Racial and Ethnic Differences in Public and Private Medical Care Expenditures among Aged Medicare Beneficiaries

JOSÉ J. ESCARCE and KANIKA KAPUR

RAND Health Program; David Geffen School of Medicine at UCLA

THE LOWER ACCESS TO AND USE OF MEDICAL CARE among black Americans, compared with white Americans, have concerned researchers and policymakers for many years. Similarly, several studies suggest that Hispanic Americans face greater barriers to access and use medical care less often than whites do. These racial and ethnic disparities in care are attracting more attention as policymakers and health care providers struggle both to understand the sources of the disparities and to eliminate them, as exemplified in a recent Institute of Medicine (2002) review of the evidence regarding disparities.

Our study, outlined in this article, examined the current differences in medical care expenditures by non-Hispanic white, non-Hispanic black, and Hispanic seniors who were Medicare beneficiaries. Racial and ethnic differences in medical care are significant when they occur among seniors because seniors are more apt to have chronic diseases and may be particularly vulnerable to the harm caused by impaired access to care. Furthermore, because most seniors obtain health insurance coverage through varying combinations of public and private sources, it is important to decide whether these sources of payment promote or diminish racial and ethnic differences in medical care expenditures.

Background

The socioeconomic and racial differences in seniors' use of medical care were sizable before the Medicare program was enacted in 1965. For

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example, in 1964, white seniors visited a physician 20 percent more often than did black seniors (Davis, Gold, and Makuc 1981; Long and Settle 1984), and whites were nearly twice as likely as blacks to be hospitalized (Long and Settle 1984). By providing insurance coverage for hospital and physician services to all seniors, the Medicare program substantially improved previously underserved populations' access to medical care. By the late 1970s, the differences between white and black seniors' visits to physicians had diminished (Davis, Gold, and Makuc 1981; Long and Settle 1984). Recent studies found that black and Hispanic seniors had higher hospitalization rates and spent more nights in hospital than whites did (Eggers and Greenberg 2000; Escarce and Puffer 1997; Gornick et al. 1996).

Most studies that compared numbers of physician visits and hospitalization for white, black, and Hispanic seniors, however, either did not adjust for racial differences in health status (e.g., Davis, Gold, and Makuc 1981; Eggers and Greenberg 2000; Gornick et al. 1996) or used only a few measures of physical health in the adjustment (e.g., Long and Settle 1984; Wolinsky et al. 1989). Racial and ethnic differences in seniors' health status extend to multiple and various dimensions of health (NCHS 1998). Older blacks not only have higher mortality rates than do older whites, but they also have higher rates of many common and frequently disabling chronic conditions, such as hypertension, diabetes, stroke, circulatory disease, end-stage kidney disease, arthritis and other musculoskeletal impairments, open-angle glaucoma, and certain cancers (Anderson and Felson 1988; Byrne, Nedelman, and Luke 1994; Leske and Rosenthal 1979; Manton, Patrick, and Johnson 1987; Polednak 1989). Not unexpectedly, blacks have many more disabilities and functional impairments than whites do (Manton, Patrick, and Johnson 1987; NCHS 1998). Black seniors also have more mental and nervous disorders (Manton, Patrick, and Johnson 1987; Polednak 1989). In contrast, although Hispanic seniors generally have a higher rate of morbidity than whites do, they have lower mortality rates (NCHS 1998). Adjusting for racial differences in health status thus requires more comprehensive health status measures than are generally used.

In addition, most studies focus on racial and ethnic differences in the numbers of physician visits and hospital nights. Recent research, however, has documented racial and ethnic differences in the qualitative aspects of medical care utilization. For instance, older blacks are less likely than whites to report a physician's office or group practice as their

usual source of care, and they are more likely than whites to report a hospital outpatient department, emergency room, or neighborhood health center as their usual source (Escarce and Puffer 1997). Black seniors are less likely to receive a wide array of specialized or high-technology medical services, including coronary angiography, angioplasty, and bypass surgery; carotid angiography and endarterectomy; cataract extraction; glaucoma surgery; hip and knee replacement; kidney transplantation; and magnetic resonance imaging (Canto et al. 2000; Eggers and Greenberg 2000; Escarce et al. 1993; Javitt et al. 1991; Kjellstrand 1988; Oddone et al. 1993; Sheifer, Escarce, and Schulman 2000). Compared with whites, black seniors who are hospitalized receive worse care and are less likely to receive follow-up physician care (Kahn et al. 1994; Moy and Hogan 1993). Although Hispanic seniors have lower rates of coronary angioplasty and bypass surgery than whites do, they have similar rates of coronary angiography (Eggers and Greenberg 2000).

Our study used medical expenditures to examine racial and ethnic differences because they include both quantitative and qualitative aspects of the use of medical services. Although Escarce and Puffer (1997) reported on differences in expenditures between black and white seniors using data from the late 1980s, more recent analyses of racial and ethnic differences in medical care spending are lacking.

