who report difficulty with bathing or toileting or have diminished physical capabilities (eg, cannot stand up from a chair without using their arms, cannot stand up from a chair without using their arms) lacked low-cost devices proven to help. We identified several important disparities in equipment provision. First, younger persons with need were more likely to lack equipment. Second, minority ethnic groups were more likely to lack equipment. Third, provision was piecemeal, with many receiving some equipment rather than the full set of equipment most experts recommend. Fourth, after 4 years of additional follow-up, many participants still lacked equipment. The yearslong absence of equipment for these 5 million Americans is a gap in the quality of care for vulnerable older persons.

When older adults discuss their health and what it means to age well, many emphasize the importance of maintaining independence and not being a burden to others.²⁷ Adaptive equipment has an important role in fostering these goals, because equipment makes it easier for an older person to safely perform basic activities of daily living with less assistance and

Figure 1. National Estimates of Equipment Presence Among Individuals in Need of Bathing or Toileting Equipment in the US, 2015



reduce injury. Geriatric-friendly health care systems should therefore prioritize an approach directed at supporting function to improve quality of life and reduce adverse health outcomes. Clinicians who notice increasing impairments or falls in their older patients should inquire about the setup of the home environment (eg, “Have you ever considered making changes to your home to help as you get older?” or “Do you have any equipment to help prevent falls at home?”). Tools such as the Home Safety Self-Assessment Tool can empower patients and caregivers to identify hazards and solutions on their own.²⁸ Where available, partnerships with occupational therapists and experienced handypersons can help conduct in-home assessments, provide information on what to get, and help with installation.

Multiple reasons many older adults who need equipment do not have it are possible. First, many do not know when and how to acquire equipment and install it. As one qualitative study on home modification noted, “People actually don’t know what these services are out there, and also how to access them. You don’t get taught, at any point in your life, how to become an older person. It just sort of happens.”^{5(p6)} Furthermore, few physicians are skilled at identifying incident disability in their older patients, asking screening questions about home environments, educating patients on available options, making recommendations, and routing patients to solutions. We observed yearslong delays in the acquisition of equipment among those in need. We also observed that participants who had been hospitalized and those who had surgery or fracture were more likely to have equipment; these experiences may prompt individuals to recognize their own disability and facilitate equipment access through resources for addressing these needs.

Second, some may find equipment stigmatizing. Aesthetics are unappealing, and some individuals may fear being perceived as old and vulnerable; older adults describe

equipment as meant for someone older but not them.⁵ This can lead to resistance, even when needs are self-evident, and may explain why the younger individuals within our study were more likely to have unmet needs and why those who already owned a walker (eg, already overcame stigma around assistive device use) were the least likely. Thus, greater uptake of adaptive equipment may require addressing societal prejudices, the stigmatization of disabled older persons, and beliefs that equipment should be installed only after impairments develop. Effective product and service design could also help. Equipment trials would let individuals test changes before committing to permanent modifications, and invisible modifications could reinforce structures such as shower doors or towel racks so they can support a person’s weight.

Third, Medicare Part B does not cover grab bars, shower seats, or raised toilet seats as durable medical equipment, although each costs only \$50.²⁹ Medicare Part B does cover walkers. Our study illustrates how this piecemeal coverage leads to piecemeal home safety for at-risk older adults; among older adults who use a walker indoors, only 59% also had shower grab bars and a bath seat. From a policy perspective, Medicare should fund complete sets of equipment, given evidence supporting efficacy and cost-effectiveness.^{6,10,11} This could incentivize installation, direct clinician and insurer attention to their utility, durably increase the stock of accessible housing for future generations, and promote access to underserved populations.

Fourth, there are important race disparities in access to equipment, with equipment use substantially lower in minority groups and those without access to a regular physician. Geography and caregiving are potential unmeasured mediators of this relationship. Regions with a predominant minority population may do a poor job of providing needed equipment. Minority populations may alternatively provide more

Table 2. Proportion With Unmet Need for Bathing or Toileting Equipment in the US by Sociodemographic, Clinical, and Functional Characteristics, Adjusted for Age, Sex, and Race/Ethnicity

