

Financial Difficulty in Acquiring Food Among Elderly Disabled Women: Results From the Women's Health and Aging Study

ABSTRACT

Objectives. This study described the prevalence and characteristics of financial difficulty acquiring food and its relation to nutritional biomarkers in older disabled women.

Methods. Baseline data were analyzed from the Women's Health and Aging Study, a population-based survey of 1002 community-dwelling, disabled women 65 years and older from Baltimore, Md.

Results. Minority women (49.5%) were more likely than White women (13.4%) to report financial difficulty acquiring food (odds ratio [OR]=6.2, 95% confidence interval [CI]=4.5, 8.6). Of the women reporting financial difficulty acquiring food, only 19.3% received food stamps and fewer than 7% participated in food assistance programs. Women reporting financial difficulty acquiring food had higher levels of psychologic depression than women not reporting such difficulty. Greater likelihood of financial difficulty acquiring food was associated with poorer quality of life and physical performance among White women and with more medical conditions among minority women. Finally, anemia (hemoglobin < 120 g/L) was associated with financial difficulty acquiring food (age-adjusted OR=2.9, 95% CI=1.9, 4.3).

Conclusions. Financial difficulty acquiring food was common, and receipt of nutritional services was rare, in community-dwelling, older disabled women. Nutrition assistance programs for the elderly should reexamine their effectiveness in preventing nutritional deficits in older disabled women. (*Am J Public Health.* 2001;91:68-75)

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The number of older Americans in the population continues to expand as life expectancy increases.¹ Given reductions in national food assistance and welfare programs in combination with these population trends, it is useful to examine the adequacy of services for ensuring good health and quality of life for older persons. One critical aspect of securing good health and well-being in older persons is providing for adequate nutritional intake.

National evaluations indicate that older persons are at significant risk for poor access to nutritionally adequate diets and that food assistance programs are not keeping pace with their needs.^{1,2} In a population-based survey of older persons, 8% to 16% (approximately 2.5 to 4.9 million persons) reported experiencing food insecurity in the previous 6 months.³ Given reductions in federal funding for welfare programs,⁴ this unmet need for food assistance will likely increase, with potentially detrimental consequences for dietary intake in the elderly.⁵

Specific deficits in nutrient intake of older persons have been reported. Recently, nutrition surveillance programs have documented that food-insufficient groups, composed of persons reporting sometimes or often not having enough to eat, have reduced dietary intakes of calcium, zinc, manganese, magnesium, and vitamins A, B₆, B₁₂, C, and E.^{6,7} Such reductions in nutrient intake may lead to increased morbidity and mortality through nutritional mechanisms. It has been estimated that one third to one half of the health conditions in older persons may be related to malnutrition.⁸

Malnutrition is a risk factor for several specific health conditions common in older persons. For example, malnourished older persons are at greater risk for osteoporosis, caused by inadequate calcium intake, which leads to increased risk of hip fractures.⁹ Additionally, iron deficiency anemia may increase fatigue and subsequent reduction of activity in older adults. Emerging evidence also indicates that low serum albumin^{10,11} and low iron¹² levels

may be biomarkers for increased risk of coronary heart disease in older persons, whereas low cholesterol is related to increased risk of noncardiovascular diseases.¹³ Causal relations between these nutritional markers and disease are not fully understood, so underlying relations to malnutrition remain speculative, albeit intriguing.

Although associations between certain nutritional deficits and disease outcomes have been reported, we know very little about how food insufficiency may affect metabolic markers of poor nutrition, especially in high-risk groups. Therefore, investigating the specific health consequences of food insufficiency may lead to a better understanding of the public health risks associated with inadequate nutritional services to the elderly and disabled. In this study, we sought to increase our knowledge of food sufficiency problems by reporting the prevalence and risk factors of financial difficulty acquiring food and describing the receipt of nutritional services in elderly disabled women. In addition, we report potential relations between financial difficulty acquiring food and biochemical markers of malnutrition in this high-risk group.

Methods

We studied the question of food sufficiency in the Women's Health and Aging Study,

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a prospective, observational study of the causes and progression of physical disability in community-dwelling, disabled women 65 years and older in Baltimore, Md. Of the 6521 women identified through sampling of Health Care Financing Administration Medicare files, 5316 were eligible and 4137 agreed to participate in the screening visit. Detailed description of the Women's Health and Aging Study design, sampling procedures, inclusion criteria, and evaluation protocols is available elsewhere.¹⁴

