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Access to Care and Functional Status Change Among Aged Medicare Beneficiaries

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Objectives. This study examined whether the extra-individual factors of better access to care and supplementary health insurance coverage can prevent, delay, or reverse transitions from functional independence to disability over time.

Methods. Six years of the Medicare Current Beneficiary Survey were pooled, yielding 40,793 transition periods for community residents aged 66 or older. Multinomial logit models of transitions among functional states were estimated, with functional improvement, functional decline, and mortality as outcomes.

Results. Insurance coverage and better access to care increased survival chances and reduced the odds of transitions from independence to disability by roughly 30%. Access and supplementary insurance did not appear to affect transitions from less disabled to more disabled states or affect functional improvement.

Discussion. The findings support the hypothesized role of extra-individual environmental factors in Verbrugge and Jette's conceptual scheme of the disablement process. Access to care is suggested to make the most difference in delaying or slowing down functional decline among functionally independent elderly persons. Transitions from less severe to more severe states of disability or to death appear to be influenced more by the natural course of chronic diseases, underlying health status, and medical instability.

THE main pathway of Verbrugge and Jette's (1994) conceptual model of the disablement process leads from pathology to disability. Extra-individual factors impact the pathway by preventing, retarding, or even reversing transitions from functional independence to disability. These interventions serve as buffers, which affect disability status by maintaining and/or improving functional ability. Access to medical care is one extra-individual factor hypothesized to affect the beginning of the disablement process, that is, from pathology to impairment. Individuals with better access to care should be more likely to receive and benefit from primary and secondary prevention efforts aimed at maintenance of health and/or the early detection of pathology with better disability outcomes.

Access to care was originally conceptualized largely in terms of factors affecting either potential entry or realized entry into the health care delivery system rather than outcomes of care. Thus, access to care has often been equated with factors related to entry, such as insurance coverage and local supply of medical providers (Aday & Andersen, 1975). Although extra-individual factors, such as access to care, are an integral component of Verbrugge and Jette's (1994) disablement process, relatively little attention has been given to such factors. Only within the last decade has the concept of access to care been formally broadened to encompass health outcomes. The Institute of Medicine's (Millman, 1993) broader definition of access to care includes the timely use of personal health services to achieve the best possible health outcomes.

Given the longstanding view of access to care as a right of entry to the system, much more research attention has been given to intermediate structural or process indicators of access, such as insurance coverage, service utilization, having a regular source of medical care, and satisfaction with care, than to the consequences of gained entry upon health outcomes (Aday, Andersen, & Fleming, 1980; Kasper, 1997). As Kasper (1997, p. 733) noted, "The impact of poor access on individuals has not been evaluated to the extent one might expect, one exception being the study by Bindman and colleagues (1995) showing higher hospital admission rates for chronic conditions as a function of community differences in access to care and other factors." Kasper's assertion is supported by the disproportionate attention given in past research to how utilization of certain services is associated with supplementary insurance coverage.

Research examining the relationship between insurance and service utilization found that Medicare beneficiaries with private supplemental health insurance are more likely than their counterparts lacking such coverage to make at least one physician visit annually (Mentnech, Ross, Park, & Brenner, 1995), to receive preventive services such as cancer screening (Blustein, 1995), and to have a usual source of care (Landerman et al., 1998). Beneficiaries who lack supplementary coverage are more likely to experience longer waits in doctors' offices (M. Hogan, Eppig, & Waldo, 1995), to delay care because of costs, and to receive medical care in a hospital setting rather than a doctor's office (Landerman et al., 1998).

Research comparing satisfaction with care, processes of care, and health outcomes is found primarily in studies of managed care given the concern that access to care may be compromised for frail elderly persons with chronic illnesses in managed care systems (Gillick, 1987; Hornbrook & Berki, 1985; Schlesinger, 1986; Siu, Brook, & Rubenstein, 1986). In reviews of the literature, R. H. Miller and Luft (1994) and Hellinger (1998) concluded that for the general population as a whole, nonenrollees with indemnity insurance receive roughly comparable quality of care in terms of process and outcome measures, but that this may not hold for more vulnerable enrollees. Several studies have suggested that older health maintenance organization enrollees with Medicare, with chronic illness, in poorer health, or with lower incomes and Medicaid exhibit greater deterioration in physical health status than otherwise similar nonenrollees (Ware, Bayliss, Rogers, Kosinski, & Tarlov, 1996; Ware et al., 1986).

Researchers have performed far fewer studies to assess more fundamental questions concerning the health and/or functional status impacts of having insurance coverage and better access to care outside the managed care system. Aside from the research of Clark, Stump, Hui, and Wolinsky (1998) and Wolinsky, Stump, Callahan, and Johnson (1996), which employed health insurance coverage as a proxy for socioeconomic status (SES), of the studies reviewed, only Landerman and colleagues (1998) specifically investigated relationships between supplementary insurance coverage, access to care, and the onset of disability among aged Medicare beneficiaries. Landerman and colleagues (1998) examined the lack of supplemental insurance coverage as an explicit risk factor for disablement among functionally independent aged Medicare beneficiaries. Employing 7 years of longitudinal data from the Duke Established Populations for Epidemiological Studies of the Elderly, Landerman and colleagues estimated discrete-time hazard models of the first occurrence of disability for respondents who were not disabled in the baseline survey. After controlling for a number of demographic factors, chronic health conditions, and lifestyle risk factors, they found that the odds of disability onset were from 35% to 48% higher among elderly persons without private supplementary insurance coverage relative to those with such coverage. Although supplementary insurance coverage was the main focus, the influence of other access to care indicators were also investigated. Significant results were not obtained for indicators such as Medicaid coverage, self-reported financial barriers, having a usual provider, and dissatisfaction with medical care.

In the present study we extend the research of Landerman and colleagues (1998) in several important ways. First, in addition to analyzing disability onset among nondisabled elderly persons, we also examined functional status changes between moderate and more severe states of disability, as well as the recovery of functional independence among disabled persons. Second, mortality risk was included as an explicit competing risk with respect to the risk of functional status change among both disabled and nondisabled persons. Third, we employed a rich set of survey questions covering multiple dimensions of access to care, including health insurance coverage, perceived access barriers, and satisfaction with care. Finally, our study data were drawn from a large representative national sample of aged Medicare beneficiaries. We estimated a series of multinomial logit models with discrete functional status and survival outcomes with longitudinal data spanning the years 1991–96 to investigate the association between access to care and the process of disablement.

METHODS

Sample

The main source of data was the Access to Care (ATC) component of the Medicare Current Beneficiary Survey (MCBS), a continuous panel survey that is representative of the Medicare population. A conventional two-stage geographic sample design is employed in the MCBS in which beneficiaries aged 85 years and older are oversampled (Adler, 1994). The ATC component of the MCBS contains information on demographics, health status and functioning, access to care, and health insurance for approximately 12,000 disabled and aged Medicare beneficiaries collected through community and facility interviews. In addition, the MCBS files contain individual claims data for Medicare-covered services reimbursed on a fee-for-service basis. We used claims data for all types of Medicare-covered services to identify diagnosed chronic conditions and used individual hospital claims to specify measures of incident inpatient hospital utilization. We used MCBS administrative nonrespondent files, which contain verified dates of death, to distinguish death outcomes from censored functional status outcomes due to nonresponse.

We used 6 years of the ATC MCBS data, 1991–96, to create 5 years of annual transition data between successive years ranging from 1991–92 through 1995–96. Pooling these data yielded 22,223 transition histories, each containing between 1 and 5 years of annual transition data. For each annual transition time period, the study sample was restricted to noninstitutionalized Medicare beneficiaries aged 66 or older, who were continuously eligible for both Parts A and B of Medicare and currently entitled under Old Age Survivors Insurance, and who were never enrolled in an HMO during the 2 successive calendar years underlying a transition time period. After we imposed these restrictions to ensure that the absence of Medicare claims reflected no service utilization, there were 47,681 annual transition observations.

Beneficiaries of either Asian descent or other nonspecified racial and ethnic group ($n = 787$) and respondents with missing data on education, functional status, height and/or weight, incontinence, or self-reported health variables ($n = 1,758$) were then dropped from the sample given their small numbers. Finally, because preliminary analyses produced results that were robust with respect to the exclusion or inclusion of proxy respondents, proxy respondents were excluded from the final sample ($n = 4,343$). The resulting sample comprised 40,793 person-years of annual transitions between 1991 and 1996.