Characteristic ^a	Unadjusted			Adjusted		
	Proportion, %	P value ^b	OR (95% CI)	Proportion, %	P value ^b	OR (95% CI)
Age, y						
65-74	50		1 [Reference]	49		1 [Reference]
75-84	37	<.001	0.6 (0.5-0.8)	37	<.001	0.6 (0.5-0.8)
≥85	29		0.4 (0.3-0.5)	29		0.4 (0.3-0.6)
Sex						
Male	46		1 [Reference]	46		1 [Reference]
Female	39	.02	0.7 (0.6-0.9)	41	.07	0.8 (0.6-1.0)
Race/ethnicity						
White	38		1 [Reference]	40		1 [Reference]
Black	48	<.001	1.5 (1.2-2.0)	51	<.001	1.6 (1.2-2.0)
Hispanic	51		1.8 (1.2-2.5)	54		1.8 (1.2-2.5)
Other ^c	55		2.0 (1.4-2.9)	55		1.9 (1.3-2.7)
Marital status						
Married/living with a partner	44		1 [Reference]	43		1 [Reference]
Separated/divorced	48		1.2 (0.9-1.6)	46		1.1 (0.8-1.6)
Widowed	34	.001	0.7 (0.5-0.9)	41	.74	0.9 (0.7-1.2)
Never married	49		1.2 (0.8-1.9)	45		1.1 (0.7-1.8)
Living arrangement						
Alone	36		1 [Reference]	40		1 [Reference]
With spouse/partner only	42		1.3 (1-1.6)	42		1.1 (0.8-1.4)
With spouse/partner and others	49	.006	1.7 (1.2-2.5)	47	.051	1.3 (0.9-2.0)
With others only	45		1.5 (1.1-1.9)	48		1.4 (1.1-1.8)
No. of health conditions						
None	55		1 [Reference]	55		1 [Reference]
1	42	<.001	0.6 (0.4-0.9)	43	.002	0.6 (0.4-0.9)
2	42		0.6 (0.4-0.8)	44		0.6 (0.5-0.9)
≥3	37		0.5 (0.3-0.7)	39		0.5 (0.4-0.7)
Prior knee and/or hip fracture/surgery						
Yes	31	<.001	1 [Reference]	35	<.001	1 [Reference]
No	45		1.8 (1.4-2.4)	46		1.6 (1.3-2.1)
Hospitalized in last year						
Yes	36		1 [Reference]	37		1 [Reference]
No	44	.006	1.4 (1.1-1.8)	46	.001	1.5 (1.2-1.9)
Has a regular physician they saw in the last year						
Yes	40	<.001	1 [Reference]	42	<.001	1 [Reference]
No	60		2.2 (1.5-3.3)	61		2.2 (1.5-3.2)

Abbreviation: OR, odds ratio.

^a Educational level, metropolitan status, home ownership, number in social network, income range, Medicaid coverage, self-reported health, and National Health and Aging Trends Study Short Physical Performance Battery score were not significant in unadjusted and adjusted comparisons.

^b Calculated using F test measuring association between the factor and unmet need in unadjusted and adjusted logistic regression.

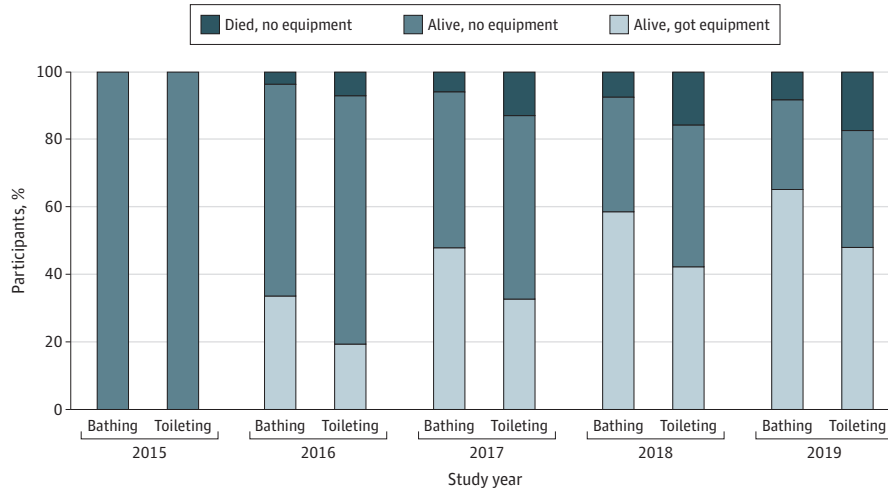
^c Includes persons who reported their race/ethnicity as American Indian, Asian, Native Hawaiian, Pacific Islander, other, do not know, or more than 1 race/ethnicity.

caregiving in lieu of equipment to overcome disability owing to cultural norms; equipment provision may thereby be an unexplored opportunity to reduce caregiving burden in minority populations. Further research into reasons for these disparities and approaches to providing access to equipment for minority populations is needed.

Limitations

Our study has several limitations. In producing specific rather than sensitive criteria for needing equipment, we may have underestimated the number of older adults who would benefit. We may have overestimated time to acquire equipment because data from the NHATS are collected annually, and some individuals

Figure 2. Cumulative Incidence of Acquiring Equipment for Bathing and Toileting Among Those Individuals Who Needed and Did Not Have Equipment in 2015



may have obtained equipment months before the survey. Medicare Advantage beneficiaries may have access to insurance plans with additional benefits to cover equipment, but Medicare Advantage enrollment status was not available in our data set to include as a factor associated with having equipment. We did not examine whether equipment acquisition was owing to moving residences or home modification.³⁰ Last, we did not examine the potential downstream clinical out-comes of unmet need for equipment; this is an important area for future research.

Conclusions

In summary, we found that 42% of older adults in the US with documented challenges in bathing or toileting lack equipment to assist them. This is a missed opportunity to help 5 million individuals live independently and avoid injury. We need better clinical assessment for and better methods of providing these low-cost and beneficial aids.

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