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# GEOGRAPHIC VARIATION IN HEALTH CARE AND THE PROBLEM OF MEASURING RACIAL DISPARITIES

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**ABSTRACT** In its study of racial and ethnic disparities in health care, the Institute of Medicine (IOM) concluded that there were large and significant disparities in the quality and quantity of health care received by minority groups in the United States. This article shows that where a patient lives can itself have a large impact on the level and quality of health care the patient receives. Since black or Hispanic populations tend to live in different areas from non-Hispanic white populations, location matters in the measurement and interpretation of health (and health care) disparities. There is wide variation in racial disparities across geographic lines: some areas have substantial disparities, while others have equal treatment. Furthermore, there is no consistent pattern of disparities: some areas may have a wide disparity in one treatment but no disparity in another. The problem of differences in quality of care across regions, as opposed to racial disparities in care, should remain the target of policy makers, as reducing quality disparities would play a major role in improving the health care received by all Americans and by minority Americans in particular.

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IN ITS COMPREHENSIVE STUDY OF racial and ethnic disparities in healthcare, the U.S. Institute of Medicine (IOM) concluded that there were large and significant disparities in the quality and quantity of health care received by minority groups in the United States. Explicit in that review is the finding that “many sources—including health systems, healthcare providers, patients, and utilization managers—may contribute to racial and ethnic disparities in healthcare” (Smedley, Stith, and Nelson 2003, 10). In this paper, we argue that another key factor must be included in that list: geography. We show that where a patient lives can itself have a large impact on the level and quality of health care the patient receives. This matters in the measurement and interpretation of health (and health care) disparities, since black or Hispanic populations tend to live in different areas from non-Hispanic white populations.

Although an earlier study suggested that geography might work in favor of low income and African American populations because of their closer proximity to inner-city academic medical centers (Kahn et al. 1994), we find a generally different result: that blacks tend to live in parts of the country that have a disproportionate share of low-quality providers. Within those hospitals, both whites and blacks tend to receive low-quality care, but since blacks are over-represented in such areas, the quality of the hospital will cause an overstatement of the role that race plays in disparities at the level of the health care provider.

A second lesson from our analysis is that racial disparities in health care are a local phenomenon. Hospitals and regions of the country vary enormously in the extent to which such health care disparities are present; there are health care markets that serve large numbers of minorities that do not have disparities, although a plurality do. This finding limits the extent to which anecdotal evidence or even detailed quantitative studies from a given hospital, city, or state may be used to shed light on the larger problem of racial disparities at the national level. Nor is it entirely clear to what extent some regions are systematically worse, or systematically better, at eliminating health care disparities. In related work, we have found some regions have small (or no) disparities for one procedure, but high disparities for another (Baicker et al. 2003). The weak systematic correlation in racial disparities across myriad different procedures undermines the case for explanations that rely on a “legacy of segregated and inferior healthcare for African Americans” (Smedley, Stith, and Nelson 2003, 103). Alternatively, a more powerful explanation may lie in the presence of “surgical signatures” in different areas (Roos and Roos 1981; Wennberg 1990; Wennberg, McPherson, and Caper 1984). Surgical signatures refer to the persistent and dramatic differences in the rates at which certain surgical procedures are performed in adjacent regions with very similar patient populations. They are the consequence of the practice patterns of individual physicians and the local medical culture regarding a particular treatment. They have not been found to be correlated with patient characteristics or differences in physician supply. The idiosyncratic variation in the location and size of disparities suggests that future inquiries should investigate

the potential role of a few individual providers, who account for a large proportion of the caseload, in generating disparities.

A focus on the geography of health care will also suggest a different perspective than the conventional wisdom on the role of public policy in mitigating the deleterious effects of the under-use of health care in some minority populations. Often, interventions are designed to ensure the treatment a patient receives in a given hospital or by a given provider is independent of the patient's race. In contrast, we argue that, in the presence of geographic disparities in health care, policies designed to equalize patients' treatment within hospitals will not erase disparities at the national level, as differences in where minority groups live would still result in large disparities in care. What is necessary to erase health care disparities is to implement national policies designed to improve the overall quality of treatment or health of all patients, which in turn will have a disproportionate effect on reducing racial, ethnic, and geographic disparities in health care and health outcomes. Interventions focused on the overall quality of hospitals in a few regions of the country (where a disproportionate share of minorities communities are located) could dramatically reduce racial disparities in care.