Conceptual Model

The disablement process model served as the conceptual foundation (Verbrugge & Jette, 1994). The main pathway from functional independence to disability comprises four time-sequential stages: pathology, impairment, functional limitations, and disability. Pathology, defined as disease or injury, affects disability by the degree of impairment caused by various medical conditions. For example, whereas arthritis might limit range of motion, a stroke could cause permanent paralysis. Impacting the pathway from functional independence to disability are risk factors, intra-individual and extra-individual factors. Risk factors are predisposing characteristics, such as demographic and social characteristics, and certain lifestyle behaviors, such as smoking, drinking, or exercise activity, that affect an individual's susceptibility to impairment. Both intra-individual and extra-individual factors act as buffers that can reduce, delay, or even reverse the disablement process by modifying functional demands or maintaining functional capability. Whereas the locus of action for intra-individual intervention springs from or operates within a person (e.g., positive affect, emotional vigor), extra-individual interventions (e.g., medical care and rehabilitation, personal assistance) are performed or introduced from outside a person (Verbrugge & Jette, 1994). Our main study hypothesis was that persons with better access to health care, an extra-individual factor, will be able to maintain better functional status over time.

Baseline and Outcome Functional Status States

We measured functional status transitions by comparing a person's reported functional state in successive years. Five baseline (year t) functional status states were defined hierarchically in terms of degree of functional impairment: functional limitations, instrumental activities of daily living (IADLs), and activities of daily living (ADLs). Table 1 contains functional state definitions and the distribution of the sample population among the five discrete functional states. Individuals reporting difficulty in performing a task or activity were classified as having a functional limitation or disability in the functional status states shown in Table 1. More specifically, a person was defined as having a functional limitation if the individual reported some or a lot of difficulty performing a task or the inability to perform the task at all. A person was defined as having an IADL disability if the individual reported difficulty in performing an activity by him- or herself, or if an activity was not performed because of a health reason. A person was defined as having an ADL disability if the individual reported difficulty in performing an activity by him- or herself without special equipment; if the individual used special equipment, human assistance, or human supervision to perform an activity; or if the individual did not perform the activity at all because of a health problem. The criteria for an ADL disability was slightly different in the 1991 MCBS survey data because respondents who reported not performing an ADL were not asked whether this was due to a health problem. Because MCBS data for later years show that all except 1 or 2 individuals out of several hundred such respondents each year reported that some ADL was not performed because of a health problem, this change in the MCBS survey instrument in 1992–96 should not impart any appreciable bias upon the empirical results. This conjecture was later confirmed by a sensitivity analysis, which demonstrated robust empirical results when 1991–92 functional state transition data were dropped from the study sample population.

In addition to the five functional states already noted, death and censored served as additional "outcome" states. Because of the relatively low prevalence of extreme functional status decline among nondisabled beneficiaries at baseline, their moderate and severe ADL disability outcome states were combined into a single ADL outcome state. For similar reasons, functional independence and functional limitation outcomes were combined into a single nondisabled outcome for beneficiaries who were either moderately or severely ADL disabled in a baseline year. We did not distinguish nursing home admissions as a separate outcome state because functional status information is not censored for MCBS facility survey respondents who enter nursing homes. However, any subsequent functional status transitions of such nursing home entrants were excluded under the sample selection criteria.

Transition Model Specification

Empirical transition models were specified as single-state transition models in which the conditional probability of being in functional state j next year ($t+1$) depended upon the current baseline functional state i, individual risk factors, and extra-individual access to care factors. Although R. T. Anderson, James, Miller, Worley, and Longino (1998) and Wolinsky, Callahan, Fitzgerald, and Johnson (1993) found improved discrimination among functional status transitions

Table 1. Functional State Definitions and the Baseline Distribution of the Pooled Sample Population Among Functional States

Functional State	Definition	Sample Population	Percentage of Total
Independent	No functional limitations, IADLs, or ADLs	15,528	38.1
Functional limitations	Difficulty or inability in at least one (stooping/kneeling, lifting 10 lb., reaching over head, writing, walking 2–3 blocks)	6,768	16.6
IADL disability	Difficulty or activity not performed because of health in at least one (heavy or light housework, money management, meal preparation, shopping, using the telephone)	5,935	14.5
Moderate ADL disability	Difficulty or activity performed with human assistance, supervision, or assistive device, or not performed because of health in one or two (bathing, dressing, eating, toileting, walking, transferring)	8,826	21.6
Severe ADL disability	Three or more ADLs	3,736	9.2
Total		40,793	100.0

Notes: ADL = activity of daily living; IADL = instrumental activity of daily living.

with a two-state transition model containing information about both current and prior functional status, there are trade-offs involved with such models. First, because there is attrition in MCBS panel samples due to death and nonresponse, restriction of the study population to individuals who responded for at least 2 successive years would reduce the size of the study sample population by 14.7%. The resulting smaller sample populations, particularly in the disabled functional states, would not permit estimation of separate transition models containing the same large set of covariates for each baseline functional state in Table 1. Separate baseline functional state models were desirable because the marginal effect of a risk factor or medical condition was allowed to vary among functional states. Second, this sample restriction would impart a significant bias upon the study sample population because it would be restricted to individuals who were healthy enough to have survived for at least 1 full year prior to their follow-up MCBS survey. Because all MCBS respondents who died before their first follow-up MCBS survey would be naturally excluded, it is not surprising that individuals in their last year of life would be greatly overrepresented among excluded cases (11.7%) versus cases retained in the study sample (3.0%).

A comparison of MCBS respondents with no follow-up responses to the remainder of the study sample supported the premise that a sicker population would be excluded. Among the more notable differences between these subgroups, MCBS respondents with no follow-up survey response were more likely than their counterparts with at least one follow-up response to self-report poor health (28% vs 23%), be ADL and/or IADL disabled (51% vs 44%), and be seriously underweight (12% vs 8%). Furthermore, on average, the sample to be excluded would be older (76.8 years vs 75.9 years), have greater prior annual Part B Medicare reimbursements ($1,634 vs $1,184), and be hospitalized more frequently in the year following a survey (0.46 admissions vs 0.29 admissions) than the remaining sample population that could be used for estimation of two-state transition models.

Risk Factors

Sociodemographic attributes.—Standard measures of sociodemographic attributes were specified in the transition models: gender, race/ethnic status, marital status, living arrangement, age, education, and income. Descriptive statistics and specific coding algorithms for all variables are found in Table 2. Whereas disability onset has not been consistently shown to vary by gender (Boult, Kane, Louis, Boult, & McCaffrey, 1994), gender differences in risk of mortality are well documented (D. P. Rice & Feldman, 1983; Verbrugge, 1984). Similarly, although some studies found socioeconomic status (SES) to account for most, if not all, racial differences in functional ability (Clark & Maddox, 1992; Kington & Smith, 1997; Mutchler & Burr, 1991), other studies have found racial differences in disability generally (Guralnik & Kaplan, 1989) or for specific subgroups such as older men (Mendes de Leon, Seemen, Baker, Richardson, & Tinetti, 1995). Waite and Hughes (1999) studied living arrangements and functional status in the Health and Retirement Survey. They found married couples living alone displayed the highest levels of physical functioning, whereas single elderly persons who did not live alone displayed the lowest levels of physical functioning. Lastly, increasing chronological age is associated with functional status decline, and higher educational and income levels are associated with higher functional status (Guralnik et al., 1993).

Although wealth data are not reported, the MCBS contains a question on household income, which is reported in terms of $5,000 income brackets ranging from $5,000 or less through $50,000 or more. Including MCBS respondents who chose to report income in grosser brackets, such as less than $25,000, about 5.8% of the study population were missing income data. We imputed income classes for these respondents on the basis of the income class distribution reported by MCBS respondents of peer subgroups with reported income using stochastic imputation methods (Little & Rubin, 1990).

Health behavior and health status.—We specified several variables to reflect differential risk of functional status change because of lifestyle behavior and health status. We specified dummy variables to distinguish persons who were current or former smokers. Both current and former smoking have been identified as risk factors for functional decline, with current smoking showing a stronger effect than former smoking (House et al., 1994; Landerman et al., 1998; X. Liu, Liang, Muramatsu, & Sugisawa, 1995). The body mass index (BMI), which has been used to measure both obesity and potential malnutrition, was specified in terms of categories used in the U.S. Department of Agriculture Dietary Guidelines. A BMI of 30 or more reflects extreme obesity, and a BMI of less than 20 reflects an underweight person. There is evidence for functional status decline associated with both low BMI and high BMI (Landerman et al., 1998; Launer, Harris, Rumpel, & Madans, 1994). Obesity also leads to a higher risk of mortality (Andres, Muller, & Sorkin, 1993). Two dummy variables for subjective health status were specified for persons reporting themselves to be of poor/fair health and very good/excellent health, respectively. Good health served as the omitted category. Mossey and Shapiro (1982) were among the first to identify a link between self-rated health and mortality. The association between poor self-rated health and death has since been documented in a variety of studies (Bernard et al., 1997; Idler & Kasl, 1991; Mor, Wilcox, Rakowski, & Hiris, 1994; Wolinsky & Tierney, 1998). Poor self-rated health has also been associated with functional decline (Idler & Kasl, 1995). In addition, persons reporting at least weekly episodes of urinary incontinence were distinguished as being at greater risk of disablement (Baker & Bice, 1995).

