

# Diabetes in the African-American Medicare Population

## Morbidity, quality of care, and resource utilization

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**OBJECTIVE** — To determine whether African-American Medicare recipients with diabetes are at increased risk for morbidity, poor quality of care, and high resource utilization.

**RESEARCH DESIGN AND METHODS** — We analyzed 1,376 patients with diabetes who were  $\geq 65$  years of age and in the 1993 Medicare Current Beneficiary Survey. Morbidity measures were the Katz Index of Activities of Daily Living, Instrumental Activities of Daily Living, overall health perception, Charlson Comorbidity Index score, and diabetic complications. Quality of care standards were glycosylated hemoglobin measurements, ophthalmological visits, lipid testing, mammography, influenza vaccination, readmission within 30 days of hospital discharge, and outpatient visits within 4 weeks of hospital discharge. We stratified Medicare reimbursement by type of service and adjusted for sex, education, and age in multivariable analyses.

**RESULTS** — Compared with white patients, African-American patients had worse health perception and lower quality of care. They were more likely to visit the emergency department and had fewer physician visits per year. African-Americans had higher reimbursement for home health services, but total reimbursement was similar after case-mix adjustment.

**CONCLUSIONS** — Improved access to preventive care for older African-Americans with diabetes may improve health perception and use of the emergency department. The potential effect on total reimbursement is unclear. Future policy interventions to improve quality of care among Medicare patients with diabetes should especially target African-Americans.

Diabetes affects  $>10\%$  of people aged  $\geq 65$  years (1) and is an excellent model for studying the burden of chronic disease among older people. Clinically, management of diabetes in older patients is particularly complicated because they often have multiple comorbid conditions, numerous cardiovascular, renal, ophthalmological, and neurological complications, limited social support, and constrained economic resources. Too often, the end result of the disease process is decreased functional status and high Medicare expenditures.

A disproportionate share of the burden of diabetes falls on African-Americans (2). Diabetes is 1.4 times more prevalent in adult African-Americans than whites (3), and significant educational, attitudinal, and socioeconomic barriers hinder efforts to improve care (4). Thus, older African-American patients with diabetes may be at particularly high risk for poor outcomes. Moreover, there are racial differences in the processes of care patients receive in general, even among patients with health insurance (5,6). For example, African-Americans with coronary artery disease and Medicare or

Veterans Administration insurance receive fewer invasive procedures than whites (7). However, most initial diabetes care does not involve expensive therapeutic procedures, but instead involves preventive care such as glucose control and screening for retinopathy. Such measures might forestall complications requiring further expenditure of resources. Therefore, we aimed to determine whether African-Americans with diabetes and enrolled in the Medicare program are at special risk for poor health, suboptimal preventive care, and high national expenditures.

### RESEARCH DESIGN AND METHODS

#### Study population

We studied diabetic patients in the Medicare Current Beneficiary Survey (MCBS), a continuous longitudinal survey of a representative sample of the Medicare population (8). The MCBS links Medicare claims data to surveys administered in patients' homes by trained interviewers. The questionnaires contain detailed information on health status, demographic characteristics, financing of health care, and access to care. Of 12,677 patients  $\geq 65$  years of age in 1993, 1,554 (12%) had diabetes as indicated by either 1) *International Classification of Diseases, Ninth Revision, Clinical Modification* (ICD-9-CM) diagnostic code of 250.00–250.91 on a Medicare claim in 1993 (89%) or 2) a self-designated diagnosis of diabetes in 1993 and a diagnostic code of 250.00–250.91 in either 1991 or 1992 (11%) (9). We then excluded 57 patients (4%) enrolled in health maintenance organizations, because Medicare claims data do not reliably capture their resource utilization. Finally, we excluded 80 patients (5%) who were neither African-American nor white and 41 (3%) for whom their level of education was unavailable. Thus, 1,376 patients were included in our sample. We analyzed outcomes and resource utilization using the 1993 MCBS.

#### Demographic characteristics and health status

We obtained sociodemographic informa-

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Received for publication 6 November 1997 and accepted in revised form 23 March 1998.

