Mineral Intakes of Elderly Adult Supplement and Non-Supplement Users in the Third National Health and Nutrition Examination Survey

R. Bethene Ervin1 and Jocelyn Kennedy-Stephenson

Centers for Disease Control/National Center for Health Statistics, Hyattsville, MD 20782

ABSTRACT  Calcium, iron and zinc are important in many of the body’s functions. We report dietary and combined (diet + supplements) intakes for these minerals for elderly supplement and non-supplement users in the United States and the prevalence of inadequate intakes. We calculated usual dietary intakes for adults 60 y and older from third National Health and Nutrition Examination Survey, 1988–94; mineral intakes from supplements and calcium-containing antacids were added to usual dietary intakes. We evaluated iron and zinc intakes using the dietary reference intakes, recommended dietary allowances and estimated average requirements for elderly adults, as well as calcium intakes using the Adequate Intake and the Healthy People 2010 objective. The highest prevalences of inadequate dietary intakes was for calcium (males, 70–75%; females, 87%) and zinc (males, 35–41%; females, 36–45%). Dietary supplements improved intakes, but nearly two-thirds of elderly adults had combined intakes below the calcium objective. Non-Hispanic blacks usually had lower intakes than non-Hispanic whites and higher prevalences of intakes below the standards. Supplement users had significantly higher mean dietary intakes than non-supplement users for all three minerals for total females and non-Hispanic white females (P < 0.05 for each mineral). Many elderly adults had inadequate dietary zinc intakes, and calcium intakes fell below the Healthy People 2010 objective; dietary supplements improved intakes. Even with supplements most older adults still had intakes below the calcium objective, partly because the supplements they took usually contained low doses of calcium. Total female and non-Hispanic white female supplement users were the only groups that had higher dietary intakes than non-supplement users for all three minerals. J. Nutr. 132: 3422–3427, 2002.

KEY WORDS:  •  dietary intake  •  dietary supplements  •  elderly  •  minerals  •  NHANES III

Diet and nutrition play important roles in maintaining health and preventing disease (1,2). This is especially important for elderly adults, for whom proper nutrition plays a crucial role in helping them maintain good health and functioning. Many older adults are at increased risk of inadequate nutritional intakes due to lower intakes of energy and other nutrients. Other risk factors for poor nutrition include disease, physical limitations and chewing difficulties, polypharmacy, living alone, lack of transportation and limited income (3,4). Although many seniors use dietary supplements, the supplement users often already have adequate dietary intakes (5–8).

This paper focuses on calcium, iron and zinc intakes among older adults in the United States. Calcium provides strength and hardness to bones and teeth and mediates vascular constriction and vasodilation, muscle contraction, transmission of nerve impulses and blood clotting (9,10). Osteoporosis, a disease affecting >28 million Americans over the age of 65 y, is characterized by a decline in bone mass, reduced bone strength and increased risk of fractures (11). Increased calcium intakes may improve calcium retention and reduce fracture rates (9).

Iron is part of many proteins, including ones involved in oxygen transport to tissues, and acts as an electron carrier (12). Iron deficiency can lead to anemia and to impaired cellular and humoral immunity (12,13). Iron overload may contribute to coronary artery disease, but the evidence is conflicting. Iron is essential for normal neurological functioning, and changes in iron metabolism in the brain may be associated with certain neurological diseases, such as Alzheimer’s disease (13).

Zinc plays a catalytic role for many enzymes and a structural role for other proteins and enzymes. It also plays a role in regulating gene expression (14). Zinc deficiency may result in growth retardation and sexual immaturity, impaired immune function, taste and smell dysfunction and eye and skin lesions (14,15).

We examined the calcium, iron and zinc intakes of elderly adults from the third National Health and Nutrition Examination Survey (NHANES III), 1988–1994, comparing non-supplement users’ dietary intakes to supplement users’ dietary intakes and to their combined intakes (dietary intakes + supplements). Also, we examined the prevalence of dietary and combined intakes below dietary reference intakes (DRI) (12,14) or Healthy People 2010 objectives (16).
METHODS

Sample population and definitions. The Centers for Disease Control and Prevention’s National Center for Health Statistics conducted NHANES III, which was designed to collect information on the civilian, noninstitutionalized U.S. population aged ≥2 y of age. A detailed description of the NHANES III plan, operation, and sample design appears elsewhere (17). All procedures were approved by the NCHS Institutional Review Board, and written informed consent was obtained from all subjects. Interviewers collected data during a household interview and at a follow-up physical examination at a mobile examination center (MEC).

