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## Racial Disparities in Age at Preventable Hospitalization Among U.S. Adults

Katie Brooks Biello, MPH<sup>1,2</sup>, James Rawlings, MPH<sup>1,3</sup>, Amy Carroll-Scott, PhD<sup>2,4</sup>, Rosa Browne, MBA<sup>3</sup>, and Jeannette R. Ickovics, PhD<sup>1,2,4</sup>

<sup>1</sup> Yale School of Public Health, Yale Center for Clinical Investigation, New Haven, Connecticut

<sup>2</sup> Center for Interdisciplinary Research on AIDS, Yale University, Yale Center for Clinical Investigation, New Haven, Connecticut

<sup>3</sup> Yale–New Haven Hospital, Department of Community Health, Yale Center for Clinical Investigation, New Haven, Connecticut

<sup>4</sup> CARE: Community Alliance for Research and Engagement, Yale Center for Clinical Investigation, New Haven, Connecticut

### Abstract

**Background**—Similar to the well-documented racial inequities in health status, disease burden, healthcare access, and hospitalization, studies have generally found higher rates of hospitalization due to ambulatory care-sensitive conditions for blacks compared to whites. Beyond identifying disparity in rates of disease or risks of hospitalization, identifying disparity in age at hospitalization may provide deeper insight into the social and economic consequences of disparities on individuals, families, and communities.

**Purpose**—The objective of this paper is to evaluate potential racial disparities in age of preventable hospitalizations as measured by ambulatory care sensitive conditions.

**Methods**—Differences in mean age at hospitalization for ambulatory care-sensitive conditions were evaluated in a nationally representative sample of 6,815 hospital discharges using the 2005 National Hospital Discharge Survey. Linear regression using robust SE procedures was used to evaluate differences among 9 chronic and 3 acute conditions. Analyses were conducted in 2008.

**Results**—After adjustment for sociodemographic characteristics, blacks were hospitalized 5 or more years earlier than whites across all conditions combined and for chronic and acute conditions separately. The largest differences were seen for uncontrolled diabetes (adjusted difference= −12.0 years) and bacterial pneumonia (adjusted difference= −7.5 years).

**Conclusions**—Racial disparities in age at preventable hospitalization exist across a spectrum of conditions. This difference in age at hospitalization places an undue burden on individuals, families, and society with long-term health and financial sequelae. Promoting equity in disease prevention, management, and treatment should be a priority of any healthcare reform efforts.

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Address correspondence and reprint requests to: Dr. Jeannette R. Ickovics, Professor, Yale School of Public Health, 60 College Street, New Haven CT 06520-8034. Jeannette.Ickovics@Yale.edu.

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## Background

From preterm birth to premature death, severe and persistent racial inequities in health status, disease burden, healthcare access, and hospitalizations are well documented in the U.S. African Americans have higher rates of morbidity and mortality for nearly all conditions compared to non-Hispanic whites, and are increasingly less likely to have health insurance and receive job-based health coverage.<sup>1–5</sup> Additionally, African Americans have less access to preventive and primary care services, and lower rates of screening, diagnostic tests, and referrals to specialists.<sup>6–8</sup> Moreover, racial and ethnic minorities of the same SES and insurance status as their white counterparts experience a lower quality of health services and are less likely to receive even routine medical procedures.<sup>9,10</sup> Prior studies also have documented higher rates of emergency department use and hospitalization among people of color.<sup>11–13</sup>

Ambulatory care-sensitive conditions are those conditions for which timely ambulatory care may reduce the need for hospitalization, thus they are often referred to as “preventable hospitalizations.”<sup>14</sup> Access to and utilization of ambulatory care can reduce risk of hospitalization in several ways: (1) prevent disease through immunization, nutrition, or behavioral interventions; (2) treat conditions that can lead to rapid onset problems, such as bacterial pneumonia; and (3) manage chronic conditions to prevent an adverse disease trajectory (e.g., more frequent and severe symptoms or complications).<sup>8</sup> Therefore, beginning with a 1993 IOM report, ambulatory care-sensitive conditions have been used as an indicator of access to and performance of primary care.<sup>15</sup>

