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Milk Consumption in Older Americans

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ABSTRACT

Objectives. The purpose of this study was to identify individual characteristics associated with types and frequency of milk consumption in older American adults.

Methods. A national probability-based sample (response rate = 91%) completed a telephone survey. Generalized logit and cumulative logit analyses were used to identify predictors of and barriers to fluid milk consumption in 494 elderly people.

Results. The likelihood of drinking skim or 1% milk rather than whole milk increased with nutrition knowledge, income, trying to reduce cholesterol intake, and being female (P < .05). Frequency of milk consumption was higher with nutrition knowledge, frequency of milk consumption during adolescence, and following a diabetic diet but was lower with milk intolerance.

Conclusions. The present results could be used to develop intervention strategies for improving milk consumption rates among older adults. These strategies might focus on increasing elderly people's awareness of milk intolerance and lactose-reduced milk products and their concern about cholesterol. The relationship between current and adolescent milk consumption suggests that intervention strategies should begin early in life. (*Am J Public Health.* 1998; 88:1221–1224)

Introduction

Failure to consistently consume the recommended 2 or more servings of milk products per day[1] is a major indicator of low calcium intake and poor nutritional status in older people[2] and is associated with increased risk of osteoporosis.[3,4] Conversely, an adequate intake of calcium has been implicated as a potential factor in the risk reduction of calcium-sensitive hypertension[5] and colon cancer.[6]

The current recommended intake for maximum calcium retention in individuals 51 years of age or older is 1200 mg per day.[7] However, phase 1 data from the Third National Health and Nutrition Examination Survey (NHANES III)[8] indicate that mean daily dietary intakes of calcium are only 721 to 875 mg in men and 626 to 711 mg in women.

One objective of *Healthy People 2000* is to increase calcium intake; the goal is for at least 50% of people 25 years of age and older to consume 2 or more servings of foods rich in calcium per day.[9] A second objective is to reduce the current national average of 36% total calories from fat to the recommended 30%.[9] Skim or 1% milk provides essential calcium but less fat than whole milk.

Although socioeconomic status,[10] physiological factors,[11] nutrition knowledge,[12] health-seeking behaviors,[13] nutritional attitudes,[14] and food patterns established during youth[15] influence eating patterns, limited information exists relating these factors to milk consumption in older adults. Thus, our goal was to determine the predictors of and barriers to the type and frequency of fluid milk consumption among older adults.

Methods

Survey Instrument

All procedures were approved by the Institutional Review Board on Human Subjects of the University of Georgia. Data on age, gender, ethnicity, income, and education were obtained with closed-ended questions. Dietary health behaviors were assessed according to Bausell,[13] and milk consumption was measured according to NHANES III.[16] Lactose maldigestion was inferred from a self-report of perceived milk intolerance (defined as experiencing a stomachache, gas, or diarrhea after consuming milk). A 12-item nutrition knowledge instrument was adapted from a 17-item instrument.[17] Attitudes toward convenience, packaging, the shelf life of milk, and milk and sleep were investigated via original questions. The final survey instrument was constructed after input from the University of Georgia Survey Research Center and the National Dairy Council and pilot testing in a pencil-and-paper format in a local sample of 50 adults.

National Telephone Survey

A telephone survey was conducted in 1994 by the University of Georgia Survey Research Center. Respondents were randomly selected from an enumerated listing of 74 mil-

lion US heads of households drawn from white page telephone directories throughout the contiguous states. Age was targeted by known age-related data or estimates of age based on individual household characteristics and US census demographic information, supplemented by voter registration and driver's license information (Survey Sampling Inc). Sample elements were then systematically selected proportionate to the population of the contiguous states from among the names targeted by age. Interviews were collected via computer-assisted telephone interviewing; interviewers received specific training regarding interviewing older adults. Approximately 20% to 30% of the interviews were monitored by the authors or by other supervisory personnel.

Based on estimated theoretical standard error, sample size, and a population proportion of 50% (i.e., a "worst case split" in variation of responses), the estimated sampling error for the survey was 4.3%. Generalized logit analyses were used to assess the type of milk consumed, and logistic regression analyses were used to assess the frequency of milk consumption. Stepwise procedures were used to identify significant predictors for both models. The significance criterion for entry into and exit from the models was $P < .10$. SAS/STAT version 6.10 (SAS Institute, Cary, NC) was used in conducting analyses.

