PREDICTORS OF HOSPITAL ADMISSIONS IN THE ELDERLY: ANALYSIS OF DATA FROM THE LONGITUDINAL STUDY ON AGING

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Healthcare for the elderly population presents enormous challenges, which are further complicated by ethnicity-related socioeconomic disparities in the United States. We set out to determine the predictors of hospital admissions in the elderly by conducting a retrospective cohort analysis of a nationally representative sample of community-dwelling individuals aged 70 and older in 1984 (n=7541). Multivariate logistic regression analysis of data from the Longitudinal Study on Aging revealed that race, health status, type of family relationship, and activities of daily living (ADL) are significant predictors of hospitalization among the elderly. Older blacks are less likely to be admitted into the hospital, compared to their white counterparts (OR 0.68, 95%CI 0.52–0.89). Elderly persons who perceive their health status as being fair or poor are three times as likely to be hospitalized than those who perceived their health status as excellent (OR 2.99, 95%CI 2.15–4.15). Those with impairment in activities of daily living are twice as likely to be confined to the hospital than those without impairment (OR 1.78, 95%CI 1.64–1.96). Elderly persons living with nonrelatives are three times as likely to be admitted for short hospital stays than those living with spouses (OR 2.90, 95%CI 1.44–5.82). Future identification of predictors of hospital admissions in the elderly may help characterize those at risk and perhaps allow for focused and timely intervention. (*J Natl Med Assoc.* 2003;95:1158–1167.)

Key words: hospital admissions ♦ predictors ♦ elderly ♦ race

INTRODUCTION

Persisting demographic trends make healthcare provisions for the elderly an important and recurring issue in the United States. The enormity of the challenges created by these demographic trends is further complicated by socioeconomic disparities among ethnic groups.

Although the elderly have a significant need for hospital care services, little is known about how these needs are met. In addition, few longitudinal studies had adequate samples of blacks to examine within-group differences that affect healthcare utilization patterns, an important gap our study seeks to fill.

The aim of this study is to determine the predictors of hospital admissions in the elderly population included in the Longitudinal Study of Aging employing Andersen's behavioral model of predisposing, enabling, and need variables.[1] Predisposing characteristics are synonymous with individual inclination to use healthcare services and include demographic factors, social systems, and health beliefs. The enabling characteristics in Andersen's model, such as income, insurance and regular source of care, comprise features that make health services available and accessible, while need is the basic and direct stimulus for the use of health services when the appropriate levels of predisposing and enabling characteristics exist.

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Table 1. Socioeconomic and Demographic Variables of the Study Sample (n=7540)

Selected Variables	%	Mean ± sd
Race/ethnicity:		
Whites	92.4	
Blacks	7.4	
Others	1.2	
Gender:		
Males	38.0	
Females	62.0	
Age:		
70–74	41.6	
75–79	30.6	
80–99	27.7	
Mean age		76.8 ± 5.5
Education:		
<12 years	57.1	
12 years	25.2	
Above 12 years	17.7	
Mean grade		10 ± 3.7
Marital Status:		
Never married	4.7	
Married	48.0	
Widowed	42.8	
Divorce/separated	4.5	
Poverty Status:		
Above poverty threshold	82.3	
Below poverty threshold	17.7	

Source: Longitudinal Survey on Aging, 1984, 1986. Percentages may not add up to 100% due to rounding of numbers

sd = standard deviation

The longitudinal design of this study permits the development of predictive models for the use of inpatient hospital care services and allows us to examine the effect of social network structure and care, on the rate of hospital admission among the study population. Most importantly, future identification of predictors of hospital admission in the elderly may help to identify those at risk and perhaps allow focused and timely intervention.

METHODS

Data Source

The LSOA is a long-term prospective study of 7,541 Americans aged 70 years and older who were not residing in nursing homes in 1984.[2] The 1984 baseline data ["Supplement on Aging" (SOA)] was collected as part of the National Health Interview Survey (NHIS) for that year and involved face-to-face interviews with respondents (or family members if participants were unable to answer the survey).[3] The 1986 and 1988 reinterviews were telephone follow-ups for those who had phones, and mail follow-ups for those who did not. The 1984 SOA collected data on past nursing home stays, source of help, family structure, relationships, support, basic and instrumental activities of daily living, opinions about health, and additional data on health conditions and impairments of older people. The LSOA 1986 and 1988 reinterviews collected data on living arrangements, death, physical limitations, and nursing home/hospital stays preceding the reinterviews. The sample for the LSOA had an overall follow-up completion rate of 92% for the 1986 reinterviews.[2] The present study is limited to data obtained from the baseline (1984) and 1986 follow-up surveys.