Our study went beyond most previous research on seniors in two important ways. First, we looked at racial and ethnic differences in the composition of medical care expenditures, especially differences in expenditures by public and private sources of payment, to discover the roles of public and private payment sources in fostering or attenuating differences in total expenditures across racial and ethnic groups.

Second, using multivariate methods, we assessed the independent effect of race and ethnicity on total medical care expenditures and the composition of expenditures from two different perspectives. Using a "need-based" perspective, we adjusted for variables affecting individuals' need for medical care, conceptualized as health status, but excluded most demographic and socioeconomic characteristics. These need-based analyses enabled us to determine the degree to which medical care expenditures for white, black, and Hispanic seniors reflected medical need and whether any racial and ethnic differences in expenditures remained after accounting for differences in need. Then, using a "demand-based" perspective, we adjusted for all other available variables that might influence the demand for medical care, including demographic and socioeconomic

characteristics and health insurance coverage. The demand-based analyses enabled us to determine whether any racial and ethnic differences in expenditures remaining after accounting for medical need could be explained by differences in socioeconomic factors and health insurance coverage. In addition, comparing the results of the two analyses offered valuable insights into the effects of socioeconomic status and insurance coverage on the distribution of expenditures across racial and ethnic groups of seniors. Our analyses included Hispanic seniors, a group about which there is relatively little published information.

Data and Methods

Data and Study Sample

The source of data for this study was the Household Component of the 1996–1998 Medical Expenditure Panel Survey (MEPS), conducted by the Agency for Healthcare Research and Quality (Cohen et al. 1996/97). The sample for the 1996 Household Component was a stratified, nationally representative, sample of about 22,000 persons in 10,500 households (Cohen 1997). The sample for the 1997 Household Component included the 1996 sample plus a new sample of about 14,000 persons in 6,300 households (Cohen 2000). And the sample for the 1998 Household Component included the sample that had been new in 1997 plus an additional sample of about 11,000 persons in 5,200 households (Rhoades, Brown, and Vistnes 2000). This design is called an *overlapping panel design*, in which the sample selected in any given year is followed for two calendar years (Cohen et al. 1996/97). All three panels oversampled blacks and Hispanics.

The MEPS Household Component elicited information about each respondent's demographic and socioeconomic characteristics, health status, use of medical care, medical care expenditures, and health insurance coverage (Cohen et al. 1996/97). We used the MEPS data files that summarized utilization and expenditures for each of 1996, 1997, and 1998.

The 1996–1998 Household Component included 5,236 persons who were 65 years or older at the start of 1996, 1997, or 1998. We excluded seniors who were not Medicare beneficiaries and seniors who had less than one full year of data on medical care expenditures, unless the reason

for the partial data was that the senior had died during the year. In addition, because of the small sample sizes, we excluded seniors who did not identify themselves as non-Hispanic white, non-Hispanic black, or Hispanic. Last, we excluded seniors who did not answer all the questions needed to construct the complete set of variables for the multivariate analyses. The remaining 4,870 seniors constituted the study sample.

To construct the analytic file, we arranged the data for each person into person-years based on the duration of the data collection. Thus those persons with complete expenditure data for 1996 and 1997 or 1997 and 1998 contributed two observations to the analytic file. Although most persons in the study sample had data for exactly one or two years, some persons had complete data for their first year of participation in a panel but only partial data for the second year. We included one observation in the analytic file for each of these persons, based on the data for the first year, and ignored the fractional year unless the reason for the partial data was that the person had died during the second year. The final analytic file consisted of 8,032 observations corresponding to person-years of data (6,231 observations for non-Hispanic whites, 996 for non-Hispanic blacks, and 805 for Hispanics).

Variables

Medical Care Expenditures. Total medical care expenditures were defined as the sum of all expenditures for medical care. We decomposed total medical care expenditures into ten categories by type of payment source (private versus public) and type or location of service (five categories, as described later). Private expenditures included respondents' out-of-pocket payments and payments made by private health insurance or other private sources (e.g., workers' compensation, automobile and homeowners' insurance). Public expenditures included payments made by Medicare, Medicaid, and other federal, state, or local sources (e.g., Veterans' Administration, state and local health departments). The five categories of expenditures by type or location of service were (1) expenditures for inpatient hospital stays, including facility and professional fees; (2) expenditures for visits to physicians and to nonphysician providers in office-based settings, such as providers' offices, group practices, and clinics[1]; (3) expenditures for visits to physicians and to nonphysician providers in hospital outpatient departments and for visits to hospital emergency rooms, including facility and professional fees;

(4) expenditures for prescription medications; and (5) expenditures for home health care services, medical equipment, or other medical services and supplies, such as disposable supplies and ambulance services.

Demographic and Socioeconomic Characteristics. The key demographic variables in the study were race and ethnicity, categorized as non-Hispanic white, non-Hispanic black, or Hispanic, according to the individuals' self-identification. Additional demographic and socioeconomic characteristics used in the analyses were age and sex categories and their interactions, educational attainment, family income, marital status, family size, and location of residence. Age was categorized as 65 to 69, 70 to 74, 75 to 79, 80 to 84, or 85 and older. Educational attainment was categorized as no high school, some high school, high school graduate, or college graduate. Family income was categorized as poor, near poor (100% to 125% of poverty), low income (125% to 200%), middle income (200% to 400%), or high income (>400%). Marital status was categorized as married, divorced or separated, widowed, or never married. Location of residence was categorized as metropolitan or nonmetropolitan.

