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Transitions in Mobility, ADLs, and IADLs among working-age Medicare beneficiaries

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Abstract

Background—Disability is a dynamic process where functional status may change over time. Examination of the Medicare population suggests that, for those over age 65, disability status will fluctuate in 30% of beneficiaries each year. Less is known about those under age 65. The dynamic nature of disability is of relevance since it has important implications for social policies related to disability.

Objectives—To: 1) describe the characteristics of Medicare beneficiaries eligible due to disability; and 2) estimate the proportion of individuals with transitions in functional status over a one-year period stratified by baseline characteristics and diagnostic subgroups.

Methods—We used the Medicare Current Beneficiary Survey from 1995 to 2005 to examine transitions in mobility and daily activities among individuals who were eligible for Medicare coverage due to disability.

Results—From the standpoint of function in mobility and daily activities, the working-age Medicare population with disability is fairly stable. While 75%–90% of our sample reported no disability or stable disability from one year to the next, depending on the condition and disability metric, as many as 13–14% of individuals showed improvement or decline in their functional status.

Conclusions—In the working-age population with disability, a small percentage of individuals will improve or worsen from one year to the next. Since these transitions are associated with a variety of individual characteristics including health conditions, further research applied to larger samples is required to refine policy relevant models that might inform decisions related to ongoing eligibility for disability programs.

Keywords

Disabled persons; Limitation of activity; Mobility limitations; Government programs

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Introduction

Over the past several decades, rehabilitation researchers have made significant advances in understanding the causes and consequences of disability. We know that individuals with disabilities have higher health care costs, even after accounting for their health conditions.¹ They have less access to care and are less likely to be satisfied with the care they receive.^{2–4} Contemporary concepts of disability suggest that it is not a static or dichotomous phenomenon, although it is often described as such in order to simplify analyses or advance policy discussions.

Disability is currently depicted as an interactive, dynamic process where people may improve or worsen over time.⁵ Prior work done in the Medicare population suggests that, for those over age 65, disability status will fluctuate for 30% of beneficiaries each year.⁶ Less is known about those under age 65. The dynamic nature of disability has a profound impact not only on health care costs but on social policy. As of January 2013, the Social Security Administration (SSA) was providing disability benefits to over 14 million children and adults, representing over 4% of the U.S. population, at an estimated federal and state cost of \$200 billion dollars.^{7,8} These payments are made to individuals who, for health reasons, cannot work (in addition to low income adults and children who are blind, have a disability, or are over the age of 64). Current SSA rules mandate that individuals enrolled in these programs receive periodic medical continuing disability reviews (CDRs) to determine whether they still meet the medical requirements for program eligibility.

As a practical matter, these redeterminations have been difficult to obtain given the enormous backlog of initial applications already facing the SSA disability program. Over the last decade, disability applications have risen dramatically, at a rate of 31% since FY 2007, totaling 3.2 million claims in 2012.^{9,10} In their March 2010 report on CDRs, SSA estimated a backlog of over 1.5 million individuals who needed to be reassessed at the end of FY 2010.⁹ As a result, SSA estimated that from 2005 through 2010, \$1.3 to 2.6 million dollars were spent in benefit payments that could have been avoided had the medical CDRs in the backlog been conducted when they were due.

In an effort to understand more about disability transitions in general, and among the U.S. working-age population in particular, we examined data from the Medicare Current Beneficiary Survey (MCBS), a nationally representative, longitudinal survey of Medicare beneficiaries. We focused our efforts on those under age 65, who qualified for Medicare benefits based on disability status. Our objectives were to: describe the characteristics of Medicare beneficiaries eligible due to disability; and estimate the proportion of individuals who make transitions in functional status level over a one-year period stratified by baseline characteristics and diagnostic subgroups.

Methods

Data source and analytic sample

Our analytic sample was composed of individuals who participated in the MCBS from 1995 to 2005 and were eligible for Medicare coverage for reasons other than age or end-stage renal disease (ESRD). The MCBS is an on-going national survey that selects a representative sample from all Medicare beneficiaries enrolled during a calendar year by using a multi-stage sampling procedure. The United States is divided into 107 geographic primary sampling units (PSUs), each composed of a group of counties, which are then subdivided into ZIP code areas. Systematic random samples stratified by age are collected within those areas. Participants are enrolled in the MCBS for up to four years and are interviewed once a year (autumn quarter) on various aspects of their health status. This

interview is followed by two more interviews on health care utilization, collected four months apart. Demographic and health status variables refer to the person's status in the autumn quarter, while survival and health-related costs refer to the entire year of the interview. We used the *Cost and Use* database which links to payment data. Survey design and methods for the MCBS have been described.¹¹

Participants less than 65 years old at the time of their first interview, who were eligible for Medicare by reasons other than ESRD, and who had at least two consecutive interviews were included in the sample. The number of consecutive interviews varied due to the design of the MCBS where participants rotate in and out; death during the survey year; and respondent refusal to continue participation in the survey.

