

Use of Prescription and Over-the-counter Medications and Dietary Supplements Among Older Adults in the United States

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RATES OF PER-CAPITA PRESCRIPTION medication use have increased considerably over the last several decades,¹ as have the rates of use of over-the-counter medications² and dietary supplements.³ Older adults are the largest per capita consumers of prescription medications¹ and the most at risk for medication-related adverse events.⁴ Implementation of the Medicare Part D Prescription Drug Benefit and efforts by Congress and the US Food and Drug Administration to enhance postmarketing surveillance to better safeguard public health^{5,6} have also focused attention on use of prescription medications among older adults. Despite concerns about drug safety and new federal policies to improve older adults' access to medications, current information on their concurrent use of prescription medications, over-the-counter medications, and dietary supplements is limited.

Most epidemiologic studies examining medication use among older adults are nearly a decade old and aggregate persons 65 years and older.^{7,8} More than 200 new drugs have come to market in the United States since most of these studies were conducted.⁹ In addition, many studies use pharmacy claims or aggregate sales data to approximate use of prescription medications, thus mea-

Context Despite concerns about drug safety, current information on older adults' use of prescription and over-the-counter medications and dietary supplements is limited.

Objective To estimate the prevalence and patterns of medication use among older adults (including concurrent use), and potential major drug-drug interactions.

Design, Setting, and Participants Three thousand five community-residing individuals, aged 57 through 85 years, were drawn from a cross-sectional, nationally representative probability sample of the United States. In-home interviews, including medication logs, were administered between June 2005 and March 2006. Medication use was defined as prescription, over-the-counter, and dietary supplements used "on a regular schedule, like every day or every week." Concurrent use was defined as the regular use of at least 2 medications.

Main Outcome Measure Population estimates of the prevalence of medication use, concurrent use, and potential major drug-drug interactions, stratified by age group and gender.

Results The unweighted survey response rate was 74.8% (weighted response rate, 75.5%). Eighty-one percent (95% confidence interval [CI], 79.4%-83.5%) used at least 1 prescription medication, 42% (95% CI, 39.7%-44.8%) used at least 1 over-the-counter medication, and 49% (95% CI, 46.2%-52.7%) used a dietary supplement. Twenty-nine percent (95% CI, 26.6%-30.6%) used at least 5 prescription medications concurrently; this was highest among men (37.1%; 95% CI, 31.7%-42.4%) and women (36.0%; 95% CI, 30.2%-41.9%) aged 75 to 85 years. Among prescription medication users, concurrent use of over-the-counter medications was 46% (95% CI, 43.4%-49.1%) and concurrent use of dietary supplements was 52% (95% CI, 48.8%-55.5%). Overall, 4% of individuals were potentially at risk of having a major drug-drug interaction; half of these involved the use of nonprescription medications. These regimens were most prevalent among men in the oldest age group (10%; 95% CI, 6.4%-13.7%) and nearly half involved anticoagulants. No contraindicated concurrent drug use was identified.

Conclusions In this sample of community-dwelling older adults, prescription and nonprescription medications were commonly used together, with nearly 1 in 25 individuals potentially at risk for a major drug-drug interaction.

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suring prescription acquisition rather than use.¹⁰ These data overestimate prescription medication use due to non-adherence,^{11,12} are limited to patients

who purchase at least 1 prescription medication, and almost always exclude nonprescription therapies. This is important because medication use

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among older adults commonly involves multiple medications and the concurrent use of prescription medications with nonprescription therapies.^{13,14} The Slone survey,^{8,15} an annual telephone-based survey of the US population 18 years and older, does provide information regarding the use of prescription and nonprescription medications. However, the most recent Slone survey, conducted in 2006, reports little change in overall medication use since 1998 but does report that the rate of polypharmacy (ie, the use of ≥ 5 medicines) has increased.¹⁵

In the current study, we build on prior reports with a particular focus on older adults. In addition, we consider the potential impact of medication use on clinical outcomes that may result from drug-drug interactions, including interactions between prescription and nonprescription therapies. To do so, we used data from the National Social Life, Health and Aging Project (NSHAP), a recent population-based survey of community-dwelling older adults in the United States.

METHODS

Participants

The NSHAP study protocol is a nationally representative probability sample of community-dwelling persons aged 57 through 84 years (at the time of screening in 2004) from households across the United States, as previously described.¹⁶ Blacks, Hispanics, men, and individuals aged 75 through 84 years at the time of screening were oversampled. Of 4400 individuals identified, 383 were not in the target population, and 1012 were not interviewed (of whom 834 refused and 147 were in poor health and could not participate). Therefore, 4017 persons were eligible, of whom 3005 were successfully interviewed, yielding an unweighted response rate of 74.8% and a weighted response rate of 75.5%.

Professional interviewers conducted in-home interviews and compiled medication logs in English and Spanish between July 2005 and March 2006. Participants who in the judgment of the interviewer were unable to adequately understand and complete the informed

consent process were not eligible for participation in the study (categorized above as in "poor health"). The protocol was approved by the University of Chicago and NORC institutional review boards, and all respondents provided written informed consent.

Data

Data on medication use were collected during the household interview by direct observation of medication bottles using a computer-based log. Participants were asked to provide the interviewer with the containers for all medications used "on a regular schedule, like every day or every week" and were instructed to include "prescription and non-prescription medications, over-the-counter medicines, vitamins, and herbal and alternative medicines." In the fewer than 5% of cases in which neither packaging nor the actual medication was available for direct observation, the medication name was obtained by respondent self-report.

The interviewer directly recorded up to 20 medication names into a laptop computer; fewer than 1% of respondents reported the use of 20 medications. All identifiable drug names for prescription and over-the-counter medications as well as dietary supplements were coded. A clinical pharmacist (D.M.Q.) reviewed all unique drug entries and recoded proprietary medication names (eg, Lopressor) to ingredient drug names (eg, metoprolol) when possible to facilitate matching to a drug database used to assign drug names.¹⁷ A total of 15 389 individual medications were reported by 2976 respondents. Of these, 15 224 (99%) were coded and linked to the drug database; of these, 702 did not originally appear in the database and therefore were classified (D.M.Q.) using the existing database categories. Most of these drug names were dietary supplements, since the coverage of this category of medications in the drug database is not complete. Additional details on the method of drug coding have been previously described.¹¹

Medications were coded by type (prescription, over-the-counter, or dietary supplement) and by the formulation of

each compound (eg, single vs multicomponent products). Medication use was defined as the regular use (at least daily or weekly) of at least 1 prescription or over-the-counter medication or dietary supplement. Use of nonprescription medications included over-the-counter medications and dietary supplements. Concurrent use was defined as the regular use of 2 or more medications at least daily or weekly.

We used Thomson Micromedex¹⁸ to determine potential major medication interactions among the 20 most common prescription and over-the-counter medications and the 20 most common dietary supplements. Micromedex was used to identify potential interactions among the list of common medications and provided a measure of the severity of the interaction (contraindicated [the drugs are contraindicated for concurrent use]; major [the interaction may be life-threatening, require medical intervention to minimize or prevent serious adverse events, or both]; moderate [the interaction may result in the exacerbation of the patient's condition, require an alternation in therapy, or both]; and minor [the interaction would have limited clinical effects]). In our analysis, we focus on those drug-drug interactions considered to be potentially of major severity.

