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Successful Aging Through Successful Accommodation With Assistive Devices

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Abstract

Objectives: To provide a profile of older adults who successfully accommodate declines in capacity by using assistive devices.

Method: Using the National Health and Aging Trends Study, we provide national estimates of prevalent, incident, and persistent successful accommodation of mobility and self-care activity limitations. For incident and persistent accommodation groups, we describe their subjective wellbeing and participation restrictions, health and functioning, demographic and socioeconomic characteristics, and acquisition of assistive devices and environmental features. We estimate regression models predicting incident and persistent successful accommodation and the extent of wellbeing and participation restrictions for incident and persistent groups (vs. those who are fully able).

Results: Nearly one-quarter of older adults have put in place accommodations that allow them to carry out daily activities with no assistance or difficulty. In adjusted models, incident and persistent successful accommodation is more common for those ages 80–89, those with more children, and those living in homes with environmental features already installed; wellbeing levels for these groups are similar and participation restrictions only slightly below those who are fully able.

Discussion: A focus on facilitating successful accommodation among those who experience declines in capacity may be an effective means of promoting participation and wellbeing in later life.

Keywords: Disability—Population aging—Successful aging

The construct of successful aging, as articulated and later operationalized by Rowe and Kahn (1987, 1997), focuses on the absence of chronic disease and maintenance of high physical and cognitive functioning in later life. Motivation for this construct stemmed from a recognition that too little was known about the determinants of aging well (Villar, 2012). Although now widely employed, the paradigm is open to a range of criticisms (Martinson & Berridge, 2015). A chief limitation is that less than 5% of older adults qualify as successful (McLaughlin et al., 2012), because a substantial proportion of older adults have multiple chronic conditions. Moreover, by focusing on primary

prevention the framework does not explicitly recognize the dynamic nature of functional change in later life and the potentially critical role of the context in which people live. Consequently, such an approach offers little in the way of guidance on how individuals who do develop chronic disease and declines in physical and cognitive capacity might compensate for such declines, nor does it highlight disparities in who might be able to make such accommodations.

Alternative frameworks recognize that successful aging can be achieved if compensations are made for physical deficits and limitations (e.g., Baltes & Carstensen, 1996; Young et al. 2009). Some argue that compensations may

be accomplished through psychological and social mechanisms such as emotional vitality, resilience, and social support (Young et al. 2009). Similarly, Baltes and Carstensen (1996) use the selection, optimization, and compensation model to describe the process of successful adaptation in later life: selecting fewer goals, optimizing by focusing on goal-directed actions, and investing in alternative means for achieving goals. These psychological models explicitly link compensation to quality of life outcomes such as continued participation in activities of value and maintenance of subjective wellbeing.

Others have framed compensatory strategies not as a facilitator of positive outcomes but as a signal of a transitional phase with overt limitations yet to come (Fried et al. 2000; Higgins et al. 2014). Fried and colleagues' (2000), for example, found that older women who modified the frequency or method by which they performed daily tasks were at higher risk for subsequently developing difficulty than those who had not adopted such compensatory strategies. In their review of the literature, Higgins and colleagues (2014) further delineate between "intrinsic" and "extrinsic" strategies, where the former involve physical changes in how the activity is carried out (more slowly, less often) and the latter modifications to the environment (such as grab bars or a bath or shower seat), use of assistive devices (such as mobility devices), or receipt of assistance from another person.

Older adults who use assistive devices, including adaptive features in the physical environment, are a substantial group (Cornman et al., 2005) and are of considerable interest because of their potential to substitute devices for costly personal assistance (Hoenig et al., 2003). Individuals who adopt such devices, report no reduction in activity level or difficulty, and carry out their activities without assistance from others have been referred to as "successfully accommodating" (Freedman et al., 2014). Unlike the original successful aging paradigm, successful accommodation does not preclude chronic disease or losses of physical or cognitive capacity; rather, ability to accommodate these losses with technological solutions that maintain independence is viewed as central. Such accommodations may allow independence in daily activities and sustain quality of life even if the stage is transitional.

