Original Investigation

Trends in Prescription Drug Use Among Adults in the United States From 1999-2012

Elizabeth D. Kantor, PhD, MPH; Colin D. Rehm, PhD, MPH; Jennifer S. Haas, MD, MSc; Andrew T. Chan, MD, MPH; Edward L. Giovannucci, MD, ScD

IMPORTANCE It is important to document patterns of prescription drug use to inform both clinical practice and research.

OBJECTIVE To evaluate trends in prescription drug use among adults living in the United States.

DESIGN, SETTING, AND PARTICIPANTS Temporal trends in prescription drug use were evaluated using nationally representative data from the National Health and Nutrition Examination Survey (NHANES). Participants included 37 959 noninstitutionalized US adults, aged 20 years and older. Seven NHANES cycles were included (1999-2000 to 2011-2012), and the sample size per cycle ranged from 4861 to 6212.

EXPOSURES Calendar year, as represented by continuous NHANES cycle.

MAIN OUTCOMES AND MEASURES Within each NHANES cycle, use of prescription drugs in the prior 30 days was assessed overall and by drug class. Temporal trends across cycles were evaluated. Analyses were weighted to represent the US adult population.

RESULTS Results indicate an increase in overall use of prescription drugs among US adults between 1999-2000 and 2011-2012 with an estimated 51% of US adults reporting use of any prescription drugs in 1999-2000 and an estimated 59% reporting use of any prescription drugs in 2011-2012 (difference, 8% [95% CI, 3.8%-12%]; *P* for trend <.001). The prevalence of polypharmacy (use of ≥5 prescription drugs) increased from an estimated 8.2% in 1999-2000 to 15% in 2011-2012 (difference, 6.6% [95% CI, 4.4%-8.2%]; *P* for trend <.001). These trends remained statistically significant with age adjustment. Among the 18 drug classes used by more than 2.5% of the population at any point over the study period, the prevalence of use increased in 11 drug classes including antihyperlipidemic agents, antidepressants, prescription proton-pump inhibitors, and muscle relaxants.

CONCLUSIONS AND RELEVANCE In this nationally representative survey, significant increases in overall prescription drug use and polypharmacy were observed. These increases persisted after accounting for changes in the age distribution of the population. The prevalence of prescription drug use increased in the majority of, but not all, drug classes.

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Author Affiliations: Author affiliations are listed at the end of this article.

Corresponding Author: Elizabeth D. Kantor, PhD, MPH, Department of Epidemiology and Biostatistics, Memorial Sloan Kettering Cancer Center, 485 Lexington Ave, Second Floor, New York, NY 10017 (kantore@mskcc.org).

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Use of prescription drugs represents a major expenditure in the United States,[1] and research suggests that use of prescription drugs is increasing.[2] Yet much of the information about prescription use is derived from pharmacy databases or expenditure data,[1,3,4] neither of which directly captures use at the population level. Although several studies have sought to assess prescription drug use on the population level,[5-15] these studies are either outdated, narrow in scope, or limited to certain populations such as older individuals or those with a given clinical indication.

An updated comprehensive assessment of prescription drug use is important given that practice patterns are continually evolving to reflect the changing health needs of the population, advances in treatment, new clinical guidelines, the entrance or exit of drugs from the market, and shifts in policies regarding drug marketing and promotion. Because of this dynamic climate, it is important to document patterns of prescription drug use to inform both clinical practice and research, while also identifying population subgroups with the potential for underuse, misuse, and polypharmacy.

Nationally representative data from the National Health and Nutrition Examination Survey (NHANES) were used to estimate the prevalence of prescription drug use from 1999-2000 to 2011-2012.

Methods

Data Source and Study Population

NHANES is a nationally representative cross-sectional survey of civilian noninstitutionalized persons living in the United States.[16] Analyses for our study are based on data collected from persons aged 20 years and older during the 7 most recent cycles. The selection of cycles was determined by data availability: 1999-2000 represents the first year of continuous NHANES, and 2011-2012 is the most recent cycle for which data are available. As a stratified, complex, multistage, probability-based survey, NHANES oversamples older adults, low-income individuals, and certain racial/ethnic groups; participants were assigned weights to account for their unequal sampling probability and nonresponse.

All participants provided written informed consent, and data are publicly available.[17] This study was deemed exempt from human subjects approval by the Harvard T. H. Chan School of Public Health institutional review board.

Assessment of Prescription Drug Use

Information about prescription drug use was collected during a household interview. Participants were asked if they had taken prescription drugs over the prior 30 days. Those who responded "yes" were asked to show the containers of all products; when unavailable, participants were asked to report the medication name. For each drug reported, the interviewer entered the information into a laptop computer, and the drug was linked to a prescription drug database (Lexicon Plus) that includes all prescription drugs available. This database was updated at the beginning of each survey year to include new products.

Most drug categories are classified as defined by the National Center for Health Statistics (NCHS). Some additional definitions were generated, including antihypertensives, noncontraceptive hormones, antibiotics (including oral antibiotic-containing medications and antibiotic-containing dermatologic, ophthalmic, and respiratory medications), and oral antibiotics. Subclasses of drugs within a given drug class are not presented if used by too few individuals to provide reliable estimates on the prevalence of use. Medications defined as combination drugs are included within both combinations as well as their component drug categories to allow for tracking of both combination drugs and specific drug classes. For example, combination drugs containing adrenergic bronchodilators are classified as adrenergic bronchodilators and also as bronchodilator combinations to allow for simple quantification of trends in the use of medications containing adrenergic bronchodilators and also of combination therapies.

Statistical Analysis

The prevalence of use within each 2-year NHANES cycle was estimated for any prescription drug use and use by drug class. Polypharmacy was defined as use of at least 5 drugs, which indicates a threshold commonly used in the literature.[18] Additional results are presented for the most commonly used individual drugs in 2011-2012. Survey-weighted logistic regression was used to calculate a *P* value for trend across survey cycles. Statistical significance of trends was assessed at the 2-sided α=.05 level. In the results presentation, data reported as an increase refers to a *P* value for trend of less than .05 and a ratio greater than 1, a decrease refers to a *P* value for trend of less than .05 and ratio of less than 1, and stable refers to a *P* value for trend of .05 or greater. We have also presented the difference in prevalence in 2011-2012 vs 1999-2000, although these data, in some cases, may not represent the most extreme difference in use across years

Because changes in the age distribution of the population may account for observed trends in prescription drug use, secondary age-adjusted analyses were conducted using standardization based on the US 2000 Standard Population (eTable 1 in the Supplement).

Given potential for heterogeneity by population subgroups, results were stratified by age (20-39 years, 40-64 years, and ≥65 years), sex, and race/ethnicity (non-Hispanic white, non-Hispanic black, and Mexican American). Data for other race/ethnicity groups were not included in the stratified analyses due to insufficient sample sizes to reliably estimate the prevalence of use. Results are presented for Mexican Americans rather than overall Hispanics because of temporal changes in data collection among Hispanics.[19] Additional analyses evaluated race/ethnicity-stratified estimates with adjustment for age (previously described) and with further adjustment for insurance coverage. In analyses adjusted for both age and insurance, standardization was implemented using the age and insurance distribution of the 1999-2000 NHANES cycle. Given the large number of drug classes analyzed, results for a given overarching drug class are discussed if they meet any of the following criteria: (1) a greater

Table 1. Prevalence of Prescription Drug Use in Prior 30 Days Among US Adults—2011-2012[a]

		No. (%) [95% CI][b]	
	No. of Participants	Any Prescriptions	Polypharmacy (≥5 Prescriptions)
Overall	5558	3144 (59) [55-62]	917 (15) [13-17]
Age group, y			
20-39	1957	596 (35) [32-39]	47 (3.1) [2.1-4.6]
40-64	2352	1428 (65) [62-67]	372 (15) [13-17]
≥65	1249	1120 (90) [87-93]	498 (39) [35-44]
Sex			
Men	2739	1398 (52) [48-57]	418 (13) [10-16]
Women	2819	1746 (65) [62-67]	499 (16) [14-19]
Race/ethnicity			
White non-Hispanic	2040	1377 (66) [63-69]	440 (17) [15-20]
Black non-Hispanic	1455	835 (52) [49-55]	266 (14) [12-17]
Asian non-Hispanic	794	335 (41) [36-45]	54 (6) [4.0-8.7]
Mexican American	539	214 (33) [28-38]	56 (6.8) [4.2-10]
Other Hispanic	578	305 (41) [36-45]	77 (8.5) [6.0-12]
Other	152	78 (51) [38-63]	24 (17) [8.6-32]
Education			
<High school	1331	806 (57) [50-64]	296 (19) [16-23]
High school	1169	658 (58) [53-64]	196 (15) [12-19]
Some college	1657	901 (57) [52-62]	264 (15) [13-19]
College	1396	776 (61) [57-65]	160 (12) [9.2-14]
Family income-to-poverty ratio[c]			
<1 (Lowest income)	1303	677 (49) [43-54]	241 (16) [11-21]
1-<2	1326	755 (59) [52-65]	258 (18) [15-21]
2-<4	1167	662 (58) [51-64]	173 (15) [11-19]
≥4 (Highest income)	1267	760 (65) [60-69]	148 (12) [10-14]
Insurance status (age <65 y)[d]			
No insurance	1259	369 (31) [25-38]	47 (3.6) [2.1-6.0]
Government only	872	544 (64) [59-70]	201 (21) [17-25]
Any private insurance	2175	1110 (57) [54-60]	171 (9.1) [7.5-11]
Body mass index[e]			
<18.5	103	50 (59) [50-68]	12 (18) [9.8-32]
18-<25	1577	768 (52) [48-57]	148 (8.4) [5.5-13]
25-<30	1684	939 (57) [52-62]	245 (12) [10-15]
30-<35	1066	1066 (62) [58-66]	212 (17) [15-19]
35-<40	451	284 (68) [60-75]	109 (24) [18-30]
≥40	354	250 (73) [66-78]	117 (29) [24-35]

[a] All paticipants were aged 20 years or older.

[b] The values for % (95% CI) are weighted to be nationally representative.