Several studies have examined patterns of hospitalization due to ambulatory care-sensitive conditions by race/ethnicity, generally finding higher rates of hospitalization for blacks compared to whites.<sup>8,13,16–23</sup> Prior research has been limited to particular age groups (e.g., pediatrics, geriatrics) or has controlled for age in analyses, thereby not directly examining potential racial differences in age at hospitalization. One study found that risk of hospitalization for all ambulatory care-sensitive conditions combined increased by 3.7% for each additional year of age for African American and Hispanic women but only by 1.7% for non-Hispanic whites.<sup>8</sup>

Beyond identifying disparity in rates of disease or risks of hospitalization, identifying disparity in *age at hospitalization* may provide deeper insight into the social and economic consequences of disparities on individuals, families, and communities. The primary objective of this study is to identify potential disparities by race in mean age of preventable hospitalizations as measured by ambulatory care-sensitive conditions, using the National Hospital Discharge Survey. It is hypothesized that, on average, blacks will have a younger age at hospitalization than whites overall and across most ambulatory care-sensitive conditions, even after controlling for various sociodemographic characteristics. Racial disparities in age at hospitalization are hypothesized to be similar for acute and chronic conditions.

## Methods

### Data Collection and Sampling

Data were obtained from the public use data files of the 2005 National Hospital Discharge Survey, the most recent year for which data were available at the time of analysis (Dec. 2008). This annual survey – which collects medical and demographic information from inpatient discharge records using a national probability sample of nonfederal, short-stay hospitals— included 501 hospitals; of these, 28 were deemed ineligible. Of the 473 eligible hospitals, 444 hospitals responded (94%).<sup>24</sup>

The survey is conducted using a modified, three-stage design. First, sampling units consist of either hospitals or geographic areas across 50 states and the District of Columbia. Second, within sampled geographic areas, additional hospitals were selected. Third, discharges were selected within sampled hospitals using systematic random sampling.<sup>24</sup> Public use data files provide probability weights that allow researchers to inflate this sample to national estimates. For this analysis, discharges were excluded if they were from individuals who were: transferred from another institution; hospitalized for pregnancy, childbirth or puerperium; or were newborn or neonate.

## Measures

For the National Hospital Discharge Survey, diagnoses were obtained for all inpatients at discharge. Specifically, up to seven diagnoses and 4 procedures were documented for each discharge using ICD-9-CM codes. Principal diagnosis was then established after determining the condition that was *chiefly responsible for occasioning the admission of the patient to the hospital for care*.<sup>24</sup> For the current analysis, only principal diagnoses were used. Notably, the discharges do not necessarily refer to first admissions for ambulatory care-sensitive conditions or to unique individuals. As a result, these should be understood as occasions of care. Diagnoses were categorized according to methodology of the Agency for Healthcare Research and Quality's prevention quality indicators for adults—or ambulatory care-sensitive conditions.<sup>25</sup>

**Chronic Conditions**—Individuals classified as having been discharged for the following conditions were classified as hospitalized due to a chronic ambulatory care-sensitive condition: (1) adult asthma, (2) chronic obstructive pulmonary disease (COPD), (3) angina, (4) hypertension, (5) congestive heart failure, (6) diabetes with short-term complication (i.e., ketoacidosis, hyperosmolarity, coma), (7) diabetes with long-term complication (i.e., renal, eye, neurologic, circulatory, complications not otherwise specified), (8) uncontrolled diabetes (without mention of short- or long-term complications), and (9) lower-extremity amputation with diagnosis code of diabetes and no diagnosis code of trauma. For those with primary code of angina, hypertension or congestive heart failure, discharges with a cardiac procedure code were excluded. Patients with these diagnoses may be admitted electively for a cardiac procedure and would be reported as principal diagnosis even though the admission did not reflect long-term outpatient management.

**Acute Conditions**—Individuals discharged for the following conditions were classified as hospitalized due to an acute ambulatory care-sensitive condition: (1) dehydration, (2) urinary tract infection, and (3) bacterial pneumonia (discharges with diagnosis codes for sickle cell anemia/HB-S disease in any other diagnosis listing were excluded). Perforated appendix is often considered an ambulatory care-sensitive condition; however, given low incidence (race-specific  $n < 30$ ) and its lack of comparability to other conditions, it was excluded from this analysis.