We used Medicare reimbursement claims data to construct two measures of chronic care needs and/or medical instability. Prior Medicare reimbursements, and in particular Part B reimbursements made up mostly of physician reimbursements, have long been shown to be a very powerful predictor of Medicare beneficiaries with higher than average expected future Medicare reimbursements (Epstein & Cumella, 1988). Although some regression to the mean effects were observed, G. Anderson and Knickman (1984)

Table 2. Descriptive Statistics and Coding for the Independent Variables

Variables	*M*	*SD*	Coding
Sociodemographics			
Age	75.87	7.10	number of years
Male	0.40	0.49	1 = male; 0 = female
Live alone	0.33	0.47	1 = yes; 0 = no
Widowed	0.37	0.48	1 = yes; 0 = no
Divorced/separated	0.07	0.25	1 = yes; 0 = no
Never married	0.04	0.20	1 = yes; 0 = no (omitted married)
Income	4.16	2.66	increments of $5,000 up to $50,001
Education	11.04	3.61	number of years completed
Hispanic	0.05	0.21	1 = yes; 0 = no (omitted White)
Black	0.09	0.28	1 = yes; 0 = no
Access to and Satisfaction With Health Care[a]			
Supplemental insurance	0.46	0.50	1 = yes; 0 = no
Supplemental insurance with RX coverage	0.35	0.48	1 = yes; 0 = no
Medicaid	0.10	0.30	1 = yes; 0 = no (omitted no supplemental coverage)
30 min to doctor's office	0.11	0.31	1 = more than 30 min; 0 = otherwise
Physician cost barrier[b]	0.10	0.30	1 = yes; 0 = no
Service availability barrier[c]	0.19	0.39	1 = yes; 0 = no
Regular physician	0.92	0.28	1 = yes; 0 = no
Dissatisfaction with care[d]	0.92	2.02	count of dissatisfaction items 0–17
Health Behaviors and Health Status			
Current smoker	0.13	0.33	1 = yes; 0 = no
Former smoker	0.45	0.50	1 = yes; 0 = no (omitted never smoked)
Prior Part B Medicare	1.25	2.29	prior year Medicare Part B reimbursements in $1,000s
Poor health	0.24	0.43	1 = poor or fair health; 0 = otherwise
Excellent health	0.45	0.50	1 = excellent or very good health; 0 = otherwise (omitted good health)
BMI over 30	0.15	0.35	1 = yes; 0 = no
BMI under 20	0.09	0.28	1 = yes; 0 = no (omitted BMI of 20–30)
Incontinent	0.10	0.30	1 = loss of urine weekly; 0 = no
Incident hospitalizations	0.31	0.80	number of inpatient admissions within 1 year after survey date
Disability entitlement	0.07	0.25	1 = original reason for Medicare entitlement was disability; 0 = no
Chronic Conditions			
Deaf[e]	0.12	0.32	1 = deaf; 0 = not hearing impaired
Hearing impaired[e]	0.37	0.48	1 = hearing impaired, use of hearing aid; 0 = not hearing impaired
Lower extremity fracture[f]	0.05	0.21	1 = broken hip or other lower extremity fracture; 0 = no
Chronic obstructive pulmonary disorder[f]	0.16	0.37	1 = COPD, emphysema, or asthma; 0 = no
Osteoporosis[f]	0.11	0.31	1 = yes; 0 = no
Stroke[f]	0.12	0.32	1 = yes; 0 = no
Cancer[f,g]	0.26	0.44	1 = yes; 0 = no
Diabetes[f]	0.18	0.39	1 = yes; 0 = no
Rheumatoid arthritis[f]	0.14	0.35	1 = yes; 0 = no
Arthritis[f,h]	0.60	0.49	1 = yes; 0 = no
Dementia[f]	0.01	0.09	1 = Alzheimer's and other nonspecified dementia; 0 = no
Congestive heart failure[i]	0.09	0.28	1 = yes; 0 = no
Other heart disease[i]	0.18	0.39	1 = unspecified heart disease not included in ischemic, PVD, CHF; 0 = no
Hypertension[g]	0.59	0.49	1 = yes; 0 = no
Peripheral vascular disease[i]	0.06	0.24	1 = yes; 0 = no
Ischemic heart disease[i,j]	0.44	0.50	1 = ischemic, angina, atherosclerosis, or myocardial infarction; 0 = no
Parkinson's[f]	0.01	0.12	1 = yes; 0 = no
Transition Base Year			
Year 92	0.17	0.38	1 = yes; 0 = no
Year 93	0.19	0.38	1 = yes; 0 = no
Year 94	0.23	0.42	1 = yes; 0 = no
Year 95	0.22	0.41	1 = yes; 0 = no

Note: *N* = 40,793.

[a] Access barrier and satisfaction variables were coded zero for individuals without a regular doctor.

[b] Trouble getting medical care, did not see a doctor, or delayed care because of cost.

[c] Trouble getting care because of physician availability, dissatisfaction with ease of getting to doctor, and dissatisfaction with getting care at same location.

[d] Dissatisfaction with quality of physician care, physician's technical competence, and physician's practice style.

[e] Self-report only.

[f] Self-report and claims.

[g] Skin, lung, bowel, female reproductive system, prostate, bladder, stomach, kidney, brain, throat, back, head, unspecified.

[h] Osteoarthritis lower and upper extremity, spine, multiple joints, nonspecific, osteoarthritis.

[i] Claims only.

[j] Myocardial infarction is also included in self-report.

found high rates of Medicare reimbursements to persist over time periods as long as 3 years. We used individual hospital claims to construct a count measure of incident hospitalizations over the course of the year following survey response date. Beneficiaries who are repeatedly hospitalized between surveys are likely to be at much greater risk of functional decline and death because of medical instability (Gruenberg, Tompkins, & Porell, 1989; Zook & Moore, 1980). After finding that hospital utilization had the largest direct effect on mortality, Wolinsky, Johnson, and Stump (1995) suggested that measures of hospital episodes "emphasize both the intensity and consistency of the underlying morbid conditions" (p. 165).

Lastly, it is probable that the disablement process, and in particular the likelihood of recovery from disability, differs for individuals disabled early in life compared with persons disabled in old age. Individuals aged less than 65 are eligible for Medicare Part A if they have been disabled (qualifying for Social Security Disability Insurance) for at least 2 years or if they have end-stage renal disease. Although individuals currently entitled because of end-stage renal disease were excluded from the study population, the sample population included aged beneficiaries whose original reason for entitlement to Medicare was disability. We created a dummy variable to identify aged beneficiaries whose original reason for entitlement was disability. Because the MCBS does not contain a variable for the original reason for entitlement, we used start dates of Part A entitlement to identify individuals entitled to Medicare before the month of their 65th birthday.

Extra-Individual Factors

Supplementary insurance, physician access, and dissatisfaction with care.—Because all persons in the study population were entitled to both Medicare Part A and B coverage, insurance-related access varied only with respect to whether a person had public Medicaid coverage or supplementary insurance (i.e., private supplementary health insurance or Medigap policy) for Medicare copayments and deductibles and whether the supplemental insurance covered prescription drugs. We specified two dummy variables to distinguish two mutually exclusive subgroups: (a) persons with private supplementary insurance containing prescription drug coverage and (b) persons with supplementary insurance without prescription drug coverage. No private supplementary insurance served as the omitted reference subgroup. No distinction was made between supplementary insurance obtained through a current/former employer or union and insurance that was self-purchased (e.g., Medigap). With the exception of prescription drug coverage, no other distinctions were made about the richness of supplementary coverage or out-of-pocket premium costs.

Beneficiaries with Medicaid coverage were distinguished with a dummy variable if Medicaid coverage was self-reported and/or Medicare administrative data showed at least 1 month of Part B Medicaid buy-in status in the baseline year. The expected impacts of Medicaid status were uncertain. Although some dual-eligible Medicaid recipients may have better access to care because they do not incur out-of-pocket expenses for Medicare deductibles and copayments, Medicaid does not fully pay for Medicare premiums and cost sharing for all dual eligibles, such as those eligible under the Specified Low-Income Medicare Beneficiary program (Lamphere & Rosenbach, 2000). Furthermore, in some 35 states individuals can qualify for Medicaid because of high medical costs rather than limited income and assets. In the latter cases, Medicaid coverage status may act as a marker for sicker beneficiaries at greater risk of functional decline.

