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FOR HEALTH POLICY & CLINICAL PRACTICE
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A Report of the Dartmouth Atlas Project

Regional and Racial Variation in Primary Care and the Quality of Care among Medicare Beneficiaries

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Summary

With the passage of the 2010 Patient Protection and Affordable Care Act, the nation has a remarkable opportunity to widen access to health care while also improving quality and affordability. Several provisions in the legislation are aimed at improving primary care, which is considered a crucial step towards creating a high-functioning, effective health care delivery system. But simply increasing *access* to primary care may not be enough to realize improvements in the *quality* of care or in health outcomes. As this Dartmouth Atlas report shows, neither a greater supply of primary care physicians in an area nor a regular visit to a primary care clinician is, by itself, a guarantee that a patient will get recommended care or experience better outcomes. This report also shows that increasing access to primary care may not be enough to overcome racial disparities in quality and outcomes. Achieving the benefits of primary care is likely to require both improving the services provided by primary care clinicians and more effective integration and coordination with other providers.

The major findings are as follows.

Access to high-quality medical care, and primary care in particular, is known to be a key factor in preventive care and chronic disease management, such as reducing complications from diabetes. Health care reform proposals, such as the "patient-centered medical home," are intended to ensure that patients suffering from chronic illness receive care that is consistent over time and is coordinated with other medical services. We found that patients' access to and use of primary care, and their likelihood of hospitalization, varied markedly in different locations.[i] Although blacks were as little as half as likely to see a primary care clinician and up to 84% more likely to be hospitalized than whites within areas, these racial disparities were less pronounced than the differences across locations.

A commonly cited reason for the wide variation in access to primary care is a shortage of clinicians (particularly physicians). This may contribute to the problem in some locations, but the findings in this Atlas suggest that there is no simple relationship between the supply of physicians and access to primary care. In some regions, the overall supply of primary care physicians was low, yet a relatively high proportion of beneficiaries had at least one annual visit, while in other regions with a higher supply of primary care physicians, fewer beneficiaries had a primary care visit. One aspect of physician supply did make a difference; beneficiaries living in regions that had more family physicians were more likely to have at least one annual primary care visit.

[i] Dartmouth Atlas data are presented at two geographic levels. The first is hospital referral regions (HRRs), which are large regionalized health care markets, defined by patients' travel for tertiary care. The second is hospital service areas (HSAs), a geographic level that corresponds to local systems of health care. HSAs can encompass a small city served by two or three hospitals, or a single community served by a single hospital. Information about the quality of care in HSAs and HRRs offers providers important insights into the steps that are needed to improve both the quality of care and health outcomes.

As we have reported previously, blacks had much higher rates of leg amputation, a grave consequence of poorly controlled diabetes and peripheral vascular disease. Amputation rates were 4.7 times greater in blacks than in whites nationally during the study period from 2003 to 2007. Among U.S. hospital referral regions (HRRs), rates of amputation for all Medicare beneficiaries differed by a factor of 10, an extraordinary degree. In a closer look at the 44 hospital service areas (HSAs) within a single HRR, Atlanta, Georgia, there was almost a fourfold variation in leg amputation rates. Addressing these disparities in health outcomes will require attention to the full spectrum of health determinants, ranging from lower levels of schooling and limited health literacy, to inadequate housing and lack of transportation, as well as lack of access to high-quality primary care that is well-coordinated with specialty care.

For evidence-based, recommended services, such as appropriate testing for diabetes and mammography, variations across the nation's HRRs were substantially greater than the disparities by race within a given region. We found similar results across the smaller HSAs, and we demonstrate this with data from the HSAs within the Atlanta, Georgia HRR. In other words, where patients live has a greater influence on the care they receive than the color of their skin. Indeed, in a few locations, blacks received equal or better care than did whites, but care for all patients was less than ideal. The data in this report highlight opportunities to improve the quality of ambulatory care for all patients regardless of race, as well as the need to improve the care of minority populations.

Introduction

The United States spends more per capita on health care than any other nation in the world, yet patients routinely fail to receive treatments of proven benefit. Too often, care in hospitals, nursing homes and physicians' offices is uncoordinated, unreliable and unsafe. Too many decisions are made without adequate participation by patients or their family caregivers. While these burdens fall heavily on racial minorities and low-income populations, race and socioeconomic status are not the only factors influencing the health care that patients receive. In the U.S. health care system, it's not only who you are that matters; it's also where you get your care. Regardless of race and income, patients receive care of widely varying quality depending upon where they live and the health system that provides their care.

This Dartmouth Atlas Project report updates and extends previous reports on geographic variation in health care quality and health outcomes, this time with a focus on access to and use of primary care. Primary care—the services delivered by family practice physicians, general internists and pediatricians—forms the foundation of well-functioning, high-performing health care delivery systems.[1] In the U.S., access to primary care varies widely across Dartmouth Atlas HRRs and HSAs, as does the quality of care and health outcomes. We present information on several indicators of quality and patient outcomes with an eye towards the role that primary care plays in each.

Improving the care delivered by primary care clinicians holds great promise for better patient health and well-being, but the value of primary care can be eroded by episodic delivery that is uncoordinated with specialists and hospitals. Thus, simply increasing *access* to primary care, either by boosting the number of primary care physicians in an area or by ensuring that most patients have better insurance coverage, may not be enough to improve the *quality* of care or health outcomes; nor is it likely to eliminate racial disparities. Primary care is most effective when it is embedded in a high-functioning *system*, where care is coordinated, where physicians communicate with one another about their patients, and where feedback is available about performance that allows physicians and local hospitals to continually improve. Some systems rely more on acute, inpatient care for the chronically ill, while others emphasize ambulatory care, particularly primary care. This report highlights the importance of understanding health care within a local context and underscores the need to address the underlying causes of racial and quality disparities both within and across regions. It is intended to help local providers, planners, and patients understand some of the challenges of translating primary care access into better outcomes, and to encourage delivery systems to consider the many factors that can contribute to improving health care.

While all providers should strive to improve care and outcomes, the greatest improvements can be realized in health markets where quality and outcomes are relatively poor. The path to improvement will vary by market, because the problems plaguing even the lowest-performing systems are not identical, and the solutions necessary to improve care may not be the same. Each HRR and HSA has unique population and delivery system characteristics, which are reflected in the patterns of care and outcomes seen in this Dartmouth Atlas report.

A Word about Methods

The methods used in this report were developed over a number of years and have been described in detail in peer-reviewed publications and in previous editions of the Dartmouth Atlas. The data are drawn from the enrollment and claims data of the Medicare program and are restricted to the fee-for-service population over age 65; HMO patients are not included in our analysis. A brief overview of the approach and measures is provided here. (For more detailed descriptions of the approach see either the Appendix on Methods, downloadable at www.dartmouthatlas.org/publications/reports.aspx, or Baicker 2004[2].) The analysis entails four basic steps.

Defining geographic areas to compare. The first step requires defining the relevant geographic areas under study. In this report we present data for two different geographic units: (1) Dartmouth Atlas hospital service areas (HSAs) (N = 3,436), which are natural markets for health care defined on the basis of travel for common causes of hospitalization; and (2) Dartmouth Atlas hospital referral regions (HRRs) (N = 306), which are larger natural markets reflecting travel for tertiary care that include one or more HSAs and at least one major referral hospital. Data are also available on our web site (www.dartmouthatlas.org) for states and counties.

Defining the population under study. Each of the analyses presented in this report focuses on either the entire fee-for-service Medicare population between the ages of 65 and 99 and eligible for both Part A and B, or a subset of that population at risk for a specific procedure or service. For example, the analysis of amputation rates examines the entire Medicare population, while the analyses of testing among diabetics are restricted to Medicare beneficiaries between the ages of 65 and 75 with a diagnosis of diabetes. The study population can be thought of as the denominator of the measure.

Defining the event. The analysis relies upon claims submitted by providers (hospitals, physicians and outpatient facilities in this case) for specific services delivered to the population eligible for the specific measure. For example, the analysis of amputations entailed identifying all hospital discharges of fee-for-service Medicare beneficiaries where an amputation of the leg was recorded. The event can be thought of as the numerator of the measure.

Calculating rates. Each of the measures is either a proportion (e.g. the proportion of diabetics receiving hemoglobin A1c testing) or a rate (e.g. the number of amputations experienced by Medicare beneficiaries divided by the total number of Medicare beneficiaries in the geographic area being studied). A rate is usually expressed as the number of events per 1,000 Medicare beneficiaries. In the latter case, beneficiaries can have more than one event. When appropriate, statistical adjustments are carried out to account for differences in age, race and sex.

A note on how race was defined. Although the analysis of treatment and outcomes across all racial and ethnic groups is an important goal, the designation of race/ethnicity in the Medicare data is currently limited. We compare blacks and non-blacks for several practical reasons. Separate analyses of the Hispanic population

are challenging because fewer than half of self-designated Hispanics are coded as such in the Medicare data, Hispanics constitute less than 6% of the elderly population (as counted by the U.S. Census), and they are highly clustered in a few communities, making it difficult to compare communities and regions. Although racial designation for Asians and American Indians is more accurate, their small numbers (less than 3%) also limit the precision of race-specific analyses. At the same time, excluding any of these populations from the regional comparisons in this report was judged to be undesirable. We therefore restricted the analyses in the current report to blacks and non-blacks, and, for ease of exposition, we refer to the non-black population as white. These challenges, and the future growth of the Hispanic population, underscore the importance of improving the coding of race and ethnicity.

A note on how annual visits to primary care clinicians were calculated. For a 20% sample of beneficiaries in each region, we identified office visits to general internists and family physicians. We also included office visits to nurse practitioners, although this may slightly over-count primary care. To calculate the rate (a proportion), the event (the numerator) was a beneficiary with at least one primary care clinician visit, and the population (the denominator) was the number of beneficiaries living in the region. These rates were calculated for each year and then averaged over the period 2003-2007.

A note on how full-time equivalent primary care physicians were calculated. Our measure of primary care physician clinical activity is reported as clinical full-time equivalents per 100,000 beneficiaries.[3] The numerator of this rate was derived in two steps. We first identified all of the claims by primary care physicians (family practice physicians and general internists) for services provided in an office-based ambulatory setting, by HSA and HRR. We then converted these to full-time equivalents by linking the claim billing codes (Healthcare Common Procedure Coding System (HCPCS) database) to work effort (work relative value units (RVUs)), and then dividing by the average number of work RVUs per primary care physician. National surveys provided the data on the average number of work RVUs per primary care physician by specialty.

Primary Care: Supply, Access, Quality and Outcomes

Primary care forms the bedrock of a well-functioning, effective health care system. Primary care clinicians, whether they are general internists, family practice physicians, pediatricians, physician's assistants or nurse practitioners, are trained to care for the whole patient. They can diagnose and treat a wide variety of illnesses, help patients avoid getting sick, and ensure that they get the specialty care they need. For chronically ill patients in particular, primary care clinicians serve a crucial role as coordinators of specialty care. They can also help patients control symptoms, slow the progression of their disease, and help manage acute and chronic conditions without resorting to hospitalization.[4]

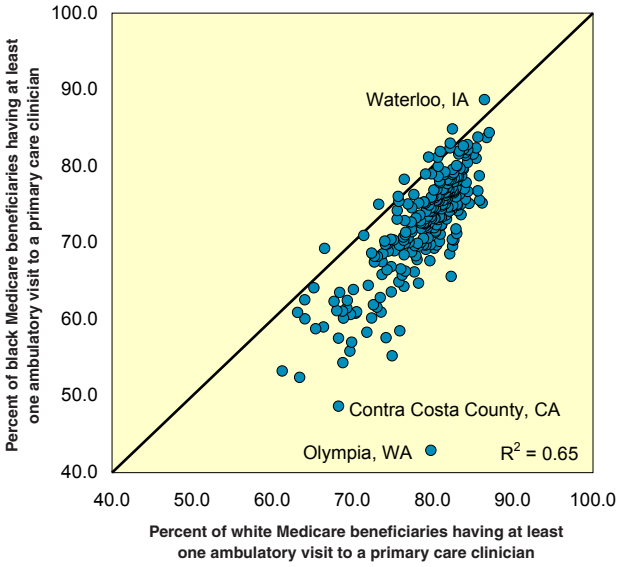


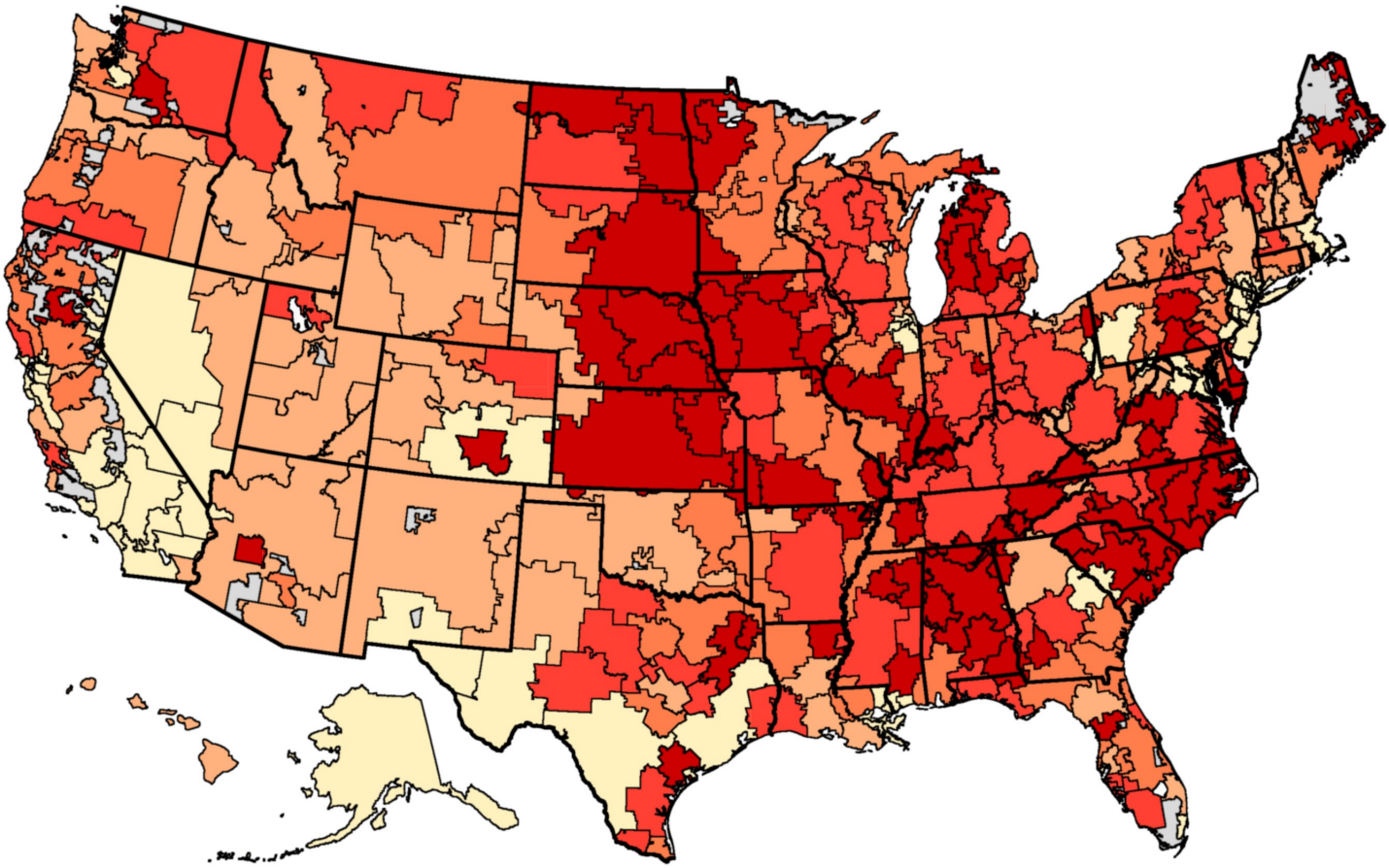
Figure 1. The relationship between the average annual percent of Medicare beneficiaries having at least one visit to a primary care clinician among blacks and whites (2003-07)

Each dot represents one of 255 regions with a sufficient black Medicare population to report race-specific rates. The percent of blacks and whites having an annual primary care visit was strongly related within HRRs (R^2 = 0.65). Dots below the diagonal line indicate that whites in the region were more likely to see a primary care clinician than blacks. In the majority of regions, blacks were less likely to have an annual primary care visit, and in Olympia, Washington, this disparity was dramatic. In a few regions, however, blacks were slightly more likely to have a visit than whites (dots above the line), including Waterloo, Iowa.