## Sociodemographic Characteristics

Sociodemographic characteristics were determined by reported status on discharge records. Age at last birthday, gender and race were reported on discharge forms. Analyses were restricted to blacks and whites, regardless of ethnicity, because Hispanic ethnicity was not included in the data set and other racial groups made up less than 1% of the sampled population. The term black was used following the primary survey label “black/African American”, indicating other groups, regardless of nationality, may be categorized (e.g, Caribbean Americans, foreign-born immigrants). Marital status was classified as married, single (never married), widowed, divorced/separated, or not stated, per patient self-report. Expected source of patient payment was categorized into public insurance (i.e., worker's compensation, Medicare, Medicaid, other government payments), private insurance (i.e., Blue Cross/Blue

Shield, HMO/PPO, other private or commercial insurance), self-pay, or other (e.g., no charge, not stated). This was used as a proxy for SES, since no income or educational attainment data were available. Finally, hospital region was categorized in geographic regions corresponding to those used by the U.S. Census: Northeast, Midwest, South and West to control for regional differences in hospitalization practices or policies.

### Sample Derivation

Overall, 65,850 hospital discharges were reported in the 2005 National Hospital Discharge Survey. Among all discharges reported, 13.8% of the hospitalizations were for one of the specified ambulatory care-sensitive conditions in patients aged  $\geq 18$  years ( $n=9,092$ ). Among those with a relevant condition, 24.5% were excluded because of a missing race designation ( $n=2,230$ ) and 0.5% were excluded because they had a race designation other than black or white ( $n=47$ ). The National Hospital Discharge Survey indicates that some hospitals submit data using an automated method that involves purchasing data collected for other purposes, and therefore may not include race.<sup>26</sup> Additionally, many Hispanics would not identify with a specific race.<sup>26</sup> Therefore, 6,815 of reported hospital discharges were included for analysis.

### Data Analyses

Mean age at hospitalization, weighted to allow inflation to national estimates, was examined for each condition described above and stratified by race. Of the 12 ambulatory care-sensitive conditions assessed, two (angina, lower-extremity amputation) had unweighted race-specific counts of hospitalizations  $<30$  and were considered unreliable.<sup>24</sup> Therefore, these conditions were not examined independently, but were included in analyses examining racial differences across all conditions combined and chronic conditions as a group.

To test for differences by race, race was regressed on age at hospitalization for each ambulatory care-sensitive condition separately. These analyses were then repeated, simultaneously adjusting for patient gender, marital status, expected source of payment for hospitalization and hospital region. It is important to note that the underlying prevalence of the ambulatory care-sensitive conditions in blacks and whites was not adjusted for, as has been advised when assessing a disparity in risk or rate of hospitalization to ensure that the observed disparity in rates of hospitalization was not simply due to a disparity in prevalence of disease.<sup>19</sup> Because this analysis examines mean age at hospitalization, regardless of differences in underlying prevalence of disease, being hospitalized at an earlier age would be considered “premature”. Both unadjusted and adjusted mean age at hospitalization for blacks and whites, differences in the mean ages, and 95% CIs are reported. Significance was determined for differences where two-sided  $p < 0.05$ .

As noted previously, individual patients are clustered into hospital and region sampling units, and thus not completely independent. While it would have been appropriate to use generalized linear models to account for this cluster effect, the variable containing primary sampling unit information was not available in public use files. Using ordinary least squares regression and, as a result, not accounting for the cluster effects may lead to an underestimation of the SEs and an overestimation of the significance. To reduce this bias, robust SEs procedures in SAS were used to obtain more conservative SEs than generated from standard regression procedures by accounting for dependence among individuals.<sup>27,28</sup>

## Results

### Racial Differences in Ambulatory Care Sensitive Conditions

Table 1 provides comparisons of demographic characteristics of those discharged for an ambulatory care-sensitive condition by race, using weighted frequencies. Among the 6,815

discharges for ambulatory care-sensitive conditions, 16.4% were black and 83.6% were white. Women represent approximately 60% of all discharged cases among both blacks and whites. However, blacks and whites differed significantly by other sociodemographic characteristics. Specifically, blacks were less likely to be aged  $\geq 65$  years at time of hospitalization compared to whites (43.6% vs 70.1%, respectively) and less likely than whites to be married (19.7% vs 31.8%, respectively). The majority of both blacks and whites expected to pay for hospital services through public insurance (72.5% vs 77.3%, respectively); however, this was significantly lower among blacks, while self-pay and “other” were slightly higher. Reflecting national demography, blacks discharged for ambulatory care-sensitive conditions were more likely than whites to live in the Northeast and South and less likely to live in the Midwest.

