Published in final edited form as:

Epidemiology. 2017 September ; 28(5): 740–746. doi:10.1097/EDE.0000000000000689.

Representativeness of Medicare Participants in the Jackson Heart Study for African American Medicare Beneficiaries

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Abstract

Background—The Jackson Heart Study (JHS) assesses cardiovascular disease risk factors among African Americans in Jackson, Mississippi. Whether characteristics of JHS participants differ from those of a broader African American population is unknown.

Methods—In a retrospective observational analysis, we compared characteristics and outcomes of JHS participants 65 years and older and enrolled in Medicare (n = 1105) to regional (n = 57,489) and national (n = 95,494) cohorts of African American Medicare beneficiaries. We weighted the regional and national cohorts to match the age and sex distributions of the JHS–Medicare cohort for pairwise baseline comparisons. Outcomes of interest included mortality and Medicare costs. We used Cox proportional hazards models to test associations between cohorts and outcomes.

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Conflicts of Interest and Source of Funding: Dr Hernandez reported receiving research support from Amgen, Bayer, Bristol-Myers Squibb, GlaxoSmithKline, Merck, and Portola Pharmaceuticals; and serving on advisory boards for Amgen, AstraZeneca, Bayer, Eli Lilly, Gilead, GlaxoSmithKline, Janssen, Merck, Novartis, Ortho-McNeil-Janssen, Pfizer, Pluristem, Sensible, and MyoKardia. Dr Mentz reported receiving research support from Amgen, AstraZeneca, Bristol-Myers Squibb, GlaxoSmithKline, Gilead, Novartis, Otsuka, and ResMed; receiving honoraria from HeartWare, Janssen, Luitpold Pharmaceuticals, Novartis, ResMed, and Thoratec; and serving on an advisory board for Luitpold Pharmaceuticals, Inc. Dr O'Brien reported receiving research support from Bristol-Myers Squibb, GlaxoSmithKline, Janssen Scientific, Novartis, and Pfizer; and serving on an advisory board for Portola Pharmaceuticals. The Jackson Heart Study is supported by contracts HHSN268201300046C, HHSN268201300047C, HHSN268201300048C, HHSN268201300049C, and HHSN268201300050C from the National Heart, Lung, and Blood Institute and the National Institute on Minority Health and Health Disparities. Research reported in this manuscript was supported by grant R01HL117305 from the National Heart, Lung, and Blood Institute and grant 5T32GM086330-05 from the National Institutes of Health.

Results—The JHS–Medicare cohort was younger, included more women, and had fewer beneficiaries with dual Medicare-Medicaid eligibility, compared with regional and national Medicare cohorts. The cohort also had lower risks of stroke, lung disease, heart failure, diabetes, and renal disease. Mean Medicare costs were lower (\$5066 [SD, \$11,932]) than in the regional (\$7419 [SD, \$17,574]) and national (\$8013 [SD, \$19,378]) cohorts. The regional and national cohorts had higher mortality (adjusted hazard ratios, 1.52; 95% CI, 1.31–1.76; and 1.49; 95% CI, 1.29–1.73, respectively). Subgroup analysis for dual Medicare-Medicaid eligibility attenuated mortality differences.

Conclusion—JHS–Medicare participants had fewer comorbid conditions, better survival, and lower Medicare costs compared with regional and national cohorts. Observed differences may reflect healthy volunteer bias and higher socioeconomic status.

Keywords

cohort; representativeness; African American

Introduction

Population-based cohort studies have informed epidemiologic research of cardiovascular diseases. Reports from studies such as the Framingham Heart Study, the Cardiovascular Health Study, and the Atherosclerosis Risk in Communities (ARIC) study have identified prognostic variables, described observed changes in risk factors over time, and generated new, testable hypotheses [1]. A sample that is representative of the defined population is ideal for these purposes, but comparison of a geographically restricted cohort to the larger population also can highlight important differences [2]. The linking of an established cohort database to Medicare data can enrich these comparisons by providing insights into health care resource use [3, 4].

