
Predictors of Preventive Service Use Among Medicare Beneficiaries

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Despite Medicare coverage, receipt of clinical preventive services is suboptimal. Using multivariate regression analyses and Medicare Current Beneficiary Survey (MCBS) data for 2001, we estimated the relationship between the number of preventive services received in the 12-month recall period and: socioeconomic, plan type, health status, health risks, and ability to address daily needs. Results are nationally representative for the study year. With the exception of blood pressure and cholesterol screening, approximately one- to two-thirds of Medicare beneficiaries did not receive recommended preventive services. Strategies should be developed to ensure appropriate use of preventive services over time.

INTRODUCTION

Many preventive services are underutilized by elderly persons in the United States, despite evidence of their effectiveness (Amonkar et al., 1999; Blustein, 1995; Fox et al., 2001; Gornick, Eggers, and Riley, 2004; Javitt et al., 1994; Kruspe et al., 2003; Mandelblatt and Phillips, 1996; Picone et al., 2004) and Medicare coverage for them. A report by the U.S. Government Accountability Office (2003) found that nearly 90 percent of Medicare beneficiaries visited a physician at least once a year,

and on average made six visits a year. Despite this number of contacts, many beneficiaries have not had the full range of recommended, Medicare-covered preventive services.

The literature is clear that expanding insurance coverage can lead to an increase in the use of preventive services. Refer, for example, to articles by Coleman and O'Sullivan (2001), Henderson and Schenck (2001), and Keleher and Stellman (2000) addressing mammography; an article by Etzioni et al. (2002) addressing the use of prostate specific antigen (PSA) testing, and a study by Morrissey et al. (1995), on office-based preventive services. However, it is also clear that expanded coverage, by itself, will not result in optimal use of preventive services (Finison et al., 1999; Keleher and Stellman, 2000; and Fox and Roetzheim, 1994).

The objective of this study was to identify factors that predict the use of clinical preventive services among Medicare beneficiaries. The results may help policymakers, health plan administrators, physicians, and others identify steps to enhance the appropriate use of these services among Medicare beneficiaries.

Data Source and Study Design

Retrospective analyses were conducted using MCBS for 2001. First, we estimated the percentage of Medicare beneficiaries who had low (less than five), medium (five or six), or high (seven) numbers of clinical preventive services that were measured in the 2001 MCBS, for a 12-month recall

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period. For all beneficiaries, these services included pneumococcal vaccination, influenza vaccination, glaucoma screening, cholesterol screening, and blood pressure testing. For females we also investigated the use of mammography and Pap smear, and for males, digital rectal exams and PSA tests were considered. Next, with multinomial logistic regression analyses, we estimated the relationship between utilization of these services and: socioeconomic factors; health plan type; health status; underlying health risks; and ability to take care of one's daily needs. The descriptive and regression analyses adjusted for the complex sampling design used for the MCBS. Results are nationally representative for the study year.

Sample

The analytic sample ($n = 11,158$) included MCBS respondents who were non-institutionalized Medicare beneficiaries living in the community. Most (51 percent) were age 65-74. Another 38 percent were age 75-84, and about 11 percent were age 85 or over. About 58 percent were female, 8 percent were Black, and 10 percent were Hispanic. About 12 percent were still employed, 50 percent were high school graduates, and 59 percent had incomes less than \$25,000. About 9 percent were dually enrolled in Medicare and Medicaid. About 21 percent were Medicare+Choice (M+C) members. About 9 percent had no children, and 32 percent lived alone.

Methods

The 2001 MCBS data provided information on several variables expected to influence preventive services utilization. The socioeconomic factors included in this study measured age, sex, race, marital status, employment status, income, educa-

tion, number of living children, whether the respondent lived alone, place of residence, and the availability of personal care services.

With regard to age, we expected lower clinical preventive services use among older patients. Blustein and Weiss (1998), Ives et al. (1996), and Mayer-Oakes et al. (1996) found that mammography use was lower for older patients, especially among those over age 75. Younger females also seemed more likely to have a Pap smear (Ives et al., 1996). Some have argued that screening rates for prostate cancer should be lower for those age 70 or over, because screening often finds asymptomatic disease for which there is no useful treatment (Potosky et al., 1995), or leads to treatments that add only a few days of life for the typical elderly patient (Coley et al., 1997).

With regard to sex, females are often observed to be greater users of health care, including preventive screenings (Sindelar, 1982). Using the example of prostate cancer, many males are reticent to be screened for that disorder (Thomas et al., 2003).

Race has also been associated with the use of clinical preventive services. For example, Gilligan et al. (2004) found that PSA screening rates were significantly lower among Black persons, even though they were more likely to be diagnosed with advanced prostate cancer. Hispanic females may be lower users of mammography, compared with Black persons and White persons (Fox and Roetzheim, 1994), and Black females may be less likely to receive an influenza vaccination (Morales et al., 2004). Thus, we expected the use of clinical preventive services to differ by race.

The literature on education, income, and employment status is mixed. Sung et al. (2002) found none of these variables to influence cervical or breast cancer screening

rates after culturally appropriate health promotion programs were implemented. In contrast, Morales et al. (2004) found that, other things equal, wealthier females received a higher number of preventive services in their M+C plans. Hardy et al. (2000) suggested that lower-income females are less likely to participate in screening mammography because they are more difficult to reach. Mayer-Oakes et al. (1996) found mammography rates to be higher for elderly females with incomes greater than \$30,000. Lane et al. (2000) also found that breast cancer screening was higher among elderly females who were better educated or had higher income.

Interestingly, it may not only be the patient who reacts to income and educational influences. Coleman and O'Sullivan (2001) found that physicians were more likely to recommend breast cancer screening among patients with better education and higher income.

Despite the mix of findings, the weight of the evidence suggests that education, employment status, and income influence the use of clinical preventive services. Consequently, we controlled for these factors in our analyses. Similarly, we expected correlates of income, such as living in a single family home or a retirement community to be associated with greater clinical preventive service use.

Other variables used in our analysis accounted for plan type, that is, whether the respondent was a member of an M+C plan, or used traditional fee-for-service (FFS) Medicare services. We also accounted for dual enrollment in Medicare and Medicaid, but this may be a proxy for income more so than plan type, since Medicaid plans involve a number of different arrangements.

The use of preventive services was expected to be higher in the M+C plans, given the general orientation of these plans

toward preventive care. Ives et al. (1996) and Blustein (1995) found the use of Pap smear and/or mammography to be greater in supplemental insurance plans, and Barton et al. (2001) found that access to better care in general was more likely for elderly patients in health maintenance organization plans, compared with those in traditional FFS plans.