**Abbreviations:** ADL, activities of daily living; CPT, Current Procedural Terminology; IADL, instrumental activities of daily living; ICD-9-CM, *International Classification of Diseases, Ninth Revision, Clinical Modification*; MCBS, Medicare Current Beneficiary Survey; OR, odds ratio.

tion, the Katz Index of Activities of Daily Living (ADL) (10), and Instrumental Activities of Daily Living (IADL) (11) from the patient survey. We categorized education into <12 years and  $\geq 12$  years, and we divided patient age into 65–74 years, 75–84 years, and  $\geq 85$  years. Overall health perception was assessed with a single question: “Now I would like to ask you about your health. In general, compared with other people your age, would you say that your health is excellent, very good, good, fair, or poor?” We used Medicare claims data to calculate comorbidity using an adaptation of the Deyo and Romano versions of the Charlson Comorbidity Index (12,13). We also used administrative claims data to record diabetic complications with ICD-9-CM diagnostic codes (renal, 250.4, 581, 583, 585; ophthalmic, 250.5, 362, 365, 366, 369; neurological, 250.6, 337, 357, 354, 355, 358.1, 713.5; and peripheral circulatory, 250.7, 440, 441, 442, 443, 785.4).

### Quality of care measures

Disease-specific quality of care measures were primarily based on criteria developed by the American Diabetes Association as well as the RAND Corporation through expert consensus panels (14,15). These were measurements of glycosylated hemoglobin, yearly ophthalmologic examinations, and yearly lipid measurements. Other quality of care measures included readmission rates within 30 days of hospital discharge and the frequency of follow-up outpatient visits within 4 weeks of hospital discharge. Measures of the quality of general preventive care were yearly influenza vaccination and rates of mammography screening for women as tabulated through the claims data.

### Resource utilization

We calculated total Medicare reimbursement and also subdivided this sum into Part A (hospital, home health services, skilled nursing facility, hospice) and Part B (physician, outpatient, durable medical equipment). We also recorded the yearly number of physician visits per patient and the percentage of patients admitted to the hospital and treated in the emergency department. To enhance understanding about the patients' sources of care, we analyzed responses to survey questions about their satisfaction with the ease and convenience of getting to a doctor, the availability of medical care at night and on weekends, and out-of-pocket costs paid for medical care. These patient satisfaction questions were rated on a 4-point scale (1 = very

satisfied, 2 = satisfied, 3 = unsatisfied, and 4 = very unsatisfied). We dichotomized the answers to the patient satisfaction questions into “very satisfied” versus all other responses because patient satisfaction generally is highly skewed toward high satisfaction (16). We also studied information on whether patients had any health problem or condition in 1992 for which they should have seen a doctor or other medical professional but did not.

### Reasons for reimbursement

We stratified reimbursement by type of service. We divided Part A reimbursement into hospitalizations and all other reimbursements (home health services, skilled nursing facility, and hospice). We categorized Part B into primary care evaluation and management, other physician evaluation and management, outpatient, and all other physician services (radiology, anesthesia, pathology, laboratory, surgery, medicine except anesthesiology, and other) using *Current Procedural Terminology* (CPT) codes (APPENDIX) (17).

### Statistical analyses

We compared patient characteristics, rates at which quality of care standards were met, and resource utilization across race, sex, education, and age. We compared African-Americans with whites. In bivariate analyses, we used the  $\chi^2$  test for categorical variables and the *t* test for continuous variables (18). To determine whether race was an independent correlate of health status, quality of care measures, and resource utilization, we used linear and logistic regression. We adjusted for sex, education, and age in these analyses. Because reimbursement variables were not normally distributed, we analyzed their natural log transformations. We corrected for sampling effects in this clustered data set using the Statistical Analysis System (SAS WesVar) statistical package software (19). We also performed stratified analyses across race to identify subgroups with lower health status and worse quality of care. We stratified by sex, education, and age in these latter analyses.

## RESULTS

### Patient characteristics

The mean age of the 1,376 Medicare patients with diabetes was 77 years, 62% were women, 14% were African-American, 56% had less than a high school education, 22% lived alone, and 73% resided

in urban areas (Table 1). Most (85%) of these patients usually went to a doctor's office or group practice for their medical care; 12% attended a clinic and 3% had other sources of primary care. The mean number of ADL deficiencies was 1.0. African-Americans and whites had a similar number of comorbidities and diabetic complications, as well as equivalent deficiencies in ADL and IADL in multivariable analyses ( $P \leq 0.05$ ). However, among patients with diabetes, African-Americans had worse health perception than whites, mirroring racial differences in the wider Medicare population.