We certainly do not argue that geographic variations in health care explain the full amount of the measured racial disparity in care. Indeed, in some cases geographic variations in health care may even mask existing disparities at the local level. Instead, our view is that overall health and health care disparities should be considered to be the sum of two components: (1) unequal treatment within a hospital or by a given provider, and (2) unequal treatment because of where people live. The reason that this distinction is important is because the sources of inequity are quite different: in the first case it is either at the level of the health care interaction (whether because of bias by the provider or poor information or preferences of the patient), while in the second case it is related to differences in where people live, which is dependent on factors such as wage and income, as well as barriers to housing that are less likely to be associated with the health care system per se.

Our analysis proceeds in four sections. First, we establish that the best unit of analysis for geographic variations in health care is the geographic area that is served by a major tertiary care hospital. We formalize this notion by introducing the concept of a "hospital referral region" (HRR) from the *Dartmouth Atlas of Health Care* (Wennberg and Cooper 1999). Second, we use these HRRs to illustrate the enormous variation in the quality of care that patients, independent of race, receive in different regions of the United States. Third, we show that there is significant residential clustering by race among these regions, with blacks disproportionately represented in the Southeast. Fourth, we use these results to quantify the relationship between geographic variation in health care and the measurement of racial disparities in care, using as an example eye examinations for diabetics in the Medicare population. We conclude with a discussion of the policy implications of our research. The degree to which racial disparities are

driven by differences in care within regions, as opposed to between regions, has profound implications for designing health care policy.

### MEASURING GEOGRAPHIC VARIATION IN HEALTH CARE

Understanding the role that geographic variation plays in driving racial disparities in health care requires a careful delineation of different health care service regions. The *Dartmouth Atlas of Health Care* divides the United States into 306 “hospital referral regions” (HRRs). These regions, some of which cross state borders, are constructed using a complex algorithm of commuting patterns of patients to major referral hospitals, and correspond to the level at which care is actually given. More simply, one may think of HRRs as representing local markets for health care, or the geographic level at which “back end” services such as cardiac surgery and end-of-life care are received. The regions are derived from data on Medicare beneficiaries, and thus capture the geographic pattern of where beneficiaries go for care.

We use data on residential clustering and the delivery of health care treatments by HRR from the *Dartmouth Atlas*, which is based on Medicare claims data. Treatment rates are determined by where the patient lived rather than where he or she received services. Thus if a Medicare enrollee living in Hartford, Connecticut, were admitted to a hospital in Boston, the utilization would be attributed to Hartford, and not to Boston. This means that the variations observed at the HRR level are blurred somewhat—since the practice patterns of Boston hospitals are assigned back to the Hartford HRR—but it avoids the potentially more serious shortcoming of unusually high utilization rates in large referral centers such as Boston or Rochester, Minnesota. Analysis at the HRR level is preferable to analysis at the city or state level, since it uses the empirical pattern of patient commuting to determine the geographic boundaries of each referral region, rather than assuming that the arbitrary political boundaries of states and cities also define the level at which the health care is delivered.

Throughout this paper we rely on data from the Medicare program. There are several advantages to using this data. First, the Medicare program is a substantial component of the U.S. health care system that comprises almost 20% of all health care expenditures and is regulated by policies designed to influence the delivery of care. Second, analysis of the Medicare population can dramatically mitigate the extent to which differences in health insurance contaminate estimates of racial disparities in health care. Third, we have a rich data set to draw on, based on tens of millions of patient visits per year. These sample sizes are necessary for a comprehensive investigation of race disparities in health care, in order that small sample sizes do not affect the quality of the inferences being made.

