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## Factors Associated With Use of Calcium and Calcium/Vitamin D Supplements in Older Mexican Americans: Results of the Hispanic EPESE Study

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### Abstract

**Background**—Current studies indicate that older Mexican Americans take fewer calcium or calcium/vitamin D supplements than do older non-Hispanic whites. Factors associated with calcium supplement use are not completely understood in this ethnic group.

**Objective**—The purpose of this article was to determine the prevalence of calcium or calcium/vitamin D supplementation and factors associated with their use in older Mexican Americans.

**Methods**—A cross-sectional survey was conducted in a random sample of older Mexican Americans residing in the southwestern United States who had participated in the Hispanic Established Populations for the Epidemiologic Study of the Elderly. Self-identified Mexican Americans 75 years of age were enrolled through household interviews in 2004–2005. Each subject was asked to bring all prescription and nonprescription medications that they had used regularly during the previous 2 weeks to allow the interviewer to record the product names. Dosages were not recorded. Subjects were assigned to 1 of 3 categories based on their use of calcium or calcium/vitamin D supplements during the previous 2 weeks: (1) calcium supplement only, (2) calcium/vitamin D supplement, or (3) vitamin D supplement only. The subjects' sociodemographic and cultural factors, self-reported health and functional status, cognitive status, number of comorbidities, and use of antiosteoporosis medications were recorded.

**Results**—A total of 2069 older Mexican Americans (1272 women, 797 men; mean age, 81.9 years) were enrolled. The overall prevalence of calcium supplement use was 10.6% (weighted). Calcium supplements were used more often by women (odds ratio [OR] = 1.76; 95% CI, 1.17–2.63), subjects with multiple comorbidities (OR = 1.29; 95% CI, 1.10–1.50), those who interviewed in English (OR = 1.59; 95% CI, 1.06–2.40), and those who used antiosteoporosis medications (OR = 3.57; 95% CI, 1.85–6.89).

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The authors have indicated that they have no other conflicts of interest regarding the content of this article.

**Conclusions**—Use of calcium or calcium/vitamin D supplements was low (<60%) among this group of older Mexican Americans. Men are particularly at risk. More should be done to raise awareness regarding the benefits of calcium supplementation in this ethnic group.

### Keywords

Mexican American; aged; calcium; supplement use

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## INTRODUCTION

Adequate calcium is necessary for the maintenance of good skeletal health in older adults.<sup>1</sup> Burnett-Hartman et al<sup>2</sup> reported that calcium or calcium/vitamin D supplement use is important in enabling older adults to reach target goals of calcium intake. In a published review of >180 articles on calcium use, Heaney<sup>3</sup> found that in 68 of 70 studies in which calcium intake was investigator controlled, subjects who took calcium or calcium/vitamin D supplements had less age-related bone loss and a lower risk of fracture than did those who did not take supplements. In a cross-sectional, retrospective, observational study of 1771 healthy, early postmenopausal women who were not taking calcium supplements, Varena et al<sup>4</sup> found that lower calcium intake was associated with an increased risk of osteoporosis. It has also been reported that vitamin D supplementation decreased bone loss and subsequent fractures, especially when combined with calcium supplementation.<sup>5–7</sup>

Although older adults tend to take more nutritional supplements than do younger persons, Ervin and Kennedy-Stephenson<sup>8</sup> found that consistent use of calcium or calcium/vitamin D supplementation in this population remains <60%. Their review of the Third National Health and Nutrition Examination Survey (NHANES III, 1988–1994) found that only 42% of men (weighted; 930/2432) and 54% of women (weighted; 1305/2570) >60 years of age took calcium supplements. Zhong et al,<sup>9</sup> using data from the 1999–2002 NHANES, found that only 35.5% (weighted) of 290 postmenopausal women >70 years of age ingested >1200 mg of calcium a day. Wakimoto and Block,<sup>10</sup> in a retrospective review of the available US national nutritional surveys and longitudinal studies, found that calcium intake was lower among persons >70 years of age, especially among men. Furthermore, minorities and those below the poverty level generally ingested less calcium or calcium/vitamin D than did whites and/or those above the poverty level.<sup>11</sup>

Based on a literature search, few studies examined dietary calcium or calcium/vitamin D intake by older Mexican Americans, with limited studies focusing on dietary differences. Although dietary calcium intake has rarely been examined in older Mexican Americans, younger cohorts (25–64 years) indicated lower intakes of calcium (percentage of recommended daily allowance) than did non-Hispanic whites.<sup>12</sup> Looker et al,<sup>13</sup> using the Hispanic NHANES and NHANES II, found that Hispanics had calcium intakes similar to those of non-Hispanic whites. However, Mexican Americans derived a substantial amount of calcium from corn tortillas, a decreasing trend in that population.