### Quality of care measures

In general, the rates for quality of care measures were low. Only 26% of patients had any measurement of glycosylated hemoglobin during the year (Table 2), and only 12% had two or more measurements. Furthermore, 56% had lipids calculated and 43% had multiple lipid measurements. Only 41% of the patients had influenza vaccinations and 23% of the women had mammograms, slightly different from the percentages for the nondiabetic Medicare population (36 and 27%, respectively).

Among all patients with diabetes, 544 (40%) had a visit to an ophthalmologist and 66 (12%) were diagnosed with retinopathy (ICD-9-CM code 362.x). Of the patients with retinopathy, 44 (67%) had background retinopathy, 20 (30%) had proliferative retinopathy, and the severity of disease was unknown in two patients. Overall, 21 (32%) patients subsequently had laser therapy (CPT codes 67141, 67145, 67208, 67210, 67227, 67228) during the year. Half of the patients with proliferative retinopathy had laser therapy, and 23% of the patients with background retinopathy received such treatment.

In multivariable analyses, African-Americans were less likely than whites to have measurement of glycosylated hemoglobin (adjusted odds ratio [OR] 0.65, 95% CI 0.48–0.88), lipid testing (OR 0.66, 95% CI 0.48–0.89), ophthalmological visits (OR 0.72, 95% CI 0.56–0.93), and influenza vaccinations (OR 0.26, 95% CI 0.19–0.36). Rates of follow-up outpatient visits within 4 weeks of a hospital admission were relatively high at 83%.

### Resource utilization and reasons for reimbursement

The mean total Medicare reimbursement

Table 1—Patient characteristics

	Total	Race		Sex		Education (years)		Age (years)		
		Black	White	Female	Male	<12	≥12	65–74	75–84	≥85
Sociodemographic										
n (sample)	1,376	190	1,186	856	520	770	606	550	617	209
≥85 years of age (%)	10	7	10*	12	5	11	8	—	—	—
Female (%)	61	72*	59	—	—	62	60	56	63‡	79§¶
Education ≥12 years (%)	47	23	50*	46	54	—	—	50‡§	44	40
Annual income ≥\$15,000 (%)	42	20	46*	29	62*	29	58*	49‡§	36¶	26
Lives alone (%)	25	23	25	34*	11	25	25	20	30‡	29§
Health status and functional status										
Charlson Comorbidity Index	2.5	2.4	2.5	2.4	2.6	2.5	2.5	2.4	2.7‡	2.5
Diabetic complications**	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8‡	0.7
ADL deficiencies	0.9	1.0	0.8	1.0*	0.6	1.0*	0.7	0.7	0.9‡	2.0§¶
IADL deficiencies	1.2	1.4	1.2	1.4*	0.8	1.4*	1.0	0.9	1.3‡	2.1§¶
Health perception††	3.2	3.4*	3.2	3.2‡	3.1	3.4*	3.0	3.2	3.2	3.2

\*P ≤ 0.01; †P ≤ 0.05; ‡P ≤ 0.01, age 65–74 years compared with age 75–84 years; §P ≤ 0.01, age 65–74 years compared with age ≥85 years; ¶P ≤ 0.01, age 75–84 years compared with age ≥85 years. ||Population estimates derived from the sampling weights: total = 4,017,442; black = 512,692; white = 3,504,750; female = 2,445,475; male = 1,571,967; education <12 years = 2,137,698; education ≥12 years = 1,879,744; age 65–74 years = 2,088,953; age 75–84 years = 1,542,429; age ≥85 years = 386,060. \*\*Mean number of complications (retinopathy, nephropathy, neuropathy, peripheral vascular disease); ††health perception: “In general, compared with other people your age, would you say that your health is excellent (= 1), very good (= 2), good (= 3), fair (= 4), poor (= 5)?”

was \$6,476, with 66% of this devoted to Part A reimbursement (Table 3). For Part B reimbursement, evaluation and management by a primary care physician accounted for ~11% of the total, while laboratory testing and radiographic procedures comprised 5% (Table 4). About 31% of the patients were admitted to the hospital, and the average number of outpatient visits was 9.6 per year.