The representativeness of the Jackson Heart Study (JHS) population, residents of Jackson, Mississippi, compared with the broader African American population is currently unknown. We compared Medicare beneficiaries in the JHS to regional and national cohorts of African American beneficiaries to establish a context for interpreting analyses of the JHS. The overall goal was to obtain deeper insight into the applicability of cardiovascular biomarkers, risk factors, and outcomes observed in the JHS for other African American populations. In addition to comparing demographic characteristics, comorbid conditions, and resource use among the groups, we investigated differences in their overall survival over 10 years.

Methods

Data Sources

The JHS is a prospective, community-based, observational study designed to assess determinants of cardiovascular disease in an African American population [5]. It was set up as an outgrowth of the ARIC study, of which Jackson, Mississippi, was one of four sites, to secure new and already participating African Americans [6]. Data collection began in 2000, and recruitment methods have been described in detail [7]. In brief, subjects recruited from four subsamples of participants were included: random (921/5302 [17.4%]), volunteer

(1570/5302 [29.6%]), ARIC (1185/5302 [22.4%]), and secondary family members (1626/5302 [30.7%]). Study visits have occurred three times since study initiation: exam 1 (September 2000–March 2004), exam 2 (October 2005–December 2008), and exam 3 (February 2009–January 2013). All participants provided written informed consent, and study protocols were approved by local institutional review boards.

We obtained inpatient, skilled nursing facility, hospice, home health, outpatient facility, carrier, and durable medical equipment claim files and the corresponding denominator files for 2002 through 2012 from the US Centers for Medicare & Medicaid Services (CMS) for all Medicare-eligible JHS cohort participants. In addition, we obtained standard analytic claims files and corresponding denominator files for 2002 through 2012 from CMS for a nationally representative 5% sample of Medicare beneficiaries. The inpatient files include institutional claims for facility costs covered under Medicare Part A. The outpatient files include claims from outpatient institutional providers, and the carrier files include noninstitutional provider claims for services covered under Medicare Part B. The denominator files include beneficiary demographic characteristics, dates of death, and program eligibility and enrollment information. Only claims filed during periods of fee-for-service coverage were included. The institutional review board of the Duke University Health System approved the study.

Study Population

We created three cohorts of African American Medicare beneficiaries who were 65 years or older and were enrolled in fee-for-service Medicare for 1 year preceding January 1, 2003: the JHS–Medicare cohort, a Medicare regional cohort (ie, a Medicare 5% sample from the South census region), and a Medicare national cohort (ie, the full Medicare 5% sample). The South census region includes Alabama, Arkansas, Delaware, the District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia [8].

Outcomes

We assessed outcomes for beneficiaries in each of the three cohorts from January 1, 2003 (cohort entry date), through December 31, 2012. The primary outcomes of interest were cumulative incidence of all-cause mortality and the following metrics of Medicare resource use: cumulative incidence of all-cause hospitalization, cumulative incidence of outpatient emergency department encounters, mean number of outpatient evaluation and management visits in 2003, and mean total Medicare costs in 2003.

All-cause mortality was based on death dates in the Medicare denominator file. All-cause hospitalizations were ascertained from inpatient claim files, excluding transfers to another hospital and admissions for rehabilitation (*International Classification of Diseases, Ninth Revision, Clinical Modification* [ICD-9-CM] diagnosis code V57.xx or diagnosis related group [DRG] code 462 before October 1, 2007, and DRG code 945 or 946 beginning on October 1, 2007). We used Healthcare Common Procedure Coding System (HCPCS) codes 992.xx–994.xx in the carrier file to identify outpatient evaluation and management visits with a physician, excluding inpatient (code 21) and emergency department (code 23) places

of service. To avoid double-counting, we considered only one visit per patient, per unique physician identification number (UPIN), and per day. Outpatient emergency department encounters were ascertained from the outpatient claim files using revenue center codes 0450–0459 and 0981. We calculated the total cost to Medicare in 2003 by summing the payment amounts for inpatient services, outpatient services, physician services, skilled nursing facility care, hospice care, home health care, and durable medical equipment.

