

## Health Care for Black and Poor Hospitalized Medicare Patients

[Original Contributions]

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### Abstract

**OBJECTIVE:** To analyze whether elderly patients who are black or from poor neighborhoods receive worse hospital care than other patients, taking account of hospital effects and using validated measures of quality of care.

**DESIGN:** We compare quality of care provided to insured, hospitalized Medicare patients who are black or live in poor neighborhoods as compared with others, using simple and multivariable comparisons of clinically detailed measures of sickness at admission, quality, and outcomes.

**SETTING:** Two hundred ninety-seven acute care hospitals in 30 areas within five states.  
**Patients or Other Participants.** The sample includes a nationally representative sample of 9932 patients 65 years of age or older who lived at home prior to hospitalization for congestive heart failure, acute myocardial infarction, pneumonia, or stroke.

**INTERVENTIONS:** This was an observational study.  
**Main Outcome Measures:** Processes of care, length of stay, instability at discharge, discharge destination, and mortality.

**RESULTS:** Within rural, urban nonteaching, and urban teaching hospitals, patients who are black or from poor neighborhoods have worse processes of care and greater instability at discharge than other patients ( $P < .05$ ). However, this worse quality is offset by patients who are black or from poor neighborhoods being 1.8 times more likely to receive care in urban teaching hospitals that have been shown to provide better quality of care ( $P < .001$ ). Because these patients receive more of their care in better-quality hospitals, there are no overall differences in quality by race and poverty status. Death rates did not vary by race or poverty status.

**CONCLUSIONS:** Quality of hospital care for insured Medicare patients is influenced both by the patient's race and financial characteristics and by the hospital type in which the patient receives care. (JAMA. 1994;271:1169-1174)

Previous studies have compared groups of patients who are potentially disadvantaged either socially or economically with other patients and found differences in access to care [1,2,3,4,5,6,7], use of services

[6,8,9,10,11,12,13,14], and outcomes [7,10,15,16,17]. However, this body of work has not simultaneously examined at a clinical level multiple measures of quality, nor have the results been generalizable to different types of hospitals across the United States.

We undertook the present study to examine the quality of care provided to insured, hospitalized Medicare patients who are black or poor as compared with those who are neither black nor poor. In particular, we investigated by race and poverty status the following questions: In what kinds of hospitals do patients receive care? How sick are patients when they arrive at the hospital? How does the care provided by physicians and nurses relate to the care patients need? What is the stability of patients at the time of hospital discharge? What are the outcomes for patients once we have taken account of the illness they bring to the hospital?

## **METHODS**

### **Sample and Data Collection**

The data are from our previously reported evaluation of the quality of hospital care for a nationally representative sample of Medicare patients in 1981, 1982, 1985, and 1986 [18,19,20,21,22,23,24,25,26]. The sample includes 9932 patients 65 years of age or older who lived at home prior to an acute care hospitalization with either congestive heart failure, acute myocardial infarction, pneumonia, or cerebrovascular accident in one of 297 hospitals located in 30 areas within five states [19]. The sample was designed to be representative of Medicare patients hospitalized with the above diseases with respect to hospital size, location in a rural or urban area, teaching intensity, ownership, and percentage of Medicare admissions. In order to report differences in quality of care for potentially disadvantaged populations, hospitals caring for more Medicaid patients than 90% of the other hospitals within the state, and hospitals labeled by state professional review organizations as "classic city-county hospitals" were oversampled. We computed weights necessary to reweight raw findings back to the population of all Medicare patients with our diseases and did sensitivity analyses to test whether reweighting affected our results. Because weighted and unweighted results differed little, we report unweighted findings here.

### **Defining the Study Population**

Medical record review provided the patient level data for race and the ZIP code of the patient's preadmission residence. Poverty of the patient's neighborhood was assessed using the patient's ZIP code and 1980 census data. We sorted all ZIP codes by the percentage of families having an income below 75% of the federal poverty level and defined patients living in the bottom 10% of that list as the patients from the poorest neighborhoods. Within the ZIP codes of these patients, between 19% and 45% of the families' incomes were below 75% of the federal poverty level.

We compared patients who are black (11% of the sample) or living in the poorest neighborhoods (10%) with "other" patients who are neither black nor from the poorest neighborhoods. Sixteen percent of the sample had either of these characteristics and 5% had both.

Results for patients who are black and for those who live in the poorest ZIP codes were similar in virtually every analysis, so we combined these groups to increase the sample size for this study population as compared with the "other" group. Results for patients who are both black and from the poorest ZIP codes were consistent with the results for patients who are either black or poor.