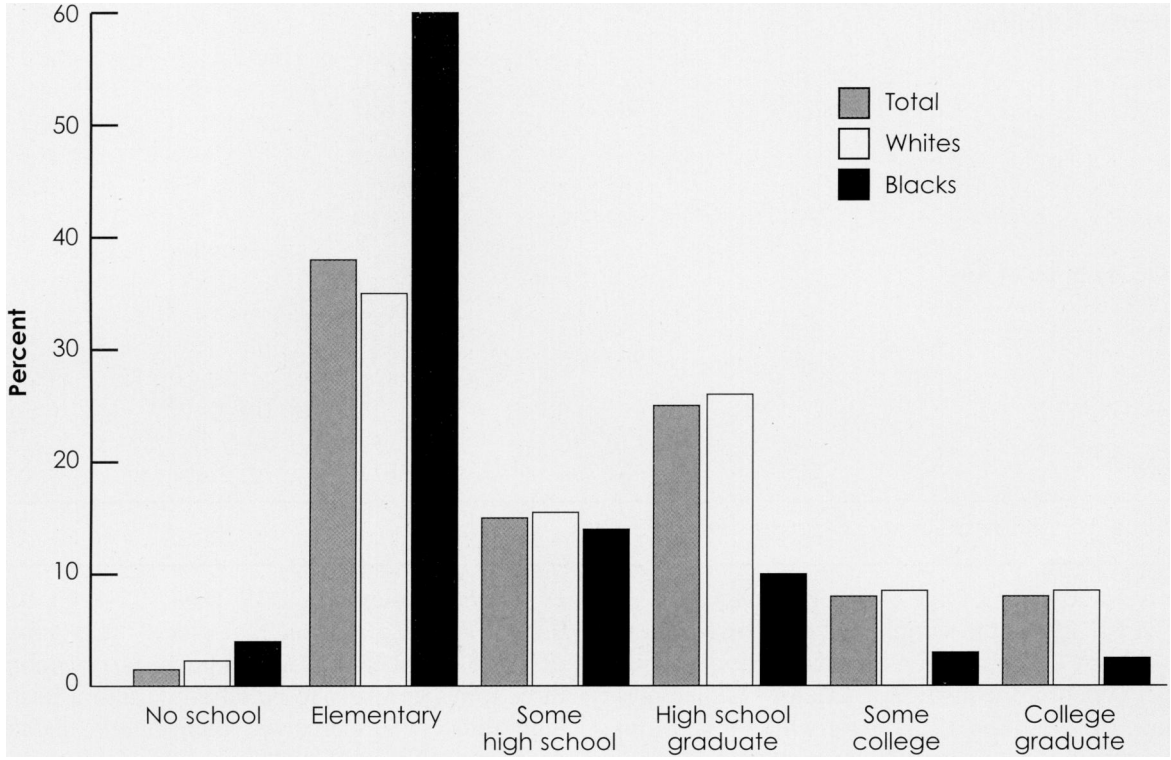
Variables

The LSOA provided a large pool of probable variables through a total of 1,991 queries posed to respondents. Demographic variables considered in the analysis include race (white, black, other), gender (male, female), age (70–74, 75–79, 80–99), education (<12 years, 12 years and >12 years), marital status (never married, married, widowed, and divorced/separated), and poverty status (above or below poverty status based on the poverty line of $4,979 for a single person aged 65 or older in 1984).

Family income was ascertained in the LSOA by asking whether family income was more or less than $20,000. Different flashcards were used to differentiate between the two categories and to determine income and expenditure patterns. Questions asked included: Do you/your partner receive social security, veterans benefits, pensions? Any mortgage/home equity? Do you own or rent residence? How do finances work out at the end of the month?

Family structure and living arrangements were determined by several issues (number of people living in household, current marital status, any adult other than spouse in household—if yes, relationship to person). Questions were also asked on getting together with family (frequency of contact with family members not living in the same household over the past two weeks through visits, mail, phone, outings, etc.) and interaction with friends/ neigh-

Figure 1. Percent Distribution of Education Attainment by Race



Source: Longitudinal Survey on Aging, 1984, 1986.

bors (frequency of contact with friends/neighbors over the past two weeks through visits, mail, phone, outings, etc.). Self-rated health status was classified as excellent, very good, good, fair, and poor.[3]

For purposes of this study, possible predictors of hospital admissions in the elderly were analyzed using the Andersen model. Race, education, and family relationship were examined as variables that predispose individuals to utilize admission services differently. Family income, health insurance coverage, and social network involvement were examined as enabling variables, while perceived health status and activities of daily living (ADL) were examined as need variables. The outcome of interest was hospital stays/admissions.