Briefly, disability level was evaluated as self-reported difficulty in task performance of 15 activities clustered in 4 domains,¹⁵ including mobility/exercise tolerance (e.g., heavy housework, getting into or out of chairs, walking a quarter of a mile), upper-extremity abilities (e.g., raising arms over head, lifting 10 pounds), activities of daily living (e.g., light housework, meal preparation), and basic self-care tasks (e.g., using the toilet, bathing). Women reporting disability in 2 or more of these domains were eligible for inclusion. The Mini-Mental State Examination¹⁶ was used to assess cognitive functioning. Women with scores of less than 18 on the Mini-Mental State Examination were excluded from the study. The study criteria were met by 1409 women, of whom 1002 consented to participate in the baseline evaluation. Therefore, the study sample consisted of women 65 years and older who were moderately to severely disabled, but not severely cognitively impaired, and represented approximately one third of the most disabled older women living in the community.¹⁷

Study Variables

The current investigation reflected cross-sectional data obtained from November 1992 to February 1995 during baseline evaluation of the Women's Health and Aging Study participants, which included a comprehensive interview to obtain information on medical history, functional status, current medication use, psychosocial functioning, health-related behaviors, and health care use as well as a physical examination. In addition, approximately 75% of the study participants provided phlebotomy specimens for hematologic analysis.

Current analyses included data from the screening and initial baseline assessments on sociodemographic variables, level of physical disability, anthropometric assessment, psychologic and cognitive functioning, health history, biochemical measures of malnutrition, and a measure of food access. Physical disability and cognitive functioning were assessed by methods described earlier; anthropometric assessment and phlebotomy were performed with standard procedures.¹⁴ We used algorithms that consider medical record reviews, physicians' reports, medications, x-rays, physical

examination, and interviews to ascertain the presence of 17 chronic health conditions.¹⁷ The 7 most frequent conditions classified as definite or possible are considered here as a summation of the total number of medical conditions adjudicated by a committee of medical experts.

Health status was self-reported as poor, fair, good, very good, or excellent, and perceived quality of life was assessed with the scale developed by Patrick et al.¹⁸ The scale consists of 20 items that assess 3 dimensions of life quality: cognitive, physical, and social. Symptoms of depression were assessed with the Geriatric Depression Scale.¹⁹ The Hopkins Symptom Checklist subscale for anxiety²⁰ categorized this construct as high (2 or more symptoms), moderate (1 symptom), or low (0 symptoms).

Food access was assessed with the following survey question: "How often does it happen that you (and your husband) do not have enough money to afford the kind of food you should have?" The possible ratings were never, once in a while, fairly often, and very often. This item is similar to measures used in US Department of Agriculture surveys of food insecurity.²¹ US Department of Agriculture questions on food insecurity, defined as "limited or uncertain availability of nutritionally adequate and safe foods or limited or uncertain ability to acquire acceptable foods in socially acceptable ways," also constrain reported events or behaviors as being the result of financial limitations.^{21,22}

The financial difficulty acquiring food question in the Women's Health and Aging Study reflects a self-perception of food sufficiency, but such single-item measures have shown validity in discriminating energy intake differences.^{6,23} Reports of food insufficiency are related to lowered dietary intake and energy consumption. Specifically, for older people from food-insufficient households, average energy intake was at 58% of the recommended daily allowance and significantly below intakes of those from food-sufficient households.⁶ However, single-item measures of food insecurity have poor sensitivity and underestimate prevalence.²²

Statistical Methods

Risk factors for financial difficulty in acquiring food were conceptualized within a framework of food insecurity specific to the elderly that considers relations to income, medical costs, nutritional services, poor health, and psychologic and social characteristics.⁵ Regression models were analyzed to consider relations between financial difficulty acquiring food and specific health and disability conditions, namely (1) measures of mental health and cognitive functioning, (2) measures of disability and performance, and (3) health status and anthropometrics.

Statistical analyses were conducted with SAS software.²⁴ The variable of financial difficulty acquiring food was dichotomized for univariate and multivariate analyses as never vs any level of difficulty. Additionally, race/ethnicity was divided into 2 categories—White and non-White—with non-White women consisting of 289 African Americans and 6 persons of other racial/ethnic minorities. Except for total household income, economic indicators were dichotomized. For ability to afford medical care and monthly payments on bills, the variables were dichotomized as never vs any level of frequency. For the question of end-of-the-month finances, "some money left over" and "just enough to make ends meet" were combined and compared with "not enough to make ends meet." Grip strength and walking speed were categorized as "unable to perform" and first tertile, second tertile, and third tertile of strength and speed, respectively.

Statistical analyses reported in this investigation, including prevalence data and associations, were conducted with weighted data that account for stratified sampling by age. Descriptive cross-tabulations and odds ratios (ORs) were calculated, and χ^2 tests were used to test univariate relations between financial difficulty acquiring food and sociodemographic and economic variables, as shown in Table 1.