Age was the self-reported age at the time of the household interview. The self-reported race and ethnic group classifications were combined to create the following categories: non-Hispanic white, non-Hispanic black, Mexican American and “other” races/ethnicities.

Data collection. Trained interviewers, bilingual in English and Spanish, collected a 24-h dietary recall during the respondent’s visit to the MEC using an automated dietary interview and coding system (17, 18). Nutrient values were assigned to the dietary recalls using food composition data from the U.S. Department of Agriculture’s Survey Nutrient Database (19). NHANES staff added nutrient values for new products and product reformulations to the database (17, 18).

During the household interview, respondents were asked whether they took any dietary supplements or antacids during the past month, and the frequency and dose. We defined a dietary supplement as any vitamin, mineral supplement or other dietary supplement, such as herbs or botanical products. See Reference 20 for a detailed description of the dietary supplement and antacid questions and the coding used.

A total of 8375 elderly adults 60 y of age and older participated in NHANES III. Of the 5302 elderly adults examined in the MEC, 5039 (95%) provided complete and reliable 24-h dietary recalls. We excluded five respondents due to missing or unknown responses for the antacid use question. No apparent bias was introduced into the data analyses due to missing or unknown responses for the supplement use question and, for the calcium analyses, we excluded 95% of the examined elderly adults. We did not impute values for missing 24-h recall data.

Estimating usual dietary intakes. We estimated usual dietary intakes from a single 24-h dietary intake recall per person and a second independent 24-h recall from a nonrandom subsample of ~8% of the examined older adults. We did not impute values for missing 24-h recall data.

Estimates from one dietary recall may contain substantial within-person variation. The usual intakes estimated in this paper were adjusted to remove within-person variation using a modified version of the model developed by the National Research Council (21). Because the model is based on an assumption of normality, we log-transformed the original mineral values to improve their distribution. Using the model developed by Feinleib et al. (22), we calculated adjusted values (x*) for each respondent after removing the within-person variation from their original values (x). The model is:

\[ x^* = \mu + (x - \mu) \left( \frac{SD_{\text{between}}}{SD_{\text{total-observed}}} \right) \]

We estimated the ratio of within-person variability to between-person variability using the formula:

\[ \frac{s_w^2}{s_b^2} = \frac{1 - r}{r} \]

where \( r \) is the correlation coefficient between the nutrient intakes from the first and second dietary recalls; \( s_w^2 \) is the within-person variance and \( s_b^2 \) is the between-person variance. This formula can be used to estimate the following ratio:

\[ \frac{SD_{\text{total-observed}}}{SD_{\text{between}}} = \frac{1}{1 + \left( \frac{1 - r}{r} \right)} \]

RESULTS

Mean dietary and combined calcium intakes for total males and total females were below the AI for calcium (Table 1).
### TABLE 1
Mean and median dietary and combined mineral intakes and prevalence of inadequate intakes among adults 60 y and older in NHANES III.1,2

