patient needs may be as important to the success of health reform as the overall reform package itself. Public hospitals will probably need assistance in defining their role and function in a system of managed competition. They will need to be monitored and, if necessary, allocated new resources to ensure that they will be able to continue offering appropriate care to those in need. □

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References

1. Gornick M, Greenberg JN, Eggers PW, Dobson A. Twenty years of Medicare and Medicaid: covered populations, use of benefits, and program expenditures. *Health Care Finance Rev.* 1985;6(suppl):13–59.
2. Mariano LA. Growth of the Medicare population. *Health Care Finance Rev.* 1989; 10:123–124.
3. Fein R. *Medical Care, Medical Costs: The Search for a Health Insurance Policy.* Cambridge, Mass: Harvard University Press; 1986:52–67.
4. Williams SJ, Torrens PR, eds. *Introduction to Health Services.* 3rd ed. Albany, NY: Delmar Inc; 1988:335–370.
5. Coe RM, Brehm HP, Peterson WA. Impact of Medicare on the organization of community health resources. *Milbank Mem Fund Q Health Soc.* 1974;52(3):231–264.
6. Gornick M. Trends and regional variations in hospital use under Medicare. *Health Care Finance Rev.* 1982;3:41–73.
7. Piore N, Lieberman P, Linnane J. Public expenditures and private control? Health care dilemmas in New York City. *Milbank Mem Fund Q Health Soc.* 1977;55(1):79–116.
8. *County and City Data Book, 1967.* Washington, DC: US Bureau of the Census; 1967:32.
9. *County and City Data Book, 1972.* Washington, DC: US Bureau of the Census; 1972:54.
10. *Quarterly Report of Hospitals, Fourth Quarter, 1991.* Sacramento, Calif: Office of the Statewide Health Planning and Development, California Department of Health Services; 1991.

Sociodemographic and Health Factors in Driving Patterns after 50 Years of Age

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ABSTRACT

Data from the 1990 Panel Study of Income Dynamics were used to predict, by means of logistic regression, the likelihood that people who had previously driven would continue to drive and to drive after dark after 50 years of age. The results support the conclusion that driving patterns appear to be explained partly by a combination of sociodemographic factors and health status. Furthermore, it is shown that those reported to drive for nondrivers appear to be the same individuals known to provide most informal support for functionally impaired elderly people. (*Am J Public Health.* 1994;84:1327–1329)

Introduction

As the ranks of older Americans grow, more older people will be driving. Using a population-based study sample that included a substantial representation of older African Americans, we attempted to answer the following questions: What sociodemographic, economic, and health factors are associated with driving and driving after dark among older people? Among older people who do not drive, who assumes responsibility for driving them?

Methods

This study was based on reports of driving habits from a 1990 health supplement questionnaire mailed to household heads and spouses more than 50 years of age taking part in the nationally representative Panel Study of Income Dynamics.[1] Of the 3277 individual eligible household heads and spouses, 2429 (74%) completed surveys.

Sociodemographic variables studied in this analysis included age, sex, race, education, marital status, gross income of head of household and spouse (in 1988), number of adults in the household, urbanicity of the county of residence, and region of the country. Health status was measured by three multi-item subscales based on the RAND SF 36 health survey: general health perceptions and physical and emotional role functioning (higher scores indicate better health status for each index).[2] Functional status was measured by reported limitations in the following activities of daily living and instrumental activities of daily living: bathing, dressing, toileting, transferring, walking inside the home, eating, doing light housework, preparing meals, doing laundry, shopping for groceries, managing money, taking medications, and telephoning. Also, the presence of the following self-reported chronic medical conditions was noted: arthritis, hypertension, hearing impairment, visual impairment, con-

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TABLE 1—Demographic, Health, and Functional Status Data of Study Participants