The purpose of this article was to determine the prevalence of calcium or calcium/vitamin D supplementation and factors associated with their use in older Mexican Americans.

## METHODS

This study was approved by the University of Texas Health Science Center at San Antonio Institutional Review Board for exempt research (Protocol #HSC20070142E) through January 15, 2011.

### Subjects

The Hispanic Established Populations for the Epidemiologic Study of the Elderly (Hispanic EPESE) is a longitudinal study of 3050 Mexican American elders (age range, 75–99 years). The sample was drawn using probability sampling procedures to represent the older Mexican American population residing in Arizona, California, Colorado, New Mexico, and Texas. This cross-sectional study utilized the fifth wave of 2069 subjects surveyed in 2004–2005. Sampling and data collection methods are detailed elsewhere.<sup>14</sup> Of the original cohort, 1167 subjects remained and 902 were added. In-home interviews were conducted in each household.

### Measures

**Interview Language**—The survey was administered in the participant’s preferred language (Spanish or English). Subjects were excluded from the Hispanic EPESE if they were unable to complete survey questions in either language.

**Use of Calcium and/or Vitamin D Supplements**—Subjects were assigned to 1 of 3 categories based on their use of calcium and/or vitamin D supplements within the previous 2 weeks: (1) calcium supplement only, (2) calcium/vitamin D supplement, or (3) vitamin D supplement only. Subjects who had taken multivitamin supplements that included both calcium and vitamin D were included in the calcium/vitamin D category.

**Sociodemographic Characteristics**—The subject’s age, sex, level of education, annual income, and living arrangements (ie, living alone or with someone) were based on self-reported data.

**Cultural Variables**—Birthplace was defined as “United States born” or “Mexican born.” Likewise, language was categorized as English or Spanish, based on their interview.

**Self-Perceived Health Status**—Subjects were asked to rate their current self-perceived health status as excellent, good, fair, or poor, which were dichotomized into “excellent/good” or “fair/poor.”<sup>15</sup>

**Activities of Daily Living**—The subject’s ability to perform activities of daily living (ADLs) was assessed using the modified Katz questionnaire.<sup>16</sup> For the purposes of this study, subjects who required assistance with any ADL were considered dependent.

**Instrumental Activities of Daily Living**—The subject’s ability to perform instrumental ADLs (IADLs), an important parameter in older community-dwelling groups, was assessed using the modified OARS (Older Americans Resources and Services) scale.<sup>17</sup> This is a well-validated, practical scale that also has predictive validity when assessed against mortality.

For the purposes of this study, subjects who required assistance with any IADL were considered dependent.

**Use of Calcium Supplements and Antiosteoporosis Medications**—Each subject was asked to bring all prescription and nonprescription medications that they had used regularly during the previous 2 weeks to allow the interviewer to record the product names. Dosages were not recorded. Data coding procedures have been described elsewhere.<sup>14</sup> Both medications and supplements were grouped by category and class using the same classification system as that used at other EPESE sites.<sup>18</sup> Subjects who were taking antiresorptive medications (bisphosphonates, estrogen, calcitonin, raloxifene) were included in the analysis.

**Body Mass Index**—Height to the nearest inch and weight to the nearest pound were recorded for each subject. The subject's height was converted to centimeters and weight was converted to kilograms, allowing calculation of the body mass index (BMI). Subjects were then categorized as “normal” (<25 kg/m<sup>2</sup>) or “obese” (≥ 25 kg/m<sup>2</sup>) based on their BMI.