During the period 2003 to 2007, the average percent of beneficiaries who had a visit to a primary care clinician during a given year was 77.6%, but patients' chances of an annual primary care visit varied widely depending upon where they lived (Map 1). The rate of primary care visits ranged from about 60% of beneficiaries in the Bronx, New York HRR to nearly 90% in Florence, South Carolina—about a 50% difference between the highest and lowest regions.

The differences across HRRs for all beneficiaries were much larger than differences between races within regions. On average, blacks were less likely to see a primary care clinician than whites—70.4% had at least one annual visit in 2003-07 compared with 78.1% for whites—about 11% more than blacks. In general, in regions where a relatively smaller percentage of blacks had a primary care visit, a smaller percentage of whites also had a visit, and vice versa. Figure 1 shows the strong correlation between the percentage of blacks and whites in a region who had at least one annual primary care visit among the 255 regions with a sufficient number of black Medicare beneficiaries to allow the reporting of race-specific rates (R^2 = 0.65)[ii]. In a few regions, blacks were slightly more likely to have had a primary care visit than whites. In the Waterloo, Iowa HRR, for example, 88.7% of blacks had an annual primary care visit versus 86.5% of whites. By contrast, in the Olympia, Washington HRR, only 42.9% of blacks had an annual primary care visit versus 79.8% of whites, nearly twice as many. The disparity was also large in the Contra Costa County HRR in California, where 48.7% of blacks had an annual primary care visit compared to 68.3% of whites.

[ii] The R^2 value is an indication of the strength of the correlation between two variables. For example, if the R^2 association between the supply of primary care physicians and the percent of beneficiaries having a primary care visit is 0.15, that means that only 15% of the variation in the percent of beneficiaries who had at least one annual visit can be explained by the supply of primary care physicians. That is a relatively weak relationship. An R^2 of 0.50, on the other hand, would suggest that the supply of primary care physicians accounted for 50% of the variation in the proportion of beneficiaries who had at least one annual visit. That is a strong relationship.



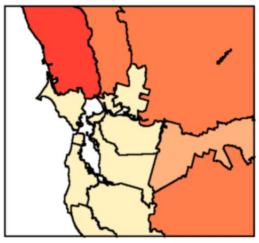
Average Annual Percent of Medicare Beneficiaries Who Had At Least One Visit to a Primary Care Clinician

by Hospital Referral Region (2003-07)

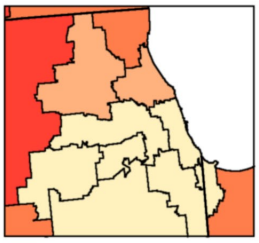
- 82% to 89% (71)
- 80% to < 82% (70)
- 78% to < 80% (63)
- 75% to < 78% (48)
- 60% to < 75% (54)
- Not populated

Map 1. Average annual percent of Medicare beneficiaries who had at least one visit to a primary care clinician among hospital referral regions (2003-07)

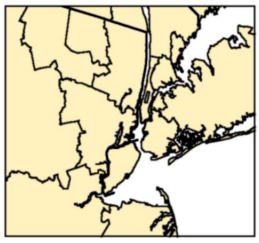
Rates are adjusted for age, sex and race using the indirect method, with the corresponding population as the standard. The standard population is the U.S. Medicare population age 65 to 99 with Medicare Parts A and B entitlement and no HMO enrollment during the measurement period.



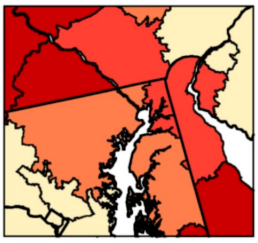
San Francisco



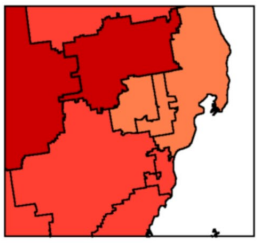
Chicago



New York



Washington-Baltimore



Detroit

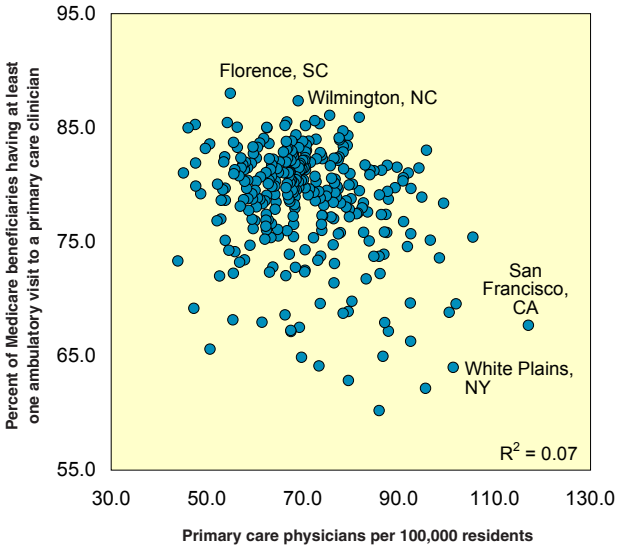


Figure 2. The relationship between the supply of primary care physicians per 100,000 residents (2006) and the percent of Medicare beneficiaries having at least one annual visit to a primary care clinician (2003-07)

Each dot represents one of 306 hospital referral regions. The relationship between the supply of primary care physicians and the percent of patients with an annual visit to a primary care clinician was negligible.

A commonly cited reason for the wide variation in access to primary care is a shortage of clinicians (particularly physicians). This may contribute to the problem in some rural and inner city areas, but the link between the supply of clinicians and access at a regional level is not as simple as one might expect. Figure 2 shows the relationship between the per capita supply of total primary care physicians (general internists, family physicians and general pediatricians) during 2006 and the percent of Medicare beneficiaries who had at least one annual visit with a primary care clinician during 2003-07 among HRRs. Surprisingly, this figure suggests that there is no relationship between the supply of physicians and access to primary care ($R^2 = 0.07$). In some HRRs, a relatively high proportion of beneficiaries had at least one visit, but the overall primary care physician supply was low. These included Florence, South Carolina, where 88% of patients had at least one annual primary care visit, but there were only 54.9 primary care physicians per 100,000 (compared to a national average rate of 71.9 per 100,000); and Wilmington, North Carolina, where there were 69.0 primary care physicians per 100,000 and 87.4% of patients had a primary care visit. Despite high physician supply in San Francisco (117.0 per 100,000) and White Plains, New York (101.4 per 100,000), less than 70% of the elderly saw a primary care clinician each year in those regions.

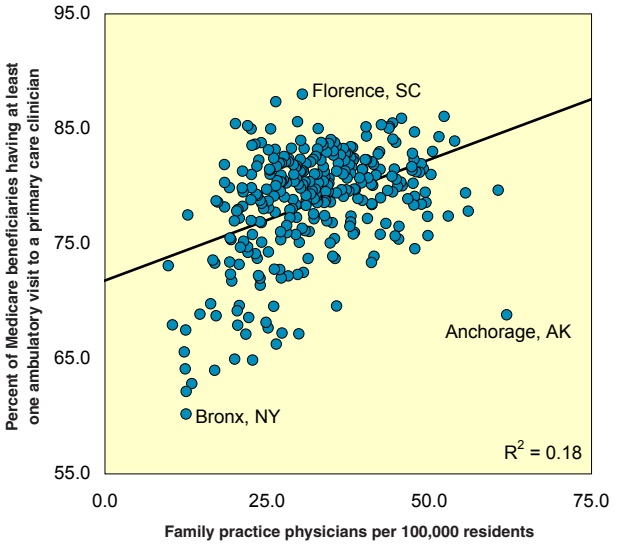


Figure 3. The relationship between the supply of family practice physicians per 100,000 residents (2006) and the percent of Medicare beneficiaries having at least one annual visit to a primary care clinician (2003-07)

Each dot represents one of 306 hospital referral regions. In regions with a higher supply of family physicians, beneficiaries were more likely to have at least one annual primary care visit. However, this relationship was not present in Anchorage, Alaska, where despite a high supply of family practice physicians, relatively few Medicare beneficiaries saw a primary care clinician. By contrast, despite a modest supply of family practice physicians in Florence, South Carolina, 88% of beneficiaries had a primary care visit. The Bronx, New York HRR had low rates of both family practice physician supply and primary care visits.

Breaking down the primary care physician supply reveals a different story. Although both general internists and family physicians are counted as primary care clinicians, in HRRs with a higher supply of family physicians, beneficiaries were more likely to have at least one annual primary care visit ($R^2 = 0.18$) (Figure 3). In HRRs with a higher supply of general internists, fewer beneficiaries had a primary care visit on average ($R^2 = 0.32$) (Figure 4). These associations, however, are not strong. Some regions had a high supply of family physicians but a relatively low percent of beneficiaries with at least one annual visit. And other regions had both a high supply of general internists and beneficiaries with annual visits.

There are several possible explanations. The presence of high numbers of physicians trained in primary care in a region does not mean that all of those physicians are working in a primary care setting or making themselves available to patients. Many physicians trained in primary care residencies actually work as hospitalists or as emergency room physicians. Other primary care physicians work part time, particularly older physicians and female doctors with young families. Finally, many primary care physicians provide mostly episodic acute care in outpatient settings. Thus, a simple head count of family physicians, general internists and pediatricians results in an overestimate of the true amount of time those trained as primary care physicians actually devote to ambulatory care that emphasizes prevention and is coordinated over time.

Having one primary care visit a year did not mean that Medicare beneficiaries received a lot more primary care overall. The amount of office-based primary care effort in regions was not correlated with the percent of beneficiaries having at least one primary care visit. Figure 5 shows the lack of relationship between clinical full-time equivalent (FTE) primary care physicians per 100,000 beneficiaries and the percent with at least one visit ($R^2 = 0.05$). In some HRRs, including Los Angeles, Miami and Manhattan, beneficiaries received a relatively high amount of office-based primary care, but this did not translate into a high proportion of Medicare beneficiaries seeing a primary care clinician. We cannot be certain of the cause of this lack of relationship, but it does suggest that the proportion seeing a primary care clinician once a year may not be a good indicator of the overall role that primary care plays within a region.

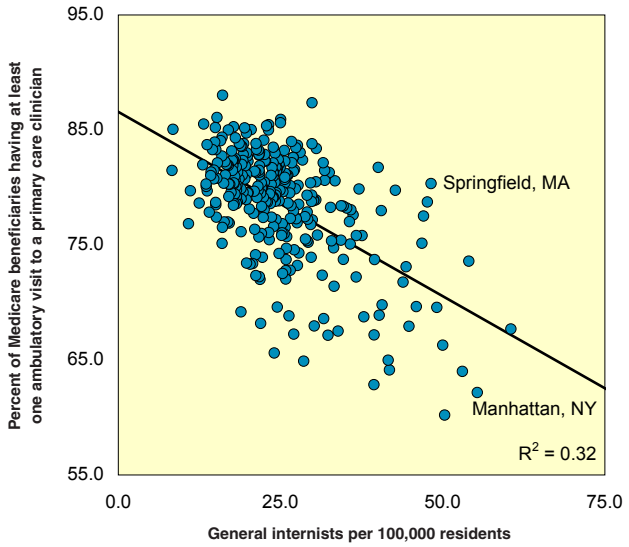


Figure 4. The relationship between the supply of general internists per 100,000 residents (2006) and the percent of Medicare beneficiaries having at least one annual visit to a primary care clinician (2003-07)

Each dot represents one of 306 hospital referral regions. In contrast to family practice physicians, in regions with a higher supply of general internists, fewer beneficiaries had a primary care visit. Springfield, Massachusetts had a relatively high supply of general internists, and 80% of Medicare beneficiaries, on average, had an annual primary care visit. In Manhattan, however, despite the high supply of general internists, only 62% of beneficiaries had an annual primary care visit.

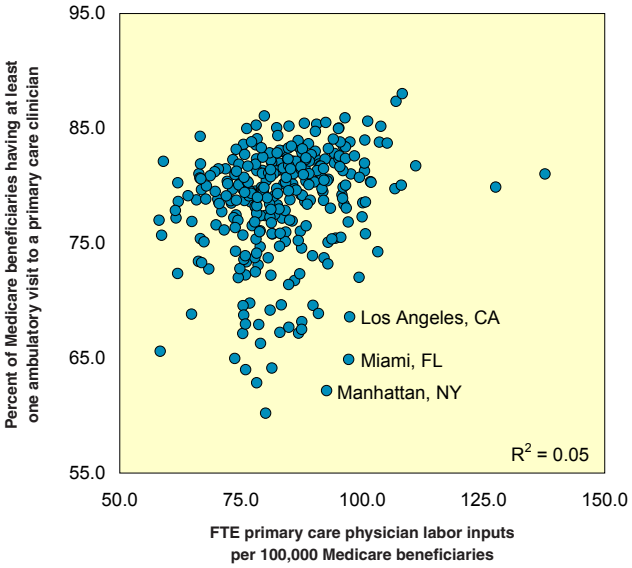


Figure 5. The relationship between full-time equivalent primary care physician labor inputs per 100,000 Medicare beneficiaries (2007) and the percent of Medicare beneficiaries having at least one annual visit to a primary care clinician (2003-07)

Each dot represents one of 306 hospital referral regions. There was virtually no relationship between the labor input of full-time equivalent primary care physicians and the rate of annual visits to a primary care clinician.