<table>
<thead>
<tr>
<th>Mineral, sex and race/ethnicity</th>
<th>Non-supplement users</th>
<th>Supplement users</th>
<th>Combined intakes2</th>
<th>Below standard</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Diet only</td>
<td>Below standard</td>
<td>Diet only</td>
<td>Below standard</td>
</tr>
<tr>
<td></td>
<td>n</td>
<td>Mean</td>
<td>Median</td>
<td>%</td>
</tr>
<tr>
<td>Calcium</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>Total3</td>
<td>2432</td>
<td>735 ± 114.5</td>
<td>690 ± 13</td>
</tr>
<tr>
<td>Non-Hispanic white</td>
<td></td>
<td>1396</td>
<td>762 ± 114.5</td>
<td>716 ± 17</td>
</tr>
<tr>
<td>Non-Hispanic black</td>
<td></td>
<td>488</td>
<td>574 ± 114.5</td>
<td>498 ± 21</td>
</tr>
<tr>
<td>Mexican American</td>
<td></td>
<td>489</td>
<td>679 ± 114.5</td>
<td>626 ± 35</td>
</tr>
<tr>
<td>Female</td>
<td>Total3</td>
<td>2570</td>
<td>582 ± 114.5</td>
<td>523 ± 13</td>
</tr>
<tr>
<td>Non-Hispanic white</td>
<td></td>
<td>1501</td>
<td>597 ± 114.5</td>
<td>542 ± 16</td>
</tr>
<tr>
<td>Non-Hispanic black</td>
<td></td>
<td>514</td>
<td>494 ± 114.5</td>
<td>446 ± 16</td>
</tr>
<tr>
<td>Mexican American</td>
<td></td>
<td>469</td>
<td>572 ± 114.5</td>
<td>505 ± 34</td>
</tr>
<tr>
<td>Iron</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>Total3</td>
<td>2447</td>
<td>15.4 ± 0.224.5</td>
<td>13.9 ± 0.18</td>
</tr>
<tr>
<td>Non-Hispanic white</td>
<td></td>
<td>1401</td>
<td>15.7 ± 0.274.5,6,7</td>
<td>14.1 ± 0.21</td>
</tr>
<tr>
<td>Non-Hispanic black</td>
<td></td>
<td>491</td>
<td>12.6 ± 0.435</td>
<td>11.0 ± 0.38</td>
</tr>
<tr>
<td>Mexican American</td>
<td></td>
<td>496</td>
<td>13.7 ± 0.515</td>
<td>12.6 ± 0.44</td>
</tr>
<tr>
<td>Female</td>
<td>Total3</td>
<td>2587</td>
<td>11.4 ± 0.204.5</td>
<td>10.0 ± 0.14</td>
</tr>
<tr>
<td>Non-Hispanic white</td>
<td></td>
<td>1510</td>
<td>11.6 ± 0.254.5,7</td>
<td>10.0 ± 0.20</td>
</tr>
<tr>
<td>Non-Hispanic black</td>
<td></td>
<td>518</td>
<td>10.6 ± 0.335</td>
<td>9.7 ± 0.38</td>
</tr>
<tr>
<td>Mexican American</td>
<td></td>
<td>472</td>
<td>9.7 ± 0.344.5</td>
<td>9.3 ± 0.37</td>
</tr>
<tr>
<td>Zinc</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>Total3</td>
<td>2447</td>
<td>10.9 ± 0.215</td>
<td>10.2 ± 0.12</td>
</tr>
<tr>
<td>Non-Hispanic white</td>
<td></td>
<td>1401</td>
<td>11.1 ± 0.264.5,6,7</td>
<td>10.3 ± 0.14</td>
</tr>
<tr>
<td>Non-Hispanic black</td>
<td></td>
<td>491</td>
<td>9.5 ± 0.285</td>
<td>8.8 ± 0.16</td>
</tr>
<tr>
<td>Mexican American</td>
<td></td>
<td>496</td>
<td>10.1 ± 0.305</td>
<td>9.6 ± 0.31</td>
</tr>
<tr>
<td>Female</td>
<td>Total3</td>
<td>2587</td>
<td>7.8 ± 0.144.5</td>
<td>7.2 ± 0.16</td>
</tr>
<tr>
<td>Non-Hispanic white</td>
<td></td>
<td>1510</td>
<td>7.9 ± 0.164.5</td>
<td>7.2 ± 0.18</td>
</tr>
<tr>
<td>Non-Hispanic black</td>
<td></td>
<td>518</td>
<td>7.3 ± 0.245</td>
<td>6.6 ± 0.16</td>
</tr>
<tr>
<td>Mexican American</td>
<td></td>
<td>472</td>
<td>7.5 ± 0.265</td>
<td>6.9 ± 0.24</td>
</tr>
</tbody>
</table>

1 Values are means or medians ± SE. Standards used: EAR for iron: males, 6 mg/d; females, 5 mg/d; EAR for zinc: males, 9.4 mg/d; females, 6.8 mg/d; Healthy People 2010 calcium objective: 924 mg/d for both sexes.

2 Combined calcium intakes include dietary intakes plus calcium from supplements plus calcium from antacids. Combined iron and zinc intakes include dietary intakes plus mineral intakes from supplements.

3 Total includes race/ethnic groups not shown separately.

4 Significant difference between non-supplement users’ mean dietary intakes vs supplement users’ mean dietary intakes stratified by sex and race/ethnicity, P < 0.05.