	Sample (n = 2429), %
Age, y	
50–59	34
60–69	36
70–79	21
80–89	8
90+	1
Sex	
Male	41
Female	59
Race/ethnicity	
White	72
African American	24
Other	2
Marital status	
Married	63
Never married	3
Widowed	22
Divorced/separated	11
General health	
Excellent, very good, or good	65
Fair or poor	35
Functional status	
Limitation in ≥ 1 activity of daily living	17
Limitation in ≥ 1 instrumental activity of daily living	21
Medical conditions: ≥ 1 chronic medical condition	72

TABLE 2—Predictors of Older Persons Continuing to Drive after 50 Years of Age and Driving after Dark

	Adjusted Odds Ratio[a] (95% Confidence Interval)	
	Driving after 50 Years of Age (n = 1880)	Driving after Dark (n = 1536)
60–70 years of age	0.07 (0.02, 0.03)	0.36 (0.18, 0.71)
70–80 years of age	0.03 (0.006, 0.012)	0.09 (0.05, 0.19)
80–90 years of age	0.004 (0.001, 0.019)	0.03 (0.01, 0.07)
90+ years of age	0.002 (0.0002, 0.014)	0.02 (0.002, 0.21)
Female	0.30 (0.17, 0.53)	0.17 (0.10, 0.29)
Married	3.06 (1.59, 5.92)	. . .
Education > 12 y	2.24 (1.21, 4.17)	3.39 (1.95, 5.92)
No. of adults in household	0.64 (0.42, 0.98)	. . .
Urban county of residence, %	0.99 (0.98, 1.00)	. . .
West	2.76 (1.30, 5.88)	. . .
North Central	2.33 (1.16, 4.65)	. . .
Health perceptions index[b]	1.18 (1.10, 1.27)	. . .
Emotional role functioning index[c]	0.86 (0.64, 1.17)	1.39 (1.06, 1.82)
Functional limitation in shopping	. . .	0.30 (0.10, 0.90)
Functional limitation in preparing meals	6.45 (1.87, 22.22)	. . .
Functional limitation in taking medication	0.07 (0.01, 0.45)	. . .
Functional limitation in using the phone	1.20 (0.34, 4.23)	17.32 (1.00, 300.67)
Visual impairment	0.47 (0.27, 0.81)	0.27 (0.16, 0.47)
Arthritis	3.08 (1.82, 5.23)	1.76 (1.08, 2.86)
Diabetes mellitus	0.84 (0.39, 1.83)	0.34 (0.18, 0.66)
Major neurological impairment	0.10 (0.04, 0.25)	0.26, (0.08, 0.80)
Pseudo R^2	.5113	.3464

Note. Race, geographic region (South [omitted category: Northeast]), number of children in household, 1988 household income, dummy variables for activities of daily living and instrumental activities of daily living, an index for physical role functioning, and dummy variables for congestive heart failure, hypertension, hearing impairment, cancer, and angina were also controlled. Only adjusted odds ratios for significant coefficients in either equation are presented. The age category 50–59 years was omitted.

[a]Estimated by multivariate logistic regression.

[b]Adjusted odds ratio for an index that takes on values from 5–25 (higher score means better health) (thus, the adjusted odds ratio for a one-unit change in the index).

[c]Adjusted odds ratio for an index that takes on values from 0–3 (higher score means better health).

gestive heart disease, diabetes mellitus, angina, and major neurological impairment. Respondents were asked whether they drove and, if they did, whether they drove after dark. If they did not drive, they were asked whether they had ever driven and, if so, when they had stopped driving and their reasons for doing so.

Logistic regression was used to estimate the likelihood of a respondent reporting driving in 1989 and driving after dark. People who had never driven or who had stopped driving before 50 years of age were excluded from these analyses. Individual observations in the regressions were weighted by a function of the probability of being included in the original Panel Study of Income Dynamics sample, continuing in the follow-up sample through 1990, and responding to the mail-out survey.