Kasper (1997) has classified conventional access indicators into three broad categories: (a) indicators of actual service use relative to need for care, (b) structure or process indicators, and (c) indicators reflecting the consumer's perspective about care. No access indicators of the first type were specified. Structure or process access indicators reflect systemic features of the health care delivery system that act as barriers to patients getting needed care. In addition to the supplementary insurance variables already discussed, two other widely used structure or process access to care indicators were specified with dummy variables: having a usual provider and travel time of 30 min or more to one's regular provider. The usual provider variable, constructed from an MCBS question asking whether a respondent has a regular doctor, was coded as 1 for persons with a regular doctor, and 0 otherwise. Because persons with a usual provider may receive higher quality care because of greater continuity of care and familiarity with medical history, better functional status outcomes were expected for such persons. Because distance has long been shown to be inversely associated with health service use rates (Shannon, Bashur, & Metzner, 1969), geographic inaccessibility should be associated with worse functional status outcomes.

Three subjective consumer perspective access indicators were specified. A financial cost barrier measure was specified as a dummy variable equal to 1 when at least one of three conditions were satisfied: (a) a respondent reported having delayed or not seeking care because of cost; (b) a respondent reported having trouble receiving care because of one or more of five cost-related reasons (not enough money, cost too high, services or supplies not covered, physician does not accept Medicare, or not eligible for public coverage); and (c) a respondent reported having a medical problem and not seeing a physician because of any one of three reasons (cost too much, doctor charges more than Medicare, doctor does not accept Medicaid).

A service availability barrier measure was specified as a dummy variable equal to 1 when at least one of three conditions were satisfied: (a) a respondent reported having trouble receiving care because of physician availability; (b) a respondent reported dissatisfaction with the ease of getting to the doctor or ability to get care at the same location; and (c) a respondent reported, in response to an open-ended question, being dissatisfied with or wanting improvements in waiting time, paperwork, or location of the doctor's office.

The MCBS contains a broad array of questions concerning physician access and satisfaction with care that we used to construct a measure of dissatisfaction with quality of care. For respondents who reported having a regular provider, we created a single 17-item scale ($\alpha = 0.85$) to measure a respondent's dissatisfaction with the medical services provided by their doctor. We reverse coded variables that measured positive attitudes to reflect a negative attitude or dissatisfaction. Respondents who did not report having a usual provider of care were coded 0 on the scale.

Potential endogeneity of insurance and access variables.—We hypothesized that disability outcomes would be influenced by experiences in the health care system (e.g., quality of physician care). These same experiences may be affected by service utilization, which in turn may be influenced by supplementary insurance coverage. Thus, there may be unobserved factors, such as individuals' preferences or tastes for medical care or individuals' occupation or industry work histories (Lillard, Rogowski, & Kington, 1997), that may influence both disability outcomes and supplementary insurance coverage. If these unobserved factors are treated as random disturbances that are correlated with observed supplementary insurance coverage and access variables, the estimated parameters for the insurance and access variables may suffer from endogeneity bias. The direction of such bias depends on whether persons whose insurance status or access to care is selectively influenced by these unobserved factors experience better or worse disability outcomes. For example, if insurance coverage effectively serves as a marker for sicker persons who have supplementary insurance because they anticipated a greater need for medical services, then estimates of the hypothesized protective effects of supplemental insurance against disability will be too small. Alternatively, if observed insurance coverage and access to care variables serve as markers for persons of higher SES and better health or for healthier persons with retiree health benefits by nature of their job histories, then parameter estimates should overstate their protective effects against disability.

The potential endogeneity of insurance coverage variables has been widely recognized in empirical research addressing the effects of insurance coverage (or features such as coinsurance rates or HMO enrollment status) on health service utilization (T. Rice & Morrison, 1994). Nevertheless, with few exceptions (Cameron, Trivedi, Milne, & Pigget, 1988; Dowd, Feldman, Cassou, & Finch, 1991; Farley & Monheit, 1985; Goldman, Leibowitz, & Buchanan, 1998; Lillard & Rogowski, 1995), insurance coverage has been specified as exogenous. Practical difficulties in specifying appropriate instruments for the endogenous insurance variables have hampered the implementation of the conventional instrumental variable approach for addressing the endogeneity problem (Ettner, 1997; Khandker & McCormack, 1999; McCall, Rice, Boismier, & West, 1991; Reschovsky, 2000). An appropriate instrument for insurance coverage should be directly associated with having coverage, but it should not be directly associated with the outcome variable of interest, such as health service utilization or disability status. Because the more salient factors influencing insurance coverage tend to be related to health status and/or SES factors (Garfinkel, Bonito, & McLeroy, 1987; Lillard et al., 1997; Long, Settle, & Link, 1982; T. Rice & McCall, 1985; Taylor, Short, & Horgan, 1988; Wilcox-Gok & Rubin, 1994; Wolfe & Goddeeris, 1991), these variables have limited utility for deriving instruments for insurance coverage when service utilization or health outcomes are the endogenous outcome variables of interest. Furthermore, when such instruments are only weakly correlated with the corresponding endogenous variables, instrumental variable parameter estimates have been shown to be inconsistent and possibly more biased than if exogeneity is assumed (Bound, Jaeger, & Baker, 1995; Staiger & Stock, 1997).

Because past empirical research on the degree and direction of selectivity of supplementary insurance coverage has yielded mixed results (Ettner, 1997; Hurd & McGarry, 1997; Lillard & Rogowski, 1995; Wolfe & Goddeeris, 1991) and good instruments for supplementary insurance coverage and access to care are not available in the MCBS data, we followed an approach taken by many other researchers. First, we estimated the multinomial logit (MNL) transition models with an extensive set of covariates to reduce the chance that unmeasured factors would strongly affect the parameter estimates of exogenous insurance and access variables. We derived instruments for supplementary insurance status (private without drug coverage, private with drug coverage, Medicaid, and none) with a single MNL regression model estimated on the entire study sample data with all sociodemographic and health variables of the MNL transition models specified as covariates. We used binary logistic regression models similarly to derive instruments for the access to care variables. These models generally showed that healthier individuals and those with higher incomes and education were more likely to have private supplemental insurance and less likely to report access problems. Second, we used these instruments to perform Hausman omitted-variable specification tests of the endogeneity of observed insurance and access variables for each of the five MNL transition models (Kennedy, 1998). In all cases the null hypothesis of exogeneity could not be rejected ($p > .23$ or higher). Third, we estimated MNL transition models employing instruments for insurance and access to care that were only technically identified because of the nonlinearity of the MNL and logit models we used to derive predicted values for instruments. Although significant parameter estimates were not obtained for most of the instrumental access variables, the estimated parameters for other variables were robust, and they remained so when all insurance and access variables were omitted in the MNL transition models. Although these analyses did not produce evidence of endogeneity bias problems, this may be attributable, at least in part, to weakness of the instruments employed. Given these findings, and following the practice of other researchers (Crystal, Johnson, Harman, Sambamoorthi, & Kumar, 2000; Khandker & McCormack, 1999; McCall et al., 1991; Reschovsky, 2000; Taylor et al., 1988), insurance coverage and the access variables were treated as exogenous.

Pathology: Chronic Medical Conditions

Various common medical conditions have been associated with disability and mortality. For the most part, we included chronic conditions commonly found in the literature; for an extensive review see Stuck and colleagues (1999). Hearing was measured by two variables: deafness and hearing impairment, which was defined as the ability to hear with a hearing aid. Pope and Sowers (2000) and Ensrud and colleagues (1994) found that hearing impairment was associated with limitations in physical functioning. Respiratory problems have been associated with mortality in a clinical sample (Seneff, Wagner, Wagner, Zimmerman, & Knaus, 1995) and functional disability (D. B. Hogan, Ebly, & Fung, 1999; Tucker, Falcon, Bianchi, Cacho, & Bermudez, 2000). Stroke and arthritis/rheumatism have been identified as risk factors for functional limitations (Boult et al., 1994; Furner, Rudberg, & Cassel, 1995). Cancer and diabetes (Boult et al., 1994; Wolinsky et al., 1995) increase the risk of mortality. In a clinical study McCully, Leiper, Sanders, and Griffin (1999) found that peripheral vascular disease caused a slowing in gait, which could impact mobility.