Table 2 provides regression results. Across all ambulatory care-sensitive conditions, weighted mean age at hospitalization was 69.2. Unadjusted results demonstrate that, on average, blacks were hospitalized 9 years earlier than whites (61.6 vs 70.7,  $p < 0.001$ ) for all conditions combined. For chronic ambulatory care-sensitive conditions, blacks were hospitalized an average of 9.7 years earlier than whites (59.3 vs 69.0,  $p < 0.001$ ). For acute ambulatory care-sensitive conditions, blacks were hospitalized 7.0 years earlier than whites (66.4 vs 73.4,  $p < 0.001$ ). Mean age at hospitalization was significantly different for blacks and whites for 5 of 10 ambulatory care-sensitive conditions observed (i.e., COPD, congestive heart failure, diabetes with long-term complications, hypertension, bacterial pneumonia), and marginally significant ( $p < 0.10$ ) for two other conditions (i.e., adult asthma, uncontrolled diabetes).

Although differences were attenuated, Table 2 demonstrates the effect of race remained after adjusting for gender, marital status, expected source of payment, and hospital region, indicating that the observed racial disparities are not entirely explained by differences in these sociodemographic characteristics. For all conditions examined, blacks were hospitalized at a younger age than whites: with a range of 2.4 to 12.0 years earlier. Considering these adjusted values, for chronic ambulatory care-sensitive conditions, blacks were hospitalized an average of 5.5 years earlier than whites (55.1 vs 60.5,  $p < 0.001$ ). For acute ambulatory care-sensitive conditions, blacks were hospitalized 5.1 years earlier than whites (57.4 vs 62.5,  $p < 0.001$ ). The largest disparities were documented for ambulatory care-sensitive hospitalizations due to uncontrolled diabetes (Adjusted difference =  $-12.0$  years,  $p < 0.001$ ) and bacterial pneumonia (Adjusted difference =  $-7.5$ ,  $p < 0.001$ ). Significant disparities in age at hospitalization were also observed for COPD, hypertension, congestive heart failure, and dehydration, with blacks significantly younger than whites at age of hospitalization. Adjustment for gender, marital status, expected source of payment, and hospital region eliminated the disparity in age at hospitalization for diabetes with long-term complications, indicating that racial disparities reflected underlying sociodemographic differences for this condition.

### **Post Hoc Analyses of Age at Hospitalization by U.S. Population Age Distribution**

—While mean age at hospitalization is a useful measure because of its ease of interpretation, it does not account for differences in the underlying population. Comparing age distributions for blacks and whites in the U.S. using 2005 mid-year census data indicated that the groups differ in age distribution, with blacks younger than whites.<sup>29,30</sup> Post hoc analyses of age-specific discharge rates for each ambulatory care-sensitive condition were thus conducted to ensure the racial differences in mean age at hospitalizations were not simply an artifact of racial differences in the underlying age distribution. If the observed disparities in age at hospitalization are valid, it would be expected that rates in the younger age groups would be higher for blacks compared to whites and that rate ratios would be larger in the younger age groups compared to older age groups. In fact, age-specific discharge rates for each ambulatory care-sensitive condition demonstrated that blacks indeed had significantly higher hospitalization rates for all ambulatory care-sensitive conditions in the 18–44 year age group and the 45–64 year age group (data not shown). Additionally, rate ratios were larger in the

younger age groups (18–44 and 45–64 years) compared to the older age groups (65 years) for all conditions except dehydration. Therefore, observed race differentials in age at hospitalization are not likely due to differences in the underlying age distributions.

## Discussion

Racial differences in age at hospitalization for ambulatory care sensitive conditions demonstrate that blacks are hospitalized for these conditions prematurely, even after controlling for individual and hospital characteristics likely to influence hospitalizations. Blacks were hospitalized at significantly younger ages than whites for all causes, chronic conditions, acute conditions, and the following conditions: uncontrolled diabetes, bacterial pneumonia, diseases of the circulatory system (congestive heart failure, hypertension), COPD, and dehydration. No racial disparities were detected for asthma, short-term complications of diabetes, or urinary tract infections. Differences in age at hospitalization for long-term diabetes complications were attenuated by sociodemographic characteristics.