[c] Data were based on the federal poverty level. In 2012, the federal poverty level for a family of 4 was $22 050. A family of 4 with an income of $40 000 would have a family income-to-poverty ratio of 1.81, indicating that their income is 181% greater than the federal poverty level.

[d] Information on insurance status was obtained from the health insurance questionnaire, assessing whether the individual was covered by health insurance at the time of the survey. Limited to adults who were younger than aged 65 since 98.9% of adults aged 65 years and older reported having some form of health insurance.

[e] Body mass index was calculated as weight in kilograms divided by height in meters squared. Data were available for 94.2% of respondents. Mobile Exam Center weights were used for analyses of body mass index (interview analytic weights were used in all other cases).

than 10% prevalence of use in any cycle; (2) prevalence of use greater than 5% with at least a 1.5-fold change; or (3) prevalence of use greater than 2.5% with at least a 2-fold change in use. This approach was selected to focus on commonly used drugs and on modestly used drugs with notable trends.

For drugs meeting the previously described criteria, we have calculated an average annual percentage change using Joinpoint Statistical Software (version 4.2.0.2), which uses a permutation test to identify points of inflection (providing an annual percentage change (APC) before and after the point of inflection [eTable 2 in the Supplement]).[20,21]

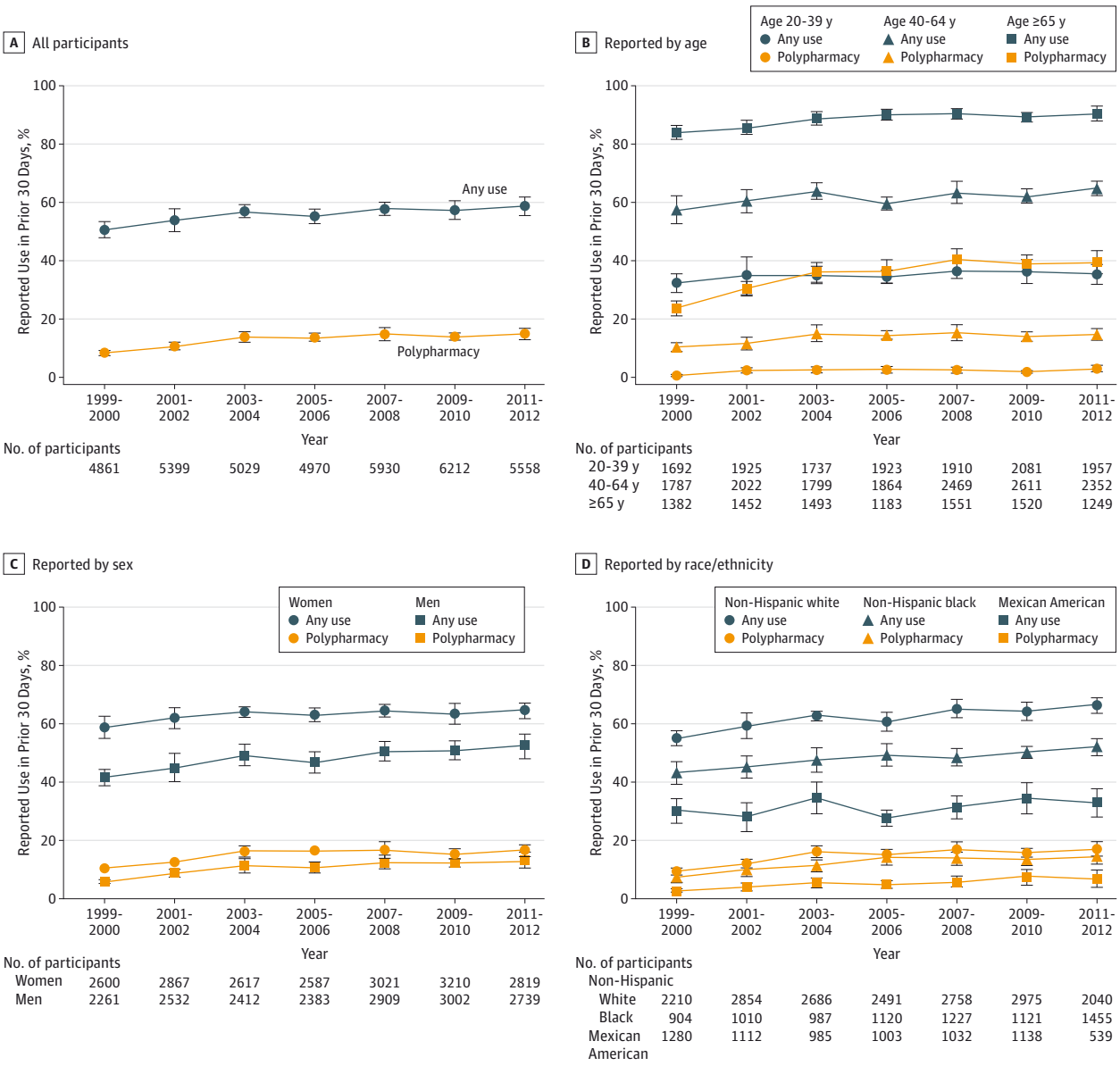
All analyses account for complex survey design and post-stratification weighting using Stata version 13.1.

Results

In these NHANES cycles, the response rate for adults aged 20 years and older was 73.6%,[22] and 84% of medication containers were seen by interviewers. After excluding 65 individuals who did not have data on prescription drug use, the final sample size was 37 959; the sample size for individual NHANES cycles ranged from 4861 to 6212.

Table 1 shows the estimated percentage of US adults reporting use of any prescription medication in 2011-2012 and also of those reporting use of 5 or more prescription medications both overall and by population characteristics. Fifty-

Figure 1. Trends in Any Prescription Drug Use and Use of 5 or More Prescription Drugs (Polypharmacy), Overall, and by Age Group, Sex, and Race/Ethnicity—1999-2012



All trends statistically significant except for any prescription drug use among persons aged 20 to39 years (*P* for trend = .22) and for any prescription drug use among Mexican Americans (*P* for trend = .17). All data are weighted to be nationally representative. Error bars indicate 95% CIs.

nine percent of adults used any prescription in the prior 30 days, while 39% of adults aged 65 years and older reported polypharmacy. A significant increase in polypharmacy was observed in all 3 adult age groups: among those aged 20 to 39 years, from 0.7% to 3.1%; among 40- to 64-year-olds, from 10% to 15%; and among those aged 65 years and older, from 24% to 39% (**Figure 1**).

From 1999-2000 to 2011-2012, the percentage of adults reporting use of any prescription in the previous 30 days increased from an estimated 51% to 59% (difference, 8% [95% CI, 3.8%-12%]). Polypharmacy increased from an estimated 8.2% to 15% (difference, 6.6% [95% CI, 4.4%-8.2%]; Figure 1 and Table 1). The increase in any prescription drug use and polypharmacy remained statistically significant in age-adjusted models (eTable 1 in the Supplement). Among the 18 drug classes used by more than 2.5% of the population, the prevalence of use increased in 11 drug classes (**Table 2**). All subsequent ranges present prevalence of use in 1999-2000 vs 2011-2012 unless specified as otherwise.

Use of antihypertensives increased (20%-27%), with increases observed in most drug classes (Table 2). Antihyperlipidemics use increased, a trend largely driven by statins (6.9%-17%). Use of statins increased markedly prior to 2005-2006 (APC = 12%, after which the APC was 4.0%; eTable 2 in the

Table 2. Trends in Prescription Drug Use in the Prior 30 Days Among US Adults by Top 18–Used Drug Classes—1999-2012[a]