We present quality-of-care data for patients who are black or from poor neighborhoods as compared with other patients across all 297 hospitals and in each of three hospital types: 44 rural hospitals (15%), 147 urban nonteaching hospitals (49%), and 106 urban teaching hospitals (36%). In this analysis, a rural hospital is one located in a county that is either not adjacent to a metropolitan county or, if adjacent, lacks an urban center of 20 000 or more population [27]. Teaching hospitals are defined as those with any

internship or residency training. Data on hospital characteristics were derived from the 1984 American Hospital Association file [26].

### **Collecting Data to Assess Quality of Care**

The database includes both clinical and administrative data. Nurses and medical records personnel averaged 90 minutes per record to review the patient's medical record in order to collect the data necessary to evaluate demographics, sickness at admission, process of care, use of services, status at discharge, and discharge destination. The kappa interrater reliability scores were 0.86 for items in records known by the data collectors to represent reliability cases and 0.78 for items in the records not so identified [19].

### **Patient, Hospital, and Community Characteristics**

We include in our study those variables shown by either the literature or our prior analyses to be important predictors of quality of care and/or to differ for patients who are black or poor as compared with others [28,29]. These patient characteristics were disease, an indicator of advanced age (ie, 85 years or older), gender, an indicator of Medicaid insurance, and an indicator of missing data. The hospital characteristics included indicators signifying a high percentage of Medicaid patients, being a city or county hospital, hospital size categories based on number of beds, for-profit or government ownership, and percentage of admissions to Medicaid patients. We also included indicators of state and study year.

Patients who are black or poor differed significantly from others in all of these characteristics except sickness at admission and study year. All of these variables with unequal distribution by race or poverty were included in our models so that they could be adjusted for in our assessment of quality of care for patients who are black or poor.

As noted earlier, we found the categorization of hospital type into rural, urban nonteaching, and urban teaching to be helpful in understanding quality-of-care differences between black or poor and other patients. To emphasize this point, we present some of our results by these categories. When looking at patients across all three hospital categories, we present results both adjusted and unadjusted for hospital characteristics.

### **Sickness at Admission**

We used clinical expertise to develop a disease-specific list of approximately 100 acute and chronic, morbid and comorbid conditions that might predict death within 30 and 180 days of admission [20]. We fit a logistic regression model for each disease on two thirds of the sample and validated it on the other one third. In fitting the model, we used clinical and statistical judgment to decide which of the variables to keep as part of the sickness-at-admission scale. The resulting disease-specific scales consist of weighted sums of 18 to 24 items. The scales predict the probability of death within 30 and 180 days of admission based on the burden of illness the patient brings to the hospital. The variance in death explained by these models averages 23% for the four diseases combined: congestive heart failure (12%), acute myocardial infarction (22%), pneumonia (26%), and cerebrovascular accident (30%). Neither race nor data about the patient's financial status are included as a variable in the sickness-at-admission scales.

### **Measuring Quality of Care**

Processes of Care.--We used branching clinical logic to measure most components of in-hospital care that were needed given each patient's level of sickness [21]. Our process scale includes measures of physician and nurse cognitive processes, ie, how well clinicians perform as gatherers of data; technical diagnostic and therapeutic processes, ie, the extent to which patients who need a diagnostic or therapeutic intervention actually receive the intervention; and monitoring processes, ie, the extent to which intensive care units and telemetry were used by patients who appeared sick enough to need these. The process measures include evaluation of both cognitive and technical aspects of care.

We report the overall process scale with a mean of zero and SD of 1. A value of +1 means the patient's care was 1 SD better than it was for the average patient. Using logistic regression, we have shown that after adjusting for sickness at admission for the four diseases combined, worse process predicts greater 30-day postadmission mortality ( $P < .05$ ) such that a 1-SD decline in process score is associated with an increase in mortality of four percentage points [21]. For example, after taking account of sickness at admission, the probability of death 30 days after admission would be 17% for patients receiving average process as compared with 21% for patients receiving process of care scored 1 SD less than average. This relationship occurred and was quantitatively similar in both black patients or those from poor areas and other patients.

**Instability at Discharge.**--We define "instability at discharge" in terms of the fraction of patients who are discharged to home with at least one clinical problem that should have been evaluated prior to discharge (eg, new confusion, new heart rate  $\geq 130$  beats per minute or respiratory rate  $\geq 30$  breaths per minute on the day prior to or day of discharge) [23,30]. After adjusting for sickness at admission, patients discharged with instability are twice as likely to die within 30 days of discharge as compared with patients discharged without instability.

**Outcome Measures.**--We used the medical record as the source of data to assess length of stay and the fraction of patients living at home prior to admission who were discharged to a nursing home. We used Social Security numbers to match each patient to existing government files that provided data about mortality 30 and 180 days after admission for 92% of the sample [24]. The 8% of the sample for whom a match could not be made between medical record and mortality data had the same proportion of patients who are black and/or from poor neighborhoods as did the others.