Health Status. We adopted the framework developed by Manning, Newhouse, and Ware (1982), in which measures of health status include a measure of general health in addition to measures of physical, mental, and social health. The measure of general health status that we used was individuals' self-rating of their current health as excellent, very good, good, fair, or poor. We used five types of variables to measure physical health: (1) indicator variables for 15 chronic conditions to determine the burden of chronic diseases like diabetes, heart disease, and arthritis; (2) indicator variables for the presence and severity of functional limitations in performing specific physical actions such as lifting, grasping, and walking; (3) an indicator variable for limitations in doing housework or work due to physical impairments; (4) an indicator variable for limitations in activities of daily living, such as using the toilet, feeding oneself, and dressing; and (5) an indicator variable for whether the person died during the year.

Mental health was measured with two variables: (1) the respondents' self-rating of their current mental health as excellent, very good, good, fair, or poor; and (2) an indicator variable for cognitive limitations, such as confusion or memory loss, problems making decisions, or supervision required for their own safety. The measure of social health was an indicator variable for social limitations.

Health Insurance Coverage. All persons in the study sample were covered by Medicare. (The MEPS data do not distinguish Medicare HMO enrollees from Medicare beneficiaries in the traditional fee-for-service program.) Additional sources of insurance coverage were indicated by using indicator variables for Medicaid, private supplementary insurance provided by an employer or union, and private supplementary insurance obtained from other sources (e.g., nonemployer group, individually purchased). These categories were not mutually exclusive, however, since a small proportion of seniors had more than one additional source of coverage.

Statistical analysis

To assess the effect of race and ethnicity on medical care expenditures, we conducted multivariate regression analyses with expenditures in each of the ten categories, defined by type of payment source and type or location of the service, as dependent variables. For each category of expenditures, we estimated two regression models.

Model 1 used a "need-based" perspective, in which we adjusted for variables affecting a person's *need* for medical care, conceptualized as health status. The explanatory variables were age, sex, and the measures of health status. Other demographic and socioeconomic characteristics, as well as health insurance coverage, were excluded.

Model 2 used a "demand-based" perspective, in which we adjusted for all available variables affecting a person's *demand* for medical care. The explanatory variables were all the demographic and socioeconomic characteristics, the measures of health status, and health insurance coverage. We expected education to influence the demand for care because better-educated individuals may be more efficient producers of health (Grossman 1972). Income was shown to affect elderly people's demand for care (Escarce and Puffer 1997). Marital status and family size also can affect demand for care because family members may encourage older persons to seek care for symptoms that otherwise would be ignored or might serve as substitutes for formal medical care. Metropolitan versus nonmetropolitan resident may be a proxy for certain nonmonetary costs of care (e.g., travel time). We expected insurance coverage to influence the demand for care through its effect on the out-of-pocket price of care.

Finally, both models included indicator variables for the year of the data (1996, 1997, or 1998).

Estimation

We based the multivariate analyses on the two-part model of medical care utilization (Blough, Madden, and Hornbrook 1999; Manning et al. 1981, 1987). The first part of the two-part model is an equation for determining whether a person had nonzero expenditures in a particular category during the year and was specified as a probit model. The second part of the two-part model is an equation for the level of expenditures in the particular category conditional on nonzero expenditures and was specified as a generalized linear model with a logarithmic link function and with variance proportional to the square of the mean (Blough, Madden, and Hornbrook 1999; Manning and Mullahy 2001; McCullagh and Nelder 1989).[2]

Many persons in the study sample contributed two person-years to the analyses, and numerous persons in the sample were spouses. Therefore, standard errors of the regression coefficients in both parts of the two-part model were corrected for clustering within person and within family. All analyses were weighted using weights reflecting both the sample design of the Household Component and the survey nonresponse. A p value of .05 or less was chosen as the criterion for statistical significance.

Simulations

We used simulations to obtain the predicted annual expenditures per person, in each category of expenditures, for non-Hispanic whites, non-Hispanic blacks, and Hispanics, adjusted for other factors that might affect medical care utilization and were included as explanatory variables in model 1 and model 2. Each simulation was conducted in three steps.

First, we used the estimated coefficients from the first part of the two-part model to predict the probability of nonzero expenditures for each person i, $E[p_i(Exp_i > 0)]$, if the person was white, black, or Hispanic, by substituting the person's covariate values and alternately switching on and off each indicator variable for race and ethnicity. Similarly, we used the estimated coefficients from the second part of the two-part model to predict conditional expenditures (i.e., conditional on nonzero spending) for person i, $E(Exp_i \mid Exp_i > 0)$, if the person was white, black, or Hispanic. (The year was set to 1998 in all simulations.)