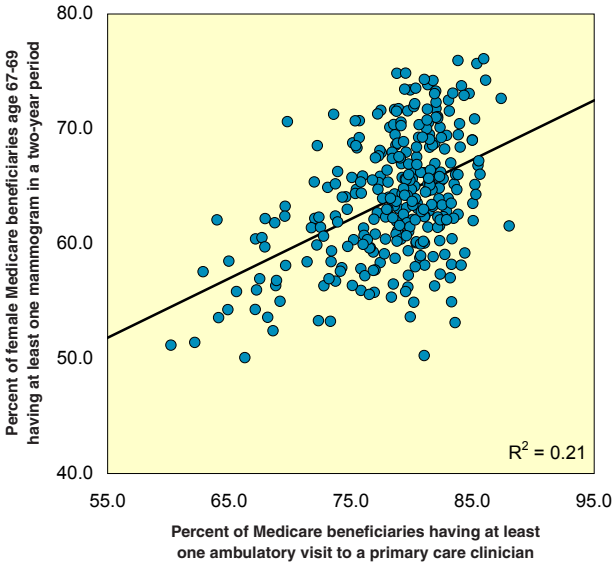


Figure 6. The relationship between the percent of Medicare beneficiaries having at least one annual visit to a primary care clinician and the percent of female beneficiaries age 67-69 having at least one mammogram over a two-year period (2003-07)

Each dot represents one of 306 hospital referral regions. There was a moderate relationship between having a primary care visit and getting a mammogram (R^2 = 0.21).

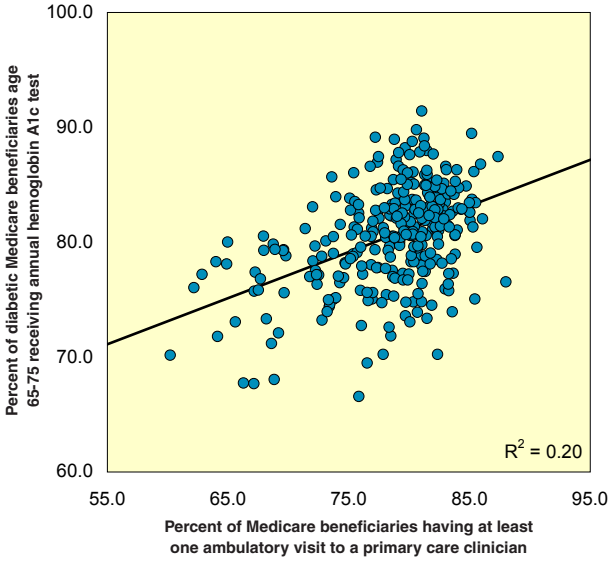


Figure 7. The relationship between the percent of Medicare beneficiaries having at least one annual visit to a primary care clinician and the percent of diabetic beneficiaries age 65-75 receiving an annual hemoglobin A1c test (2003-07)

Each dot represents a hospital referral region. There was a moderate relationship between having a primary care visit and receiving an annual hemoglobin A1c test (R^2 = 0.20).

Nevertheless, there is strong evidence that primary care physicians can play a crucial role in ensuring that patients get high-quality care.[1,4] An example can be seen in the modest relationship between the percent having at least one visit annually with a primary care clinician and the percent of female Medicare beneficiaries ages 67-69 who received a mammogram every two years (R^2 = 0.21) (Figure 6). Similarly, in regions where beneficiaries were more likely to see a primary care clinician, a higher percentage of diabetic Medicare beneficiaries received an annual hemoglobin A1c test to measure how well their blood sugar was controlled (R^2 = 0.20) (Figure 7). The hemoglobin A1c test is one of several widely accepted measures of the quality of care for diabetic patients.

However, despite the central role that primary care can play, access is not always enough to ensure that patients receive high-quality care. Figures 8 and 9 show the relationship between the percent having an annual visit with a primary care clinician and the percent of diabetic Medicare beneficiaries who had two other tests considered to be measures of the quality of diabetic care: an annual eye exam to look for evidence of diabetic retinopathy (R^2 = 0.05); and a blood lipids test to measure cholesterol and triglyceride levels in the bloodstream (R^2 = 0.00). Access to a primary care clinician (as measured by having at least one annual visit) by itself is no guarantee that diabetic patients will receive two of the tests they need; nor is the overall amount of office-based primary care delivered in a region, as measured by the number of clinical FTEs per beneficiary (not shown). In other words, having more office-based primary care visits in a region did not automatically translate into higher quality care as reflected in the use of these two diagnostic tests.

Access to primary care also does not appear to guarantee better outcomes. For example, leg amputation is a serious complication of diabetes and peripheral vascular disease. A broad array of factors go into a patient's risk of amputation, including obesity, smoking, poverty, and poor control of blood sugar, and preventing amputation requires diligent attention from both the patient and clinician. One might assume that, at a regional level, access to a primary care clinician would be a predictor of the risk of amputation. Yet Figure 10 shows that improving this outcome of peripheral vascular disease is much more complicated than simply ensuring access to primary care; there is no relationship between having at least one annual visit with a primary care clinician and the rate of leg amputation (R^2 = 0.03).

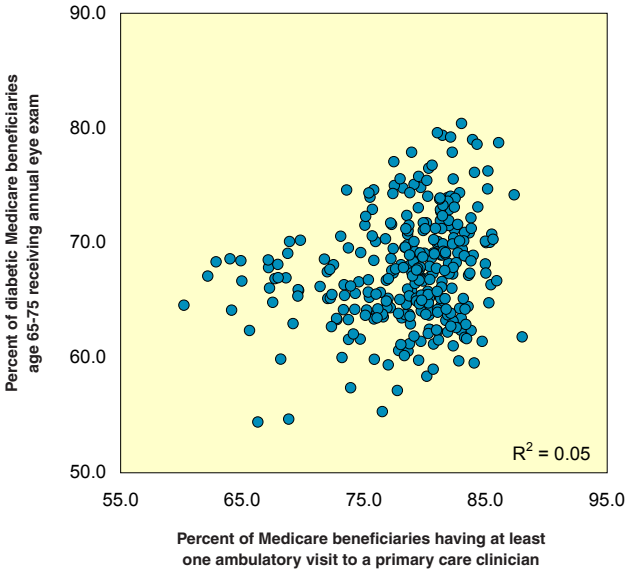


Figure 8. The relationship between the percent of Medicare beneficiaries having at least one annual visit to a primary care clinician and the percent of diabetic beneficiaries age 65-75 receiving an annual eye exam (2003-07)

Each dot represents a hospital referral region. There was no relationship between having a primary care visit and receiving an annual eye exam.

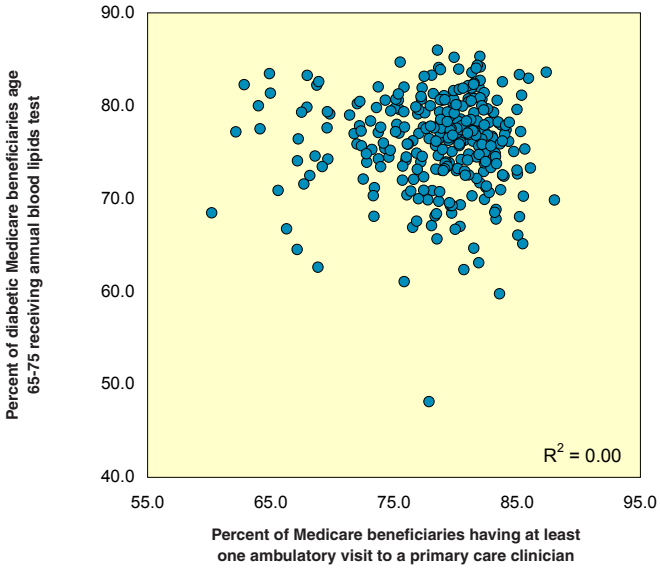


Figure 9. The relationship between the percent of Medicare beneficiaries having at least one annual visit to a primary care clinician and the percent of diabetic beneficiaries age 65-75 receiving annual blood lipids test (2003-07)

Each dot represents a hospital referral region. There was no relationship between having a primary care visit and receiving an annual blood lipids test.

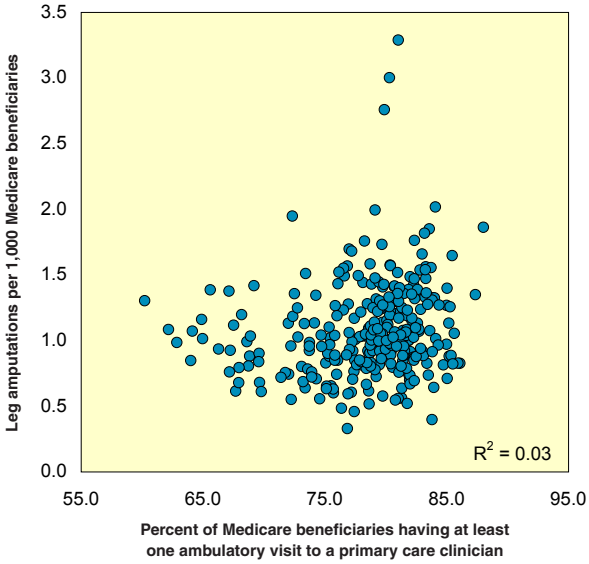


Figure 10. The relationship between the percent of Medicare beneficiaries having at least one annual visit to a primary care clinician and the rate of leg amputation per 1,000 Medicare beneficiaries (2003-07)

Each dot represents one of 306 hospital referral regions. There was no relationship between access to primary care and the rate of leg amputation (R^2 = 0.03).

Another important outcome is hospitalization. Many hospitalizations are for medical conditions, such as poorly controlled diabetes and congestive heart failure, which can be treated either in the inpatient or the outpatient setting. Studies have shown that primary or other ambulatory (outpatient) care that does a good job of managing the chronic disease can prevent hospitalizations.[5-7] Researchers have identified a group of diagnoses, known as "ambulatory care-sensitive conditions," that fall into this category. However, Figure 11 shows that having an annual primary care visit did not keep patients out of the hospital for ambulatory care-sensitive conditions (R^2 = 0.00). We also did not find that regions with higher amounts of primary care, as measured by clinical FTEs per beneficiary, generally had better outcomes (not shown).

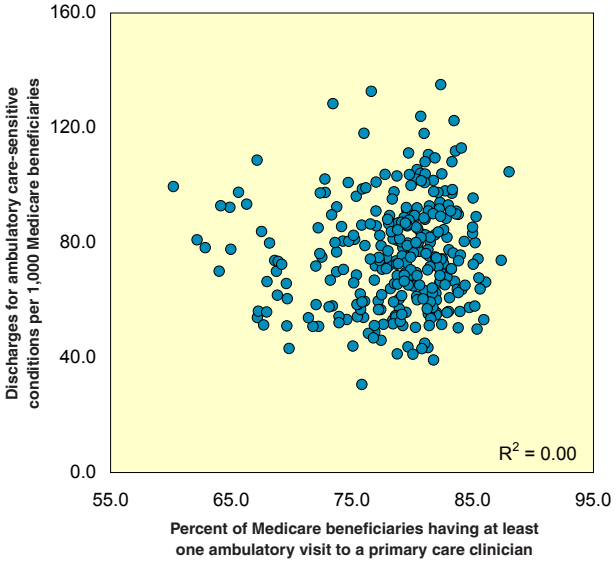


Figure 11. The relationship between the percent of Medicare beneficiaries having at least one annual visit to a primary care clinician and discharge rates for ambulatory care-sensitive conditions per 1,000 Medicare beneficiaries (2003-07)

Each dot represents one of 306 hospital referral regions. There was no relationship between primary care visits and discharges for ambulatory care-sensitive conditions (R^2 = 0.00).

One possible explanation is that primary care visits may be very helpful in improving outcomes, but the patients most in need of this care are not receiving it. Another possible explanation is that primary care is most effective when it is embedded within a health care system that allows the coordination of primary care services with those delivered by specialists and hospitals.[8-11] Unfortunately, most health care providers in the U.S., including primary care physicians, are not organized to do this; many physicians work in small practices, where there is little coordination of care, and communication among a chronically ill patient's various physicians is often poor to non-existent. Large delivery systems can also fall short in these areas. The quality of the care provided by primary care physicians also varies widely. As a result, patients in regions of the country where they are more likely to have had a primary care visit are not necessarily receiving higher quality care—or enjoying better outcomes.

Finally, a stronger relationship between primary care and outcomes may be revealed with studies at a local level, such as communities or practices. This report uses a regional level of analysis, in keeping with the geographic scale of most physician workforce policy in the U.S.—largely directed toward national and regional supply of clinicians, with relatively little attention to local supply.

The Quality of Care

In this section, we examine each quality measure and report the variation across hospital referral regions for all Medicare beneficiaries and by race.

Diabetes

Diabetes is a chronic disease that affects almost 23 million Americans. Between 5 and 10% of patients with the disease have type 1 diabetes, which is caused by the destruction of the insulin producing cells in the pancreas. Type 2 diabetes is far more common, especially in the Medicare population, and is associated with older age, physical inactivity and excess weight. Patients with type 2 diabetes still produce insulin, but their cells cannot use the insulin effectively. In both types of diabetes, blood sugar levels rise and, without treatment, serious complications can occur, including blindness, stroke, heart attack, kidney failure and nerve damage. Diabetes is a significant cause of hospitalization and is the sixth leading cause of death in the United States.

Clinical trials have shown that proper management of diabetes can reduce the risk of complications. To improve the care of patients with diabetes, the American Diabetes Association has recommended an initial set of quality measures for diabetic care. These include three measures of whether a diabetic patient has received specific diagnostic tests: a hemoglobin A1c test to measure blood sugar control; a retinal exam to test for nerve or blood vessel damage; and blood lipids testing to measure cholesterol and triglyceride levels.

While the average rate of hemoglobin A1c testing in the United States increased almost 5% from 2003 to 2007, rates still varied by a factor of 1.4 across hospital referral regions (Map 2). During the period 2003-07, the rate of hemoglobin A1c testing in the Medicare population age 65-75 with diabetes ranged from a low of 66.6% percent of patients in the Albuquerque, New Mexico HRR to a high of 91.4% in Dubuque, Iowa. The national average was 80.3%. There was a modest relationship between rates of hemoglobin A1c testing in diabetic patients and the overall likelihood that beneficiaries saw a primary care physician at least once a year (R^2 = 0.20) (Figure 7). There was no relationship between rates of hemoglobin A1c testing and the amount of primary care delivered (clinical FTE labor inputs) in the year 2007 (R^2 = 0.00) (not shown).