Results

Table 1 describes the study population. Of the 2429 respondents, 1716 (71%) reported driving in 1989, and 1442 (84%) of these individuals reported driving after dark. Of those 577 who did not drive, about half (284) had never driven. The average age at which former drivers had stopped driving was 60 years. The most common reasons for stopping were a health problem other than eyesight or hearing impairment (30%), "trouble with eyesight" (29%), and "not comfortable driving" (27%). Only 4% reported having their driver's license revoked. Eighteen percent and 15%, respectively, reported that they could not afford a car and the accompanying insurance premiums. For those who did not drive, the sources of transportation were an adult child (39%), a spouse (21%), a sibling (7%), other relatives (24%), a friend (23%), and taxi drivers or other paid individuals (15%).

Table 2 presents significant coefficients ($P \leq .05$) for logistic regressions estimating the likelihood that an individual reported driving or driving after dark in 1989. Older people, women, and those in more urban counties and in households with more adults were less likely to drive, and better educated and married individuals and residents of the West and North Central regions were more likely to drive. Individuals with better self-reported general health were more likely to drive, but physical and emotional role functioning were not significant predictors of driving. The only activities of daily living or instrumental activities of daily living with significant

coefficients were "difficulty with taking medications" and "difficulty with preparing meals," and those with the latter condition were more likely to drive. Of the medical conditions, individuals with major neurological conditions and visual impairment were significantly less likely to drive, and those with arthritis were more likely to drive. The pattern of predictors of not driving after dark was similar to that for the predictors of not driving. The self-perceived health index, marital status, the number of adults in the household, and the regional dummies, however, were not significant predictors of driving after dark. People with diabetes and with worse scores on the emotional role functioning index were more likely to restrict driving after dark.

Discussion

The patterns of association between driving and sociodemographic factors were similar to those found in previous research.[3–5] Of note was the new finding that individuals who lived in households with more adults were less likely to drive. This pattern may reflect the choice of elderly people to stop driving when other adults are readily available to drive or the decision of those who can no longer drive to choose living arrangements that provide them a larger pool of potential drivers on which to draw.

Multivariate analyses of the contribution of health status in explaining driving patterns revealed that few of the self-reported functional and health status measures were predictors of driving patterns. Instead, a combination of the sociodemographic variables, an index of self-perceived health, and three medical conditions—visual impairment, arthritis, and major neurological impairment—explained much of the variation.

Surprisingly, the presence of arthritis was associated with a higher probability of continuing driving. Perhaps other modes of transportation (e.g., most buses) are so poorly suited to accommodate those with functional limitations due to chronic arthritis that they continue driving as the least difficult means of reliable transportation.

Restricting driving after dark is often an intermediate step in self-regulation of driving before complete discontinuation. In the equations for predicting driving after dark, the presence of diabetes, which may lead to visual impairment, also led to a greater likelihood of restricting such driving.

Driving patterns appear to be explained partly by a combination of sociodemographic factors and health status. Our results go beyond previous research in defining more precisely various dimensions of health and socioeconomic status and in controlling for regional characteristics such as urbanicity. Furthermore, the results show that those reported to drive for nondrivers appear to be the same individuals known to provide most informal support for functionally impaired elderly people.[6] □

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References

1. Becketti S, Gould W, Lillard L, Welch F. The Panel Study of Income Dynamics after fourteen years: an evaluation. *J Labor Economics.* 1988;6:472–492.
2. Hays RD, Sherbourne CD, Mazel RM. The RAND 36-Item Health Survey 1.0. *Health Economics.* 1993;2:217–227.
3. Jette A, Branch L. A ten-year follow-up of driving patterns among the community-dwelling elderly. *Hum Factors.* 1992;34:25–32.
4. Rosenbloom S. The mobility needs of the elderly. In: *Transportation in an Aging Society.* Washington, DC: National Research Council; 1988.
5. Campbell MK, Bush TL, Hale WE. Medical conditions associated with driving cessation in community-dwelling, ambulatory elders. *J Gerontol.* 1993;48:S230–S234.
6. Doty P. Family care of the elderly: the role of public policy. *Milbank Q.* 1986;64:34–75.