Statistical Analysis

Initial bivariate analyses of selected predisposing, enabling, and need variables by race was conducted. Exploratory factor analysis was then performed using SAS® to determine whether the predisposing, enabling, and need variables load differently between blacks and whites. Because of the disproportionately higher number of whites compared to blacks in the LSOA sample, and the fact that the predisposing, enabling, and need variables had different factor-loading between blacks and whites, separate odds ratio, Chi-square statistics and 95% confidence intervals were estimated for individual ethnic groups in the initial bivariate models. Cross tabulations, logistic regression, and other final analyses were performed in SUDAAN®, a statistical software that takes into account the multistage sampling design in estimating variance. Statistical significance was assessed at the 5% level.

RESULTS

Table 1 illustrates the socioeconomic and demographic characteristics of the study population. The cohort consisted of 560 blacks and 6,880 whites

Table 2. Distribution of Difficulty in Walking and Difficulty in Toilet Use by Race

	Sample Size	Weighted Size	Percent	p-value
Difficulty in Walking				
Whites				0.0001
Yes	1,484	229,970	22.1	
No	5,343	808,094	77.9	
Blacks				
Yes	160	27,763	30.6	
No	394	62,839	69.4	
Difficulty in Toilet Use				
Whites				0.0017
Yes	353	53,948	5.2	
No	6,468	983,175	94.8	
Blacks				
Yes	46	8,196	9.0	
No	508	82,767	91.0	

Source: Longitudinal Survey on Aging, 1984, 1986.

who were 70 years of age or older in 1984.

Overall, 2% of the sample had no formal education (Figure 1), but when stratified by ethnicity, blacks constitute a disproportionately higher percentage (4.98% versus 1.37% for whites). The converse is true for college education, with 8.90% of whites in the sample having completed college, compared to only 2.72% of blacks.

Fewer blacks (9.4%) rated their health status excellent, compared to whites (15.5%). Blacks who rated their health status as being poor were twice as many in number as whites who rated their health status as being poor (χ^2=40.42; p-value <0.001, Figure 2).

Figure 3 shows the distribution of living arrangements (family relationships) by race. While a large number (35%) of the elderly in the LSOA live alone, elderly blacks are more likely to live with relatives (35.8% blacks versus 15.1% whites, see Figure 3). In addition, a higher proportion of whites (49.4%) were married and lived with their spouses, compared to blacks (38.5%). These differences were statistically significant (χ^2=36.68, p-value <0.001).

As shown in Table 2, analysis of the various ADL measures and variation across races revealed significant differences between blacks and whites with regards to difficulty ambulating (p=0.0001) and difficulty in toilet use (p=0.002).

Multivariate logistic regression analysis (Table 3) showed that older blacks are less likely to be admitted into the hospital as compared to their older white counterparts (OR 0.68, 95% CI 0.52–0.89). It is also evident that elderly persons who perceive their health status as being fair or poor are three times as likely to be admitted into a hospital than those who perceived their health status as excellent (OR 2.99, 95% CI 2.15–4.15 and OR 2.79, 95% CI 1.92–4.05 respectively, Table 3).

The type of family relationship (i.e., living arrangements) was also a predictor of short hospital stays. Elderly persons living with nonrelatives are three times as likely to be admitted into the hospital for short stays than those living with their spouses (OR 2.90, 95% CI 1.44–5.82, Table 3).

Another significant predictor of hospital admission in the elderly was ADL. The elderly with deficiency in ADL are more likely to be admitted into a hospital than those who do not have a deficiency (OR 1.78, 95% CI 1.64–1.96, Table 3).