The analyses also investigated relationships between clinical preventive service use and having a history of one or more of the following conditions: hardening of the arteries; hypertension; myocardial infarction; angina or coronary heart disease; other heart problems; stroke; diabetes; rheumatoid arthritis; osteoporosis; broken hip; emphysema, asthma or chronic obstructive pulmonary disease (COPD); complete or partial paralysis; cancer related to the preventive services of interest; other types of cancer; depression; loss of general interest in life in the past 12 months; or other psychiatric or mental health problems. The notion behind including these variables in the analyses was that having a history of these health problems may motivate patients to take better care of themselves, or may result in more visits to the doctor, where additional preventive services could be conducted as part of the patient's treatment. The health impacts of these diseases may vary, however, and the literature suggests that screening behavior varies according to condition (Ives et al., 1996; Morales et al., 2004), so the impact of a personal history of each of these conditions was studied separately.

The analyses also investigated the relationship between perceived health status and the use of clinical preventive services. The expected impact of health status is unclear. One may surmise that better health status leads to lower preventive service use, because patients who feel good about their health are less likely to request

medical tests. Alternatively, as Blustein (1995) and Ives et al. (1996) found for mammography or Pap smear, screening rates may be higher among females who are healthier, either because of a general desire to remain healthy, or because healthier beneficiaries may be better able to handle the logistics of making and keeping appointments for preventive services.

The analyses also investigated the relationship between the existence of health risks measured by the MCBS and the use of clinical preventive services. These risks included being: a current smoker, a former smoker, overweight (i.e., having a body mass index of 25-29), obese (having a body mass index of ≥ 30), a heavy drinker (i.e., having at least four drinks per night on 8 or more nights per month), failing to get at least some weekly exercise, and failing to do moderate, vigorous, or muscle-building exercise at least once a week. Beneficiaries with these risks were expected to exhibit more risk-taking behavior in general, and were therefore expected to use fewer clinical preventive services. For example, Hsia et al. (2000) found that smokers were less likely to use screening services for breast, colorectal, or cervical cancer. Mayer-Oakes et al. (1996) found that mammography rates were lower among females whose personal care habits were less prevention-oriented.

Next, the analyses investigated the relationship between the ability to perform instrumental activities of daily living (IADLs) and the use of clinical preventive services. These IADLs were measured individually, and included indicators for whether the beneficiary could use the telephone, perform light housework, perform heavy housework, pay bills, prepare meals, and shop. The analyses accounted for the ability to do these activities, and for the desire to carry them out. The latter was

assessed by asking whether beneficiaries would usually perform these activities in their household if their health was not at issue. The ability to handle the logistics of making and keeping appointments for clinical preventive services was thought to be related to the ability to perform these IADLs, so beneficiaries who could not do these were expected to use fewer preventive services. Similarly, the number of living children and the availability of personal care services were expected to influence beneficiaries' use of preventive services, because having more children and access to personal care services may facilitate making and keeping appointments.

Statistical Methods

To estimate the proportions of beneficiaries who received each service, the SVRMEAN program in the STATA[®] statistical software package was used. This program accounted for the binary nature of the demographic, plan type, health status, and other variables of interest (Winter, 2004).

The variables mentioned were also entered into multinomial logistic regression analyses designed to test whether each was associated with the likelihood of using low, medium, or high numbers of preventive services. The possible range of services was 0 to 7 for each patient. The cut points used to determine low, medium, or high numbers were determined statistically. Low users were those who were in the first quartile of service use. They used 0 to 4 clinical preventive services (4 = 25th percentile). Medium users were within the 26th-75th percentiles (using 5 or 6 services). High users were those who used all 7 possible services (the 76-100th percentiles were all = 7 services).

Table 1
Percent of Respondents Reporting Selected Characteristics Related to Health Status: 2001

Ever Had Heart or Related Problems	Percent	% Standard Error	95% Confidence Interval	Interval	Design Effect ¹
Diabetes	18.3	0.43	17.42	19.13	1.47
Stroke	10.9	0.29	10.38	11.52	1.00
Angina or CHD	12.9	0.35	12.15	13.56	1.32
Myocardial Infarction	14.1	0.36	13.37	14.78	1.24
Hardening of Arteries	9.8	0.27	9.26	10.35	1.00
Other Heart Problems	15.8	0.39	15.20	16.59	1.38
Hypertension	58.0	0.51	56.96	58.97	1.24
Mental Health Problems					
Depressed All or Most of Last 12 Months	5.4	0.20	5.04	5.85	0.96
Ever Had Psychiatric or Mental Health Problem	6.7	0.22	6.30	7.17	0.91
Ever Had Musculoskeletal Problems					
Rheumatoid Arthritis	9.4	0.29	8.84	9.99	1.17
Broken Hip	3.4	0.16	3.11	3.73	0.89
Osteoporosis	16.5	0.35	15.80	17.20	1.07
Paralysis	3.5	0.19	3.10	3.84	1.23
Cancer, Emphysema, Asthma, and COPD					
Cancer Related to the 7 Possible Clinical Preventive Services	14.2	0.30	13.63	14.83	0.88
Other Types of Cancer	5.8	0.22	5.33	6.20	1.04
Emphysema, Asthma, COPD	13.5	0.35	12.82	14.22	1.26
Perceived General Health Status					
Excellent	16.2	0.36	15.52	16.96	1.14
Very Good	29.1	0.41	28.27	29.89	0.95
Good	32.8	0.48	31.88	33.77	1.21

¹ The design effect is an estimate of the relative size of the variance of a variable, compared with what it would have been if simple random sampling had been used for the Medicare Current Beneficiary Survey. For example, the design effect for the diabetes variable is 1.47, suggesting that the variance is 1.47 times as large as it would have been if the Medicare Current Beneficiary Survey used a simple random sample. All analyses reported in this article are adjusted for the size of the design effect.

NOTES: CHD is coronary heart disease. COPD is chronic obstructive pulmonary disease.

SOURCE: Centers for Medicare & Medicaid Services: 2001 Medicare Current Beneficiary Survey.

The multinomial logistic regression analyses used the SVRMODEL program in the STATA[®] software package (Winter, 2004). Like the descriptive analyses, these analyses were weighted using the MCBS cross-sectional weights, and adjusted for the complex sampling scheme used in the MCBS.

Because the output of the weighted multinomial logistic regression process is difficult to decipher on its face, we used the regression results to estimate the predicted probabilities that each type of beneficiary represented by the independent variable categories would have low, medium, or high numbers of tests. The unadjusted probabilities were also estimated.