Multivariate models considered interactions between race/ethnicity and other predictors and were consistently significant, so subsequent models stratified by race/ethnicity were analyzed. Multivariate models also were scrutinized for confounding by those social and demographic variables shown in Table 2 to be statistically significant. Adjusted odds ratios were reported when influential confounding was observed. Economic and financial variables were included as potential mediators of associations with financial difficulty acquiring food.

Final analyses modeled relations between financial difficulty in acquiring food and nutritional status measured as biochemical markers, namely, low iron (<120 g/L hemoglobin), low albumin (<36 g/L), and low total cholesterol (<4.14 mmol/L) levels. These cutpoints were chosen as population-based predictors of morbidity and mortality on the basis of previously reported literature for iron,¹⁵ albumin,¹³ and serum cholesterol.¹⁶ In assessing the relation between financial difficulty acquiring food and nutritional outcomes, potential confounders of physical disability, cognitive impairment, and age were considered.

Results

Of the 1002 baseline participants, 1001 women were evaluated for financial difficulty

TABLE 1—Averages and Frequencies of Sample Characteristics, by Financial Difficulty in Acquiring Food^{a,b}

| | Financial Difficulty in Acquiring Food | | P |
|---|--|-------------|------|
| | No (n=774) | Yes (n=227) | |
| Demographics and Lifestyle | | | |
| Race/ethnicity | | | |
| Non-White | 19.2 | 59.9 | .001 |
| Age, y | | | |
| 65–74 | 41.0 | 54.1 | |
| 75–84 | 42.1 | 36.7 | .001 |
| ≥85 | 17.0 | 9.2 | |
| Education ^c | | | |
| <12th grade | 58.3 | 80.2 | .001 |
| Marital status ^d | | | |
| Married | 27.3 | 15.1 | .001 |
| Cigarette smoking ^e | | | |
| Never | 50.5 | 48.3 | |
| Current | 12.2 | 16.4 | .240 |
| Former | 37.4 | 35.3 | |
| Alcohol intake per week ^f | | | |
| <1 drink/day | 83.9 | 87.9 | |
| 1–7 drinks/day | 12.0 | 8.5 | .287 |
| ≥8 drinks/day | 4.1 | 3.6 | |
| Nutritional Services | | | |
| Food stamps received | 2.9 | 19.3 | .001 |
| Home-delivered meals | 1.4 | 2.2 | .388 |
| Eating Together program | 4.5 | 4.3 | .892 |
| Economic | | | |
| Total household income, \$ ^g | | | |
| <6000 | 11.9 | 34.5 | |
| 6000–7999 | 14.3 | 25.2 | |
| 8000–9999 | 9.4 | 10.8 | .001 |
| 10 000–14 999 | 14.2 | 9.9 | |
| >15 000 | 37.0 | 9.2 | |
| Unknown/refused | 4.1 | 3.6 | |
| How often does it happen that you (and your husband) do not have enough money to afford the kind of medical care you (or your husband) should have? | | | |
| Never | 88.5 | 38.2 | .001 |
| How often does it happen that you (and your husband) do not have enough money to afford monthly payments on your bills? | | | |
| Never | 90.5 | 34.8 | .001 |
| In general, how do your finances usually work out at the end of the month? | | | |
| Some money left over or just enough to make ends meet | 95.4 | 65.8 | .001 |
| Social | | | |
| Household composition ^h | | | |
| Alone | 47.3 | 42.6 | |
| Spouse only | 20.6 | 7.4 | .001 |
| Spouse and others | 5.4 | 6.8 | |
| Others only | 26.7 | 43.3 | |
| No. of household members ⁱ | | | |
| 0 | 47.3 | 42.6 | |
| 1 | 35.3 | 27.4 | .001 |
| 2 | 0.6 | 14.8 | |
| ≥3 | 6.9 | 15.2 | |
| Type of living quarters ^j | | | |
| Detached single-family house | 23.4 | 10.7 | |
| Apartment | 19.6 | 15.7 | |
| Semidetached row or townhouse | 47.8 | 60.3 | .001 |
| Retirement community or apartments | 1.3 | 1.0 | |
| Disability and Performance Measures | | | |
| Activities of daily living (ADL) ^k | | | |
| No ADL (disabled >2 domains) | 33.1 | 42.3 | |
| ADL difficulty | 67.0 | 57.7 | .009 |
| Walking speed at usual pace ^l | | | |
| Unable to do, % | 3.1 | 5.5 | |
| First tertile of speed, m/s | 22.0 | 32.1 | |
| Second tertile of speed, m/s | 32.9 | 34.2 | .001 |
| Third tertile of speed, m/s | 39.9 | 27.1 | |
| Grip strength ^m | | | |
| Unable to do, % | 2.5 | 3.2 | |
| First tertile of pressure, kg | 23.6 | 26.0 | |
| Second tertile of pressure, kg | 37.0 | 28.8 | .212 |
| Third tertile of pressure, kg | 32.7 | 34.9 | |