## **Analytic Methods**

We use simple comparisons and regression techniques to study the effect of race or poverty on process of care and length of stay (ordinary least squares techniques) and on instability, discharge to a nursing home, and mortality (logistic regression). Differences in process of care, instability at discharge, discharge to a nursing home, and mortality are presented with and without adjustment for hospital characteristics, state, and study year. We first adjusted for the patient, hospital, and community characteristics that we determined to be important indicators of the type of care provided, as well as study year.

Analyses with length of stay, instability, and mortality as the dependent variables were also adjusted for sickness at admission. Analyses with instability at discharge as the dependent variable were limited to patients who were discharged alive, who did not have a do-not-resuscitate order, and who were not transferred to another acute care hospital. Analyses with length of stay and discharge to nursing home as the dependent variables were limited to patients discharged alive.

Analyses with process as the dependent variable did not adjust for sickness at admission, because the explicit process criteria that are the building blocks of the process scales incorporate specific measures of sickness that are relevant to each process criterion. Therefore, relevant clinical components of sickness are incorporated into the process measure.

We also present some results that are not adjusted for hospital characteristics. However, even these minimally adjusted results control for disease and the patient's sickness at admission.

Finally, in order to test whether the effect on mortality of sickness at admission, process, or instability at discharge differed for patients who were black or poor as compared with others, we interacted race and poverty variables with each of these measures. However, the interaction terms were not significant and they were deleted from the models.

Results from significance tests are adjusted for our cluster sampling design by Huber's method [31,32]. Significance tests are not adjusted for multiple comparisons. Because our findings are similar in the preprospective and postprospective payment time periods, our results include the full sample.

## RESULTS

### Distribution of Patients

Hospital Type.--Patients who are black or from the poorest neighborhoods are 1.8 times as likely as other patients (57% vs 31%,  $P < .001$ ) to receive care in the urban teaching hospitals [Table 1](#). These hospitals have been previously shown by both our implicit and explicit quality-of-care measures to provide better care than do other urban hospitals or rural hospitals [21,22,28]. [Table 1](#)

**Table 1.**—Distribution of Patients by Hospital Type

Hospital Type	Hospitals, n	Distribution of Patients*†	
		Black or From Poor Neighborhood, n (%)	Other, n (%)
Rural	44	159 (10)	1317 (16)
Urban nonteaching	147	529 (33)	4424 (53)
Urban teaching	106	922 (57)	2581 (31)
<b>Total</b>	<b>297</b>	<b>1610 (100)</b>	<b>8322 (100)</b>

\*As noted in the 'Methods' section of the text, these data are unweighted. Reweighting for national representativeness results in the following distribution for patients who are black or from poor neighborhoods and others, respectively: rural (10%, 14%), urban nonteaching (37%, 55%), and urban teaching (53%, 31%) with  $P < .001$  for the difference in distribution.

† $P < .001$  for the difference in distribution ( $\chi^2$  test).

**Table 1.** Distribution of Patients by Hospital Type

Sickness at Admission.--Sickness at admission, expressed as the predicted probability of dying 30 days after admission based on the burden of illness the patient brings to the hospital, is similar (17.2%) for patients who are black or poor and other patients [Table 2](#). However, for patients who are neither black nor poor, the sickest patients are in urban teaching hospitals, while for patients who are black or poor, sickness at admission does not vary by hospital type (not shown). [Table 2](#)

Table 2.—Sickness at Admission, Process, and Outcomes for Patients Who Are Black or Poor as Compared With Others

	Adjusted for Hospital Characteristics, State, and Year*	Black or From Poor Neighborhood† (n=1830)	Other (n=8372)	Difference‡	95% Confidence Interval
Sickness at admission, measured as probability of death within 30 d of admission, %	Yes	17.2	17.2	+0.0	+1.5 to +1.5
	No	17.6	17.2	+0.4	+0.5 to +1.9
Overall process, SD	Yes§	+0.09	+0.02	+0.11‡	+0.17 to +0.04
	No	+0.01	+0.00	+0.01	+0.11 to +0.08
Instability of discharge, % of sample¶	Yes	19.0	13.7	+5.3**	+2.9 to +8.7
	No	17.0	13.9	+3.9**	+1.8 to +6.4
Length of stay, days‡‡	Yes	12.6	12.0	+0.6‡‡	+0.1 to +1.2
	No	12.9	11.9	+0.9‡‡	+0.0 to +1.5
Discharged to nursing home, % of sample§§	Yes	0.5	10.0	+9.5	+2.4 to +16.6
	No	0.5	10.2	+9.7	+3.8 to +15.6
In-hospital mortality, % of sample	Yes	14.2	15.3	+1.1	+2.2 to +1.0
	No	14.1	15.5	+1.4	+2.0 to +0.8
Death within 30 d after admission, % of sample¶¶	Yes	15.4	10.8	+4.6	+3.1 to +6.1
	No	14.5	16.9	+2.4	+4.5 to +0.5
Death within 180 d after admission, % of sample¶¶¶	Yes	27.5	20.7	+6.8	+4.5 to +9.1
	No	27.0	20.8	+6.2	+4.3 to +8.0

\*All values are adjusted for the type of disease.