The shift in focus from successful aging to successful accommodation also fosters exploration of key social, economic, and physical environment-related factors that promote independent functioning irrespective of chronic disease and diminished underlying capacity. Although it is well-established that racial minorities, those with few economic resources, and those with few social ties are more likely to develop activity limitations in later life (Stuck et al., 1999), factors central to successful accommodation are less clear. Racial differences in assistive device use, for example, have been attributed to differences in need and predisposing and enabling factors (Cornman & Freedman, 2008), so racial disparities in successful accommodation may not

be apparent once other factors are controlled. Individuals with more family ties (e.g., married and with adult children) are more likely to receive assistance with daily activities (Boaz & Hu, 1997), and therefore, we anticipate, less likely to successfully accommodate. Since Medicare offers only limited coverage of assistive devices, and some modifications such as grab bars require permanent installation, we expect that having higher income, owning one's home, and living in a place that already has features installed are all likely to facilitate successful accommodation.

The National Health and Aging Trends Study (NHATS), a national survey of Medicare beneficiaries beginning in 2011, has reengineered traditional activity limitation measures to allow for the first time on a national basis identification of individuals who successfully accommodate declines in capacity (Freedman et al., 2011). Using NHATS, Freedman and colleagues (2014) found that more than one in four older adults may be classified as successfully accommodating, but substantially lower estimates were found for race/ethnicity minorities and those with low income. In addition, quality of life indicators did not differ between those who were fully able and those who successfully accommodated. The cross-sectional analysis explored only bivariate relationships, however, leaving important gaps in understanding of predictors and quality-of-life-related consequences of the successful aging construct.

This article provides the first national portrait of incident and persistent successful accommodation among older adults and implications of such changes for quality of life. We describe incident and persistent groups in terms of their health and functioning, demographic and socioeconomic factors, and the extent of assistive devices and environmental features (both in place and added) and associated costs. We posit that those who are unmarried and have fewer adult children but more economic resources and a supportive physical environment are more likely to successfully accommodate and that those who adapt in this way are comparable to persons who are fully able with respect to participation in activities that they value and maintenance of wellbeing. Discussion focuses on public health and policy implications that stem from a focus on successful accommodation.

Data and Methods

Data

We draw upon the first two rounds of NHATS, a national panel study of older adults designed to study late-life disability trends and trajectories. Since 2011, NHATS has conducted annual in-person interviews with a nationally representative sample of individuals ages 65 and older enrolled in Medicare. The initial NHATS cohort was 8,245 older adults, including 7,609 respondents living in settings other than nursing homes who were interviewed in person (71% response rate). In Round 2, 86% of survivors were re-interviewed ($N = 6,056$). NHATS collected detailed

information on participants' physical and cognitive capacity; how activities of daily life are carried out; the social, physical, and technological environment; and subjective wellbeing and participation in valued activities. A physical performance battery and measures of cognition provide complementary measures of physical and cognitive capacity. In addition, information is obtained on family and economic status (Kasper & Freedman, 2015).

Measures

Successful accommodation

For each self-care and mobility activity (going outside, getting around inside, getting out of bed, eating, getting cleaned up, using the toilet, and dressing), NHATS participants were first asked about use of devices or environmental modifications (canes, walkers, wheelchairs, scooters, grab bars, bath/shower seat, eating and dressing devices) and help from another person during the previous month. Those who ever performed the activity without help were asked about difficulty when doing the activity alone (with the particular devices or environmental features named earlier, if used). For activities other than getting out of bed, toileting, and eating, participants were asked about changes in the last year in the frequency of activity performance.

From these measures we created three hierarchical categories for each activity: (a) no device use, reduction in activities, difficulty, or assistance (*fully able*); (b) device use, but no reduction in activities, difficulty performing by oneself (when using devices), or assistance from another person (*successful accommodation*); and (c) reductions in activities, difficulty, or assistance (*limited*).

We created a summary measure indicating the lowest level of functioning across all activities. Measures of the seven activities have statistical properties that suggest they belong in the scale ($\alpha = 0.93$) and a validation study conducted by NHATS investigators suggests good test-retest reliability for this type of hierarchical measure over a 2- to 4-week period ($\kappa = 0.6$) (Freedman et al., 2011). This scale differs fundamentally from many others in the gerontology literature. Previous scales have generally differentiated individuals with no limitations from those reporting difficulty without using help or special equipment and those receiving assistance from another person, an approach that precludes identifying the subset of persons who fully address limitations through use of assistive devices.

Subjective wellbeing and participation restrictions

NHATS asks nonproxy respondents four items reflecting positive and negative emotions (frequency in the last month of feeling cheerful, bored, full of life, upset) and three reflecting self-realization (extent of disagreement with statements about purpose in life, self-acceptance and environmental mastery, adapted from Ryff & Keyes, 1995). We coded items so that 0 indicates low wellbeing and summed them to form a scale ranging from 0 to 22. Factor analysis

confirmed that these items formed one factor with loadings 0.47 or higher. We omitted from models a small number (<50 in each year or about 1.5%) with at least one missing response.