Continued

TABLE 1—Continued

| Mental Health and Cognitive Functionⁿ | | | |
|---|----------|----------|------|
| Perceived quality of life | | | |
| Cognitive subscale | 7.6±2.1 | 7.5±2.1 | .928 |
| Physical health subscale | 6.4±2.2 | 5.7±2.4 | .001 |
| Social health subscale | 7.8±1.8 | 7.1±1.8 | .001 |
| Depression, mean±SD | 7.5±5.4 | 9.4±6.3 | .001 |
| Anxiety (total symptoms) | | | |
| 0 | 60.8 | 52.0 | |
| 1 | 22.8 | 21.9 | .003 |
| ≥2 | 16.5 | 26.1 | |
| Mini-Mental State Examination score | | | |
| 18–23 | 13.1 | 23.0 | .001 |
| ≥24 | 86.9 | 77.0 | |
| Health Status and Anthropometrics | | | |
| Self-reported health status | | | |
| Excellent | 4.2 | 1.6 | |
| Very good | 15.6 | 6.4 | |
| Good | 29.4 | 27.3 | .001 |
| Fair | 35.0 | 37.1 | |
| Poor | 15.8 | 27.6 | |
| Body mass index, kg/m ² | | | |
| ≤15th percentile ^o | 12.2 | 10.1 | |
| Normal | 62.4 | 51.0 | .001 |
| ≥85th percentile | 25.4 | 38.9 | |
| Triceps skinfold, mm ^p | 21.8±8.2 | 22.0±9.3 | .742 |
| Medical conditions (adjudicated disease) | | | |
| Coronary heart disease/myocardial infarction | 16.3 | 9.8 | .014 |
| Stroke | 10.6 | 17.9 | .003 |
| Congestive heart failure | 22.8 | 28.6 | .068 |
| Diabetes | 17.3 | 34.4 | .001 |
| Peripheral arterial disease | 27.5 | 37.5 | .003 |
| Pulmonary disorder | 46.0 | 50.8 | .188 |
| Cancer | 16.8 | 10.6 | .020 |
| Nutritional Biochemistry | | | |
| Hemoglobin, g/L | | | |
| <120 | 16.0 | 33.2 | |
| ≥120 | 84.0 | 66.8 | .001 |
| Albumin, g/L | | | |
| <36 | 7.8 | 9.6 | |
| ≥36 | 92.2 | 90.4 | .457 |
| Total cholesterol, mmol/L | | | |
| <4.14 | 3.6 | 4.2 | |
| ≥4.14 | 96.4 | 95.8 | .729 |

^aAll variables have <2% missing data. Results are based on nonmissing data.

^bPercentages and means are based on weighted data.

^c"What is the highest grade in school or year of college that you completed?"

^d"Are you now married, or are you widowed, separated, divorced, or have you never been married?"

^e"Which of the following best describes your current cigarette smoking status?" (Former combined those who quit >1 year ago with those who quit ≤1 year ago.)

^fd(w), where d = drinks per day ("On the days when you drink, about how many drinks do you usually have?") and w = days ("Over the past 6 months, how many days per week did you typically drink like this?").

^g"What was your household's total income from all sources before taxes in [previous year]?"

^h"What are the names of all persons living or staying in the household?" (Name, relationship to the participant, sex, and age are given.)

ⁱ"Besides yourself, how many other people live in your household?"

^jBased on interviewer's discretion.

^kAdapted from Lawton MP, Brody EM. Assessment of older people: self-maintaining and instrumental activities of daily living. *Gerontologist*. 1969;9:179–186.

^lFaster of 2 usual-pace measured walks of 4 m. If 4 m was not available, the walk was 3 m. Lower tertiles indicate slower speeds.

^mFifty-three women are missing information. Missing data are due to discontinuance of task because of increased blood pressure; inability to perform task because of recent worsening of pain or arthritis in the wrist, tendonitis, or recent surgery on hands or arms; or concerns for safety. Lower tertiles indicate lower blood pressure.

ⁿLower scores on mental health scales indicate poorer outcomes or functioning.

^oWeight in kg/(height in m)². Percentile based on data from the First National Health and Nutrition Examination Survey references for females aged 70–74 years.

^pSkinfold thickness usually was computed by averaging the first 2 measures. A third measure was taken if the difference between the first 2 exceeded 2 mm. If the third measure was within 2 mm of just 1 of the earlier measures, then the average of the 2 close measures was computed. Otherwise, the average of 3 measures was used. When a single measure was taken, it was used for the thickness.