†The patient is black or lives in a neighborhood with more poor families than 50% of the other patients in the sample.

‡A positive value in this column suggests that the variable has a higher value for patients who are black or live in a poor neighborhood. A negative value suggests that the variable has a lower value for patients who are black or live in a poor neighborhood.

§Adjusted for age, Medicaid insurance, and gender. Each process criterion individually accounts for whether the patient needed the care being evaluated (P<.01).

¶Adjusted for age, Medicaid insurance, gender, and sickness at admission.

\*\*The sample for measuring instability at discharge excludes patients with in-hospital deaths, do-not-resuscitate orders, or acute care transfers. The samples for measuring length of stay and discharge to nursing home exclude patients who died in the hospital.

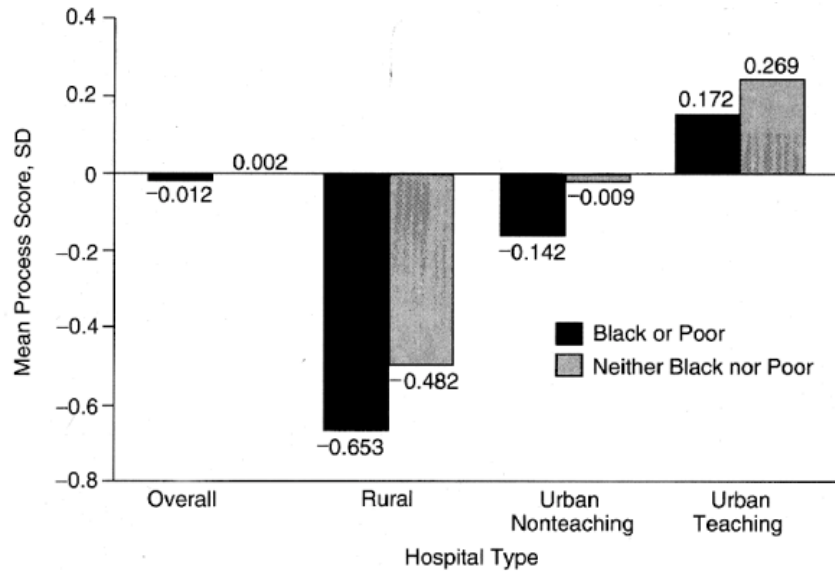
\*\*\*P<.001.

‡‡P<.05.

Table 2. Sickness at Admission, Process, and Outcomes for Patients Who Are Black or Poor as Compared With Others

## Process of Care

Figure 1 shows process-of-care scores by hospital type. The overall results are not adjusted for the fact that blacks and patients from poor neighborhoods receive more of their care in urban hospitals. For both patient groups, process of care is best in urban teaching hospitals and worst in rural hospitals. In addition, within each hospital type, process of care is worse for patients who are black or from poor neighborhoods ( $P < .05$  for urban teaching hospitals). However, because patients who are black or from poor neighborhoods receive more of their care in urban teaching hospitals, there are no differences in overall process of care by race and poverty status (see the two left-most bars in Figure 1).



**Figure 1.** Mean process scores, in SD units, by hospital type for patients who are black or poor as compared with others.

After adjusting for patient and hospital characteristics (ie, removing the effect caused by blacks and people from poor neighborhoods receiving care in better hospitals), patients who were black or from poor neighborhoods have worse process of care. **Table 2** shows that after complete adjustment the process score was on average 0.11 SD lower for these patients ( $P < .01$ ).

To determine whether this significantly lower process-of-care score was caused by the process being different within each hospital as opposed to hospital type (eg, urban teaching), we included in our model a dummy variable for each of the 297 individual hospitals. Using this model, the decrement in process of care for patients who are black or from poor neighborhoods improves from -0.11 to -0.05 SD (not shown). Thus, one half of the difference in process-of-care scores between the patients who are black or poor and others is because of differences in the care provided at the individual hospital.