African-Americans, women, and less-educated patients used the emergency department more frequently than other patients. African-Americans also had fewer visits to the physician than whites. Compared with whites, African-Americans were less likely to be very satisfied with the ease of getting to a doctor from where they lived (15 vs. 22%, P = 0.06). However, rates of being very satisfied with access to care on

nights and weekends as well as out-of-pocket medical costs were similar. Overall, 15% of African-Americans and 9% of whites reported having a health problem for which they should have seen a doctor but did not. These rates were statistically similar (P = 0.15).

Within Part A, African-Americans had higher reimbursement for home health services (Table 4). However, in linear regression

Table 2—Quality of care measures

Strata	n (sample)	HbA <sub>1c</sub>	Ophthalmic visit	Lipids	Influenza vaccination	Mammogram	Readmission within 30 days of hospital discharge	Follow-up 4 weeks after discharge
Total	1,376	26	40	56	41	23	19	83
Race								
Black	190	19	32	47	16	22	16	86
White	1,186	27†	41†	57	45*	23	19	83
Sex								
Female	856	27	41	58	39	23	21	84
Male	520	23	38	53	44	NA	16	83
Education (years)								
<12	770	23	37	53	35	16	19	86
≥12	606	29†	44†	59†	48*	31*	19	81
Age (years)								
65–74	550	25	38	56	41	29‡§	20	83
75–84	617	29¶	44¶	57¶	43¶	21¶	19	86
≥85	209	20	35	46	34	5	18	78

Data are %, unless otherwise indicated. \*P ≤ 0.01; †P ≤ 0.05; ‡P ≤ 0.01, age 65–74 years compared with age 75–84 years; §P ≤ 0.01, age 65–74 years compared with age ≥85 years; ¶P ≤ 0.01, age 75–84 years compared with age ≥85 years. ||Mammogram analyses limited to women.

Table 3—Resource utilization

Strata	n (sample)	Total reimbursement (\$)	Part A reimbursement (\$)	Part B reimbursement (\$)	Hospitalized (%)	Physician visits per year	Emergency visits (%)
Total	1,376	6,476	4,253	2,223	31	9.6	30
Race							
Black	190	8,063	5,153	2,910	30	8.4	39*
White	1,186	6,243	4,121	2,123	31	9.7†	29
Sex							
Female	856	6,525	4,386	2,139	31	9.8	32†
Male	520	6,398	4,045	2,353	30	9.1	26
Education (years)							
<12	770	6,396	4,157	2,239	32	9.6	34*
≥12	606	6,566	4,362	2,205	29	9.5	25
Age (years)							
65–74	550	6,671	4,293	2,377	29	9.3	29
75–84	617	6,201	4,111	2,090	31	9.7	31
≥85	209	6,518	4,600	1,918	37‡	10.1	35‡

\* $P \leq 0.01$ ; † $P \leq 0.05$ ; ‡ $P \leq 0.05$ , age 65–74 years compared with age  $\geq 85$  years. Part A reimbursement equals hospital, home health services, skilled nursing facility, hospice; Part B reimbursement equals physician, outpatient, durable medical equipment.

adjusting for age, sex, education, number of ADL and IADL deficiencies, overall health perception, comorbidities, and number of diabetic complications, race was not associated ( $P = 0.09$ ) with total reimbursement.

#### Stratified analyses

In stratified analyses across race, differences were most consistent among women. African-American women fared poorly compared with white women, having lower health perception, fewer measurements of glycosylated hemoglobin, fewer influenza vaccinations, more emergency department visits, and fewer visits to the physician. Among patients who were  $\geq 85$  years of age, African-Americans received fewer measurements of glycosylated hemoglobin and fewer ophthalmological visits and had lower health perception. In addition, among patients who had less than a high school education, African-Americans had fewer measurements of glycosylated hemoglobin and fewer influenza vaccinations.