Covariates

Baseline age, sex, and indication for Medicare insurance coverage (ie, disability insurance benefit, diagnosis of end-stage renal disease, or both, and dual Medicare-Medicaid eligibility) were ascertained from the denominator file. We derived a rural indicator variable from rural–urban commuting area scores based on the zip code of residence [8].

We identified comorbid conditions using previously validated coding algorithms [9, 10] and searched all inpatient, outpatient, and carrier claims in 2002 for evidence of cancer, cerebrovascular diseases, chronic obstructive pulmonary disease, dementia, diabetes mellitus, heart failure, hypertension, ischemic heart disease, myocardial infarction, peptic ulcer, peripheral vascular disease, renal disease, stroke or transient ischemic attack, and valvular disease (eTable 1).

Statistical Analysis

For baseline characteristics of the study population, we present categorical variables as frequencies with percentages and continuous variables as means with standard deviations (SDs) stratified by cohort. We tested for differences between cohorts using χ^2 tests for categorical variables and Wilcoxon rank-sum tests for continuous variables. We tested for pairwise differences between (a) the JHS–Medicare cohort and the regional cohort and (b) the JHS–Medicare cohort and the national cohort. For all analyses, we weighted beneficiaries in the regional and national cohorts such that each cohort reflected the age and sex distribution of the JHS–Medicare cohort. For weighting, we truncated age at 94 years for all cohorts, which is the maximum age in the JHS cohort. Of 60 possible age–sex groups, 48 were represented in the JHS cohort. Beneficiaries in the regional and national cohorts in unrepresented groups were assigned a weight of zero.

We calculated age- and sex-adjusted Kaplan-Meier estimates of 10-year mortality, hospitalization outcomes (ie, all-cause, cardiovascular, cerebrovascular, and heart failure hospitalizations), and outpatient emergency department encounters and log-rank tests to assess pairwise differences in outcomes by cohort (ie, JHS–Medicare cohort vs regional cohort; JHS–Medicare cohort vs national cohort). The censoring date was the earliest of (1) the end of the 10-year follow-up period, (2) the date on which the patient's data were no longer available because the patient enrolled in a Medicare managed care plan, (3) for outcomes other than mortality, the date of death, or (4) December 31, 2012. We used Cox proportional hazards models to compare unadjusted and multivariable-adjusted mortality, hospitalizations, and outpatient emergency department encounters by cohort (separate models for JHS–Medicare cohort vs regional cohort, and JHS–Medicare cohort vs national

cohort). The multivariable-adjusted models controlled for age, sex, Medicaid eligibility, rural location, and baseline comorbid conditions.

We describe counts of outpatient evaluation and management visits and total Medicare costs in 2003 by cohort using means with SDs, and we tested for differences using Wilcoxon rank-sum tests. All costs are reported as observed 2003 US dollars. The analyses of evaluation and management visits and costs were restricted to beneficiaries who were continuously enrolled in fee-for-service Medicare from January 1, 2003, through December 31, 2003, or until the date of death if it occurred in 2003.

We conducted 3 sensitivity analyses. First, we accounted for possible overlap between the JHS–Medicare and Medicare cohorts (approximately 60 beneficiaries). Because beneficiary encryption for the JHS–Medicare cohort differed from the Medicare 5% sample, we removed beneficiaries who resided in the JHS counties (ie, Madison, Hinds, and Rankin) from the regional and national cohorts and repeated outcomes analyses. Second, we assessed outcomes in the subgroup of JHS participants who had continuous fee-for-service Medicare until death or end of study, excluding those who switched to managed care. Finally, we conducted a subgroup analysis of beneficiaries who were dually eligible for Medicare and Medicaid, given the significant baseline differences of its frequency between the JHS and Medicare cohorts.

Statistical significance was established with 2-tailed $\alpha = .05$ for all tests. We used SAS version 9.4 (SAS Institute Inc, Cary, North Carolina) for all analyses.