We selected age intervals (57-64 years, 65-74 years, and 75-85 years; some individuals aged 84 years at enrollment had turned 85 during the study) for consistency with previous studies and the age structure of the study design. We determined race or ethnic group on the basis of the questions: "Do you consider yourself primarily white or Caucasian, black or African American, American Indian, Asian, or something else?" and "Do you consider yourself Hispanic or Latino?" Race/ethnicity was considered important for this study because previous studies have documented racial and ethnic differences in the prevalence of medication use.^{19,20}

We asked respondents to rate their physical health using the standard 5-point scale with the responses excellent, very good, good, fair, or poor. We also asked respondents whether a phy-

sician had ever told them they had any of several common medical conditions, including high blood pressure, stroke, myocardial infarction, heart fail-

ure, diabetes, thyroid problems, Alzheimer disease or dementia, cancer, and any type of arthritis. We used the responses to these questions to compute

a previously validated version of the Charlson Comorbidity Index.²¹

Information about insurance status was ascertained by asking, "Are you cur-

Table 1. Weighted Prevalence Estimates of Medication Use by Sociodemographic and Health-Related Characteristics^a

Characteristic	Estimated Prevalence, % (95% CI)				
	Overall Sample (N = 2976)	No Medication (n = 259)	Prescription Medication (n = 2455)	Over-the-counter Medication (n = 1253)	Dietary Supplement ^b (n = 1425)
Overall	100	9 (7.5-10.0)	81 (79.4-83.5)	42 (39.7-44.8)	49 (46.2-52.7)
Weighted No.	2979	261	2426	1258	1473
Age, y					
57-64	42 (39.0-44.1)	13.3 (10.7-15.9)	74.3 (69.9-78.7)	36.1 (32.4-39.9)	43.6 (40.0-47.2)
Weighted No.	1237	165	920	447	539
65-74	35 (32.6-37.1)	6.0 (4.6-7.3)	84.2 (81.9-86.5)	46.0 (42.6-49.5)	53.2 (49.0-57.4)
Weighted No.	1038	62	875	478	553
75-85	24 (21.7-25.5)	4.9 (3.1-6.6)	89.7 (87.4-92.1)	47.3 (43.1-51.5)	54.2 (49.2-59.2)
Weighted No.	703	34	631	333	381
Gender					
Men	49 (46.2-51.0)	11.0 (9.1-13.0)	76.6 (73.1-80.1)	42.6 (39.5-45.7)	43.1 (39.5-46.8)
Weighted No.	1448	160	1109	617	624
Women	51 (49.0-53.8)	6.6 (5.0-8.2)	86.0 (83.8-88.2)	41.9 (38.7-45.1)	55.4 (51.7-59.2)
Weighted No.	1531	101	1317	641	849
Education					
<High school	18 (15.2-21.6)	10.8 (7.4-14.2)	82.1 (78.3-86.0)	45.8 (41.0-50.5)	44.5 (39.3-49.7)
Weighted No.	548	59	450	251	244
High school or equivalent	27 (24.4-29.5)	8.8 (6.3-11.3)	81.3 (77.7-85.0)	42.7 (38.8-46.5)	48.1 (43.8-52.3)
Weighted No.	803	71	653	343	386
Some college	30 (27.3-32.8)	8.0 (5.3-10.6)	83.0 (79.7-86.3)	41.6 (36.4-46.8)	52.3 (46.0-58.7)
Weighted No.	895	71	743	372	469
≥Bachelor's degree	25 (21.3-27.9)	8.1 (5.5-10.7)	79.1 (74.9-83.3)	39.8 (35.8-43.9)	51.1 (45.4-56.7)
Weighted No.	732	60	579	292	374
Race/ethnicity ^c					
White, non-Hispanic	81 (77.0-84.4)	8.0 (6.7-9.3)	82.0 (79.8-84.2)	44.1 (40.8-47.4)	51.7 (48.1-55.4)
Weighted No.	2397	191	1966	1056	1240
Black, non-Hispanic	10 (7.6-12.1)	8.5 (5.2-11.7)	84.0 (79.6-88.5)	36.1 (28.3-43.9)	37.3 (30.3-44.3)
Weighted No.	294	25	247	106	110
Hispanic, any race	7 (3.5-10.2)	18.1 (12.3-23.8)	71.4 (65.2-77.6)	30.6 (23.9-37.3)	41.9 (34.5-49.3)
Weighted No.	204	37	146	62	85
Other	3 (1.6-3.4)	11.1 (3.6-18.6)	76.9 (65.2-88.7)	37.1 (26.1-48.0)	43.7 (31.8-55.5)
Weighted No.	74	8	57	28	32
Household income ^d					
Poor (≤100% FPL)	8.4 (5.5-11.2)	13.4 (7.8-18.9)	78.6 (72.7-84.6)	40.9 (34.8-46.9)	49.4 (42.4-56.4)
Weighted No.	177	24	139	72	87
Near poor (101%-200% FPL)	16.7 (14.7-18.8)	8.7 (5.1-12.2)	83.5 (79.4-87.6)	47.2 (39.9-54.5)	47.1 (40.1-54.1)
Weighted No.	354	31	295	167	167
Nonpoor (>200% FPL)	74.9 (71.1-78.7)	6.9 (5.3-8.4)	81.9 (78.9-84.8)	44.2 (40.2-48.1)	52.4 (48.6-56.3)
Weighted No.	1582	109	1295	699	829
Health insurance ^e					
None	5.1 (3.9-6.3)	14.8 (7.2-22.5)	73.5 (64.9-82.2)	40.5 (30.7-50.4)	39.0 (31.3-46.6)
Weighted No.	131	19	97	53	51
Medicare	57.7 (54.8-60.7)	5.0 (3.7-6.4)	87.6 (85.8-89.4)	47.9 (44.1-51.7)	54.2 (49.5-58.9)
Weighted No.	1478	74	1295	708	802
Private insurance	30.3 (27.2-33.5)	12.8 (8.7-16.8)	74.0 (68.4-79.7)	36.5 (31.7-41.4)	45.4 (40.8-50.0)
Weighted No.	777	99	575	284	353
Medicaid, VA, other	6.8 (5.6-8.0)	14.1 (7.4-20.8)	74.8 (66.2-83.5)	39.0 (28.4-49.5)	52.9 (43.0-62.8)
Weighted No.	174	24	130	68	92

(continued)

Table 1. Weighted Prevalence Estimates of Medication Use by Sociodemographic and Health-Related Characteristics^a (continued)

Characteristic	Estimated Prevalence, % (95% CI)				
	Overall Sample (N = 2976)	No Medication (n = 259)	Prescription Medication (n = 2455)	Over-the-counter Medication (n = 1253)	Dietary Supplement ^b (n = 1425)
Self-reported health					
Poor	6.7 (5.4-8.1)	6.2 (1.5-10.8)	89.9 (83.9-95.9)	51.0 (42.4-59.5)	49.1 (41.8-56.4)
Weighted No.	200	12	180	102	98
Fair	17.9 (15.9-19.9)	3.8 (1.9-5.7)	89.6 (84.9-94.3)	50.5 (45.4-55.6)	50.1 (43.7-56.6)
Weighted No.	533	20	478	269	267
Good	29.6 (27.5-31.7)	5.7 (3.8-7.8)	87.2 (84.2-90.2)	45.2 (41.0-49.4)	48.0 (43.0-53.0)
Weighted No.	879	51	767	397	422
Very good	32.6 (30.5-34.7)	10.6 (8.3-12.9)	77.3 (74.1-80.4)	38.2 (34.6-41.7)	50.7 (46.8-54.7)
Weighted No.	969	103	749	370	492
Excellent	13.1 (11.3-14.9)	19.2 (14.0-24.5)	62.8 (56.4-69.1)	29.2 (22.3-36.1)	48.1 (40.7-55.5)
Weighted No.	389	75	244	114	187
Comorbidity index ^f					
0	24.7 (22.9-26.4)	19.5 (15.7-23.3)	63.4 (58.7-68.1)	29.1 (22.8-35.4)	45.1 (40.8-49.4)
Weighted No.	734	143	466	214	331
1-4	68.8 (66.8-70.8)	5.7 (4.5-6.9)	86.3 (84.1-88.5)	45.2 (42.6-47.8)	50.0 (46.3-53.7)
Weighted No.	2049	117	1768	926	1025
≥5	6.6 (5.5-7.7)	0.6 (0 to 1.4)	98.2 (96.5-99.9)	60.2 (52.9-67.5)	59.8 (52.7-66.9)
Weighted No.	196	1	192	118	117

Abbreviations: CI, confidence interval; FPL, federal poverty level; VA, Veterans Administration.