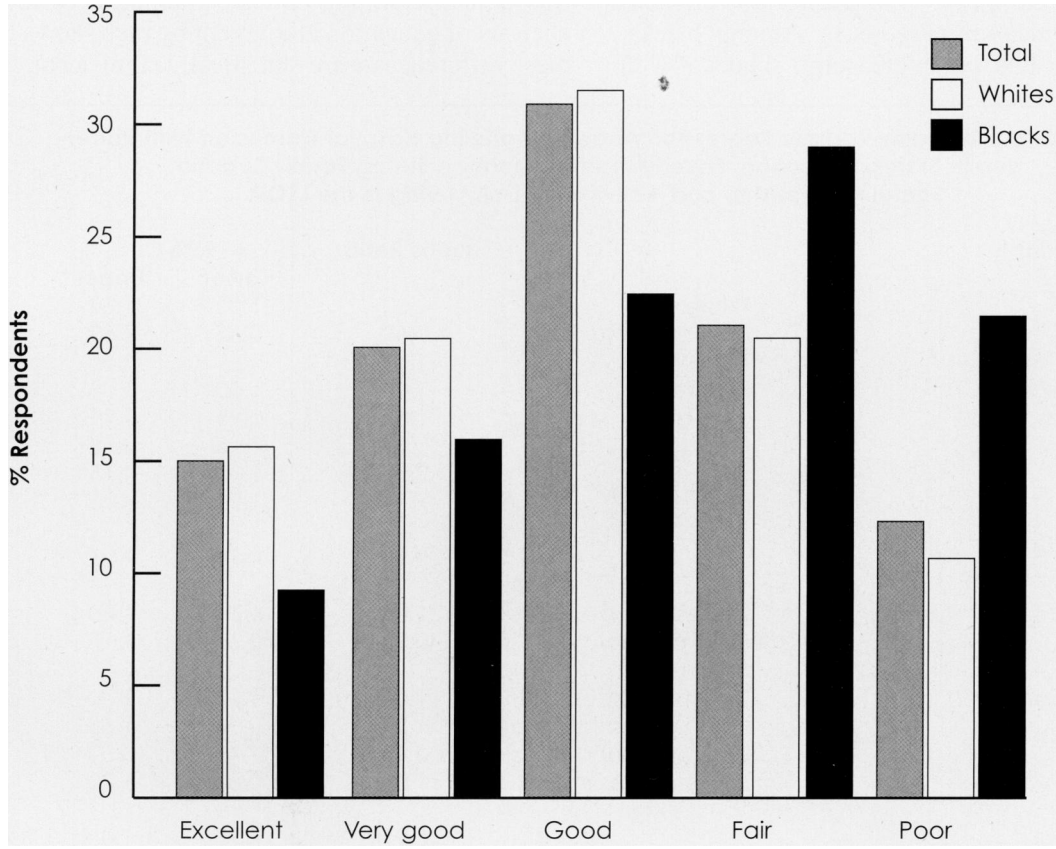
Education, poverty status, family income, medicare, and social network variables (getting together with friends, getting together with friends/neighbors, going to church, talking with relatives on the phone, attending movies, and attending sport events) are not predictors of short hospital stays/admissions.

DISCUSSION

Race

The importance of skin color in racial classification schemata has contributed to the dichotomy in

Figure 2. Perceived Health Status by Race



Source: Longitudinal Survey on Aging, 1984, 1986.

racial categorization into black and white.[4] The Longitudinal Study of Aging classified race into white, black, and other; but our analysis examined race using white and black categories, because our primary interest was in white-versus-black comparison.

Given the result of the multivariate logistic regression analysis (Table 3), we believe that race/ethnicity is a predictor of short hospital stays/admissions. We also found that black elderly persons are less likely to be admitted into the hospital, compared to their older white counterparts. Several studies have shown that blacks are less likely to receive medical services—particularly intensive care—than whites.[5,6] Medicare data on hospital discharges among persons 65 years of age or older show that from 1986–1992, black beneficiaries used 17 common procedures less often than white beneficiaries. Of note is the fact that coronary artery bypass surgery, percutaneous transluminal coronary angioplasty, and total hip replacement were less than half as frequent among blacks.[7] Although we know that the rate of osteoporosis in blacks is lower than in whites[8,9] and may be responsible for the difference in frequency of hip replacement surgeries, these common procedures are likely to require hospitalization and could partly explain our findings. Andersen and Newman[10] also examined trends in hospital admissions rates between 1957–1970 and found that while overall admission rates decreased slightly over the latter 10 years or so, the rates for whites continue to be significantly higher. Our analysis shows that the trend may have persisted to the present.

Factors, such as education and the skills that come from it, inevitably restrict the ability of some blacks to gain access to and negotiate effectively

for the best medical treatment available.[11] In the LSOA population, the highest level of education completed by the majority of blacks was elementary school education (Figure 1). Among blacks, the proportion that completed high school (12%) was less than half the proportion of whites that completed high school (26%). This observation was repeated among college graduates. Bivariate analysis of education attainment by race shows that these differences were statistically significant.