Analytic variables

During the yearly interview (autumn quarter), the status of mobility limitation, activities of daily living (ADL), and instrumental activities of daily living (IADL) were obtained for each participant. Mobility limitation was defined according to the algorithm developed by Shumway-Cook et al.¹² based on four walking-related questions ("Do you have any difficulty walking?," "Do you have any difficulty walking ¼ of a mile," "Do you need help from a person to walk?," and "Do you use equipment to walk?"). Five categories of mobility limitation were defined based on responses to these questions: none (no difficulty with walking any distance), mild (difficulty walking 2 to 3 blocks or difficulty walking but without need of help or equipment), moderate (difficulty walking with need of equipment but without need personal help), severe (difficulty walking and need of personal help to walk), and does not walk (individual reported "not walking"). ADL and IADL questions asked respondents about difficulties with certain activities. Respondents could answer "yes," "no," or "don't do it." In the latter case, there was a follow-up question asking if the respondent did not do the activity due to health problems. Respondents were classified as having difficulty with an activity if they answered "yes" to the first question or "don't do it" followed by "yes" to the second question. ADL questions asked about difficulty bathing, dressing, eating, walking, toileting, and transferring from a bed to a chair. IADL questions asked about difficulty using the telephone, doing light housework, doing heavy housework, preparing meals, shopping, and managing money. For each respondent, we counted the number of ADL and IADL activities for which they reported difficulty.

Demographic and clinical data at baseline (1st interview) included: age, sex, race/ethnicity, education level (less than high school [HS] vs. HS graduate or higher education), income level (less than \$25,000 vs. \$25,000 or more per year), marital status (married vs. not married), self-reported health status (fair, poor, good, very good, or excellent health), smoking status (smoking now vs. not smoking), living status (living alone vs. not living alone), living setting (living in the community for the entire year, living in a facility for the entire year, or living part of the year in the community and part in a facility [both]), body mass index (BMI), number of co-morbidities (0, 1, 2, 3, or 4 or more among 18 self-reported medical conditions such as high blood pressure and arthritis), and primary reason for Medicare eligibility.

Transition States and Types of Transitions

The five mobility limitation categories plus the category "death" constituted the set of all possible mobility states. Similarly, "death" was one of the states for total number of ADL and IADL difficulties. A transition was defined as a set of two states representing the person's state at the first and subsequent interview (one year later). Each person could contribute one or two sets of transitions, depending on the number of interviews in which they participated and whether they died during a certain year. Death was an absorbent state,

since no further transitions were possible. Transitions were further categorized into five types: no disability, stable, improving, worsening, and death. Note that, since the MCBS is a self-report survey and slight variations in response from one year to another could affect transition status, we defined improvement and worsening as changes of at least two categories (for better or for worse, respectively). Thus, respondents in the “no disability” category reported no limitations in mobility, ADLs or IADLs at either interview. Those in the “stable” category reported some limitation that was the same or one level better or worse across the interviews. Those in the “improving” and “worsening” categories reported limitations that were 2 or more levels better or worse between interviews, respectively. Respondents who died during the time frame of the study were included in the “death” category.

Statistical Analysis

Descriptive analyses were performed for all variables in the study. For categories of baseline characteristics, we calculated the proportion of individuals in each transition type for each of the three functional disability measures. Chi-square tests were performed to examine homogeneity of distribution among the categories of baseline characteristics. The level of statistical significance was set at $\alpha = 0.05$ and no attempt was made to correct for multiple comparisons, as this was an exploratory study. Analyses were performed using SPSS-PASW 18.0 for Mac (Chicago, 2007).

Results

We identified 5,948 Medicare beneficiaries who were eligible for benefits based on their disability status. Of those, 1,107 (19%) had data for two interviews and 4,841 (81%) had three interviews. Table 1 shows the descriptive characteristics at baseline for all participants. The mean age at baseline was 45.7 years (SD = 10.5, median 44.0, range 21–64). The sample was comprised of mostly white men with a low annual income. Roughly one third of the participants had less than a high school education (37%) and were married (32%). About 38% smoked at the time of the interview and 67% of the participants were overweight or obese. At least three comorbid conditions were reported by 49% of the sample at baseline, with mental disorders, hypertension, and arthritis most commonly cited (47%, 42%, and 41%). Fifty-six percent of the sample reported fair or poor general health. Only 22% reported living alone at the baseline interview and about 10% of the participants were in facilities for at least part of the interview year. The proportion of deaths for each year of follow-up remained stable.