	Prevalence of Use, %[b] (95% CI)								2011-2012 vs 1999-2000	
	1999-2000 (n = 4861)	2001-2002 (n = 5399)	2003-2004 (n = 5029)	2005-2006 (n = 4970)	2007-2008 (n = 5930)	2009-2010 (n = 6212)	2011-2012 (n = 5558)	*P* for Trend	Difference in Prevalence, % (95% CI)[c]	Ratio of Prevalence, Ratio (95% CI)[d]
Any prescription	51 (48-53)	54 (50-58)	57 (55-59)	55 (53-58)	58 (55-60)	57 (54-61)	59 (55-62)	<.001	8.0 (3.8 to 12)	1.2 (1.1 to 1.3)
≥5 Prescriptions	8.2 (7.4-9.2)	11 (9.4-12)	14 (12-16)	14 (12-15)	15 (13-17)	14 (13-15)	15 (13-17)	<.001	6.6 (4.4 to 8.2)	1.8 (1.5 to 2.1)
Antihypertensive agents	20 (18-22)	20 (18-23)	24 (22-27)	25 (23-27)	26 (25-28)	27 (24-30)	27 (25-30)	<.001	8.2 (4.6 to 12)	1.4 (1.2 to 1.6)
ACE inhibitors	6.3 (5.3-7.5)	7.6 (7.0-8.2)	9.7 (8.5-11)	9.7 (8.5-11)	10 (9.0-11)	11 (10-12)	12 (10-13)	<.001	5.3 (3.4 to 7.1)	1.8 (1.5 to 2.3)
Angiotensin II inhibitors	2.1 (1.6-2.8)	3.0 (2.5-3.7)	4.7 (3.8-5.7)	4.5 (3.6-5.6)	6.5 (5.7-7.4)	6.5 (5.3-8.0)	5.8 (4.9-6.9)	<.001	3.6 (2.5 to 4.8)	2.7 (1.9 to 3.7)
β-Blockers	6.0 (5.2-7.0)	6.8 (5.6-8.1)	9.4 (8.5-10)	11 (9.2-12)	10 (9.2-11)	11 (9.8-13)	11 (8.7-13)	<.001	4.5 (2.4 to 6.7)	1.8 (1.4 to 2.2)
Cardioselective	4.7 (3.9-5.6)	5.7 (4.7-7.0)	7.7 (6.9-8.6)	8.9 (7.4-11)	8.4 (7.5-9.3)	8.9 (7.7-10)	8.2 (6.5-10)	<.001	3.5 (1.5 to 5.5)	1.7 (1.3 to 2.3)
Noncardioselective	1.5 (1.3-1.8)	1.4 (1.1-1.8)	2.8 (2.3-3.4)	3.0 (2.5-3.6)	3.0 (2.4-3.7)	3.7 (3.0-4.5)	3.2 (2.8-3.7)	<.001	1.7 (1.2 to 2.2)	2.1 (1.7 to 2.7)
Calcium-channel blockers	6.3 (5.8-6.9)	5.3 (4.3-6.6)	6.7 (5.8-7.8)	7.1 (6.1-8.3)	6.2 (5.5-7.1)	6.7 (6.0-7.5)	6.5 (5.4-7.8)	.28	0.2 (−1.1 to 1.5)	1.0 (0.84 to 1.3)
Any diuretic	8.6 (7.3-10)	9.3 (7.6-11)	11 (9.9-13)	11 (9.8-13)	12 (10-14)	12 (11-13)	12 (11-14)	<.001	3.7 (1.6 to 5.8)	1.4 (1.2 to 1.8)
Loop	2.5 (2.0-3.0)	2.6 (2.1-3.3)	3.1 (2.6-3.8)	2.7 (2.2-3.4)	2.9 (2.4-3.7)	2.9 (2.4-3.5)	2.7 (2.2-3.4)	.49	0.3 (−0.6 to 1.1)	1.1 (0.81 to 1.5)
Potassium-sparing	2.3 (2.0-2.8)	2.0 (1.5-2.7)	2.6 (1.9-3.4)	2.1 (1.8-2.4)	2.4 (2.0-2.9)	2.0 (1.6-2.5)	1.6 (1.4-1.9)	.04	−0.7 (−1.2 to −0.2)	0.70 (0.54 to 0.90)
Thiazide	5.6 (4.4-7.0)	6.3 (5.0-7.9)	7.9 (6.8-9.3)	8.4 (7.1-9.9)	8.8 (7.7-10)	8.8 (7.5-10)	9.4 (8.2-11)	<.001	3.8 (2.0 to 5.7)	1.7 (1.3 to 2.2)
Antihypertensive combinations	3.6 (2.9-4.5)	4.1 (3.1-5.3)	5.6 (4.7-6.7)	5.0 (4.2-6.1)	6.1 (5.3-7.1)	6.3 (5.3-7.5)	5.4 (4.4-6.6)	<.001	1.8 (0.4 to 3.2)	1.5 (1.1 to 2.0)
Antihyperlipidemic agents	7.6 (6.9-8.3)	9.5 (8.0-11)	12 (11-14)	14 (13-16)	17 (16-18)	18 (16-19)	18 (16-21)	<.001	11 (8.5 to 13)	2.4 (2.1 to 2.8)
Fibric acid derivatives	0.7 (0.4-1.3)	1.0 (0.7-1.5)	1.1 (0.8-1.6)	1.0 (0.7-1.5)	1.6 (1.2-2.0)	1.5 (1.1-2.2)	1.7 (1.2-2.5)	.002	1.0 (0.2 to 1.8)	2.3 (1.2 to 4.7)
Statins	6.9 (6.4-7.5)	8.5 (7.1-10)	11 (9.6-12)	13 (12-15)	15 (14-16)	16 (15-18)	17 (15-19)	<.001	10.2 (8.1 to 12.2)	2.5 (2.1 to 2.8)
Antihyperlipidemic combinations	0	0	[e]	1.0 (0.7-1.5)	1.9 (1.5-2.4)	0.9 (0.7-1.2)	[e]	.07	NA	NA
Antidepressants	6.8 (5.8-7.9)	9.1 (8.0-10)	11 (9.9-12)	11 (10-12)	12 (11-14)	11 (9.4-12)	13 (11-15)	<.001	6.0 (3.5 to 8.6)	1.9 (1.5 to 2.4)
Phenylpiperazine	1.0 (0.8-1.2)	1.4 (1.0-1.9)	1.0 (0.7-1.4)	1.0 (0.8-1.4)	1.0 (0.8-1.3)	0.9 (0.7-1.2)	1.3 (0.9-1.7)	.92	0.3 (−0.1 to 0.7)	1.3 (0.92 to 1.9)
SSNRIs	0.4 (0.3-0.7)	0.7 (0.4-1.0)	1.1 (0.7-1.7)	1.9 (1.5-2.5)	2.3 (1.8-2.8)	1.9 (1.5-2.4)	2.0 (1.5-2.6)	<.001	1.6 (1.0 to 2.2)	4.7 (2.6 to 8.5)
SSRIs	4.3 (3.6-5.2)	5.8 (5.1-6.7)	7.4 (6.5-8.5)	7.0 (6.2-7.9)	7.3 (6.3-8.4)	6.9 (5.6-8.5)	8.5 (6.9-10.4)	<.001	4.2 (2.3 to 6.1)	2.0 (1.5 to 2.6)

(continued)

Table 2. Trends in Prescription Drug Use in the Prior 30 Days Among US Adults by Top 18–Used Drug Classes—1999-2012[a] (continued)

	Prevalence of Use, %[b] (95% CI)									
									2011-2012 vs 1999-2000	
	1999-2000 (n = 4861)	2001-2002 (n = 5399)	2003-2004 (n = 5029)	2005-2006 (n = 4970)	2007-2008 (n = 5930)	2009-2010 (n = 6212)	2011-2012 (n = 5558)	*P* for Trend	Difference in Prevalence, % (95% CI)[c]	Ratio of Prevalence, Ratio (95% CI)[d]
Tricyclics	1.2 (0.9-1.7)	1.5 (0.9-2.3)	1.5 (1.2-1.9)	1.1 (0.9-1.4)	1.4 (1.2-1.6)	1.0 (0.8-1.5)	1.3 (1.0-1.8)	.59	0.1 (−0.4 to 0.7)	1.1 (0.72 to 1.8)
Prescription analgesics	11 (10-12)	13 (12-14)	17 (15-19)	12 (10-13)	12 (10-14)	12 (10-13)	11 (9.2-14)	.13	−0.1 (−2.6 to 2.5)	0.99 (0.79 to 1.2)
COX-2 inhibitors	1.9 (1.3-2.7)	4.3 (3.6-5.0)	4.5 (3.8-5.2)	1.3 (0.8-2.0)	1.0 (0.7-1.6)	0.5 (0.3-0.7)	0.6 (0.4-1.0)	<.001	−1.3 (−2.0 to −0.6)	0.32 (0.17 to 0.59)
Narcotic analgesics	3.8 (3.1-4.8)	4.5 (3.6-5.6)	5.8 (4.7-7.2)	5.9 (4.9-7.0)	5.8 (4.5-7.4)	5.1 (4.2-7.6)	5.7 (4.2-7.6)	.05	1.8 (0.0 to 3.7)	1.5 (1.0 to 2.1)
Prescription NSAIDs[f]	5.6 (4.7-6.6)	3.7 (3.1-4.4)	6.6 (5.6-7.8)	4.6 (4.0-5.2)	4.2 (3.4-5.1)	4.5 (3.8-5.2)	4.2 (3.4-5.2)	.03	−1.4 (−2.7 to −0.1)	0.75 (0.57 to 0.98)
Salicylates	0.6 (0.4-0.9)	0.7 (0.5-0.9)	0.5 (0.3-0.8)	0.6 (0.5-0.8)	1.0 (0.7-1.4)	1.5 (1.2-2.0)	0.6 (0.4-0.9)	.002	0.0 (−0.3 to 0.3)	1.0 (0.58 to 1.8)
Miscellaneous analgesics	0.4 (0.2-0.7)	0.4 (0.2-0.6)	1.0 (0.7-1.7)	0.8 (0.5-1.2)	1.1 (0.7-1.6)	1.3 (1.0-1.7)	1.3 (1.0-1.8)	<.001	0.9 (0.4 to 1.4)	3.3 (1.8 to 5.9)
Hormones[g]										
Sex	19 (16-21)	21 (18-24)	14 (13-16)	12 (11-14)	12 (10-14)	10 (8.6-12)	11 (8.7-13)	<.001	−7.9 (−11 to −4.6)	0.57 (0.45 to 0.73)
Contraceptive	8.1 (6.6-9.8)	8.5 (6.7-11)	7.0 (6.0-8.3)	6.9 (5.7-8.3)	7.6 (5.8-9.9)	7.1 (5.9-8.5)	7.1 (5.1-9.9)	.35	−0.9 (−3.8 to 1.9)	0.88 (0.60 to 1.3)
Noncontraceptive	12 (10-15)	14 (12-16)	7.2 (6.0-8.7)	5.6 (4.8-6.5)	4.3 (3.2-5.6)	3.1 (2.6-3.8)	4.0 (3.2-5.1)	<.001	−8.5 (−11 to −5.6)	0.32 (0.23 to 0.45)
Antidiabetic agents	4.6 (3.8-5.5)	5.3 (4.5-6.1)	6.4 (5.5-7.5)	6.4 (5.6-7.3)	7.7 (6.5-9.1)	7.7 (6.8-8.6)	8.2 (7.2-9.3)	<.001	3.6 (2.3 to 5.0)	1.8 (1.4 to 2.2)
Biguanides	2.0 (1.5-2.6)	2.5 (2.0-3.1)	3.6 (3.0-4.3)	3.6 (2.9-4.5)	4.7 (3.9-5.7)	4.9 (4.3-5.7)	5.5 (4.7-6.4)	<.001	3.5 (2.5 to 4.5)	2.7 (2.0 to 3.7)
Insulin	1.1 (0.8-1.6)	1.3 (0.9-1.8)	1.5 (1.2-1.9)	1.6 (1.4-1.9)	2.1 (1.6-2.8)	2.1 (1.6-2.7)	2.6 (2.2-3.1)	<.001	1.5 (0.9 to 2.1)	2.3 (1.6 to 3.3)
Sulfonylureas	2.6 (2.2-3.2)	2.7 (2.3-3.1)	3.3 (2.6-4.1)	2.9 (2.3-3.6)	3.3 (2.8-3.8)	3.0 (2.6-3.5)	3.2 (2.5-4.2)	<.001	0.6 (−0.4 to 1.5)	1.2 (0.88 to 1.7)
Thiazolidinediones	0.5 (0.3-0.8)	0.9 (0.7-1.2)	2.0 (1.7-2.4)	2.0 (1.5-2.6)	1.9 (1.4-2.4)	1.2 (1.0-1.6)	0.8 (0.6-1.1)	.17	0.3 (−0.1 to 0.7)	1.6 (0.86 to 2.9)
Prescription proton-pump inhibitors	3.9 (3.0-5.0)	6.2 (5.5-7.1)	7.5 (6.4-8.7)	8.0 (6.7-9.5)	9.0 (7.4-11)	9.3 (8.0-11)	7.8 (6.2-9.6)	<.001	3.9 (1.9 to 5.9)	2.0 (1.4 to 2.8)
Thyroid hormones	5.1 (4.4-5.9)	5.2 (4.5-6.0)	7.0 (6.1-8.0)	7.1 (6.0-8.3)	6.7 (5.9-7.6)	7.1 (6.2-8.3)	6.4 (5.3-7.7)	.007	1.3 (−0.2 to 2.7)	1.2 (0.98 to 1.6)
Anxiolytics, sedatives, hypnotics	4.2 (3.4-5.1)	4.4 (3.7-5.2)	6.1 (4.6-7.9)	5.5 (4.8-6.4)	6.5 (5.5-7.7)	6.1 (5.4-6.8)	6.1 (5.0-7.3)	<.001	1.9 (0.5 to 3.3)	1.5 (1.1 to 1.9)
Benzodiazepines	2.8 (2.2-3.5)	3.2 (2.6-3.8)	4.2 (3.1-5.6)	3.4 (2.9-4.0)	3.8 (3.1-4.6)	3.8 (3.1-4.6)	3.9 (3.3-4.8)	.04	1.1 (0.2 to 2.1)	1.4 (1.0 to 1.9)
Anticonvulsants	2.3 (1.9-2.9)	3.5 (2.8-4.3)	4.5 (3.7-5.5)	4.3 (3.7-5.0)	5.3 (4.5-6.3)	5.3 (4.8-5.8)	5.5 (4.6-6.6)	<.001	3.2 (2.0 to 4.3)	2.3 (1.8 to 3.1)
Benzodiazepines	1.2 (0.9-1.7)	1.6 (1.1-2.1)	2.1 (1.5-2.9)	1.8 (1.5-2.2)	1.9 (1.6-2.3)	2.1 (1.7-2.7)	2.3 (1.8-2.9)	.002	1.1 (0.4 to 1.7)	1.8 (1.3 to 2.7)
γ-Aminobutyric acid analogs	[e]	0.9 (0.7-1.2)	1.2 (0.8-1.8)	1.2 (0.8-1.7)	1.9 (1.4-2.5)	1.9 (1.6-2.3)	2.1 (1.6-2.7)	<.001	1.8 (1.2 to 2.4)	7.4 (2.8 to 19)
Bronchodilators	3.2 (2.6-4.0)	3.3 (2.6-4.2)	3.9 (3.1-4.8)	4.4 (3.7-5.2)	5.1 (4.3-5.9)	4.7 (3.8-5.7)	5.2 (4.0-6.6)	<.001	1.9 (0.5 to 3.4)	1.6 (1.1 to 2.2)
Adrenergic bronchodilators	2.9 (2.3-3.6)	3.2 (2.5-4.1)	3.7 (3.0-4.5)	4.2 (3.6-5.0)	4.9 (4.1-5.7)	4.4 (3.6-5.3)	4.9 (3.7-6.3)	<.001	2.0 (0.5 to 3.4)	1.7 (1.2 to 2.4)
Anticholinergic bronchodilators	0.6 (0.5-0.7)	0.5 (0.4-0.7)	1.1 (0.8-1.6)	0.9 (0.7-1.2)	1.3 (1.0-1.8)	1.0 (0.7-1.5)	1.1 (0.8-1.6)	<.001	0.5 (0.1 to 1.0)	1.9 (1.2 to 3.0)