RESULTS

Sample Characteristics

The socioeconomic and health plan characteristics of the sample were mentioned earlier. The accompanying tables illustrate the health status, health risk, and IADL characteristics of the sample members.

Table 1 shows health status in terms of the proportions of patients who report ever having diabetes and cardiovascular disease. Fewer than 20 percent of the sample had diabetes (18.3 percent), stroke (10.9 percent), angina or coronary heart disease (12.9 percent), myocardial infarction (14.1 percent), hardening of the arteries (9.8

Table 2
Prevalence of Risk Factors: 2001

Risk Factor	Percent	% Standard Error	95% Confidence Interval	Design Effect
Heavy Drinker	1.08	0.10	0.88	1.18
Does Not Do Moderate, Vigorous, or Muscle-Building Exercise at Least Once Weekly	80.82	0.37	80.08	1.05
Does Not Get at Least Some Weekly Exercise	53.57	0.59	52.40	1.63
Overweight	38.58	0.52	37.56	1.29
Obese	20.60	0.47	19.67	1.56
Current Smoker	10.98	0.34	10.30	1.42
Former Smoker	47.86	0.59	46.68	1.66

SOURCE: Centers for Medicare & Medicaid Services: 2001 Medicare Current Beneficiary Survey.

Table 3
Respondents Having Difficulty With Instrumental Activities of Daily Living: 2001

Activity	Percent	% Standard Error	95% Confidence Interval	Design Effect
Difficulty Shopping	8.28	0.29	7.71	1.29
Difficulty Preparing Meals	5.28	0.20	4.88	0.94
Difficulty Paying Bills	3.48	0.16	3.16	0.94
Difficulty Using Telephone	5.20	0.24	4.71	1.42
Difficulty Doing Light Housework	6.69	0.26	6.18	1.25
Difficulty Doing Heavy Housework	18.20	0.47	17.27	1.75

SOURCE: Centers for Medicare & Medicaid Services: 2001 Medicare Current Beneficiary Survey.

percent), or other heart problems (15.8 percent). A much higher percentage had hypertension (58.0 percent).

Table 1 also shows that 5.4 percent reported being depressed for all or most of the previous 12 months and 6.7 percent had one or more psychiatric or mental health problems.

Musculoskeletal problems may reduce the ability to attend appointments for clinical preventive services. The table also shows that fewer than 10 percent of the respondents reported having rheumatoid arthritis (9.4 percent), or ever having a broken hip (3.4 percent); about 3.5 percent were completely or partially paralyzed; and 16.5 percent had osteoporosis.

Next, Table 1 shows that 14.2 percent of the respondents had cancer related to the clinical preventive services of interest, and 5.8 percent had some other form of cancer. About 13.5 percent reported having emphysema, asthma, or COPD.

Despite the fact that 98 percent of respondents had one or more of the previously mentioned problems, 16.2 percent reported that their general health status

was excellent, and 29.1 percent said it was very good. About 32.8 percent said their general health was good, and only 21.9 percent said it was fair or poor.

The prevalence of health risks varied across beneficiaries, as shown in Table 2. Only 1.1 percent of beneficiaries reported being heavy drinkers, but 80.8 percent were sedentary, reporting that they failed to do moderate, vigorous, or muscle-building exercise at least once a week. Almost 60 percent were either overweight (38.6 percent) or obese (20.6 percent), and 58.8 percent were either current smokers (10.9 percent) or former smokers (47.9 percent).

Most respondents had few problems with IADLs that might limit their ability to make and keep appointments for preventive services. Table 3 shows that fewer than 10 percent had difficulties shopping (8.3 percent), preparing meals (5.3 percent), paying bills (3.5 percent), using the telephone (5.2 percent) or doing light housework (6.7 percent), although 18.2 percent said they had difficulty doing heavy housework.

Table 4
Respondents Who Used Clinical Preventive Services: 2001

Service Type	Percent	% Standard Error	95% Confidence Interval	Design Effect
Mammogram (Females Only)	54.69	0.68	53.35	1.27
Pap Smear (Females Only)	36.28	0.63	35.04	1.15
PSA Test (Males Only)	69.62	0.78	68.06	1.36
Digital Rectal Exam (Males Only)	54.23	0.85	52.55	1.41
Pneumonia Shot	65.19	0.51	64.19	1.32
Eye Exam	62.14	0.55	61.06	1.50
Flu Shot	67.87	0.52	66.85	1.44
Blood Pressure Check	94.80	0.22	94.36	1.16
Cholesterol Test	82.62	0.42	81.79	1.38

NOTE: PSA is prostate specific antigen.

SOURCE: Centers for Medicare & Medicaid Services: 2001 Medicare Current Beneficiary Survey.

Use of Clinical Preventive Services

Table 4 reports utilization of clinical preventive services. These range from a low of 36.3 percent of females who had a Pap smear in the previous 12 months, to 94.8 percent of all beneficiaries who had their blood pressure taken at least once in that period. About 82.6 percent of respondents had a cholesterol test in the prior 12 months, but all other preventive services were used by fewer than 70 percent of Medicare beneficiaries.

Table 5 presents detailed results obtained from the multinomial logistic regression analyses. The table presents regression coefficients that estimate the impact of each independent variable on the log odds of having medium (five to six) or high (seven) numbers of preventive services, compared with the reference category of interest. For example, the coefficients for female sex report whether females were more or less likely than males to have medium or high numbers of services. Table 5 shows females were significantly less likely to have medium or high numbers of preventive services when compared with males. (In other words, one may infer that females were more likely than males to have low numbers of tests.)

To facilitate interpreting the regression results for a large number of variables, Table 6 reports the probabilities that each group of

beneficiaries (e.g., males and females) had low, medium, or high numbers of clinical preventive services. Table 6 shows adjusted probabilities, meaning the probabilities were derived from the results of the multinomial logistic regression analyses. For example, the probabilities presented for males and females already accounted for the influences of the other variables listed in the table. Similarly, the probabilities reported for racial categories account for the influence of sex and all other variables examined, and so on. Unadjusted probabilities that do not account for other sample characteristics are provided for the reader's convenience, as are the differences between the adjusted and unadjusted probabilities.

The adjusted probabilities provide a more accurate view of the impact of each variable on the number of services received, so the following discussion focuses on these adjusted probabilities.

Significant Associations

A few variables were associated with the likelihood of using a high number of clinical preventive services. As shown in Table 6, the adjusted probability of having all seven services was significantly greater (Table 5) for M+C members or FFS beneficiaries (14.7 and 14.4 percent, respectively, versus 10.3 percent for those dually enrolled in Medicare and Medicaid).