Second, we predicted unconditional expenditures for each person i, $E(Exp_i)$, if the person was white, black, or Hispanic, as

$$E(Exp_i) = E[p_i(Exp_i > 0)] \times E(Exp_i \mid Exp_i > 0).$$

Third, for each racial/ethnic group, we averaged the individual predictions of unconditional expenditures across all the persons in the study sample. We used the delta method (Bishop, Fineberg, and Holland 1975) to derive the standard errors of the predicted annual expenditures per person and the statistical tests of differences in expenditures across the three racial/ethnic groups.

For each of the three racial/ethnic groups, we obtained the predicted annual total medical care expenditures per person by summing the predicted expenditures across the ten categories of expenditures. We found the standard errors of predicted total expenditures per person and the statistical tests of differences in total expenditures across racial and ethnic groups by using a bootstrapping technique (Efron 1982). This article presents the findings of the simulations; full regression results are available from the authors on request.

Results

Descriptive Data

White seniors constituted 87.2 percent of the weighted study sample, black seniors 8.1 percent, and Hispanic seniors 4.7 percent. The Hispanic seniors' countries of origin were Mexico (43.3 percent), Puerto Rico (8.8 percent), Cuba (15.7 percent), and other countries in Central and South America (32.2 percent).

White seniors were older, on average, than black seniors, who in turn were older than Hispanic seniors (table 1). Whites also had more education and higher incomes than blacks and Hispanics did and were more likely than blacks and Hispanics to be married, although blacks and Hispanics lived in larger families. Blacks, and especially Hispanics, were more likely than whites to live in metropolitan areas.

As table 2 shows, white seniors perceived themselves to be in better general health than black or Hispanic seniors did. For instance, 18.4 percent of whites rated their current health as excellent, whereas only

TABLE 1
Demographic and Socioeconomic Characteristics

Characteristic	Racial or Ethnic Group		
	Whites	Blacks	Hispanics
Age category (%)			
65–69	28.9	30.8	35.2
70–74	27.5	30.7	30.3
75–79	22.0	20.3	20.2
80–84	13.4	9.9	7.8
85+	8.3	8.3	6.6
Sex (%)			
Male	42.7	39.0	43.1
Female	57.3	61.0	56.9
Educational attainment (%)			
No high school	17.3	33.7	44.4
Some high school	15.8	22.4	15.5
High school graduate	52.5	34.8	28.0
College graduate	14.3	9.1	12.1
Family income (%)			
Poor	8.8	26.0	23.9
Near poor	6.1	11.7	13.0
Low income	20.9	21.7	21.5
Middle income	36.5	24.4	26.8
High income	27.8	13.2	14.7
Married status (%)			
Married	56.5	37.9	50.7
Divorced or separated	7.1	12.8	13.4
Widowed	32.8	43.5	32.3
Never married	3.6	5.9	3.6
Family size	1.81	2.11	2.27
Location of residence (%)			
Metropolitan area	73.8	79.6	87.8
Nonmetropolitan area	24.6	19.0	10.7
Missing	1.7	1.5	1.5

12.7 percent of blacks and 13.7 percent of Hispanics did so. Conversely, 6.9 percent of whites rated their current health as poor, compared with 13.3 percent of blacks and 12.9 percent of Hispanics. White seniors also had more favorable indicators of physical, mental, and social health than did black or Hispanic seniors (table 2). Comparisons of black and

TABLE 2
Health Status Measures

Measure	Racial or Ethnic Group		
	Whites	Blacks	Hispanics
Self-rated general health (%)			
Excellent	18.4	12.7	13.7
Very good	27.0	21.1	19.7
Good	31.3	26.3	31.3
Fair	16.3	26.6	22.3
Poor	6.9	13.3	12.9
Physical health			
Chronic conditions (%)			
Diabetes	12.8	21.3	22.5
Hypertension	39.1	54.5	42.2
Angina	4.1	2.1	2.6
Myocardial infarction	2.5	3.0	2.5
Congestive heart failure	2.8	1.7	2.1
Hyperlipidemia	12.9	6.9	7.5
Stroke	3.8	5.2	4.3
Arthritis	21.1	28.9	26.1
Emphysema	2.8	3.1	1.4
Asthma	3.5	4.2	4.3
Depression	7.0	2.5	8.1
Anxiety disorder	3.0	0.8	5.4
Thyroid disorder	4.9	0.8	1.6
Peptic ulcer	2.0	2.9	2.2
Cancer	6.6	4.3	4.0
Functional limitations (%)			
Lifting: some	11.1	14.4	10.7
Lifting: a lot	10.6	18.8	19.9
Reaching: some	11.3	13.4	11.2
Reaching: a lot	9.6	16.3	13.4
Grasping: some	9.6	12.3	10.9
Grasping: a lot	3.4	5.9	7.5
Standing: some	11.7	14.3	11.5
Standing: a lot	15.1	19.5	17.2
Walking 3 blocks: some	10.7	11.3	9.6
Walking 3 blocks: a lot	20.3	28.5	24.0
Walking 1 mile: some	7.2	7.3	5.8
Walking 1 mile: a lot	27.1	34.7	30.3
Climbing: some	12.5	13.7	9.8