Table 3. Multivariable Logistic Regression Analysis Modeling Hospital Admission With Race, Health Status, Education, Poverty Index, Insurance Status, Family Support, Social Relationship and Activities of Daily Living in the LSOA

Predictor Variables		Odds Ratio	95% CI	
			Lower	Upper
Race**	Whites	1.00	1.00	1.00
	Blacks	0.68	0.52	0.89
Health Status***	Excellent	1.00	1.00	1.00
	Very good	1.30	0.95	1.79
	Good	1.59	1.15	2.18
	Fair	2.99	2.15	4.15
	Poor	2.79	1.92	4.05
Education		0.98	0.96	1.01
Poverty Status	Above poverty	1.00	1.00	1.00
	Blow poverty	0.88	0.67	1.17
Family Relationship**	Living with spouse	1.00	1.00	1.00
	Living with other relative	1.26	0.97	1.63
	Living with nonrelative	2.90	1.44	5.82
	Living alone	1.00	0.80	1.23
Family Income		0.99	0.93	1.05
Medicare	Covered	1.00	1.00	1.00
	Not covered	1.16	0.68	1.97
Get Together With Relatives	Yes	1.00	1.00	1.00
	No	0.93	0.75	1.15
Talk With Relatives on Phone	Yes	1.00	1.00	1.00
	No	0.97	0.74	1.27
Get Together With Friends/Neighbors	Yes	1.00	1.00	1.00
	No	1.10	0.91	1.34
Go to Movies, Sports, Events	Yes	1.00	1.00	1.00
	No	0.96	0.73	1.27
ADL*	Yes	1.00	1.00	1.00
	No	1.78	1.64	1.96

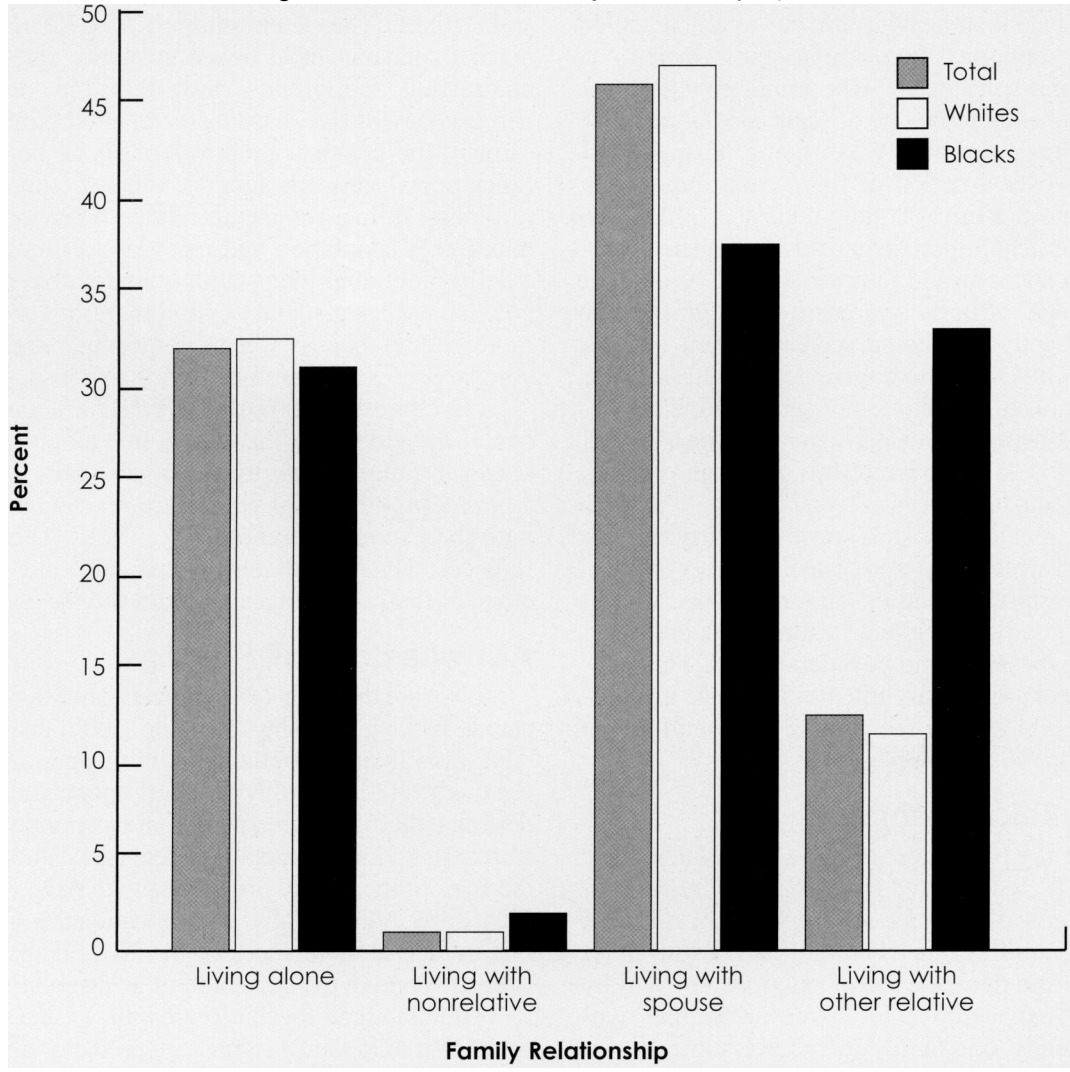
Source: Longitudinal Survey on Aging, 1984, 1986.