NHATS also asks in the last month about visiting in person with friends or family; attending religious services; participating in clubs, classes or other organized activities; and going out for enjoyment. For each activity, whether the person valued the activity (a lot, somewhat, or not at all) and whether their health or functioning kept them from doing the activity in the last month was queried. Respondents also were asked whether in the last month if they worked, volunteered, or had a favorite activity that they carried out and whether their health or functioning kept them from doing each activity. Participation restrictions were defined as not being able to do a valued activity or not being able to work, volunteer or carry out a favorite activity due to health or functioning.

Health and functioning

To measure multi-morbidity, we created a count of chronic conditions (0–13) in each year. We included history of a heart attack, heart disease, high blood pressure, arthritis, osteoporosis, diabetes, lung disease, stroke, Alzheimer's or dementia, cancer, or a broken or fractured hip, and current symptoms of depression and generalized anxiety based on previously validated scales (Kroenke, Spitzer, Williams, & Löwe, 2009; Lowe et al., 2009).

NHATS included several established physical performance measures: usual walking speed, balance tests, rapid chair stands, grip strength using a hand held dynamometer, and peak air flow. For each test, quartiles were used to assign values 1–4 and 0 was assigned to individuals meeting exclusion criteria related to functioning, unable to complete a test, or not attempting it for safety reasons (Kasper et al., 2012). A composite score was calculated by summing the five scores. We imputed missing scores for the physical performance measures (13% and 14% of the analytic sample in 2011 and 2012, respectively) based on age, gender, a self-reported physical capacity scale (Freedman et al., 2011), and, for those with only one (6%–7%) or two (3%) missing tests, a score based on the number of tests completed. Separate prediction models were estimated for different patterns of missing information; R^2 calculations for all but one model fell in the 0.88–0.97 range.

To measure memory, NHATS included a 10-word recall test. A randomly assigned list of nouns was read to respondents at 2-s intervals (Ofstedal et al., 2005). Participants were asked to recall as many words as possible, in any order, in up to 2 min (immediate recall) and again after a brief interval (delayed recall). For the 2%–3% of participants in the analytic sample with missing scores in 2011 and 2012 we assigned a predicted score based on gender, age, self-reported (or proxy-reported) memory, whether the respondent was a proxy, and education level.

We also combined these three measures to create an indicator of successful aging as defined in the Rowe and Kahn framework: no chronic conditions, top quartile for physical functioning (score of 13 or more) and top quartile for cognitive functioning (score of 9 or more).

Demographic and socioeconomic covariates

Age and gender were confirmed with participants. Race was reported using eight categories (White, Black, American Indian, Alaskan Native, Asian, Native Hawaiian, Pacific Islander, and other). Respondents giving multiple responses were asked to identify a primary race. NHATS also asked whether participants considered themselves Hispanic or Latino. For this study, we classified primary race/ethnicity as follows: White non-Hispanic, Black non-Hispanic, Hispanic, and all other (including unknown, but primarily Asian).

We also control for marital status (currently married/cohabiting, formerly married, and never married), number of living children, completed education (less than high school; high school; some college; college; and post-college degree), annual income from all sources, and home ownership. For income, we used an imputed value provided by NHATS to construct quartiles with cut points at \$15,000, \$30,000, and \$60,000.

Environmental features and devices

NHATS asked annually about home environmental features: a ramp, elevator, stair glide, grab bars (in the shower or tub or around the toilet), a seat for the shower or tub, and a raised toilet. We distinguish those who had no features in either year (2011 or 2012), from those with one or more in 2011, and from those who by 2012 had added or moved to a new environment that had one or more feature. In addition, NHATS asks whether participants or family members paid for adding such features in the last year and whether they paid in the last year for assistive devices including glasses or vision aids, a hearing aid, a cane, a walker, a wheelchair, a scooter, a reacher/grabber, items to help with dressing or adapted utensils for eating. The amount paid is collected through a series of questions with answers more than \$X, less than \$X or about \$X; from this information we constructed a four-category measure (<\$100, \$100 to <\$500, \$500 to <\$1,000, and \$1,000 or more).