During 2003-07, among Medicare beneficiaries with diabetes, blacks were 6% less likely to receive an annual hemoglobin A1c test than whites, but the differences between blacks and whites varied from place to place; and the difference in screening rates across hospital referral regions was greater than the racial disparities within regions (Figure 12). In about 10% of HRRs, black diabetics were more likely to receive annual hemoglobin A1c testing than whites. In Columbia, Missouri, for example, black diabetic patients were 9% more likely to receive testing than whites (88.5% for blacks versus 80.9% for whites). In Chicago, white diabetics were 18% more likely to receive testing than blacks (61.9% for blacks versus 73.3% for whites), but rates for all diabetic Medicare beneficiaries in this region were 16% below the national average.

The other two measures of the quality of diabetic care exhibited similar patterns. The national average rate of annual eye testing increased about 1% between 2003 and 2007, while the rate of blood lipids testing showed the largest increase of the three rates—about 10%. Among HRRs, rates of blood lipids testing also had the largest degree of variation; rates varied by a factor of about 1.8, from 48.1% of diabetic Medicare beneficiaries age 65-75 in Casper, Wyoming, to 86.0% in Clearwater, Florida. Meanwhile, rates of eye examination varied by a factor of 1.5, from 54.4% in Chicago to 80.4% in Bangor, Maine. The national average rate of eye examination for Medicare diabetics age 65-75 was 67.1%; the national average rate of blood lipids testing was 76.5%.

Among hospital referral regions, there was no relationship between these two measures of diabetic care quality and the overall likelihood that patients saw a primary care clinician at least once a year (Figures 8 and 9) or the amount of primary care delivered in the region (clinical FTEs) (R^2 = 0.00 for eye examination: R^2 = 0.06 for blood lipids testing). Whites were much more likely than blacks to receive appropriate testing, but the relationship between testing rates within regions for blacks and whites was evident for both measures (R^2 = 0.35 for eye examination: R^2 = 0.53 for blood lipids testing). Rates for these measures are available from our web site.

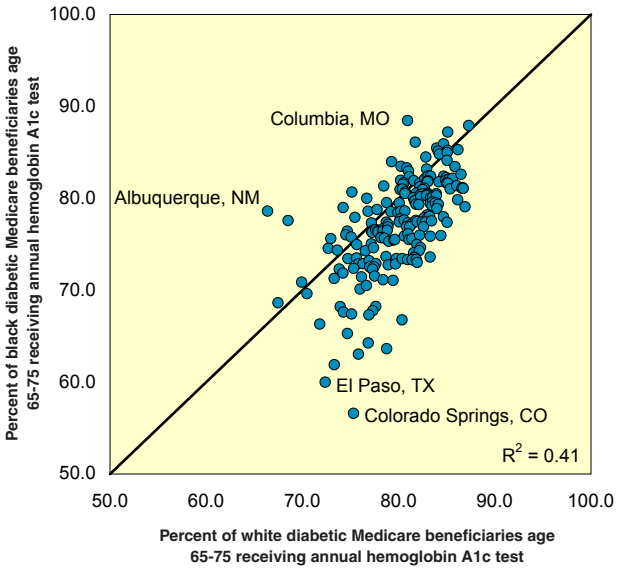


Figure 12. The relationship between rates of hemoglobin A1c testing among black and white diabetic Medicare beneficiaries age 65-75 (2003-07)

The figure shows the proportion of diabetics age 65-75 receiving hemoglobin A1c testing for black and white Medicare beneficiaries. Each dot represents one of 199 HRRs with a sufficient number of diabetic black beneficiaries to report race-specific rates. There was a strong relationship (R^2 = 0.41) between the percent of black diabetics who received the test and the percent of whites, although blacks were generally less likely to receive the test. In other words, in regions where a high percentage of white diabetics got tested, a higher percentage of blacks also got tested. Dots above the diagonal line indicate regions where blacks were more likely to get tested than whites, including Columbia, Missouri and Albuquerque, New Mexico. In some regions, however, including Colorado Springs, Colorado and El Paso, Texas, rates for blacks were far lower than for whites. Rates for all HRRs with sufficient sample sizes to report are available from our web site.

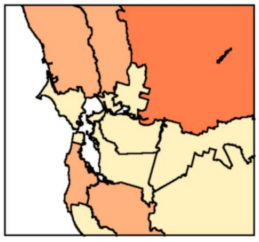
Average Annual Percent of Diabetic Medicare Beneficiaries Age 65-75 Receiving Hemoglobin A1c Testing

by Hospital Referral Region (2003-07)

- 84% to 92% (63)
- 82% to < 84% (66)
- 80% to < 82% (54)
- 77% to < 80% (64)
- 66% to < 77% (59)
- Not populated

Map 2. Average annual percent of diabetic Medicare beneficiaries age 65-75 receiving hemoglobin A1c testing among hospital referral regions (2003-07)

Measures of the quality of diabetic care for Medicare beneficiaries age 65-75 are not adjusted. Because every diabetic patient in this cohort should receive these tests, regardless of age, sex or race, statistical adjustments to correct for underlying population differences are not relevant.



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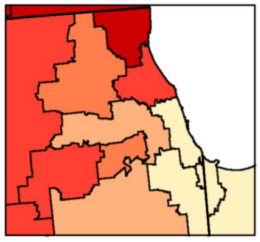
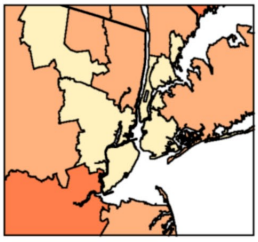


Chicago



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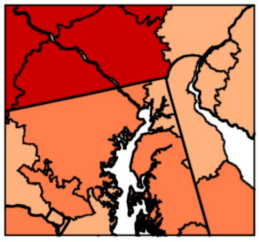
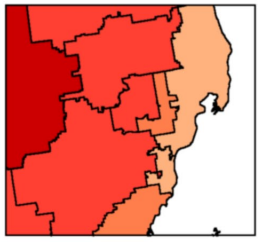


Washington-Baltimore



Detroit

Screening for Breast Cancer

Routine mammograms can reduce a woman's risk of dying from breast cancer. The U.S. Preventive Services Task Force recommends that women age 50-74 get a mammogram once every two years. We measured the percent of female Medicare beneficiaries age 67-69[iii] who had at least one mammogram over a two-year period during 2003-07. The average proportion of Medicare women who underwent mammography at least once every two years remained mostly unchanged during the period 2003-07, increasing less than 1%. Overall, 63.2% of female beneficiaries age 67 to 69 had mammograms at least once during a two-year period in the United States. Among HRRs, rates varied by a factor of about 1.5, from 50.1% in Chicago to 76.1% in Traverse City, Michigan (Map 3). There was a modest relationship between the percent receiving recommended mammograms and the percent of beneficiaries seeing a primary care physician at least once a year (R^2 = 0.21) (Figure 6). There was no relationship between rates of breast cancer screening and the amount of primary care delivered (clinical FTE labor inputs) in the year 2007 (R^2 = 0.00) (not shown).

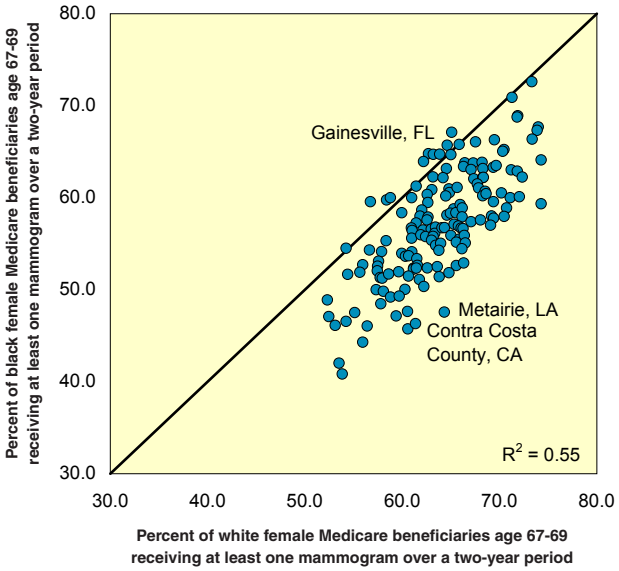
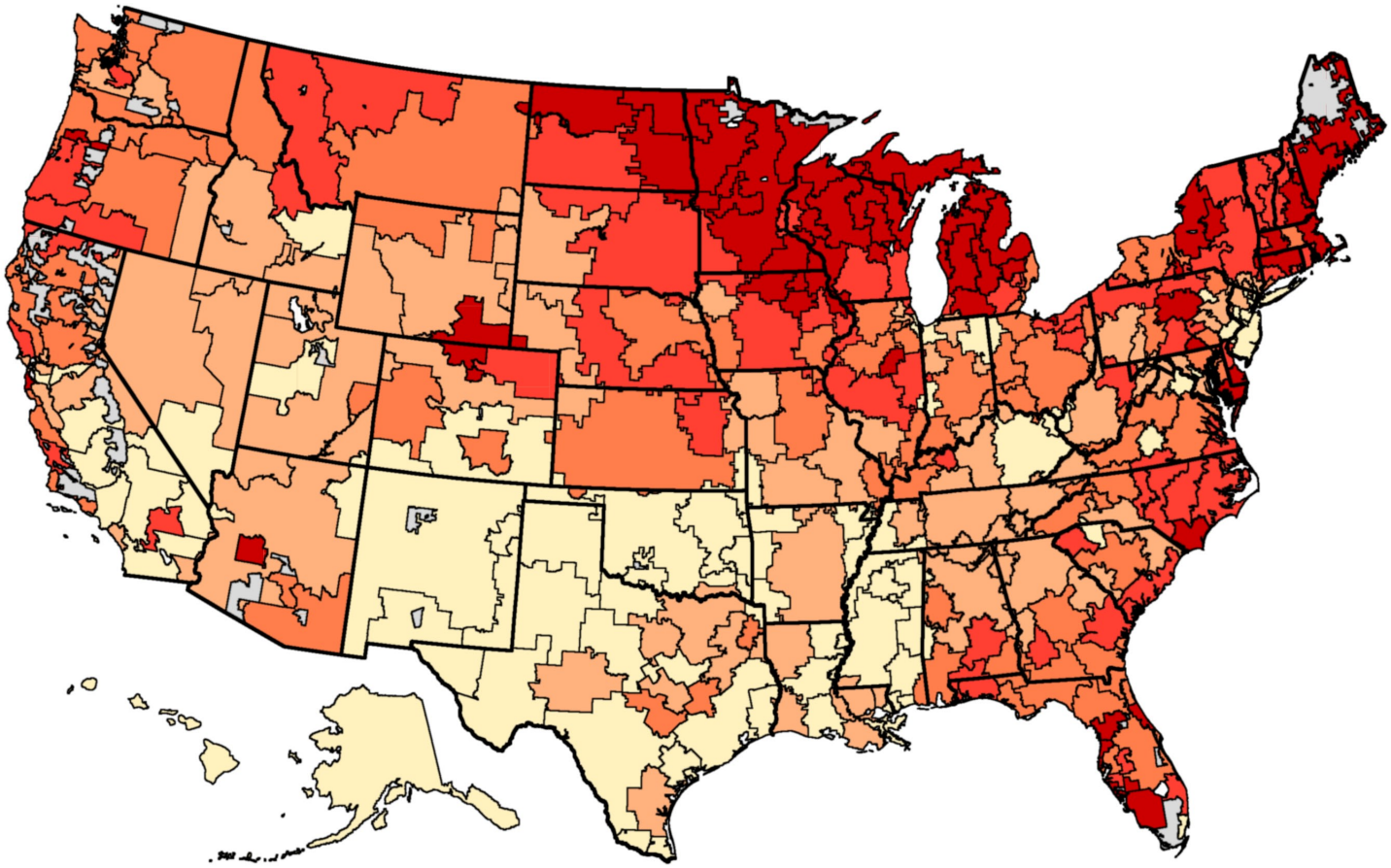


Figure 13. The relationship between the percent having at least one mammogram over a two-year period among black and white female Medicare beneficiaries age 67-69 (2003-07)

The figure shows the proportion of women age 67-69 receiving mammograms for black and white Medicare beneficiaries. Each dot represents one of 157 hospital referral regions with a sufficient number of black women to report race-specific rates. There was a strong relationship (R^2 = 0.55) between the percent of black women who received the test and the percent of whites, although blacks were generally less likely to receive the test. In other words, in regions where a high percentage of white women got tested, a higher percentage of black women also got tested. Dots above the diagonal line indicate HRRs where blacks were more likely to get a mammogram than whites, including Gainesville, Florida and Lexington, Kentucky. In some HRRs, however, including Contra Costa County, California and Metairie, Louisiana, rates for blacks were far lower than for whites. Rates for all HRRs with sufficient sample sizes to report are available from our web site.

During 2003-07, among female Medicare beneficiaries age 67-69, blacks were 13% less likely to receive at least one mammogram in a two-year period than whites, but the differences between blacks and whites varied from place to place; and the difference in screening rates across hospital referral regions was greater than the racial disparities within regions (Figure 13). In ten regions, black female beneficiaries were more likely to receive at least one mammogram over a two-year period than whites. In Gainesville, Florida, for example, black female beneficiaries were slightly more likely (3%) to receive a mammogram than whites (67.1% for blacks versus 65.1% for whites). In the Contra Costa County, California HRR, white female beneficiaries were 33% more likely to receive testing than blacks (46.3% for blacks versus 61.4% for whites), but rates for all female Medicare beneficiaries in this region were 4% below the national average.

[iii] To maintain continuity with previously released measures based on prior recommendations, we report rates for female Medicare enrollees age 67-69.



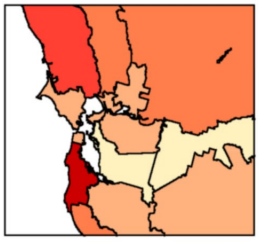
Average Percent of Female Medicare Beneficiaries Age 67-69 Having At Least One Mammogram in a Two-Year Period

by Hospital Referral Region (2003-07)

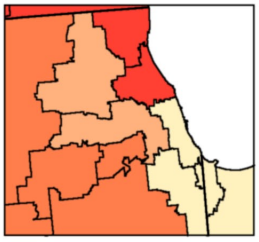
- 70% to 77% (50)
- 66% to < 70% (56)
- 63% to < 66% (69)
- 60% to < 63% (61)
- 50% to < 60% (70)
- Not populated

Map 3. Average annual percent of female Medicare beneficiaries age 67-69 receiving at least one mammogram during a two-year period among hospital referral regions (2003-07)

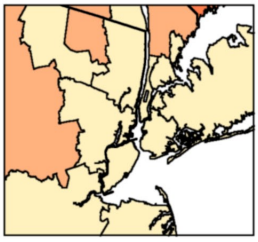
Mammography rates for female Medicare beneficiaries age 67-69 are not adjusted. Because the measure is already restricted by age and sex, and women of all races should receive the test, statistical adjustments to correct for underlying population differences are not relevant.