**CONCLUSIONS** — The role of race in the natural history and care of patients with diabetes has been a concern because African-Americans have a greater prevalence of diabetes than whites, as well as higher rates of complications, including retinopathy, nephropathy, and amputation (4,20). Among patients with diabetes, older people are of particular interest clinically and with regard to health policy issues because they have high functional impairment and account for significant Medicare expenditures. Moreover, diabetes in the

elderly has been relatively understudied in the clinical, epidemiological, and medical-effectiveness literature (21,22).

It may be possible to improve the quality of care for older African-Americans with diabetes. We found that African-Americans with diabetes had a lower health perception than whites. In addition, processes of care

designed to enhance glucose control and prevention of microvascular problems, such as measurement of glycosylated hemoglobin and screening for retinopathy, were frequently not performed. African-Americans also visited the emergency department more frequently than whites and were less satisfied with the ease of get-

Table 4—Reasons for reimbursement

Reimbursement category	Black patients	White patients
n	190	1,186
Part A		
Hospitalization	3,722	3,238
Other A	1,432†	886
Home health services	1,187*	647
Skilled nursing facility	192	239
Hospice	53	0
Part B		
Evaluation and management	555	597
Primary care	269	307
Other physician	286	290
Outpatient	953†	472
All other	1,955	1,525
Radiology	143	172
Anesthesia	55	62
Pathology	16	23
Laboratory	123	141
Surgery	481	556
Medicine (except anesthesiology)	410†	237
Other physician	727†	334
Total	8,617	6,718

Data are given in \$, unless otherwise indicated. \* $P \leq 0.01$ , † $P \leq 0.05$ . Details of coding scheme are described in the APPENDIX. Total reimbursements differ slightly from the summary figures in Table 3 because they are based on partially different data.

ting to a doctor. While African-Americans tended to have higher reimbursement for home health services, total reimbursement was similar after case-mix adjustment. This skewed distribution of expenditures and heavier use of the emergency department may reflect the worse health perception of African-Americans as well as difficulties in accessing primary care. In stratified analyses, the racial differences were most consistently found among women, the less educated, and patients  $\geq 85$  years of age.

Our study and previous studies suggest that the rates at which key processes of care are delivered are low among older people in general. A study of Medicare patients  $\geq 65$  years of age in Alabama, Iowa, and Maryland revealed that 16% received glycosylated hemoglobin measurements, 46% saw an ophthalmologist, and 55% received lipid screening (23). A recent study of the Medicare population performed by the Physician Payment Review Commission and the RAND Corporation found that African-Americans received fewer eye examinations and measurements of glycosylated hemoglobin than whites (24). We confirmed these general findings even after adjusting for age, sex, and education.

Our analyses highlight several challenges in evaluating the quality of care of older African-Americans with diabetes. First, the most appropriate measures of high-quality care for older people with diabetes are unclear. Definitive evidence does not exist for documenting the style of care that will lead to the best outcomes for the elderly with diabetes (25). Interestingly, even though older African-Americans were less likely than whites to receive processes of care associated with reduced morbidity in younger patients, their rates of diabetic complications were similar. The similar complication rates may reflect a weaker linkage between these processes of care and outcomes among older patients than among younger patients. Compared with younger patients with diabetes, older patients are more likely to have multiple comorbidities and to die before developing diabetic complications (26). Thus, tight glucose control may benefit only a subset of older people with diabetes. Patient preferences regarding the aggressiveness of treatment may be especially important to elicit.

In addition, process measures of quality care are only proxies for actual clinical outcomes. Even if recommended processes of care, such as measurements of glycosylated hemoglobin or dilated eye examina-

tions, are performed, physicians need to take appropriate actions based on the results. Our findings indicate, for example, that patients with proliferative retinopathy were appropriately more likely to receive laser therapy than patients with background retinopathy. For older persons, however, functional status and health-related quality of life are often some of the most important outcomes to assess.

Regardless of the validity of the American Diabetes Association's standards for care for older patients (14), African-Americans were less likely than whites to receive several recommended services. These discrepancies may reflect a preference by African-Americans to avoid medical testing and procedures, but they could also result from a less aggressive treatment style by physicians for African-Americans or difficulties by African-Americans in gaining access to the health care system. In the Medicare program, all patients have financial access to basic medical services, yet these racial differences in the quality of care still exist. Nonfinancial barriers to access, including transportation, could also contribute, because African-Americans were less satisfied than whites with the convenience of getting medical care. In addition, racially and culturally specific treatment programs may be advantageous for some older patients with diabetes (27).