TABLE 2—Independent Predictors of Financial Difficulty Acquiring Food From Social, Demographic, and Economic Variables, by Racial/Ethnic Group^a

| | White | | Non-White | |
|--|-------|-------------|-----------|-------------|
| | OR | 95% CI | OR | 95% CI |
| Model 1: Sociodemographic Model | | | | |
| Age (per 5 y) | 0.72 | 0.60, 0.86 | 0.88 | 0.73, 1.06 |
| Marital status (unmarried) | 3.34 | 1.80, 6.18 | 1.26 | 0.20, 7.89 |
| Education (<12 y) | 2.82 | 1.65, 4.82 | 1.24 | 0.68, 2.26 |
| No. of household members (per member) | 1.28 | 1.01, 1.62 | 0.79 | 0.53, 1.19 |
| Model 2: Economic and Financial Model | | | | |
| Income (<\$6000) | 3.51 | 1.81, 6.81 | 1.57 | 0.85, 2.88 |
| Not able to afford medical care | 16.56 | 6.29, 43.57 | 5.31 | 1.93, 14.65 |
| Not able to pay monthly bills | 5.80 | 3.22, 10.46 | 8.39 | 4.47, 15.74 |
| Trouble with end-of-the-month finances | 1.97 | 1.10, 3.53 | 1.58 | 0.87, 2.89 |
| Model 3: Combined Sociodemographic and Economic Model | | | | |
| Age (per 5 y) | 0.96 | 0.92, 1.00 | 0.99 | 0.94, 1.03 |
| Marital status (unmarried) | 2.15 | 1.02, 4.53 | 1.04 | 0.42, 2.62 |
| Education (<12 y) | 1.90 | 1.03, 3.51 | 1.23 | 0.58, 2.61 |
| No. of household members (per member) | 1.08 | 0.80, 1.46 | 1.00 | 0.75, 1.33 |
| Income (<\$6000) | 3.05 | 1.55, 6.01 | 1.55 | 0.82, 2.92 |
| Not able to afford medical care | 14.66 | 5.49, 39.11 | 5.06 | 1.82, 14.06 |
| Not able to pay monthly bills | 5.21 | 2.86, 9.52 | 8.44 | 4.48, 15.91 |
| Trouble with end-of-the-month finances | 1.95 | 1.08, 3.54 | 1.55 | 0.84, 2.87 |

Note. OR=odds ratio; CI=confidence interval.
^aDescription of variables provided in Table 1.

acquiring food. The sample was primarily White (71.1%), poorly educated (63.5% with less than a 12th-grade education), and not currently married (75.5%). Approximately 35% of the sample was moderately disabled (disabled in 2 domains), and 65% had more severe disabilities, including difficulties performing activities of daily living. Additional detailed description of the Women's Health and

Aging Study cohort is available elsewhere.¹⁴ Baseline nutritional biomarkers were available for a subsample of 762 participants who accepted an invitation to give a blood sample at the third home visit (76% of the total sample). Those with biochemical data were similar in race/ethnicity and educational status to the larger cohort; however, those refusing to provide a blood sample were significantly older

(81.1 vs 77.5 years) and more functionally disabled in self-care tasks than those who provided a blood sample.

Of the 23.9% of the women in this sample who reported financial difficulty acquiring food, 16.8%, 3.7%, and 3.4%, respectively, reported that they experienced such difficulty once in a while, fairly often, and very often. Racial/ethnic differences in financial difficulty acquiring food were pronounced (Figure 1); some level of financial difficulty acquiring food was reported by 13.4% of the White women compared with 49.5% of the non-White women (OR=6.2, 95% confidence interval [CI]=4.5, 8.6).

Table 1 presents univariate associations between financial difficulty acquiring food and demographic and lifestyle characteristics. Younger, unmarried, and less educated women were more likely to report financial difficulty with food acquisition than their respective counterparts. Alcohol consumption was not significantly related to financial difficulty acquiring food, but for White women, the prevalence of cigarette smoking was higher in those reporting financial difficulty acquiring food (data not shown).

In addition, as shown in Table 1, a very low percentage of older disabled women reported receiving food assistance or nutritional services. In particular, fewer than 3% received home-delivered meals, and fewer than 5% regularly attended group meal programs. Only 19.3% of the women reporting financial difficulty acquiring food were receiving food stamps; however, this percentage was significantly higher than that for receipt of food stamps in the food-sufficient group (OR=8.1, 95% CI=4.8, 13.9).

As would be expected, financial difficulty acquiring food was less prevalent as household income increased and was strongly related to financial security in general. Those who had financial difficulty acquiring food were more likely to report that their finances at the end of the month resulted in "not enough to make ends meet" (34.0%) than those who did not have financial difficulty acquiring food (4.5%). Additionally, financial difficulty acquiring food was related to greater financial difficulties affording medical care and meeting payments on monthly bills.