CI = Confidence interval
* p-value=0.01 ** p-value <0.01 *** p-value<0.0001

In addition, other studies[12] have shown that blacks are less likely to demand or receive adequate information about their disease process and more likely to report themselves to be in poor health than whites of the same age group and gender. It has also been speculated that blacks and whites may differ in terms of their treatment choices.[13] These findings should give rise to concern in view of the relatively "poor" health status of blacks, compared to whites in this country. Black/white differences among adults in mortality and in prevalence of hypertension, diseases of the circulatory system, diabetes, cancer, arthritis, nervous and mental disorders, disabling conditions, and activity limitations have been acknowledged.[14,15] Such findings indicate that, by most of these measures, the health of black adults is worse than that of their white counterparts. Diseases that account for the largest proportion of excess morbidity and mortality among blacks are chronic diseases—especially hypertension, diabetes, stroke, renal disease, and common cancers.

In contrast to our findings, a study on younger age groups (25–64 years) shows black beneficiaries are hospitalized more often and have higher

Figure 3. Distribution of Family Relationship by Race



Source: Longitudinal Survey on Aging, 1984, 1986.

mortality rates.[16] Perhaps this may hold true for a subcategory of hospitalized, much sicker blacks who enter the acute care hospital setting.

Health Status

The process through which individuals perceive symptoms, interpret them, and decide to seek specific kinds of healthcare is extraordinarily complex. Self-assessed health status is an important need variable in Andersen's model and is related to such factors as psychological distress, social competence, and educational level of the individual. In this study, elderly persons who perceived their health status as being "fair" or "poor" were found to be three times more likely to be admitted into a hospital than those who perceived their health status as "excellent". Our finding is supported by a similar study carried out by Boult and colleagues,[17] who found poor self-rated general health to be one of eight risk factors that affect elders' probability of being hospitalized repeatedly over a period of four years. Individuals that are more aware of their bodies are likely to assess their health more negatively than their objective health status would indicate. Hansell[18] reported a higher level of body awareness was significantly associated with longitudinal increases in the volume of patient-initiated illness visits to a health maintenance organization but was not significantly associated with longitudinal changes in physician-initiated follow-up visits, internal referrals, external referrals, or hospital inpatient days.

When separate models were constructed for blacks and whites, only poor health status predicted short hospital admissions among blacks, whereas a very good to excellent health status predicted short hospital stay among older whites. This provides support for the argument that blacks are usually sicker before seeking medical attention, an observation we discussed earlier.

Family Relationships

During the past three decades, researchers have consistently documented that family members provide the bulk of care for the impaired or disabled aged.[19-22] Families are distinguished from other groups by the permanence of relationships and by members' expectations for love and mutual support. Typically, one family member assumes major responsibility for care[23-25]; this person is most often the spouse or daughter of the care recipient.[26,27]

In this study, we found that individuals living with nonrelatives are three times more likely to be admitted into the hospital for short stays than those living with their spouses. This finding is not unexpected, since in times of need the elderly generally first turn to their family for social support,[28-30] and illness is certainly no exception. Elders' desire for families to provide support is borne out the strong supportive roles of families. The elderly individual living with a spouse has access to services that a nonrelative may not readily provide (such as feeding, toileting, bathing, administering medications, etc.) and which might influence the decision of the physician to attend to the individual on an outpatient basis.