5 Significant difference between non-supplement users’ mean dietary intakes vs supplement users’ mean combined intakes stratified by sex and race/ethnicity, P < 0.05.

6 Comparing within each supplement use classification, differences between non-Hispanic whites’ mean dietary or combined intakes vs non-Hispanic blacks’ comparable intakes, P < 0.05.

7 Comparing within each supplement use classification, differences between non-Hispanic whites’ mean dietary or combined intakes and Mexican Americans’ comparable intakes, P < 0.05.

8 Comparing within each supplement use classification, differences between Mexican Americans’ mean dietary or combined intakes and non-Hispanic blacks’ comparable intakes, P < 0.05.
Seventy to 75% of males and 87% of females had mean dietary calcium intakes below the Healthy People 2010 calcium objective, but the proportion with combined intakes below this objective fell to 60% for males and 66% for females. In contrast, mean dietary and combined iron intakes for total males and total females were above the RDA, and very few elderly adults had inadequate dietary or combined iron intakes (Table 1). Mean dietary and combined zinc intakes were either near the RDA or above it for total males and total females. Anywhere from 35 to 45% of elderly adults had inadequate dietary zinc intakes, but only 20–25% had inadequate combined zinc intakes (Table 1).

There were significant differences in mean dietary mineral intakes between supplement and non-supplement users for total females for all three minerals (P < 0.001 for calcium; P < 0.005 for iron; and P < 0.01 for zinc) and for total males for calcium (P < 0.02) and iron (P < 0.002) (Table 1). When the data were stratified by race/ethnicity within sex, the significant differences remained for non-Hispanic white females for all three minerals (P < 0.005 for calcium; P < 0.01 for both iron and zinc), and for iron for non-Hispanic white males (P < 0.005) and Mexican-American females (P < 0.05). In each case supplement users had higher dietary intakes than non-supplement users.

Supplement users’ combined intakes were significantly different from non-supplement users’ dietary intakes for all three minerals for total males (P < 0.001 for each mineral) and total females (P < 0.001 for each mineral) (Table 1). When the data were stratified by race/ethnicity within sex, the significant differences remained (P < 0.02 for calcium for non-Hispanic black males; P < 0.05 for iron for Mexican-American males; P < 0.001 for all other comparisons). As expected, supplement users’ combined intakes were higher than non-supplement users’ dietary intakes.

Non-Hispanic whites generally had higher intakes than the other two race-ethnic groups. Mean dietary intakes were significantly different between non-Hispanic white and non-Hispanic black males for all three minerals (P < 0.001 for each comparison) (Table 1). These results applied to supplement and non-supplement users. Non-Hispanic whites’ dietary intakes were 166 and 188 mg higher for calcium, 3.7 and 3.1 mg higher for iron and 1.9 and 1.6 mg higher for zinc for supplement and non-supplement users, respectively. Combined intakes for calcium (P < 0.001) and zinc (P < 0.001) were also significantly different between these groups, and the magnitude of the differences was larger than those for dietary intakes.

Mean dietary intakes were also significantly different between non-Hispanic white and Mexican-American males for calcium (P < 0.02) and iron (P < 0.001) (Table 1). These results applied to supplement and non-supplement users. The only significant differences for zinc were for non-supplement users’ dietary intakes (P < 0.02) and for combined intakes (P < 0.01). Non-Hispanic whites had larger intakes, but the magnitude of the differences were smaller than for non-Hispanic blacks.

Non-Hispanic blacks and Mexican Americans generally had larger prevalences of intakes below the Healthy People 2010 calcium objective and inadequate iron and zinc intakes than non-Hispanic whites, with non-Hispanic blacks having the largest prevalences (Table 1). The differences in prevalences of inadequate iron intakes between non-Hispanic whites and either non-Hispanic blacks or Mexican Americans were usually minimal. In fact, there were no differences in the prevalences of inadequacy between non-Hispanic white and Mexican-American supplement users for either dietary or combined intakes.