^aPercentages and numbers of respondents are weighted estimates to account for differential probabilities of selection and differential nonresponse; CIs based on inversion of Wald tests constructed with the use of design-based SEs.

^bIncludes the use of nutritional products and alternative therapies.

^cExcludes 12 respondents who refused to answer or answered "don't know."

^dExcludes 860 respondents for whom information on household income was not collected.

^eExcludes 473 respondents for whom information on health insurance was not collected. "Private insurance" and "Medicaid, VA, other" exclude respondents with Medicare. Insurance categories are mutually exclusive.

^fRange of possible scores, 0-10.

rently covered by any of the following health insurance programs (Medicare, Medicaid, private insurance, Veterans Administration, or other)?" We computed household income as percentage of federal poverty level (FPL), computed based on reported household income and household size. In 2006, the FPL was \$9669 for a single person 65 years or older and \$12 201 for a household of 2 adults.²² We considered respondents who reporting being currently married as a household of 2 adults; all other respondents were considered single persons. We defined poor respondents as those having a household income at or below 100% of the FPL, near-poor respondents as those having a household income between 101% through 200% of the FPL, and nonpoor as those having a household income above 200% of the FPL.

Analysis

For each analysis, we used weights included in the NSHAP data set to adjust

for differential probability of selection and differential nonresponse.²³ Reported confidence intervals (CIs) were constructed by inverting the corresponding Wald test and do not include any adjustment for multiple testing. Descriptive statistics were used to estimate the prevalence of use of prescription medications, over-the-counter medications, or dietary supplements; concurrent medication use; and medication interactions among the entire sample and stratified by age and gender. Logistic regression was used to compare prevalence between subgroups. All *P* values reported are 2-sided. We also used logistic regression to assess which variables were significantly (*P* < .05) associated with no regular medication use. We selected all variables listed in TABLE 1 to be tested in our adjusted model, since these variables have previously been shown to be related to the probability of medication use. The variables were entered into the model simultaneously, and all analyses were performed using Stata version

10.1.²⁴ All CIs and tests use design-based estimates of variance.

RESULTS

The weighted distribution of demographic and health characteristics in the NSHAP sample correspond closely to those of the population and other national samples.¹⁶ Of the 3005 respondents, 2976 (99%) completed the medication log.

Table 1 reports the prevalence of medication use by type, both overall and within sociodemographic and health subgroups. During 2005 to 2006, 91% (95% CI, 90.0%-92.5%) of older adults, corresponding to 50.5 million adults aged 57 to 85 years, regularly used at least 1 medication. Among all medication types, prescription medication use was the most prevalent, used by 81% (95% CI, 79.4%-83.5%), or 44.9 million older adults. Nearly one-half of older adults regularly used at least 1 over-the-counter medication or dietary supplement. The prevalence of prescription medication use was highest among the oldest age group; 89.7% (95% CI,

87.4%-92.1%) of persons aged 75 to 85 years used at least 1 prescription medication, compared with 74.3% (95% CI, 69.9%-78.7%) of those aged 57 through 64 years. Women were more likely to use prescription medications (86.0%; 95% CI, 83.8%-88.2%) than men (76.6%; 95% CI, 73.1%-80.1%). While the prevalence of dietary supplement use was greater in women (55.4%; 95% CI, 51.7%-59.2%) compared with men (43.1%; 95% CI, 39.5%-46.8%), the prevalence of over-the-counter medication use was similar among women (41.9%; 95% CI, 38.7%-45.1%) and men (42.6%; 95% CI, 39.5%-45.7%).

TABLE 2 depicts the likelihood of no regular medication use by individuals' sociodemographic and health characteristics. As expected, medication use was more likely among those with poorer self-reported health and more comorbid conditions. In addition, medication use was more likely among nonpoor respondents and those with greater formal education.

Commonly Used Prescription and Nonprescription Medications

The most commonly used prescription or over-the-counter medications, either as single or multicomponent products, were cardiovascular agents, including antihyperlipidemics and anticoagulants such as aspirin, hydrochlorothiazide, atorvastatin, lisinopril, metoprolol, simvastatin, atenolol, amlodipine, furosemide, ezetimibe, valsartan, warfarin, and clopidogrel (TABLE 3). Across all age groups, the prevalence of use of the statins atorvastatin and simvastatin was higher among men compared with women.

The most commonly used dietary supplements were nutritional products, including multivitamins and individual vitamins or minerals (TABLE 4). Alternative therapies intended for use in improving cardiovascular health (eg, omega-3 fatty acids, garlic, coenzyme Q) and other age-related chronic conditions (eg, "eye vitamins" for macular degeneration, glucosamine-chondroitin, saw palmetto) were also widely used. The prevalence of dietary supplement use tended to be lowest in the youngest age group. Across all age groups, calcium, vitamin D, and glucosamine-chondroitin

supplements were more commonly used among women than men, while niacin was more commonly used among men.

Most Commonly Reported Medical Conditions and Comorbidity

Cardiovascular disease was the most commonly reported medical condition, and its prevalence was similar among men and women (TABLE 5). Women reported more comorbid conditions compared with men aged 57 through 64 years. For example,

37% (95% CI, 33.6%-40.9%) of men reported no comorbid conditions compared with 25% (95% CI, 20.6%-29.6%) of women in this age group. In addition, thyroid problems, arthritis, and asthma were more prevalent in women than in men across all age groups. A total of 26 respondents reported that a physician had told them that they had Alzheimer disease or some other form of dementia, but the interviewers considered them able to participate in the survey.

Table 2. Sociodemographic and Health-Related Factors Associated With No Regular Medication Use Among Older Adults in the United States

Characteristic	OR (95% CI)	
	Unadjusted	Adjusted ^a
Age, y		
57-64	1 [Reference]	1 [Reference]
65-74	0.41 (0.30-0.57) ^b	0.23 (0.11-0.45) ^b
75-85	0.33 (0.21-0.53) ^b	0.34 (0.13-0.85) ^b
Gender		
Men	1 [Reference]	1 [Reference]
Women	0.57 (0.41-0.79) ^b	0.40 (0.25-0.64) ^b
Education		
<High school	1 [Reference]	1 [Reference]
High school or equivalent	0.80 (0.49-1.3)	0.62 (0.34-1.1)
Some college	0.71 (0.43-1.2)	0.66 (0.33-1.3)
Bachelor's degree or more	0.73 (0.45-1.2)	0.44 (0.24-0.8) ^b
Race/ethnicity		
White, non-Hispanic	1 [Reference]	1 [Reference]
Black, non-Hispanic	1.1 (0.68-1.69)	0.63 (0.28-1.4)
Hispanic, any race	2.6 (1.67-3.9) ^b	1.3 (0.76-2.3)
Other	1.4 (0.67-3.1)	1.6 (0.59-4.3)
Household income		
Poor (≤100% FPL)	1 [Reference]	1 [Reference]
Near poor (101%-200% FPL)	0.61 (0.32-1.2)	0.87 (0.43-1.8)
Nonpoor (>200% FPL)	0.48 (0.3-0.77) ^b	0.37 (0.17-0.79) ^b
Health insurance		
None	1 [Reference]	1 [Reference]
Medicare	0.30 (0.17-0.55) ^b	0.65 (0.36-1.2)
Private insurance	0.84 (0.40-1.77)	0.46 (0.18-1.2)
Medicaid, VA, other	0.94 (0.42-2.1)	0.58 (0.24-1.4)
Self-reported physical health		
Poor	1 [Reference]	1 [Reference]
Fair	0.60 (0.25-1.43)	0.73 (0.18-3.0)
Good	0.93 (0.36-2.43)	1.7 (0.5-5.5)
Very good	1.8 (0.87-3.74)	2.9 (1.0-8.6) ^b
Excellent	3.6 (1.53-8.51) ^b	6.2 (1.5-25.1) ^b
Comorbidity index ^c		
0	1 [Reference]	1 [Reference]
1-4	0.25 (0.18-0.34) ^b	0.33 (0.20-0.53) ^b
≥5	0.024 (0.01-0.11) ^b	0.04 (0.01-0.38) ^b