At the time of the first interview, the five most cited primary reasons for Medicare eligibility (Table 2) were mental disorder (20.6%), mental retardation (12.5%), back/spine/disc problems (8.6%), rheumatoid or other type of arthritis (7.3%), and stroke (3.8%), with 16% reporting a non-specific primary reason for eligibility. Most of the missing information for this variable was associated with respondents who were in facilities for all or part of the year of the interview.

Transitions in Mobility Limitation

Table 3 shows the percentage of individuals across transitions in mobility limitation by baseline characteristics. Percentages are relative to row totals. For example, there were 361 individuals who were 20–29 years of age at the first interview, and 59% of them reported no mobility limitation on both interviews, 37% reported stable limitation, 2% reported improving limitation, 2% reported worsening limitation, and 0.6% died before the 2nd interview.

Only race/ethnicity ($p = .84$), education level ($p = .25$), and smoking status ($p = .27$) were not statistically associated with type of mobility transition. As age increased, the percentage of individuals with no mobility limitations on both interviews decreased while the percentage with stable mobility limitation increased. The groups reporting improvement and worsening of mobility limitations were comparable in magnitude, with a small increase in magnitude after age 40. Males tended to report no limitation and death more often than females. Higher income and married individuals tended to report more stable and improving mobility limitations than lower income and unmarried counterparts. Underweight or obese people, at the two extremes of BMI, were more likely to report stable mobility limitation and less likely to report no limitation. In particular, the underweight group, though small in size, had the highest percentage reporting worsening mobility limitation and death. As expected, reports of no mobility limitation decreased sharply with increasing co-morbidities, while the percentages for all other transition types increased. While a similar percentage of individuals in good-to-excellent health reported no limitations and stable limitations, only 15% of those in fair or poor health reported no mobility limitation. This latter group reported a larger percentage of improving, worsening, and dying before the second interview. Individuals living with others reported stable, improving, and worsening transitions more often than the ones living alone. We did not perform a statistical test to examine differences in transition status across settings, since the groups of individuals who were in a facility for all or part of the year had very small sample sizes relatively to the group in the community.

Transitions for ADL Difficulties

Table 4 shows the results for transitions in ADL difficulties. Only education level ($p = .70$) and smoking status ($p = .06$) were not statistically associated with type of ADL transition. As age increased, the percentage of individuals with no difficulties on both interviews decreased with an increase in the percentages of all other types of transition. Higher percentages of no difficulty in both interviews were observed for people who were male, non-white, had incomes less than \$25,000/year, were not married, were smokers, reported good-to-excellent health, and who lived alone. For BMI, the percentages of people reporting no ADL difficulties were similar for normal and overweight people (around 51%), and for those who were underweight and obese (42–43%). As the number of co-morbidities increased, the percentage of individuals with no ADL difficulties on both interviews decreased.

About 14% of the entire sample improved or worsened during the year. However, the pattern of transitions differed according to baseline characteristics. For example, 8.3% of non-whites and 7.1% of whites reported improvement in ADL. On the other hand, only 6% of individuals with no co-morbidities reported improving or worsening, while 23% of the group with 4 or more co-morbidities reported improving or worsening. While this pattern is not unexpected, it provides evidence that people in certain risk categories are more likely to be unstable during a one-year period. As expected, the percentages of people reporting no limitations in both years were higher for those with ADL rather than mobility difficulties.

Transitions for IADL Difficulties

Table 5 shows the results for transitions in IADL difficulties. Only education level ($p = .49$) was not statistically significant. As age increased, the percentage of individuals with no difficulties on both interviews decreased with an increase in the percentages of all other types of transition.

Most individuals reported having some level of stable IADL disability, even by baseline characteristics. Similar percentages of individuals reported improving or worsening across most baseline characteristics. Noteworthy exceptions were males and underweight

individuals reporting more worsening transitions than females and normal to obese individuals, people with fair or poor general health reporting more improving transitions than people with good to excellent health, and people living with others reporting more improving and worsening transitions than people living alone.

Transitions by Reason for Medicare Eligibility

We examined the type of transitions for mobility, ADL, and IADL incurred by beneficiaries in the five largest condition-related eligibility groups. Table 6 shows the results for transitions in 2 consecutive years. For example, in the Medicare group by reason of mental disorder (a total of 1,104 from Table 3), 1,061 individuals had data for the 1st and 2nd interview for mobility limitations, while 873 had data for the 2nd and 3rd interviews. For the first transition, 48% of individuals reported no mobility limitation on both interviews, 48% reported stable mobility limitations, with 2% improving, 1% worsening, and 1% dying before the 2nd interview. In the second transition period, the observed percentages were 50%, 46%, 1.4%, 1.3%, and 1.3% respectively. The next lines in the table show the same type of results for ADL and IADL difficulties in the mental disorder group, followed by results in the groups defined by mental retardation, back/spine/disc problems, arthritis (any type), and stroke.