San Francisco



Chicago



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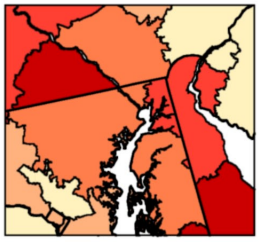
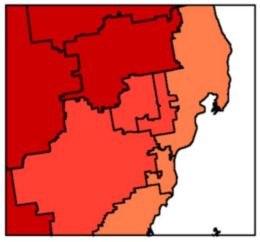


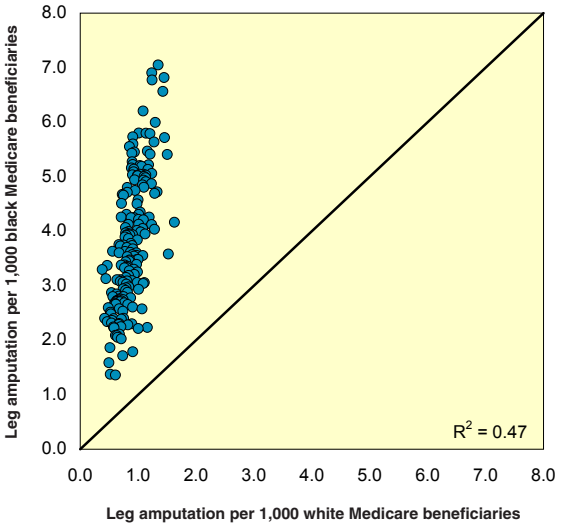
Washington-Baltimore



Detroit

Outcomes

In this section, we examine two outcome measures and report the variation across hospital referral regions for all Medicare beneficiaries and by race.



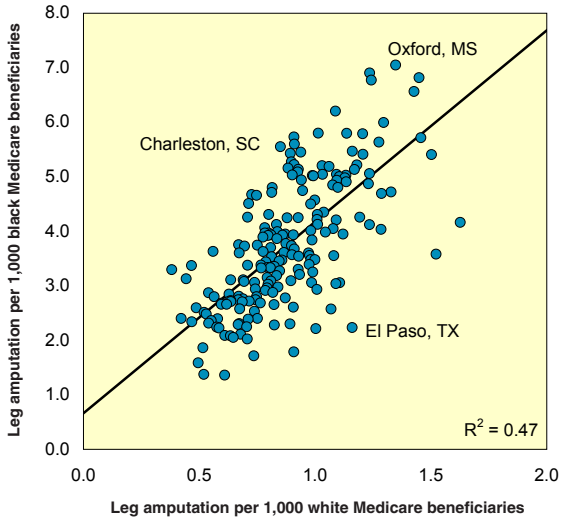


Figure 14. The relationship between rates of leg amputation among black and white Medicare beneficiaries (2003-07)

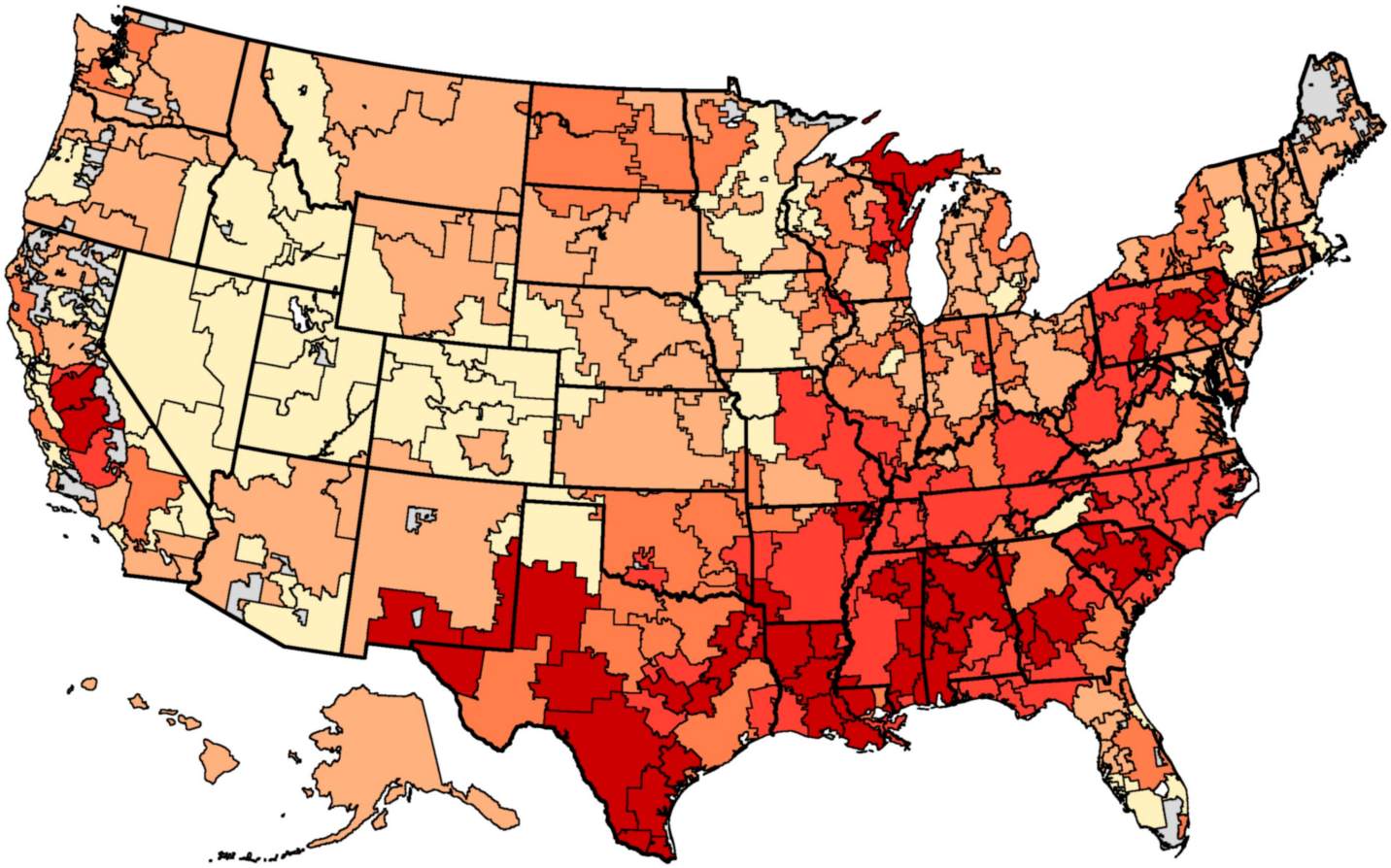
The top display shows the relationship between rates of leg amputation among black and white Medicare beneficiaries during 2003-07 with a 45-degree line. Dots along the line would represent areas where black and white rates were equal, while dots above the line represent regions where the rate among blacks was higher than the rate among whites. Blacks were on average 4.7 times more likely to have a leg amputated than whites. The bottom display shows the same data, with the scale modified to reflect the range of variation among whites and show the strong correlation between black and white amputation rates (R^2 = 0.47).

Leg Amputation

Amputation of a leg is an infrequent but devastating complication of peripheral vascular disease and diabetes. Inadequate blood supply and nerve damage predispose patients to injury and to infection that can fail to heal. Sometimes the infection can only be treated by amputation. A broad array of environmental, social and behavioral factors put patients at greater risk for developing the underlying conditions that lead to the loss of a limb. These include smoking, obesity, a sedentary lifestyle, high blood pressure that is poorly controlled, and lack of access to high-quality primary and specialty medical care. Rigorous attention to proper foot care is essential for those at risk, including daily self-examination, the use of specially fitted shoes, and timely attention to what would otherwise be trivial injuries such as calluses, blisters or splinters. Poverty and race represent major risk factors for amputation. Among Medicare beneficiaries who have an amputation, more than 25% have a second amputation within a year and over 30% die within the same period.[12]

Nationally, rates of amputation decreased about 26% between 2003 and 2007. However, patients' risk of leg amputation varied dramatically depending upon who they were and where they lived (Map 4). During the period 2003-07, in the fee-for-service Medicare population, there was a tenfold difference in the rate of leg amputation, ranging from 0.33 per 1,000 in the Provo, Utah HRR to 3.29 per 1,000 beneficiaries in McAllen, Texas. The national average was 1.06 per 1,000.

While blacks were on average more than four times more likely to undergo amputation than whites—3.87 versus 0.82 procedures per 1,000 Medicare beneficiaries—the variation in overall rates across regions was greater than the disparities between races within regions. In other words, in HRRs where amputation rates were higher for blacks, they were also higher for whites, though rates were higher for blacks in every HRR. Figure 14 shows the relationship between amputation rates for blacks and whites in the 192 HRRs with a sufficient number of black Medicare beneficiaries to allow reporting of race-specific rates. In El Paso, Texas, the disparity between blacks and whites was relatively low—the rate of amputation among blacks (2.23 per 1,000) was less than twice the rate among whites (1.16 per 1,000)—but the amputation rate for whites was relatively high. By contrast, the disparity in Charleston, South Carolina was dramatic; blacks underwent amputation at a rate more than six times that of whites (5.55 versus 0.85 per 1,000). In Oxford, Mississippi, amputation rates among both blacks and whites were among the highest in the nation (7.05 and 1.35, respectively).



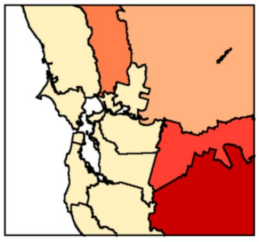
Average Annual Rates of Leg Amputation per 1,000 Medicare Beneficiaries

by Hospital Referral Region (2003-07)

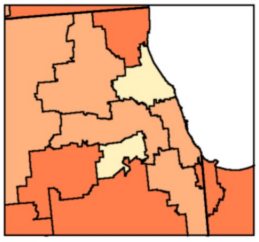
- 1.4 to 3.3 (45)
- 1.2 to < 1.4 (53)
- 1.0 to < 1.2 (69)
- 0.8 to < 1.0 (85)
- 0.3 to < 0.8 (54)
- Not populated

Map 4. Leg amputation among hospital referral regions (2003-07)

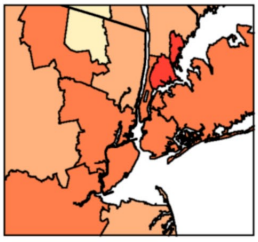
Rates are adjusted for age, sex and race using the indirect method, with the corresponding population as the standard. The standard population is the U.S. Medicare population age 65 to 99 with Medicare Part A entitlement and no HMO enrollment during the measurement period.



San Francisco



Chicago



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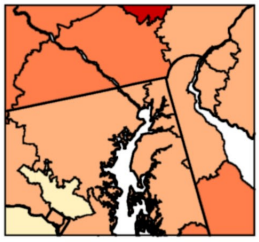
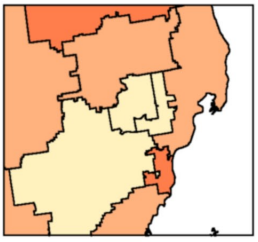


Washington-Baltimore



Detroit

Hospitalization for Ambulatory Care-Sensitive Conditions

Many hospital admissions are for medical conditions—such as poorly controlled diabetes or worsening heart failure—that can be treated in either the inpatient or the outpatient setting, and for which hospitalization can often be prevented by better outpatient management. Discretionary admissions to the hospital may seem safer for the patient, make it easier for the physician to keep track of the patient, or be the only option for a patient with inadequate home or community-based support. Even so, hospitalization might not be the best choice. Spending time in a hospital poses risks to patients, including infection and error, and a substantial cost to their families and to society. Clinicians have identified a group of diagnoses, such as diabetes, pneumonia and congestive heart failure, referred to as "ambulatory care-sensitive conditions." For these conditions, the rate of hospitalization is partly determined by, or sensitive to, the availability and quality of ambulatory care.

Discharge rates for ambulatory care-sensitive conditions decreased about 11% between 2003 and 2007 as health care systems increasingly shifted care to ambulatory settings. Despite the decline, there is still wide variation in rates of ambulatory care-sensitive discharges among HRRs. During 2003-07 there was a more than fourfold difference in the rate of ambulatory care-sensitive discharges among Medicare beneficiaries, ranging from 30.7 per 1,000 beneficiaries in Honolulu to 135.0 per 1,000 in Monroe, Louisiana (Map 5). The national average was 76.0 per 1,000.

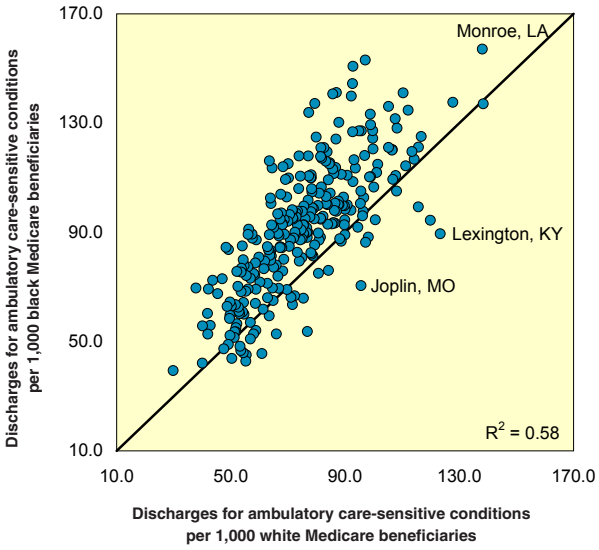


Figure 15. The relationship between discharge rates for ambulatory care-sensitive conditions among black and white Medicare beneficiaries (2003-07)

Several regions had about equal rates of hospitalization for blacks and whites (dots along the diagonal line), but in 36 regions, rates were higher for whites (dots below the diagonal line). In Lexington, Kentucky, for example, the rate for whites was 123.3 per 1,000 versus 89.5 for blacks; similarly, in Joplin, Missouri, the rate for whites was 36% higher than the rate for blacks (95.6 versus 70.5 per 1,000). Monroe, Louisiana had the highest rate of hospitalization for these conditions overall and for blacks; it also had the second highest hospitalization rate for whites.

Discharge rates for blacks were significantly higher than for whites (101.8 per 1,000 black beneficiaries vs. 73.8 per 1,000 whites). Rates for blacks and whites were strongly correlated during the period 2003-07 (R^2 = 0.58) (Figure 15).

Previous research has shown that hospitalization rates for these conditions, and for most medical conditions, are highly correlated with the local supply of hospital beds.[13] The more beds per capita, the more likely it is that physicians will make the discretionary decision to hospitalize patients with medical conditions. This pattern makes it difficult to know how much of the variation seen in discharge rates for ambulatory care-sensitive conditions is due to the local supply of hospital beds, to the prevalence of illness—both of which would lead to higher hospitalizations rates—or to lack of access to high-quality ambulatory care, which would presumably keep patients healthier and out of the hospital. We did not find that regions with a higher percent of beneficiaries having at least one primary care visit (R^2 = 0.00) (Figure 11) or the amount of primary care labor delivered in the region (R^2 = 0.00) was associated with lower hospitalization rates. These measures of primary care access were also not correlated with discharge rates at the hospital service area level (R^2 = 0.01 for both measures).