Mean dietary calcium intakes for supplement (P < 0.001) and non-supplement (P < 0.001) users were significantly different between non-Hispanic white and non-Hispanic black females (Table 1). Non-Hispanic whites’ dietary calcium intakes were 103 mg higher than non-Hispanic blacks’ intakes for non-supplement users and 143 mg higher for supplement users. There were also significant differences for supplement users for iron (P < 0.001) and zinc (P < 0.001). Non-Hispanic whites had a mean dietary iron intake 2.1 mg higher and a mean dietary zinc intake 1.1 mg higher than non-Hispanic blacks. There were significant differences between these two race-ethnic groups for combined intakes for all three minerals (P < 0.005 for iron; P < 0.001 for both calcium and zinc), and the magnitude of the differences was larger than the differences for the dietary intakes. There were significant differences between non-Hispanic white and Mexican-American female supplement users for dietary (P < 0.01) and combined (P < 0.001) calcium intakes (Table 1). Non-Hispanic whites’ dietary calcium intakes were 58 mg higher than Mexican Americans’ intakes and combined intakes were 153 mg higher. There were also significant differences for dietary iron intakes for supplement (P < 0.002) and non-supplement users (P < 0.001). Non-Hispanic white supplement users’ dietary intakes were 1.5 mg higher and non-supplement users’ intakes were 1.9 mg higher than those of Mexican Americans.

Non-Hispanic white females usually had the lowest prevalences of intakes below the calcium objective and inadequate iron and zinc intakes, followed by Mexican-American females; non-Hispanic black females had the highest prevalences (Table 1). The only exception to this pattern was non-supplement users’ dietary iron intakes, where Mexican-American females had the highest prevalence of inadequacy.

Forty-two percent of males and 54% of females ≥60 y in this sample reported taking a dietary supplement during the previous month (data not shown). More importantly, between 41 and 44% of total male and total female supplement users took supplements that contained iron or zinc, and 42% of total male supplement users took supplements that contained calcium (Table 2). A larger proportion of total female supplement users (54%) took supplements that contained calcium. There were differences by race/ethnicity in use of supplements containing these minerals. In general, non-Hispanic whites and Mexican Americans were more likely to take supplements that contained these minerals than non-Hispanic blacks.

Among the elderly adults in this sample who reported taking an antacid during the previous month, a little less than one-third of the total males and total females took an antacid that contained calcium (Table 2). Stratified by race/ethnicity, a much smaller proportion of the non-Hispanic blacks took calcium-containing antacids than the other two race-ethnic groups, both for males and females.

**DISCUSSION**

Results from NHANES III indicated that most elderly adults had dietary calcium intakes below the Healthy People 2010 objective, and many also had inadequate dietary zinc intakes. Intakes improved when minerals from dietary supplements and calcium-containing antacids were added to dietary intakes. Even so, a substantial proportion of supplement users still had combined intakes below the calcium objective and EAR for zinc. Non-Hispanic whites generally had higher mean dietary intakes and lower prevalences of inadequate iron and zinc intakes or intakes below the calcium objective than non-Hispanic blacks and Mexican Americans. Many of these
Table 2

Percentage of adults 60 y or older in NHANES III taking dietary supplements or antacids that contained each mineral

<table>
<thead>
<tr>
<th>Sex and race/ethnicity</th>
<th>Calcium</th>
<th>Iron</th>
<th>Zinc</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>From dietary supplements</td>
<td>From antacids</td>
<td>From dietary supplements</td>
</tr>
<tr>
<td>Male</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>930 (567)</td>
<td>42</td>
<td>32</td>
</tr>
<tr>
<td>Non-Hispanic white</td>
<td>586 (412)</td>
<td>42</td>
<td>33</td>
</tr>
<tr>
<td>Non-Hispanic black</td>
<td>149 (78)</td>
<td>32</td>
<td>132</td>
</tr>
<tr>
<td>Mexican American</td>
<td>167 (64)</td>
<td>46</td>
<td>332</td>
</tr>
<tr>
<td>Female</td>
<td>1305 (644)</td>
<td>54</td>
<td>30</td>
</tr>
<tr>
<td>Total</td>
<td>846 (453)</td>
<td>56</td>
<td>31</td>
</tr>
<tr>
<td>Mexican American</td>
<td>215 (64)</td>
<td>28</td>
<td>162</td>
</tr>
</tbody>
</table>

1 The sample size is based on the number of respondents who reported taking a dietary supplement. The number in parentheses is the sample of respondents who reported taking an antacid.