Abbreviations: CI, confidence interval; FPL, federal poverty level; OR, odds ratio; VA, Veterans Administration.

^aModel included the variables age group, gender, education, racial/ethnic group, household income, health insurance ("private insurance" and "Medicaid, VA, other" exclude respondents with Medicare), self-reported health, and comorbidity index.

^bStatistically significant ($P < .05$).

^cRange of possible scores, 0-10.

Concurrent Use of Medications

Overall, more than half of older adults used 5 or more prescription medications, over-the-counter medications, or dietary supplements. FIGURE 1 depicts this practice, stratified by respondents' age and gender. For prescrip-

tion medications, 29% (95% CI, 26.6%-30.6%) of all respondents used more than 5 medications. The prevalence of the use of 5 or more prescription medications increased steadily with age for both men and women and was overall significantly higher among women

($P = .003$), though this gender difference was observed only among the youngest 2 age groups. Only 3 respondents reported the use of 5 or more over-the-counter medications. However, nearly 1 in 8 older adults regularly used 5 or more dietary supplements.

Table 3. Weighted Prevalence Estimates of the Most Commonly Used Prescription and Over-the-counter (OTC) Medications by Age and Gender^a

Medication	Estimated Prevalence, % (95% CI)						
	Aged 57-64 y (n = 1016)		Aged 65-74 y (n = 1082)		Aged 75-85 y (n = 878)		Total (N = 2976)
	Men (n = 525)	Women (n = 491)	Men (n = 543)	Women (n = 539)	Men (n = 377)	Women (n = 501)	
Aspirin (OTC available)	23.8 (19.4-28.3)	20.5 (15.5-25.5)	34.5 (29.9-39.1)	26.6 (23.0-30.1)	39.1 (32.1-46.1)	31.2 (26.0-36.5)	28.0 (25.3-30.7)
Weighted No.	151	124	175	142	121	123	835
Hydrochlorothiazide	9.1 (6.1-12.2)	16.6 (11.8-21.4)	15.2 (10.9-19.5)	16.9 (13.0-20.7)	19.4 (15.1-23.7)	20.0 (15.2-24.8)	15.6 (13.4-17.7)
Weighted No.	58	100	77	90	60	79	464
Atorvastatin	15.8 (11.7-19.8)	9.6 (6.8-12.3)	15.5 (11.9-19.0)	13.4 (10.1-16.7)	15.6 (11.8-19.4)	11.5 (7.6-15.3)	13.4 (11.9-15.0)
Weighted No.	100	58	78	71	48	45	401
Levothyroxine	3.1 (1.8-4.5)	16.4 (11.7-21.1)	7.6 (5.2-10.0)	18.8 (15.7-21.9)	9.6 (5.8-13.3)	20.9 (17.2-24.6)	12.4 (10.8-14.0)
Weighted No.	20	99	38	100	30	82	369
Lisinopril	9.9 (6.8-13.0)	9.6 (5.4-13.8)	14.8 (11.5-18.2)	10.0 (7.2-12.8)	21.1 (17.5-24.7)	12.8 (9.5-16.1)	12.2 (10.5-14.0)
Weighted No.	63	58	75	53	65	51	365
Metoprolol	9.6 (7.6-11.7)	8.0 (5.0-11.1)	12.1 (8.5-15.6)	9.4 (7.0-11.7)	15.2 (10.9-19.6)	14.4 (11.7-17.2)	10.9 (9.6-12.2)
Weighted No.	61	49	61	50	47	57	324
Simvastatin	9.3 (7.0-11.7)	5.3 (3.0-7.7)	11.6 (8.7-14.5)	8.7 (6.0-11.4)	18.0 (13.2-22.8)	8.6 (5.3-11.8)	9.6 (8.5-10.7)
Weighted No.	59	32	59	46	56	34	286
Atenolol	6.2 (3.7-8.8)	6.9 (4.5-9.3)	9.5 (7.1-11.8)	8.4 (5.3-11.5)	13.3 (8.8-17.8)	11.0 (8.3-13.8)	8.7 (7.5-9.9)
Weighted No.	39	42	48	44	41	44	258
Amlodipine	6.8 (3.6-9.9)	7.9 (5.2-10.7)	11.1 (8.2-14.0)	7.5 (5.1-9.8)	8.1 (4.7-11.4)	9.3 (6.5-12.1)	8.3 (7.5-9.2)
Weighted No.	43	48	56	40	25	37	249
Metformin	9.7 (6.3-13.1)	8.4 (5.6-11.2)	8.7 (6.2-11.3)	8.5 (6.4-10.6)	6.0 (3.3-8.6)	6.0 (3.9-8.2)	8.2 (7.0-9.4)
Weighted No.	61	51	44	45	18	24	244
Acetaminophen (OTC available)	3.5 (1.6-5.5)	9.4 (5.5-13.3)	6.7 (4.2-9.2)	9.5 (6.7-12.2)	5.8 (3.2-8.4)	10.3 (7.8-12.8)	7.5 (6.0-9.0)
Weighted No.	22	57	34	50	18	41	222
Furosemide	2.3 (1.1-3.5)	5.6 (2.7-8.5)	8.7 (6.1-11.3)	5.6 (3.7-7.5)	8.4 (5.3-11.5)	10.5 (7.7-13.2)	6.4 (5.3-7.5)
Weighted No.	15	34	44	30	26	41	190
Ezetimibe	4.8 (2.7-7.0)	3.6 (1.8-5.4)	6.9 (4.6-9.2)	5.4 (3.1-7.7)	5.1 (1.8-8.3)	5.9 (2.8-9.1)	5.2 (4.2-6.2)
Weighted No.	31	22	35	29	16	23	155
Valsartan	2.7 (1.0-4.4)	5.3 (2.8-7.8)	3.7 (2.0-5.5)	7.0 (4.7-9.2)	3.4 (0.9-6.0)	5.4 (3.6-7.2)	4.6 (3.8-5.4)
Weighted No.	17	32	19	37	11	21	137
Alendronate	0.3 (0-0.8)	5.4 (3.1-7.8)	1.2 (0.5-1.8)	9.3 (6.0-12.5)	1.8 (0.1-3.5)	9.4 (6.7-12.1)	4.5 (3.6-5.4)
Weighted No.	2	33	6	49	6	37	133
Warfarin	2.5 (1.2-3.9)	1.7 (0.7-2.7)	4.4 (2.8-6.1)	2.7 (1.4-3.9)	12.7 (8.5-16.9)	7.3 (4.8-9.9)	4.4 (3.7-5.1)
Weighted No.	16	10	22	14	39	29	131
Omeprazole (OTC available)	2.9 (1.4-4.5)	4.2 (1.5-6.9)	5.4 (3.1-7.6)	3.8 (1.9-5.7)	7.1 (3.8-10.3)	4.4 (2.0-6.8)	4.4 (3.4-5.4)
Weighted No.	19	25	27	20	22	17	130
Clopidogrel	3.4 (1.7-5.1)	3.9 (0.8-6.9)	6.1 (3.8-8.5)	3.3 (1.5-5.1)	5.3 (3.1-7.5)	4.8 (2.6-6.9)	4.3 (3.3-5.3)
Weighted No.	22	23	31	18	16	19	129
Albuterol	2.3 (0.6-4.0)	5.9 (3.3-8.4)	6.1 (3.7-8.6)	4.3 (1.9-6.7)	3.9 (1.5-6.3)	3.3 (2.0-4.7)	4.3 (3.3-5.3)
Weighted No.	14	35	31	23	12	13	129
Conjugated estrogens	NA	9.1 (6.1-12.2)	NA	9.2 (5.6-12.8)	NA	5.1 (2.9-7.4)	4.2 (3.1-5.2)
Weighted No.	NA	55	NA	49	NA	20	124