Analytic Sample and Methods

We focus on two groups at baseline: those who in 2011 are fully able to carry out self-care and mobility-related activities and those who have successfully accommodated. To compare outcomes 1 year later, we further limit the analyses to those who are among the 6,056 NHATS sample members who survived to Round 2. We use 2012 analytic weights that account for differential probabilities of selection at baseline and nonresponse.

We first present national estimates, age profiles, and selected characteristics for all those who survived to 2012.

We describe and test for differences across all groups in the outcomes of interest (wellbeing and participation restrictions) and in key health and functioning, demographic, socioeconomic characteristics and environmental features (such as grab bars and bath seats) and devices (such as canes or walkers). However, two groups are of special interest: incident successful accommodation (fully able in 2011 to successful accommodation in 2012) and persistent successful accommodation (successful accommodation in both years). We model characteristics of both incident and persistent successful accommodation using a multinomial logistic regression model, with omitted categories consisting of individuals who remain fully able (in incidence models) or transition back to fully able (in persistence models). Finally, we model wellbeing (using regression) and participation restrictions (using logistic regression) in 2012 among the fully able in 2011 ($N = 1,555$ nonproxy cases and $N = 1,653$ cases for wellbeing and participation models, respectively) and among those successfully accommodating in 2011 ($N = 1,458$ and $N = 1,541$ for wellbeing and participation models, respectively). We focus on differences in outcomes for incident and persistent successful accommodation versus fully able. For each model we present unadjusted estimates and then estimates adjusted for baseline wellbeing or participation restrictions and other covariates of interest. Full models are available in Supplementary Material.

Results

Prevalence, Incidence, and Persistence of Successful Accommodation

In 2011, 32% of adults ages 65 and older living in settings other than nursing homes who survived to 2012 were fully able to carry out mobility and self-care activities and another 26% had successfully accommodated their limitations (Table 1). In contrast, only about 5% of the population could be classified as successfully aging using criteria for the original paradigm (not shown).

About 5% of older adults transitioned to successful accommodation from fully able (incident) between 2011 and 2012. Another 16% continued to successfully accommodate their limitations (persistent). Incidence is stable at roughly 5% for each age group through age 80–84 before declining for ages 85 or older, whereas persistence increases through age 80–84 before declining. Among those fully able in 2011, 16% experienced incident successful accommodation, and the percentage increased through age 85–89, peaking at 28%. Among those who were successfully accommodating in 2011, 60% continued successfully accommodating in 2012, a percentage that remained roughly stable through age 80–84 before declining.

Bivariate Relationships With Wellbeing and Participation Restrictions

Differences across groups in wellbeing and participation are evident (Table 2). Levels of wellbeing are similar in both years

Table 1. Percent With Incident and Persistent Successful Accommodation of Self-Care and Mobility Activities, U.S. Adults Ages 65 and Older, By Age Group

2011	Fully able (32.3%)			Successful accommodation (26.0%)		
2012	Fully able	Successful accommodation (incident)	Limited	Fully able	Successful accommodation (persistent)	Limited
All, and by age, 2011	Among all older adults ^a					
All	22.5	5.2	4.7	4.1	15.6	6.3
65–69	33.7	5.5	5.4	4.3	14.2	3.9
70–74	28.5	5.6	5.2	5.1	15.6	4.6
75–79	17.1	5.7	4.9	5.1	17.2	8.3
80–84	11.8	5.2	4.1	3.0	18.9	8.6
85–89	6.1	3.4	2.5	1.4	14.0	9.9
90+	2.4	1.3	1.5	0.9	10.1	8.4
	Among fully able in 2011			Among successful accommodation in 2011		
All	69.5	16.0	14.5	15.6	60.1	24.2
65–69	75.6	12.3	12.1	19.0	63.4	17.5
70–74	72.5	14.2	13.3	20.1	61.8	18.1
75–79	61.8	20.5	17.7	16.6	56.2	27.3
80–84	55.9	24.6	19.5	9.9	61.9	28.3
85–89	50.9	28.1	20.9	5.5	55.5	39.0
90+	45.6	25.2	29.2	4.8	52.1	43.1
N	1,084	301	268	220	900	421

Note: ^aAdults ages 65 and older in 2011 living in settings other than nursing homes and surviving to 2012 (N = 6,056).