(continued)

Table 2. Trends in Prescription Drug Use in the Prior 30 Days Among US Adults by Top 18–Used Drug Classes—1999-2012[a] (continued)

	Prevalence of Use, %[b] (95% CI)									
									2011-2012 vs 1999-2000	
	1999-2000 (n = 4861)	2001-2002 (n = 5399)	2003-2004 (n = 5029)	2005-2006 (n = 4970)	2007-2008 (n = 5930)	2009-2010 (n = 6212)	2011-2012 (n = 5558)	*P* for Trend	Difference in Prevalence, % (95% CI)[c]	Ratio of Prevalence, Ratio (95% CI)[d]
Bronchodilator combinations	0.3 (0.2-0.4)	0.6 (0.4-0.8)	1.9 (1.4-2.5)	1.9 (1.4-2.4)	2.2 (1.7-2.7)	2.1 (1.5-2.9)	2.1 (1.4-3.0)	<.001	1.8 (1.0 to 2.6)	7.9 (4.6 to 14)
Antibiotics	5.7 (5.1-6.3)	5.6 (4.5-6.9)	5.5 (4.8-6.3)	5.4 (4.5-6.4)	4.3 (3.8-4.8)	4.0 (3.4-4.7)	4.2 (3.7-4.9)	<.001	−1.4 (−2.3 to −0.6)	0.75 (0.63 to 0.90)
Oral antibiotics	3.8 (3.2-4.4)	3.6 (2.9-4.5)	3.7 (3.1-4.4)	3.4 (2.6-4.4)	2.8 (2.3-3.3)	2.7 (2.3-3.2)	2.9 (2.5-3.3)	<.001	−0.9 (−1.6 to −0.1)	0.77 (0.63 to 0.96)
Antiarrhythmic agents	4.9 (4.5-5.4)	4.5 (3.8-5.3)	4.3 (3.7-5.0)	4.5 (3.8-5.3)	3.4 (2.8-4.1)	3.0 (2.5-3.7)	2.7 (2.1-3.5)	<.001	−2.2 (−3.0 to −1.4)	0.55 (0.42 to 0.73)
Class IV	2.7 (2.4-2.9)	2.4 (1.9-2.9)	2.1 (1.7-2.6)	2.2 (1.8-2.8)	1.3 (1.0-1.6)	1.4 (1.1-1.8)	1.0 (0.6-1.5)	<.001	−1.7 (−2.2 to −1.2)	0.52 (0.30 to 0.89)
Class V	1.4 (1.1-1.8)	1.0 (0.8-1.3)	1.1 (0.8-1.5)	0.9 (0.6-1.3)	0.7 (0.5-0.9)	0.5 (0.3-1.0)	0.7 (0.4-1.0)	<.001	−0.8 (−1.2 to −0.3)	0.83 (0.42 to 1.6)
Coagulation modifiers	2.3 (1.9-2.8)	2.6 (2.1-3.1)	3.3 (2.6-4.2)	3.8 (3.1-4.8)	4.8 (4.1-5.6)	4.8 (3.9-5.8)	4.0 (3.4-4.8)	<.001	1.8 (0.9 to 2.6)	1.8 (1.4 to 2.3)
Anticoagulants	1.3 (0.9-1.8)	1.5 (1.2-1.9)	1.4 (1.1-1.9)	1.7 (1.5-2.0)	1.9 (1.4-2.6)	1.8 (1.4-2.4)	1.7 (1.3-2.1)	.04	0.4 (−0.2 to 1.0)	1.3 (0.87 to 2.0)
Warfarin	1.3 (0.9-1.8)	1.4 (1.1-1.8)	1.4 (1.1-1.9)	1.7 (1.5-2.0)	1.9 (1.4-2.6)	1.8 (1.4-2.3)	1.5 (1.1-2.1)	.10	0.3 (−0.3 to 0.9)	1.2 (0.79 to 1.9)
Antiplatelet agents	0.9 (0.7-1.2)	1.1 (0.8-1.4)	1.8 (1.4-2.4)	2.2 (1.6-3.0)	2.9 (2.3-3.5)	3.1 (2.4-4.0)	2.4 (1.9-3.0)	<.001	1.5 (0.9 to 2.1)	2.7 (1.9 to 3.9)
Clopidogrel	0.3 (0.2-0.4)	0.5 (0.4-0.8)	1.3 (0.9-1.8)	1.6 (1.1-2.4)	1.9 (1.5-2.4)	1.3 (0.9-2.0)	1.6 (1.2-2.0)	<.001	1.3 (0.9 to 1.7)	6.1 (3.6 to 10)
Muscle relaxants	1.2 (0.9-1.7)	1.6 (1.2-2.2)	2.6 (2.2-3.0)	2.2 (1.8-2.7)	2.2 (1.8-2.8)	2.0 (1.6-2.6)	2.5 (1.8-3.5)	.008	1.3 (0.4 to 2.2)	2.0 (1.3 to 3.2)
Nasal preparations	1.9 (1.5-2.3)	2.0 (1.5-2.6)	2.6 (2.0-3.2)	3.4 (2.8-4.1)	2.3 (1.8-2.9)	2.2 (1.7-3.0)	2.5 (1.9-3.3)	.16	0.7 (−0.1 to 1.5)	1.4 (0.96 to 1.9)
Nasal steroids	1.7 (1.4-2.2)	1.9 (1.5-2.6)	2.4 (1.9-3.1)	3.2 (2.7-3.9)	2.1 (1.6-2.8)	2.1 (1.5-2.7)	2.2 (1.8-2.8)	.39	0.5 (−0.2 to 1.2)	1.3 (0.91 to 1.8)
H_2 Antagonists	2.1 (1.6-2.9)	1.8 (1.4-2.4)	2.4 (1.9-3.1)	1.7 (1.3-2.2)	2.2 (1.7-2.8)	3.0 (2.3-3.8)	2.4 (1.9-3.1)	.08	0.3 (−0.6 to 1.2)	1.1 (0.76 to 1.7)
Prescription antihistamines	3.9 (3.3-4.5)	5.0 (4.1-6.1)	4.2 (3.5-4.9)	4.4 (3.8-5.1)	4.0 (3.4-4.7)	2.8 (2.2-3.7)	2.1 (1.6-2.7)	<.001	−1.8 (−2.6 to −1.0)	0.54 (0.40 to 0.72)

Abbreviations: ACE, angiotensin-converting enzyme; COX-2, cyclooxygenase 2; NA, not applicable; NSAID, nonsteroidal anti-inflammatory drug; SSNRI, selective serotonin–norepinephrine reuptake inhibitor; SSRI, selective serotonin reuptake inhibitor.