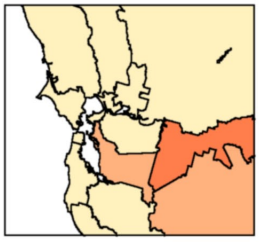
Discharges Rates for Ambulatory Care-Sensitive Conditions per 1,000 Medicare Beneficiaries

by Hospital Referral Region (2003-07)

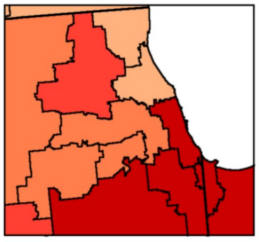
- 90 to 136 (65)
- 80 to < 90 (57)
- 70 to < 80 (63)
- 60 to < 70 (51)
- 30 to < 60 (70)
- Not populated

Map 5. Discharges for ambulatory care-sensitive conditions among hospital referral regions (2003-07)

Rates are adjusted for age, sex and race using the indirect method, with the corresponding population as the standard. The standard population is the U.S. Medicare population age 65 to 99 with Medicare Part A entitlement and no HMO enrollment during the measurement period.



San Francisco



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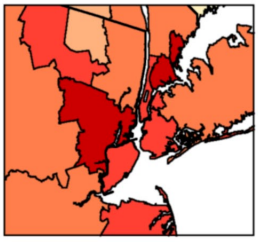

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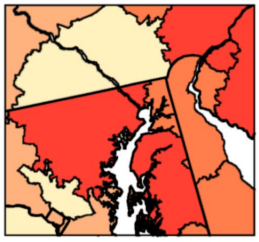
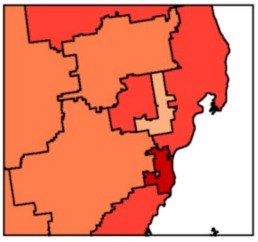


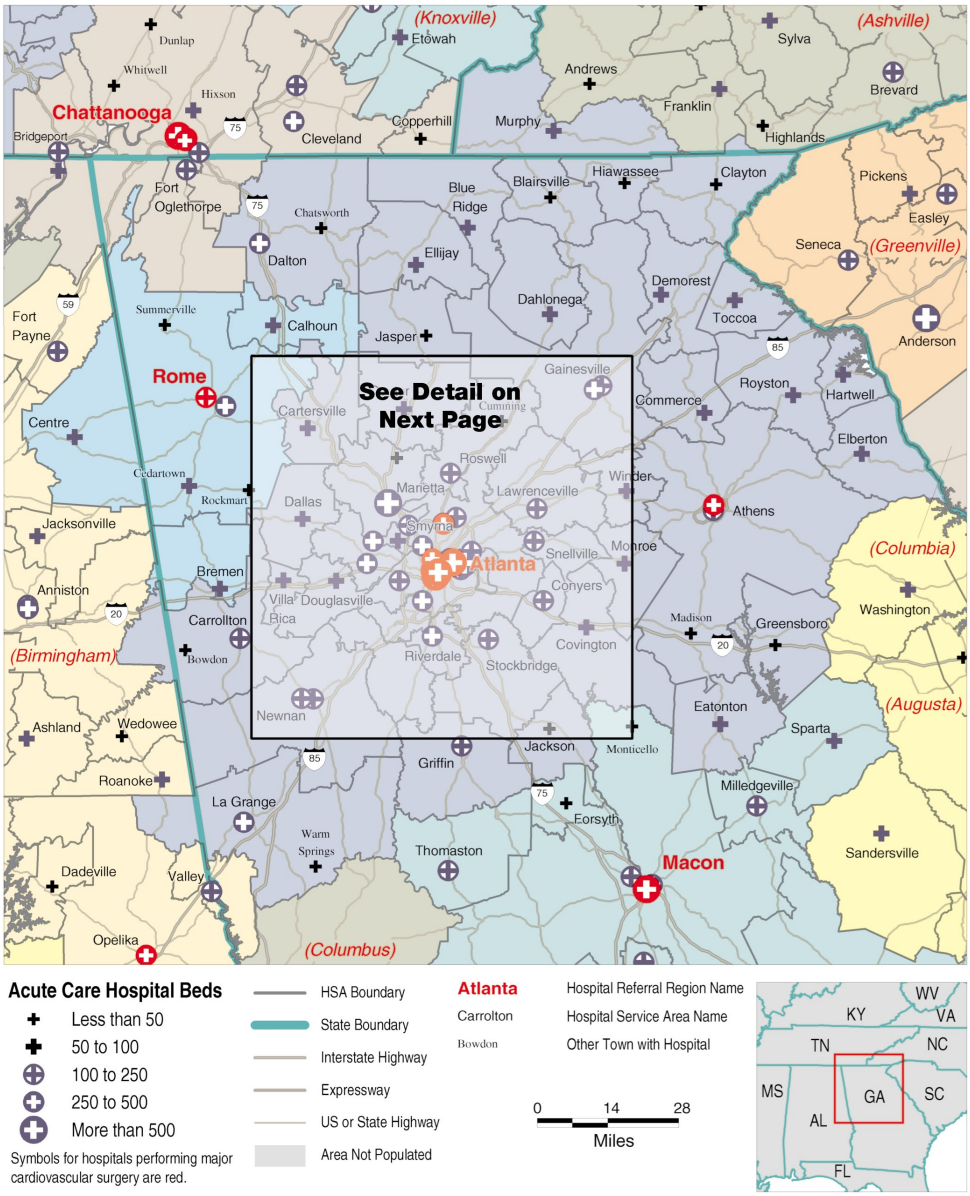
Washington-Baltimore



Detroit

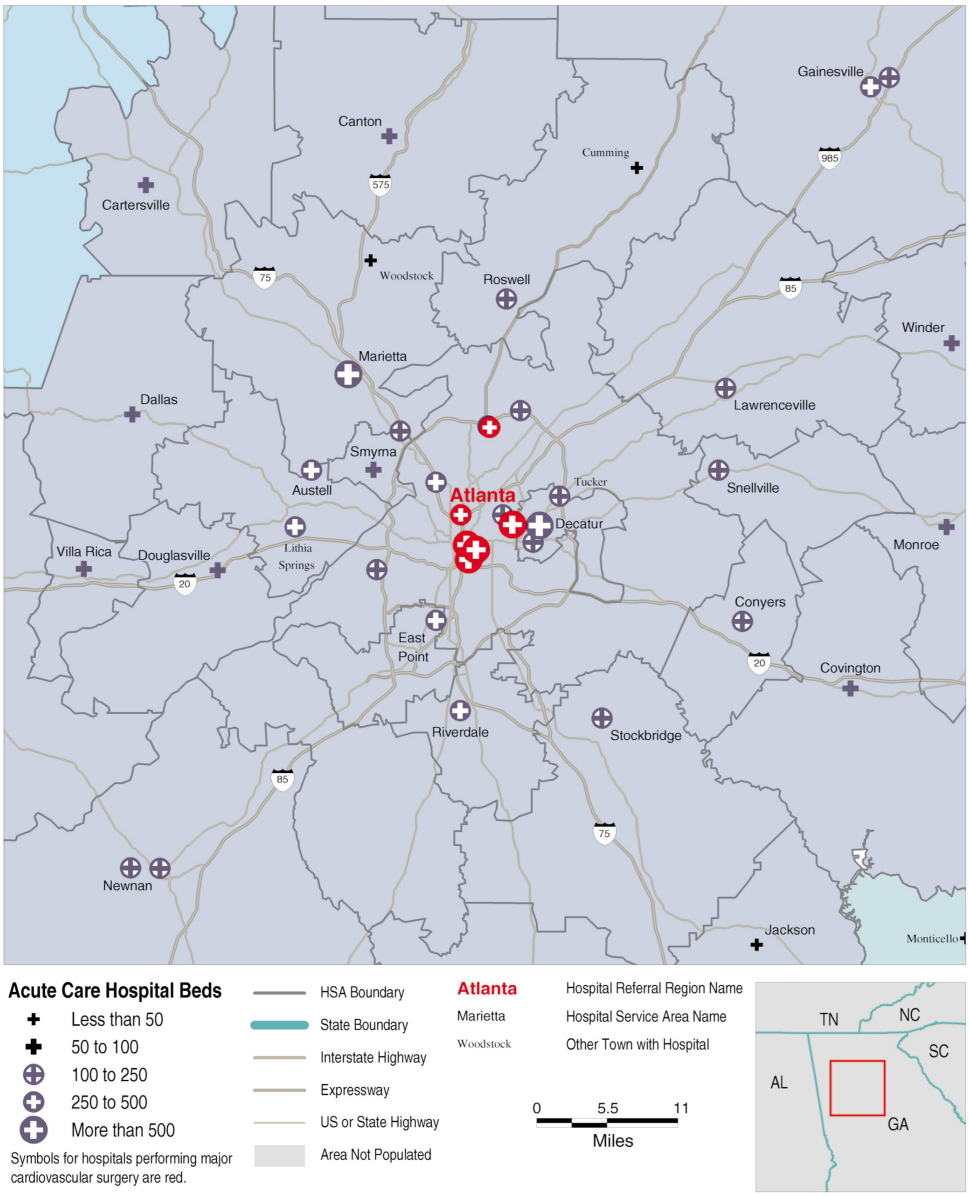
Primary Care and Quality of Care in Local Hospital Markets: The Case of Atlanta, Georgia

Although medical care delivery for many conditions is increasingly regionalized in the United States, an important locus of improvement is at the level of the hospital, and the physicians whose patients are admitted to that hospital. Hospital service areas represent local markets for health care around one or several hospitals. We use the Atlanta, Georgia HRR as a case study of local hospital service area variation in primary care and the quality of care.



Map 6. Hospital service areas assigned to the Atlanta, Georgia hospital referral region

The Atlanta, Georgia hospital referral region comprises 44 hospital service areas. The fee-for-service Medicare population in 2007 was about 428,000 beneficiaries in the region as a whole, ranging from 2,192 beneficiaries in the Greensboro, Georgia HSA to 97,086 in the metropolitan Atlanta HSA. In the Atlanta HRR as a whole, 14.5% of the Medicare population was black; the percent of the Medicare population that was black among HSAs with at least 200 black beneficiaries varied from about 2% in Dalton to 60% in East Point.



Map 7. Detail of hospital service areas assigned to the Atlanta, Georgia hospital referral region

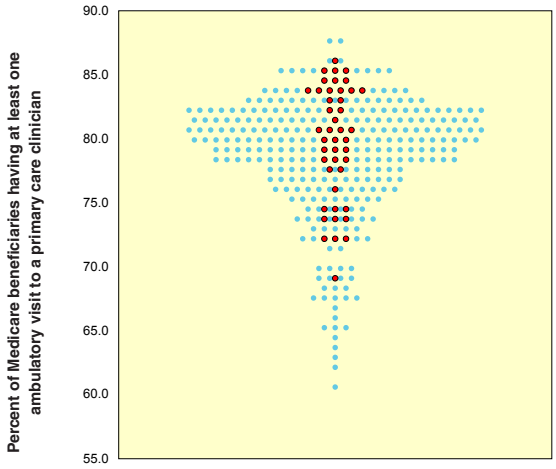


Figure 16. Average annual percent of Medicare beneficiaries having at least one ambulatory visit to a primary care clinician (2003-07)

Each blue dot represents the percent of Medicare beneficiaries who had at least one primary care visit annually during 2003-07 in one of 306 HRRs. The red dots represent the percent of beneficiaries who had a primary care visit in one of the 44 HSAs within the Atlanta HRR. The taller and more spindle-shaped the graph, the greater the degree of variation in rates across regions and service areas. The actual rates for the Atlanta HSAs are listed in Table 1. Variation in access to primary care across Atlanta HSAs was nearly as great as the variation across HRRs in the U.S.

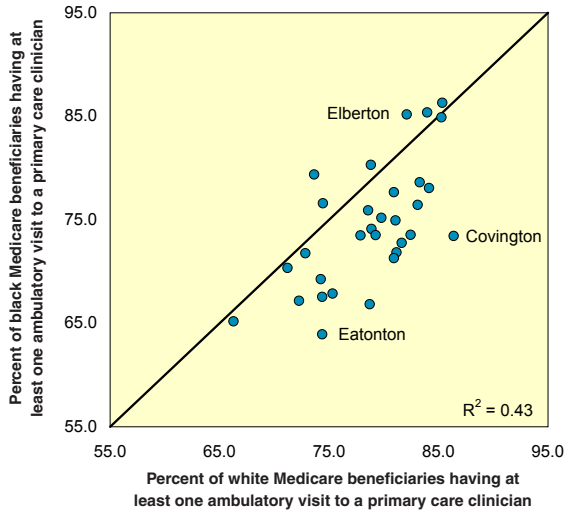


Figure 17. The relationship between the average annual percent of Medicare beneficiaries having at least one visit to a primary care clinician among blacks and whites in hospital service areas in the Atlanta, Georgia hospital referral region (2003-07)

Each dot represents one of 31 HSAs in the Atlanta region with a sufficient black Medicare population to report race-specific rates. The percent of blacks and whites having an annual primary care visit was correlated within the Atlanta HRR (R^2 = 0.43). Dots below the diagonal line indicate that whites in the area were more likely to see a primary care clinician than blacks. In the majority of areas, blacks were less likely to have an annual primary care visit.

The size of the primary care physician workforce and the amount of primary care actually delivered in the region varied considerably. In 2006, the Atlanta HRR had 64.2 primary care physicians per 100,000 residents. There were fewer than 50 physicians per 100,000 in Snellville (39.3), Demorest (48.1) and Lawrenceville (48.6); the workforce was more than twice the size of those hospital service areas in Blue Ridge (111.9) and Hiawassee (103.8). The measure of office-based primary care provided to beneficiaries in 2007 was 84.1 physician FTEs per 100,000 beneficiaries in the Atlanta region as a whole. In the Smyrna HSA, primary care labor input measured 70.4 FTEs per 100,000 beneficiaries, while in the Ellijay area it measured 117.9 per 100,000 (Table 1).

It should not be surprising that there was also considerable variation in access to primary care within the Atlanta hospital referral region. The percent of Medicare beneficiaries having at least one primary care visit during 2003-07 among the 44 hospital service areas in the Atlanta region ranged from a low of 68.8% in East Point to a high of 86.2% in Demorest. Figure 16 shows that the variation in the percent having a primary care visit across the HSAs in Atlanta (red dots) was almost as great as the variation across all U.S. regions (blue dots).