(continued)

TABLE 2—*Continued*

Measure	Racial or Ethnic Group		
	Whites	Blacks	Hispanics
Climbing: a lot	12.7	22.3	19.9
Bending: some	14.4	14.7	13.3
Bending: a lot	13.1	20.6	19.2
Limitations with housework or work (%)	20.9	27.7	23.4
Limitations in activities of daily living (%)	6.4	9.9	9.6
Died during the year (%)	3.4	3.2	2.7
Mental health			
Self-rated mental health (%)			
Excellent	31.6	25.1	22.5
Very good	29.5	24.6	30.1
Good	29.8	35.4	30.6
Fair	6.7	11.1	12.0
Poor	2.3	3.9	4.8
Cognitive limitations (%)	9.4	11.6	15.5
Social health			
Social limitations (%)	12.5	15.3	11.8

Hispanic seniors found that blacks generally had less favorable indicators of health status than did Hispanics.

Sources of supplementary health insurance coverage differed considerably among the three racial and ethnic groups in the study (table 3). Specifically, black and Hispanic seniors were much more likely than white seniors to have Medicaid coverage in addition to Medicare, whereas

TABLE 3
Health Insurance Coverage

Source of Coverage	Racial or Ethnic Group		
	Whites	Blacks	Hispanics
Medicare only (%)	26.0	35.7	34.8
Supplementary insurance			
Medicaid (%)	7.3	29.8	37.3
Private insurance from employer or union (%)	38.5	26.5	16.9
Private insurance from employer or union (%)	32.5	12.2	14.1

whites were much more likely than blacks and Hispanics to have private supplementary insurance. The net result of these coverage patterns was that blacks (35.7 percent) and Hispanics (34.8 percent) were more likely than whites (26.0 percent) to have Medicare only, that is, Medicare without either public or private supplementary coverage.[3]

The proportion of seniors with nonzero medical care expenditures differed little across racial and ethnic groups. Thus 94.9 percent of whites had nonzero expenditures, compared with 91.4 percent blacks and 94.1 percent of Hispanics.

Table 4 lists the mean annual medical care expenditures for white, black, and Hispanic seniors by public versus private sources of payment and type or location of services. The mean total expenditures for medical care did not differ significantly across the three racial and ethnic groups. Similarly, there were few statistically significant differences across racial and ethnic groups in expenditures by type or location of services. White seniors had higher expenditures than did black seniors for visits in office-based settings, and white seniors had higher expenditures than did Hispanic seniors for visits in outpatient hospital departments. Black and Hispanic seniors had higher expenditures than did white seniors for home health care and medical equipment.

But white seniors differed substantially from black and Hispanic seniors in the sources of their medical care expenditures. Blacks had higher total expenditures for medical care from public sources than did whites. In addition, blacks and Hispanics had higher public expenditures than whites did for prescription medications and for home health care and medical equipment. Conversely, white seniors had much higher total private expenditures for medical care than did blacks or Hispanics; specifically, medical care expenditures from private sources were about twice as high for whites as for blacks or Hispanics. This pattern was consistent across categories of expenditures defined by type or location of services. Overall, 35.2 percent of total medical care expenditures for white seniors were from private sources, compared with 17.7 percent for blacks and 17.9 percent for Hispanics.

Multivariate Analyses

Model 1. As discussed earlier, model 1 used a "need-based" perspective, in which we adjusted for variables affecting a person's need for medical care, conceptualized as health status. Table 5 gives the predicted

TABLE 4
Mean Annual Medical Care Expenditures for Non-Hispanic Whites, Non-Hispanic Blacks, and Hispanics (unadjusted)

Source of Expenditures/ Racial or Ethnic Group	Type or Location of Services					
	Inpatient Hospital Stays	Office-Based Visits	Hospital Outpatient Visits	Prescription Medications	Home Health/ Equipment	Total
Public						
Whites	$1911	$492	$391[c]	$123[b,d]	$442[b,d]	$3359[b]
Blacks	$2222	$525	$446	$279[b]	$1073[b]	$4546[b]
Hispanics	$2056	$604	$294[c]	$302[d]	$953[d]	$4210
Private						
Whites	$431[a,d]	$314[b,d]	$206[b,d]	$647[b,d]	$224[b,d]	$1823[b,d]
Blacks	$262[a]	$136[b,c]	$89[b]	$442[b]	$52[b]	$981[b]
Hispanics	$151[d]	$217[d,e]	$70[d]	$415[d]	$65[d]	$917[d]
Overall						
Whites	$2342	$806[a]	$598[d]	$771	$666[b,c]	$5182
Blacks	$2484	$661[a]	$535	$721	$1126[b]	$5527
Hispanics	$2206	$821	$364[d]	$717	$1018[c]	$5127

[a] $p < .05$ for test of difference between whites and blacks.
[b] $p < .01$ for test of difference between whites and blacks.
[c] $p < .05$ for test of difference between whites and Hispanics.
[d] $p < .01$ for test of difference between whites and Hispanics.
[e] $p < .05$ for test of difference between blacks and Hispanics.