Lower incidence of mental illness and heart attacks in communities characterized by close-knit and stable ties has been reported.[31,32] Evidence that married persons have lower mortality rates than unattached individuals, and that the recently bereaved are at risk, has also been cited as an indicator of the health-related role of social bonds.[33,34] Since social network support enhances immunity to illness, influences health-related behaviors, and maximizes adaptation and recovery to illness,[35] an elderly individual living with a nonrelative is likely to have weaker social ties and therefore becomes more vulnerable to illness requiring admission, compared to someone living with a spouse.

It is interesting to note that while a large number of the elderly in the LSOA live alone, elderly blacks are more likely to live with relatives, while a higher proportion of whites are married and live with their spouses, compared to blacks. These differences were statistically significant and reflect ethnocultural differences between the races.

Activities of Daily Living

ADLs are the basic tasks of everyday life, such as eating, bathing, dressing, toileting, and transferring. ADL assessment is useful in describing and comparing the level of disability in elderly populations and defining the need for personal assistance in home care among disabled persons. Reported estimates of the sizes of the elderly population with ADL disabilities differ substantially across national surveys,[36] mainly due to differences in the ADL items being measured and in the definition of a "disability".

In multivariate logistic regression (Table 3), we found that ADLs are a significant predictor of hospital admission. The elderly with deficits in the performance of everyday activities are twice as likely to be admitted into the hospital than those who have no

deficits. Our finding is similar to the observations by Scott and colleagues where they found that clients with a decline in ADL function in the South Carolina Long Term Care data were at increased risk of institutionalization.[37] When we examined the various ADL measures and variation across races, we found that significant differences exist between blacks and whites with regards to difficulty in ambulating and in toilet use, with more blacks reporting difficulty in walking and in their ability to use the toilet compared to whites. This finding suggests that blacks are more functionally dependent in ADL activities than whites[38,39] and is consistent with the reports that elderly blacks are often admitted to the hospital more severely ill than whites.[40] In addition, medical conditions, such as stroke that have substantial impact on physical function in the elderly have been found to be more common in blacks, compared to whites[41] and might be a contributory factor to the difference seen in impairment between the two races.

CONCLUSION

Important differences continue to exist between older Americans' access to healthcare services and their overall health status. Elderly black persons are less likely to be admitted into the hospital, compared to their white counterparts. Poor health status is a predictor of hospital admission among both older whites and blacks. It appears that blacks are largely admitted to the hospital in the later stages of a disease process. Overall, living with nonrelatives appears to be a predictor of hospital admission among the elderly but more so for whites than it is for blacks. Health programs designed for and targeted towards elderly persons who report fair to poor health status may provide a useful and early intervention for preventing future disabilities. Identified predictors could, in the future, be useful in estimating the risk of hospitalization, as well as in identifying those at risk and those who may derive the greatest benefit from focused and timely intervention.

ACKNOWLEDGEMENT

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REFERENCES

1. Andersen RM. A Behavioral Model of Families' Use of Health Services, Chicago: Center for Health Administration Studies, 1968.

2. Kovar MG, Fitti JE, Chyba MM. The Longitudinal Study of Aging: 1984-90. *Vital Health Stat 1.* 1992;1:1-248.

3. The Supplement on Aging to the 1984 National Health Interview Survey. Washington DC: Government Printing Office; 1987. US Dept of Health and Human Services Publication No. 87-1323.

4. Krieger N. Shades of difference: theoretical underpinnings of the medical controversy on black/white differences in the United States, 1930–1970. *Int J Health Serv.* 1987;17:259-278.

5. Yergan J, Flood AB, LoGerfo JP, et al. Relationship between patient race and the intensity of hospital services. *Med Care.* 1987;25:592-603.

6. Council on Ethical and Judicial Affairs, AMA, Chicago, Ill. Black-White disparities in healthcare. *JAMA.* 1990;263:2344-2346.

7. McBean AM, Gornick M. Differences by race in the rates of procedures performed in hospitals for Medicare beneficiaries. *Health Care Finance Rev.* 1994;15:77-90.

8. Bohannon AD, Hanlon JT, Landerman R, et al. Association of race and other potential risk factors with nonvertebral fractures in community-dwelling elderly women. *Am J Epidemiol.* 1999; 149:1002-1009.

9. Henry YM, Eastell R. Ethnic and gender differences in bone mineral density and bone turnover in young adults: effect of bone size. *Osteoporos Int.* 2000;11:512-517.

10. Anderson R, Newman J. Societal and individual determinants of medical care utilization in the United States. *Milbank Memorial Fund Quarterly.* 1973;51:95-124.

11. Levy DR. White doctors and black patients: influence of race on the doctor–patient relationship. *Pediatrics.* 1985;75:639-643.

