There are racial differences in many aspects of health care delivery. For example, black patients are less likely to receive coronary angiography after myocardial infarction than white patients and after receiving coronary angiography, they are less likely to undergo revascularization. Physicians are more likely to delay referrals to nephrologists for black patients than for white patients, and black women are less likely to receive surgery for lung cancer and black women are less likely to undergo mammography than white women. Most but not all studies have demonstrated poorer outcomes for blacks. A few studies have even found improved clinical outcomes for blacks compared with whites, for example, while blacks who have had renal transplantation have higher rates of graft rejection than whites, blacks undergoing hemodialysis have better survival rates than whites.

Prior studies evaluating the association of race with health care delivery and outcomes have been limited to specific disease diagnoses or regions of the country. Few studies have examined racial differences in health outcomes in an equal-access health care system. The Veterans Affairs (VA) system operates a nationwide, government-funded health care system that has few financial barriers and therefore may allow for improved access to care for black patients. As a result, we hypothesized that racial disparities in health outcomes would be less pronounced at VA hospitals.
RACIAL DIFFERENCES IN MORTALITY

METHODS
Subjects
We identified 39,190 patients who were admitted to 1 of 147 VA hospitals in the 48 continental states between October 1, 1995, and September 30, 1996, with a primary diagnosis of angina (diagnosis related group [DRG] 140, 143), pneumonia (DRG 89-91), congestive heart failure (DRG 127), chronic obstructive pulmonary disease (DRG 88), diabetes mellitus (DRG 294, 295), or chronic renal failure (International Classification of Diseases, Ninth Revision, Clinical Modification code 585) using definitions established in a prior study.35 Data for the other 21 VA hospitals were incomplete or not available. For patients with multiple hospitalizations during that year, we randomly selected 1 hospital admission.

Measurements
The primary source of data was the Patient Treatment File, a VA administrative database that contains demographic characteristics (age, sex, race, marital status, length of stay, and eligibility for VA services), International Classification of Diseases, Ninth Revision (ICD-9) and DRG codes for discharge diagnoses, and discharge status. Race was recorded as black, white, Hispanic, Asian, or other and was determined by patient self-identification. Due to relatively small numbers, we excluded women (n=839, 2.1%) and other racial groups (n=1842, 4.7%). We used the Beneficiary Identification Record Locator System Death File to determine the vital status of each veteran. We estimated financial status using each patient’s eligibility for VA services. We used a previously validated method for comorbidity adjustment, in which the presence of a medical condition was assessed for each of 8 potential comorbidity categories (cardiovascular, respiratory, endocrine, hematologic, gastrointestinal, gastrointestinal, musculoskeletal, and neurologic).36 Each patient was assigned 1 point for each comorbidity category in which they had a condition that usually prolongs the length of hospitalization by at least 1 day.33,37

We also evaluated several hospital characteristics. For each hospital, we used data from the VA Health Services Web page and the VA Automated Management Information Systems file to determine the number of hospital beds, the number of patients treated annually, and the proportion of patients with these 6 diagnoses who were black. To determine the annual research budget and the number of resident trainees, we used data from the VA Academic Administration Office. We obtained data from the VA Medical Services Office to determine technological capability, which we defined as the availability of coronary artery bypass surgery. Finally, we used data from the Area Resource File to determine urban or rural location. We designated a hospital as “urban” if it was in a metropolitan area with a population of 1 million or more persons and assigned hospitals to a geographic location by dividing the country into 4 regions, as follows: (1) Northeast region: north of Virginia and east of Ohio; (2) Southeast region: south of (and including) Virginia and east of the Mississippi River; (3) Midwest region: west of (and including) Ohio and east of Colorado; and (4) West region: west of (and including) Colorado and Texas.38 Each patient was assigned the hospital characteristics of the hospital to which he was admitted.

The primary outcome was the 30-day mortality rate from the day of hospital admission, which was available in the Beneficiary Identification Record Locator System database. We also determined inpatient mortality and 6-month mortality for patients admitted during the first 6 months of the study.

Statistical Methods
We used t tests, χ2 tests, and nonparametric methods, as appropriate, to compare characteristics of black patients and white patients. To evaluate the association of race with 30-day mortality, we compared both the overall and the disease-specific unadjusted mortality rates.