TABLE 5
Predicted Annual Medical Care Expenditures for Non-Hispanic Whites, Non-Hispanic Blacks, and Hispanics, Adjusted for Age, Sex, and Health Status (model 1)

Source of Expenditures/ Racial or Ethnic Group	Type or Location of Services					
	Inpatient Hospital Stays	Office-Based Visits	Hospital Outpatient Visits	Prescription Medications	Home Health/ Equipment	Total
Public						
Whites	$2073	$546	$349	$161[b,d]	$292[b,c]	$3421
Blacks	$2157	$554	$413	$259[b]	$559[b]	$3943
Hispanics	$2295	$628	$306	$327[d]	$545[c]	$4100
Private						
Whites	$441[d]	$299[b,d]	$207[b,d]	$655[b,d]	$142[b,d]	$1744[b,d]
Blacks	$341	$140[b,e]	$106[b]	$402[b]	$38[b]	$1027[b]
Hispanics	$220[d]	$202[d,e]	$82[d]	$389[d]	$66[d]	$960[d]
Overall						
Whites	$2514	$845[a]	$556[d]	$816[b]	$434	$5165
Blacks	$2499	$694[a]	$519	$661[b]	$597	$4970
Hispanics	$2515	$830	$389[d]	$716	$611	$5060

[a] $p < .05$ for test of difference between whites and blacks.
[b] $p < .01$ for test of difference between whites and blacks.
[c] $p < .05$ for test of difference between whites and Hispanics.
[d] $p < .01$ for test of difference between whites and Hispanics.
[e] $p < .05$ for test of difference between blacks and Hispanics.

annual medical care expenditures for white, black, and Hispanic seniors, by public versus private sources of payment and type or location of services, adjusted for differences in the explanatory variables included in model 1.

As table 5 shows, the predicted total expenditures for medical care did not differ significantly across the three racial and ethnic groups in the study, similar to the unadjusted data (table 4). The need-based analyses also found that white seniors had higher expenditures than blacks did for visits in office-based settings and for prescription medications, whereas white seniors had higher expenditures than Hispanics did for visits in hospital outpatient departments. The predicted expenditures for home health care and medical equipment in tables 5 and 6 are much lower than the unadjusted expenditures in table 4 because the year was set to 1998 in all simulations. Medicare's payment policy for home health care services changed in 1998, leading to sizable reductions in spending for these services.

White seniors differed from black and Hispanic seniors in the sources of payment for their medical care expenditures. There were no statistically significant differences across racial and ethnic groups in predicted total expenditures for medical care from public sources (table 5). But black and Hispanic seniors had higher public expenditures than whites did for prescription medications and for home health care and medical equipment. Moreover, the differences in predicted expenditures from private sources were substantial. As in the unadjusted data, white seniors had much higher total private expenditures for medical care than did blacks or Hispanics, and this pattern was consistent across categories of expenditures defined by type or location of services. Specifically, white seniors had higher private expenditures than blacks did in four of the five categories of services defined by type or location, and they had higher private expenditures than Hispanics in all five categories. Overall, 33.8 percent of predicted total medical care expenditures for white seniors were from private sources, compared with 20.7 percent for black seniors and 19.0 percent for Hispanic seniors.

Model 2. Model 2 used a "demand-based" perspective in which we adjusted for all variables affecting a person's demand for medical care, including demographic and socioeconomic characteristics and health insurance coverage, in addition to health status. Table 6 gives the predicted annual medical care expenditures for non-Hispanic whites, non-Hispanic blacks, and Hispanics, by private versus public sources of payment and

TABLE 6
Predicted Annual Medical Care Expenditures for Non-Hispanic Whites, Non-Hispanic Blacks, and Hispanics, Adjusted for Demographic and Socioeconomic Characteristics, Health Status, and Health Insurance Coverage (model 2)

Source of Expenditures/ Racial or Ethnic Group	Type or Location of Services					
	Inpatient Hospital Stays	Office-Based Visits	Hospital Outpatient Visits	Prescription Medications	Home Health/ Equipment	Total
Public						
Whites	$2059	$539	$353	$181	$307	$3439
Blacks	$2032	$518	$397	$167	$410	$3524
Hispanics	$2452	$560	$303	$199	$452	$3966
Private						
Whites	$434	$293[b]	$204	$632[b,d]	$135[b]	$1698[a]
Blacks	$478	$218[b,e]	$164	$484[b]	$57[b]	$1401[a]
Hispanics	$337	$347[e]	$141	$512[d]	$133	$1471
Overall						
Whites	$2494	$832	$556	$813[b]	$441	$5137
Blacks	$2509	$735	$562	$651[b]	$468	$4925
Hispanics	$2790	$908	$444	$710	$585	$5437

[a] $p < .05$ for test of difference between whites and blacks.
[b] $p < .01$ for test of difference between whites and blacks.
[c] $p < .05$ for test of difference between whites and Hispanics.
[d] $p < .01$ for test of difference between whites and Hispanics.
[e] $p < .05$ for test of difference between blacks and Hispanics.

type or location of services, adjusted for differences in the explanatory variables included in model 2.