Abbreviations: CI, confidence interval; NA, not applicable.

^aEstimates (numbers and percentages) weighted to account for differential probabilities of selection and differential nonresponse; CIs based on inversion of Wald tests constructed with the use of design-based SEs. Medications used by respondent as a single or multicomponent product. Prescription-only and OTC medications were combined, because prescription status varies for several medications depending on formulation and strength and because medication data collection was limited to drug names.

FIGURE 2 illustrates the prevalence of concurrent use of nonprescription therapies (those available without a prescription, regardless of whether a physician had prescribed them) among us-

ers of prescription medications by age and gender. Overall, 68% (95% CI, 64.8%-71.1%) of older adults using prescription medications were concurrently using over-the-counter medica-

tions, dietary supplements, or both. Across all age groups, men and women were equally likely to use prescription and nonprescription medications concurrently. However, men were more

Table 4. Weighted Prevalence Estimates of the Most Commonly Used Dietary Supplements by Age and Gender^a

Supplement	Estimated Prevalence, % (95% CI)						
	Aged 57-64 y (n = 1016)		Aged 65-74 y (n = 1082)		Aged 75-85 y (n = 878)		Total (N = 2976)
	Men (n = 525)	Women (n = 491)	Men (n = 543)	Women (n = 539)	Men (n = 377)	Women (n = 501)	
Multivitamin/minerals	20.0 (15.7-24.3)	32.3 (27.2-37.4)	29.6 (23.9-35.3)	33.5 (28.1-38.8)	23.7 (16.8-30.5)	28.3 (23.3-33.2)	28.0 (24.7-31.3)
Weighted No.	127	196	150	178	73	111	835
Calcium	6.3 (3.1-9.5)	25.7 (20.8-30.5)	8.7 (6.0-11.3)	30.1 (26.1-34.1)	6.2 (3.4-9.0)	25.6 (21.3-29.9)	17.4 (15.8-19.0)
Weighted No.	40	155	44	160	19	101	519
Vitamin C	7.5 (4.8-10.2)	9.6 (5.9-13.2)	9.4 (6.6-12.1)	12.3 (8.8-15.7)	5.7 (3.0-8.4)	8.2 (5.3-11.1)	9.0 (7.5-10.5)
Weighted No.	47	58	47	65	18	32	268
Vitamin E	2.8 (1.3-4.2)	9.7 (5.5-13.9)	10.6 (5.8-15.4)	11.6 (8.0-15.1)	7.6 (4.2-10.9)	8.8 (5.8-11.8)	8.4 (6.7-10.1)
Weighted No.	18	58	54	62	23	35	250
Any vitamin B ^b	4.3 (2.5-6.1)	9.1 (5.5-12.7)	8.5 (5.8-11.2)	8.3 (5.5-11.2)	9.3 (5.3-13.4)	8.0 (5.2-10.8)	7.7 (6.4-9.0)
Weighted No.	27	55	43	44	29	32	230
Chondroitin-glucosamine	5.8 (2.6-8.9)	8.8 (5.6-11.9)	5.1 (2.8-7.5)	10.0 (7.1-12.8)	5.9 (2.5-9.4)	8.4 (5.3-11.5)	7.4 (6.3-8.5)
Weighted No.	37	53	26	53	18	33	220
Potassium supplements ^c	2.8 (1.0-4.6)	8.2 (4.6-11.9)	5.5 (3.3-7.8)	6.6 (4.4-8.7)	8.5 (5.3-11.7)	11.3 (8.2-14.5)	6.8 (5.9-7.6)
Weighted No.	17	50	28	35	26	45	201
Folic acid	2.6 (1.2-4.0)	4.9 (2.3-7.5)	6.0 (4.0-7.9)	5.9 (3.6-8.2)	7.5 (3.5-11.5)	6.2 (4.3-8.2)	5.2 (4.2-6.2)
Weighted No.	17	30	30	31	23	25	156
Omega-3 fatty acids	2.0 (0.6-3.4)	6.8 (4.5-9.1)	5.7 (3.1-8.3)	4.7 (2.1-7.3)	3.8 (1.3-6.3)	3.5 (1.7-5.3)	4.5 (3.1-5.8)
Weighted No.	13	41	29	25	12	14	133
Vitamin D	2.9 (0-6.1)	4.4 (2.2-6.6)	2.3 (0.7-4.0)	7.0 (4.4-9.6)	2.3 (0.6-4.1)	8.3 (4.8-11.7)	4.5 (3.3-5.7)
Weighted No.	18	27	12	37	7	33	134
Magnesium	2.6 (0-5.9)	3.5 (1.6-5.4)	1.5 (0.4-2.6)	6.1 (3.3-9.0)	1.3 (0.2-2.5)	1.8 (0.6-3.0)	3.0 (1.9-4.1)
Weighted No.	17	21	8	32	4	7	90
Eye vitamins ^d	0.7 (0.3-1.1)	2.4 (0.8-4.0)	2.6 (0.5-4.6)	2.7 (1.2-4.2)	3.3 (1.5-5.1)	4.9 (2.5-7.3)	2.6 (1.9-3.2)
Weighted No.	4	15	13	15	10	19	76
Zinc	3.5 (0.2-6.7)	1.1 (0.1-2.1)	3.3 (1.1-5.6)	3.7 (1.4-6.1)	1.8 (0.4-3.1)	1.7 (0.3-3.1)	2.6 (1.6-3.6)
Weighted No.	22	7	17	20	5	7	78
Methylsulfonylmethane (MSM)	1.8 (0.3-3.4)	2.9 (1.0-4.9)	1.1 (0.2-2.0)	3.1 (1.6-4.6)	0.5 (0-1.3)	3.1 (1.3-4.9)	2.2 (1.5-2.9)
Weighted No.	12	18	5	16	2	12	65
Niacin	1.5 (0.3-2.6)	0.9 (0.1-1.7)	2.7 (1.2-4.2)	1.6 (0.3-3.0)	3.1 (1.5-4.8)	1.3 (0.1-2.6)	1.7 (1.3-2.2)
Weighted No.	9	6	14	9	10	5	52
Saw palmetto	2.6 (0.7-4.5)	NA	5.1 (2.4-7.8)	NA	2.2 (0.6-3.9)	NA	1.7 (1.0-2.3)
Weighted No.	17	NA	26	NA	7	NA	49
Flax	1.0 (0-2.3)	1.2 (0.1-2.3)	2.4 (0.5-4.3)	2.8 (1.1-4.5)	0.3 (0-0.8)	0.7 (0-1.7)	1.5 (0.8-2.2)
Weighted No.	6	7	12	15	1	3	45
Garlic	1.1 (0.2-2.0)	1.7 (0.8-2.6)	2.8 (0.9-4.8)	0.7 (0-1.4)	1.6 (0.1-3.0)	0.7 (0-1.8)	1.4 (0.9-2.0)
Weighted No.	7	10	14	4	5	3	43
Coenzyme Q-10	0.5 (0-1.0)	1.9 (0.7-3.1)	2.0 (0.3-3.7)	1.7 (0.5-2.9)	1.4 (0.5-2.4)	1.0 (0-2.1)	1.4 (1.0-1.8)
Weighted No.	3	11	10	9	4	4	42
Ginkgo	0.8 (0-1.9)	0.8 (0-1.7)	1.9 (0.4-3.3)	2.5 (0.7-4.3)	1.7 (0-3.3)	1.2 (0-2.4)	1.4 (0.9-2.0)
Weighted No.	5	5	9	14	5	5	42