Of the 241 process criteria that represent the building blocks of the process scores, two thirds of the criteria were met more often for patients who were neither black nor from poor neighborhoods. **Table 3** shows some examples of the criteria in which patients who were black or poor received worse care. **Table 3**

Table 3. Examples of Differences in Process Criteria by Race and Poverty

Criteria	Disease†	Patients to Whom Criteria Were Applicable, %‡	Patients to Whom Criteria Were Applicable Who Met Process Criteria*		Difference, %§	95% Confidence Interval
			Black or From Poor Neighborhood, %	Other, %		
<b>Physician Cognitive Scale</b>						
Within the initial 2 d of hospitalization, the physician should document the medication used immediately before admission in the medical record	CHF	100	75.2	83.7	-8.5%	-14.6 to -2.1
Within the initial 2 d of hospitalization, the physician should document the time of onset of neurologic symptoms in the medical record	CVA	100	88.0	93.6	-4.9%	-10.2 to -1.1
<b>Nurse Cognitive Scale</b>						
Within the initial 2 d of hospitalization, the nurse should document the presence or absence of shortness of breath on day 2 in the medical record	PNE	100	75.8	82.7	-6.1%	-13.2 to -0.1
<b>Technical Diagnostic Scale</b>						
Within the initial 2 d of hospitalization, if patients are moderately or very sick, they should obtain arterial blood gas on day 1 or 2	CHF	24	84.2	78.4	+14.2%	+24.6 to +4.0
<b>Technical Therapeutic Scale</b>						
For patients with ventricular tachycardia on day 1 or 2 or premature ventricular contractions on day 3, THEN use antiarrhythmics or oral or intravenous beta-blockers on day 3	AMI	5	41.8	95.3	-27.8%	-45.1 to -10.3
<b>Intensive Care Split and Monitoring Scale</b>						
For patients who are moderately sick on day 1, use the intensive care unit	CHF	18	40.4	48.6	-8.1	-15.7 to +1.5
For patients who are very sick, use the intensive care unit	CHF	8	47.0	69.7	-22.7	-44.2 to -1.0

\*Adjusted for patient characteristics, hospital characteristics, disease, state, and time period

†CHF indicates congestive heart failure; CVA, cerebrovascular accident; PNE, pneumonia; and AMI, acute myocardial infarction

‡Within the specified disease.

§The difference represents the percentage for black or poor patients minus the percentage for the other patients. A positive value in this column suggests process is better for black or poor patients; a negative value suggests process is better for the other patients. P < .05 for the difference between the percentage of black or poor patients to whom the criteria were applicable who met the process criteria and the percentage of the other patients to whom the criteria were applicable who met the process criteria.

¶P < .01 for this difference.

#Moderately sick was defined as a score of 6 or 6 and very sick as a score of 7 or more on each hospital day, with points assigned as follows: chest pain, 1 point; shortness of breath, 1 point; confusion, 2 points; heart rate >120 beats per minute, 2 points; respiratory rate >20 breaths per minute, 2 points; and diastolic blood pressure, >105 mm Hg, and systolic blood pressure, >180 mm Hg, 3 points.

Table 3. Examples of Differences in Process Criteria by Race and Poverty

## Instability at Discharge

Patients who were black or from poor neighborhoods were more likely to be discharged in an unstable condition after adjustment for sickness at admission, patient and hospital characteristics, disease, state, and time period (P<.001). Nineteen percent of black or poor patients and 13.7% of the other patients were discharged with at least one instability Table 2.

## Length of Stay and Discharge to Nursing Home

After adjusting for all covariates, patients who were black or from poor neighborhoods average 12.6 hospital days, compared with 12.0 hospital days for the other patients (P<.05) Table 2. There is no significant difference in the percentage of patients discharged to a nursing home.

## Mortality Rates

The in-hospital and postadmission mortality rates (unadjusted except for sickness at admission and the disease that precipitated admission) were better for patients who were black or from poor neighborhoods. After adjustment for other patient characteristics and for the fact that blacks and patients from poor neighborhoods were more likely to receive care in better hospitals, these differences were not significant

Table 2. However, because we demonstrated both worse process of care and instability at discharge for these patients, we had expected to observe slightly higher postadmission death rates for patients who are black or poor [21,23,30]. Based on our process-outcome relationship we would expect the worse process of care in patients who are black or from poor neighborhoods to result in an additional 45 deaths per 10 000 patients. This would raise their 30-day postadmission death rate from 1540 to 1585 per 10 000. However, our sample size was inadequate to reliably detect this difference. In our sample of 9932 patients, 16% of whom are black or poor, the 95% CI around a death rate difference of -1.4 percentage points Table 2 is -3.1 to +0.6. The expected mortality difference of +0.45 percentage points is within this CI. Our mortality results therefore are not inconsistent with those predicted based on the observed differences in process of care. Mortality is not as sensitive a measure of quality as is process [28].