Given the distress and economic costs it imposes, diabetes among older people has been understudied. African-Americans are a subgroup among older people with diabetes who have particularly low health perception. Basic health services research is greatly needed, including understanding the preferences and treatment goals of older patients with diabetes, what treatment approaches will lead to the best outcomes for older people, why African-Americans may be receiving suboptimal care, and the cost implications of substandard care.

**Acknowledgments**— This project is a National Institute of Diabetes and Digestive and Kidney Disease Diabetes Research and Training Center Pilot and Feasibility Study (P60 DK-20595). M.H.C. is supported by the National Institute on Aging Geriatric Academic Program Award 5-K12-AG-00488.

The authors would like to thank Nicholas Christakis, MD, PhD, MPH, and Diane Lauderdale, PhD, for their helpful reviews of the manuscript.

This study was presented in part at the annual meeting of the Association for Health Services Research, 15 June 1997, Chicago, Illinois.

## APPENDIX

### Reimbursement categories: CPT codes

#### Part A

- Hospitalizations
- All other (home health services, skilled nursing facility, hospice)

#### Part B

- Physician
  - Evaluation and management
    - Primary care
      - Office visits
        - 99201–99205
        - 99211–99215
      - Emergency department services
        - 99281–99285
      - Nursing facility assessments
        - 99301–99303
        - 99311–99313
      - Domiciliary, rest home, or custodial care services
        - 99321–99323
        - 99331–99333
      - Home services
        - 99341–99343
        - 99351–99353
      - Prolonged physician service with direct patient contact
        - 99354–99355
      - Care plan oversight services
        - 99375–99376
    - Other physician evaluation and management
      - Office consult
        - 99241–99245
      - Preventive medicine services
        - 99387
        - 99397
        - 99401–99404
        - 99411–99412
        - 99420–99429
      - Special evaluation and management services (e.g., disability evaluation)
        - 99450
        - 99455–99456
        - 99499
    - Hospital
      - 99217–99223
      - 99231–99233
      - 99238–99239
    - Inpatient consult
      - 99251–99255
      - 99261–99263
    - Critical care services
      - 99291–99292
    - Confirmatory consult
      - 99271–99275
    - Emergency department services,

MD direction of EMS  
99288  
Prolonged physician service in  
inpatient setting  
99356-99357  
Prolonged physician service  
without direct patient contact  
99358-99360  
Case management services  
99361-99362  
Telephone calls  
99371-99373  
All other physician  
Radiology  
70000-79999  
Anesthesia  
00100-01999  
99100-99140  
Pathology  
80500-80502  
88000-88399  
Laboratory  
80002-80440  
81000-84999  
85002-87999  
Surgery  
10040-69979  
Medicine except anesthesiology  
90701-99199  
Other  
Outpatient