We used logistic regression models for inpatient mortality and Cox proportional hazard models for 30-day and 6-month mortality to estimate the independent association of race with mortality; results are reported as relative risks (RRs) with 95% confidence intervals (CIs). We included the following patient-specific variables: age (years), race, marital status (married, widowed, or unmarried), financial assets (<$25000, ≥$25000), presence of individual comorbid conditions (categorized as cardiovascular, respiratory, endocrine, hematologic, gastrointestinal, genitourinary, musculoskeletal, and neurologic ICD-9 codes used in analysis available from authors), and length of stay (0-3 days, 4-6 days, 7-9 days, and ≥10 days). Hospital-based characteristics included in the models were availability of coronary artery bypass surgery, region of the country, urban vs rural location, number of hospital beds, number of patients treated annually, and the number of comorbid conditions for each patient and compared the association between the comorbidity score and 30-day mortality separately for blacks and whites. Because the mean (SD) comorbidity score was some-
what higher in whites than blacks (1.1 [1.2] vs 1.0 [1.2], P < .001), we con-
ducted sensitivity analyses to evaluate
the additional difference in comorbid-
ity score between blacks and whites that
would have eliminated the association
of race and mortality. We modeled the
effects of increasing the comorbidity
score of white patients in increments
of 0.1 until a difference in adjusted mor-
tality by race was no longer apparent.
We considered a P value of less than
.05 (2-sided) to be statistically signifi-
cant. All analyses were performed us-
ing STATA 5.0 (Stata Corporation, Col-
lege Station, Tex).

RESULTS
Blacks who were admitted to VA hos-
pitals were somewhat younger and more
likely to be poor and unmarried than
whites (Table 1). Blacks were more
likely to be admitted to large, urban hos-
pitals with greater technological capa-
bilities, larger research budgets, and
more physician trainees. More than half
of the black patients were admitted to
hospitals in the southeastern United
States. Blacks were more likely to be ad-
mitted for complications of diabetes
mellitus and renal disease and less likely
to be admitted for chronic obstructive
pulmonary disease.

In unadjusted analyses, black pa-
tients had lower 30-day mortality than
white patients (4.5% vs 5.8%; RR, 0.77;
95% CI, 0.69-0.87; P = .001). Mortal-
ity rates were lower among blacks for all
6 diagnoses (Figure 1); the differ-
ces by race were statistically signifi-
cant for pneumonia, congestive heart
failure, and chronic renal failure. Com-
pared with whites, blacks had lower un-
adjusted inpatient mortality (4.2% vs
4.8%; RR, 0.86; 95% CI, 0.76-0.97;
P = .02) and 6-month mortality (11.7%
vs 14.3%; RR, 0.80; 95% CI, 0.66-0.94;
P = .01). We found no statistically significant interactions
among the prespecified subgroups that
we evaluated (all P > .10).

Comorbidity score was strongly asso-
ciated with 30-day mortality in both
blacks and whites (Figure 3). For ex-
ample, patients with the highest co-
 morbidity scores (≥4, n = 1576) had
greater mortality at 30 days (RR, 6.4;
95% CI, 5.6-7.3; P = .001) than those
with comorbidity scores of 0 or 1
(n = 26183). Within each category of co-
 morbidity score, blacks had lower ad-
justed mortality than whites. In sensi-

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(Reprinted) JAMA, January 17, 2001—Vol 285, No. 3  299
RACIAL DIFFERENCES IN MORTALITY

We found that black patients had lower 30-day mortality compared with white patients after admission to a VA hospital with 1 of 6 common medical diagnoses. Our findings persisted after adjusting for baseline differences and were consistent across disease, age, financial status, length of stay, comorbidity score, and several hospital-level subgroups, including technological capability, region of the country, proportion of treated patients who were black, and urban location. The mortality difference for black patients remained evident 6 months after admission. This mortality benefit, even in an equal-access health care system, may be surprising given that black patients generally experience higher social barriers to care. For example, blacks are less likely than whites to have seen a physician in the previous year and have fewer visits for chronic conditions.