**Cognitive Status**—The subject's cognitive status was assessed using the MMSE (Mini-Mental State Examination). For the purposes of this study, subjects who scored >18 were considered to have cognitive impairment.<sup>14</sup> This variable was dichotomized (>18 or ≤ 18). Scores >18 indicated severe cognitive impairment, 18 to 24 indicated mild cognitive impairment, and >24 indicated no impairment (cognitively intact).

**Comorbid Illnesses**—Comorbid illnesses were based on the condition checklist that was used in other EPESE studies.<sup>19</sup> Specific questions were asked regarding the subject's history of hypertension, type 2 diabetes mellitus, angina or myocardial infarction, cerebrovascular accident, cancer, and arthritis (the most common comorbidities seen in older adults in the United States). Subjects who reported that a physician “definitely” informed them that they had one of these specific illnesses were categorized as having that illness. The sum of the comorbid illnesses ranged from 0 to 6, the same scale that was used previously.<sup>14</sup>

**Alcohol Use**—Regular alcohol use has been associated with beginning use of calcium or calcium/vitamin D supplementation (relative risk = 1.3; 95% CI, 1.1–1.6).<sup>20</sup> The subject's drinking status was dichotomized as “never” or “ever” drank.

## Analysis

The prevalence of calcium use was estimated, based on data from stratified probability samples. The study sample was weighted to compensate for the differential probability of selection applied to census tract sampling. Sample weights were adjusted to conform with the distribution of Mexican Americans aged ≥ 75 years across the southwestern United States. The original cohort of 3050 had been reduced to 1167 by wave 5.

Subjects were lost to attrition, relocation, or facility access denial. To sustain a sufficient sample size, 902 additional participants aged ≥ 75 years were included in the wave-5 sampling. To maintain population representation with the augmented sample of 2069, new weights were constructed. These new cohort weights were based on the inverse of the

probability of selection based on the United States Census 2000. Sampling weights for each wave were referenced to population totals from Census 2000, public use microdata files containing individual characteristics, for a 5% sample of people and housing units. Poststratification weights were constructed to estimate control totals from the Census 2000 5-Percent Public Use Microdata Sample files.<sup>21</sup> This allowed weight calculations based on 13,759 cases of older Mexican Americans (aged 75 years) living in 1 of the 5 southwestern states. Raking variables were sex, age (75–79, 80–84, 85), state (California, Texas, other), and the cross-tabulation of nativity (United States vs other) and schooling (<5.5, <12, 12 years), using an enhanced raking macro.<sup>22</sup> Raking also utilized a percentage of Mexican Americans in tracts of the Census 2000.

The data were analyzed using the complex sample weights and compiled into descriptive statistics, simple 2-way cross-classification tables, and a series of logistic regressions. Descriptive statistics were used to examine sample characteristics, and bivariate analyses were used to identify correlates of supplement use. Weighted odds ratios (ORs), the corresponding 95% CIs, and *P* values from Pearson  $\chi^2$  tests were cross-tabulated. Initially, we examined the unadjusted weighted ORs, corresponding 95% CIs, and *P* values to identify factors related to supplement use. Factors that met the screening criteria of *P* < 0.25, as recommended by Hosmer and Lemeshow,<sup>23</sup> were then used for multivariate testing in the first of a series of logistic regression models. Variables in the initial model included language of interview (English), female sex, less than a 5th-grade education, living alone, number of comorbidities, and use of antiosteoporosis medication. The least significant characteristic for each iteration was discarded, and the model was retested until the remaining terms had a *P* value of 0.05. Analyses were performed using SPSS version 17 (SPSS Inc., Chicago, Illinois) and Stata version 10 (StataCorp LP, College Station, Texas).

## RESULTS

A total of 2069 older Mexican Americans (1272 women, 797 men; mean age, 81.9 years) were enrolled. Most (74.5%) of the subjects were <85 years of age, and 60.1% were female; >75% of the sample preferred to interview in Spanish (Table I; weighted). The mean number of comorbid illnesses from our major illness index was 1.79. Only 4% of the subjects took antiosteoporosis medication.

Two hundred ten subjects were using some type of calcium or calcium/vitamin D supplement and were able to provide the requested information. Of these subjects, 132 were using calcium/vitamin D supplements, 70 were using calcium only (or a multivitamin that contained calcium but no vitamin D), and 8 were using vitamin D alone. The study sample is shown in Table II, based on supplement use.