Results

Overall, 1105/5302 (21%) participants in the JHS were included in the JHS–Medicare cohort. We studied three cohorts over a 10-year follow-up period: the JHS–Medicare cohort ($n = 1105$), the Medicare regional cohort ($n = 57,489$), and the Medicare national cohort ($n = 95,494$). Table 1 shows the baseline characteristics of each cohort. Compared with the regional and national cohorts, the JHS–Medicare cohort was younger, included more women, and had fewer beneficiaries who were dually eligible for Medicare and Medicaid. After adjustment for age and sex, beneficiaries in the JHS–Medicare cohort were less likely to have a history of heart failure, ischemic heart disease, diabetes mellitus, cerebrovascular disease, chronic obstructive pulmonary disease, and renal disease. Over the study duration, 59% (654/1105) of beneficiaries in the JHS–Medicare cohort switched to a managed care plan (vs 28% and 29% in regional cohorts, respectively). These beneficiaries were more likely to be women (80% vs 63%;), to be dually eligible for Medicare and Medicaid (28% vs 20%), and to have diabetes (32% vs 26%). Other demographic characteristics and rates of comorbid conditions were similar.

The age- and sex-adjusted cumulative incidence of all-cause mortality was lower in the JHS–Medicare cohort (29%; 95% CI, 25–33), compared with both the regional cohort (43%; 95% CI, 42–44) and the national cohort (43%; 95% CI, 42–43; Figure 1 and eTable 2). The greater mortality risk in the Medicare cohorts remained after adjustment in the full multivariable model (hazard ratio [HR] for the regional cohort, 1.52; 95% CI, 1.31–1.76; HR

for the national cohort, 1.49; 95% CI, 1.29–1.73; Table 2). In addition, the JHS–Medicare cohort had lower age- and sex-adjusted cumulative incidence of all-cause hospitalization (71%; 95% CI, 68–75), compared with the regional cohort (79%; 95% CI, 78–79) and the national cohort (79%, 95% CI, 78–79; Figure 2 and eTable2), and a lower cumulative incidence of outpatient emergency department encounters (78%; 95% CI, 74–81), compared with the regional cohort (83%; 95% CI, 83–84) and the national cohort (82%; 95% CI, 82–82); eFigure and eTable2). However, the risks for both outcomes were similar after multivariable adjustment. Finally, the JHS–Medicare cohort had fewer outpatient evaluation and management visits and total Medicare costs (mean \$5066 [SD, \$11,932]) compared to both Medicare cohorts (regional mean: \$7419 [\$17574]; national mean: \$19,378 [\$8013]) (Table 3).

We conducted three sensitivity analyses. When we excluded JHS counties from the regional and national cohorts, the risks of mortality, hospitalization, and emergency department encounters remained higher in the Medicare cohorts than in the JHS–Medicare cohort (eTable 3). Second, we assessed only beneficiaries who had continuous fee-for-service Medicare until death or end of study (eTable 4). Although the directions of associations were similar, the adjusted hazard for mortality was attenuated compared to the primary cohort analyses. In contrast, the adjusted hazards for all-cause hospitalization and outpatient emergency department encounters were strengthened compared to the primary analysis. Last, we studied only participants with dual Medicare–Medicaid eligibility. Dually eligible participants in the JHS–Medicare cohort compared with those in the regional and national cohorts remained younger, were more likely to be women, and were less likely to have history of cerebrovascular disease and chronic obstructive pulmonary disease, but they had similar age- and sex-adjusted rates of heart failure, diabetes mellitus, ischemic heart disease, and renal disease (eTable 5). Dually eligible beneficiaries in the regional and national cohorts again had greater mortality risk before and after multivariable adjustment, but the strength of these associations was attenuated relative to the primary analyses (Table 4). The comparison of hospitalization and emergency department encounter risks were both nonsignificant after adjustment.

Discussion

In this analysis of the representativeness of JHS participants for a broader African American population, we found several important differences between the JHS–Medicare cohort and the regional and national cohorts. JHS participants were younger, had fewer comorbid conditions, and were less likely to be dually eligible for Medicare and Medicaid, a marker of low socioeconomic status compared with both the South census region and national cohorts. Consistent with these findings, age- and sex-adjusted Kaplan–Meier analyses showed that the regional and national cohorts had virtually identical survival curves over 10 years of follow-up, whereas the JHS–Medicare cohort fared substantially better, even after covariate adjustment. Analysis of health care resource use consistently showed that the JHS–Medicare cohort also had less interaction with health care providers during the study period.