## COMMENT

Using a clinically detailed, nationally representative database of patients hospitalized with congestive heart failure, acute myocardial infarction, pneumonia, and cerebrovascular accident, we have found differences in quality of care for acutely ill, elderly, insured patients who are black or poor as compared with others in similar hospitals. After accounting for hospital type, patients who are black or poor have process-of-care scores 0.11 SD less than other patients ( $P < .01$ ). This effect was apparent across diseases and for each process measure. The process criteria measure underuse of basic, not luxury, components of care. Moreover, discharge with instability is 1.4 times as great for patients who are black or poor as compared with others.

The differences in quality at the individual hospital were not apparent from inspection of the data, because patients who are black or from poor neighborhoods are 1.8 times more likely to receive care in urban teaching hospitals than in rural or nonteaching hospitals. The greater frequency of use of urban teaching hospitals by patients who are black or poor almost completely offsets the worse process of care they receive within each hospital. This phenomenon (known as Simpson's paradox) [33] should be considered in studying the care received for groups of patients whose care may be influenced by the setting in which it is provided.

The high prevalence of patients who are black or from poor neighborhoods in urban teaching hospitals may reflect the historical placement of many teaching hospitals in urban centers or that many Medicare patients may have established relationships with these hospitals even before they had Medicare insurance. Further research into how patients select hospitals would be useful to ascertain the truth of these speculations.

We do not know why insured Medicare patients who are black or poor experience lower quality of care and more instability at discharge than other patients cared for within the same hospital. We do not know whether their longer hospital stays reflect less efficient care or difficulties in placement. In addition, further research is needed to clarify whether sociocultural and educational incongruity between providers and patients translates into misunderstandings about patients' preferences and expectations, and to evaluate the extent to which stereotyping, discrimination, or bias exist in the hospital setting [34,35,36,37,38,39,40].

Previous work has emphasized the importance of insurance rather than race or financial status in predicting quality of care [10]. This work suggests that even among insured patients, those who are black or from poor neighborhoods receive worse care. We know of no significant changes in American social or health policy that would make these results out-of-date.

Patients who are black or from poor neighborhoods, despite receiving worse process of care, had lower posthospital mortality. Even recognizing the statistical insignificance of this result and that it was most likely produced by lack of power, we nonetheless think it is useful to consider the following as a stimulus for future research. At a fixed level of sickness at hospital admission, process of care, or instability at

hospital discharge, elderly patients who are black or from poor neighborhoods may actually have lower death rates. This hypothesis bears some similarity to the principle of the crossover effect in which very old black survivors, who may be hardier, have longer life expectancies than very old white people [17,41,42,43,44,45,46,47,48]. In addition, although our measures of sickness at admission, processes of care, and instability at discharge are clinically detailed and precisely defined, they were limited to variables that could be abstracted reliably from the medical record. It is possible that patient characteristics not well measured from the medical record differ between patients who are black and poor as compared with others. It is hoped that this hypothesis could be tested in a new generation of studies now specifically collecting data directly from the patient [49,50].

Prior research has drawn attention to the finding that racial and poverty status influence access to care. We report that racial characteristics and poverty status also influence the quality of care received by acutely ill, insured patients after they have gained access to the hospital. As seen in [Table 4](#), this difference is about three times the difference in quality of process of care between female and male patients, but one-third the difference of being hospitalized in a rural vs urban teaching hospital [28,51]. However, because patients who are black or from poor neighborhoods receive more of their care in the best urban teaching hospitals, their overall hospital quality of care is no different than for other patients. [Table 4](#)

**Table 4.—Predicted Decrease in Death Rate if All Patients Received Care From the Best Hospital Type or Received Care Given to the Type of Patient Who Experienced the Best Care**

Contrasts		Difference, SD*	Predicted Decrease in No. of Deaths at 30 d, per 10 000 Patients
Best Process	Worse Process		
Males	Females	+0.04†	-16
Neither black nor from poor neighborhood	Black or from poor neighborhood	+0.11‡	-45
Urban teaching hospital	Urban nonteaching hospital	+0.19§	-78
Urban teaching hospital	Rural hospital	+0.33§	-135

\*These analyses are adjusted for patient characteristics, hospital characteristics (eg, size), disease, state, and time period.

†P<.05.

‡P<.01.

§P<.001.

**Table 4.** Predicted Decrease in Death Rate if All Patients Received Care From the Best Hospital Type or Received Care Given to the Type of Patient Who Experienced the Best Care

This study shows quality of care is influenced by both the type of hospital in which care is received and the type of patient who receives the care. We recommend that policymakers and clinicians involved in the reform of the American health care system supplement efforts to improve access to care with efforts to improve quality of care for those acutely ill patients who now receive suboptimal care. Efforts to improve quality of care must address both where people go and who people are.