Abbreviations: CI, confidence interval; NA, not applicable.

^aEstimates (numbers and percentages) weighted to account for differential probabilities of selection and differential nonresponse; CIs based on inversion of Wald tests constructed with the use of design-based SEs. Dietary supplements used by respondent as a single or multicomponent product.

^bIncludes vitamin B₁₂, vitamin B₆, vitamin B-complex, or unspecified vitamin B.

^cIncludes potassium chloride (available by prescription only), potassium acetate, potassium gluconate, and unspecified potassium.

^dIncludes I-Caps, Preservision, and any medication recorded as an "eye vitamin" by interviewer.

likely to concurrently use over-the-counter medications, whereas women were more likely to concurrently use dietary supplements. Sixty percent (95% CI, 54.0%-66.8%) of women in the oldest age group used prescription medications in combination with dietary supplements. Among prescription medication users, more women than men concurrently used nutritional products, alternative therapies, or both.

Potential Major Drug-Drug Interactions

A total of 46 potential drug-drug interactions were identified using Micromedex (TABLE 6). Among these, 11 were classified as potentially of major severity, 28 were classified as potentially of moderate severity, and 7 were classified as potentially of minor severity. Not one absolutely contraindicated drug-drug interaction was identified in the

entire sample. Overall, 1 in 25 older adults (approximately 2.2 million) were at risk for a major potential drug-drug interaction. The rate of any major medication interaction increased with age for both men and women but was higher among men compared with women across all age groups. Prevalence of a major interaction was significantly greater among men than among women ($P=.01$). More than half of these major interactions involved the use of non-prescription therapies. In addition, nearly half involved the use of anticoagulants (eg, warfarin) or antiplatelet agents (eg, aspirin). Across all age groups, the concurrent use of aspirin and warfarin was significantly more common in men than women ($P<.001$). In addition, the concurrent use of niacin and atorvastatin was also significantly more common in men than in women ($P=.03$).

COMMENT

Older adults are the biggest consumers of prescription and over-the-counter medications and dietary supplements and are most vulnerable to medication adverse effects and drug-drug interactions.⁴ This study uses directly observed medication information from a recent national probability sample of individuals in their homes to establish that the vast majority of older adults in the United States use prescription medications regularly, 1 in 3 uses 5 or more prescription medications regularly, and about half regularly use over-the-counter medications and dietary supplements. Thus, the use of prescription medications with over-the-counter medications or dietary supplements is common, particularly among the oldest age group and women. In 2005-2006, at least 1 in 25 older adults used a regimen posing a

Table 5. Weighted Prevalence Estimates of the Most Commonly Reported Medical Conditions and Comorbidity By Age and Gender^a

Medical Condition ^b	Estimated Prevalence, % (95% CI)						
	Aged 57-64 y (n = 1016)		Aged 65-74 y (n = 1082)		Aged 75-85 y (n = 878)		Total (N = 2976)
	Men (n = 525)	Women (n = 491)	Men (n = 543)	Women (n = 539)	Men (n = 377)	Women (n = 501)	
Cardiovascular disease ^c	52.6 (47.2-58.1)	51.1 (45.7-56.6)	66.5 (62.8-70.1)	57.8 (52.1-63.5)	70.2 (64.2-76.2)	70.3 (64.7-75.8)	59.8 (57.2-63.3)
Weighted No.	333	309	336	308	217	277	1780
Arthritis	37.2 (33.3-41.0)	53.7 (49.3-58.1)	44.8 (40.1-49.5)	57.7 (53.6-61.9)	54.6 (48.1-61.2)	68.4 (63.9-73.0)	51.4 (49.5-53.3)
Weighted No.	235	325	226	307	169	270	1532
Diabetes	20.4 (16.5-24.3)	17.9 (13.4-22.4)	22.8 (18.6-27.0)	20.3 (16.6-24.1)	21.5 (17.1-25.9)	15.7 (12.2-19.2)	19.8 (17.7-21.8)
Weighted No.	129	108	115	108	66	62	589
Thyroid problems	3.3 (1.7-4.9)	21.9 (16.9-26.9)	7.8 (4.7-10.9)	27.4 (24.1-30.7)	8.8 (5.5-12.1)	23.8 (19.8-27.8)	15.4 (13.7-17.2)
Weighted No.	21	132	39	146	27	94	460
Ulcers	8.4 (6.11-10.6)	14.1 (11.0-17.2)	15.2 (11.5-18.9)	15.0 (11.2-18.8)	15.1 (11.5-18.7)	14.8 (11.4-18.3)	13.4 (12.1-14.8)
Weighted No.	53	85	77	80	47	58	400
COPD or emphysema	6.4 (3.3-9.5)	10.5 (7.1-13.9)	12.4 (8.1-16.7)	13.7 (10.5-16.9)	14.4 (9.7-19.2)	12.0 (8.8-15.1)	11.1 (10.0-12.3)
Weighted No.	41	63	63	73	45	47	332
Asthma	8.2 (5.5-10.9)	14.9 (11.3-18.6)	8.3 (5.7-10.9)	11.1 (8.1-14.2)	7.0 (4.2-9.8)	9.2 (6.4-11.9)	10.1 (9.0-11.2)
Weighted No.	52	90	42	59	22	36	301
Comorbidity index ^d							
0	37.3 (33.6-40.9)	25.1 (20.6-29.6)	21.9 (18.2-25.6)	21.5 (17.6-25.5)	17.8 (14.1-21.4)	16.8 (12.6-21.1)	24.7 (22.9-26.4)
Weighted No.	236	152	111	115	55	66	734
1-4	58.4 (54.5-62.3)	69.4 (64.2-74.7)	68.7 (64.9-72.6)	72.9 (68.4-77.4)	72.2 (67.6-76.8)	76.2 (71.9-80.5)	68.8 (66.8-70.8)
Weighted No.	370	420	348	388	223	300	2049
≥5	4.3 (2.5-6.0)	5.5 (2.8-8.2)	9.4 (6.6-12.2)	5.5 (3.5-7.6)	10.0 (6.4-13.6)	7.0 (4.4-9.5)	6.6 (5.5-7.7)
Weighted No.	27	33	47	30	31	27	196

Abbreviations: CI, confidence interval; COPD, chronic obstructive pulmonary disease.

^aEstimates (numbers and percentages) weighted to account for differential probabilities of selection and differential nonresponse; CIs based on inversion of Wald tests constructed with the use of design-based SEs.

^bConditions included are those of highest relevance to the most commonly used prescription and over-the-counter medications.