Table 5

**Likelihood of Having Medium (Five to Six) and High (All Seven) Number of Preventive Services
Relative to Relevant Reference Group: 2001**

Independent Variable	Medium Number of Services			High Number of Services		
	Coefficients	Relative Risk Ratio ¹	P-Value	Coefficients	Relative Risk Ratio ¹	P-Value
(n=11,158)						
Socioeconomic Factors						
Female Sex	-0.180	0.835	0.003	-0.607	0.545	0.000
Black Persons	-0.183	0.833	0.028	-0.381	0.683	0.006
Never Married	-0.258	0.772	0.074	-0.368	0.692	0.156
Currently Employed	-0.194	0.823	0.008	-0.560	0.571	0.000
Income = \$0 to \$25,000	-0.605	0.546	0.000	-0.955	0.385	0.000
Income = \$25,001 to \$50,000	-0.233	0.792	0.027	-0.474	0.622	0.000
Has High School Diploma	0.220	1.246	0.000	0.417	1.517	0.000
College Graduate or Higher	0.439	1.551	0.000	0.708	2.031	0.000
One or Two Children	0.126	1.134	0.191	0.132	1.142	0.375
Three Plus Children	0.063	1.065	0.507	0.076	1.079	0.594
Lives Alone	-0.062	0.940	0.188	-0.106	0.899	0.142
Lives in Single Family Detached Home	-0.019	0.981	0.723	-0.057	0.945	0.486
Lives in a Retirement Community	0.080	1.083	0.616	0.192	1.212	0.360
Personal Care Services Available in Home	0.229	1.258	0.130	0.302	1.353	0.074
Plan Type and Medicaid Enrollment						
HMO Member	0.219	1.245	0.000	0.152	1.164	0.039
Dually Enrolled in Medicaid	-0.234	0.792	0.006	-0.602	0.548	0.000
Physical Health Status Measures						
Had Hardening of Arteries	0.167	1.182	0.054	0.383	1.467	0.000
Had Hypertension	0.392	1.480	0.000	0.337	1.401	0.000
Had Myocardial Infarction	-0.045	0.956	0.530	0.143	1.154	0.142
Had Angina or CHD	0.113	1.120	0.139	0.056	1.058	0.566
Had Other Heart Conditions	0.218	1.243	0.001	0.228	1.256	0.011
Had Stroke	0.048	1.049	0.532	-0.021	0.980	0.852
Had Diabetes	0.344	1.410	0.000	0.470	1.600	0.000
Had Rheumatoid Arthritis	0.155	1.168	0.039	0.017	1.017	0.872
Had Psychiatric/Mental Health Problem	0.114	1.120	0.342	0.235	1.265	0.069
Had Osteoporosis	0.425	1.530	0.000	0.579	1.784	0.000
Had Broken Hip	-0.222	0.801	0.095	-0.400	0.670	0.037
Had Emphysema, Asthma, or COPD	0.487	1.628	0.000	0.508	1.662	0.000
Had Complete or Partial Paralysis	-0.149	0.861	0.271	-0.308	0.735	0.040
Had Cancer Related to Screening Test of Interest	0.413	1.512	0.000	0.549	1.732	0.000
Had Cancer Not Related to Screening Test of Interest	0.190	1.209	0.076	0.175	1.191	0.312
Mental Health Measures						
Was Depressed All or Most of the Time in the Last 12 Months	-0.169	0.844	0.132	-0.040	0.961	0.794
Was Depressed a Little of the Time in the Last 12 Months	-0.010	0.990	0.887	0.154	1.167	0.091
Had Lost Interest in the Last 12 Months	-0.085	0.919	0.308	-0.055	0.946	0.636
Perceived General Health Status						
Excellent	-0.243	0.784	0.009	-0.433	0.649	0.004
Very Good	-0.058	0.943	0.462	-0.181	0.835	0.152
Good	0.054	1.056	0.464	0.125	1.133	0.275
Instrumental Activities of Daily Living						
Has Difficulty Using Telephone	-0.109	0.897	0.337	0.069	1.071	0.604
Does Not Use Telephone	-0.090	0.914	0.691	-1.054	0.349	0.046
Has Difficulty Doing Light House Work	-0.069	0.934	0.564	-0.112	0.894	0.509
Does Not Do Light Housework	-0.034	0.967	0.753	-0.209	0.811	0.167
Has Difficulty Doing Heavy Housework	-0.077	0.926	0.334	-0.280	0.756	0.008
Does Not Do Heavy Housework	-0.045	0.956	0.556	0.020	1.020	0.815
Has Difficulty Paying Bills	0.105	1.111	0.538	0.228	1.256	0.238
Does Not Pay Bills	0.005	1.005	0.967	-0.245	0.783	0.316
Has Difficulty Preparing Meals	0.029	1.029	0.814	-0.239	0.788	0.260

See footnotes at the end of the table.

Table 5—Continued

Likelihood of Having Medium (Five to Six) and High (All Seven) Number of Preventive Services Relative to Relevant Reference Group: 2001

Independent Variable	Medium Number of Services			High Number of Services		
	Coefficients	Relative Risk Ratio ¹	P-Value	Coefficients	Relative Risk Ratio ¹	P-Value
Does Not Prepare Meals	0.025	1.026	0.819	0.017	1.017	0.908
Has Difficulty Shopping	-0.247	0.781	0.006	-0.253	0.777	0.134
Does Not Do Shopping	-0.393	0.675	0.002	-0.645	0.525	0.001
Health Risks						
Is a Current Smoker	-0.476	0.621	0.000	-0.788	0.455	0.000
Is a Former Smoker	-0.061	0.941	0.276	-0.054	0.947	0.520
Is Overweight	0.159	1.172	0.003	0.081	1.084	0.266
Is Obese	0.229	1.257	0.000	0.079	1.082	0.335
Is a Heavy Drinker	-0.277	0.758	0.208	-1.397	0.247	0.001
Participates in at Least Some Weekly Exercise	0.162	1.176	0.007	0.189	1.208	0.015
Does Moderate, Vigorous, or Muscle-Building Exercise at Least Once a Week	0.072	1.075	0.327	0.088	1.092	0.428
Constant	-0.054	—	0.759	-0.757	—	0.005

¹ The relative risk ratio reports the relative odds that one group of beneficiaries has a medium (or high) number of services, as opposed to having a low number of services, compared with its reference category. For example, the relative risk ratio for females having a medium number of services = 0.836. This means that females are only 0.836 times as likely as males to have a medium number of services (and, conversely, that females are more likely than males to have a low number of services).

NOTES: Results obtained from the multinomial logistic regression analyses. HMO is health maintenance organization. CHD is coronary heart disease. COPD is chronic obstructive pulmonary disease.