## References

- Kenny SJ, Aubert RE, Geiss LS: Prevalence and incidence of non-insulin-dependent diabetes. In *Diabetes in America*. 2nd ed. Harris MI, Cowie CC, Stern MP, Boyko EJ, Reiber GE, Bennett PH, Eds. Washington, DC, U.S. Govt. Printing Office, 1995, p. 47-67 (NIH publ. no. 95-1468)
- Gavin JR III: Diabetes in minorities: reflections on the medical dilemma and the healthcare crisis. *Transactions Am Clin Climatol Assoc* 107:213-225, 1995
- Tull ES, Roseman JM: Diabetes in African Americans. In *Diabetes in America*. 2nd ed. Harris MI, Cowie CC, Stern MP, Boyko EJ, Reiber GE, Bennett PH, Eds. Washington, DC, U.S. Govt. Printing Office, 1995, p. 613-629 (NIH publ. no. 95-1468)
- Anderson RM, Herman WH, Davis JM, Freedman RP, Funnell MM, Neighbors HW: Barriers to improving diabetes care for blacks. *Diabetes Care* 14:605-609, 1991
- Feinstein JS: The relationship between socioeconomic status and health: a review of the literature. *Milbank Q* 71:279-322, 1993
- Adler NE, Boyce WT, Chesney MA, Folkman S, Syme SL: Socioeconomic inequalities in health: no easy solution. *JAMA* 269:3140-3145, 1993
- Ford ES, Cooper RS: Racial/ethnic differences in health care utilization of cardiovascular procedures: a review of the evidence. *Health Serv Res* 30:237-273, 1995
- Adler GS: A profile of the Medicare Current Beneficiary Survey. *Health Care Financing Rev* 15:153-163, 1994
- Medicode: *The International Classification of Diseases, Ninth Revision, Clinical Modification*. 5th ed. Salt Lake City, UT, Medicode Publications, 1995
- Katz S, Ford AB, Moskowitz RW, Jackson BA, Jaffe MW: Studies of illness in the aged. The Index of ADL: a standardized measure of biological and psychosocial function. *JAMA* 185:914-919, 1963
- Lawton MP, Brody EM: Assessment of older people: self-maintaining and instrumental activities of daily living. *Gerontologist* 9:179-186, 1969
- Deyo RA, Cherkin DC, Ciol MA: Adapting a clinical comorbidity index for use with ICD-9-CM administrative databases. *J Clin Epidemiol* 45:613-619, 1992
- Romano PS, Roos LL, Jollis JG: Adapting a clinical comorbidity index for use with ICD-9-CM administrative data: differing perspectives. *J Clin Epidemiol* 46:1075-1079, 1993
- American Diabetes Association: Clinical practice recommendations 1998. *Diabetes Care* 21 (Suppl. 1):S1-S98, 1998
- Asch S, Sloss E, Kravitz R, Kamberg C, Genovese B, Young R: *Access to Care for the Elderly Project (ACE-PRO) Project Memorandum*. Santa Monica, CA, RAND, 1995 (RAND publ. PM-435-PPRC)
- Kaplan SH, Ware JE Jr: The patient's role in health care and quality assessment, with an update by Norbert Goldfield. In *Providing Quality Care: Future Challenges*. 2nd ed. Goldfield N, Nash DB, Eds. Ann Arbor, MI, Health Administration Press, 1995, p. 25-57
- Kirschner CG, Frankel LM, Jackson JA, Jacobson CA, Kotowicz GM, Leoni G, O'Heron MR, O'Hara KE, Reyes D, Rozell D, Willard DM, Yacorella SL, Young RL, Zanutto J: *Physicians' Current Procedural Terminology CPT 1996*. Chicago, American Medical Association, 1995
- Rao JNK, Scott AJ: The analysis of categorical data from complex sample surveys: chi-squared tests for goodness of fit and independence in two-way tables. *J Am Stat Assoc* 76:221-230, 1981
- A User's Guide to WesVarPC, Version 2.1*. Rockville, MD, Westat, 1997
- Veal YS: African Americans and diabetes: reasons, rationale, and research. *J Natl Med Assoc* 88:203-204, 1996
- Singh I, Marshall MC Jr: Diabetes mellitus in the elderly. *Endocrinol Metab Clin North Am* 24:255-272, 1995
- Dornan T: Diabetes in the elderly: epidemiology. *J R Soc Med* 87:609-612, 1994
- Weiner JP, Parente ST, Garnick DW, Fowles J, Lawthers AG, Palmer RH: Variation in office-based quality: a claims-based profile of care provided to Medicare patients with diabetes. *JAMA* 273:1503-1508, 1995
- Physician Payment Review Commission: *Monitoring Access of Medicare Beneficiaries*. Washington, DC, PPRC, 1995 (no. 95-1)
- Vijan S, Stevens DL, Herman WH, Funnell MM, Standiford CJ: Screening, prevention, counseling, and treatment for the complications of type II diabetes mellitus: putting evidence into practice. *J Gen Intern Med* 12:567-580, 1997
- Welch HG, Albertsen PC, Nease RF, Bubolz TA, Wasson JH: Estimating treatment benefits for the elderly: the effect of competing risks. *Ann Intern Med* 124:577-584, 1996
- Agurs-Collins TD, Kumanyika SK, Ten Have TR, Adams-Campbell LL: A randomized controlled trial of weight reduction and exercise for diabetes management in older African-American subjects. *Diabetes Care* 20:1503-1511, 1997