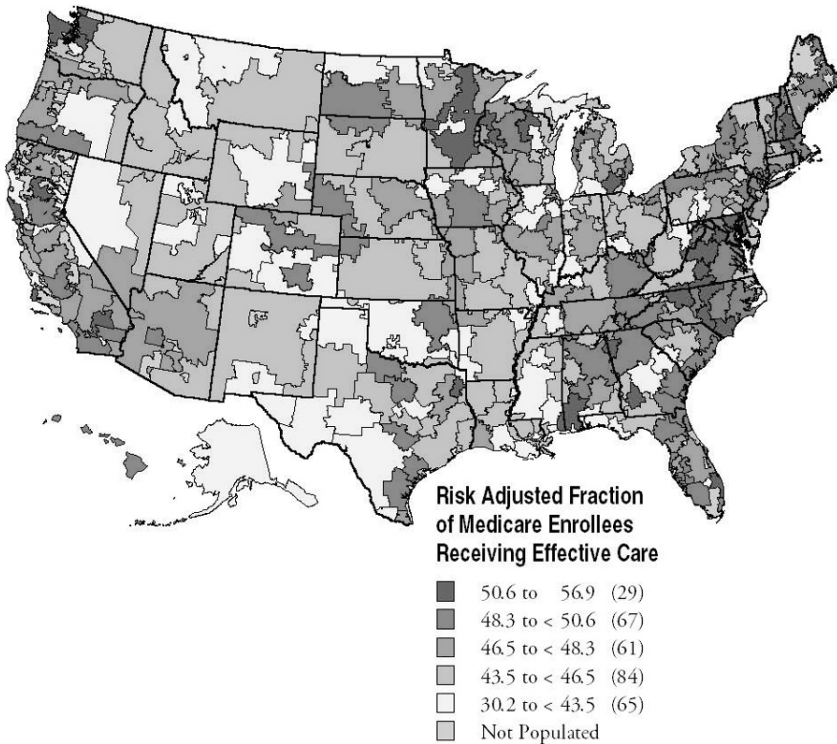
## GEOGRAPHIC VARIATION IN HEALTH CARE

We now examine the extent to which geographic disparities affect health care across hospital referral regions, including the quality of care provided to patients in different HRRs. The data we use are obtained from the *Dartmouth Atlas of Health Care* and are based on Medicare claims data for 1995–1996 (Wennberg and Cooper 1998).

One way to measure the quality of health care provided in a region is the use of low-cost, highly effective procedures that have known medical benefits and are rarely contraindicated. This methodology was pioneered by the Medicare Quality Improvement Organization and is designed to capture interventions and evaluations “for which there is strong scientific evidence and professional consensus that the process of care either directly improves outcomes or is a necessary step in a chain of care that does so” (Jencks et al. 2000, 1670). As such, detailed risk adjustment is less critical, as few patients are contraindicated for these procedures (such as the prescription of warfarin for atrial fibrillation or biennial eye examination for diabetics). Following Wennberg, Fisher, and Skinner (2002), we use an “effective care” index of 11 such measures, including the administration of angiotensin-converting enzyme inhibitors, aspirin, and beta-blockers after heart attacks; mammograms for older women; influenza and flu vaccines; and eye exams and the evaluation of lipid profiles and HbA1c for diabetics. The use of these procedures should be relatively insensitive to the preferences and characteristics of the population and relatively uniform across areas—most beneficiaries should be receiving this care across the country. Nevertheless, we also adjust the use of the measures for the age, sex, race, and underlying illness of the population (as reflected by discharges for a number of conditions such as heart attacks, gastrointestinal bleeding, hip fracture, and the like). These adjustments do not affect the results of the analysis.

Figure 1 shows the distribution of the use of effective care across HRRs. Some HRRs use effective care at a much higher rate than others, with the mean use varying from a low of 30% to a high of almost 60%. Residents in the Northeast, for example, are much more likely to get effective care than those in the Southwest.