2 Indicates a statistic that is potentially unreliable because of small sample size.

Race-ethnic differences remained when we examined supplement users' combined intakes.

The most convincing evidence indicating that supplement users had better dietary intakes than non-supplement users were for women, particularly non-Hispanic white women. Supplement users' mean dietary intakes were significantly different from non-supplement users' intakes for all three minerals for total women and non-Hispanic white women. In previous analyses of B-vitamins we found significant differences in the prevalences of inadequate dietary intakes between supplement and non-supplement users for total women, but not for total men (race-ethnic differences were not examined) (28). Other researchers have found no association between supplement use and dietary nutrient intakes or dietary deficiency (5–8).

Mean and median dietary calcium, iron and zinc intakes for elderly men and women in NHANES III were similar to or higher than results from other national and regional studies (6,8,29–31), although dietary calcium intakes were higher in the Boston Nutritional Status Survey (BNSS) (31) and the Beaver Dam study (6) than in NHANES III. Combined intakes in NHANES III were sometimes different from those in the BNSS and the Beaver Dam study, but that may be because each study used a different approach for calculating combined intakes.

The 1994–1996 Continuing Survey of Food Intakes by Individuals (CSFII) lists prevalences of intakes <75% of the 1989 RDA recommendations—a criterion similar to the one used to assess nutrient adequacy in the Third Scientific Report on Nutrition Monitoring (77% of the 1989 RDAs) (32). A smaller proportion of elderly adults had dietary calcium intakes below the CSFII standard and a larger proportion had dietary iron and zinc intakes below this standard than in NHANES III (33). However, the 1989 RDAs and the values used for assessing adequacy were much lower for calcium and higher for iron and zinc than the Healthy People 2010 calcium objective or the EARs for iron and zinc, and could explain some of the differences in the prevalences of inadequacy between CSFII and NHANES. Marshall et al. (30) evaluated combined intakes of rural, community-dwelling elderly and reported similar prevalences of inadequacy for calcium and iron intakes but a higher prevalence of inadequate zinc intakes.

Other studies have also reported black-white differences in mineral intakes. Whites in CSFII had higher dietary mineral intakes than blacks, and a larger proportion of blacks than whites had intakes <75% of the 1989 RDAs (34). Two studies of rural Southern elderly showed that blacks had significantly lower calcium intakes than whites (35), and black men had significantly lower iron and zinc intakes than white men (36). None of the studies reported combined intakes or intakes of elderly Mexican Americans.

The prevalence of supplement use among elderly adults in NHANES III was similar to results reported in other surveys (5–8,31). Although a large proportion of this population took dietary supplements, usually less than half of them were taking a supplement(s) that contained calcium (except for women), iron or zinc. Non-Hispanic blacks were usually less likely to take supplements containing these minerals than the other two race-ethnic groups.

Most of the calcium-containing supplements taken in NHANES III provided a low dose of calcium. Seventy-three percent of the calcium-containing supplements were a combination vitamin and mineral, and 87% of these products contained <250 mg of calcium. In contrast, 20% of the calcium-containing supplements were a single nutrient mineral, but 93% of these products contained ≥250 mg of calcium. Only a small fraction of those taking a combination vitamin and mineral supplement took another supplement that contained calcium.

We also looked at calcium intakes based on reported antacid use. Because interviewers did not ask respondents whether they took antacids as a source of calcium, our results may underestimate true intake. Approximately one-third of men and women took a calcium-containing antacid during the previous month, but the median calcium intake from antacids was only 58 mg (mode = 26 mg) compared with a median calcium intake from supplements of 160 mg (mode = 160 mg).

There may be several limitations to these results. First, elderly respondents who came to the MEC and received the dietary recall may represent a healthier population than those who did not participate in the MEC exam. Our results may not be applicable to homebound elderly adults. Second, intakes reported in this paper may underestimate the actual intakes. Briefel et al. (37) reported that older adults in NHANES III were among the groups that underreported their energy intakes, and that iron and calcium intakes were significantly lower than reported in this study.
lower for underreporters. Nonetheless, our findings support the results from other national and regional surveys indicating that many elderly adults have inadequate dietary zinc intakes and that calcium intakes are below the Healthy People 2010 objective. Using dietary supplements improved intakes, but even with supplements many older adults still have intakes below the calcium objective and EAR for zinc.

LITERATURE CITED