Beyond identifying disparity in rates of disease or risks of hospitalization, identifying disparity in age at hospitalization provides deeper insight into the social and economic consequences of disparities on individuals, families and communities. Premature hospitalizations due to preventable ambulatory care-sensitive conditions result in substantial economic burden to society, with treatment estimated to exceed \$263 billion annually.<sup>31</sup> Moreover, these costs are dwarfed by secondary costs and long-term sequelae. Families must endure direct costs through rising out-of-pocket expenses and lost days of work.<sup>32,33</sup> Poor health, particularly resulting from more severe diseases or disease complications, can lower social status, by limiting a person's ability to work, wages earned, and level of education attained, resulting in lower SES for the family within one to two generations.<sup>34–37</sup> For example, consider direct and indirect health and economic consequences of hospitalization for uncontrolled diabetes for a black man aged 46 years compared to a white man aged 58 years.

Reducing disparities and promoting equity in health will require challenging systems-level changes. A recent Kaiser Family Foundation brief outlined priorities to reduce disparities: (1) increase public/provider awareness of disparities, (2) expand health insurance coverage, (3) improve capacity in underserved areas, and (4) increase the knowledge base of intervention strategies.<sup>38</sup> With the current economic downturn, escalating healthcare costs, and persistent systemic disparities, a window of opportunity to make these changes exists.<sup>39</sup> Because blacks are disproportionately uninsured and thus have less access to routine care, expanding and enhancing programs such as Medicaid and SCHIP could promote health equity.<sup>40</sup> Finally, a commitment to prevention could reduce unnecessary hospitalizations across all racial/ethnic groups.

This study has several limitations. The data did not allow a determination of whether these were first or repeat admissions for ambulatory care-sensitive conditions. Using discharge records with incomplete data on SES and comorbid conditions limits the extent to which underlying causes can be disentangled. Primary sampling units are not available in the public use files of the NHDS; therefore, generalized linear models could not be performed and robust SEs had to be calculated to account for the dependence of individuals within clusters.<sup>27,28</sup> Finally, because data were collected using discharge records, missing data and measurement error may be problematic. One quarter of discharges were missing information on race. A previous review of this data source indicated that the majority of Hispanics did not report a specific race, and therefore would be appropriately excluded.<sup>26,27,41</sup> Of Hispanics who reported race, 90% reported race as white. Because Hispanics in the U.S. are younger on average than whites,<sup>42</sup> this would likely lead to an underestimation of the noted difference. This study also has several notable strengths, utilizing data from a representative, national

sample of more than 6,800 hospital discharges. The focus on ambulatory care-sensitive conditions, which are frequently used measures, can be easily replicated. Moreover, this can serve as a common metric through which changes over time can be documented. This is the first study to examine racial disparities in age at hospitalization for each ambulatory care-sensitive condition separately, thus providing more detailed documentation of observed disparities. Results of this study highlight the impact that younger age at hospitalization may have on the social and economic well being of individuals and their families, through loss of wages, poorer quality of life, and risk for a greater number of hospitalizations and severity of illness over the life span. Therefore, this focus on ambulatory care-sensitive conditions has important implications for future prevention efforts designed to reduce health disparities and promote health equity.

## Conclusion

Racial disparities in health persist across a large spectrum of indicators. Future studies should focus on understanding underlying causes of the observed racial disparity in age at hospitalization by assessing differences in access to care, quality of care, underlying conditions, and relevant socioeconomic factors. Additionally, studies should aim to further describe the social and economic impact of premature hospitalizations. Premature hospitalization for ambulatory care-sensitive conditions places an undue burden and cost on black individuals and their families, as well as society at large. While reducing disparities will require challenging system-level changes, the renewed focus on health reform in the U.S. presents new opportunities for prevention and care.