What causes this wide geographic variation in the use of cheap and effective care that we would argue should be universal? A substantial literature stemming in large part from the *Dartmouth Atlas* documents and explores the causes of this geographic variation—seen not just in effective care, but in rates of many different surgical procedures and intensity of treatment (Baicker and Chandra 2003; Baicker et al. 2003; Chandra and Skinner 2004; Fisher et al. 2003a, 2003b; Wennberg and Cooper 1999; Wennberg, Fisher, and Skinner 2002). Differences could stem from historical practice patterns, the slow diffusion of technology, differential supply of specialists and hospital capacity, differences in patient characteristics and preferences, or any of a number of other factors. Our analysis does not attempt to discern the root causes of geographic disparities, but rather seeks to



**FIGURE 1**

*Distribution of effective care in health referral regions (HRRs).*

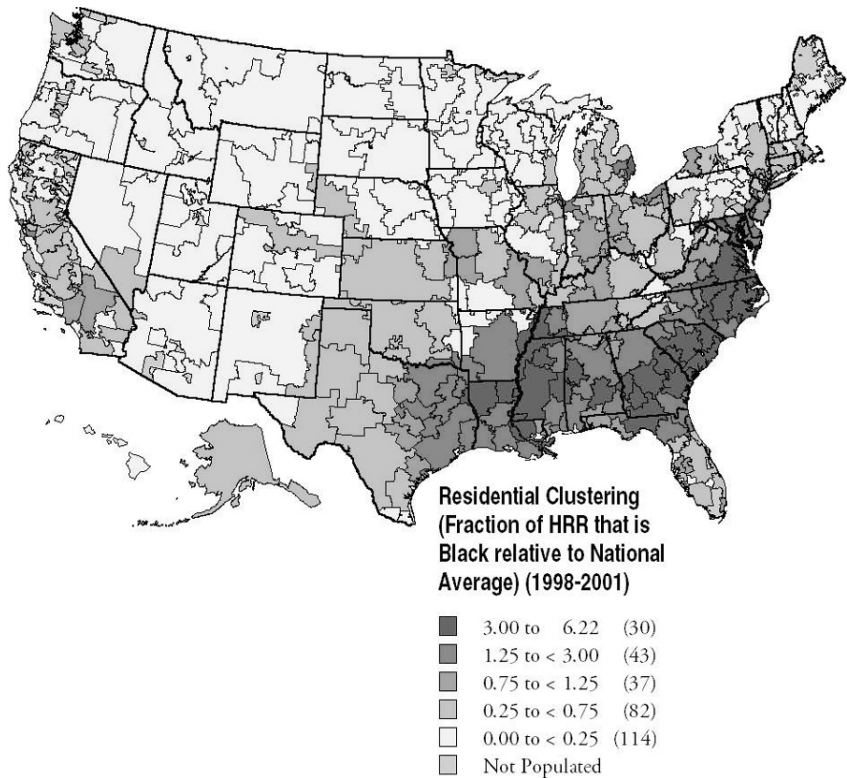
establish the importance of these disparities in widespread racial differences in the quality of care received.

### GEOGRAPHIC CLUSTERING BY RACE

Blacks and whites are not equally represented in different parts of the country. In order to understand the role that this uneven distribution plays in health care disparities, we need to understand how much segregation there is in the health care providers and hospitals used by blacks and whites.

Figure 2 shows the extent to which black and white residents are not evenly distributed across the country. The shading of each HRR represents the fraction of blacks living in an area relative to the national average (of approximately 14%). If blacks and whites were not residentially clustered, all of the HRRs would have a ratio of around 1, meaning that each one would have the same mix of black and white residents—each would be about have about 14% black residents. Only 37 of the 306 HRRs have a nationally representative mix of residents. In fact, several regions of the country have black population rates that are three to six times greater than the national average. Blacks disproportionately live in the Southeast, while whites disproportionately live in the West and in the Northeast.





**FIGURE 2**

*Relative distribution of blacks in HRRs.*

### **DISENTANGLING WITHIN-AREA AND BETWEEN-AREA RACIAL DIFFERENCES IN CARE**

There is a substantial literature documenting racial disparities in health care. In nearly every study, African American or Hispanic patients experience lower levels of health care even when high-quality controls for patient risk adjustment are included in the analysis (Smedley, Stith, and Nelson 2003). Most previous studies have used national samples, and thus their results represent an average across the many regions in the United States (although some focus on a single area). Having established above both that there is substantial variation in care between different hospital areas and that there is substantial residential clustering by race, we turn to the role that residential segregation plays in driving observed racial disparities in health care.