Blacks were generally less likely to have had an annual primary care visit than whites in the 44 Atlanta HSAs, though not always. The percent of blacks with an annual primary care visit in Elberton (85.2%) was slightly higher than the percent of whites (82.1%); by contrast, more whites (86.4%) had a primary care visit than blacks (73.4%) in Covington. Rates for blacks and whites were generally correlated within HSAs (R^2 = 0.43) (Figure 17). Among the HSAs in the Atlanta HRR, the smallest percentage of blacks had an annual primary care visit in Eatonton (63.9%), where the rate for whites was the seventh lowest in the HRR (74.4%). The supply of primary care delivered in the Eatonton region was higher than average, at 92.8 primary care FTEs per 100,000 beneficiaries.

The remainder of this report provides information about variation and racial disparities in three measures of the quality of care for diabetics, rates of mammography, and two outcomes across the HSAs in the Atlanta HRR.

Table 1. Primary care physician supply, labor input, and the percent having at least one visit to a primary care clinician among hospital service areas in the Atlanta, Georgia hospital referral region

Hospital service area	Primary care physicians per 100,000 residents (2006)	FTE primary care physician labor inputs per 100,000 Medicare beneficiaries (2007)	Average annual percent of Medicare enrollees having at least one ambulatory visit to a primary care clinician (2003-07)		
			Overall	Black	White
Athens, GA	54.9	87.6	80.9	72.8	81.6
Atlanta, GA	76.1	73.0	74.0	67.6	74.4
Austell, GA	54.6	85.0	80.4	71.9	81.2
Blairsville, GA	69.7	95.1	84.5		
Blue Ridge, GA	111.9	105.3	83.6		
Canton, GA	70.4	100.4	82.5		
Carrollton, GA	63.6	83.2	80.8	77.7	80.9
Cartersville, GA	72.9	104.4	85.2	84.9	85.3
Clayton, GA	99.0	109.0	83.4		
Commerce, GA	63.6	76.2	75.7		
Conyers, GA	75.5	92.2	82.7	76.4	83.1
Covington, GA	64.2	102.2	85.0	73.4	86.4
Dahlonega, GA	50.5	102.7	82.2		
Dallas, GA	50.3	80.6	77.9		
Dalton, GA	54.5	88.2	80.5	74.9	81.1
Decatur, GA	90.9	74.9	74.4	69.3	74.3
Demorest, GA	48.1	97.4	86.2		
Douglasville, GA	59.3	87.3	79.5	75.2	79.8
East Point, GA	80.6	73.5	68.8	65.2	66.3
Eatonton, GA	70.6	92.8	73.4	63.9	74.4
Elberton, GA	81.7	94.6	84.0	85.2	82.1
Ellijay, GA	93.1	117.9	80.2		
Gainesville, GA	56.8	91.6	81.8	73.6	82.5
Greensboro, GA	79.6	104.3	83.4	78.6	83.3
Griffin, GA	58.7	93.6	79.0	73.5	79.3
Hartwell, GA	77.0	86.9	84.5	85.4	84.0
Hiawassee, GA	103.8	98.1	83.4		
Jackson, GA	79.9	75.1	74.8	67.9	75.3
Jasper, GA	68.5	99.2	80.1		
La Grange, GA	58.8	77.5	71.9	70.3	71.2
Lawrenceville, GA	48.6	81.1	74.4	76.6	74.4
Marietta, GA	53.0	78.9	77.5	73.5	77.9
Monroe, GA	79.4	103.8	79.4	80.3	78.8
Newnan, GA	57.1	77.7	78.7	75.9	78.6
Riverdale, GA	50.6	79.6	72.2	67.2	72.3
Roswell, GA	56.5	85.2	78.0	66.8	78.7
Royston, GA	92.3	107.7	85.4	86.3	85.4
Smyrna, GA	64.3	70.4	74.1	79.4	73.6
Snellville, GA	39.3	72.9	72.5	71.8	72.8
Stockbridge, GA	59.3	83.5	78.6	74.1	78.9
Toccoa, GA	63.5	100.5	80.2	71.3	80.9
Villa Rica, GA	54.6	95.8	82.9		
Winder, GA	87.0	100.7	83.6	78.1	84.1
Murphy, NC	79.0	89.6	84.6		

Blank cells indicate that there were not enough black Medicare beneficiaries in the region to report race-specific rates.

The Quality of Care for Diabetes in the Atlanta, Georgia Region

As was the case among the 306 hospital referral regions across the United States, the rates at which diabetic Medicare beneficiaries received recommended tests varied considerably across the HSAs in the Atlanta HRR during the period 2003-07. Annual hemoglobin A1c testing rates ranged from a low of 65.3% of diabetic beneficiaries in Hartwell to a high of 88.2% in Demorest (Figure 18), a difference of about 35% from the lowest to the highest region. Rates of eye examination for diabetics were 42% higher in Clayton (70.8%) than in Elberton (50%), while rates of blood lipids testing were 38% higher in Conyers (85.0%) than in Hartwell (61.5%) (Table 2).

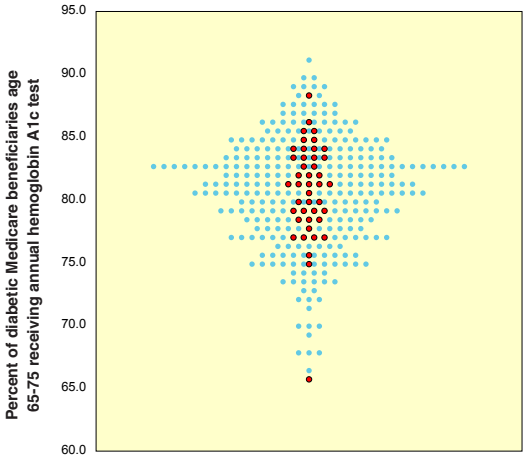


Figure 18. Average annual percent of diabetic Medicare beneficiaries age 65-75 receiving annual hemoglobin A1c testing (2003-07)

Each blue dot represents the percent of Medicare fee-for-service beneficiaries age 65-75 with diabetes who received an annual hemoglobin A1c test in one of 306 HRRs. The red dots represent the percent of beneficiaries with diabetes who received the test in the HSAs in the Atlanta HRR. The rates for the Atlanta HSAs are listed in Table 2. The variation in rates for hospital service areas in Atlanta mirrored the variation among HRRs around the country.

Though these measures of the quality of diabetic care varied to a similar degree among the HSAs in the Atlanta HRR, it was not necessarily the case that an area that ranked high in quality for one measure ranked high for the others. Some areas, such as Blairsville, performed well for all three measures; that HSA ranked second in the percent of diabetics age 65-75 receiving both hemoglobin A1c and blood lipids testing and third in the percent receiving eye exams. However, the highest-ranked region for eye exams—Clayton—ranked 27th for blood lipids testing and 41st for hemoglobin A1c testing. Demorest was among the top five areas for hemoglobin A1c and blood lipids testing but was in the bottom half of the areas for eye examination. Hartwell ranked among the lowest areas for all three measures.

Rates of testing for blacks were generally lower than for whites in the twelve Atlanta HSAs where there were sufficient numbers of black diabetic Medicare beneficiaries to measure. The rate of hemoglobin A1c testing for black diabetics ranged from 74.2% in the East Point HSA to 86.0% in Stockbridge. Rates for whites also varied across service areas, from 77.0% in La Grange to 85.5% in Decatur. In five Atlanta hospital service areas, the rate of testing for blacks was higher than it was for whites. In Stockbridge, for example, the rate was 86.0% for blacks and 81.2% for whites.

Only two HSAs had higher rates of eye examination for diabetics among blacks than among whites: Marietta, where the rate for blacks was 67.8% and the rate for whites was 64.6%; and Newnan, where the rate for blacks was 66.4% and the rates for whites was 62.3%. White diabetics experienced much higher rates of eye examination than blacks in the metropolitan Atlanta HSA, where the rate among blacks was 45.4% and the rate among whites was 66.6%, 47% higher. There were no HSAs where black diabetics experienced higher rates of blood lipids testing than whites. The disparities were lowest in Stockbridge (76.4% of blacks and 80.3% of whites received testing) and Riverdale (72.6% and 76.5%); the differences were much greater in East Point (66.1% and 79.2%) and Covington (65.3% and 81.1%).

Table 2. The percent of diabetic Medicare beneficiaries age 65-75 receiving recommended testing among hospital service areas in the Atlanta, Georgia hospital referral region

Hospital service area	Average annual percent of diabetic Medicare enrollees age 65-75 having hemoglobin A1c test (2003-07)			Average annual percent of diabetic Medicare enrollees age 65-75 having eye examination (2003-07)			Average annual percent of diabetic Medicare enrollees age 65-75 having blood lipids (LDL-C) test (2003-07)		
	Overall	Black	White	Overall	Black	White	Overall	Black	White
Athens, GA	81.3	80.4	81.6	64.0	59.7	65.3	69.6	61.9	71.8
Atlanta, GA	82.0	78.8	85.3	55.8	45.4	66.6	76.6	71.2	82.3
Austell, GA	83.5			63.6			79.5		
Blairsville, GA	86.2			68.7			83.8		
Blue Ridge, GA	80.3			54.8			79.4		
Canton, GA	82.8			61.1			77.1		
Carrollton, GA	76.8			59.6			75.7		
Cartersville, GA	81.5			56.8			78.2		
Clayton, GA	75.3			70.8			75.3		
Commerce, GA	81.7			60.1			68.2		
Conyers, GA	84.6			70.0			85.0		
Covington, GA	83.9	80.1	85.0	63.0	54.6	65.4	77.7	65.3	81.1
Dahlonega, GA	83.1			66.9			76.0		
Dallas, GA	75.0			62.2			71.6		
Dalton, GA	78.6			58.8			76.1		
Decatur, GA	84.1	82.7	85.5	58.1	49.4	66.7	80.7	77.1	84.3
Demorest, GA	88.2			59.5			82.4		
Douglasville, GA	82.2			57.1			78.9		
East Point, GA	77.0	74.2	83.9	58.3	55.0	66.1	69.9	66.1	79.2
Eatonton, GA	84.9			63.5			80.5		
Elberton, GA	77.0			50.0			65.9		
Ellijay, GA	77.3			55.0			77.3		
Gainesville, GA	79.5			60.7			74.4		
Greensboro, GA	78.7			62.1			71.5		
Griffin, GA	81.3	84.7	80.0	60.3	56.6	61.6	69.8	63.2	72.3
Hartwell, GA	65.3			54.4			61.5		
Jackson, GA	84.1			54.2			75.3		
Jasper, GA	79.2			57.9			73.3		
La Grange, GA	77.5	79.0	77.0	60.2	57.5	61.0	69.8	61.1	72.7
Lawrenceville, GA	83.1	83.5	83.0	63.9	56.9	64.9	81.5	75.3	82.3
Marietta, GA	81.5	80.8	81.6	64.9	67.8	64.6	80.5	72.6	81.4
Monroe, GA	78.1			65.7			74.2		
Newnan, GA	79.0	76.6	79.7	63.1	66.4	62.3	73.1	66.4	74.9
Riverdale, GA	79.9	81.5	79.2	55.5	55.2	55.6	75.3	72.6	76.5
Roswell, GA	84.2			65.3			79.5		
Royston, GA	78.1			58.2			70.8		
Smyrna, GA	80.8			60.2			77.6		
Snellville, GA	85.5			65.7			80.5		
Stockbridge, GA	82.3	86.0	81.2	66.1	65.4	66.3	79.4	76.4	80.3
Toccoa, GA	83.1			68.3			73.2		
Villa Rica, GA	79.5			54.5			82.5		
Winder, GA	85.3			59.4			82.4		
Murphy, NC	79.1			68.1			71.9		

Blank cells indicate that there were not enough black Medicare beneficiaries in the area to report race-specific rates.

Screening for Breast Cancer in the Atlanta, Georgia Region

As was the case among the 306 HRRs across the United States, the rates at which female Medicare beneficiaries age 67-69 received at least one mammogram over a two-year period varied considerably across the HSAs in the Atlanta region during 2003-07. Mammography rates ranged from a low of 48.6% of female beneficiaries in Royston to a high of 71.8% in Blairsville (Figure 19), a difference of about 48% from the lowest to the highest region.

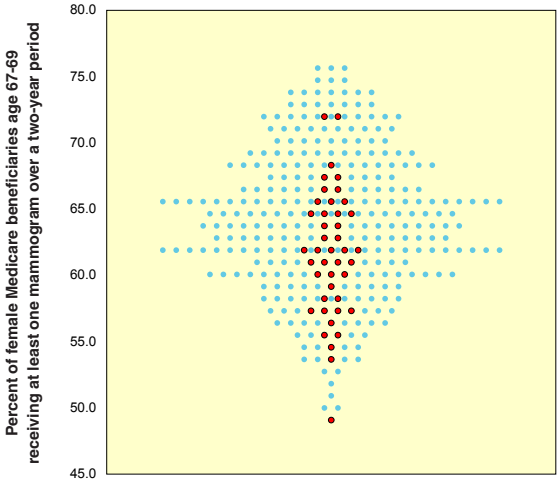


Figure 19. Average annual percent of female Medicare beneficiaries age 67-69 receiving at least one mammogram over a two-year period (2003-07)

Each blue dot represents the percent of female Medicare fee-for-service beneficiaries age 67-69 who received at least one mammogram over a two-year period in one of 306 HRRs. The red dots represent the percent of female beneficiaries who received the test in 43 HSAs in the Atlanta HRR with a sufficient number of female beneficiaries age 67-69 to report rates. The rates for the 43 Atlanta HSAs are listed in Table 3. The variation in rates among HSAs in Atlanta for the most part mirrored the variation among hospital referral regions around the country.

Rates of mammography for blacks were lower than for whites in the four Atlanta HSAs where there were sufficient numbers of black female Medicare beneficiaries to measure. The percent having at least one mammogram over a two-year period for black Medicare beneficiaries ranged from 52.6% in the Riverdale HSA to 56.9% in Decatur. Rates for whites also varied across service areas, from 58.4% in Riverdale—where the rate was also the lowest for blacks—to 68.1% in the Atlanta HSA.