Placing the JHS cohort within the spectrum of a defined population, and understanding its relative trajectory over time, offers perspective for findings from JHS analyses [1]. Previous

assessments of the external validity of other population-based cohorts, including the Framingham Heart Study and the Cardiovascular Health Study, provided a similar framework [2, 11, 12]. Although we found no evidence to discount the prognostic relevance of cardiovascular risk factors in the JHS population, our results suggest that the distribution and prevalence of risk factors and interactions with the local health care system should be considered in assessments of absolute health risks for a specific African American population. We note several potential factors contributing to the unique attributes of the JHS population, including the recruitment strategy of the cohort, volunteer bias, and the influence of socioeconomic status.

Approximately 22% of JHS participants were recruited as part of the ARIC study in an effort to address underrepresentation of African American participants in cardiovascular disease research and to create the largest historical study of African American patients from a single site [7]. There was a deliberate effort to include participants representing all levels of socioeconomic status, and overall participation rates in JHS exams 2 and 3 were 77% to 81%. However, recruitment was challenging; compared with other ARIC study sites, 20% fewer Jackson residents remained in the JHS after the initial home interview [13]. Similar to Framingham's methods, the JHS random sample was also enriched with volunteers meeting inclusion criteria (30%) to compensate for high costs and low response from random sampling. Therefore, volunteer bias, a common potential limitation of population-based cohort studies [2], may have skewed the study population. Compared with 2000 US Census data for the Jackson metropolitan statistical area, the overall JHS cohort at the time of recruitment in 2000 was more likely to have at least a high school education (77.7% vs 70.5%) and self-reported income of \$50,000 or greater (34.1% vs 22.1%) [7]. However, among ARIC sites, socioeconomic status and comorbid conditions among non-respondents differed from those of survey respondents to a lesser extent among African American participants than among white participants [13].

Perhaps partly explained by volunteer bias and cohort enrichment, we observed lower rates of Medicaid eligibility in the JHS–Medicare cohort and, therefore, performed a sensitivity analysis for dually eligible participants. Dually eligible beneficiaries have high rates of cognitive impairment, multiple chronic conditions, greater medical needs, and more complex care, combined with low income, worse survival, and more hospitalizations [14–17]. As expected, the JHS–Medicare subgroup with dual eligibility had a greater disease burden and worse outcomes, compared with those without dual eligibility. Their overall profiles were more similar to corresponding Medicare 5% sample subgroups than overall cohort comparisons, and between-group differences in outcomes and health care resource use were attenuated. It is possible that further adjustment for socioeconomic status with additional variables such as income and education may account for remaining differences.

Our analysis of the JHS–Medicare cohort highlights the importance of recognizing the context and potential limitations of population-based cohort studies, which continue to aid in making new scientific discoveries and generating new, testable hypotheses for diverse populations [18]. Precisely defining the population the cohort represents (or does not represent) may reveal unexpected results and will become more important as observational epidemiologic research continues to evolve and the value of combining data sets appreciates.

Whether due to differences in ethnicity, geographic location, sampling strategy, or other reasons specific to the cohort, these characteristics must be considered when investigating population-based cohort studies.

Observed differences in phenotype and outcome in the JHS–Medicare cohort may reflect healthy volunteer bias and higher socioeconomic status. Although absolute rates of disease and outcomes may not be representative of the larger group and, therefore, should not be used as surrogate values based on our findings, the JHS–Medicare cohort may still provide useful insight into the relative trajectory of disease in African American patients and their health.

This was a retrospective analysis from an observational cohort study. A sizeable portion of the JHS–Medicare cohort switched their original fee-for-service Medicare plan to managed care, and their claims data for hospitalizations and resource use were censored at the time of the switch. The participants who switched had lower socioeconomic status and comorbid diabetes but overall similar comorbid conditions at baseline. Although we adjusted for covariates, our analysis was limited to data found in Medicare claims and denominator files. Other measured and unmeasured factors including income, education, disease severity, and access to care may have influenced our findings.