Relations between financial difficulty acquiring food and household characteristics varied by race/ethnicity (data not shown). Among non-White women, no significant associations between financial difficulty acquiring food and household composition, number of household members, or type of living quarters were observed. Among White women, household characteristics were significantly associated with food acquisition. White women reporting financial difficulty acquiring food were less likely to live with only a spouse (24.0%) and were more likely

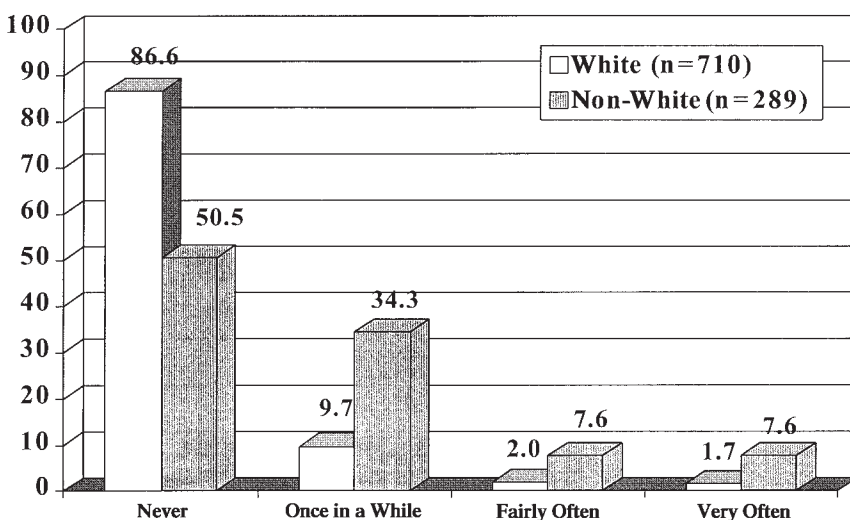


FIGURE 1—Prevalence of financial difficulty in acquiring food, by race/ethnicity (based on weighted data).

to have others residing with them (26.3%) than were those not reporting financial difficulty acquiring food (37.7% and 14.6%, respectively).

Logistic regression models were analyzed to identify significant independent predictors of financial difficulty acquiring food from demographic and social factors (Table 2). Among non-White women, initial models indicated no significant relations between age, marital status, education, type of living quarters, household composition, or number of household members and financial difficulty acquiring food. However, among White women, lower age, lower education, being unmarried, and having a greater number of household members were significant independent predictors of financial difficulty acquiring food.

After economic factors were included in the logistic regression models, several socio-demographic relations from the earlier models were no longer significant independent predictors of financial difficulty acquiring food—specifically, among White women, age and number of household members. Combined models of sociodemographic and financial variables indicated that among White women,

all 4 measures of economic hardship were significant predictors of financial difficulty acquiring food. Among non-White women, those reporting at least some level of financial difficulty affording monthly bill payments or affording medical care, compared with those without financial difficulty, had a greater likelihood of reporting financial difficulty in acquiring food.

The next phase of analyses explored independent relations among variables from Table 1. Multivariate models included relations between financial difficulty acquiring food and the following: mental health, cognitive functioning, physical disability and performance measures, health status measures, and receipt of nutritional services. Specific variables included in these multivariate models were (1) social and physical health subscales of perceived quality of life, depression, and anxiety; (2) cognitive impairment assessments based on the Mini-Mental State Examination; (3) walking speed and difficulty with activities of daily living; (4) self-reported health, health history of adjudicated disease, body mass index, and triceps skinfold; and (5) receipt of nutritional services, such as food stamps, home-

delivered meals, and eating-out programs. Models were adjusted for confounding by age, education, marital status, and number of household members.

Additional logistic regression models explored independent relations among all significant predictors from the previous mental health, physical disability, and health status models (model 5 from Table 3) for each racial/ethnic group. In addition to controlling confounding variables, we explored income and financial variables as potential mediators of these relations.

Results for White women indicated that better social quality of life and greater difficulty with activities of daily living were associated with decreased financial difficulty acquiring food (see Table 3). Initial models indicated that depression and slower walking speed were significantly related to greater financial difficulty acquiring food, but they were not independently associated after all variables were considered together. Receipt of food stamps was associated with a greater likelihood of financial difficulty acquiring food. Although financial variables were highly associated with financial difficulty acquiring food among White women, the variables were not found to mediate these relations.

Among non-White women, higher levels of depression and a greater number of adjudicated medical conditions were associated with an increased risk of financial difficulty acquiring food. No significant associations were seen between financial difficulty acquiring food and physical performance measures or anthropometric variables. Additionally, financial variables and receipt of food stamps were predictive of financial difficulty acquiring food but did not mediate associations with mental health and health status measures. Unlike White women, non-White women did not show significant relations between financial difficulty acquiring food and the following variables: education, income, and trouble with end-of-the-month finances.