Medicare beneficiaries by reason of mental disorder tended to report large percentages of stable or no mobility limitation, while they reported very little improvement or worsening. In this group, most people reported no ADL disability, but 5% reported improvement and worsening. The majority reported stable IADL with higher percentages of people improving and worsening (about 10% each). The mental retardation group had similar patterns, except for reporting higher percentages of no mobility limitation, lower percentages of ADL disability, and much lower percentages of no IADL disability, comparatively. Improving and worsening was reported more often (about 12% in each).

The groups by reason of back/spine/disc problems and any type of arthritis behaved similarly across all measures of disability. For mobility, a very large percentage were in the stable limitation group with little improving or worsening. For ADL, the largest percentages were also in the stable limitation group, but more people reported no disability, improving, and worsening transitions. A similar pattern is seen for IADL, though more people reported to have IADL functional disability.

In the stroke group, stability was reported most often for mobility limitation, with little movement (improving or worsening). For ADL, most individuals reported no or stable functional disability, with a substantial movement. IADL had a similar pattern, but fewer people reporting no functional disability and more reporting stable functional disability.

Discussion

We have shown that, from the standpoint of function, the working-age Medicare population with disability is fairly stable from one year to the next. Whether the disability metric is mobility, ADLs or IADLs, 75%–90% of our sample either did not report any disability or their level of disability did not change from one year to the next. However, we also found that there was a substantial proportion of the cohort that reported functional improvement or decline over the short timeframe of the MCBS. Depending on the condition and disability metric, as many as 13–14% of individuals with certain conditions showed change in their functional status.

In addition to the effects of age, there are other conclusions suggested by Tables 3–5. Surprisingly, it does not appear as if education plays a significant role in disability

transitions. However, greater weight and number of co-morbid illnesses seems highly associated with the degree to which respondents demonstrate transitions in ADL and IADL function. Finally, while other baseline variables may have had a statistical association with the transitions in this cohort, the magnitude of those associations were not large.

Findings presented in Table 6 speak to the association between conditions and functional trajectories. In general, a greater percentage of adults in all condition groups reported improving/worsening transitions for daily activities rather than mobility. This could reflect an adaptive process whereby respondents learn new ways to approach daily activities in the context of their impairments. Alternately, deconditioning, worsening of the condition, or the onset of new conditions could cause decline in performance of daily activities that is not condition specific. The group with back/spine/disc problems and arthritis show the most improvement/decline for ADLs and IADLs (on the order of 8–14%) while a smaller percentage of respondents reported transitions in mobility (2–5%). While this is somewhat counterintuitive given that these conditions would be expected to affect mobility, it could be that fluctuations in pain or mobility are more apparent in the context of performing daily activities.

Our findings differ somewhat from a similar report that focused on transitions in those over age 64.¹³ In our current cohort, 35.8% of those with ADL limitations were stable, while 7.4% improved and 7.4% worsened. In the older cohort, respondents were more volatile, with 9.4% (stable), 13.0% (improved) and 17.6% (worsened). These findings are also supported by the figures on table 4, which show progressive changes as respondents age. Using a different definition of transition (the development of 2 or more new difficulties), Wolinsky et al. found declines on the order of 30% over an 8 year period across the domains of mobility, ADLs and IADLs among participants in the Assets and Health Dynamics among the Oldest Old (AHEAD) study whose data were successfully linked to Medicare claims.¹⁴ While the proportion of individuals who had declines in their sample was much greater than we report, they observed participants over a much greater time period. In another study of community dwelling older adults (65 years and older), improvements on the order of 6–9% and decline on the order of 13–38% was found after controlling for baseline functional status, prior disability, functional limitations, cognitive impairment, and comorbid disease burden.¹⁵ Stineman and colleagues¹⁶ found that different clinical traits were associated with mortality as well as functional improvement and decline in this older age group which is consistent with our findings among younger Medicare participants with disabilities. Very few studies have examined transitions in functional status among working age adults with disabilities. Among adults aged 51–61 with limitations, Choi et al. reported far greater proportions of improvement in mobility/physical function and ADL status over a 2 year period than we report. In their study, roughly one third to one half of those with 1–2 mobility/physical function limitations recovered in the 2 year timeframe of the study.¹⁷ For those with ADL limitations, one half to two thirds of those with 1–2 limitations reported no limitations by the end of the study. Of those with 3+ ADL limitations one fourth to one third reported complete recovery by the end of the study. Their data source was the 1992 and 1994 interviews from the Health and Retirement Study. Given that we examined working-age adults with disabilities from the Medicare population, in all likelihood, our cohort had much greater impairment and therefore may have been less likely to make improvements.