SOURCE: Centers for Medicare & Medicaid Services: 2001 Medicare Current Beneficiary Survey.

Those with several chronic conditions were more likely to use all seven services, but the magnitude of the differences was small, and statistical significance (Table 5) may have resulted because of the large sample used for the analysis. Specifically, 17.4 percent of those with hardening of the arteries used all seven services, compared with 13.7 percent of those without hardening of the arteries; 14.7 percent of those with hypertension used all seven services, compared with 13.0 percent without hypertension; 15.0 percent of those with other heart problems used all seven services, compared with 13.8 percent without other heart problems; 16.9 percent of those with diabetes used all seven services, compared with 13.4 percent without diabetes; 17.4 percent of those with osteoporosis used all seven services, compared with 13.4 percent without osteoporosis; 16.1 percent of those with emphysema, asthma, or COPD used all seven services, compared with 13.7 percent without these conditions; and 17.3 percent of those who had cancer

related to the clinical preventive services of interest used all seven services, compared with 13.5 percent who did not have such cancers.

In terms of risk factors, 14.2 percent of those who participated in some weekly exercise used all seven services, compared with 13.2 percent who did not. Table 6 also shows that the adjusted probabilities of having a medium number (five or six) of clinical preventive services were significantly greater (Table 5) for those who were overweight (48.0 percent) or obese (49.9 percent), compared with those at normal weight (45.3 percent). Beneficiaries who were neither overweight nor obese were more likely to have a low number of preventive services (40.9 percent) than those who were overweight (38.0 percent) or obese (36.4 percent). This particular pattern is unexpected, but the magnitude of these differences is small.

Many of the same variables that were associated with having all seven tests were also associated with having a medium

Table 6

Adjusted and Unadjusted Probabilities of Having Low (Zero to Four), Medium (Five to Six), or High (All Seven) Numbers of Preventive Services: 2001

Respondent Characteristic	Adjusted Probabilities			Unadjusted Probabilities			Adjusted-Unadjusted		
	Low Number of Services	Medium Number of Services	High Number of Services	Low Number of Services	Medium Number of Services	High Number of Services	Low Number of Services	Medium Number of Services	High Number of Services
Socioeconomic Factors									
Female Sex	0.423	0.464	0.110	0.520	0.444	0.037	-0.097	0.020	0.073
Male Sex	0.342	0.473	0.181	0.439	0.446	0.114	-0.097	0.027	0.067
Black Persons	0.434	0.451	0.111	0.512	0.397	0.091	-0.078	0.054	0.020
Other Race	0.385	0.472	0.143	0.396	0.449	0.155	-0.011	0.023	-0.012
Never Married	0.453	0.429	0.118	0.512	0.382	0.105	-0.059	0.047	0.013
Married at Some Point	0.387	0.472	0.141	0.402	0.447	0.151	-0.015	0.025	-0.010
Currently Employed	0.447	0.455	0.098	0.425	0.446	0.129	0.022	0.008	-0.030
Not Employed Currently	0.382	0.474	0.144	0.404	0.445	0.152	-0.022	0.029	-0.008
Income = \$0 to \$25,000	0.428	0.444	0.128	0.470	0.414	0.116	-0.042	0.030	0.012
Income = \$25,001 to \$50,000	0.331	0.510	0.159	0.317	0.494	0.189	0.014	0.016	-0.030
Income = More Than 50k	0.286	0.517	0.197	0.261	0.492	0.247	0.025	0.025	-0.050
No High School Diploma	0.442	0.445	0.114	0.495	0.453	0.052	-0.054	-0.008	0.062
High School Diploma	0.378	0.474	0.148	0.385	0.448	0.167	-0.006	0.026	-0.020
College Graduate or Higher	0.325	0.503	0.172	0.294	0.448	0.258	0.030	0.055	-0.086
No Children	0.411	0.455	0.133	0.473	0.401	0.126	-0.062	0.055	0.007
One or Two Children	0.380	0.479	0.141	0.396	0.402	0.202	-0.016	0.077	-0.061
Three Plus Children	0.392	0.468	0.140	0.401	0.458	0.142	-0.009	0.010	-0.002
Respondent Lives Alone	0.402	0.465	0.133	0.450	0.491	0.059	-0.048	-0.025	0.073
Does Not Live Alone	0.382	0.474	0.144	0.383	0.428	0.189	-0.001	0.045	-0.045
Lives in Single Family Detached Home	0.391	0.470	0.138	0.402	0.453	0.145	-0.010	0.017	-0.007
Does Not Live in Single Detached Home	0.383	0.472	0.145	0.416	0.447	0.137	-0.033	0.026	0.007
Lives in a Retirement Community	0.369	0.465	0.167	0.323	0.440	0.237	0.046	0.025	-0.070
Does Not Live in a Retirement Community	0.389	0.471	0.140	0.407	0.465	0.128	-0.018	0.006	0.012
Has Personal Care Services Available in Dwelling Place	0.341	0.503	0.156	0.359	0.445	0.196	-0.018	0.058	-0.040
Personal Care Services Not Available in Dwelling Place	0.391	0.470	0.140	0.407	0.477	0.116	-0.017	-0.007	0.024
Plan Type and Medicaid Enrollment									
HMO Member	0.350	0.503	0.147	0.364	0.444	0.192	-0.014	0.059	-0.046
Dually Enrolled in Medicaid	0.422	0.474	0.103	0.524	0.478	-0.002	-0.102	-0.004	0.106
Neither HMO Nor Dually Enrolled in Medicaid	0.390	0.466	0.144	0.396	0.407	0.198	-0.006	0.059	-0.054
Physical Health Status Measures									
Had Hardening of Arteries	0.348	0.477	0.174	0.320	0.446	0.234	0.028	0.032	-0.060
Did Not Have Hardening of Arteries	0.394	0.470	0.137	0.415	0.477	0.107	-0.022	-0.008	0.029
Had Hypertension	0.352	0.501	0.147	0.368	0.441	0.191	-0.016	0.060	-0.044
Did Not Have Hypertension	0.444	0.426	0.130	0.460	0.477	0.063	-0.016	-0.051	0.067
Had Myocardial Infarction	0.384	0.460	0.156	0.368	0.399	0.232	0.016	0.061	-0.076

See footnotes at the end of the table.