The overall prevalence of calcium supplement use was 10.6%. Calcium supplements were used more often by women (OR = 1.76; 95% CI, 1.17–2.63), subjects who interviewed in English (OR = 1.59; 95% CI, 1.06–2.40), those with multiple comorbidities (OR = 1.29; 95% CI, 1.10–1.50), and those who used antiosteoporosis medications (OR = 3.57; 95% CI, 1.85–6.89). The vitamin D group was too small to allow conclusions to be drawn.

The bivariate associations between calcium or calcium/vitamin D supplement use and the confounding factors are shown in Table III. Significant associations ( $P < 0.05$ ) were seen between calcium supplement use and female sex, English-language interview, number of comorbidities, and use of antiosteoporosis medication.

The significant factors from the multivariate analysis that were retained in the final logistic regression model are shown in Table IV. The goodness-of-fit test for the regression model yielded an acceptable  $P$  value of 0.70, indicating that the predicted model does not deviate significantly from the data. Women were 1.76 times more likely than men to use calcium supplements. Likewise, older Mexican Americans who interviewed in English were 1.59 times more likely to use calcium supplements than were those who interviewed in Spanish, and subjects with increasing comorbidities were 1.29 times more likely to use supplements. As expected, older Mexican Americans who used antiosteoporosis medications were 3.57 times more likely to use calcium supplements than were those who did not to enhance the effects of the prescribed medications.

## DISCUSSION

The results of this study indicate that 10.6% (weighted) of these 2069 older Mexican Americans reported calcium use. Radimer et al<sup>24</sup> examined vitamin supplementation in the NHANES (1999–2000) and found that 18.4% (SE = 1.3%) of 1825 persons >60 years of age used calcium supplements. Davis et al<sup>20</sup> found that 20% (weighted) of 1087 older Japanese American women (mean age at baseline, 63.9 years) used calcium supplements at 10-year follow-up. Therefore, older Mexican Americans may be at risk for osteoporosis and subsequent fractures due to inadequate intake of these supplements compared with other groups.

The low prevalence of calcium or calcium/vitamin D supplements in this group of older Mexican Americans may reflect a lack of perceived benefit and/or health care barriers leading to inadequate education regarding bone health. Attention should be placed on increasing awareness of the value of these supplements, especially among older, Spanish-speaking, male Mexican Americans.

The low use of calcium or calcium/vitamin D supplements in older Mexican Americans may be due to ethnicity independent of low socioeconomic status. Ethnicity may be a function of language barriers, less acculturation,<sup>12</sup> or health status. Because osteoporosis is a silent disease, unless older Mexican Americans are counseled on the risks of this disease, the use of supplements might be seen as an unnecessary expense. English proficiency, as measured by the decision to take the Hispanic EPESE survey in English, was a key factor in calcium or calcium/vitamin D supplement use. Su et al<sup>25</sup> evaluated data from the 2002 National Health Interview Survey and found that as English proficiency (also measured based on language of interview) increased, so did the use of megavitamin supplements. Low English proficiency may simply reflect an inability to access health care, where education on ways to improve bone health would most commonly occur. The effect of physician counseling has been seen in other Mexican American populations; only 13.1% (16/122) of postmenopausal, low-income, Mexican American women from 2 community clinics in South Texas reported



that they had been counseled on bone health and the use of calcium supplements.<sup>26</sup> However, those who had been counseled on bone health were 2.7 times (95% CI, 1.44–4.93) more likely to use calcium supplements than were those who had not been counseled. Men are also particularly at risk. Community-based bone health initiatives should particularly target older Mexican Americans to decrease the potential risks of fractures.

The women in the cohort were 1.76 times more likely than their male counterparts to take calcium or calcium/vitamin D supplements (95% CI, 1.17–2.63). This finding can be attributed to increased awareness of the need for monitoring bone health, especially after menopause.<sup>27</sup>

Furthermore, it was found that increasing comorbidity was associated with increased use of calcium or calcium/vitamin D supplements in older Mexican Americans (by 1.29 times).<sup>19</sup> It could be that the increase in the number of comorbid illnesses (95% CI, 1.10–1.50) increased supplement use because older Mexican Americans accessed health care resources more often.