Our primary finding, that the JHS cohort differs in profile, resource use, and outcomes from other groups of African American Medicare beneficiaries after adjustment, implies that absolute rates of disease and resource use observed in the JHS may not generalize to broader groups of African Americans. Instead, the data set should be used for understanding disease trajectories and risk factor associations. As researchers move to understand how to best use data from large groups of people, we believe this study serves as an important reminder of the strengths and limitations of the community-based cohort study design.

Conclusions

Older participants in the JHS population have fewer health problems, lower health care resource use, and better survival compared to regional and national cohorts of Medicare beneficiaries. These differences were partially explained by differences in socioeconomic status.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

Author Contributions: Drs Parikh and Mentz had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

Disclaimer: The views expressed in this manuscript are those of the authors and do not necessarily represent the views of the National Heart, Lung, and Blood Institute; the National Institutes of Health; or the U.S. Department of Health and Human Services.

Role of the Sponsors: The funding agencies were not directly involved in the design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; or the decision to submit the manuscript for publication.

Additional Contributions: The authors thank the participants and data collection staff of the Jackson Heart Study. Damon M. Seils, MA, Duke University, provided editorial assistance and prepared the manuscript. Mr Seils did not receive compensation for his assistance apart from his employment at the institution where the study was conducted.

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Figure 1.
Age- and Sex-Adjusted Cumulative Incidence of All-Cause Mortality by Cohort

Figure 2.
Age- and Sex-Adjusted Cumulative Incidence of All-Cause Hospitalizations by Cohort

Table 1

Baseline Characteristics of the Study Cohorts

Characteristic	JHS-Medicare Cohort (n = 1105)	MedicareRegional Cohort (n = 57,489)	MedicareNational Cohort (n = 95,494)
Age, median (IQR) ^a	71.0 (68.0–75.0)	74.0 (69.0–80.0)	74.0 (69.0–80.0)
Women, No. (%) ^a	745 (67.4)	36,303 (63.1)	59,819 (62.6)
Urban location ^a	1097 (99.3)	40,426 (70.3)	77,084 (80.7)
Medicare indication, No. (%) ^a			
Disability insurance benefit	184 (16.7)	8604 (15.0)	14,368 (15.0)
End-stage renal disease	— ^b	105 (0.2)	189 (0.2)
Both	— ^b	97 (0.2)	159 (0.2)
Dual Medicare-Medicaid eligibility	274 (24.8)	20,876 (36.3)	30,765 (32.2)
Medical history, No. (%) ^c			
Cancer	121 (11.0)	6414 (10.3)	11,403 (11.0)
Metastatic carcinoma	15 (1.4)	797 (1.4)	1515 (1.6)
Cerebrovascular disease	87 (7.9)	8176 (12.6)	13,811 (12.7)
Stroke or transient ischemic attack	57 (5.2)	6709 (10.2)	11,191 (10.1)
Chronic obstructive pulmonary disease	109 (9.9)	9455 (16.1)	16,587 (17.0)
Dementia	13 (1.2)	3139 (3.5)	5601 (3.6)
Diabetes mellitus	330 (29.9)	19,229 (35.0)	31,852 (34.6)
Heart failure	101 (9.1)	8862 (13.4)	15,001 (13.6)
Hypertension	812 (73.5)	41,993 (73.1)	68,710 (71.9)
Ischemic heart disease	191 (17.3)	12,803 (20.7)	23,064 (22.4)
Myocardial infarction	37 (3.3)	2339 (3.8)	4332 (4.2)
Peptic ulcer disease	19 (1.7)	1611 (2.6)	2721 (2.7)
Peripheral vascular disease	108 (9.8)	7702 (11.5)	14,313 (12.8)
Renal disease	37 (3.3)	4146 (6.6)	6941 (6.7)
Valvular heart disease	67 (6.1)	5500 (9.1)	9261 (9.2)

Abbreviations: IQR, interquartile range; JHS, Jackson Heart Study.