Table 2. Wellbeing and Participation Restrictions, U.S. Adults Ages 65 and Older, By Accommodation Status

2011	Fully able			Successful accommodation			
2012	Fully able	Successful accommodation (incident)	Limited	Fully able	Successful accommodation (persistent)	Limited	<i>p</i> Value ^a
2012							
Wellbeing score (mean)	18.3	18.2	16.5	18.0	18.0	16.6	.00
Participation restriction	11.4	14.2	37.0	14.2	21.2	43.2	.00
2011							
Wellbeing score (mean)	18.6	18.4	17.5	18.2	18.2	17.5	.00
Participation restriction	6.7	10.7	13.0	11.5	11.9	24.4	.00
N Wellbeing	1,029	284	242	207	866	385	
N Participation	1,084	301	268	220	900	421	

Note: ^a*p*-value for design-based *F*-test for participation restriction and for model based *F*-test (vs. null) for wellbeing score (within year).

for those who are either fully able or successfully accommodating their limitations, and higher relative to those who were limited in 2012. Participation restriction shows a similar pattern, but is far more responsive, with values two to three times higher in both years for those classified as limited relative to those who are fully able or successfully accommodating their limitations. Those with incident or persistent successful accommodation have greater participation restriction in 2012 compared with the fully able, although their level of restriction is far less than for those who are limited.

Bivariate Relationship With Other Covariates

Among those fully able and those successfully accommodating in 2011, gradients in morbidity, physical capacity, and cognitive capacity are evident by 2012 status (Table 3). Estimates of successful aging in 2011 also vary across these groups from 13% if fully able in both years, to only 1% if successfully accommodating in 2011 and limited in 2012. Incident and persistent successful accommodators have similar morbidity and physical and cognitive capacity levels and changes.

Table 3. Characteristics of U.S. Adults Ages 65 and Older, By Accommodation Status in 2011 and 2012

2011	Fully able				Successful accommodation			
2012	Fully able	Successful accommodation (incident)	Limited	<i>p</i> Value ^a	Fully able	Successful accommodation (persistent)	Limited	<i>p</i> Value ^a
Health and functioning								
Chronic conditions, 2011 (m)	1.9	2.1	2.3	.00	2.1	2.4	2.9	.00
Change in conditions (m)	0.18	0.25	0.39	.00	0.22	0.22	0.38	.00
Physical score, 2011 (m)	14.8	13.8	12.5	.00	13.7	12.4	10.3	.00
Change in physical score (m)	-0.23	-0.26	-0.85	.05	-0.16	-0.14	-1.07	.00
Cognitive score, 2011 (m)	9.5	9.1	8.6	.01	9.0	8.9	7.9	.00
Change in cognitive score (m)	0.25	0.18	-0.04	.63	0.51	0.28	0.14	.34
Successful aging, 2011	12.6	5.3	3.3	.00	6.6	4.4	1.2	.01
Demographic and socioeconomic factors								
Age, 2011 (m)	71.7	74.0	73.6	.00	73.4	75.2	77.5	.00
Female	43.5	48.1	47.9	.26	51.8	63.6	60.8	.01
Race/ethnicity				.01				.00
White	84.3	84.1	74.8		81.4	90.7	82.4	
Black	5.8	8.5	9.6		7.4	5.0	8.6	
Other	4.6	4.3	9.0		7.8	1.9	3.3	
Hispanic	5.4	3.1	6.6		3.4	2.5	5.7	
Marital status				.00				.07
Married	70.2	58.7	61.6		62.0	59.3	51.7	
Previously married	27.2	37.5	36.5		36.5	37.2	44.6	
Never married	2.7	3.8	2.0		1.6	3.5	3.8	
Number of children (m)	2.7	3.0	2.9	.06	2.6	2.9	2.9	.05
Education				.06				.00
<High school	14.2	15.3	23.1		19.5	13.6	21.0	
High school	32.5	29.4	32.9		30.7	38.4	37.3	
Some college	18.5	21.3	16.2		14.6	21.2	15.8	
College grad	34.8	34.0	27.8		35.2	26.8	25.9	
Income, 2011				.00				.01
1st quartile	13.2	19.1	26.8		16.9	16.3	22.7	
2nd quartile	17.3	19.3	24.8		18.0	20.8	26.6	
3rd quartile	29.2	28.5	23.0		32.6	32.5	28.0	
4th quartile	40.3	33.1	25.5		32.5	30.5	22.7	
Own home	83.2	75.3	77.4	.01	82.7	80.9	73.5	.02
Environmental features and devices								
Had environmental feature	31.8	56.5	35.3	.00	83.1	90.7	86.4	.00
Added feature	3.9	29.2	19.1	.00	8.2	16.0	22.3	.00
Paid for feature	6.0	26.9	25.9	.00	13.3	21.0	30.3	.00
Cost				.74				.39
<\$100	23.9	24.7	27.8		28.9	28.2	31.0	
\$100 to <\$500	28.3	38.4	33.6		45.5	27.6	31.2	
\$500 to <\$1,000	15.4	15.4	18.3		12.3	20.3	22.0	
\$1,000 or more	32.5	21.6	20.2		13.3	23.9	15.8	
N	1,084	301	268		220	900	421	

Note: ^a*p*-value for design-based *F*-test for categorical variables and for model based *F*-test (vs. null) for means.