Finally, subjects who were using antiosteoporosis medications were 3.57 times more likely to take calcium supplements than were those not taking the prescription drugs (95% CI, 1.85–6.89), most likely following a clinician's directive to use these supplements concomitantly with the prescription drugs.

### Limitations

Our data set limited our ability to fully examine factors associated with calcium or calcium/vitamin D intake in this population. Subjects who reported that a physician “definitely” informed them that they had one of these specific illnesses were categorized as having that illness; this was based on subject recall and was not confirmed. We were unable to assess dietary intake, although the calcium or calcium/vitamin D dose contained in supplements exceeded that obtainable from diet alone. Poor subject recall may have resulted in an underreporting of supplement usage, although the strategy of requesting the subject to present all of the bottles of regularly used medications and supplements should have improved the reliability of the results. Finally, information was not available on the consistency or length of use or the dose of the calcium or calcium/vitamin D supplements used, which reduced the strength of our findings. These limitations do not allow us to make inferences on whether overall calcium or calcium/vitamin D intake in older Mexican Americans is different from that in other ethnic groups.

### CONCLUSIONS

The use of calcium or calcium/vitamin D supplements by this group of older Mexican Americans was low (<60%). Men are particularly at risk. More should be done to raise awareness regarding the benefits of calcium supplementation in this ethnic group.

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**Table I**

Weighted sample characteristics for older Mexican Americans in the wave-5 cohort of the Hispanic Established Populations for the Epidemiologic Study of the Elderly (n = 2069).

Characteristic *	Weighted, %	Raw Count, n <sup>†</sup>
Age, y		
75–84	74.5	1501
85–94	23.2	515
95	2.3	53
Sex		
Female	60.1	1272
Male	39.9	797
Education		
5th Grade	47.8	833
>5th Grade	52.2	1236
Income (2004–2005 US \$)		
\$ 10,000	57.5	942
<\$ 10,000	42.5	845
Living arrangements		
Alone	73.2	1492
Not alone	26.8	577
Citizenship		
Born in United States	43.8	911
Born in Mexico	56.2	1158
Interview language		
Spanish	76.6	1661
English	23.4	408
Health		
Poor/fair	65.3	1358
Good/excellent	34.7	693
ADLs		
Independent	66.7	1307
Dependent	33.3	761
IADLs		
Independent	26.9	529
Dependent	73.1	1540
Body mass index		
Normal (<25 kg/m <sup>2</sup> )	32.3	542
Obese (≥ 25 kg/m <sup>2</sup> )	67.7	1101
Cognition, MMSE score		
>18	79.4	1499
18	20.6	436

Characteristic *	Weighted, %	Raw Count, n <sup>†</sup>
Alcohol use		
Never drank	40.7	940
Ever drank	59.3	1129
Antiosteoporosis medication use		
No	96	1983
Yes	4	86

ADLs = activities of daily living; IADLs = instrumental ADLs; MMSE = Mini-Mental State Examination.

\* Mean (SE) number of comorbidities (range, 0–6) = 1.79 (0.03).

<sup>†</sup> Some raw counts do not total 2069 due to missing data.

**Table II**

Weighted characteristics for older Mexican Americans who used or did not use calcium or calcium/vitamin D supplements in wave 5 of the Hispanic Established Populations for the Epidemiologic Study of the Elderly (n = 2069).