^cIncludes respondents reporting ever being diagnosed with myocardial infarction, stroke, hypertension, and/or heart failure.

^dRange of possible scores, 0-10.

risk of a major potential drug-drug interaction; half of these potential interactions involved the use of nonprescription medications.

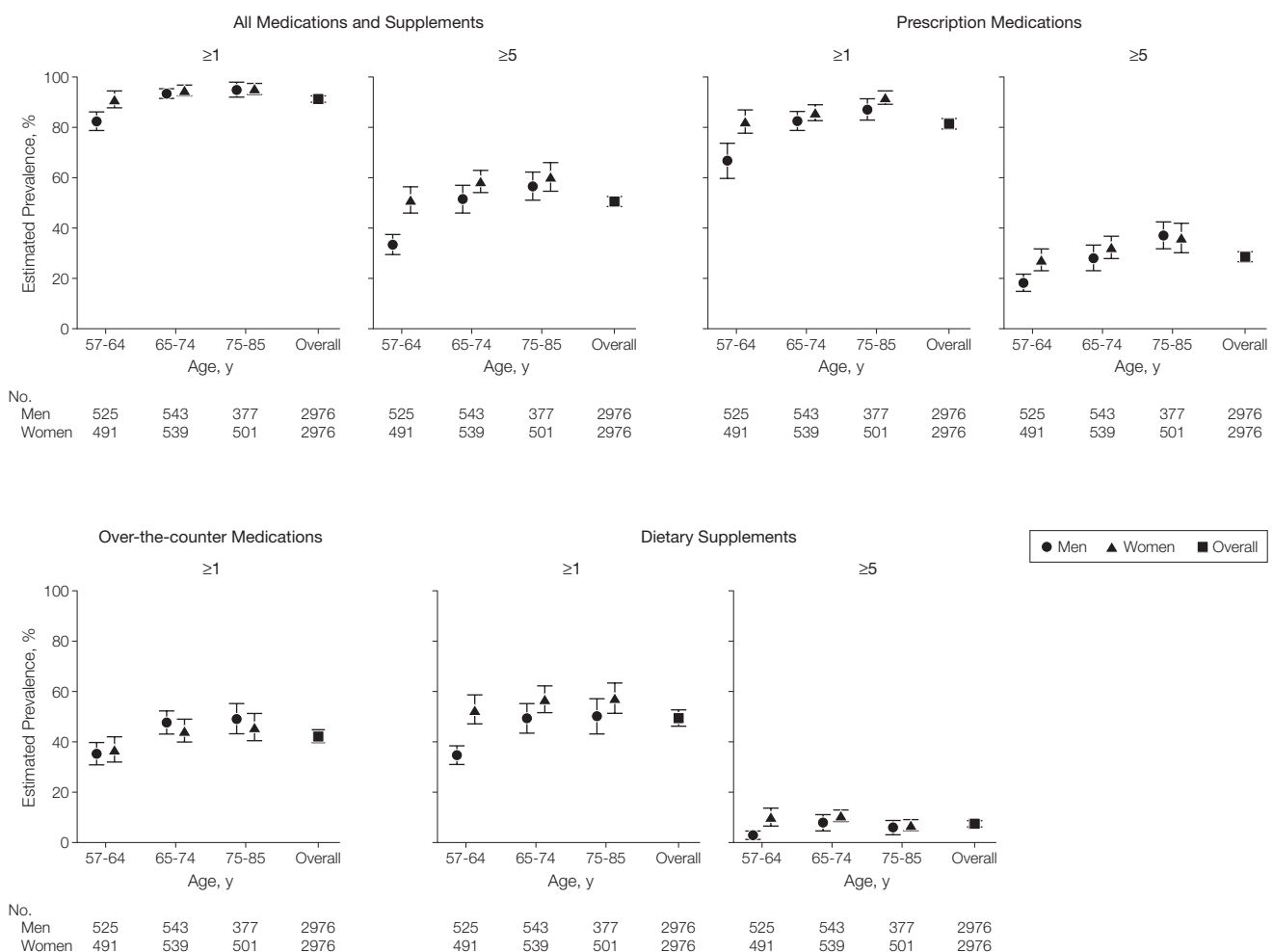
Our estimates of the prevalence of any medication use, as well as of the use of prescription medications, for men and women aged 65 through 74 and 75 to 85 years are similar to those reported among adults 65 years and older in the 2006 Slone survey,¹⁵ the most comparable population-based study of medication use in the United States. Compared with a decade prior,⁸ both we and the Slone researchers found that while the prevalence of overall medication use has remained stable among

older adults, the rate of polypharmacy (ie, the use of ≥ 5 medications) has increased. Several factors have likely contributed to this increase in the rate of polypharmacy among older adults over the last decade. These include intensification of therapy for common chronic medical conditions (eg, diabetes, cardiovascular disease),²³ increased access to medications because of policy changes (eg, Medicare Part D and assistance programs),¹ and growth of the generic drug market.²⁶

Our report also highlights substantial use of a number of newer drugs brought to the market during the last several years (eg, ezetimibe and clopi-

dogrel) and a decrease in the use of conjugated estrogens coinciding with the widely publicized Women's Health Initiative Study findings about health risks associated with use of menopausal hormone therapy by older women.²⁷ We also find higher rates of use of dietary supplements among older adults as compared with earlier studies, including glucosamine, chondroitin, and omega-3 fish oils, as well as decreases in the use of *Ginkgo biloba* and garlic. This may be due to the increasing evidence supporting the benefits of glucosamine-chondroitin in the treatment of osteoarthritis²⁸ and of omega-3 fish oils in reducing cardiovascular events.²⁹ More-

Figure 1. Weighted Prevalence Estimates of Prescription Medication, Over-the-counter Medication, and Dietary Supplement Use by Age and Gender



Error bars indicate 95% confidence intervals.

over, a decline in the use of *G biloba* and garlic may be due to the increased awareness of the potential adverse effects associated with their use.

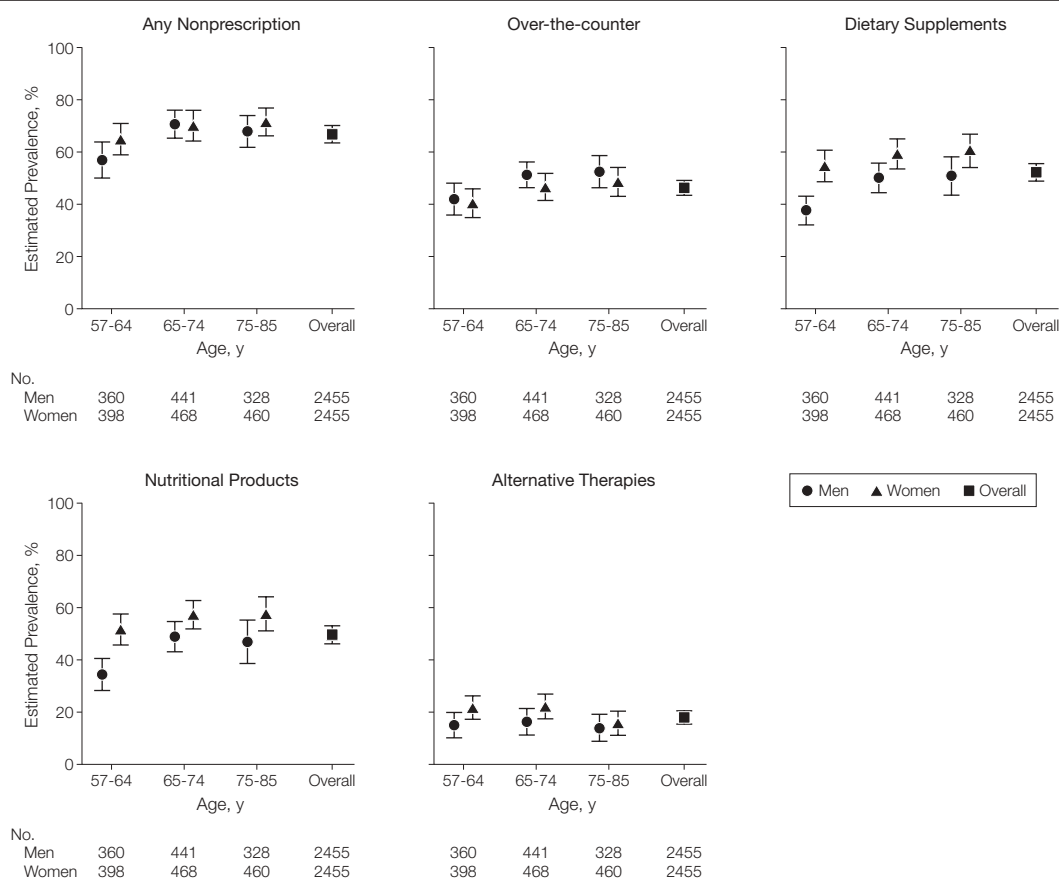
Important gender differences in medication use among older adults include a significantly higher prevalence of the use of 5 or more prescription medications among women aged 57 through 64 years and a higher prevalence of dietary supplement use. This corresponds to the higher prevalence of diagnosed comorbid conditions among women as compared with men in this age group. Previous studies have shown that women use more prescription medications and dietary supplements than men across all age groups,^{3,8,14} but most have aggregated adults 65 years and older, therefore masking heterogeneity across older age