Group differences are also evident for several demographic and socioeconomic characteristics. Those who transition to successful accommodation are on average age 74, whereas those who remain fully able are on average less than age 72. Compared with those who remain fully able, those who transition to successful accommodation are more likely to be

Black, less likely to be married, more likely to be low income and less likely to own their home. Compared with those who transition back to being fully able, those who persistently successfully accommodate are older (75 vs. 73), more likely to be female, more likely to be White, and less likely to be married (although the latter result is significant at *p* = .07). Compared

to those who transition to fully able, persons who persistently successfully accommodate also are more likely to have only a high school degree or some college education, have lower incomes and are less likely to own their home.

The presence, addition, and payment for environmental features and modifications varied by group but payment amounts in the last year did not. Over half of the incident successful accommodation group had environmental features in 2011, when they were fully able, compared with only a third of those who transitioned from fully able to limited. Similarly, 29% of those who were in the incident group added or moved to a place with at least one feature, far more than either of the other two groups, and a similar percentage paid for features or other devices in the last year. Those who persisted in successful accommodation were most likely to have an environmental feature (91%) but those who transitioned to limited were more likely to add features and pay for features or devices. A sizeable percentage of the incident (27%) and persistent (21%) groups paid for environmental features or devices in the last year. Levels of expenditures did not vary across groups (<\$500 among those with expenditures). As shown in Supplementary Table 1, environmental features were more common than other devices, and the two most common features across all groups were grab bars and a seat for the shower or tub.

Multivariate Models

Among those fully able in 2011, the chances of transitioning to successful accommodation are lower the higher the baseline physical capacity score (Table 4). In addition, being age 75–79 through 84–89, having more children, not owning one's home, and having an environmental feature already in place all predict transition to successful accommodation from fully able. Persistent successful accommodation is associated with being age 85–89, female, having more children, having a high school degree or some college, and having a home with an environmental feature already installed. Those reporting their race as other also have a much lower chance of persistently accommodating and a higher chance of transitioning back to fully able.

Table 5 shows changes in wellbeing and participation for those with incident or persistent successful accommodation and those who became limited, relative to the fully able in 2012, before and after adjusting for potentially confounding factors. In unadjusted models, those who were fully able in 2011 and experienced incident successful accommodation had no significant change in wellbeing or participation restrictions relative to those who remained fully able, and the nominal change is further reduced after controlling for baseline wellbeing or participation restrictions and differences in health and functioning, demographic and socioeconomic factors, and environmental features/devices (Table 5, left panel). In contrast, those who transitioned to being limited experienced a significant decline in wellbeing and an increase in participation restrictions, both before and after adjusting for confounders.

Among those who successfully accommodated in 2011 (right panel), those who persistently accommodated also had no significant change in wellbeing relative to those who returned to fully able in 2012, but they did experience small but significant increases in participation restrictions that were somewhat reduced in adjusted models. Those who transitioned to being limited, experienced both significant reductions in wellbeing and far larger significant increases in participation restrictions relative to the fully able.

Discussion

Our findings indicate that when the concept of successful aging is reframed to emphasize the ability of the older population to maintain independence, nearly a quarter have put in place accommodations that allow them to carry out daily activities with no assistance or difficulty. Another third of the older population are fully able to carry out daily activities. Together these estimates (58%) are substantially higher than even the least stringent definition of successful aging reported in McLaughlin and colleagues (36%; 2012).

We find incident and persistent successful accommodation is more common during the 8th decade (ages 80–89), for those with more living children, and for those who are living in homes with environmental features already installed. Individuals who successfully accommodate, both incident and persistent groups, also maintain high levels of wellbeing on par with those fully able and participate in valued activities well above those who are limited. These relationships are robust after controlling for other differences between groups. We also found about one-quarter of the group classified as successfully accommodating paid for environmental features or devices in the last year and the majority paid less than \$500.