Hypertension has been associated with IADL disability (Furner et al., 1995; D. B. Hogan et al., 1999) and mortality (Wolinsky et al., 1995). Heart conditions were measured by congestive heart failure, ischemic heart disease, and other heart disease. Heart disease has been found to be a risk factor for a housework IADL disability (Furner et al., 1995; D. B. Hogan et al., 1999) and for IADL limitations in a Hispanic sample (Tucker et al., 2000). Separate measures of osteoporosis and hip fracture were included. Furner and colleagues (1995) found a combined measure of osteoporosis/hip fracture did not affect IADL status, whereas Tucker and colleagues (2000) found hip fracture to be a risk factor for ADL disability. Parkinson's disease and Alzheimer's disease have not been frequently used in past empirical research, presumably because of relatively low prevalence rates among community elders. However, cognitive impairment was shown to be associated with mortality in a community sample (Bruce, Hoff, Jacobs, & Leaf, 1995).

Information about prevalent chronic medical conditions was obtained from both self-reports of survey respondents to a series of questions asking "Has a doctor ever told you that you have medical condition X?" and diagnostic information recorded on individual Medicare claims. Table 2 contains a list of 17 chronic condition dummy variables and whether claims and/or survey data were used in specification. For nine of the conditions, a prevalent chronic condition was defined whenever the condition was either self-reported by a respondent or the appropriate International Classification of Disease, Ninth Revision (ICD-9) CM diagnosis was recorded as a principal or secondary diagnosis in prior-year Medicare claims data. This option was chosen primarily because past research suggests that the sole use of either self-reports or claims data is likely to result in an understatement of prevalent chronic conditions (Ettinger, Fried, Lind, Newman, & Gardin, 1994; Turner et al., 1997). For six chronic conditions, only claims data were employed because MCBS question phrasing was too imprecise to identify the specific conditions of interest. Self-reported data were used for hearing impairments because of their low prevalence rates in the claims data.

A possible drawback of using both claims and self-report data is that individuals who are being actively treated for a chronic condition may be more likely to have the diagnosis coded on Medicare claims. Treatment may be indicative of condition severity. However, agreement rates between self-report and claims data exceeded 87% for all but two of the nine chronic conditions. Because of the high rates of agreement and the large number of covariates already specified in the transition models, specification of dummy variables to distinguish those cases where there was disagreement between the two information sources was not feasible. The lower agreement rates for hypertension (71%) and osteoarthritis (62%) were primarily due to self-reports of conditions that were not identified in the claims data. With the exception of osteoarthritis, the empirical results were fairly insensitive to whether chronic conditions were defined solely with claims data, self-reported data, or both sources of data. Self-reports of osteoarthritis yielded stronger empirical results than use of claims data alone.

Model Specification and Parameter Estimation

Separate MNL models were estimated on pooled transition data for persons in each of the five baseline functional status states (Table 1). Because pooling these transition data over the 5 years (1991–92 through 1995–96) entailed the assumption of time-invariant slope and intercept parameters, these assumptions were formally tested through likelihood ratio tests. Although these tests indicated that the null hypothesis of time-invariant slope parameters could not be rejected, the null hypothesis of time-invariant intercepts was rejected in all cases ($p < .05$). The latter result was largely due to a substantial increase in censored outcomes in 1995 and 1996 associated with the involuntary retirement of some respondents from the sample because of a decision to alter the sample design of the MCBS from a longitudinal to a revolving 4-year panel design in 1994. Because all respondents from 1991 and 1992 MCBS surveys were not retired from the 1994–95 and 1995–96 panels, and it was not possible to distinguish between involuntary panel member retirement and voluntary nonresponse, four year-specific dummy variables were included as covariates with the year 1991 omitted.

Because the pooled sample data had repeated observations over time for most beneficiaries and nonzero covariance among disturbances can bias the standard error estimates of the estimated MNL model coefficients, we used a maximum likelihood procedure developed by White (1980) and Huber (1967) to obtain asymptotic bootstrap standard error estimates for the model coefficients with the STATA 6.0 MLOGIT procedure. This procedure, intended for use in situations where nonrandom clustering of data can produce complex nonzero covariances among model disturbance terms, has been commonly employed with panel data (R. T. Anderson et al., 1998; Manning et al., 1987; Waidmann & Liu, 2000).

The literature is unclear concerning the problem of intercorrelated disturbances when both survey design effects and repeat observations are present in sample data. M. E. Miller, Longino, Anderson, James, and Worley (1999), who estimated MNL models of residence transitions with pooled data from the Longitudinal Study of Aging 1982–90, opted only to adjust the standard errors of their MNL model parameter estimates for complex survey design effects. However, Waidmann and Liu (2000) employed only the same asymptotic bootstrap procedure as we did to adjust the standard errors of parameter estimates in their MNL disability prevalence models estimated with pooled data from 1992–96 MCBS surveys. Although our reported MNL model results did not take account of potential design effects, we reestimated each MNL logit model with (normalized) weighted observations using STATA 6.0 SVYMLOG. This procedure accounts for survey design effects, and the empirical results were found to be robust. Finally, various routine tests for multicollinearity showed no evidence of parameter instability suggestive of a multicollinearity problem, despite the large number of covariates, a few of which had pairwise correlations as high as .60 (i.e., widowhood and living alone among the functionally independent).

Results

Descriptive Statistics

The descriptive statistics presented in Table 2 pertain to the pooled sample of transition data and thus the sample size reflects person-years of observations rather than persons. The sample population comprised mostly women (60%), Whites (86%), and married persons (52%). On average, sample population members were about 76 years old and had 11 years of formal education. A substantial fraction of them were either current (13%) or former (45%) smokers. Although 45% of the sample reported excellent or very good health, nearly a quarter (24%) reported fair or poor health. Average annual Part B Medicare reimbursements were about $1,250 per year, but the distribution was highly skewed because one quarter of the sample had annual Part B reimbursements of $60 or less. About 23% of the sample (including nonrespondents and decedents) had one or more incident hospitalizations between successive MCBS surveys or prior to death, resulting in an average of about 0.30 incident hospitalizations per year.

A relatively small minority of study population members appeared to have access to care problems. More than 80% of the study population had private supplementary insurance, and one third had prescription drug coverage of some kind. About 8% of the study population reported not having a usual physician. The highest prevalence rate of reported access problems or dissatisfaction was for service availability barriers (19%). Expressed dissatisfaction with quality of physician care was relatively low. About two thirds of the sample population did not express dissatisfaction with any of the 17 items in the quality of care scale. These data, which suggest that most Medicare beneficiaries are generally satisfied with access and quality of care, are consistent with other studies of the aged Medicare population employing alternative data sources (Kasper & Riley, 1992). This does not mean that there are no adverse functional status consequences associated with provider dissatisfaction or perceived access barriers, however.

Similar to other studies of the aged community population, the sample means for the chronic condition dummy variables indicated a relatively high prevalence of chronic conditions in the study population. The highest prevalence rates were found for hypertension (59%), arthritis (60%), and ischemic heart disease (44%). Not surprisingly, the lowest prevalence rates were found for Alzheimer's disease and related dementia (1%) and Parkinson's disease (1%).

Multinomial Logit Model Results

The empirical results for the five MNL models are reported in Table 3 in the form of odds ratios. For each MNL model the reference functional outcome state in the odds ratios is defined so that it corresponds to no change in functional state or the origin functional state at time t. Although Table 3 does not include odds ratios for censored outcomes, the risk factors associated with censored nonresponse outcomes tended to be more similar to those for functional decline rather than functional improvement. Estimated odds ratios for censored outcomes other than death can be obtained from the primary author upon request.

Supplementary Insurance and Access to Care

The empirical results suggest that functionally independent elders with private supplementary insurance and/or with prescription drug coverage were less likely to become ADL disabled within a year than those with no private supplementary insurance. The odds of becoming ADL disabled relative to remaining functionally independent were estimated to be about 28–34% lower among such beneficiaries relative to beneficiaries without any private supplementary insurance. Perhaps more importantly, the results suggest that among both the disabled and nondisabled those with private supplementary insurance coverage exhibited better survival outcomes than those without such coverage. The odds of dying within a year relative to no change in functional state were estimated to be about 36–53% lower among beneficiaries with private supplementary insurance. No other significant associations were found between private supplementary insurance coverage and functional status outcomes among disabled beneficiaries, however.

The empirical findings for Medicaid status were very different from those of private supplementary insurance coverage. Medicaid recipients with functional limitations (OR = 0.71) were less likely to experience improvements in functional status than those without private supplementary insurance. Moderately disabled Medicaid recipients were less likely to die within a year than those without supplementary insurance (OR = 0.49). Although the reasons for this latter finding are not entirely clear, it could be explained by better access to long-term care benefits among Medicaid beneficiaries. Generally the findings are not consistent in suggesting that Medicaid coverage results in better disability outcomes. However, there may be potential selection effects, because Medicaid eligibility is attained by some individuals as a direct consequence of high medical costs associated with an illness.