Results

From a random sample of 3270 potential households, 543 had age-eligible potential participants; 495 individuals (91%) completed the survey. Inclusion criteria limited the final sample to 494 individuals in 3 age groups: 60 to 69 years (n = 155); 70 to 79 years (n = 186); and 80 to 94 years (n = 151). Two participants indicated only that they were 60 years of age or older. Participants were predominantly female (73%) and White (93%). Eighty percent had completed high school, and 16% had completed at least 4 years of college (n = 491). The annual household income distribution (n = 357) was as follows: $9999 or less, 12%; $10 000 to $19 999, 40%; $20 000 to $29 999, 19%; $30 000 to $49 999, 19%; and $50 000 or more, 11%.

More than 50% of the participants reported that they had consumed milk at least 2 times per day during adolescence (Table 1). Fifty-one percent of the participants indicated that they currently drink milk at least once per day, but only 16% reported that they drink milk at least 2 times per day. More than 80% indicated that they drink milk with a fat content of 2% or less. Perceived milk intolerance was reported by 18% of the participants, and

TABLE 1—Milk Consumption and Health-Seeking Behaviors Related to Diet in Community-Dwelling Older Americans (Aged 60–94 Years), 1994

	Sample, No. (%)
During the past year, about how often did you drink milk as a beverage? (n = 491)	
Less than once a day	240 (48.9)
Once a day	173 (35.2)
2 or more times a day	78 (15.9)
What type of milk do you usually drink? (n = 488)	
Whole milk	77 (15.8)
2% milk	188 (38.5)
1% or skim milk	170 (34.9)
Buttermilk[a]	10 (2.0)
Flavored milk[a]	0 (0.0)
Don't drink milk[a]	43 (8.8)
During your adolescence (12–19 years), did you drink milk? (n = 483)	
Rarely/never	87 (18.0)
A few times a week	28 (5.8)
Once a day	114 (23.6)
Twice a day	105 (21.7)
3 or more times a day	149 (30.8)
Does milk disagree with you? (n = 493)	
Yes	87 (17.6)
No	406 (82.4)
Are you trying to reduce your fat intake? (n = 479)	
Don't try at all	166 (34.7)
Try a little	177 (37.0)
Try a lot	136 (28.4)
Are you trying to reduce your intake of foods high in cholesterol? (n = 482)	
Don't try at all	154 (32.0)
Try a little	169 (35.1)
Try a lot	159 (33.0)
Are you trying to get enough calcium from the foods you eat? (n = 466)	
Don't try at all	157 (33.7)
Try a little	167 (35.8)
Try a lot	142 (30.5)

[a]Not used in logistic regression analyses owing to low response rates.

approximately two thirds of the participants were trying "a little" or "a lot" to reduce dietary fat or cholesterol intake or to get enough calcium from foods.

Approximately 26% to 38% of the participants agreed with the statements that milk is too expensive, milk helps them sleep, milk spoils too fast, and milk containers are too difficult to open (Table 2). Nearly all participants (94%) agreed with the statement that milk is packaged in the right size for them.

One nutrition knowledge item was eliminated owing to poor discrimination. Interitem reliability (Cronbach's alpha) for the 11 final items was .73. The nutrition knowledge score, the sum of correct responses, was coded as "missing" if 3 or more items were unanswered (n = 5). Most participants (61%) correctly answered 5 to 8 items (mean = 5.9 ± 2.3).

Type of Milk Consumption

Given this nominal variable, generalized logit analyses were used to identify variables affecting the probability of drinking skim/1% milk or 2% milk rather than whole milk.

Based on hypothesized relationships, 12 variables were considered as candidates for the model (Table 3). In a stepwise approach, 4 variables were found to significantly increase the probability of drinking the lower-fat milks rather than whole milk ($P < .05$): nutrition knowledge, income, trying to reduce dietary cholesterol, and being female. Although these variables all increased the probability of drinking skim/1% milk relative to whole milk, only the trying to reduce cholesterol variable increased the probability of drinking 2% milk relative to whole milk. The goodness of fit was adequate for this model ($Q_L = 288.81$, $df = 330$, $P = .95$).