The dynamic nature of disability has important implications for social policies related to disability. For instance, the SSA is responsible for the largest disability programs in the U.S. Current SSA rules mandate that individuals enrolled in these programs receive periodic medical CDRs to determine whether they still meet the medical requirements for continued program eligibility. These redeterminations have been difficult to obtain given SSA's current system pressures including progressively more applications each year, as well as

backlogs in initial applications and hearings in the context of a dwindling work force. If SSA could identify only those beneficiaries most likely to improve, and therefore in need of a CDR, the gains in efficiency, time, and cost are potentially enormous. Studies such as ours demonstrate that a relatively small proportion of working-age Medicare beneficiaries with disabilities actually improve in daily activities or mobility over a two year timeframe. The implications for SSA relate not only to identifying those who are most likely to improve in order to minimize unnecessary CDRs, but also to optimizing the periodicity of CDRs.

Our findings have limitations. Measures of disability that were available in the MCBS were limited to the domains of mobility (characterized by walking) and daily activities (ADLs and IADLs). Many other types of limitations that might interfere with work such as behavioral health function, upper extremity function, other types of mobility limitations, cognitive limitations, and well as visual and hearing limitations were not captured. Thus, respondents in the “no limitation” groups may actually have had limitations relevant to work that were not captured by the survey, thus limiting our examination of transitions in disability status. Respondents’ co-morbidities were identified through self report and might be subject to recall bias and response error. Although we used data from a large national survey, the sample sizes for those who improved were relatively small. This prevented us from doing any extensive modeling that might help SSA target specific disability subgroups with a high likelihood of improvement for redetermination. Finally, in our discussion related to SSA policy issues, we used activity limitation as a proxy for work disability. This is an assumption, although not without some evidence.¹⁸

Conclusions

This study has shown that, in the working-age population with disability, a small percentage of individuals will improve or worsen from one year to the next. In addition, these transitions are associated with variety of individual characteristics including age, weight, co-morbid illnesses, and primary diagnosis. Further research applied to larger samples is required to refine policy relevant models that might inform decisions related to ongoing eligibility for national disability programs.

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Table 1

Baseline characteristics of the entire sample

Characteristics at Baseline (1 st interview)	Total Sample
Sample size	5948
Age at baseline, % in each category	
20 – 29	6.7
30 – 39	23.1
40 – 49	32.6
50 – 59	24.4
60 – 64	13.2
Sex, % of Females	42.6
Race, % of White	74.4
Income, % with 25K or less	85.5
Education Level, % with less than High School [*]	36.9
Marital Status, % married [†]	31.5
Smoking status, % smoking now [‡]	38.0
Body Mass Index, in each category [§]	
Underweight (BMI<18.5)	3.3
Normal (18.5 ≤ BMI < 25)	29.1
Overweight (25 ≤ BMI < 30)	31.4
Obese (BMI ≥ 30)	36.2
Number of comorbidities, % in each category	
0	6.5
1	22.1
2	22.5
3	18.8
4 – 12	30.0
General Health, % with fair or poor [¶]	55.8
Living Situation, % living alone	21.8
Setting, % in each category	
Community	89.6
Facility	9.1
Both	1.2
Percent of participants who died	
Before 2 nd interview (among 5948)	1.6

Characteristics at Baseline (1 st interview)	Total Sample
Before 3 rd interview (among 4841)	2.0
* 182 missing values	
† 10 missing values	
‡ 487 missing values	
\$ 631 missing values	
// 437 missing values	
¶ 490 missing values	

Table 2

Primary reason for Medicare eligibility

Primary Reason	Frequency	Percent
Mental disorder	1104	20.6
Mental retardation	671	12.5
Back/spine/disc	462	8.6
Rheumatoid arthritis/other arthritis	391	7.3
Stroke	203	3.8
Partial paralysis	183	3.4
High blood pressure	173	3.2
Severe eyesight loss	123	2.3
Myocardial infarction	120	2.2
Seizure disorder	108	2.0
Car/bike/train accident	105	2.0
Cancer or tumor	104	1.9
Diabetes	103	1.9
Emphysema or asthma	101	1.9
Multiple sclerosis	95	1.8
Angina pectoris	73	1.4
Severe hearing loss	61	1.1
Other heart condition	53	1.0
Hardening of the arteries	44	.8
Kidney/renal failure	41	.8
Cerebral palsy	39	.7
Loss of limb	35	.7
Broken hip	25	.5
Broken bones	25	.5
Muscular dystrophy	21	.4
Osteoporosis	18	.3
Cong heart failure	9	.2
Alzheimer's disease	7	.1
Parkinson's disease	5	.1
New occurrence of skin cancer	4	.1
Heartbeat rhythm	4	.1
Problems with heart valves	3	.1
Other	845	15.8
Total	5358	100.0

Note : 590 missing values, of which 438 (81% of 543) were in facility only, 115 (2% of 5332) were in the community only, and 37 (51% of 73) were in both facility and community in that year.