[a] All data are weighted to be nationally representative. Overarching drug classes are presented in order of descending prevalence in 2011-2012. Prevalence of use for drug classes reported in this table were at least 2.5% at any point over the study period.

[b] Prevalence values of 10% and greater are rounded to the nearest whole number.

[c] Indicates the absolute increase or decrease in prevalence of use between 1999-2000 and 2011-2012.

[d] Indicates the relative increase or decrease in prevalence of use between 1999-2000 and 2011-2012.

[e] Data withheld due to relative standard error of greater than 30% in results for a given survey cycle, consistent with NHANES analytic guidelines.[23]

[f] Excludes COX-2 inhibitors.

[g] Analyses limited to women.

Supplement). Use of antidepressants increased (6.8%-13%), reflected by an increase in use of selective serotonin-norepinephrine reuptake inhibitors (SSNRIs) (0.4%-2.0%) and also in selective serotonin reuptake inhibitors (SSRIs) (4.3%-8.5%). Use of antidepressants increased most in the early years, driven by a sharp increase in SSNRIs before 2005-2006 (APC = 32%), after which time, the trend leveled off (APC, −0.2%).

Prescription analgesic use remained stable (11%), although trends differed by type. Use of cyclooxygenase-2 (COX-2) inhibitors decreased from 1.9% to 0.6%, while the prevalence of narcotic analgesic use increased from 3.8% to 5.7%. Notably, narcotic analgesics increased before 2003-2004 (APC=12%), after which time, the use stabilized (APC, −1.2%).

Use of sex hormones among women decreased from 19% to 11%, which was a change primarily driven by a decline in use of noncontraceptive hormones (12.0%-4.0%, a drug class composed largely of menopausal hormone therapy). Use of antidiabetic agents increased from 4.6% to 8.2%, specifically, increases were observed for biguanides, insulin, and sulfonylureas. Although use of thiazolidinediones remained unchanged overall, a significant inflection point was observed in 2003-2004 (before which, use increased [APC = 48%], and after which, use decreased [APC, −8.8%]).

An increase was reported in the use of prescription proton-pump inhibitors (PPIs) (3.9%-7.8%) and also the use of anticonvulsants (2.3%-5.5%). Notably, the use of anticonvulsants increased most in the early years with an APC of 16% observed before 2003-2004, and an APC of 3.0% was observed thereafter. Use of bronchodilators increased (3.2%-5.2%) overall, with use of adrenergic bronchodilators increasing most before 2007-2008 (APC = 6.6%) and stabilizing afterwards (APC, −1.2%). Use of bronchodilator combinations increased sharply before 2003-2004 (APC = 66%), and were reported with an APC 2.2% afterwards. Further, use of muscle relaxants increased (1.2%-2.5%), with the increase sharpest in the periods between 1999-2000 and 2003-2004 (APC prior to 2003-2003, 19%; thereafter, −1.7%). Use of antibiotics decreased from 5.7% to 4.2% over the study period. Trends of use for prescription drug classifications with a prevalence of use less than 2.5% are reported in **Table 3**.

Prescription drug use increased significantly among persons aged 40 to 64 years (57%-65%) and also among those aged 65 years and older (84%-90%) (**Table 4**), but not among adults aged 20 to 39 years (32%-35%) (Figure 1, panel B). For specific drug classes, trends were generally similar by age and sex with some exceptions (eg, use of prescription analgesics did not change among adults aged 40-64 years [13%-14%], but use significantly decreased among adults aged ≥65 years [18%-14%]; use of muscle relaxants increased significantly among women [1.2%-3.3%], but did not increase significantly among men [1.3%-1.7%]) (Table 4 and **Table 5**; eTables 3 and 4 in the Supplement).

Although significant increases in the percentage of persons using 5 or more prescriptions were observed in all racial/ethnic groups (eTable 5 in the Supplement), an overall increase in prescription drug use was evident among individuals who were non-Hispanic white (55%-66%) and non-Hispanic black (43%-52%), but not Mexican American (30%-33%). This pattern remained unchanged with age adjustment, and the prevalence of use among individuals who were Mexican American remained markedly lower than among that of those who were non-Hispanic white (although the difference was attenuated somewhat; eTable 6 in the Supplement). Further sensitivity analyses revealed that this difference in any prescription use was not entirely attributable to adjustment for insurance status, although race/ethnicity-specific differences in polypharmacy were attenuated (eTable 6 and eTable 7 in the Supplement).

The most commonly used individual drug in 2011-2012 was simvastatin (7.9%), increasing from 2.0% in 1999-2000 (eTable 8 in the Supplement and **Figure 2**). The remaining top 10 drugs included lisinopril, levothyroxine, metoprolol, metformin, hydrochlorothiazide, omeprazole, amlodipine, atorvastatin, and albuterol; all of the top 10 most commonly used drugs increased over the study period except atorvastatin.

Discussion

Overall, prescription drug use increased among US adults between 1999-2000 and 2011-2012, as reflected by an increase in any prescription drug use and a marked increase in polypharmacy. Specifically, the prevalence of prescription drug use increased from 51% in 1999-2000 to 59% in 2011-2012, while the prevalence of polypharmacy increased from 8.2% to 15%. The increase in prescription drug use was observed for the majority of but not all drug classes.

Use of antihypertensive drugs increased over the study period, with a marked increase observed for several antihypertensives, including thiazide diuretics. The increase in use of thiazide diuretics is notable, given the recommendations for their use as first-line agents by the 2003 JNC 7 (Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure).[24] However, in trend analyses accounting for potential inflection points the APC was highest before 2003-2004, suggesting that the increase in thiazide diuretics use preceded rather than resulted from the 2003 recommendations. In 2014, the JNC 8 guidelines relaxed recommendations for drug initiation and expanded the options for first-line drug therapy, which may further influence the landscape of antihypertensive use.[25]

Use of antihyperlipidemics increased markedly, driven primarily by an increase in use of statins, for which the greatest increase was observed prior to 2005-2006. Although use of both simvastatin and atrovastatin increased early in the study period, use of atorvastatin started to decline after 2005-2006. This pattern likely reflects the fact that simvastatin came off patent in 2006 while atorvastatin remained patent protected, and therefore more costly, until 2011. Notably, this study preceded the release of the 2013 American College of Cardiology/American Heart Association recommendations, which expanded guidelines for statin use.[26]

The increase in use of antidepressant drugs may, in part, reflect shifting attitudes regarding depression.[27] Use of SSRIs

Table 3. Trends in Prescription Drug Use in the Prior 30 Days Among US Adults by Lesser-Used Drug Classes—1999-2012[a]