Finally, associations between financial difficulty acquiring food and malnutrition biomarkers were scrutinized. As shown in Table 4, age-adjusted odds of iron deficiency anemia (<120 g/L hemoglobin; OR=2.9, 95% CI=1.9, 4.3) were significantly higher in those reporting financial difficulty acquiring food than in the food-sufficient group. Although not statistically significant, a similar trend was seen between low albumin (<36 g/L; OR=1.3, 95% CI=0.7, 2.3) and low total cholesterol (<4.14 mmol/L; OR=1.4, 95% CI=0.6, 3.3) levels and a greater likelihood of reported financial difficulty acquiring food. Nutritional relations were examined for potential confounding by physical disability measures but were not appreciably affected.

TABLE 3—Associations Between Psychologic, Health, Disability, and Nutritional Services Variables and Financial Difficulty Acquiring Food, by Racial/Ethnic Group^a

| | White | | Non-White | |
|---|-------|-------------|-----------|-------------|
| | OR | 95% CI | OR | 95% CI |
| Model 1: Mental Health and Cognitive Functioning^b | | | | |
| Depression score | 1.09 | 1.02, 1.16 | 1.09 | 1.03, 1.16 |
| Quality of life social health | 0.77 | 0.68, 0.87 | | |
| Model 2: Physical Disability and Performance^b | | | | |
| Walking speed | 0.69 | 0.52, 0.93 | | |
| Difficulty with activities of daily living (yes) | 0.56 | 0.34, 0.93 | | |
| Model 3: Health Status and Anthropometrics^b | | | | |
| No. of adjudicated medical conditions | | | 1.24 | 1.02, 1.50 |
| Body mass index | 1.02 | 0.99, 1.06 | | |
| Model 4: Nutritional Services^b | | | | |
| Receive food stamps | 17.28 | 5.39, 55.36 | 2.07 | 1.07, 3.97 |
| Model 5: Combined Model^c | | | | |
| Depression score | | | 1.13 | 1.04, 1.22 |
| Quality of life social health | 0.77 | 0.66, 0.91 | | |
| Difficulty with activities of daily living (yes) | 0.47 | 0.26, 0.86 | | |
| No. of adjudicated medical conditions | | | 1.32 | 1.03, 1.69 |
| Education (<12 y) | 2.27 | 1.21, 4.25 | | |
| Income (<\$6000) | 2.76 | 1.35, 5.63 | | |
| Not able to afford medical care | 19.8 | 6.89, 56.94 | 3.75 | 1.90, 7.40 |
| Not able to pay monthly bills | 3.42 | 1.78, 6.57 | 8.71 | 4.51, 16.81 |
| Trouble with end-of-the-month finances | 2.04 | 1.10, 3.81 | | |
| Receipt of food stamps | 14.80 | 3.81, 57.52 | 3.19 | 1.38, 7.39 |

Note. OR=odds ratio; CI=confidence interval.

^aDescription of variables provided in Table 1. Race/ethnicity-specific analyses reflect the most parsimonious model (i.e., only statistically significant variables are included).

^bAdjusted for confounding variables: age, education, marital status, and number of household members.

^cAdjusted for confounding variables: age, marital status, and number of household members.

TABLE 4—Age-Adjusted Associations Between Financial Difficulty Acquiring Food and Nutritional Deficits

| | Adjusted Odds Ratio | 95% Confidence Interval |
|----------------------------|---------------------|-------------------------|
| Hemoglobin (<120 g/L) | 2.87 | 1.90, 4.34 |
| Albumin (<36 g/L) | 1.27 | 0.69, 2.33 |
| Cholesterol (<4.14 mmol/L) | 1.35 | 0.55, 3.32 |

Discussion

Financial difficulty acquiring food is highly prevalent in cognitively intact, community-dwelling, older disabled women—13.4% of the White women and almost 50% of the non-White women reported some level of difficulty. This prevalence for women with mild to moderate disability is well above age-specific national estimates of about 2% and remains elevated when compared with the estimates of 1% to 6% in lower-income households.²⁵ The prevalence of financial difficulty acquiring food in our study was likely higher than reported because of the low sensitivity of our single-item financial difficulty acquiring food measure.²²

Despite national programs targeted at reducing nutritional deficits in the elderly, particularly the frail elderly, many older disabled women still appear to be having difficulties obtaining adequate food. Deficits in access to nutritional services for the elderly are also indicated by findings that fewer than 3% of the city-dwelling mildly to moderately disabled women older than 65 years were receiving home-delivered meals, and only 4% were regularly attending Eating Together programs in their community. The public health implications of these findings support the need to increase availability and acceptability of services to those at risk for problems of food access, such as minorities, the poor, and the disabled.