Table 3

Percentage in each type of mobility limitation transition (from 1st to 2nd interview) by baseline characteristics

Characteristics at Baseline (1 st interview)	No disability*	Stable	Improving	Worsening	Death	P-value †
Entire Sample (n=5364)	29.7	63.0	2.9	2.9	1.5	
Age at baseline (n=5364)						
20 – 29 (n= 361)	59.3	36.8	1.7	1.7	.6	
30 – 39 (n= 1221)	44.1	51.3	2.1	1.9	.6	
40 – 49 (n= 1705)	30.1	62.6	3.0	3.2	1.0	<.001
50 – 59 (n= 1342)	15.2	75.1	3.5	3.9	2.3	
60 – 64 (n= 735)	16.6	74.3	3.0	3.0	3.1	
Sex (n=5364)						
Male (n=3062)	33.1	60.1	2.4	2.7	1.8	
Female (n=2302)	25.2	66.9	3.5	3.2	1.1	<.001
Race/Ethnicity (n=5364)						
White (n=3945)	29.4	63.4	2.8	3.0	1.5	.84
Non-white (n=1419)	30.6	62.1	3.1	2.7	1.5	
Income (n=5364)						
More than 25K (n=838)	18.7	73.0	4.3	2.7	1.2	
25K or less (n=4526)	31.7	61.2	2.6	3.0	1.5	<.001
Education Level (n=5263)						
Less than HS (n=1840)	29.1	63.9	3.2	2.3	1.5	.25
HS or more (n=3423)	29.4	63.0	2.7	3.3	1.5	
Marital Status (n=5359)						
Not married (n=3517)	37.0	57.0	2.0	2.6	1.4	<.001
Married (n=1842)	15.9	74.5	4.5	3.5	1.6	
Smoking status (n=5352)						
Doesn't smoke (n=3308)	29.8	62.4	3.1	3.0	1.7	.27

Characteristics at Baseline (1 st interview)	No disability [*]	Stable	Improving	Worsening	Death	P-value [†]
Smokes (n=2044)	29.5	64.1	2.4	2.8	1.2	
Body Mass Index (n=5205)						
Underweight (n=169)	26.6	60.4	3.0	6.5	3.6	
Normal (n=1505)	36.6	56.3	2.8	2.7	1.7	
Overweight (n=1633)	32.3	60.9	2.9	3.1	.9	<.001 [‡]
Obese (n=1898)	21.6	71.2	2.9	2.6	1.6	
# of comorbidities (n=5364)						
0 (n=356)	48.3	46.1	2.5	2.5	.6	
1 (n=1159)	51.1	44.3	1.6	2.7	.4	
2 (n=1196)	34.7	59.2	2.3	2.4	1.3	<.001
3 (n=1019)	24.5	67.9	3.5	2.6	1.4	
4 – 12 (n=1634)	10.0	79.8	3.8	3.7	2.6	
General Health (n=5351)						
Good-Excellent (n=2342)	48.3	46.3	2.0	2.8	.6	<.001
Fair or poor (n=3009)	15.3	76.0	3.5	3.1	2.2	
Living Situation (n=5364)						
With others (n=4111)	28.4	64.0	3.2	3.0	1.3	<.001
Living alone (n=1253)	33.9	59.8	1.6	2.6	2.2	
Setting (n=5364)						
Community (n=5273)	29.5	63.3	2.8	2.9	1.5	
Facility (n=70)	40.0	52.9	4.3	1.4	1.4	
Both (n=21)	42.9	38.1	4.8	4.8	9.5	

* No disability reported on both years

[†] P-value from Chi-square test

[‡] 3 cells with expected value less than 5

Table 4

Percentage in each type of ADL transition (from 1st to 2nd interview) by baseline characteristics