12. Schoenbaum M, Waidmann T. Race, socioeconomic status, and health: accounting for race differences in health. *J Gerontol.* 1997;52B:61-73.

13. Perkoff GT, Anderson M. Relationship between demographic characteristics, patient's chief complaint, and medical care destination in an emergency room. *Med Care.* 1970;8:309-323.

14. Manton KG, Patrick CH, Johnson KW. Health differentials between blacks and whites: recent trends in mortality and morbidity. *Milbank Quarterly.* 1987;65:129-199.

15. Bernard MA. The health status of African-American elderly. *J Natl Med Assoc.* 1993;85:521-528.

16. Pappas G, Queen S, Hadden W, et al. The increasing disparity in mortality between socioeconomic groups in the United States, 1960 and 1986. *NEJM.* 1993;329:103-109.

17. Boult C, Dowd B, McCaffrey D, et al. Screening elders for risk of hospital admission. *J Am Geriatr Soc.* 1993;41:811-817.

18. Hansell S, Sherman G, Mechanic D. Body awareness and medical care utilization among older adults in an HMO. *J Gerontology.* 1991;46:3,S151-159.

19. Cantor MH. Strain among caregivers: a study of experience in the United States. *Gerontologist.* 1983;23:597-604.

20. The well-being of older people in Cleveland, Ohio: a report to Congress. Comptroller General of the United States 1977. Washington, DC: General Accounting Office.

21. Shanas E. The family as a social support system in old age. *Gerontologist.* 1979;19:169-174.

22. The well-being of older people in Cleveland, Ohio: a report to congress. Comptroller General of the United States 1977. Washington, DC: General Accounting Office.

23. Shanas E. The family as a social support system in old age. *Gerontologist.* 1979;19:169-174.

24. Horl J, Rosenmayr L. Families versus organizations as

caregivers. XIIIth International Congress of Gerontology, 1985. New York.

25. Johnson CL. Dyadic family relations and social support. *Gerontologist.* 1983;23:377-383.

26. Bass DM. An evaluation of the success of a home-based hospice program. Doctoral dissertation, 1985. University of Akron.

27. Sommers T. Caregiving: a woman's issue. *Generations.* 1985;X:9-13.

28. Gottlieb BH. Assessing and strengthening the impact of social support on mental health. *Social Work.* 1985;30:293-300.

29. Kaye LW. Home care for the aged: a fragile partnership. *Social Work.* 1985;30:312-317.

30. Hooyman N. Social support networks in services to the elderly. In: Whittaker J, Garbarino and Associates, eds. Social support networks: informal helping in the human services, New York: Aldine; 1983:133-164.

31. Bruhn J. An epidemiological study of myocardial infarctions in an Italian-American community. *Journal of Chronic Disease.* 1965;18:353-365.

32. Bruhn J, Brandt E, Shackelford M. Incidence of treated mental illness in three Pennsylvania communities. *Am J Pub Health.* 1966;56:871-883.

33. Parkes CM. The effects of bereavement on physical and mental health: a study of the medical records of widows. *BMJ.* 1964;4:13-16.

34. Jacobs S, Ostfeld A. An epidemiological review of the mortality of bereavement. *Psychosomatic Medicine.* 1977;39:344-357.

35. Bloom J. Social support systems and cancer: a conceptual view. In: Cohen J, Cullen J, Martin R eds. Psychological aspects of cancer. New York: Raven Press, 1982.

36. Weiner JM, Hanley RJ, Clark R, et al. Measuring the activities of daily living: comparisons across national surveys. *J Gerontol.* 1990;45:S229-237.

37. Scott WK, Edwards KB, Davis DR, et al. Risk of institutionalization among community long-term care clients with dementia. *Gerontologist.* 1997;37:46-51.

38. Miller DK, Carter ME, Miller JP, et al. Inner-city older blacks have high levels of functional disability. *Journal of American Geriatrics Society.* 1996;44:1166-1173.

39. Wallace Jr PE. Characteristics of black Medicaid elderly and their access to postacute care. *J Natl Med Assoc.* 1995;87:467-472.

40. Buckle JM, Horn SD, Oates VM, et al. Severity of illness and resource use differences among white and black hospitalized elderly. *Arch Intern Med.* 1992;152:1596-1603.

41. Kennedy BS, Kasl SV, Brass LM, et al. Trends in hospitalized stroke for blacks and whites in the United States, 1980-1999. *Neuroepidemiology.* 2002;21:131-141.