Frequency of Milk Consumption

Given this ordinal variable, a stepwise logistic procedure was used to identify variables affecting the probability of drinking milk more frequently. Based on hypothesized relationships, 19 variables were considered as candidates for the model (Table 3).

Deviance and Pearson goodness-of-fit statistics ($\chi^2 = 217$, $df = 216$, $P = .47$, and

TABLE 2—Attitudes Related to Milk Consumption in Community-Dwelling Older Americans (Aged 60–94 Years), 1994

Survey Item	No. (%)			
	Strongly Agree	Somewhat Agree	Somewhat Disagree	Strongly Disagree
Milk is too expensive (n = 460)	61 (13.3)	113 (24.6)	200 (43.5)	86 (18.7)
Milk helps me get to sleep (n = 371)	52 (14.0)	80 (21.6)	130 (35.0)	109 (29.4)
Milk spoils too fast (n = 468)	47 (10.0)	88 (18.8)	237 (50.6)	96 (20.5)
Milk is packaged in the right size for me (n = 476)	272 (57.1)	175 (36.8)	20 (4.2)	9 (1.9)
Milk containers are too difficult for me to open (n = 482)	45 (9.3)	81 (16.8)	191 (39.6)	165 (34.2)

$\chi^2 = 219.6$, $df = 216$, $P = .42$, respectively), as well as the score test ($\chi^2 = 4.13$, $df = 4$, $P = .39$), suggested a reasonable model fit. Variables that significantly increased the likelihood of drinking milk more often ($P < .05$) included nutrition knowledge, frequency of milk consumption during adolescence, perceived milk intolerance, and following a diabetic diet.

Discussion

Although nutrition knowledge has not consistently been correlated with nutrition behavior,[18,19] Axelson et al.[12] speculated that low correlations may be explained by limitations such as a lack of correspondence between measures of dietary intake and knowledge. Our nutrition knowledge instrument overcomes this limitation, and nutrition knowledge was positively associated with drinking skim/1% milk (rather than whole milk) and with drinking milk more often.

Type of Milk Consumed

In support of our findings, other researchers have reported that women tend to consume less dietary fat than men[20] and that gender influences the consumption of whole milk.[21] Concern about fat or cholesterol has also been associated with the type of milk consumed but not the frequency of consumption.[17,22] As suggested by Axelson,[23] relationships between dietary patterns and income may reflect "a growing concern about health in higher socioeconomic groups."

Frequency of Milk Consumption

The present findings confirm our earlier results[17] regarding the positive relationship between milk consumption in youth and in late adulthood. This relationship, also supported by physiological evidence,[24,25] has implications for the prevention of osteoporosis. Consistent with Fischer et al.,[22] frequency of milk consumption was associated with following a diabetic diet. It is likely that people following a diabetic diet have had education or

TABLE 3—Logistic Regression Analyses for the Type and Frequency of Milk Consumption in Community-Dwelling Older Americans (Aged 60–94 Years), 1994

	Odds Ratio	95% Confidence Interval
Type of milk consumed[a]: analysis of generalized logits (n = 301)[b]		
Nutrition knowledge (nutrition knowledge score[c])		
Skim or 1% vs whole milk	1.3	1.12, 1.58
2% vs whole milk	1.1	0.91, 1.22
Income (What is your total household income before taxes?[d])		
Skim or 1% vs whole milk	1.6	1.20, 2.08
2% vs whole milk	1.3	0.99, 1.64
Health behavior (Are you trying to reduce your cholesterol intake?[e])		
Skim or 1% vs whole milk	4.7	2.76, 8.00
2% vs whole milk	3.3	2.00, 5.39
Gender (Are you male or female?[f])		
Skim or 1% vs whole milk	1.6	1.08, 2.48
2% vs whole milk	1.1	0.77, 1.59
Frequency of milk consumed[g]: analysis of proportional odds model (n = 415)[h]		
Nutrition knowledge (total nutrition knowledge score)	1.1	1.02,[i] 1.21
Milk consumption during youth (During adolescence [12–19 years], I had milk [how often][j])	1.6	1.34, 1.78
Perceived milk intolerance (Does milk disagree with you?[k])	3.0	1.68, 5.20
Special diet (Are you currently following a diabetic diet?[l])	2.6	1.38, 4.83