Table 6—Continued
Adjusted and Unadjusted Probabilities of Having Low (Zero to Four), Medium (Five to Six), or High (All Seven) Numbers of Preventive Services: 2001

Respondent Characteristic	Adjusted Probabilities			Unadjusted Probabilities			Adjusted-Unadjusted		
	Low Number of Services	Medium Number of Services	High Number of Services	Low Number of Services	Medium Number of Services	High Number of Services	Low Number of Services	Medium Number of Services	High Number of Services
Did Not Have Myocardial Infarction	0.390	0.473	0.138	0.412	0.450	0.138	-0.022	0.023	0.000
Had Angina or CHD	0.366	0.496	0.138	0.334	0.444	0.222	0.032	0.052	-0.084
Did Not Have Angina or CHD	0.393	0.467	0.140	0.416	0.485	0.098	-0.024	-0.018	0.042
Had Other Heart Conditions	0.355	0.495	0.150	0.345	0.439	0.216	0.010	0.056	-0.066
Did Not Have Other Heart Conditions	0.396	0.466	0.138	0.418	0.483	0.099	-0.022	-0.017	0.039
Had Stroke	0.387	0.479	0.134	0.413	0.437	0.150	-0.026	0.042	-0.016
Did Not Have Stroke	0.389	0.470	0.141	0.405	0.444	0.151	-0.015	0.026	-0.010
Had Diabetes	0.317	0.514	0.169	0.343	0.486	0.171	-0.026	0.028	-0.002
Did Not Have Diabetes	0.405	0.460	0.134	0.420	0.436	0.145	-0.014	0.025	-0.010
Had Rheumatoid Arthritis	0.363	0.501	0.137	0.379	0.484	0.137	-0.017	0.017	0.000
Did Not Have Rheumatoid Arthritis	0.392	0.468	0.141	0.408	0.441	0.151	-0.017	0.027	-0.010
Had Psychiatric/Mental Health Problem	0.356	0.485	0.159	0.391	0.464	0.146	-0.034	0.021	0.013
Did Not Have Psychiatric/Mental Health Problem	0.391	0.470	0.139	0.407	0.444	0.150	-0.015	0.026	-0.011
Had Osteoporosis	0.301	0.524	0.174	0.336	0.506	0.158	-0.035	0.019	0.016
Did Not Have Osteoporosis	0.408	0.459	0.134	0.420	0.433	0.148	-0.012	0.026	-0.014
Had Broken Hip	0.443	0.440	0.116	0.502	0.397	0.101	-0.059	0.044	0.015
Did Not Have Broken Hip	0.387	0.472	0.141	0.402	0.447	0.151	-0.015	0.025	-0.010
Had Emphysema, Asthma, or COPD	0.300	0.539	0.161	0.334	0.502	0.164	-0.034	0.037	-0.002
Did Not Have Emphysema, Asthma, or COPD	0.404	0.459	0.137	0.417	0.436	0.147	-0.013	0.024	-0.010
Had Complete or Partial Paralysis	0.431	0.451	0.118	0.458	0.415	0.127	-0.027	0.036	-0.009
Did Not Have Complete or Partial Paralysis	0.387	0.472	0.141	0.404	0.446	0.150	-0.016	0.026	-0.009
Had Cancer Related to Any of the Seven Clinical Preventive Services of Interest	0.304	0.523	0.173	0.307	0.502	0.191	-0.003	0.021	-0.018
Did Not Have Cancer Related to Preventive Services of Interest	0.404	0.461	0.135	0.422	0.435	0.142	-0.018	0.026	-0.008
Had Cancer Not Related to Preventive Services of Interest	0.349	0.501	0.150	0.359	0.477	0.164	-0.010	0.025	-0.015
Did Not Have Cancer Not Related to Preventive Services of Interest	0.391	0.469	0.140	0.409	0.443	0.148	-0.017	0.026	-0.009
Mental Health Measures									
Was Depressed All or Most of the Time in the Last 12 Months	0.426	0.432	0.142	0.484	0.394	0.122	-0.059	0.038	0.020
Was Depressed a Little of the Time in the Last 12 Months	0.387	0.473	0.140	0.392	0.450	0.158	-0.005	0.023	-0.018
Was Not Depressed at All	0.406	0.454	0.141	0.446	0.427	0.127	-0.054	0.034	0.021
Had Lost Interest in the Last 12 Months	0.387	0.473	0.140	0.398	0.449	0.153	-0.012	0.027	-0.013
Did Not Lose Interest in the Last 12 Months									

See footnotes at the end of the table.

Table 6—Continued
Adjusted and Unadjusted Probabilities of Having Low (Zero to Four), Medium (Five to Six), or High (All Seven) Numbers of Preventive Services: 2001

