

Receipt of and Spending on Cessation Medication Among US Adults With Employer-Sponsored Health Insurance, 2010 and 2017

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Sundar S. Shrestha, PhD¹ ; Xin Xu, PhD¹; Xu Wang, PhD¹; Stephen D. Babb, MPH¹; Brian S. Armour, PhD¹; Brian A. King, PhD, MPH¹; and Katrina F. Trivers, PhD, MSPH¹

Abstract

Objective: Studies examining the use of smoking cessation treatment and related spending among enrollees with employer-sponsored health insurance are dated and limited in scope. We assessed changes in annual receipt of and spending on cessation medications approved by the US Food and Drug Administration (FDA) among tobacco users with employer-sponsored health insurance from 2010 to 2017.

Methods: We analyzed data on 439 865 adult tobacco users in 2010 and 344 567 adult tobacco users in 2017 from the IBM MarketScan Commercial Database. We used a negative binomial regression to estimate changes in receipt of cessation medication (number of fills and refills and days of supply). We used a generalized linear model to estimate spending (total, employers', and out of pocket). In both models, covariates included year, age, sex, residence, and type of health insurance plan.

Results: From 2010 to 2017, the percentage of adult tobacco users with employer-sponsored health insurance who received any cessation medication increased by 2.4%, from 15.7% to 16.1% ($P < .001$). Annual average number of fills and refills per user increased by 15.1%, from 2.5 to 2.9 ($P < .001$) and days of supply increased by 26.4%, from 81.9 to 103.5 ($P < .001$). The total annual average spending per user increased by 53.6%, from \$286.40 to \$440.00 ($P < .001$). Annual average out-of-pocket spending per user decreased by 70.9%, from \$70.80 to \$20.60 ($P < .001$).

Conclusions: Use of smoking cessation medications is low among smokers covered by employer-sponsored health insurance. Opportunities exist to further increase the use of cessation medications by promoting the use of evidence-based cessation treatments and reducing barriers to coverage, including out-of-pocket costs.

Keywords

nicotine, tobacco, out of pocket, fills and refills, days of supply

Smoking cessation is beneficial at any age and has major health benefits.^{1,2} It improves health status, enhances quality of life, reduces the risk of premature death, and can add as much as a decade to life expectancy.² Evidence-based cessation treatments that have been shown to increase quit rates among adult cigarette smokers include individual, group, and telephone counseling and 7 cessation medications approved by the US Food and Drug Administration (FDA). These FDA-approved medications include 5 forms of nicotine replacement therapy (NRT; the nicotine patch, gum, lozenge, nasal spray, and inhaler) and 2 non-nicotine cessation medications (non-NRTs; bupropion and varenicline).^{2,3} Comprehensive health insurance coverage of proven cessation treatments that include the removal or

reduction of cost sharing and other coverage barriers has been shown to improve access to and use of cessation services.^{2,4} This improved access to and use of cessation services can increase

¹ Office on Smoking and Health, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention, Atlanta, GA, USA

Corresponding Author:

Sundar S. Shrestha, PhD, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health, 4770 Buford Hwy NE, MS S107-7, Atlanta, GA 30341, USA.

Email: gqm2@cdc.gov

quit attempts and chances of successful cessation.³⁻⁵ In 2017, employer-sponsored health insurance covered 56% of the total US adult population and comprised 83.4% of people covered by private health insurance.⁶ Rates of quit intention and quit attempts are high among this population. In 2015, 69.0% of privately insured smokers reported wanting to quit smoking, and 57.2% of privately insured smokers had attempted to quit in the past year.⁷