To understand the role of residential segregation in racial disparities, we first establish that there are different patterns of care in areas with different racial compositions. We focus on one particular component of effective care—annual eye exams for diabetics—as an example. We divide the 306 HRRs into quintiles based on the fraction of their population that is black, and then examine the fraction of



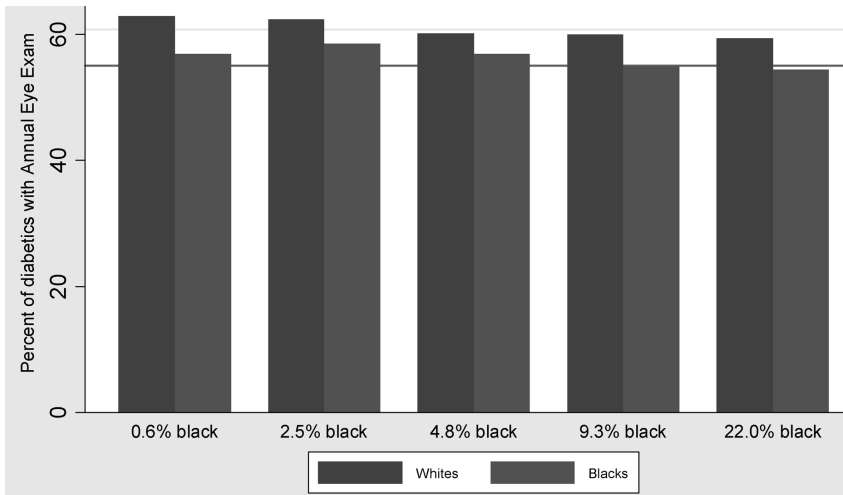


FIGURE 3

*Black-white differences in eye exams for diabetes in HRRs with different percentages of black patients. Notes: Each quintile contains an equal proportion of beneficiaries. Numbers below quintile bars report the average percent of blacks in the HRRs that comprise the quintile. Horizontal lines report the U.S. rate for white (light line) and black (dark line) beneficiaries. The analysis adjusts for age and sex.*

patients in these quintiles receiving effective care and other surgical procedures. The 61 HRRs with the highest proportion of black residents are, on average, 22% black, while the 61 with the lowest proportion are less than 1% black. The two horizontal lines on the graph in Figure 3 report the use of annual eye exams for diabetics for the average white and average black beneficiary across all quintiles. As Figure 3 shows, a significantly lower fraction of blacks living in the fifth of HRRs with the most blacks (that is, those areas that are on average 22% black) receive annual eye exams, relative to those living in the fifth of HRRs with the fewest blacks. In other words, the quality of care received by African Americans deteriorates as the black population in an area increases. The same pattern holds true for whites: the rate at which white diabetics receive an annual eye exam falls as the percentage of blacks in an area increases. In the quintile with the fewest proportion of blacks (areas that are 0.6% black on average), black diabetic patients receive eye exams at a slightly higher rate than the average white beneficiary.

This graph highlights the fact that there *are* disparities in care within HRRs, but that residential segregation increases racial differences. To explore this point further, we examined racial disparities within specific HRRs. Figure 4 shows data for the 25 HRRs with the greatest number of black residents. More than 45% of blacks live in these 25 HRRs. In the Bronx, black diabetics receive eye exams at a higher rate than do whites. Similarly, there are several HRRs where racial disparities are small to negligible—for example, in Birmingham, Alabama, Raleigh, North Carolina, and Washington, D.C. On the other hand, HRRs like