The empirical findings for other access indicators suggest that various access barriers largely influenced functional status outcomes only among functionally independent beneficiaries. The odds of becoming functionally limited, IADL disabled, or moderately ADL disabled within a year relative to remaining functionally independent were about 33%, 38%, and 60% greater, respectively, among functionally independent beneficiaries who reported trouble in accessing care, delaying care, or forgoing care because of financial reasons. Similarly, the odds of becoming IADL disabled relative to remaining functionally independent were estimated to be about 38% greater and 25% greater among beneficia-

Table 3. Multinomial Logit Model for Functional Ability

	Functionally Independent[a]				Functional Limitations[b]				IADL Disability[c]					Moderate ADL Disability[d]				Severe ADL Disability[e]			
Variables	FLM	IADL	ADL+[f]	DTH	IND	IADL	ADL+[f]	DTH	IND	FLM	ADL1[g]	ADL3[h]	DTH	NDIS	IADL	ADL3[h]	DTH	NDIS	IADL	ADL1[g]	DTH
Sociodemographics																					
Age	1.03**	1.07**	1.08**	1.10**	0.99*	1.05**	1.07**	1.10**	0.95**	0.97**	1.02*	1.07**	1.06**	0.93**	0.98**	1.05**	1.05**	0.92**	0.97*	0.96**	1.04**
Male	0.77**	0.55**	0.77**	1.67**	1.15	0.51**	1.02	1.77*	1.95**	1.62**	1.31*	1.07	2.31**	1.55**	0.69**	0.90	1.30*	3.80**	0.69	1.09	1.78**
Live alone	0.95	0.76*	0.76*	1.17	0.89	0.84	0.97	1.10	1.04	1.01	0.97	0.80	1.27	1.21	0.99	0.81*	0.87	1.35	0.77	1.07	0.90
Widowed	1.04	1.24	1.27	0.99	1.17	1.13	1.35*	1.36	1.18	1.14	1.38**	1.23	1.01	0.97	0.85	1.10	1.19	0.89	1.03	1.17	1.00
Divorced/separated	1.05	1.43	1.43	1.34	1.26	1.43	1.49	0.55	1.24	1.24	1.45	1.11	0.99	0.78	0.63**	0.93	0.84	1.04	1.84	1.16	0.93
Never married	0.86	0.79	1.12	0.95	1.39	2.25**	1.89*	1.08	1.23	1.35	1.32	1.19	1.03	0.77	0.85	1.36	1.28	1.10	1.85	1.03	0.87
Income	0.96**	0.98	0.98	0.89**	1.03	1.03	1.03	1.03	1.03	0.98	0.99	0.99	0.97	1.05**	1.01	1.02	1.03	1.10	1.06	1.04	1.02
Education	1.00	0.98	0.99	1.02	0.99	0.96**	0.97*	0.98	0.99	0.99	1.00	0.98	1.00	0.98	0.98*	0.99	1.00	0.96	0.96	0.98	1.03
Hispanic	1.10	0.88	1.13	0.55	1.60**	1.36	0.79	0.70	1.66*	0.86	0.76	0.40*	0.28**	1.35	1.34	0.85	0.85	1.78	1.64	1.34	0.97
Black	0.91	1.05	1.01	0.78	1.43**	1.04	0.72	0.69	1.42	1.20	1.25	1.40	0.84	1.44**	1.41**	1.04	1.04	2.18*	1.39	0.78	0.78
Access to and Satisfaction With Health Care																					
Supplemental insurance	0.99	0.80	0.66**	0.63*	1.04	1.07	0.86	0.47**	0.97	1.13	1.04	1.12	0.61*	0.92	0.91	0.81	0.55**	1.73	0.83	0.85	0.76
Supplemental insurance with RX coverage	1.03	0.95	0.72*	0.70	1.06	1.02	0.89	0.56*	0.98	1.10	1.11	1.37	0.78	0.86	0.96	0.90	0.49**	1.87	0.80	1.14	0.64*
Medicaid	1.04	1.16	1.40	1.29	0.71*	1.03	1.12	0.66	0.79	0.98	1.21	1.48	1.18	0.81	0.99	0.96	0.49**	1.12	0.83	0.93	0.80
30 min to doctor's office	0.99	1.38**	1.07	0.78	0.94	0.93	1.02	0.91	0.93	1.00	0.87	0.78	1.16	0.96	1.08	1.33*	1.03	1.03	0.94	1.10	1.17
Physician cost barrier	1.33*	1.38*	1.60**	1.22	0.88	1.06	1.03	0.35	0.98	1.02	1.08	1.53*	0.88	0.94	0.88	0.98	0.76	1.36	1.81**	0.94	0.73
Service availability barrier	1.02	1.25*	1.00	1.09	0.82*	1.15	0.96	0.60	0.94	0.90	0.84	1.15	0.71	0.86	1.23*	1.20*	1.18	0.97	0.85	0.93	0.89
Regular physician	1.22*	0.95	0.89	0.90	0.82	0.94	0.77	0.73	0.81	0.97	0.74	0.63	0.50**	1.11	0.93	1.07	0.86	0.85	0.82	0.84	0.88
Dissatisfaction with care	1.03*	1.02	1.00	0.93	1.00	0.99	1.03	0.97	0.97	1.00	1.01	1.02	0.99	0.99	1.00	1.02	0.98	1.07	1.00	0.98	0.96
Health Behaviors and Health Status																					
Current smoker	1.27**	1.31*	1.37*	2.35**	0.98	1.30	1.38*	2.09**	1.06	1.11	1.40*	1.91**	2.28**	0.69**	0.79	0.92	1.20	0.52	1.15	1.17	1.48
Former smoker	0.95	1.02	1.11	1.47**	0.96	1.10	1.11	1.12	1.01	0.93	1.23*	1.13	1.29	0.99	0.99	0.85	1.25	0.55*	0.91	0.79*	1.43**
Prior Part B Medicare	1.02	0.99	1.04	1.10**	0.97	1.02	1.02	1.08	1.00	1.01	0.96*	1.05	1.06*	0.99	1.00	1.01	1.06**	1.01	1.04	1.02	1.04*
Poor health	1.47**	1.33*	1.16	1.73**	0.76*	1.28*	1.05	1.38	0.70**	1.15	1.00	1.01	1.56*	0.60**	0.94	1.01	1.40**	0.47**	0.91	0.79*	1.20
Excellent health	0.74**	0.64**	0.69**	0.82	1.12	0.99	0.82*	0.83	1.53**	1.25*	0.75**	0.68*	0.80	1.22*	1.12	0.89	0.89	1.48	1.78*	1.50**	1.05
BMI over 30	1.91**	1.66**	1.56**	1.57	0.75**	1.07	1.64**	1.71*	0.63**	1.16	1.31*	1.27	0.59	0.68**	0.77**	1.08	0.64**	0.58	0.61*	1.09	0.88*
BMI under 20	0.90	1.16	0.85	2.23**	1.00	1.22	1.11	2.83**	0.83	0.70*	0.80	1.07	1.54*	0.81	1.00	1.17	1.96**	0.79	1.10	0.88	1.44*
Incontinent	1.44**	1.91**	1.25	1.09	1.04	1.07	1.12	1.03	0.71*	0.85	1.31*	0.87	1.07	0.66**	0.92	1.43**	0.93	0.50*	0.37**	0.62**	0.93
Incident hospitalizations	1.37**	1.90**	2.35**	3.42**	0.90	1.27**	1.59**	2.75**	0.66**	0.84*	1.17**	1.78**	1.95**	0.83**	0.95	1.55**	1.80**	0.51*	0.73**	0.80**	1.28**
Disability entitlement	0.86	1.30	1.51	1.00	0.79	1.78**	1.43	1.51	0.47**	0.96	1.08	1.48	0.78	0.73*	0.91	1.30	1.13	0.34*	1.03	0.70*	0.97
Chronic Conditions																					
Deaf	1.24*	2.30**	1.17	1.02	0.94	1.47**	1.08	0.81	0.71**	0.68**	0.76*	0.75	0.84	0.77*	1.11	0.91	1.13	0.81	1.57	1.16	0.84
Hearing impaired	1.38**	1.20*	1.30**	0.98	0.80**	1.00	0.98	1.25	0.80*	0.96	0.94	1.10	0.77	0.90	1.06	0.93	0.78*	1.15	1.27	1.10	0.96
Lower extremity fracture	1.60**	1.29	1.62*	2.24*	0.90	1.10	1.92**	1.85	1.46	1.05	1.32	1.16	0.64	0.97	0.80	1.20	1.23	1.74	0.35**	0.69**	0.95
COPD	1.12	1.40**	1.36*	1.04	0.95	0.97	1.01	1.21	1.03	0.93	1.14	0.92	1.24	0.92	1.04	0.96	1.33*	0.93	1.08	1.30*	1.65**
Osteoporosis	1.14	1.58**	1.70**	0.81	1.01	0.81	1.12	0.85	0.71*	0.77	1.17	1.30	0.68	0.77*	1.01	1.28*	0.96	1.25	0.93	0.88	0.84
Stroke	1.16	1.56**	1.43*	1.22	1.07	1.39*	1.43*	1.14	0.98	0.90	1.26	1.71**	1.54*	0.78*	1.11	1.41**	1.26	0.24**	0.78	0.74**	0.96
Cancer	0.97	1.15	1.08	1.44**	1.05	1.00	1.11	1.86**	1.11	0.96	1.04	1.13	1.50**	1.16	1.16	1.00	1.76**	0.86	1.35	1.00	1.54**
Diabetes	1.23*	1.20	1.34*	1.73**	0.80*	0.89	1.21	0.96	0.71*	0.89	1.10	1.41*	1.49*	0.77**	0.82*	0.97	1.23	0.49*	0.88	0.85	1.10
Rheumatoid arthritis	1.53**	1.28	1.78**	1.19	0.87	0.95	1.12	1.28	0.78	0.99	1.33**	1.59**	0.75	0.81*	1.02	1.17	0.93	1.06	0.93	1.01	1.25
Arthritis	1.69**	1.26**	1.49**	0.71*	0.71**	1.04	1.15	0.67*	0.80*	1.11	1.16	1.44*	0.85	0.87	1.03	1.11	0.63**	0.74	1.67*	1.27	0.84
Dementia	2.60*	4.84**	6.51**	2.63	3.11	6.53**	1.19	0.88	0.88	0.18	0.95	3.36*	2.67*	1.20	0.73	2.26**	1.86	1.27	0.59	0.44	0.66
CHF	1.26	1.12	1.25	2.09**	0.70*	0.87	1.01	1.42	0.73	0.79	1.02	1.21	1.94**	0.67**	0.75*	1.16	1.91**	0.38*	0.85	1.06	2.13**
Other heart disease	0.89	1.20	1.20	1.28	1.23	1.30	0.78	1.16	0.89	1.04	1.02	1.08	0.97	0.82	1.16	0.80*	1.15	1.09	0.97	0.98	1.27
Hypertension	1.02	1.10	1.12	1.01	0.90	0.98	1.14	1.37	0.94	1.04	1.16	1.07	1.17	0.88	0.96	1.07	0.89	1.21	0.92	1.36**	0.76
PVD	1.34	0.71	1.29	0.85	0.92	1.38	1.60**	1.64	0.99	1.09	0.81	0.44*	0.97	1.04	0.93	1.06	1.51**	1.11	0.88	0.66**	1.03
Ischemic heart disease	1.00	0.99	0.89	0.93	1.08	1.15	1.15	0.93	1.07	0.95	0.98	0.67*	0.86	0.93	1.13	0.82*	0.83	1.39	0.98	0.87	0.85
Parkinson's	1.67	0.41	1.42	0.82	0.80	1.88*	1.59	0.65	0.34	0.80	1.74	4.66**	2.46	0.54	0.75	1.97**	1.53	0.15	0.52	0.34**	1.03
Transition Base Year																					
Year 92	0.82*	0.89	1.08	0.76	1.02	0.86	0.97	0.67	0.92	0.82	0.97	0.88	0.95	0.80*	1.04	1.34**	0.89	0.72	0.00	0.87	0.73
Year 93	0.94	0.80*	0.79	0.87	0.76*	0.82	0.85	0.57*	0.75*	0.74*	0.90	0.86	0.80	0.72**	0.99	1.13	0.91	0.96	0.61*	0.80	0.75
Year 94	1.03	0.82	0.82	1.47*	0.69**	0.76*	0.69**	0.50**	0.84	0.90	0.92	0.92	1.10	0.90	0.88	1.14	1.36*	0.79	0.66	0.85	0.87
Year 95	1.02	0.78*	0.77*	1.07	0.81	0.77	0.84	0.65	0.74*	1.04	0.90	0.59*	0.79	0.79*	0.92	1.12	1.18	1.64	0.61*	0.79	1.14
Sample *N*	15,528				6,768				5,935					8,826				3,736			
Pseudo R^2	0.09				0.08				0.09					0.10				0.10			