Table 6 shows that the predicted total expenditures for medical care did not differ significantly across the three racial and ethnic groups, as in the need-based analyses (table 5). The results of the analyses for categories of expenditures defined by type or location of services, moreover, found fewer racial and ethnic differences than did the need-based analyses. In particular, white seniors had higher expenditures than did black seniors only for prescription medications.

The major changes between table 5 and table 6 were in the results of the analyses for the sources of medical care expenditures. Adjusting for demographic and socioeconomic characteristics and health insurance coverage eliminated all statistically significant differences in expenditures from public sources that we found in the need-based analyses. Furthermore, adjusting for these variables increased the predicted total expenditures for medical care from private sources for black and Hispanic seniors. Consequently, the significant differences in total private expenditures between whites and both blacks and Hispanics that we found in the need-based analyses narrowed considerably, and the difference between whites and Hispanics became insignificant. Whites had higher private expenditures than blacks did in only three of the five categories of services defined by type or location, and they had higher private expenditures than Hispanics did in only one of the five categories. Overall, 33.1 percent of predicted total medical care expenditures for white seniors were from private sources, compared with 28.4 percent for blacks and 27.1 percent for Hispanics. These figures represent a marked reduction of the gap between whites and the other two groups compared with those of the need-based analyses.

Sensitivity Analyses. As mentioned earlier, Medicare's payment policy for home health care services changed in 1998, largely in response to rapid increases in Medicare expenditures for home health care during the 1990s. We also observed in the unadjusted data sizable and significant differences in expenditures for home health care services and medical equipment favoring blacks and Hispanics (table 4). Therefore, we were concerned that expenditures in this category might be driving some of our findings for the total medical care expenditures. To address this concern, we repeated our analyses of the total medical care expenditures excluding expenditures for home health care services and medical equipment. Excluding these expenditures did not change

the results appreciably, although the new analyses based on model 2 found no significant difference between white seniors and black seniors in their predicted total medical care expenditures from private sources.

We conducted two additional sensitivity analyses. In the first set, we excluded seniors who died during the year of the data, to determine whether our findings were affected by treatment patterns in the last year of life. In the second set of analyses, we included indicator variables for census regions in all the regression models, to account for regional variations in the use of medical care. The results of these analyses were similar to those of the main analyses reported in tables 5 and 6.

Discussion

Our study offers evidence that racial and ethnic differences in medical care expenditures among older persons in the United States are small if they exist at all. The study found that non-Hispanic white, non-Hispanic black, and Hispanic seniors had similar mean annual total expenditures for medical care during the late 1990s. This finding was consistent across analyses of unadjusted data as well as in multivariate regression analyses using need-based and demand-based perspectives. The findings of the need-based analyses are noteworthy because they indicate that white, black, and Hispanic seniors in similar health have the same medical care expenditures, irrespective of socioeconomic factors or health insurance coverage. Put another way, the current allocation of expenditures among older whites, blacks, and Hispanics mainly reflects differences in medical need.

Our study also suggests that public sources of payment for medical care play a crucial role in muting racial and ethnic differences in medical care expenditures among seniors. Black seniors had higher total expenditures for medical care from public sources than did white seniors in the unadjusted data, and blacks and Hispanics had higher public expenditures than did whites for several categories of services defined by type or location in the unadjusted data and the need-based analyses. Conversely, white seniors had much higher total medical care expenditures from private sources than did black or Hispanic seniors in the unadjusted data and the need-based analyses, and these patterns were

consistent across categories of expenditures defined by type or location of services. The result was that the proportion of medical care expenditures paid by public sources was considerably higher for older blacks and Hispanics than for older whites in the unadjusted data and the need-based analyses. Higher public expenditures for black and Hispanic seniors, compared with whites, clearly compensated for their lower private expenditures.

Notably, racial and ethnic differences in public and private medical care expenditures all but vanished in the demand-based analyses. The few remaining differences in private expenditures still generally favored whites, but the gaps were small. This finding indicates that the differences in public and private expenditures that we observed in the unadjusted data and the need-based analyses were driven largely by differences in socioeconomic status and health insurance coverage across racial and ethnic groups. Indeed, additional analyses based on a regression model that included socioeconomic characteristics but excluded insurance coverage found that most of the racial and ethnic differences in public and private expenditures were explained by the observed patterns of public and private supplementary insurance coverage among white, black, and Hispanic seniors (data not shown).

The few differences in private expenditures remaining in the demand-based analyses may have resulted from variables we could not measure, such as the generosity of private supplementary coverage. For example, the ten model policies available in the individual supplementary insurance market vary substantially in their scope of covered services (Atherly 2001). The finding that white seniors had higher private expenditures than black and Hispanic seniors did for prescription medications is especially noteworthy in this regard. Whites are more likely than blacks or Hispanics to obtain their private supplementary coverage from an employer, and these policies are much more likely to cover prescription medications than are policies purchased in the individual market (Poisal and Chulis 2000).