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## REFERENCES

1. Aday LA, Andersen R, Fleming GV. Health Care in the US: Equitable for Whom? Beverly Hills, Calif: Sage Publications; 1980.

2. Aday LA, Fleming GV, Andersen R. Access to Medical Care in the US: Who Has It, Who Doesn't. Chicago, Ill: Pluribus Press, Inc, and the Center for Health Administration Studies, University of Chicago; 1984.
3. Eggers PW. Effect of transplantation on the Medicare End-Stage Renal Disease Program. *N Engl J Med*. 1988;318:223-229.
4. Kjellstrand CM. Age, sex, and race inequality in renal transplantation. *Arch Intern Med*. 1988;148:1305-1309.
5. Blendon RJ, Aikin LH, Freeman HE, Corey CR. Access to medical care for black and white Americans. *JAMA*. 1989;261:278-281.
6. Council on Ethical and Judicial Affairs, American Medical Association. Black-white disparities in health care. *JAMA*. 1990;263:2344-2346.
7. Kasiske BL, Newlan JF, Riggio RR, et al. The effect of race on access and outcome in transplantation. *N Engl J Med*. 1991;324:302-307.
8. Yergan J, Flood AN, LoGerfo JP, Diehr P. Relationship between patient race and the intensity of hospital services. *Med Care*. 1987;25:592-603.
9. Epstein AM, Stern RS, Tognetti J, et al. The association of patients' socioeconomic characteristics with the length of hospital stay and hospital charges within diagnosis-related groups. *N Engl J Med*. 1988;318:1579-1585.
10. Burstin HR, Lipsitz SR, Brennan TA. Socioeconomic status and risk for substandard medical care. *JAMA*. 1992;268:2383-2387.
11. Wenneker MB, Epstein AM. Racial inequalities in the use of procedures for patients with ischemic heart disease in Massachusetts. *JAMA*. 1989;261:253-257.
12. Epstein AM, Stern RS, Weissman JS. Do the poor cost more? a multihospital study of patients' socioeconomic status and use of hospital resources. *N Engl J Med*. 1990;322:1122-1128.
13. Wenneker MB, Weissman JS, Epstein AM. The association of payer with utilization of cardiac procedures in Massachusetts. *JAMA*. 1990;264:1255-1260.
14. Goldberg KC, Hartz AJ, Jacobsen SJ, Krakauer H, Rimm AA. Racial and community factors influencing coronary artery bypass graft surgery rates for all 1986 Medicare patients. *JAMA*. 1992;267:1473-1477.
15. Lurie N, Ward NB, Shapiro MF, Gallego C, Vaghaiwalla R, Brook RH. Termination of Medi-Cal benefits: a follow-up study one year later. *N Engl J Med*. 1986;314:1266-1268.
16. Braveman P, Oliva G, Miller MG, Reiter R, Egerter S. Adverse outcomes and lack of health insurance among newborns in an eight-county area of California, 1982 to 1986. *N Engl J Med*. 1989;321:508-513.
17. Sorlie P, Rogot E, Anderson R, Johnson NJ, Backlund E. Black-white mortality differences by family income. *Lancet*. 1992;340:346-350.
18. Kahn KL, Rubenstein LV, Draper D, et al. The effects of the DRG-based prospective payment system on quality of care for hospitalized Medicare patients: an introduction to the series. *JAMA*. 1990;264:1953-1955.
19. Draper D, Kahn KL, Reinisch EJ, et al. Studying the effects of the DRG-based prospective payment system on quality of care: design, sampling, and fieldwork. *JAMA*. 1990;264:1956-1961.
20. Keeler EB, Kahn KL, Draper D, et al. Changes in sickness at admission following the introduction of the prospective payment system. *JAMA*. 1990;264:1962-1968.
21. Kahn KL, Rogers WH, Rubenstein LV, et al. Measuring quality of care with explicit process criteria before and after implementation of the DRG-based prospective payment system. *JAMA*. 1990;264:1969-1973.
22. Rubenstein LV, Kahn KL, Reinisch EJ, et al. Changes in quality of care for five diseases measured by implicit review 1981 to 1986. *JAMA*. 1990;264:1974-1979.
23. Kosecoff J, Kahn KL, Rogers WH, et al. Prospective payment system and impairment at discharge: the quicker-and-sicker story revisited. *JAMA*. 1990;264:1980-1983.
24. Kahn KL, Keeler EB, Sherwood MJ, et al. Comparing outcomes of care before and after implementation of the DRG-based prospective payment system. *JAMA*. 1990;264:1984-1988.
25. Rogers WH, Draper D, Kahn KL, et al. Quality of care before and after implementation of the DRG-based prospective payment system. *JAMA*. 1990;264:1989-1994.
26. Kahn KL, Draper D, Keeler EB, et al. The Effects of the DRG-Based Prospective Payment System on Quality of Care for Hospitalized Medicare Patients: Final Report. Santa Monica, Calif: RAND; 1992. Publication R-3931-HCFA.
27. Agriculture and Rural Economy Division. 1983 Rural-Urban Continuum Codes. Washington, DC: Economic Research Service, US Dept of Agriculture; 1990.
28. Keeler EB, Rubenstein LV, Kahn KL, et al. Hospital characteristics and quality of care. *JAMA*. 1992;268:1709-1714.
29. Hartz AJ, Krakauer H, Kuhn EM, et al. Hospital characteristics and mortality rates. *N Engl J Med*. 1989;321:1720-1725.
30. Brook RH, Kahn KL, Kosecoff J. Assessing clinical instability at discharge: clinician's responsibility. *JAMA*. 1992;268:1321-1322.
31. Computing Resource Center. STATA Reference Manual, II. Version 3.0. College Station, Tex: Stata Corporation; 1992.
32. Huber PJ. The behavior of maximum likelihood estimates under non-standard conditions. In: Proceedings of the Fifth Berkeley Symposium on Mathematical Statistics and Probability, I. Berkeley: University of California Press; 1967:221-233.
33. Kotz S, Johnson NL, eds. Encyclopedia of Statistical Sciences, III. New York, NY: John Wiley & Sons; 1983:24-25.
34. Roth JA. Treatment of the sick. In: Kosa J, Antomovsky A, Zola IK, eds. Poverty and Health: A Sociological Analysis. Cambridge, Mass: Harvard University Press; 1969:214-243.