Notes: See Sample section in text for full description. IADL = instrumental activity of daily living; ADL = activity of daily living; FLM = functional limitations; DTH = death; IND = functional independence; NDIS = at most functionally limited, or nondisabled; BMI = body mass index; COPD = chronic obstructive pulmonary disorder; CHF = congestive heart failure; PVD = peripheral vascular disease.

[a] Odds ratios refer to the odds of moving to a state of functional limitations, IADLs, one or more ADLs, or death relative to remaining functionally independent.

[b] Odds ratios refer to the odds of moving to a state of functional independence, IADLs, one or more ADLs, or death relative to remaining functionally limited.

[c] Odds ratios refer to the odds of moving to a state of functional independence, functional limitations, one or two ADLs, three or more ADLs, or death relative to remaining IADL disabled.

[d] Odds ratios refer to the odds of moving to a state of nondisability (functional independence or functional limitations), IADLs, three or more ADLs, or death relative to remaining disabled in 1–2 ADLs.

[e] Odds ratios refer to the odds of moving to a state of nondisability (functional independence or functional limitations), IADLs, one or two ADLs, or death relative to remaining disabled in three or more ADLs.

[f] One or more ADLs.

[g] One to two ADLs.

[h] Three or more ADLs.

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

ries reporting long travel times to their provider and service availability barriers, respectively. Finally, functionally independent beneficiaries who expressed greater dissatisfaction with the quality of medical care they received were more likely to become functionally limited within a year (OR = 1.03). There were inconsistent findings regarding the effects of a usual provider. Among functionally independent beneficiaries, the findings suggest that those with a usual physician were more likely to incur functional limitations within a year than otherwise similar individuals without a regular doctor (OR = 1.22). On the other hand, among IADL-disabled beneficiaries, individuals with a regular physician were less likely to die within a year (OR = 0.50). Otherwise, among functionally limited or disabled beneficiaries, access to care barriers were generally insignificant or there were inconsistent results.

Sociodemographic Factors

The empirical results for sociodemographic factors were generally consistent with those found in previous research. Increased age was associated with an increased likelihood of functional decline, death, and a decreased likelihood of functional improvement. Men were more likely to die within a year than women regardless of functional status. The estimated odds ratios ranged from 1.30 among the moderately ADL disabled to 2.31 among the IADL disabled. Although the size of relative risk varied somewhat among functional states, men were generally less likely to decline functionally and more likely to improve if disabled than were women.

Less consistency was found in the empirical results for the remaining sociodemographic factors, but there were some notable patterns. Generally, nonmarried beneficiaries were more likely to experience functional decline than married beneficiaries. Beneficiaries of higher SES as reflected in either education level or income were generally at lesser risk of decline in functional status and in some cases more likely to exhibit functional improvement than their lower SES counterparts. Finally, although race/ethnic status was not usually associated with risk of functional decline, greater consistency was found in results suggesting that Hispanics and Blacks were more likely than Whites to move from states of disablement to states of functional independence. This greater resiliency toward functional status improvement among Hispanics and Blacks relative to Whites may be the result of their being more physiologically robust because of selective survival effects (Clark, Maddox, & Steinhauser, 1993).

Health Behaviors and Health Status

The empirical results regarding health behaviors and health status were generally consistent with prior research. Regardless of baseline functional status, beneficiaries with a BMI of more than 30 were more likely to exhibit functional decline, and those with a BMI of less than 20 were more likely to die, relative to beneficiaries with normal BMI levels. These nonlinear effects are consistent with the recent findings of Ferraro and Booth (1999). Smokers, and current smokers in particular, were more likely to experience functional status decline and death than those who had never smoked, regardless of current functional status. Although former smokers did not appear to be at greater risk of disability, the results suggest they retained a higher mortality rate than nonsmokers. The MCBS does not contain any information about how long ago a respondent quit smoking, however.