What unmeasured attribute or attributes of black patients who are admitted to VA hospitals might explain the observed difference in mortality? It is possible, for example, that black patients who are cared for within the VA health care system are unusually healthy compared with white patients. However, all of the patients in this study were sick enough with a major medical illness to have been admitted to a hospital. Other investigators have found that blacks have a similar or greater number of comorbid conditions than white patients in the VA system. For instance, in a study of more than 16000 patients who had a cholecystectomy at a VA hospital, blacks were more likely to have hypertension, diabetes, chronic renal insufficiency, chronic renal failure, chronic liver disease, and cancer. Other studies have found similar results.

Another possibility is that black patients were less severely ill than white patients at the time of admission. In non-VA settings, however, black patients usually present to emergency departments later in their disease course than white patients, and blacks are sicker at the time of admission than whites. It could be that black patients seek or receive inpatient care at VA medical centers earlier in the course of an illness than do white patients, perhaps because they perceive a diminished barrier to obtaining care at the VA.

Racial differences in other unmeasured factors might have influenced our findings. For example, it is possible that blacks had better social support or were less likely to be depressed, which may have reduced their mortality. Marital status is a marker of social isolation that has been shown to affect mortality, at least among patients with coronary artery disease. In our sample, however, blacks were less, not more, likely to be married than whites. Prior studies have found that black patients in the VA system are less likely to be functionally independent and more likely to be functionally dependent on the care of others; black patients in the VA system are also less likely to be fully employed, be a homeowner, and more likely to live alone than white patients.

Another possibility is that whites might have had higher rates of alcohol or tobacco consumption. Though we did not directly measure these rates, we were able to adjust for the effects of alcohol-related disease and chronic obstructive pulmonary disease. Furthermore, previous studies found that black patients in the VA system have higher rates of current or past tobacco use than whites.

Table 2. Association Between Race and Mortality Among Patients Admitted to 147 Veterans Affairs Hospitals

<table>
<thead>
<tr>
<th>Mortality</th>
<th>Blacks, % (n = 7575)</th>
<th>Whites, % (n = 28934)</th>
<th>Relative Risk (95% CI)*</th>
<th>Unadjusted</th>
<th>Adjusted†</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>In-hospital</td>
<td>4.2</td>
<td>4.8</td>
<td>0.86 (0.76-0.97)</td>
<td>0.74 (0.64-0.86)</td>
<td>&lt;.001</td>
<td></td>
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<tr>
<td>At 30 days</td>
<td>4.5</td>
<td>5.8</td>
<td>0.77 (0.69-0.87)</td>
<td>0.75 (0.66-0.85)</td>
<td>&lt;.001</td>
<td></td>
</tr>
<tr>
<td>At 6 months</td>
<td>11.7</td>
<td>14.3</td>
<td>0.80 (0.73-0.89)</td>
<td>0.80 (0.72-0.89)</td>
<td>.001</td>
<td></td>
</tr>
</tbody>
</table>

*Comparing black patients with white patients. CI indicates confidence interval.
†Adjusted for age, financial assets, length of stay, presence of comorbid disease groups, diagnosis, availability of bypass surgery, number of hospital beds, urban status, proportion of treated patients who were black, and region of the country. Inpatient mortality rates were adjusted using logistic regression; 30-day and 6-month mortality rates were adjusted using Cox proportional hazards models. P values for the adjusted analyses are provided.

Figure 1. Unadjusted Mortality Differences Between Blacks and Whites, Stratified by Diagnosis

COPD indicates chronic obstructive pulmonary disease; CHF, congestive heart failure; and CRF, chronic renal failure. Numbers of patients in each category are listed in Table 1.
do white patients.39,40,42,44 Two studies reported greater rates of heavy alcohol consumption among black veterans,42,53 although 1 study found that white veterans were more likely to have 1 or more drinks of alcohol per day.40 Studies among nonveterans have found similar results.54-56 Therefore, it seems unlikely that greater rates of tobacco or alcohol use among whites accounted for our findings.

Finally, since greater education level is associated with better survival,37,38 lower mortality for blacks could be explained if their level of education were greater than among whites treated at VA hospitals. A previous study among veterans with lung and colon cancer, however, found that blacks had less education than white veterans.41 Thus, although we lacked information on several potential confounding variables, none of these characteristics appear likely to explain the survival advantage of black veterans compared with white veterans.