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## References

1. Singh GK, Kogan MD. Widening socioeconomic disparities in U.S. childhood mortality, 1969–2000. *Am J Public Health* 2007;97:1658–65. [PubMed: 17666705]
2. Williams DR, Jackson PB. Social sources of racial disparities in health. *Health Aff* 2005;24:325–34.
3. Wong MD, Shapiro MF, Boscardin WJ, Ettner SL. Contribution of major diseases to disparities in mortality. *N Engl J Med* 2002;347:1585–92. [PubMed: 12432046]
4. Brown, ER.; Ojeda, VD.; Wyn, R.; Levan, R. Racial and ethnic disparities in access to health insurance and health care. UCLA Center for Health Policy Research and the Henry J. Kaiser Family Foundation; 2000.
5. Shi L. Vulnerable populations and health insurance. *Med Care Res Rev* 2000;57:110–34. [PubMed: 10705705]
6. Mayberry RM, Mili F, Ofili E. Racial and ethnic differences in access to medical care. *Med Care Res Rev* 2000;11(Suppl 1):108–145. [PubMed: 11092160]
7. Weinick RM, Zuvekas SH, Cohen JW. Racial and ethnic differences in access to and use of healthcare services, 1977 to 1996. *Med Care Res Rev* 2000;57(Suppl 1):36–54. [PubMed: 11092157]
8. Laditka JN, Laditka SB, Mastanduno MP. Hospital utilization for ambulatory care sensitive conditions: health outcome disparities associated with race and ethnicity. *Soc Sci Med* 2003;57:1429–1441. [PubMed: 12927473]
9. Nelson A. Unequal treatment: confronting racial and ethnic disparities in health care. *J Natl Med Assoc* 2002;94:666–8. [PubMed: 12152921]

10. Williams, DR. Racial variations in adult health status: patterns, paradoxes, and prospects. In: Smelser, N.; Wilson, WJ.; Mitchell, F., editors. *America becoming: racial trends and their consequences*. Vol. II. Washington, DC: National Academy of Sciences; 2001. p. 371-410.
11. Pitts SR, Niska RW, Xu J, Burt CW. National Hospital Ambulatory Medical Care Survey: 2006 emergency department summary. *Natl Health Stat Report* 2008;(7):1–38. [PubMed: 18958996]
12. Heron SL, Stettner E, Haley LL Jr. Racial and ethnic disparities in the emergency department: a public health perspective. *Emerg Med Clin North Am* 2006;24:905–23. [PubMed: 16982346]
13. Decker SL, Schappert SM, Sisk JE. Use of medical care for chronic conditions. *Health Aff* 2009;28:26–35.
14. Kruzikas, DT.; Jiang, HJ.; Remus, D.; Barrett, ML.; Coffey, RM.; Andrews, R. HCUP Fact Book No. 5. AHRQ Publication No. 04-0056. Agency for Healthcare Research and Quality; Rockville, MD: Sep2004 [Accessed April 27, 2009.]. Preventable Hospitalizations: A Window Into Primary and Preventive Care, 2000. Available at: <http://www.ahrq.gov/data/hcup/factbk5/>
15. Millman, M., editor. *Access to health care in America*. Washington, DC: IOM, National Academy of Sciences; 1993.
16. Chang CF, Mirvis DM, Waters TM. The effects of race and insurance on potentially avoidable hospitalizations in Tennessee. *Med Care Res Rev* 2008;65:596–616. [PubMed: 18490268]
17. Howard DL, Hakeem FB, Njue C, Carey T, Jallah Y. Racially disproportionate admission rates for ambulatory care sensitive conditions in North Carolina. *Public Health Rep* 2007;122:362–72. [PubMed: 17518308]
18. Laditka JN. Hazards of hospitalization for ambulatory care sensitive conditions among older women: evidence of greater risks for African Americans and Hispanics. *Med Care Res Rev* 2003;60:468–495. [PubMed: 14677221]
19. Laditka JN, Laditka SB. Race, ethnicity, and hospitalization for six chronic ambulatory care sensitive conditions in the U. S *Ethn Health* 2006;11:247–63.
20. Oster A, Bindman AB. Emergency Department visits for ambulatory care sensitive conditions. *Med Care* 2003;41:198–207. [PubMed: 12555048]
21. Pappas G, Hadden WC, Kozak LJ, Fisher GF. Potentially avoidable hospitalizations: inequalities in rates between U.S. socioeconomic groups. *Am J Public Health* 1997;87:811–6. [PubMed: 9184511]
22. Parker JD, Schoendorf KC. Variation in hospital discharges for ambulatory care-sensitive conditions among children. *Pediatrics* 2000;106:942–948. [PubMed: 11044148]
23. Shi L, Samuels ME, Pease M, Bailey WP, Corley EH. Patient characteristics associated with hospitalizations for ambulatory care sensitive conditions in South Carolina. *South Med J* 1999;92:989–98. [PubMed: 10548172]
24. CDC. Public use data file documentation: National Hospital Discharge Survey 2005. Atlanta: CDC; 2007 [Accessed December 12, 2008.]. Available at: [ftp://ftp.cdc.gov/pub/Health\\_Statistics/NCHS/Dataset\\_Documentation/NHDS/NHDS\\_2005\\_Documentation.pdf](ftp://ftp.cdc.gov/pub/Health_Statistics/NCHS/Dataset_Documentation/NHDS/NHDS_2005_Documentation.pdf)
25. Prevention Quality Indicators Software Documentation, Version 3.1 SAS. AHRQ Quality Indicators. Agency for Healthcare Research and Quality; Rockville, MD: [Accessed December 12, 2008.]. Available at: [http://www.qualityindicators.ahrq.gov/pqi\\_download.htm](http://www.qualityindicators.ahrq.gov/pqi_download.htm)
26. Kozak, LJ. Advance Data from Vital and Health Statistics No. 265. Hyattsville, MD: NCHS; 1995. Underreporting of race in the National Hospital Discharge Survey.
27. Hayes AF, Cai L. Using heteroskedasticity-consistent standard error estimators in OLS regression: an introduction and software implementation. *Behav Res Methods* 2007;39:709–22. [PubMed: 18183883]
28. White H. A Heteroskedasticity-Consistent Covariance Matrix Estimator and a Direct Test for Heteroskedasticity. *Econometrica* 1980;48:817–38.
29. U.S. Census Bureau, Population Division. National Population Estimates April 1, 2000 to July 1, 2005. [Accessed December 12, 2008.]. Available at <http://www.census.gov/popest/national/asrh/NC-EST2005-asrh.html>
30. Meyer, J. Age: 2000. Census 2000 Brief. Washington, DC: U.S. Census Bureau; 2001 [Accessed December 27, 2008.]. Available at <http://www.census.gov/prod/2001pubs/c2kbr01-12.pdf>