Our study has several limitations. Although we define success as the ability to accomplish goals independently, maintain well-being, and participate as fully as possible in valued activities, our use of the term, nevertheless, implicitly conveys that individuals who carry out activities independently and with ease in later life are more effective in their daily lives than those who receive help or have difficulty. We recognize that this normative definition is not uniformly applicable. Younger populations who are aging with disability or younger generations may experience accommodations differently than cohorts born prior to the second World War. For example, Iezzoni (2014) in contrasting older and younger generations posits that for younger cohorts, "accommodations, including the physically-intimate assistance of a personal care assistant with basic activities of daily living, facilitate independence under the assumption of consumer-directed services." At the same time, this analysis demonstrates a strong link for the current older generation between successful accommodation, as conceptualized here, and subjective end points evaluated by the older adult that capture both pleasure and self-realization (Ryan & Deci, 2001)—participation in self-defined valued activities

Table 4. Predictors of Incident and Persistent Successful Accommodation

	Among fully able in 2011		Among successful accommodation in 2011	
	Incident successful accommodation (vs. fully able)	Limited (vs. fully able)	Persistent successful accommodation (vs. fully able)	Limited (vs. fully able)
2012	β (SE)	β (SE)	β (SE)	β (SE)
Health and functioning				
Chronic conditions, 2011	0.07 (0.05)	0.10 (0.05)*	0.13 (0.07)	0.23 (0.08)**
Change in conditions	0.19 (0.12)	0.36 (0.09)**	-0.08 (0.16)	0.32 (0.18)
Physical score, 2011	-0.06 (0.03)*	-0.22 (0.03)**	-0.05 (0.03)	-0.27 (0.04)**
Change in physical score	-0.02 (0.03)	-0.17 (0.03)**	-0.03 (0.03)	-0.23 (0.04)**
Cognitive score, 2011	0.02 (0.03)	0.00 (0.03)	-0.01 (0.04)	0.00 (0.04)
Change in cognitive score	0.01 (0.04)	-0.03 (0.04)	-0.03 (0.04)	-0.03 (0.04)
Demographic and socioeconomic factors				
Age (vs. 65–69)				
70–74	0.03 (0.21)	-0.27 (0.22)	-0.19 (0.29)	-0.58 (0.32)
75–79	0.54 (0.22)*	0.02 (0.29)	-0.27 (0.29)	-0.41 (0.34)
80–84	0.66 (0.26)*	-0.17 (0.35)	0.37 (0.30)	-0.11 (0.32)
85–89	0.81 (0.32)**	-0.24 (0.45)	0.88 (0.41)*	0.62 (0.44)
90+	0.76 (0.44)	0.11 (0.62)	0.81 (0.58)	0.54 (0.60)
Female	-0.04 (0.16)	-0.47 (0.19)*	0.40 (0.18)*	-0.40 (0.22)
Race/ethnicity (vs. White)				
Black	0.30 (0.20)	0.21 (0.22)	-0.44 (0.26)	-0.09 (0.31)
Other	-0.26 (0.41)	0.41 (0.30)	-1.43 (0.53)*	-1.07 (0.53)
Hispanic	-0.71 (0.38)	-0.13 (0.38)	-0.52 (0.65)	0.15 (0.56)
Marital status (vs. married)				
Previously married	0.30 (0.15)	-0.21 (0.21)	-0.21 (0.21)	-0.33 (0.24)
Never married	0.64 (0.40)	-0.80 (0.51)	0.70 (0.75)	0.19 (0.71)
Number of children	0.13 (0.05)*	0.08 (0.04)*	1.01 (0.06)*	0.13 (0.06)*
Education (vs. <high school)				
High school	0.02 (0.23)	-0.03 (0.29)	0.62 (0.27)*	0.61 (0.26)*
Some college	0.50 (0.28)	0.21 (0.32)	0.80 (0.24)**	0.57 (0.29)
College grad	0.46 (0.29)	0.46 (0.29)	0.35 (0.25)	0.72 (0.30)*
Income, 2011 (vs. 1st quartile)				
2nd quartile	-0.05 (0.24)	-0.18 (0.25)	0.04 (0.28)	0.07 (0.35)
3rd quartile	-0.24 (0.21)	-0.82 (0.26)**	0.04 (0.31)	-0.10 (0.33)
4th quartile	-0.28 (0.25)	-0.87 (0.31)**	0.06 (0.34)	-0.21 (0.41)
Own home	-0.40 (0.20)*	0.07 (0.19)	-0.17 (0.25)	-0.10 (0.28)
Environmental features and devices				
Had environmental feature	1.05 (0.15)**	0.15 (0.13)	0.88 (0.23)**	0.45 (0.30)
Constant	-1.85 (0.62)**	1.56 (0.79)	0.26 (0.71)	2.49 (0.95)**
N		N = 1,653		N = 1,541