Characteristics at Baseline (1 st interview)	No disability*	Stable	Improving	Worsening	Death	P-value †
Entire Sample (n=5388)	47.8	35.8	7.4	7.2	1.7	
Age at baseline (n=5388)						
20 – 29 (n= 363)	72.5	19.3	3.0	4.4	.8	
30 – 39 (n= 1226)	60.7	28.1	4.8	5.8	.6	
40 – 49 (n= 1710)	49.0	34.3	8.0	7.5	1.2	<.001
50 – 59 (n= 1349)	33.4	45.4	9.6	8.8	2.7	
60 – 64 (n= 740)	38.0	42.4	8.6	7.3	3.6	
Sex (n=5388)						
Male (n=3078)	49.6	34.0	7.3	7.1	2.0	
Female (n=2310)	45.4	38.1	7.6	7.4	1.4	.008
Race/Ethnicity (n=5388)						
White (n=3958)	46.5	37.4	7.1	7.3	1.7	
Non-white (n=1430)	51.5	31.3	8.3	7.0	1.8	.001
Income (n=5388)						
More than 25K (n=839)	35.3	44.0	9.4	10.1	1.2	
25K or less (n=4549)	50.1	34.3	7.1	6.7	1.8	<.001
Education Level (n=5285)						
Less than HS (n=1851)	48.6	35.1	7.0	7.6	1.8	
HS or more (n=3434)	47.2	36.3	7.7	7.1	1.7	.70
Marital Status (n=5385)						
Not married (n=3537)	53.8	31.8	6.2	6.4	1.7	
Married (n=1846)	36.4	43.3	9.7	8.7	1.8	<.001
Smoking status (n=5361)						
Doesn't smoke (n=3313)	46.7	36.3	8.0	7.3	1.7	
						.06

Characteristics at Baseline (1 st interview)	No disability [*]	Stable	Improving	Worsening	Death	P-value [†]
Smokes (n=2048)	50.0	35.2	6.5	7.1	1.2	
Body Mass Index (n=5215)						
Underweight (n=169)	42.0	44.4	4.7	5.3	3.6	
Normal (n=1509)	51.8	33.3	6.4	6.8	1.7	
Overweight (n=1637)	50.6	34.3	7.7	6.5	.9	<.001 [‡]
Obese (n=1900)	42.8	38.6	8.7	8.2	1.6	
# of comorbidities (n=5375)						
0 (n=358)	65.6	27.7	2.5	3.4	.8	
1 (n=1161)	67.2	23.4	4.4	4.6	.4	
2 (n=1203)	51.9	35.1	5.6	6.2	1.3	<.001
3 (n=1020)	42.9	41.0	7.2	7.5	1.4	
4 – 12 (n=1633)	30.6	43.9	12.2	10.6	2.6	
General Health (n=5359)						
Good-Excellent (n=2347)	63.1	27.5	3.7	5.1	.6	<.001
Fair or poor (n=3012)	36.3	42.3	10.4	8.9	2.2	
Living Situation (n=5388)						
With others (n=4133)	46.2	37.2	7.7	7.4	1.6	<.001
Living alone (n=1255)	53.3	31.1	6.6	6.8	2.2	
Setting (n=5388)						
Community (n=5283)	48.0	35.8	7.5	7.2	1.5	
Facility (n=79)	32.9	41.8	5.1	7.6	12.7	
Both (n=26)	53.8	11.5	7.7	0.0	26.9	

* No disability reported on both years

[†] P-value from Chi-square test

[‡] 1 cells with expected value less than 5

Table 5

Percentage in each type of IADL transition (from 1st to 2nd interview) by baseline characteristics

Characteristics at Baseline (1 st interview)	No disability*	Stable	Improving	Worsening	Death	P-value †
Entire Sample (n=5303)	20.1	56.9	11.0	10.2	1.8	
Age at baseline (n=5303)						
20 – 29 (n= 357)	24.6	55.5	11.5	7.6	.8	
30 – 39 (n= 1196)	25.8	54.3	9.5	9.8	.6	
40 – 49 (n= 1691)	21.3	55.4	11.4	10.7	1.2	<.001
50 – 59 (n= 1328)	12.4	61.0	12.7	11.2	2.7	
60 – 64 (n= 731)	19.7	58.0	9.4	9.2	3.7	
Sex (n=5303)						
Male (n=3018)	22.3	53.2	11.4	11.2	2.0	<.001
Female (n=2285)	17.2	61.8	10.5	8.9	1.4	
Race/Ethnicity (n=5303)						
White (n=3901)	19.4	58.1	10.6	10.3	1.7	.03
Non-white (n=1402)	22.2	53.7	12.2	10.1	1.9	
Income (n=5303)						
More than 25K (n=839)	16.2	61.0	11.9	9.7	1.2	.009
25K or less (n=4464)	20.8	56.1	10.8	10.3	1.9	
Education Level (n=5224)						
Less than HS (n=1822)	19.6	56.1	11.6	10.9	1.8	.49
HS or more (n=3402)	20.7	57.2	10.7	9.8	1.7	
Marital Status (n=5300)						
Not married (n=3456)	22.0	55.8	10.4	10.0	1.7	<.001
Married (n=1844)	16.4	58.9	12.3	10.6	1.8	
Smoking status (n=5281)						
Doesn't smoke (n=3258)	18.5	59.0	11.2	9.7	1.7	<.001