Respondent Characteristic	Adjusted Probabilities			Unadjusted Probabilities			Adjusted-Unadjusted		
	Low Number of Services	Medium Number of Services	High Number of Services	Low Number of Services	Medium Number of Services	High Number of Services	Low Number of Services	Medium Number of Services	High Number of Services
Perceived General Health Status									
Excellent	0.450	0.438	0.112	0.447	0.422	0.131	0.003	0.016	-0.018
Very Good	0.398	0.470	0.131	0.395	0.452	0.153	0.003	0.018	-0.021
Good	0.365	0.479	0.156	0.379	0.456	0.165	-0.014	0.023	-0.009
Fair/Poor	0.370	0.479	0.152	0.423	0.439	0.138	-0.054	0.040	0.014
Instrumental Activities of Daily Living									
Has Difficulty Using Telephone	0.408	0.444	0.148	0.460	0.394	0.145	-0.052	0.050	0.002
Does Not Have Difficulty Using Telephone	0.388	0.473	0.140	0.401	0.449	0.150	-0.014	0.024	-0.010
Does Not Use Telephone	0.425	0.520	0.055	0.607	0.361	0.033	-0.181	0.159	0.022
Uses the Telephone	0.388	0.470	0.141	0.403	0.446	0.151	-0.015	0.024	-0.009
Has Difficulty Doing Light Housework	0.409	0.456	0.135	0.492	0.405	0.103	-0.083	0.051	0.032
Does Not Have Difficulty Doing Light Housework	0.387	0.472	0.141	0.398	0.449	0.153	-0.011	0.023	-0.013
Does Not Do Light Housework	0.405	0.470	0.125	0.463	0.408	0.129	-0.058	0.062	-0.004
Does Light Housework	0.388	0.471	0.142	0.400	0.449	0.151	-0.013	0.022	-0.010
Has Difficulty Doing Heavy Housework	0.407	0.477	0.116	0.433	0.452	0.114	-0.027	0.025	0.002
Does Not Have Difficulty Doing Heavy Housework	0.385	0.469	0.146	0.398	0.444	0.158	-0.014	0.025	-0.012
Does Not Do Heavy Housework	0.393	0.467	0.140	0.427	0.428	0.144	-0.035	0.039	-0.004
Does Heavy Housework	0.388	0.472	0.140	0.399	0.450	0.151	-0.011	0.022	-0.011
Has Difficulty Paying Bills	0.362	0.473	0.165	0.491	0.394	0.115	-0.128	0.079	0.050
Does Not Have Difficulty Paying Bills	0.390	0.471	0.139	0.401	0.448	0.151	-0.012	0.023	-0.012
Does Not Pay Bills	0.410	0.473	0.117	0.523	0.386	0.091	-0.113	0.087	0.027
Pays Bills	0.388	0.471	0.141	0.399	0.449	0.153	-0.011	0.022	-0.011
Has Difficulty Preparing Meals	0.410	0.476	0.113	0.506	0.400	0.094	-0.096	0.076	0.019
Does Not Have Difficulty Preparing Meals	0.388	0.470	0.142	0.399	0.448	0.153	-0.011	0.022	-0.011
Does Not Prepare Meals	0.382	0.480	0.138	0.434	0.421	0.146	-0.052	0.059	-0.008
Prepares Meals	0.390	0.470	0.140	0.402	0.448	0.150	-0.013	0.022	-0.009
Has Difficulty Shopping	0.441	0.437	0.122	0.494	0.403	0.102	-0.053	0.034	0.020
Does Not Have Difficulty Shopping	0.384	0.474	0.142	0.396	0.450	0.154	-0.012	0.024	-0.013
Does Not Do Shopping	0.497	0.404	0.099	0.549	0.364	0.088	-0.052	0.040	0.011
Does Shopping	0.381	0.475	0.143	0.394	0.451	0.154	-0.013	0.024	-0.011
Health Risks									
Is a Current Smoker	0.507	0.407	0.086	0.539	0.371	0.090	-0.032	0.036	-0.004
Is a Former Smoker	0.381	0.476	0.143	0.365	0.461	0.174	0.016	0.015	-0.031
Neither Current Nor Former Smoker	0.369	0.482	0.149	0.420	0.444	0.136	-0.050	0.037	0.013
Is Overweight	0.380	0.480	0.140	0.376	0.463	0.161	0.004	0.018	-0.021
Is Obese	0.364	0.499	0.138	0.364	0.488	0.148	-0.001	0.011	-0.010
Is Neither Overweight Nor Obese	0.409	0.453	0.138	0.438	0.419	0.143	-0.029	0.034	-0.006
Is a Heavy Drinker	0.503	0.453	0.044	0.525	0.417	0.058	-0.022	0.036	-0.014

See footnotes at the end of the table.

Table 6—Continued
Adjusted and Unadjusted Probabilities of Having Low (Zero to Four), Medium (Five to Six), or High (All Seven)
Numbers of Preventive Services: 2001

Respondent Characteristic	Adjusted Probabilities			Unadjusted Probabilities			Adjusted-Unadjusted		
	Low Number of Services	Medium Number of Services	High Number of Services	Low Number of Services	Medium Number of Services	High Number of Services	Low Number of Services	Medium Number of Services	High Number of Services
Is Not a Heavy Drinker	0.388	0.472	0.140	0.403	0.446	0.151	-0.016	0.027	-0.011
Participates in at Least Some Weekly Exercise	0.369	<i>0.488</i>	<i>0.142</i>	0.361	0.471	0.168	0.008	0.018	-0.026
Does Moderate, Vigorous, or Muscle-Building Exercise at Least Once a Week	0.402	0.460	<i>0.138</i>	0.448	0.419	0.133	-0.046	0.041	0.004
No Exercise	0.416	<i>0.452</i>	<i>0.132</i>	0.453	0.419	0.128	-0.037	0.033	0.005

NOTES: Adjusted probabilities are the probabilities of using low, medium, or high numbers of clinical preventive services, estimated after adjusting for other variables in the table. HMO is health maintenance organization. CHD is coronary heart disease. COPD is chronic obstructive pulmonary disease. Probabilities in italics are significantly different from the probabilities of using low numbers of clinical preventive services

SOURCE: Analyses of 2001 Medicare Current Beneficiary Survey data.

number of tests. For example, if males were more likely than females to have a high number of tests, it makes sense that they would also be more likely than females to have a medium number of tests, and that females would be more likely than males to have a low number of tests. The results in Table 6 illustrate this surprising pattern for sex and for many other variables.

Table 6 also shows that Medicare beneficiaries with a significantly lower (Table 5) number of preventive services (four or fewer) tended to be: Black persons (43.4 versus 38.5 percent for other races); low income beneficiaries (42.8 versus 28.6 percent for those with high income); or those who were dually enrolled in Medicare and Medicaid (42.2 percent for the dually enrolled versus 39.0 percent for those in traditional FFS Medicare and 35.0 percent for those in M+C plans).

Health status and health risks were also associated with low use of clinical preventive services. Table 6 shows that the adjusted probability of using a low number of services was higher for those with better health status (i.e., 45 percent for those with excellent health status, compared with only 37 percent for those with fair or poor health status). The adjusted probabilities of using a low number of services was also higher for beneficiaries who suffered a broken hip (44.3 percent), compared with 38.7 percent for those with no broken hip. Those who were paralyzed also tended to use fewer services; their probability of using four or fewer services was 43.1 percent, versus 38.7 percent for those who were not paralyzed. Heavy drinkers were also more likely to use low numbers of services; 50.3 percent for them, versus only 38.8 percent for those who were not heavy drinkers.

Those who had difficulty shopping (44.1 percent) or using a telephone (40.8 percent) were also more likely to use four or fewer services, compared with those who

did not have difficulty shopping (38.4 percent) or using a telephone (38.8 percent). Finally, Table 6 shows that the adjusted probability of using a low number of services was higher for those who were currently employed (44.7 percent), than it was for those who were not currently employed (38.2 percent).

Implications for Policy, Delivery, and Practice

We reviewed clinical preventive services utilization among Medicare beneficiaries in 2001. With the exception of blood pressure and cholesterol screening, approximately one- to two-thirds of Medicare beneficiaries did not receive covered preventive services within the 1- year study period. Thus, more effective strategies should be devised and implemented to improve utilization across the board. In addition, interventions to promote appropriate use of clinical preventive services should target segments of the population where use was particularly low. These segments include females, Black persons, those of Hispanic origin, those who are currently employed, lower income beneficiaries, and those who are dually enrolled in Medicare and Medicaid.

Other low users included heavy drinkers, those who had a broken hip, the completely or partially paralyzed, and those who had difficulties using a telephone or shopping. It may be more difficult to find or serve these people, but health risk appraisals or analyses of claims data may help in this regard. Health risk appraisals are often used by managed care plans to estimate the need for a variety of services, some of which may be more compelling than the need for clinical preventive services. Low users may not know that these services are covered by Medicare, or they may face physical or social barriers that prevent them from accessing such care.