Characteristic *	No Supplement		Supplement	
	Weighted, %	Raw Count, n <sup>†</sup>	Weighted, %	Raw Count, n <sup>†</sup>
No. of subjects	89.3	1859	10.6	210
Age, y				
75–84	88.9	1356	11.1	145
85–94	90.8	466	9.2	49
95	90.0	48	10.0	5
Sex				
Male	92.8	742	7.2	55
Female	87.0	1128	13.0	144
Education				
5th Grade	87.6	738	12.4	95
>5th Grade	90.9	1132	9.1	104
Income (2004–2005 US \$)				
\$10,000	88.9	846	11.1	96
<\$10,000	89.6	761	10.4	84
Living arrangements				
Alone	87.7	515	12.3	62
Not alone	90.0	1355	10.0	137
Citizenship				
Born in United States	89.3	1054	10.7	104
Born in Mexico	89.4	816	10.6	95
Interview language				
Spanish	90.6	1508	9.4	153
English	85.2	362	14.8	46
Health				
Poor/fair	89.3	1214	10.7	144
Good/excellent	89.2	638	10.8	55
ADLs				
Independent	89.2	1177	10.8	130
Dependent	89.6	692	10.4	69
IADLs				
Independent	89.7	474	10.3	55
Dependent	89.2	1396	10.8	144
Body mass index				
Normal (<25 kg/m <sup>2</sup> )	89.4	485	10.6	57
Obese (≥ 25 kg/m <sup>2</sup> )	88.8	988	11.2	113

Characteristic*	No Supplement		Supplement	
	Weighted, %	Raw Count, n <sup>†</sup>	Weighted, %	Raw Count, n <sup>†</sup>
Cognition, MMSE score				
>18	88.4	1339	11.6	160
18	90.4	399	9.6	37
Alcohol use				
Never drank	90.2	857	9.8	83
Ever drank	88.8	1013	11.2	116
Antiosteoporosis medication use				
No	90.2	1805	9.8	178
Yes	69.4	65	30.6	21

ADLs = activities of daily living; IADLs = instrumental ADLs; MMSE = Mini-Mental State Examination.

\* Mean (SE) number of comorbidities (range, 0–6) = 1.75 (0.03) for no supplement use; 2.1 (0.11) for supplement use.

<sup>†</sup> Some raw counts do not total 2069 due to missing data.

**Table III**

Associations between factors of calcium or calcium/vitamin D supplement use in older Mexican Americans in wave 5 of the Hispanic Established Populations for the Epidemiologic Study of the Elderly (n = 2069): Bivariate analysis.

Characteristic	Odds Ratio (95% CI)	P
Age, y		
85–94 vs 75–84	0.81 (0.53–1.24)	0.334
95 vs 75–84	0.89 (0.26–3.03)	0.851
Sex, female vs male	1.90 (1.29–2.87)	<0.001
Education, 5th vs >5th grade	0.70 (0.49–1.01)	0.057
Income (2004–2005 US \$), <\$10,000 vs \$10,000	0.93 (0.63–1.37)	0.720
Living arrangements, alone vs not alone	1.26 (0.85–1.87)	0.251
Citizenship, born in United States vs Mexico	1.01 (0.70–1.45)	0.970
Interview language, English vs Spanish	1.68 (1.11–2.55)	0.015
Health, good/excellent vs poor/fair	1.01 (0.67–1.50)	0.980
ADLs, any vs none	0.96 (0.65–1.40)	0.821
IADLs, any vs none	1.05 (0.70–1.58)	0.796
Body mass index, obese vs normal*	1.07 (0.70–1.63)	0.751
Cognition, MMSE score 18 vs >18	0.81 (0.51–1.28)	0.370
No. of comorbidities	1.30 (1.11–1.52)	<0.001
Alcohol use, ever vs never drank	1.16 (0.80–1.68)	0.440
Antihypertension medication, use vs no use	4.05 (2.05–8.02)	<0.001

ADLs = activities of daily living IADLs = instrumental ADLs; MMSE = Mini-Mental State Examination.

\* Obese = body mass index  $\geq 30$  kg/m<sup>2</sup>; normal = <25 kg/m<sup>2</sup>.



**Table IV**

Significant factors associated with use of calcium or calcium/vitamin D supplements in a multivariate logistic regression analysis of older Mexican Americans in wave 5 of the Hispanic Established Populations for the Epidemiologic Study of the Elderly (n = 2069).

<b>Supplement Use</b>	<b>Adjusted Odds Ratio (95% CI)<sup>*</sup></b>
Sex, female	1.76 (1.17–2.63)
Interview language, English	1.59 (1.06–2.40)
No. of comorbidities	1.29 (1.10–1.50)
Antiosteoporosis medication use	3.57 (1.85–6.89)

\* Odds ratios adjusted for all terms in the model.