The results of this study represent a departure from the earlier findings regarding differences in total medical care expenditures between black and white seniors reported by Escarce and Puffer (1997). Using data from the 1987 National Medical Expenditure Survey (NMES), these investigators found that in need-based analyses, older blacks had lower medical care expenditures than did older whites. Thus older blacks, as compared with whites, received less medical care than would be expected

given their health status. The investigators also found that socioeconomic status greatly affected expenditures.

One explanation for the two studies' different results might be that the differences in socioeconomic status between white and black seniors disappeared during the past decade. In fact, however, the differences between older whites and older blacks in education and income narrowed only slightly between the late 1980s and the late 1990s (see Escarce and Puffer 1997). Differences in socioeconomic characteristics between whites and Hispanics also remain substantial.

A more likely explanation for the divergence in results is that recent Medicare policies have helped minimize the relationship between socioeconomic status and older persons' use of medical care. First, the extension of public supplementary coverage, in the form of dual eligibility for Medicaid, to a higher percentage of low-income seniors decreased out-of-pocket payments for this group and is likely to have resulted in higher utilization. (There are several categories of Medicare beneficiaries with dual eligibility, including Qualified Medicare Beneficiaries, created in 1988, and Specified Low-Income Medicare Beneficiaries, created in 1995 [Barents Group 1999].) Second, rapid growth in enrollment in Medicare HMOs during the 1990s may have been a factor as well. Many managed care organizations assign patients to primary care physicians and use utilization and quality management techniques that could help diminish the relationship between medical care and sociodemographic characteristics (Institute of Medicine 2002). But the available evidence suggests that racial differences in quality of care persist in Medicare HMOs (e.g., Schneider et al. 2001; Schneider, Zaslavsky, and Epstein 2002). Third, the resource-based Medicare Fee Schedule (U.S. Dept. of Health and Human Services 1991), implemented in the early 1990s, reduced differences in physician payment rates between Medicare patients with private and with public supplementary insurance, removing incentives for providers to offer more services to high-income seniors whose private policies previously paid higher fees. Finally, the providers' increased awareness of racial differences in medical care utilization also may have contributed to reducing the racial gap in expenditures (AMA 1990).

Our study had several limitations. First, although expenditures incorporate both quantitative and qualitative aspects of medical care utilization, they do not directly measure the mix of services received by patients or the technical quality of care. As discussed in the introduction,

a large body of evidence indicates that compared with whites, nonwhite seniors are less likely to receive a variety of specialized and high-technology services and also to receive a lower quality of care. These differences in important qualitative dimensions of care across racial and ethnic groups were not reflected in our analyses of medical care expenditures.

Second, our study overlooked the complex relationships among race and ethnicity, socioeconomic status, and health. A comprehensive model of these relationships, for instance, would explicitly account for the impact of race on socioeconomic opportunities as well as the effects of socioeconomic factors on health (Feinstein 1993; Williams, Lavizzo-Mourey, and Warren 1994). Such a model would require a life-cycle perspective, however, and was beyond the scope of our study and our cross-sectional data.

Third, several important variables used in our study were measured imprecisely. The measure of financial resources was contemporaneous income, assessed in the same year as medical care expenditures. But wealth is a much better measure of seniors' financial resources than income is because many seniors have retired and income generally declines after retirement (Smith and Kington 1997). Unfortunately, the MEPS did not report information on assets or wealth. The measure of educational attainment we used in the study—completed years of schooling—also is imprecise, especially for analyses of racial and ethnic differences. Historically, there have been sizable disparities in the quality of education across racial and ethnic groups.

Fourth, we did not know whether seniors were in traditional fee-for-service Medicare or in Medicare HMOs. Racial and ethnic disparities in care may be affected by managed care.

Despite these limitations, our study provides encouraging evidence regarding the allocation of medical care expenditures across white, black, and Hispanic seniors. Persistent racial and ethnic disparities in the mix of services and in the quality of care are likely to be beyond the reach of blunt policy instruments such as the extension of public supplementary coverage to more Medicare beneficiaries. Rather, addressing these disparities probably will require a multifaceted approach that includes changes in health care delivery systems, patient and provider education, and changes in provider behavior (Institute of Medicine 2002).

ENDNOTES

1. Nonphysician providers included chiropractors, midwives, nurses, nurse practitioners, physician assistants, optometrists, podiatrists, physical and occupational therapists, psychologists, social workers, and others.
2. In preliminary analyses, we estimated Box-Cox models and found that the logarithmic link function was suitable for all the categories of expenditures used in the study. As suggested by Manning and Mullahy (2001), we used the Park (1966) test to determine the relationship between the variance of expenditures and the mean. The gamma family of distributions accommodates the finding that the variance was proportional to the square of the mean.
3. As noted earlier, the percentages of seniors on Medicare include only enrollees in Medicare HMOs. During the study period, about 15 percent to 18 percent of Medicare beneficiaries were in HMOs (Murray and Eppig 2002).

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Address correspondence to: José J. Escarce, MD, PhD, 911 Broxton Plaza, Box 951736, Los Angeles, CA 90024 (e-mail: escarce@rand.org).