	Prevalence of Use, %[b] (95% CI)								2011-2012 vs 1999-2000	
	1999-2000 (n = 4861)	2001-2002 (n = 5399)	2003-2004 (n = 5029)	2005-2006 (n = 4970)	2007-2008 (n = 5930)	2009-2010 (n = 6212)	2011-2012 (n = 5558)	*P* for Trend	Difference in Prevalence, % (95% CI)[c]	Ratio of Prevalence, Ratio (95% CI)[d]
Peripherally acting antiadrenergic agents	1.6 (1.3-2.0)	1.4 (1.1-1.9)	1.7 (1.4-2.1)	1.7 (1.3-2.1)	2.0 (1.6-2.6)	1.9 (1.6-2.2)	2.1 (1.6-2.8)	.01	0.5 (−0.1 to 1.2)	1.3 (0.95 to 1.9)
5 α-Reductase inhibitors[e]	[f]	[f]	0.7 (0.5-1.1)	1.0 (0.6-1.5)	1.5 (1.1-2.0)	1.4 (0.8-2.2)	2.0 (1.5-2.7)	<.001	1.6 (0.9 to 2.3)	5.4 (2.1 to 14)
Antiemetic/antivertigo agents	1.8 (1.3-2.5)	2.1 (1.6-2.7)	2.0 (1.4-2.7)	2.0 (1.5-2.5)	2.4 (2.0-2.8)	1.8 (1.4-2.5)	2.0 (1.5-2.7)	.72	0.2 (−0.6 to 1.0)	1.1 (0.73 to 1.7)
CNS stimulants	[f]	0.6 (0.4-1.1)	[f]	0.9 (0.7-1.2)	1.1 (0.8-1.6)	0.8 (0.6-1.1)	1.8 (1.1-2.8)	<.001	1.3 (0.5 to 2.2)	4.1 (1.7 to 9.7)
Antipsychotics	1.2 (0.7-2.0)	1.2 (0.8-1.7)	1.2 (0.7-1.9)	1.4 (1.0-1.8)	1.4 (1.0-2.0)	1.3 (1.0-1.8)	1.7 (1.3-2.1)	.15	0.4 (−0.3 to 1.2)	1.4 (0.77 to 2.4)
Atypical antipsychotics	[f]	0.8 (0.5-1.3)	0.8 (0.5-1.3)	1.1 (0.8-1.5)	1.2 (0.9-1.7)	1.0 (0.7-1.3)	1.3 (1.0-1.7)	.006	0.7 (0.2 to 1.2)	2.2 (1.1 to 4.4)
Glucocorticoids	2.2 (1.8-2.8)	1.8 (1.4-2.4)	1.5 (1.2-1.9)	1.6 (1.2-2.2)	1.2 (1.0-1.6)	1.2 (0.9-1.6)	1.5 (1.2-2.0)	.004	−0.7 (−1.3 to −0.1)	0.69 (0.48 to 0.97)
Prescription ophthalmic preparations	1.0 (0.8-1.4)	1.1 (0.9-1.5)	1.5 (1.1-2.0)	1.4 (1.0-1.8)	1.5 (1.3-1.7)	1.6 (1.3-1.9)	1.5 (1.1-2.0)	.03	0.4 (−0.1 to 1.0)	1.4 (0.94 to 2.2)
Ophthalmic glaucoma agents	0.8 (0.6-1.1)	0.9 (0.6-1.3)	1.2 (0.8-1.7)	1.0 (0.8-1.4)	0.9 (0.8-1.1)	1.1 (0.9-1.3)	1.0 (0.7-1.3)	.44	0.2 (−0.2 to 0.5)	1.2 (0.78 to 1.9)
Antiviral agents	0.5 (0.3-1.0)	0.5 (0.3-0.9)	0.3 (0.2-0.6)	0.7 (0.4-1.1)	0.7 (0.5-1.0)	0.7 (0.5-1.1)	1.4 (1.0-1.9)	<.001	0.9 (0.3 to 1.4)	2.7 (1.3 to 5.6)
Antiparkinson agents	0.7 (0.5-1.0)	0.6 (0.4-1.0)	0.5 (0.3-0.8)	0.8 (0.6-1.1)	0.9 (0.7-1.2)	0.9 (0.6-1.2)	1.3 (0.9-1.9)	.002	0.6 (0.1 to 1.2)	1.9 (1.2 to 3.2)
Prescription dermatologic agents	1.0 (0.7-1.3)	1.4 (0.9-2.1)	1.8 (1.3-2.4)	1.2 (0.8-1.6)	0.9 (0.6-1.3)	1.3 (1.0-1.7)	1.2 (0.8-1.9)	.76	0.3 (−0.3 to 0.9)	1.3 (0.75 to 2.2)
Antigout agents	0.7 (0.5-1.0)	1.1 (0.8-1.6)	0.7 (0.5-0.9)	1.2 (0.9-1.6)	1.3 (0.9-1.8)	1.4 (1.0-1.9)	1.1 (0.7-1.6)	.02	0.4 (−0.1 to 0.9)	1.6 (0.94 to 2.6)
Leukotriene modifiers	0.4 (0.3-0.6)	0.8 (0.5-1.2)	1.1 (0.8-1.5)	1.3 (0.9-1.9)	1.1 (0.9-1.5)	1.2 (0.9-1.7)	1.1 (0.7-1.7)	.003	0.7 (0.2 to 1.2)	2.6 (1.5 to 4.5)
Urinary antispasmodics	0.8 (0.5-1.3)	0.6 (0.5-0.8)	0.8 (0.5-1.2)	1.0 (0.8-1.3)	1.1 (0.8-1.4)	1.1 (0.7-1.6)	0.9 (0.6-1.4)	.14	0.1 (−0.5 to 0.7)	1.1 (0.58 to 2.2)
Antianginal agents	1.5 (1.2-2.0)	1.3 (1.0-1.5)	1.1 (0.8-1.6)	1.1 (0.8-1.6)	0.8 (0.6-1.2)	0.7 (0.5-0.9)	0.8 (0.6-1.0)	<.001	−0.8 (−1.2 to −0.3)	0.50 (0.33 to 0.75)
Bone-resorption inhibitors	0.6 (0.4-0.8)	1.3 (1.1-1.6)	2.2 (1.8-2.7)	2.0 (1.5-2.7)	2.2 (1.8-2.8)	1.7 (1.5-2.0)	0.8 (0.5-1.2)	.12	0.3 (−0.1 to 0.6)	1.5 (0.82 to 2.6)
Antineoplastic hormones	2.0 (1.6-2.6)	1.9 (1.6-2.4)	1.3 (1.0-1.8)	1.1 (0.9-1.5)	1.1 (0.9-1.4)	1.1 (0.7-1.6)	0.7 (0.5-1.2)	<.001	−1.3 (−1.9 to −0.7)	0.37 (0.22 to 0.61)
Inotropic agents (digoxin)	1.4 (1.1-1.8)	1.0 (0.8-1.3)	1.1 (0.8-1.5)	0.9 (0.6-1.3)	0.7 (0.5-0.9)	0.5 (0.3-1.0)	0.7 (0.4-1.0)	<.001	−0.8 (−1.2 to −0.3)	0.47 (0.28 to 0.77)
Respiratory-inhalant products	0.9 (0.7-1.3)	1.2 (0.9-1.7)	0.8 (0.5-1.1)	0.8 (0.5-1.3)	0.9 (0.7-1.3)	0.7 (0.5-1.1)	0.6 (0.4-1.0)	.046	−0.3 (−0.7 to 0.1)	0.69 (0.40 to 1.2)
Inhaled corticosteroids	0.9 (0.7-1.1)	1.0 (0.7-1.5)	0.7 (0.5-1.1)	0.7 (0.4-1.3)	0.9 (0.6-1.2)	0.6 (0.4-0.9)	0.6 (0.4-1.0)	.06	−0.3 (−0.6 to 0.1)	0.70 (0.40 to 1.2)
Selective estrogen receptor-modulators	1.1 (0.8-1.6)	1.6 (1.2-2.1)	1.4 (1.0-2.1)	1.4 (0.9-2.0)	1.4 (1.0-1.8)	1.0 (0.7-1.5)	[f]	.01	−0.3 (−0.6 to 0.0)	0.54 (0.26 to 1.1)

Abbreviations: CNS, central nervous system.

[a] All data are weighted to be nationally representative. Overarching drug classes are presented in order of descending prevalence in 2011-2012. Prevalence of use for drug classes reported in this table were less than 2.5% at all time points during the study period.

[b] Prevalence values of 10% and greater are rounded to the nearest whole number.

[c] Indicates the absolute increase or decrease in prevalence of use between 1999-2000 and 2011-2012.

[d] Indicates the relative increase or decrease in prevalence of use between 1999-2000 and 2011-2012.

[e] Analyses limited to men.

[f] Data withheld due to relative standard error of greater than 30% in results for a given survey cycle, consistent with NHANES (National Health and Nutrition Examination Survey) analytic guidelines.[23]

Table 4. Trends in Use of Selected Prescription Drugs in the Prior 30 Days Among US Adults by Age Group—1999-2012[a]

	Aged 40-64 Years					Aged ≥65 Years				
	Prevalence of Use, % (95% CI)			2011-2012 vs 1999-2000		Prevalence of Use, % (95% CI)			2011-2012 vs 1999-2000	
	1999-2000 (n = 1787)	2011-2012 (n = 2352)	*P* for Trend	Difference in Prevalence, % (95% CI)[b]	Ratio of Prevalence, Ratio (95% CI)[c]	1999-2000 (n = 1382)	2011-2012 (n = 1249)	*P* for Trend	Difference in Prevalence, % (95% CI)[b]	Ratio of Prevalence, Ratio (95% CI)[c]
Any prescription	57 (52-63)	65 (62-67)	.01	7.4 (1.7 to 13)	1.1 (1.0 to 1.2)	84 (81-86)	90 (87-93)	<.001	6.5 (2.8 to 10)	1.1 (1.0 to 1.1)
≥5 Prescriptions	10 (8.8-12)	15 (13-17)	.002	4.4 (1.8 to 6.9)	1.4 (1.2 to 1.7)	24 (21-26)	39 (35-44)	<.001	16 (10 to 21)	1.7 (1.4 to 1.9)
Antihypertensive agents	24 (21-28)	31 (28-33)	<.001	6.4 (2.0 to 11)	1.3 (1.1 to 1.5)	55 (50-59)	66 (62-69)	<.001	11 (5.9 to 17)	1.2 (1.1 to 1.3)
Antihyperlipidemic agents	11 (8.9-13)	21 (18-24)	<.001	10 (6.5 to 14)	2.0 (1.6 to 2.4)	21 (17-25)	47 (44-51)	<.001	27 (22 to 32)	2.3 (1.9 to 2.7)
Antidepressants	8.4 (7.0-10)	15 (13-18)	<.001	6.9 (3.9 to 9.8)	1.8 (1.4 to 2.3)	8.4 (6.8-10)	17 (13-22)	<.001	8.8 (4.3 to 13)	2.0 (1.5 to 2.8)
Prescription analgesics	13 (12-15)	14 (11-18)	.27	0.4 (−3.3 to 4.2)	1.0 (0.79 to 1.3)	18 (16-21)	14 (11-18)	.01	−3.9 (−8.4 to 0.7)	0.79 (0.59 to 1.1)
Sex hormones[d]	24 (19-29)	9.7 (7.5-12)	<.001	−14 (−20 to −8.8)	0.41 (0.28 to 0.53)	16 (12-22)	3.9 (2.0-7.5)	<.001	−13 (−18 to −7.3)	0.24 (0.08 to 0.40)
Antidiabetic agents	5.5 (4.2-7.3)	9.4 (7.9-11)	<.001	3.9 (1.7 to 6.1)	1.7 (1.3 to 2.3)	13 (11-15)	19 (17-22)	<.001	6.5 (3.4 to 9.7)	1.5 (1.3 to 1.8)
Prescription proton-pump inhibitors	4.9 (3.4-7.1)	8.3 (5.8-12)	.006	3.4 (0.0 to 6.7)	1.7 (1.0 to 2.7)	8.2 (6.4-10)	18 (14-22)	<.001	9.6 (5.4 to 14)	2.2 (1.6 to 2.9)
Thyroid hormones	5.9 (4.6-7.4)	6.9 (5.1-9.2)	.13	1.0 (−1.4 to 3.4)	1.2 (0.82 to 1.7)	13 (11-17)	15 (12-18)	.25	1.6 (−2.7 to 5.8)	1.1 (0.84 to 1.5)
Anxiolytics, sedatives, hypnotics	5.5 (4.1-7.3)	6.7 (5.1-8.7)	.17	1.2 (−1.2 to 3.6)	1.2 (0.83 to 1.8)	8.6 (6.8-11)	9.3 (7.7-11)	.52	0.7 (−1.9 to 3.4)	1.1 (0.81 to 1.4)
Anticonvulsants	3.1 (2.1-4.8)	5.8 (4.3-7.8)	.002	2.7 (0.5 to 4.8)	1.8 (1.1 to 3.0)	4.5 (3.5-5.8)	9.0 (6.5-12)	<.001	4.5 (1.5 to 7.4)	2.0 (1.4 to 2.9)
Bronchodilators	3.4 (2.5-4.5)	6.0 (4.0-8.7)	.002	2.6 (0.1 to 5.1)	1.8 (1.1 to 2.8)	6.3 (4.2-9.2)	7.3 (5.8-9.2)	.14	1.1 (−1.8 to 3.9)	1.2 (0.77 to 1.8)
Antibiotics	5.9 (4.5-7.6)	3.7 (2.5-5.6)	.009	−2.1 (−4.2 to −0.1)	0.64 (0.40 to 1.0)	4.4 (3.2-6.0)	3.5 (2.2-5.4)	.01	−0.9 (−2.9 to 1.1)	0.80 (0.47 to 1.3)
Antiarrhythmic agents	5.4 (4.7-6.2)	2.1 (1.6-2.7)	<.001	−3.3 (−4.3 to −2.4)	0.38 (0.28 to 0.51)	17 (14-19)	9.0 (6.9-12)	<.001	−7.5 (−11 to −4.0)	0.54 (0.40 to 0.74)
Coagulation modifiers	2.7 (1.9-3.8)	2.8 (1.9-3.9)	.02	0.0 (−1.3 to 1.3)	1.0 (0.64 to 1.6)	7.0 (5.6-8.9)	15 (13-18)	<.001	7.9 (5.0 to 11)	2.1 (1.6 to 2.8)
Muscle relaxants	1.8 (1.1-2.9)	3.4 (2.4-4.7)	.04	1.6 (0.2 to 3.0)	1.9 (1.1 to 3.3)	1.1 (0.6-1.9)	2.6 (0.9-7)	.19	1.5 (−1.2 to 4.2)	2.4 (0.79 to 7.2)
H_2 Antagonists	1.9 (1.2-2.9)	2.2 (1.2-4)	.34	0.3 (−1.2 to 1.8)	1.2 (0.58 to 2.4)	5.8 (3.7-9.1)	4.9 (3.3-7.1)	.45	−0.9 (−4.0 to 2.2)	0.84 (0.48 to 1.5)
Prescription antihistamines	4.6 (3.3-6.3)	2.0 (1.3-2.9)	<.001	−2.6 (−4.2 to −1.0)	0.43 (0.27 to 0.69)	3.9 (2.7-5.4)	3.3 (1.9-5.6)	.09	−0.6 (−2.7 to 1.6)	0.85 (0.46 to 1.6)
Antiemetic/antivertigo agents	2.6 (1.7-3.8)	2.1 (1.3-3.3)	.54	−0.5 (−1.8 to 0.9)	0.81 (0.46 to 1.4)	3.8 (2.1-6.6)	3.6 (2.4-5.6)	.38	−0.1 (−2.7 to 2.4)	0.97 (0.49 to 1.9)
Glucocorticoids	2.7 (2.1-3.5)	1.8 (1.2-2.8)	.01	−0.9 (−1.9 to 0.1)	0.66 (0.41 to 1.1)	3.8 (2.7-5.2)	2.4 (1.7-3.4)	.02	−1.4 (−2.8 to 0.1)	0.64 (0.41 to 1.0)