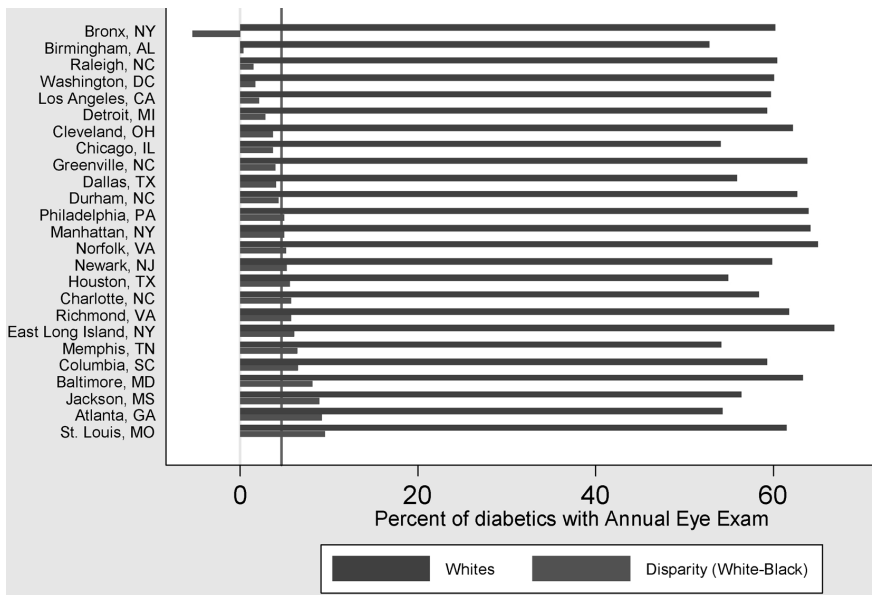


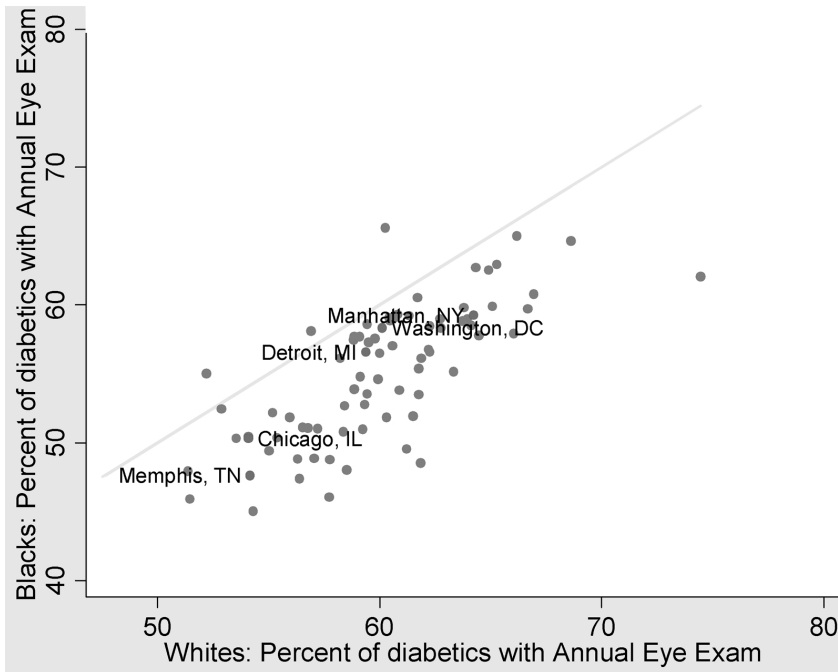
FIGURE 4

*Black-white differences in eye exams for diabetes in cities with the largest black populations. Notes: Vertical line indicates the disparity for the typical black beneficiary in the United States. Cities are ranked by the magnitude of racial disparity. The analysis adjusts for age and sex.*

St. Louis, Atlanta, and Jackson, Mississippi, have disparities that exceed the average national disparity. Thus, even within cities with a sizeable black community, there are large differences in the degree of disparity between white and black treatment: Birmingham and Jackson have large African American populations and share a history of institutionalized segregation, yet the two areas have remarkable different levels of disparities for the procedure that we have studied.