Although we cannot readily explain why black patients had lower mortality than white patients, a prior study among patients with common medical diagnoses treated in community hospitals in Ohio found similar results.29 The in-hospital mortality rates in that study for both blacks and whites were similar to those we observed. However, they were unable to evaluate survival after hospital discharge. Since black patients in their study had shorter lengths of stay, the observed difference in mortality could have been partly explained by differences in discharge practices based on race.

Other studies have suggested that outcomes for blacks may be better at VA than at non-VA hospitals. Among patients with *Pneumocystis carinii* pneumonia, inpatient mortality was the same for blacks and whites treated at VA hospitals.21,22

![Figure 2](https://example.com/figure2.png)

**Figure 2.** Adjusted Relative Risks for 30-Day Mortality for Black Patients Compared With White Patients Within the Veterans Affairs Health Care System Stratified by Selected Patient and Hospital Characteristics

<table>
<thead>
<tr>
<th>Patient Characteristics</th>
<th>0.2</th>
<th>0.5</th>
<th>1.0</th>
<th>2.0</th>
<th>5.0</th>
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<tr>
<td>Age ≥ 65 y</td>
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<td>Age &lt; 65 y</td>
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<tr>
<td>No. of Comorbid Illnesses</td>
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<td>≥ 4</td>
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<td>Primary Admission Diagnosis</td>
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<td>Angina</td>
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<td>Pneumonia</td>
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<td>Congestive Heart Failure</td>
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<td>Chronic Obstructive Pulmonary Disease</td>
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<td>Diabetes</td>
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<td>Chronic Renal Failure</td>
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<td>Length of Stay, d</td>
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<td>≥ 11</td>
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<td>Hospital Characteristics</td>
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<td>Bypass Surgery Available</td>
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<tr>
<td>Treated Patients Who Were Black, %</td>
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<td>&lt; 7</td>
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<td>7-16</td>
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<td>17-35</td>
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<td>&gt; 35</td>
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<td>Multivariate Adjusted</td>
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The dot indicates the relative risk, and the line indicates the 95% confidence interval (CI). Comparisons are adjusted for age, comorbid illness, diagnosis, financial assets, length of stay, availability of coronary artery bypass surgery, urban status, number of beds in the hospital, region of the country, and proportion of treated patients who were black. The stratification variable is not included within its subgroup analyses.

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...but was greater for blacks treated at non-VA hospitals.27 Blacks in the United States with colorectal or lung cancer have greater mortality than whites with these conditions,23,59,60 yet mortality does not vary by race for patients treated for these conditions at VA hospitals.21,25

Our study has several limitations. First, we used administrative databases for clinical and demographic information. More detailed information on severity of illness or other patient characteristics would have allowed for more thorough adjustment for confounders. However, many of the problems in interpreting our results—which suggest the possibility of unmeasured or unmeasurable confounders—also apply to previous studies of racial difference in health outcomes. Second, as discussed above, we could not rule out the possibility that the sickest black patients or the healthiest white patients were denied admission to VA hospitals or sought care elsewhere. Finally, our findings should not be generalized to other health care settings.

In conclusion, we studied mortality for 6 common medical diagnoses at 147 VA hospitals and found that survival among black patients treated at the largest health care system in the United States was better than among whites. Our results suggest that equal access to care provided by the VA health care system has closed—and perhaps even crossed—the racial gap in health care access provided by the VA United States was better than among 147 VA hospitals and found that survival among black patients or the healthiest white patients were denied admission to VA hospitals or sought care elsewhere. Finally, our findings should not be generalized to other health care settings.

Author Contributions: Dr Jha and Mr Hosmer participated in study concept and design, acquisition of data, analysis and interpretation of data, drafting of the manuscript, critical revision of the manuscript for important intellectual content, and provided statistical expertise. Dr Shlipak participated in study concept and design, analysis and interpretation of data, drafting of the manuscript, critical revision of the manuscript for important intellectual content, and supervised conduct of the study. Dr Frances participated in acquisition of data, analysis and interpretation of data, critical revision of the manuscript for important intellectual content, and provided administrative, technical, or material support. Dr Browner participated in study concept and design, analysis and interpretation of data, drafting of the manuscript, and critical revision of the manuscript for important intellectual content; provided statistical expertise; and critical revision of the manuscript for important intellectual content, and supervised conduct of the study.


My writing is simply a set of experiments in life—an endeavour to see what our thought and emotion may be capable of.
—George Eliot (1819-1880)