groups and limiting cross-study comparisons. Although women were equally likely as men to have cardiovascular disease, they were significantly less likely than men to be using the most widely prescribed class of cholesterol-lowering drugs.³⁰ Prevalence in the use of these lipid-lowering medications has increased in both men and women compared with previous studies,⁸ but previously documented gender disparities in primary and secondary prevention of cardiovascular disease persist as an important public health problem.³¹ The pattern we observe may indicate undertreatment of women at risk for a cardiovascular event. Alternatively, women may have been equally likely to be prescribed cardioprotective drugs but less likely than men to use them. The higher prevalence of hy-

pothyroidism, osteoporosis, and menopausal use of hormone therapy among women in our study was expected because of the distributions of these conditions in the population and corroborates the internal validity of the NSHAP data set.¹¹

We found that the potential for major drug-drug interactions extends beyond the concurrent use of prescription medications. Half of all potential major drug-drug interactions that we identified involved a nonprescription medication. Physicians are frequently unaware of their patients' nonprescription medication use because they do not ask patients, patients do not report use of nonprescription medications, or both.^{14,32} With as many as 4%, or 2.2 million, of older adults in the United States affected, the economic and

Figure 2. Weighted Prevalence Estimates of Concurrent Use of Nonprescription Medications (Over-the-counter Medications and/or Dietary Supplements) Among Prescription Medication Users by Age and Gender



Error bars indicate 95% confidence intervals.

health consequences of these potential interactions are considerable. One recent report estimated that US adults older than 65 years make more than 175 000 emergency department visits annually for adverse drug events; commonly prescribed medications accounted for one-third of these events.³³ Reassuringly, we found no cases of absolutely contraindicated drug-drug combinations. Our findings suggest that concurrent use of prescription and nonprescription medications in older adults remains a public health problem and could be an important focal point for further improvements in drug safety for seniors.

Our study has several limitations. First, methodological differences across

studies may limit some cross-study comparisons. Second, virtually all therapeutic classes are underused by some populations and overused by others; our data do not allow for us to completely examine important questions for health policy and clinical care regarding the appropriateness of the regimens that we observe. For example, even in cases of a potential major drug-drug interaction, an individual's physician may have prescribed the regimen, may be aware of the risks, and may be monitoring the patient appropriately. Third, we based our analyses of major medication interactions on Thomson Micromedex classifications; other methods of classification may lead to different estimates of the population prevalence of drug-drug interactions. No one method

of classification is able to capture the entirety of clinical evidence to support a given drug's safety, and we examined potential interactions, rather than actual patient harm. Despite this, Thomson Micromedex is a widely used clinical reference. Our method of classification would generally lead to underestimates of the potential risks associated with concurrent use of prescription and nonprescription therapies because the related drug safety literature, albeit increasing, is limited. Furthermore, because we identified interactions only among the 20 most common medications and dietary supplements and focus only on major interactions, our results underestimate the total risk for potential interactions.

Table 6. Potential Major Medication Interactions by Age and Gender^a

Medication Interaction ^b	Interactions, Weighted No.						Total (N = 2976)	Potential Interaction Effect
	Age 57-64 y (n = 1016)		Age 65-74 y (n = 1082)		Age 75-85 y (n = 878)			
	Men (n = 525)	Women (n = 491)	Men (n = 543)	Women (n = 539)	Men (n = 377)	Women (n = 501)		
Prescription-prescription								
Albuterol-atenolol	0	1	1	0	1	1	5	Decreased effectiveness
Albuterol-metoprolol	0	1	1	1	2	1	6	Decreased effectiveness
Warfarin-simvastatin	5	2	4	3	7	5	25	Increased risk of bleeding/ rhabdomyolysis
Clopidogrel-warfarin	0	0	0	1	1	1	3	Increased risk of bleeding
Lisinopril-potassium	0	8	5	5	9	6	33	Increased risk of hyperkalemia
Nonprescription-prescription								
Aspirin-warfarin ^c	7	0	7	1	11	2	27	Increased risk of bleeding
Niacin-atorvastatin ^d	7	0	5	0	3	3	18	Increased risk of myopathy or rhabdomyolysis
Garlic-warfarin	0	0	0	0	1	0	1	Increased risk of bleeding
Niacin-simvastatin	1	1	4	2	1	0	10	Increased risk of myopathy or rhabdomyolysis
Nonprescription-nonprescription								
Ginkgo-aspirin	0	0	1	3	4	3	10	Increased risk of bleeding
Any interaction, No. (% [95% CI]) ^e	18 (2.9 [0.9-4.8])	13 (2.1 [0.2-4.0])	24 (4.7 [2.9-6.4])	14 (2.6 [1.2-3.9])	31 (10.1 [6.4-13.7])	19 (4.8 [2.7-6.9])	118 (4.0 [3.1-4.8])	

^aPercentages and numbers are weighted estimates to account for differential probabilities of selection and differential nonresponse.

^bPotential major medication interactions for the 20 most common prescription and over-the-counter medications and 20 most common dietary supplements.

^cStatistically significant ($P < .001$) difference between men and women.

^dStatistically significant ($P = .03$) difference between men and women.

^eStatistically significant ($P = .01$) difference between men and women.

CONCLUSIONS

Medications are a critical modality for prolongation of life and improved quality of life for many older adults. By establishing patterns of prescription and nonprescription medication use among older adults, these data may help support efforts to increase the safety and quality of pharmacotherapy for older adults. This is especially important, since in this sample of community-dwelling older adults in the United States, nearly 1 in 25 reported taking concurrent drugs with the potential for harm from serious drug-drug interactions.

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Study concept and design: Schumm, Lindau.

Acquisition of data: Johnson, Schumm, Lindau.

Analysis and interpretation of data: Qato, Alexander, Conti, Schumm, Lindau.

Drafting of the manuscript: Qato, Alexander, Conti, Schumm, Lindau.

Critical revision of the manuscript for important intellectual content: Qato, Alexander, Conti, Johnson, Schumm, Lindau.

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