Note: * $p < .05$. ** $p < .01$.

and self-assessed wellbeing. Whether such connections will hold going forward is an important question for future research, as is whether the beneficial effects of successful accommodation, as we have conceived it, lasts for a substantial period, what life-course predictors are important in laying the ground work for successful accommodation, and whether successful accommodation is linked to less subjective outcomes like mortality, hospitalizations, and falls.

We also acknowledge that our definition of successful accommodation is limited to a handful of mobility and self-care activities and oversimplifies the complex course of older

adults' lives by including only two time points. We focus on mobility and self-care in part because such activities—although not the only targets of functional preservation—have long been recognized as essential to older adults' wellbeing and to their continued social and community participation. In the future, the concept of successful accommodation could be extended to include household activities and to focus on trajectories over a longer time horizon.

Despite these limitations, our findings have potentially important implications for enhancing participation and wellbeing for older adults. The numbers currently accommodating

Table 5. Influence of Incident and Persistent Successful Accommodation on Wellbeing and Participation, U.S. Adults Ages 65 and Older

	Among those fully able, 2011		Among those successfully accommodating, 2011	
	Unadjusted	Adjusted ^a	Unadjusted	Adjusted ^a
Wellbeing score 2012 (mean)				
Successful accommodation vs. fully able in 2012	-0.12	-0.01	0.04	0.11
Limited vs. fully able in 2012	-1.79**	-0.88**	-1.38**	-0.68**
	N = 1,555		N = 1,458	
Participation restriction 2012 (Yes/No)				
Successful accommodation vs. fully able in 2012	0.25	0.07	0.48*	0.42*
Limited vs. fully able in 2012	1.52**	1.28**	1.52**	1.16**
	N = 1,653		N = 1,541	

Notes: ^aAdjusted for baseline wellbeing or participation restriction status and variables in Table 3 (health and functioning, demographic and socioeconomic factors, and having, adding, and paying for environmental features/devices).

* $p < .05$. ** $p < .01$.

loss of function are substantial, but drop off as people enter their mid-80s. In addition, contrary to our expectations, successful accommodation is more common among those with more living children, suggesting adult children may play an important role in identifying and encouraging parents to incorporate assistive devices into their daily lives. Moreover, consistent with McLaughlin and colleagues (2012), we found that advanced age, not having a college education, and lower income were associated with lower rates of onset of successful accommodation and higher rates of transition to limitation. Thus, our findings suggest a potentially important role for public policy in addressing disparities in successful accommodation related to smaller family size, low education, and low socioeconomic status through increasing accessible environments and access to effective assistive devices. Targeting those with a high school or some college education may be especially fruitful as these groups continue to increase in the future. Studies are also needed to determine how best to target those age 85 and older to enhance their ability to maintain a high quality of life.

We have also demonstrated that the ability to continue the maximum feasible level of independent activity through effective accommodative measures can preserve wellbeing and the ability to participate in valued activities. Our results therefore support redoubling current public program focus on integrated whole-person care. Such programs aim to not only better manage and slow progression of existing disease but also attend to the physical environments in which older people live. The conclusion that those who successfully accommodate have wellbeing similar to those with no restrictions is also an important reminder that, in addition to prevention, maintenance can be a valuable goal of care management.

Finally, a major contribution of Rowe and Kahn's successful aging paradigm was to draw attention to the need to investigate maintaining high physical and mental capacity at older ages. This conceptual shift has led to an increased appreciation that a broad range of functioning exists in later life. Our study shares with earlier work on successful aging the view

that functioning in the older population should be characterized in terms of a spectrum. However, unlike the successful aging concept, which identifies a relatively small group at one extreme, the construct of successful accommodation identifies a substantial group in the middle. Because of the link between successful accommodation and quality of life outcomes, a focus on expanding successful accommodation to those who experience declines in capacity (and are therefore at risk of further declines along the spectrum) may be an especially effective means of promoting participation and wellbeing in later life.

Supplementary Material

Please visit the article online at <http://psychsocgerontology.oxfordjournals.org/> to view supplementary material.

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