Characteristics at Baseline (1 st interview)	No disability [*]	Stable	Improving	Worsening	Death	P-value [†]
Smokes (n=2023)	22.9	54.0	10.9	11.1	1.2	
Body Mass Index (n=5133)						
Underweight (n=165)	11.5	62.4	9.7	12.7	3.6	
Normal (n=1476)	22.8	54.3	11.5	9.7	1.7	
Overweight (n=1614)	21.6	56.9	10.5	10.2	.9	<.001 [‡]
Obese (n=1878)	17.5	58.8	11.7	10.3	1.7	
# of comorbidities (n=5290)						
0 (n=356)	28.9	54.2	6.7	9.3	.8	
1 (n=1127)	30.3	50.6	8.7	9.9	.4	
2 (n=1183)	20.4	56.3	11.2	10.7	1.4	<.001
3 (n=1004)	18.5	58.7	12.3	9.2	1.4	
4 – 12 (n=1620)	12.0	61.7	12.7	10.9	2.7	
General Health (n=5274)						
Good-Excellent (n=2283)	28.3	52.7	7.9	10.5	.7	<.001
Fair or poor (n=2991)	14.0	60.3	13.4	10.1	2.2	
Living Situation (n=5303)						
With others (n=4056)	18.2	58.1	11.7	10.3	1.6	<.001
Living alone (n=1247)	26.3	52.9	8.7	9.9	2.2	
Setting (n=5303)						
Community (n=5274)	20.1	57.1	11.1	10.2	1.5	
Both (n=19)	21.1	26.3	5.3	10.5	36.8	
Facility (n=10) [§]	0.0	0.0	0.0	0.0	100.0	

^{*} No disability reported on both years

[†] P-value from Chi-square test

[‡] 1 cells with expected value less than 5

[§] Participants in Facilities for the entire year usually did not answer the question about IADL.

Table 6

Percentage of individuals in the five largest eligibility reason categories by type of transition in a 1-year period

Condition and Disability Measure	Transition *	N	Percentage in each Condition and type of transition, disability †					Worsening	Death	
			No	Stable	Improving					
Mental Disorders										
Mobility	1	1061	47.8	48.4	1.7	1.3	.8			
	2	873	50.3	45.8	1.4	1.3	1.3			
ADL	1	1065	70.0	19.9	4.3	4.9	.8			
	2	874	69.3	19.5	5.0	4.9	1.3			
IADL	1	1049	32.1	46.7	10.3	10.0	.9			
	2	873	33.4	45.5	10.2	9.7	1.3			
Mental Retardation										
Mobility	1	629	54.1	40.2	1.9	2.5	1.3			
	2	519	55.7	39.3	2.5	1.9	.6			
ADL	1	635	60.6	28.3	4.6	5.2	1.3			
	2	520	65.8	24.6	5.4	3.7	.6			
IADL	1	596	9.2	64.8	12.6	12.1	1.3			
	2	513	11.1	65.5	12.9	9.9	.6			
Back/Spine/Disc										
Mobility	1	461	8.7	83.7	3.0	3.3	1.3			
	2	356	10.7	82.0	2.8	2.0	2.5			
ADL	1	461	27.5	47.5	13.9	9.8	1.3			
	2	356	30.6	44.7	12.9	9.3	2.5			
IADL	1	460	11.7	63.0	14.1	9.8	1.3			
	2	356	13.8	63.8	9.6	10.4	2.5			

Condition and Disability Measure	Transition *	N	Percentage in each Condition and type of transition.				
			No disability †	Stable	Improving	Worsening	Death
Arthritis ‡							
Mobility	1	390	8.2	84.6	4.4	1.5	1.3
	2	321	7.2	83.8	3.1	4.7	1.2
ADL	1	389	31.9	45.0	12.6	9.3	1.3
	2	321	34.3	40.8	10.3	13.4	1.2
IADL	1	389	12.1	62.2	13.1	11.3	1.3
	2	321	14.6	68.8	7.8	7.5	1.2
Stroke							
Mobility	1	202	21.8	70.3	3.0	2.0	3.0
	2	166	22.3	69.9	1.2	5.4	1.2
ADL	1	201	34.3	48.3	10.0	4.5	3.0
	2	166	39.3	44.6	7.2	7.8	1.2
IADL	1	201	12.9	63.2	11.4	9.5	3.0
	2	166	15.7	59.0	12.7	11.4	1.2

* Transition 1 = from 1st to 2nd interview, Transition 2 = from 2nd to 3rd interview

† No disability reported on both years

‡ Includes Rheumatoid and other arthritis