35. Papper S. The undesirable patient. *J Chronic Dis.* 1970;22:777-779.
36. Wolkon GH, Yamamoto J. Medical student attitudes about quality of care and training of minority persons. *JAMA.* 1978;70:185-188.
37. Eisenberg JM. Sociologic influences on decision-making by clinicians. *Ann Intern Med.* 1979;90:957-964.
38. Flaherty JA, Meagher R. Measuring racial bias in inpatient treatment. *Am J Psychiatry.* 1980;137:679-682.
39. Hooper EM, Comstock LM, Goodwin JM, Goodwin JS. Patient characteristics that influence physician behavior. *Med Care.* 1982;20:630-638.
40. Levy DR. White doctors and black patients: influence of race on the doctor-patient relationship. *Pediatrics.* 1985;75:639-643.
41. Manton KG, Poss SS, Wing S. The black/white mortality crossover: investigation from the perspective of the components of aging. *Gerontologist.* 1979;19:291-300.
42. Manton KG. Sex and race-specific mortality differentials in multiple cause of death data. *Gerontologist.* 1980;20:480-493.
43. Manton KG. Differential life expectancy: possible explanations during the later ages. In: Manuel RC, ed. *Minority Aging: Sociological and Social Psychological Issues.* Westport, Conn: Greenwood Press; 1982:63-68.
44. Wing S, Manton KG, Stallard E, Hames CG, Tryoler HA. The black/white mortality crossover: investigation in a community-based study. *J Gerontol.* 1985;40:78-84.
45. Manton KG, Patrick CH, Johnson KW. Health differentials between blacks and whites: recent trends in mortality and morbidity. *Milbank Q.* 1987;65(suppl 1):129-199.
46. Manuel RC. The demography of older blacks in the United States. In: Jackson JS, ed. *The Black American Elderly: Research on Physical and Psychosocial Health.* New York, NY: Springer Publishing Co; 1988:25-49.
47. Ford AB, Haug MR, Jones PK, Roy AW, Folmar SJ. Race-related differences among elderly urban residents: a cohort study, 1975-1984. *J Gerontol.* 1990;45:S163-S171.
48. Keil JE, Sutherland SE, Knapp RG, Tyroler HA. Does equal socioeconomic status in black and white men mean equal risk of mortality? *Am J Public Health.* 1992;82:1133-1136.
49. Stewart AL, Sherbourne CD, Hays RD, et al. Summary and discussion of MOS measures. In: Stewart AL, Ware JE, eds. *Measuring Functioning and Well-being: The Medical Outcomes Approach.* Durham, NC: Duke University Press; 1992:345-371.
50. Murphy DJ, Cluff LE, eds. Support: study to understand prognoses and preferences for outcomes and risks of treatments; study design. *J Clin Epidemiol.* 1990;43(suppl, theme issue):1S-124S.
51. Pearson ML, Kahn KL, Harrison ER, et al. Differences in quality of care for hospitalized elderly men and women. *JAMA.* 1992;268:1883-1889.