[a]3 = whole milk, 2 = 2% milk, 1 = 1% milk or skim milk.
[b]Variables entered for type of milk consumed: age, gender, ethnicity, income, education, nutrition knowledge score, trying to reduce fat, trying to reduce cholesterol, trying to get enough calcium from foods, following a weight loss diet, following a low cholesterol diet, and following a diet for diabetes.
[c]Coded sum of correct responses from 11-item instrument (0 = wrong/don't know, 1 = right).
[d]Coded 1 = less than $4999, 2 = $5000–$9999, 3 = $10 000–$19 999, 4 = $20 000–$29,000, 5 = $30 000–$39 999, 6 = $40 000–$49,999, and 7 = $50 000 or more.
[e]Coded 1 = not at all, 2 = a little, 3 = a lot.
[f]Coded 1 = male, 2 = female.
[g]2 = <1 time/day, 1 = 1 time/day, 0 = 2 or more times/day. Comparisons were as follows: 1 or 0 vs 2 and 0 vs 2 or 1.
[h]Variables entered for trial in the model for frequency of milk intake: age, gender, ethnicity, income, education, nutrition knowledge score, trying to reduce fat intake, trying to reduce cholesterol intake, trying to get enough calcium from foods, following a weight loss diet, following a low cholesterol diet, following a diet for diabetes, milk is too expensive, milk helps me get to sleep, milk spoils too fast, milk is packaged in the right size for me, milk containers are too difficult to open, milk disagrees with me, and frequency of milk intake during youth.
[i]Only 1 set of confidence intervals is shown because the proportional odds model assumes that parameter estimates for all logits of single explanatory variables are equivalent.
[j]Coded 1 = rarely/never, 2 = a few times a week, 3 = once a day, 4 = twice a day, and 5 = 3 or more times a day.
[k]Coded 1 = yes, 2 = no.
[l]Coded 0 = no, 1 = yes.

counseling and been encouraged to regularly drink milk.

In North America, lactose maldigestion associated with lactase nonpersistence occurs in 21% of Whites, 51% of Hispanics, 75% of Blacks, 79% of Native Americans, and 80% of Asian Americans.[11] Perceived milk intolerance, probably caused at least in part by lactose maldigestion, was inferred for 18% of the participants who indicated that milk consumption causes them stomachaches, gas, or diarrhea. In this sample, consumption of milk less than once per month was reported by 57% of those with perceived milk intolerance but in only 22% of those who indicated tolerance.[26] Previous work has similarly shown that women with low calcium intakes indicate that "milk disagrees with them" more often than women with high calcium intakes ($P < .01$).[27]

Ethnicity did not enter either model. Our data suggest that income and concern about cholesterol have a greater effect than ethnicity on the type of milk consumed. Similarly, it appears that perceived milk intolerance is more important than ethnicity as a predictor of the frequency of milk consumption. Alternatively, the low percentage of minority elders in this study may have limited our ability to detect relationships between ethnicity and milk consumption.

Limitations

The validity of historical food consumption data has long been debated. However, epidemiological studies demonstrate that food frequency information can be used to predict major diseases and show that human diets are heterogeneous and measurable.[28] Self-report of milk intolerance is not a clinical diagnosis of lactose maldigestion. Nonetheless, our data extend the observations of others[29–32] and establish a significant relationship between perceived maldigestion and reduced consumption of milk. The majority of participants in this study were community dwelling, able to use a telephone, and White. Thus, results may not be generalizable to all older adults.

Conclusions

These results yield important information regarding development of strategies to optimize milk consumption in older adults. Further studies in older adults are needed to determine whether (1) the consumption of lower-fat milks may be enhanced by increasing nutrition knowledge and promoting the role of low-fat milk products in diets low in fat

and cholesterol and (2) total milk intake may be improved by enhanced marketing of lactose-reduced milk products and increasing milk consumption in youth. □

Acknowledgments

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