Difficulties with food sufficiency appear to be exacerbated for non-White women. Our findings are supported by previous investigations documenting high risk for poor nutritional intake in older, city-dwelling, non-White Americans.^{26,27} In addition, prior reports have documented that minority elders, compared with Whites, are at high risk for a lack of services and lack of awareness of Title III nutrition programs.^{7,28,29} Our results suggest that receipt of food stamps did not ameliorate financial difficulty acquiring food but was associated with an increased likelihood of reported food insufficiency.

Racial/ethnic disparities in reported financial difficulty acquiring food were found in our analyses and perhaps are explained in part by the depth of poverty in non-White women. In race/ethnicity-specific models, other

potential risk factors did not, after control for financial problems, significantly increase the explained variance in financial difficulty acquiring food for non-White women. This leads to uncertainty about how life experiences and perceptions of non-White women may differ from those of White women in relation to self-reported financial difficulty acquiring food. Theoretic and empiric models of relations between race/ethnicity, socioeconomic status, and health³⁰ as well as the cultural aspects of dietary intake and other health behaviors³¹ may be useful for further investigation of reported food insecurity among the elderly in racial/ethnic minorities. In particular, Wolfe and colleagues^{5,32} provided a conceptual framework for food insecurity in the elderly that could be empirically tested for better estimates of potential cultural and health status differences of minorities and nonminorities.

In our study, psychologic, social, and health status factors were related to financial difficulty acquiring food. Specifically, in all women, more symptoms of depression were significantly associated with increased financial difficulty acquiring food. Additionally, among White women, poorer performance on walking speed was associated with a greater likelihood of financial difficulty acquiring food, and among minority women, worse disease status, measured as number of adjudicated medical conditions, was indicative of financial difficulty acquiring food. Although these relations are consistent with hypotheses proposed by Campbell,²³ empiric reports of such interrelations are not well documented.

Several interpretations of these cross-sectional results are possible. Perhaps better physical functioning and health reduce the risk of financial difficulty acquiring food, or perhaps the absence of financial difficulty acquiring food reduces the risk of poorer health status and physical disability. Bidirectional relations are plausible. In addition to these results, the finding that women reporting difficulty with activities of daily living had a lower prevalence of financial difficulty acquiring food is intriguing. This finding may be influenced by factors such as informal care for women who have difficulty with activities of daily living or less likelihood that these women will report financial difficulty ac-

quiring food when faced with financial limitations on the types or quantity of food available to them.

These associations give preliminary insight into a potential relation between food insufficiency and poor health and well-being, but the cross-sectional nature of this study precludes strong causal inferences. Longitudinal data are needed to ascertain the relation between these measures and financial difficulty acquiring food. Prospective data from the Women's Health and Aging Study will provide a unique opportunity to further elucidate the causes and consequences of financial difficulty acquiring food.

The current findings indicate that those women reporting financial difficulty acquiring food were significantly more likely to have anemia than were women in food-sufficient groups, and similarly, trends between financial difficulty acquiring food and low cholesterol and albumin levels were identified. These results are consistent with population-based estimates of food intake, which indicated deficits in dietary intake in the elderly.⁶ Rose and Oliveira⁶ reported that the average nutrient intake in elders (≥ 65 years) was only 58% of their recommended dietary intake. Additionally, elders reporting food insecurity were twice as likely as those without insecurity to have low iron and protein intake (defined as 50% of the recommended daily allowance). Although previous investigations have associated problems of food insecurity with lowered dietary intake, this study is among the first to document a relation with biochemical markers of malnutrition.

In addition to our preliminary findings, further evaluation of the relations between food insufficiency and malnutrition may help to improve methods to ensure adequate food access and dietary intake in older persons. Medical and societal costs associated with malnutrition related to food insecurity also can be considered in prioritizing nutritional interventions as essential primary prevention strategies to reduce potential morbidity and mortality. Such studies also may identify subpopulations of older adults who may benefit from screening for financial difficulty acquiring food. □

Contributors

L. M. Klesges conceived and wrote the paper and was primarily responsible for conceptualizing analytic methods and interpreting results. M. Pahor, R. I. Shorr, and J. M. Guralnik assisted with conceptualizing analytic methods and interpreting results, particularly those related to biochemical markers of malnutrition. J. Y. Wan conducted statistical analyses and assisted in their interpretation. J. D. Williamson and J. M. Guralnik participated in the original study design and inclusion of measures for the Women's Health and Aging Study. All authors contributed to the rewriting and editing of the paper.

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L. M. Klesges dedicates this article to the memory of her grandmother, Mary Elizabeth Hansen.

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