31. Kruzikas, DT.; Jiang, HJ.; Remus, D.; Barrett, ML.; Coffey, RM.; Andrews, R. Preventable hospitalizations: a window into primary and preventive care, 2000. Rockville, Md: Agency for Healthcare Research and Quality; 2004 [Accessed December 12, 2008]. Pub. No. 04-0056 Available at <http://www.ahrq.gov/data/hcup/factbk5/>
32. Paez KA, Zhao L, Hwang W. Rising out-of-pocket spending for chronic conditions: a ten-year trend. *Health Aff* 2009;28:15–25.
33. Marmot MG, Bell R. Action on health disparities in the U. S *JAMA* 2009;301:1169–71.
34. Adler NE, Ostrove JM. Socioeconomic status and health: what we know and what we don't. *Ann N Y Acad Sci* 1999;896:3–15. [PubMed: 10681884]
35. Goldman N. Social inequalities in health disentangling the underlying mechanisms. *Ann N Y Acad Sci* 2001;954:118–139. [PubMed: 11797854]
36. Smith JP, Kington R. Demographic and economic correlates of health in old age. *Demography* 1997;34:159–170. [PubMed: 9074837]
37. Smith, JP.; Kington, R. Race, socioeconomic status and health in later life. In: Martin, LG.; Soldo, BJ., editors. *Racial and ethnic differences in the health of older Americans*. Washington, DC: National Academy Press; 1997. p. 106–62.1997
38. Kaiser Family Foundation. Eliminating racial/ethnic disparities in health care: what are the options?. Menlo Park, CA: Henry J. Kaiser Family Foundation; Oct2008 [Accessed December 29, 2008.]. Available at: <http://www.kff.org/minorityhealth/upload/7830.pdf>
39. Altman, D. Window of opportunity?. Menlo Park, CA: Henry J. Kaiser Family Foundation; Jan2009 [Accessed January 14, 2009.]. Available at <http://www.kff.org/minorityhealth/upload/7830.pdf>
40. Cutler DM, Wilensky GR. Health care in the next administration. *N Engl J Med* 2008;359:e17. [PubMed: 18815390]
41. Blustein J. The reliability of racial classifications in hospital discharge abstract data. *Am J Public Health* 1994;84:1018–21. [PubMed: 8203669]
42. U.S. Census Bureau. An older and more diverse nation by midcentury. Press Release. Aug 142008 [Accessed April 27, 2009.]. Available at <http://www.census.gov/Press-Release/www/releases/archives/population/012496.html>
43. Health Committee of the Connecticut State Conference of NAACP Branches. A health status report on African Americans in Connecticut. Jun2007 [Accessed January 19, 2009.]. Available at <http://naacp-ct.org/pdf/2008healthreport.pdf>