Table 3. The percent of female Medicare beneficiaries age 67-69 receiving at least one mammogram over a two-year period among hospital service areas in the Atlanta, Georgia hospital referral region

Hospital service area	Average percent of female Medicare enrollees age 67-69 having at least one mammogram over a two-year period (2003-07)		
	Overall	Black	White
Athens, GA	63.0	56.6	64.2
Atlanta, GA	63.3	56.6	68.1
Austell, GA	64.3		
Blairsville, GA	71.8		
Blue Ridge, GA	57.4		
Canton, GA	71.7		
Carrollton, GA	61.8		
Cartersville, GA	61.6		
Clayton, GA	63.9		
Commerce, GA	53.5		
Conyers, GA	65.2		
Covington, GA	67.8		
Dahlonega, GA	65.9		
Dallas, GA	55.7		
Dalton, GA	57.3		
Decatur, GA	61.0	56.9	63.5
Demorest, GA	67.1		
Douglasville, GA	60.7		
East Point, GA	57.5		
Eatonton, GA	68.2		
Elberton, GA	58.0		
Ellijay, GA	54.3		
Gainesville, GA	64.6		
Greensboro, GA	57.7		
Griffin, GA	55.2		
Hartwell, GA	60.2		
Hiawassee, GA	64.4		
Jackson, GA	61.1		
Jasper, GA	60.3		
La Grange, GA	62.2		
Lawrenceville, GA	60.6		
Marietta, GA	63.1		
Monroe, GA	66.2		
Newnan, GA	58.7		
Riverdale, GA	56.7	52.6	58.4
Roswell, GA	65.5		
Royston, GA	48.6		
Smyrna, GA	59.3		
Snellville, GA	61.5		
Stockbridge, GA	64.9		
Toccoa, GA	60.5		
Winder, GA	62.2		
Murphy, NC	66.4		

Blank cells indicate that there were not enough black Medicare beneficiaries in the area to report race-specific rates.

Leg Amputation in the Atlanta, Georgia Region

Overall leg amputation rates varied nearly fourfold across the HSAs within the Atlanta HRR (Figure 20). Rates of amputation ranged from 0.50 per 1,000 Medicare beneficiaries in Roswell to 1.93 per 1,000 in La Grange. In the eight HSAs where there were enough amputations among individual races to make comparisons, rates among blacks were dramatically higher than rates among whites. Rates of amputation among whites ranged from 0.39 per 1,000 in Marietta to 1.46 in La Grange, while rates of amputation among blacks ranged from 3.08 per 1,000 in Marietta to 7.15 in La Grange. The rates for blacks was no less than four times the rate for whites in any HSA in the Atlanta HRR (Table 4).

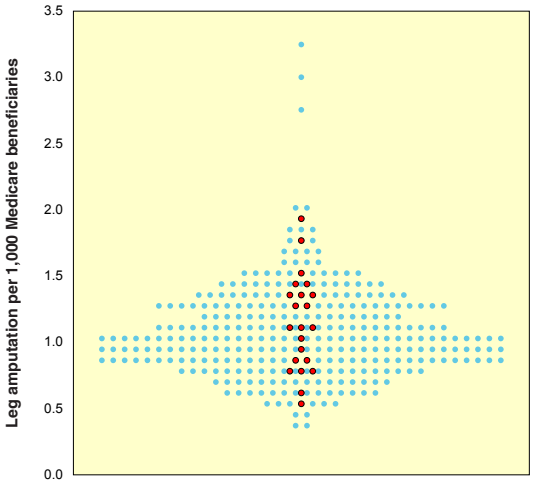


Figure 20. Leg amputation per 1,000 Medicare beneficiaries (2003-07)

Each blue dot represents the rate of leg amputation in one of 306 HRRs. The red dots represent the leg amputation rates in the 22 HSAs in the Atlanta region where there were enough amputations to report rates. The rates for the Atlanta HSAs are listed in Table 4.

Table 4. Leg amputation per 1,000 Medicare beneficiaries among hospital service areas in the Atlanta, Georgia hospital referral region (2003-07)

Hospital service area	Leg amputations per 1,000 Medicare beneficiaries (2003-07)		
	Overall	Black	White
Athens, GA	1.53	5.54	1.20
Atlanta, GA	0.85	3.40	0.52
Austell, GA	0.90		
Canton, GA	1.13		
Carrollton, GA	1.33		
Cartersville, GA	1.08		
Conyers, GA	1.29		
Covington, GA	1.47		
Dalton, GA	1.74		
Decatur, GA	0.80	3.37	0.48
Douglasville, GA	1.27		
East Point, GA	0.82		
Gainesville, GA	1.01		
Griffin, GA	1.47	6.23	0.95
La Grange, GA	1.93	7.15	1.46
Lawrenceville, GA	0.81		
Marietta, GA	0.58	3.08	0.39
Newnan, GA	1.34	5.52	0.94
Riverdale, GA	1.12	4.29	0.80
Roswell, GA	0.50		
Snellville, GA	1.33		
Stockbridge, GA	0.95		

Blank cells indicate that there were not enough black Medicare beneficiaries in the area to report race-specific rates.

Hospitalization for Ambulatory Care-Sensitive Conditions in the Atlanta, Georgia Region

The overall discharge rate for ambulatory care-sensitive conditions in the Atlanta HRR was 74.8 per 1,000 Medicare beneficiaries. Discharge rates for these conditions varied nearly twofold across the 44 HSAs within the Atlanta HRR, ranging from 58.7 per 1,000 beneficiaries in the Murphy, North Carolina[iv] HSA to 114.0 per 1,000 in Blue Ridge, Georgia. The variation in discharge rates within the Atlanta HRR was not as great as the range across the 306 hospital referral regions in the U.S. (Figure 21).

Ambulatory care-sensitive discharge rates were moderately correlated for blacks and whites within the 35 HSAs in which there were enough discharges for each race to make a comparison (R^2 = 0.18) (Figure 22). Rates for blacks were higher than rates for whites in 21 of the 35 areas. There was wide variation in the rate of hospitalization among blacks, ranging from 52.0 per 1,000 in Cartersville to 127.2 per 1,000 in Monroe, a more than twofold variation. Rates varied nearly as much for whites, from 54.0 in the Atlanta HSA to 110.6 per 1,000 in the Covington HSA.

[iv] Hospital service areas can belong to hospital referral regions in different states if patients frequently cross state lines to receive care at the closest tertiary care hospital.

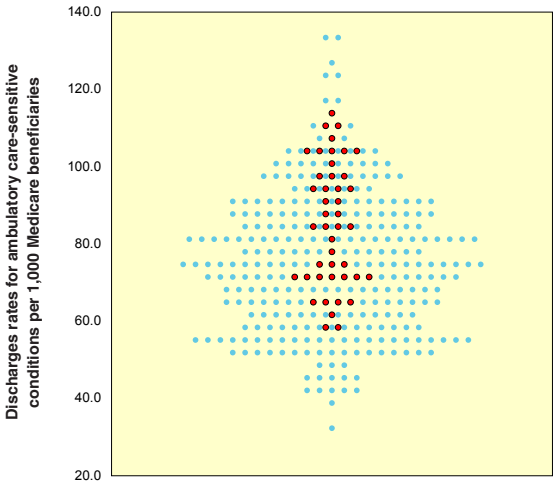


Figure 21. Discharges rates for ambulatory care-sensitive conditions per 1,000 Medicare beneficiaries (2003-07)

Each blue dot represents the discharge rate per 1,000 for ambulatory care-sensitive conditions among Medicare beneficiaries in one of 306 hospital referral regions. The red dots indicate the 44 HSAs within the Atlanta HRR. Atlanta hospital service areas varied somewhat less than the hospital referral regions across the country. The rates for each Atlanta hospital service area are listed in Table 5.

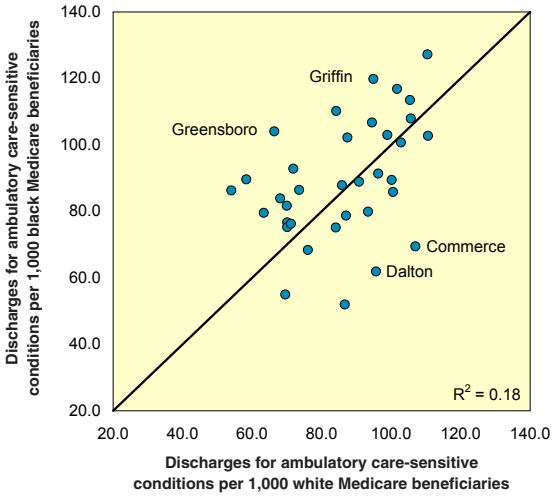


Figure 22. The relationship between discharge rates for ambulatory care-sensitive conditions among black and white Medicare beneficiaries in hospital service areas in the Atlanta, Georgia hospital referral region (2003-07)

Each dot represents a single HSA. Dots above the diagonal line indicate that blacks were more likely to be hospitalized for ambulatory care-sensitive conditions than whites. In 14 HSAs, whites were more likely to be hospitalized than blacks, including Commerce and Dalton. Blacks were more likely to be hospitalized than whites in 21 areas, including Griffin and Greensboro. The rates for the Atlanta HSAs are listed in Table 5.

Table 5. Discharge rates for ambulatory care-sensitive conditions per 1,000 Medicare beneficiaries among hospital service areas in the Atlanta, Georgia hospital referral region (2003-07)

Hospital service area	Discharges for ambulatory care-sensitive conditions per 1,000 Medicare beneficiaries (2003-07)		
	Overall	Black	White
Athens, GA	69.9	81.7	70.0
Atlanta, GA	59.1	86.3	54.0
Austell, GA	84.9	78.7	87.0
Blairsville, GA	64.8		
Blue Ridge, GA	114.0		
Canton, GA	75.4	86.5	73.5
Carrollton, GA	88.5	102.2	87.4
Cartersville, GA	84.0	52.0	86.7
Clayton, GA	104.5		
Commerce, GA	106.1	69.5	107.0
Conyers, GA	81.5	75.2	84.1
Covington, GA	105.4	102.7	110.6
Dahlonega, GA	92.2		
Dallas, GA	94.0	79.9	93.4
Dalton, GA	96.7	61.9	95.7
Decatur, GA	62.2	89.6	58.3
Demorest, GA	65.0		
Douglasville, GA	97.9	89.4	100.2
East Point, GA	65.8	83.9	68.0
Eatonton, GA	92.4	91.4	96.3
Elberton, GA	102.7	113.5	105.4
Ellijay, GA	109.3		
Gainesville, GA	72.5	76.3	71.2
Greensboro, GA	71.1	104.0	66.4
Griffin, GA	95.8	119.8	94.9
Hartwell, GA	94.9	106.7	94.5
Hiawassee, GA	70.5		
Jackson, GA	102.3	107.9	105.7
Jasper, GA	79.5		
La Grange, GA	95.0	103.0	98.9
Lawrenceville, GA	70.9	76.7	70.1
Marietta, GA	64.8	79.6	63.4
Monroe, GA	110.5	127.2	110.5
Newnan, GA	73.3	68.4	76.1
Riverdale, GA	84.5	88.9	90.8
Roswell, GA	70.8	55.0	69.5
Royston, GA	103.2	100.7	102.8
Smyrna, GA	73.5	92.8	71.9
Snellville, GA	71.3	75.3	70.1
Stockbridge, GA	84.5	87.9	85.9
Toccoa, GA	103.0	116.8	101.7
Villa Rica, GA	98.1	85.8	100.6
Winder, GA	86.3	110.2	84.2
Murphy, NC	58.7		

Blank cells indicate that there were not enough black Medicare beneficiaries in the area to report race-specific rates.

Appendix Table 1. Description of measures

Short description	Label	Definition
Primary Care Access	Average annual percent of Medicare beneficiaries who had at least one visit to a primary care clinician (2003-07)	Numerator: Medicare enrollees with at least one visit to an office, outpatient center, rural health clinic or federally qualified health center with one of the following clinician specialty codes: general practice, family practice, internal medicine, pediatrician, nurse practitioner, physician assistant or clinic. Denominator: fee-for-service (FFS) Medicare enrollees age 65-99 at mid-year eligible for Part B. Measure is average over five years and is age, sex and race adjusted.
Primary Care Physician Supply	Primary care physicians per 100,000 residents (2006)	Numerator: physicians present in American Medical Association Physician Masterfile with the following self-designated specialties: family practice, internal medicine or pediatrics. Denominator: resident population according to U.S. Census estimate. Measure is adjusted for patient age, sex and border crossing.
FTE Primary Care Physician Labor	Full-time equivalent primary care physician labor inputs per 100,000 Medicare beneficiaries (2007)	Numerator: claims by primary care physicians (family practice physicians and general internists) for services provided in an office-based ambulatory setting, converted to full-time equivalents by linking the claim billing codes (HCPCS) to work effort (work relative value units) and dividing by the average number of work RVUs per primary care physician by specialty. Denominator: FFS Medicare enrollees age 65-99 at mid-year eligible for Parts A and B. Measure is age, sex and race adjusted.
Diabetes: Annual Hemoglobin A1c Testing	Average annual percent of diabetic Medicare enrollees age 65-75 having hemoglobin A1c test (2003-07)	Numerator: diabetics age 65-75 having one or more hemoglobin A1c tests during measurement year. Denominator: diabetics age 65-75 on December 31 enrolled in FFS Medicare eligible for Parts A and B. Measure is average over five years and is not adjusted.
Diabetes: Annual Eye Exam	Average annual percent of diabetic Medicare enrollees age 65-75 having eye exam (2003-07)	Numerator: diabetics age 65-75 having a retinal or dilated eye exam by eye care professional in measurement year, or a negative retinal exam in the previous year. Denominator: diabetics age 65-75 on December 31 enrolled in FFS Medicare eligible for Parts A and B. Measure is average over five years and is not adjusted.
Diabetes: Annual Blood Lipid Testing	Average annual percent of diabetic Medicare enrollees age 65-75 having blood lipids test (2003-07)	Numerator: diabetics age 65-75 having at least one low-density lipoprotein-cholesterol (LDL-C) test during measurement year. Denominator: diabetics age 65-75 on December 31 enrolled in FFS Medicare eligible for Parts A and B. Measure is average over five years and is not adjusted.
Mammography	Average annual percent of female Medicare beneficiaries age 67-69 receiving at least one mammogram during a two-year period (2003-07)	Numerator: any, but only one occurrence of mammogram per patient during measurement year or prior year. Denominator: FFS Medicare women age 67-69 on December 31 of last year of measurement period eligible for Part B. Measure is average over five years and is not adjusted.
Leg Amputation	Leg amputations per 1,000 Medicare enrollees (2003-07)	Numerator: MedPAR claims for inpatient leg amputation procedures at short-stay acute care hospitals. Denominator: FFS Medicare enrollees age 65-99 at mid-year eligible for Part A. Measure is average over five years and is age, sex and race adjusted.
ACS Discharges	Discharges for ambulatory care-sensitive conditions per 1,000 Medicare enrollees (2003-07)	Numerator: MedPAR claims for discharges for ambulatory care-sensitive conditions (convulsions, COPD, pneumonia, asthma, CHF, hypertension, angina, cellulitis, diabetes, gastroenteritis, kidney/urinary tract infections, dehydration) from short-stay acute care hospitals. Denominator: FFS Medicare enrollees age 65-99 at mid-year eligible for Part A. Measure is average over five years and is age, sex and race adjusted.

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The Dartmouth Atlas Project works to accurately describe how medical resources are distributed and used in the United States. The project offers comprehensive information and analysis about national, regional, and local markets, as well as individual hospitals and their affiliated physicians, in order to provide a basis for improving health and health systems. Through this analysis, the project has demonstrated glaring variations in how health care is delivered across the United States.

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