Similar to much of previous research, subjective perceptions about health status were consistently found to be predictive of both functional status change and mortality (Stuck et al., 1999). The two variables serving as indicators of medical instability constructed from Medicare claims data, prior Part B reimbursements and incident hospitalizations, were also consistently found to be associated with functional decline and death regardless of baseline functional status. The suggested impacts were particularly large among beneficiaries who were functionally independent. Among the functionally independent, the odds of ADL disability and death within a year increased by 2.35 times and 3.42 times, respectively, for each additional incident hospitalization following a survey. Finally, incontinence increased the risk of functional decline but not death. Beneficiaries who were originally entitled to Medicare before turning 65 years old because of disability were much less likely to recover from a disabled state. The estimated odds of recovery from disability over continued disability were between 27% and 66% lower among aged beneficiaries originally entitled to Medicare because of disability.

Chronic Conditions

The empirical results for the chronic condition dummy variables were generally consistent with findings from previous research (Stuck et al., 1999). Although there were a few exceptions to the general rule, most chronic conditions were associated with a greater risk of functional decline and death and a lower likelihood of functional improvement. Relatively few significant associations were found between functional decline or functional improvement and a number of heart-related diseases such as hypertension, ischemic heart disease, and other heart disease. In contrast, chronic conditions such as diabetes, arthritis, rheumatoid arthritis, stroke, Alzheimer's disease, and Parkinson's disease appeared to both increase the likelihood of functional decline among the nondisabled and reduce the chances of functional improvement among the disabled. Congestive heart failure and cancer were more often associated with death than functional decline. Although arthritis was consistently found to be associated with increased risk of functional decline, the results of three models suggest that arthritis was associated with a lower risk of death. These findings are presumably the result of arthritis not being life-threatening in general, and because many persons without arthritis have other chronic conditions that are much more strongly associated with death.

DISCUSSION

In this article we examined the effect of access to health care on the disablement process. Our empirical results suggest that access to care is an important extra-individual risk factor in delaying or slowing the disablement process and in extending lifespan. Among functionally independent Medicare beneficiaries, the odds of becoming disabled within a year relative to remaining functionally independent are estimated to be about 30% lower for those with private supplemental insurance. However, the protective effect of this coverage against functional decline appears largely to be limited to delaying an initial onset of IADL or moderate ADL disability. Private supplemental insurance is not associated with retarding or reversing functional status among individuals who are disabled.

Of importance is that private supplementary insurance coverage is associated with better survival outcomes. In contrast to the findings for functional status, this protective effect is not limited to Medicare beneficiaries who are functionally independent. With the exception of those who are more severely disabled in ADLs, the odds of dying within a year are estimated to be between 37% and 53% lower among Medicare beneficiaries with private supplementary insurance relative to those without such coverage.

Whereas private supplementary insurance should increase access through the reduction or elimination of deductibles or coinsurance, insurance coverage alone does not ensure access to care (Kasper, 1997). Our study findings differ from Landerman and colleagues (1998) in that we find other access to care indicators as affecting the disablement process. Among functionally independent Medicare beneficiaries, the odds of becoming disabled within a year are about 30% higher among those who report experiencing financial barriers to care, those who are unable to access care or are dissatisfied with service availability, or those with poor geographic access to their regular provider, relative to those who do not report such problems. Similar to our findings for supplemental insurance coverage, reported access problems and physician dissatisfaction are not associated with delaying further functional decline or functional improvement among individuals who were already functionally limited or moderately disabled. This general pattern of results supports Verbrugge and Jette's (1994) original hypothesis that access to medical care should largely affect earlier (i.e., pathology to impairment) rather than later stages of the disablement process.

Although the Health Care Financing Administration has encouraged the enrollment of Medicare beneficiaries in managed care as a strategy for controlling rising Medicare program costs, our findings suggest that it may be prudent for the Medicare program to encourage the purchase of supplemental coverage among Medicare beneficiaries receiving care from fee-for-service providers as well. It may be particularly useful to target moderately low-income beneficiaries who are ineligible for Medicaid, because the purchase of private supplementary insurance is more likely to impose a financial burden upon such beneficiaries. The existing Qualified Medicare Beneficiary and Specified Low-Income Medicare Beneficiary programs enacted in 1988 as amendments to the Medicare Catastrophic Coverage Act were intended to provide supplemental coverage to such lower income Medicare beneficiaries through Medicaid by raising limits on income and asset levels for Medicaid eligibility. Unfortunately, national participation rates in these programs has been low because of a number of factors including beneficiaries' lack of knowledge about the program, barriers in the application and enrollment processes, and lack of coordination between national and state administration (Lamphere & Rosenbach, 2000). Our findings provide some empirical evidence supportive of the goals motivating these existing programs and highlight the importance of pursuing the necessary administrative steps to make them work.

Although it is beyond the scope of this article for us to formally assess the cost effectiveness of supplementary insurance on the Medicare program, our findings suggest that proposals to tax supplementary insurance policies for the incremental costs imposed upon Medicare may be unwise. A substantial body of research suggests that Medicare beneficiaries with supplementary insurance use more services and consequently have higher annual Medicare reimbursements, on average, than otherwise similar beneficiaries without supplementary insurance (Ettner, 1997; Khandker & McCormack, 1999; McCall et al., 1991; Taylor et al., 1988). Because the premium costs of supplementary insurance are based only on the actuarial value of coinsurance and deductibles, the costs borne by Medicare for any additional service utilization associated with lower out-of-pocket costs at the point of service are not included. Hence, some have called for imposition of a tax on supplemental insurance policies to cover these incremental costs to the Medicare program (Dowd, Christianson, Feldman, Wisner, & Klein, 1992; Ettner, 1997; Taylor et al., 1988). Because, on average, annual Medicare costs have been shown to be between 1.6 times (for IADLs) to 3.6 times (for three or more ADLs) higher among aged Medicare beneficiaries who are disabled relative to nondisabled aged beneficiaries (K. Liu, Wall, & Wissoker, 1997), our empirical findings suggest that at least some of the short-run incremental cost to the Medicare program of supplementary insurance for nondisabled beneficiaries may be offset by lower future-year Medicare costs by delaying the onset of disability.

Our findings regarding private supplementary insurance with prescription drug coverage are also important given the current policy interest by both Democratic and Republican members of the U.S. Congress in expanding access to prescription drugs for Medicare beneficiaries. Although expanding Medicare coverage for prescription drugs will almost certainly result in higher prescription drug expenditures among Medicare beneficiaries (Poisal & Chulis, 2000), little, if any, hard empirical evidence exists about its likely broad impacts on health outcomes. Our findings suggest that the protective effects of supplementary insurance against disability and death are not enhanced by adding prescription drug coverage. Expansion of Medicare coverage of prescription drugs may have to be justified on other grounds.

Our study has some potential limitations. Similar to most studies of disablement that use secondary data, measurement errors in self-reported functional status and other factors may obscure some relationships between risk factors and functional status transitions. Second, the functional status states employed in this study are defined in terms of an assumed hierarchy among functional limitations, IADLs, and ADLs based on the items reported in the MCBS. Much attention has been given to the greater relative importance of lower body functional limitations rather than upper body limitations as predictors of subsequent disability (Johnson

& Wolinsky, 1993; Lawrence & Jette, 1996). Because of the small number of functional limitations reported in the MCBS, we could not use upper versus lower body functional limitations to distinguish separate functional status states. Furthermore, although similar simple hierarchical disability scales based on undifferentiated counts of IADLs or ADLs have been used elsewhere (R. T. Anderson et al., 1998; Mor et al., 1994), there is no consensus among researchers about the dimensionality of IADL and ADL functional status (Fitzgerald, Smith, Martin, Freedman, & Wolinsky, 1993; Spector & Fleishman, 1998).

Beneficiaries with individually purchased supplemental coverage could be different from beneficiaries with employer-sponsored insurance, and this study did not distinguish between the two. Additionally, in spite of our efforts to seriously address possible biases associated with the potential endogeneity of supplementary insurance discussed earlier, it is still possible that the significant associations we find between access to care and disability transitions are spurious and result from their correlation with some other poorly specified or unspecified factor. Although the MCBS study data indicate that respondents with private supplementary coverage are more likely to report certain behaviors associated with preventive care (e.g., flu shots, mammograms), such insurance is associated with SES indicators as well (e.g., income, education). If SES effects account for our study findings, however, it is difficult to explain why significant protective income and/or education effects are found for all beneficiaries except the most severely disabled, whereas significant effects of access to care barriers are largely restricted to individuals who were functionally independent.

Given the substantial associations found among access to care, disablement, and survival, further study is warranted. Individual Medicare claims data may provide a basis for identifying medical practice styles and specific medical inputs that underlie our empirical findings of protective effects associated with health care access.

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