[a] Results for adults aged 20-39 years are not presented because of small numbers (see eTable 3 in the Supplement). Overarching drug classes are presented in order of descending prevalence in 2011-2012. All data are weighted to be nationally representative.

[b] Indicates the absolute increase or decrease in prevalence of use between 1999-2000 and 2011-2012.

[c] Indicates the relative increase or decrease in prevalence of use between 1999-2000 and 2011-2012.

[d] Analyses limited to women.

Table 5. Trends in Use of Selected Prescription Drugs in the Prior 30 Days Among US Adults by Sex—1999-2012[a]

	Men					Women				
	Prevalence of Use, % (95% CI)			2011-2012 vs 1999-2000		Prevalence of Use, % (95% CI)			2011-2012 vs 1999-2000	
	1999-2000 (n = 2261)	2011-2012 (n = 2352)	*P* for Trend	Difference in Prevalence, % (95% CI)[b]	Ratio of Prevalence, Ratio (95% CI)[c]	1999-2000 (n = 1382)	2011-2012 (n = 1249)	*P* for Trend	Difference in Prevalence, % (95% CI)[b]	Ratio of Prevalence, Ratio (95% CI)[c]
Any prescription	42 (39-45)	52 (48-57)	<.001	11 (5.4 to 16)	1.3 (1.1 to 1.4)	59 (55-63)	65 (62-67)	.03	5.7 (0.7 to 11)	1.1 (1.0 to 1.2)
≥5 Prescriptions	5.8 (5.2-6.6)	13 (10-16)	<.001	7.2 (4.3 to 10)	2.2 (1.8 to 2.8)	10 (9.0-12)	16 (15-19)	<.001	6.0 (3.5 to 8.6)	1.6 (1.3 to 1.9)
Antihypertensive agents	18 (16-21)	26 (23-30)	<.001	8.0 (3.6 to 12)	1.4 (1.2 to 1.7)	21 (18-24)	29 (26-32)	<.001	7.7 (3.9 to 12)	1.4 (1.2 to 1.6)
Antihyperlipidemic agents	8.6 (7.4-10)	19 (16-22)	<.001	10 (7.3 to 14)	2.2 (1.8 to 2.7)	6.7 (5.8-7.7)	18 (15-20)	<.001	11 (8.5 to 14)	2.7 (2.2 to 3.2)
Antidepressants	4.1 (3.1-5.4)	8.8 (7.2-11)	<.001	4.8 (2.6 to 6.9)	2.2 (1.6 to 3.0)	9.3 (7.7-11)	17 (14-20)	<.001	7.2 (3.6 to 11)	1.8 (1.4 to 2.3)
Prescription analgesics	9.4 (8.0-11)	9.7 (7.6-12)	.73	0.2 (−2.5 to 3.0)	1.0 (0.78 to 1.4)	13 (11-15)	13 (10-16)	.04	−0.4 (−3.5 to 2.8)	0.97 (0.76 to 1.2)
Antidiabetic agents	4.6 (3.5-6.0)	9.1 (7.7-11)	<.001	4.5 (2.6 to 6.4)	2.0 (1.5 to 2.7)	4.6 (3.7-5.8)	7.4 (6.2-8.8)	<.001	2.8 (1.2 to 4.4)	1.6 (1.2 to 2.0)
Prescription proton-pump inhibitors	3.4 (2.3-4.9)	7.0 (5.1-9.4)	<.001	3.6 (1.1 to 6.0)	2.1 (1.3 to 3.3)	4.3 (3.3-5.7)	8.5 (6.6-11)	<.001	4.2 (1.8 to 6.6)	2.0 (1.4 to 2.8)
Thyroid hormones	2.0 (1.3-3.0)	3.2 (2.3-4.6)	.04	1.2 (−0.2 to 2.7)	1.6 (0.96 to 2.8)	8.0 (6.7-9.4)	9.3 (7.8-11)	.02	1.3 (−0.7 to 3.3)	1.2 (0.93 to 1.5)
Anxiolytics, sedatives, hypnotics	3.0 (2.2-4.3)	5.3 (4.0-7.0)	.002	2.3 (0.5 to 4.1)	1.8 (1.2 to 2.7)	5.2 (4.1-6.6)	6.8 (5.4-8.5)	.01	1.5 (−0.4 to 3.5)	1.3 (0.94 to 1.8)
Anticonvulsants	1.8 (1.3-2.4)	4.9 (3.9-6.2)	<.001	3.1 (1.9 to 4.4)	2.8 (1.9 to 3.9)	2.8 (2.0-3.9)	6.0 (4.8-7.6)	<.001	3.2 (1.5 to 4.8)	2.1 (1.5 to 3.1)
Bronchodilators	2.3 (1.6-3.2)	5.0 (3.6-6.9)	.001	2.7 (0.9 to 4.5)	2.2 (1.4 to 3.4)	4.1 (3.0-5.5)	5.3 (4.0-6.9)	.006	1.2 (−0.6 to 3.1)	1.3 (0.88 to 1.9)
Antibiotics	4.6 (3.8-5.6)	3.7 (2.7-5.0)	.047	−0.9 (−2.3 to 0.5)	0.79 (0.56 to 1.1)	6.6 (5.4-8.0)	4.8 (3.7-6.2)	.001	−1.7 (−3.4 to 0.1)	0.72 (0.53 to 0.99)
Antiarrhythmic agents	4.6 (3.6-5.8)	2.7 (1.8-4.0)	.001	−1.9 (−3.4 to −0.4)	0.58 (0.37 to 0.92)	5.3 (4.4-6.2)	2.8 (2.2-3.5)	<.001	−2.5 (−3.5 to −1.4)	0.53 (0.40 to 0.70)
Coagulation modifiers	2.3 (1.7-3.3)	4.1 (3.0-5.7)	<.001	1.8 (0.2 to 3.3)	1.8 (1.1 to 2.7)	2.2 (1.5-3.3)	3.9 (3.3-4.7)	<.001	1.7 (0.6 to 2.9)	1.8 (1.2 to 2.7)
Muscle relaxants	1.3 (0.7-2.2)	1.7 (1.1-2.8)	.27	0.5 (−0.6 to 1.5)	1.4 (0.68 to 2.8)	1.2 (0.8-1.9)	3.3 (2.4-4.4)	.001	2.0 (0.9 to 3.2)	2.7 (1.6 to 4.3)
H_2 Antagonists	1.7 (1.3-2.3)	2.1 (1.6-2.8)	.04	0.4 (−0.4 to 1.1)	1.2 (0.82 to 1.8)	2.4 (1.5-3.9)	2.7 (1.9-3.9)	.30	0.3 (−1.2 to 1.7)	1.1 (0.63 to 1.9)
Prescription antihistamines	2.8 (2.0-3.8)	1.4 (0.8-2.2)	<.001	−1.4 (−2.5 to −0.3)	0.49 (0.28 to 0.87)	4.9 (3.8-6.3)	2.7 (2.1-3.6)	<.001	−2.1 (−3.5 to −0.7)	0.56 (0.39 to 0.80)
Antiemetic/antivertigo agents	1.2 (0.9-1.7)	1.4 (0.9-2.1)	.62	0.2 (−0.5 to 0.9)	1.2 (0.69 to 2.0)	2.4 (1.5-3.7)	2.6 (1.8-3.7)	.85	0.2 (−1.1 to 1.6)	1.1 (0.64 to 1.9)
Glucocorticoids	2.0 (1.5-2.7)	1.5 (1.0-2.4)	.04	−0.5 (−1.4 to 0.4)	0.76 (0.45 to 1.3)	2.5 (1.8-3.3)	1.5 (1.1-2.1)	.02	−0.9 (−1.8 to 0.0)	0.63 (0.41 to 0.96)

[a] Overarching drug classes are presented in order of descending prevalence in 2011-2012. All data are weighted to be nationally representative.