The initial preventive physical exam, sometimes referred to as the “Welcome to Medicare Visit,” is a new Medicare benefit that became effective in January, 2005. It provides an opportunity to introduce new Medicare beneficiaries to clinical preventive services and to educate them about proper use. However, beneficiaries must be made aware of this new benefit, and physicians must educate patients and perform the recommended services even beyond the initial visit, perhaps following the periodicity recommended by the U.S. Preventive Services Task Force.

Other Substantive Issues

An important issue to consider when interpreting these results is the implied notion that more is better when referring to the use of clinical preventive services. As noted at the beginning of this article, there is ample evidence that preventive services are underused by Medicare beneficiaries. However, the more is better notion is not universally accepted, nor is it likely to be universally true, especially for older Medicare beneficiaries. Blustein and Weiss (1998) assert that “...mammography screening for breast cancer is of uncertain clinical benefit for females 75 years of age and older...” and Messacar (2000) estimates the cost-effectiveness of mammography to be very low for females over age 75. Similarly, Coley et al. (1997) question the value of prostate cancer screening for males over age 69. Sirovich, Gottlieb, and Fisher (2003) note little evidence of the utility of Pap smear testing for females over age 65, especially those who have had a recent screening with normal results, and are not otherwise at high risk for cervical cancer.

Medicare coverage for cervical cancer screening conflicts with this recommendation, as physicians can be reimbursed for

Pap smears every 24 months for females who are not considered high risk. More research is needed to determine at what point screenings achieve a point of diminishing returns where the inconvenience, discomfort, and risks imposed by screening outweigh the health and quality of life benefits.

Implications

Consideration of the evidence leads us to conclude that the use of clinical preventive services is suboptimal. Interventions designed to enhance the appropriate use of clinical preventive services should focus on educating physicians how to prescribe these services, and target beneficiaries for whom utilization and health status are low, and risks of disease are high.

The Medicare Program has expanded funding for clinical preventive services a number of times, yet there are other factors that may yield better utilization of these services. For example, Finison et al. (1999) found that the specialty of one’s physician matters—recommendations for screening mammography were made more often when the physician was a gynecologist than when he or she was an internist or family practitioner. Similarly, testing for glaucoma, blood sugar problems, and high cholesterol were more often recommended when diabetic patients were treated by endocrinologists (Chin, Zhang, and Merrell, 2000). Thus, educational efforts designed to enhance the appropriate use of preventive services may be helpful if directed toward family practitioners and internists. Local practice patterns vary (Freeman et al., 2003), so educational efforts could be tailored to the particular community of clinicians.

Educational efforts should also be directed at patients. Amonkar et al. (1999) and Thomas et al. (1996) note that patient

preferences for screening and fears about pain or findings will influence screening rates, so interventions should address these issues.

Simple interventions may work to influence screening patterns as well. Terrell-Perica et al. (2001) demonstrated that a simple reminder letter can increase influenza and pneumococcal immunization rates, as can standing orders to screen patients with particular criteria of interest (Shekelle et al., 1999). Other organized approaches, such as more intensive health promotion efforts that build awareness of the value of screenings, can have an impact on the appropriate use of clinical preventive services by Medicare beneficiaries (Morrisey et al., 1995). Such efforts should address the appropriateness of clinical preventive services, not just the volume of those services.

Methodological Issues

The information in this article should be considered within the context of four important methodological issues:

- The list of services considered in this article.
- The use of survey data to find evidence of the use of these services.
- The list of predictors of service use.
- The multinomial logistic regression approach used to estimate the impact of factors that may determine clinical preventive service utilization.

With regard to the list of services considered here, we focused on some, but not all, of the preventive services covered by Medicare. More specifically, Medicare offers coverage for one lifetime pneumococcal vaccination, annual influenza vaccinations, annual mammography, and one Pap smear every 24 months (every 12 months if a person is considered high risk) (Centers for Disease Control and Prevention, 1997).

Colorectal cancer screening, prostate cancer screening, glaucoma screening, and bone density testing are also covered (Freeman et al., 2002). We addressed all of these except colorectal cancer screening and bone density testing, because these services were not addressed by the 2001 MCBS. If we had been able to address these services, results may have differed, and others are encouraged to investigate this issue. (Medicare also covers hepatitis B vaccination, diabetes self-management, and medical nutrition therapy, but these services are for specific subgroups of the general Medicare population.)

Next, we examined the use of clinical preventive services in a 12-month recall period. As previously noted, some of the services considered are covered by Medicare for different time intervals (e.g., one lifetime pneumococcal vaccination, one Pap smear every 24 months). We focused on a 12-month period because asking for recall beyond 12 months would reduce the reliability of the respondent's estimation of whether or when services were received.

We also included two services that were not explicitly covered by Medicare, namely blood pressure and cholesterol testing. Nearly all beneficiaries had their blood pressure and cholesterol measured during the prior 12 months. While this might be expected for blood pressure, as it is routinely measured during physician office visits, one might speculate that the need for cholesterol screening has been more broadly accepted by patients and physicians.

The second methodological issue is that we only used MCBS data to estimate whether clinical preventive services were provided. We did not examine administrative claims data to corroborate self report. Mouchawar et al. (2004) found that Medicare FFS claims may underestimate the use of one preventive service

(mammography) by 15 percent. They also found that the sensitivity of claims data for counting mammography use varied by age, race, and income, which were important covariates in our analyses.

The third methodological issue involves the number of predictors of clinical service use in our analyses; there were 56 of these (refer to Table 5 for the complete list). One may wonder if the use of so many variables would induce a collinearity problem, reducing the reliability of the results. This was not the case here. Tests for collinearity did not show high correlations or linear relationships between the independent variables used in the analyses. However, some variables (namely census region, urban-rural location, and a measure of functional status known as the activities of daily living scale) were omitted from the analyses, because they were too highly correlated with socioeconomic or health status variables retained in the analyses.

Finally, one may wonder why multinomial logistic regression analyses were used instead of other estimation approaches, such as ordered probit or ordered logit analyses, or count models. We decided not to use the ordered probit model because it requires the assumption of normality in the distribution of the regression error terms, a hypothesis we could not substantiate with our data. The ordered logit model was rejected because it is based on an assumption of proportionality that was rejected by a chi-square specification test ($p > 0.05$). We did estimate Poisson count models though, and results are available on request. Those models estimated the impact of each independent variable on the number of services received, without categorizing beneficiaries as low, medium, or high users. Results did not contradict the findings noted here.

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