**Table 1**

Demographic characteristics of discharges for at least one ambulatory care-sensitive condition (n=6,815), by race.<sup>a</sup>

Variable (n)	Black % (n=1404)	White % (n=5411)
<u>Age</u> *		
18–44 (742)	17.0 (263)	8.4 (479)
45–64 (1741)	39.4 (532)	21.5 (1209)
65+ (4332)	43.6 (609)	70.1 (3723)
<u>Gender</u>		
Male (2810)	41.2 (601)	39.9 (2209)
Female (4005)	58.8 (803)	60.1 (3202)
<u>Marital status</u> *		
Married (1634)	19.7 (204)	31.8 (1430)
Single (790)	30.4 (318)	9.4 (472)
Widowed (1176)	21.3 (174)	22.5 (1002)
Divorced/Separated (403)	8.2 (85)	6.2 (318)
Not stated (2812)	20.4 (623)	30.0 (2189)
<u>Expected Source of Payment</u> *		
Public (5187)	72.5 (1013)	77.3 (4174)
Private (1220)	16.6 (241)	16.7 (979)
Self-pay (227)	6.8 (88)	4.1 (139)
Other <sup>b</sup> (181)	4.1 (62)	1.9 (119)
<u>Region</u> *		
Northeast (4231)	41.2 (1036)	33.3 (3195)
Midwest (740)	5.1 (36)	29.6 (704)
South (1721)	52.3 (318)	33.6 (1403)
West (123)	1.4 (14)	3.5 (109)

<sup>a</sup> ns are unweighted frequencies and %s are weighted using NHDS probability weights

<sup>b</sup> Other includes other (n=75), no charge (n=51), and not stated (n=55)

\* p<0.01 using Rao–Scott chi-square test for clustered data

**Table 2**  
Mean Age at Hospitalization for Ambulatory Care-Sensitive Conditions, National Hospital Discharge Survey, 2005

AMBULATORY CARE-SENSITIVE CONDITIONS <sup>b</sup> (N) <sup>c</sup>	Unadjusted			Adjusted <sup>d</sup>		
	Black	White	Difference	Black	White	Difference
<b>Overall</b> * (6815)	61.7	70.9	-9.2	55.7	61.2	-5.5
<b>Chronic Conditions</b> * (4162)	59.3	69.0	-9.7	55.1	60.5	-5.5
Adult Asthma (477)	50.1	55.7	-5.5	48.9	51.3	-2.4
Chronic Obstructive Pulmonary Disease * (805)	63.0	69.5	-6.5	56.7	61.1	-4.4
Hypertension * (495)	56.9	65.9	-8.9	56.1	62.4	-6.3
Congestive Heart Failure * (1460)	67.9	77.0	-9.2	66.1	71.1	-5.0
Diabetes Short-Term Complication (159)	38.7	45.2	-6.4	42.7	46.6	-3.9
Diabetes Long-Term Complication (464)	58.1	63.2	-5.2	52.3	54.8	-2.5
Diabetes Uncontrolled * (109)	52.4	62.8	-10.4	46.2	58.2	-12.0
<b>Acute Conditions</b> * (2653)	66.4	73.4	-7.0	57.4	62.5	-5.1
Dehydration * (549)	68.1	69.0	-0.9	52.3	57.4	-5.2
Urinary Tract Infection (684)	70.8	74.4	-3.6	59.4	62.0	-2.6
Bacterial Pneumonia * (1420)	62.6	74.3	-11.7	57.1	64.5	-7.5

<sup>a</sup> Adjusted for gender, marital status, region of hospital, and expected source of payment using NHDS probability weights

<sup>b</sup> Of the 12 ambulatory care-sensitive conditions assessed, two (angina, lower-extremity amputation) had race-specific unweighted counts of hospitalizations of less than 30; therefore, these conditions were not examined independently but were included in the analyses examining racial differences across all conditions combined and chronic conditions as a group

<sup>c</sup> The n's are unweighted frequencies and mean ages and differences are weighted using NHDS probability weights

\* p<0.05 for adjusted model