What is it about some cities that causes them to provide high-quality care to African Americans? Standard explanations that rely on a legacy of discrimination are not borne out by the data, since places such as Raleigh and Birmingham show almost no racial disparities. For some surgical treatments, the differences may arise from one or two surgeons accounting for the majority of procedures in their region. In other cases, the differences in racial disparities may arise from spatial “mismatches” of patients and physicians, for example, because of segregation in residential areas, the location of hospital services, or the efficiency of the public transportation system. Skinner and colleagues (2003) found that Detroit had one of the largest disparities in knee replacement surgery for both men and women, which contrasts with its more positive ranking for eye examinations.

What fraction of the overall difference in the health care that blacks and whites receive can be attributed to different care within a region, and what fraction is attributable to the fact that blacks and whites often live in different regions? We can decompose the disparities into a within-area component and



**FIGURE 5**

*Black-white differences in eye exams for diabetes in cities with the largest black populations. Data from Figure 4 is incorporated.*

between-area component graphically, by plotting the white rate along one axis and the black rate along another, as in Figure 5. Each point represents the one of the 80 largest HRRs in terms of African American population. These 80 HRRs account for over 80% of the African American population; the HRRs in the Figure 5 include those in Figure 4 and additional ones. The five HRRs with the largest African American populations are Chicago, Detroit, Memphis, New York, and Washington, D.C. In HRRs close to the 45-degree line, such as Detroit or Washington, D.C., black diabetics receive annual eye exams at rates equal to whites. In HRRs below the line, such as Chicago, black diabetics receive annual eye exams at a lower rate than whites.

The fact that most of the points are below the line shows that, on average, blacks receive eye exams at a lower rate within a local region. If all of the difference in the treatment that blacks and whites receive is driven by different residential patterns, and none by differential treatment within a hospital referral region, then each HRR would be located along the 45-degree line shown on the graph. We can decompose the national difference in the rate at which black and white diabetics receive eye exams into the portion attributable to differences within regions and the portion attributable to different residential patterns. For this procedure, more than 56% of the racial disparity is attributable to blacks and

whites living in different hospital markets. Conversely, 44% of the observed disparity in eye exams for diabetics is the consequence of blacks and whites being treated differently within hospital referral regions. Figure 5 also illustrates an interesting point regarding the preoccupation with studying disparities as opposed to noting differences in the levels of care received by race: in HRRs such as Chicago and Memphis, the white rate is substantially below the black rate in HRRs such as New York. Therefore, whites in Chicago and Memphis would also benefit from quality improvements that raise the level of care for all diabetics in these HRRs.

As long as African Americans continue to live in regions with disproportionately low rates of treatment, policies that simply aim to equalize rates within hospitals will still result in national disparities in care. Furthermore, such policies do nothing to improve the quality of care received by non-black Medicare beneficiaries who also reside in areas with low rates of effective care. While it is not our view that the welfare of these (non-black) individuals exceeds that of black beneficiaries, it is a mathematical fact that there are more non-black beneficiaries than black beneficiaries. As such, policies that target the geographic schism in health care, as opposed to a narrow focus on racial disparities, will positively affect a greater number of Americans.

### **POLICY IMPLICATIONS**

This analysis highlights two important points with significant implications for health policy. First, geographic variations in health care are responsible for a substantial component of the observed racial disparity in care, since blacks live disproportionately in parts of the country that have low-quality hospitals and providers. Second, there is wide variation in racial disparities: some areas have substantial disparities, while others have equal treatment. Furthermore, there is no consistent pattern of disparities—some areas may have a wide disparity in one treatment but no disparity in another. These facts mean that studies of individual conditions or areas are at best uninformative and at worst misleading for national policy makers.

There are many barriers to providing high-quality health care to minority populations, particularly in the presence of distrust and poor information surrounding health care procedures (Ibrahim et al. 2002). In this paper, we have argued that even aggressive behavior on the part of regional health providers to improve the quality of information and access to care at the local level cannot eliminate entirely overall racial or ethnic disparities. The problem of differences in quality of care across regions should still remain a target of policy makers, as reducing such disparities would play a major role in improving the health care received by all Americans in general and by minority Americans in particular.

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