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^bUnweighted cohort comparison.

^bIn accordance with the privacy policy of the Centers for Medicare & Medicaid Services, data for cells containing 10 or fewer observations and data for cells that would allow for calculation of cells containing 10 or fewer observations are not reported.

^cBeneficiaries in the Medicare regional and national cohorts were weighted to the age and sex distribution of the JHS–Medicare cohort. For weighting, we truncated age at 94 years for all cohorts, which is the maximum age in the JHS cohort. Of 60 possible age–sex groups, 48 were represented in the JHS cohort. Regional and national Medicare beneficiaries in unrepresented groups were assigned a weight of zero.

Table 2
Risks of Mortality, Hospitalization, and Emergency Department Encounters by Study Cohort^a

	Regional 5% Medicare Cohort		National 5% Medicare Cohort	
	HR (95% CI)	Adjusted HR ^b (95% CI)	HR (95% CI)	Adjusted HR ^b (95% CI)
Mortality	2.4 (2.1–2.8)	1.5 (1.3–1.8)	2.3 (2.0–2.7)	1.5 (1.3–1.7)
All-cause hospitalization	1.4 (1.3–1.5)	1.06 (1.0–1.2)	1.4 (1.3–1.5)	1.1 (1.0–1.2)
Emergency department encounter	1.3 (1.2–1.4)	1.06 (1.0–1.15)	1.2 (1.1–1.3)	1.0 (1.0–1.1)

^aThe Jackson Heart Study–Medicare cohort served as the reference group.

^bAdjusted for age, sex, Medicaid eligibility, urban location and baseline comorbid conditions: cancer, cerebrovascular disease, chronic obstructive pulmonary disease, congestive heart failure, dementia, diabetes, hypertension, ischemic heart disease, myocardial infarction, peripheral vascular disease, renal disease, valvular heart disease, peptic ulcer disease. Proportionality assumptions were met for study variable (regional/national) in all models.

Table 3

Age- and Sex-Adjusted Comparisons of Resource Use Among Cohorts in 2003^a

Cohort	Outpatient evaluation and management visits mean diff (95% CI)	Total Medicare costs mean diff (95% CI), \$
Medicare Regional Cohort (n = 56,771)	0.8 (0.4, 1.1)	2352 (1632, 3072)
Medicare National Cohort (n = 93,956)	0.9 (0.6, 1.3)	2947 (2231, 3663)

^aRestricted to beneficiaries who were continuously enrolled in fee-for-service Medicare in 2003. Mean difference (95% CI) from Jackson Heart Study-Medicare Cohort (n=1104) (Satterthwaite method based on unequal group variance)

Table 4

Risks of Mortality, Hospitalization, and Emergency Department Encounters by Cohort Among Participants Dually Eligible for Medicare and Medicaid^a

	Regional 5% Medicare Cohort		National 5% Medicare Cohort	
	HR (95% CI)	Adjusted HR ^b (95% CI)	HR (95% CI)	Adjusted HR ^b (95% CI)
Mortality	1.9 (1.5–2.5)	1.4 (1.1–1.8)	1.9 (1.5–2.5)	1.3 (1.0–1.7)
All-cause hospitalization	1.2 (1.0–1.3)	1.0 (0.8–1.1)	1.2 (1.0–1.4)	1.0 (0.9–1.2)
Emergency department encounter	1.1 (0.9–1.2)	1.0 (0.9–1.1)	1.0 (0.9–1.2)	1.0 (0.8–1.1)

^aThe Jackson Heart Study–Medicare cohort served as the reference group.

^bAdjusted for age, sex, urban location and baseline comorbid conditions: cancer, cerebrovascular disease, chronic obstructive pulmonary disease, dementia, diabetes, heart failure, hypertension, ischemic heart disease, myocardial infarction, peptic ulcer disease, peripheral vascular disease, renal disease, valvular heart disease. Proportionality assumptions were met for study variable (regional/national) in all models.