[b] Indicates the absolute increase or decrease in prevalence of use between 1999-2000 and 2011-2012.

[c] Indicates the relative increase or decrease in prevalence of use between 1999-2000 and 2011-2012.

and SSNRIs markedly increased; notably, use of SSNRIs increased between 1999-2000 and 2005-2006, remaining stable thereafter. Even so, SSRIs remain much more commonly used than the other antidepressant drugs, and the continued popularity of the SSRIs may reflect the availability of several generic options with a wide range of indications and a favorable profile regarding adverse effects.[28]

Overall, trends in analgesic use were stable; however, there was marked heterogeneity by class. Use of COX-2 inhibitors decreased, likely a result of rofecoxib being taken off the market in 2004.[29] Conversely, use of narcotic analgesic drugs increased from 1999-2000 to 2011-2012. Although increased use of narcotic analgesics may raise concern about their potential misuse or abuse, it should be noted that use stabilized after 2003-2004. This flattening trend may reflect increased awareness of prescription opioid drug misuse or abuse,[30] although underreporting of these drugs may have increased with awareness regarding their potential for abuse.

Use of sex hormones decreased substantially among women, resulting from the decrease in noncontraceptive hormone use (following the release of results from the Women's Health Initiative Hormone Therapy Trial).[10,31] This decrease is notable because conjugated estrogens once represented the most commonly used prescription drug.[11]

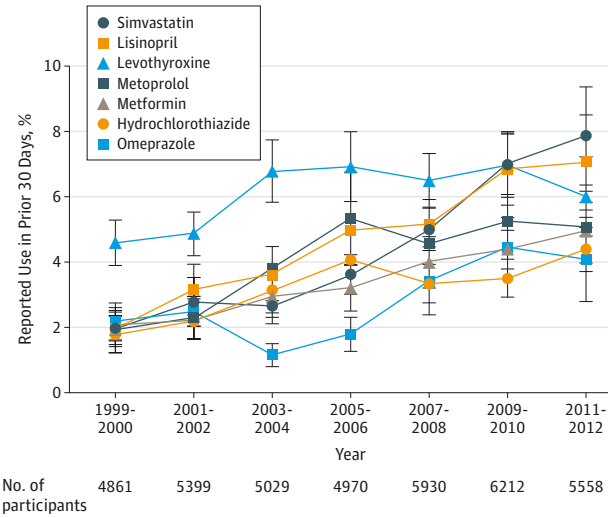
As the prevalence of diabetes increased,[32] use of antidiabetic drugs also increased, driven by a sharp rise in use of insulin and biguanides. Accordingly, metformin, considered a first-line agent in the treatment of diabetes,[33] is now the fifth most commonly used drug. Use of thiazolidinediones decreased in recent years, likely owing to concern regarding the link between rosiglitazone and risk of cardiovascular events.[34]

Despite certain proton-pump inhibitors becoming available over the counter (OTC), use of prescription proton-pump inhibitors increased, a trend which would be likely even more marked if we were able to account for OTC use. The increase in prescription proton-pump inhibitors may, in part, reflect the availability of more affordable varied options for proton-pump inhibitors following the loss of patent protection for omeprazole in 2001 and subsequent market entry of esomeprazole. It remains unclear how use of prescription proton-pump inhibitors will be affected long term by increasing availability of OTC proton-pump inhibitors.

Use of anticonvulsant drugs increased over the study period. Several anticonvulsants are cross-classified in other drug classes (eg, benzodiazepines), and it is likely that these alternative indications are in part driving the observed increase in use.

A significant inflection point was observed for use of adrenergic bronchodilators in 2007-2008, after which time use stabilized. It is possible that this pattern may in part reflect the 2005 US Food and Drug Administration's Public Health Advisory regarding use of long-acting β_2-adrenergic agonists. The sharp early increase in use of bronchodilator combinations may reflect other market forces, including direct-to-consumer advertising (DCTA), which peaked in the mid-2000s.[35,36] DCTA is particularly relevant to bronchodilator combinations such as the popular combination drug Advair, which was ranked as one of the top drugs in terms of DCTA in 2010.[36] Even so, a recent study found little evidence of association between DCTA and Advair prescriptions, and it therefore seems unlikely that DCTA alone is responsible.[37]

Figure 2. Trends in Individual Prescription Medications Used By More Than 4% of US Adults—2011-2012



All trends were statistically significant (*P* for trend for each drug < .001). All data are weighted to be nationally representative. Error bars indicate 95% CIs.

Use of muscle relaxants increased over the study period. Although the reasons underlying this increase are unclear, there has been discussion about the potential for misuse or abuse of carisoprodol, one of the more commonly used muscle relaxants. In 2011, the Drug Abuse Warning Network released a report showing an increase in emergency department visits associated with carisoprodol between 2004 and 2009,[38] and in 2012, the Drug Enforcement Administration classified this drug as a controlled substance. Notably, however, in our data, the sharpest increase in prevalence of use of muscle relaxants was observed before 2003-2004, with no significant change observed thereafter.

The increases in any prescription drug use and polypharmacy are not explained by changes in the age distribution of the population. An alternative explanation for the observed increase in prescription drug use might be large-scale policy changes, including the implementation of Medicare Part D. However, the increase in prescription drug use was not observed only among adults aged 65 years and older but also among adults aged 40 to 64 years. Furthermore, Medicare Part D went into effect in 2006, and for many of the drug classes discussed, the sharpest increase occurred before 2006.

It is unclear if this pattern, with the sharpest increases observed early in the study period, reflects a saturation of the market, the peak of DCTA in the mid-2000s,[36] or lagged effects resulting from the increase in obesity in the population. Eight of the 10 most commonly used drugs in 2011-2012 are used to treat components of the cardiometabolic syndrome, including hypertension, diabetes, and dyslipidemia. Another is a proton-pump inhibitor used for gastroesophageal reflux, a condition more prevalent among individuals who are overweight

or obese.[39] Thus, the increase in use of some agents may reflect the growing need for treatment of complications associated with the increase in overweight and obesity.

For most drugs and drug classes, trends were generally comparable across age, sex, and race/ethnicity. One major difference was that any prescription drug use was substantially lower for Mexican American than for non-Hispanic white individuals. Because the Mexican American population is younger than the non-Hispanic white population,[40] we conducted age-adjusted analyses and found that a marked difference between groups persisted, although the difference attenuated somewhat. Further adjustment for insurance status did not entirely account for the difference in any prescription use, although it is possible that prescription drug coverage may better account for the observed pattern. An alternative explanation may be the *Hispanic paradox*, which is that despite lower socioeconomic status, individuals of Hispanic descent have better-than-expected health status, which would likely result in less use of prescription medications.[41] The reasons underlying these differences are likely multifactorial, meriting further investigation.

We have provided a comprehensive picture of prescription drug use in the US adult population using nationally representative data. Prescription drug use was assessed via in-home interviews in which containers were seen for 84% of drugs, giving confidence to participants' self-reported use. Further, NHANES has a high response rate, reducing concern about bias. Even so, this study has several limitations. First, recall of intermittently used drugs may be more prone to measurement error than drugs used daily. Second, we are unable to capture OTC drug use, and some trends, such as the decrease in antihistamines use, reflect the availability of certain drugs becoming available OTC. Third, this survey was conducted among noninstitutionalized adults; thus, results do not capture use among adults living in nursing homes and should only be generalized to the community-dwelling US adult population. Additionally, certain drugs may be in more than one class and some drugs may be taken for off-label use, and therefore, the classifications of drugs do not perfectly align with reasons for use.

Conclusions

In this nationally representative survey, significant increases in overall prescription drug use and polypharmacy were observed. These increases persisted even after accounting for changes in the age distribution of the population. The prevalence of prescription drug use increased in the majority of but not all drug classes.

ARTICLE INFORMATION

Author Affiliations: Department of Epidemiology, Harvard T. H. Chan School of Public Health, Boston, Massachusetts (Kantor, Giovannucci); Department of Epidemiology and Biostatistics, Memorial Sloan Kettering Cancer Center, New York, New York (Kantor); Friedman School of Nutrition Science and Policy, Tufts University, Boston, Massachusetts (Rehm); Office of Community & Population Health, Montefiore Medical Center, Bronx, New York (Rehm); Division of General Internal Medicine and Primary Care, Brigham and Women's Hospital, Boston, Massachusetts (Haas); Department of Social and Behavioral Sciences, Harvard T. H. Chan School of Public Health, Boston, Massachusetts (Haas); Channing Division of Network Medicine, Brigham and Women's Hospital, Boston, Massachusetts (Chan, Giovannucci); Division of Gastroenterology, Massachusetts General Hospital, Boston (Chan); Clinical and Translational Epidemiology Unit, Massachusetts General Hospital, Boston (Chan); Department of Nutrition, Harvard T. H. Chan School of Public Health, Boston, Massachusetts (Giovannucci).

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Study concept and design: Kantor, Rehm, Chan.
Acquisition, analysis, or interpretation of data: Kantor, Rehm, Haas, Chan, Giovannucci.
Drafting of the manuscript: Kantor, Rehm, Chan.
Critical revision of the manuscript for important intellectual content: Rehm, Haas, Chan, Giovannucci.
Statistical analysis: Kantor, Rehm, Giovannucci.
Study supervision: Haas, Chan, Giovannucci.

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