However, studies examining the use of smoking cessation treatment and related spending among adults with employer-sponsored health insurance are dated and limited in scope. A study using data from employees, retirees, and adult dependents covered under Wisconsin state employee health insurance plans estimated that the annual average cost per user of smoking cessation treatment ranged from \$146 in 2001 to \$187 in 2003.⁸ Little is known about recent receipt of or spending on cessation medications among adults covered by employer-sponsored health insurance or changes in these indicators over time. To address this knowledge gap, we assessed changes in receipt of and annual spending on FDA-approved cessation medications among adult tobacco users with employer-sponsored health insurance in the IBM MarketScan Commercial Claims and Encounters Database from 2010 to 2017.⁹ Although the primary objective of this study was not to assess the independent effect of the Patient Protection and Affordable Care Act, these years cover the time before and after the passage of the Affordable Care Act on March 23, 2010; most non-grandfathered private health plans are required by the Affordable Care Act to cover, without cost sharing when provided in network, preventive services receiving an A or B recommendation from the US Preventive Services Task Force, including FDA-approved tobacco-cessation medications.¹⁰ We hypothesized that from 2010 to 2017, the proportion of adult tobacco users with employer-sponsored health insurance using FDA-approved cessation medications would increase significantly. We further hypothesized that among people who used cessation medication, the annual average total spending and spending paid by employers would increase significantly and the annual average out-of-pocket spending of tobacco users would decrease significantly.

Methods

Data Source

We used data from the 2010 and 2017 IBM MarketScan Commercial Claims and Encounters Database.⁹ This database contains data on individual enrollment records and patient-level paid health insurance claims, including inpatient, outpatient, and pharmacy reimbursements. Data are provided by approximately 350 employer-sponsored health insurance plans across the United States and can be linked through encrypted unique enrollee identifications at the patient level.⁹ Employer-sponsored health insurance plans

captured in the database include both fee-for-service (FFS) plans and capitated plans. FFS plans in this database included preferred provider organization (PPO) plans, exclusive provider organization plans, point-of-service plans, consumer-directed health plans, and indemnity plans.⁹ Because this study was a secondary analysis of de-identified data, institutional review board review was not required.

Study Population

In this analysis, we included data on adult tobacco users aged 18-64 who were enrolled for 12 months in an FFS plan in the 2010 or 2017 calendar year and who had prescription drug coverage. We restricted our analysis to fully enrolled unique people in these calendar years to estimate annual receipt of and spending on cessation medications. In addition, we restricted the analysis to adults enrolled in FFS plans because information on receipt of medication and spending under capitated plans (which involve payment of a flat fee for each patient covered) is incomplete.⁹ We further restricted our analysis to enrollees with prescription drug coverage to capture data on prescription reimbursement completely and to nonpregnant women because cessation medications are not recommended for pregnant women.¹¹ The final sample size was 439 865 adult tobacco users in 2010 and 344 567 in 2017.

Measures

Tobacco users. We identified tobacco users by the presence of claims with any tobacco use-related codes in the current and/or previous year in outpatient and inpatient settings (*International Classification of Diseases, Ninth Revision, Clinical Modification* [ICD-9-CM] codes 305.1x and V15.82^{12,13}; *International Classification of Diseases, Tenth Revision, Clinical Modification* [ICD-10-CM] codes F17.2x, Z72.0x, and Z87.891¹⁴; Current Procedural Terminology codes 1034F and 1035F¹⁵; and Healthcare Common Procedure Coding System codes G9276, G9792, and G9902.¹⁶

FDA-approved cessation medications. We identified 5 forms of NRTs (nicotine patch, gum, lozenge, inhaler, and nasal spray) and 2 non-NRTs (bupropion and varenicline) through prescription claim records using the FDA National Drug Code (NDC) directory. Data sources included the FDA NDC directory,¹⁷ the old FDA NDC directory,¹⁸ and a one-time report provided by the FDA to the Centers for Disease Control and Prevention in 2018 (unpublished data, FDA, 2018). Because bupropion is approved for use as an antidepressant as well as a smoking cessation medication, we included claims data only for the 150 mg formulation of bupropion, the most commonly prescribed dosage for smoking cessation.

Receipt of cessation medications. We identified receipt of cessation medications based on paid claims for cessation

medication during the calendar year. We measured receipt as whether enrollees received tobacco cessation medication, the annual number of fills and refills, and the number of days on which cessation medication was supplied among enrollees who received cessation medication during a calendar year.

Spending. We calculated total annual spending for tobacco cessation medication as the sum of paid claims for each enrollee who received cessation medication(s) during a calendar year, both for any medication and by medication type. We also calculated the portion of total annual spending incurred by employers and by individuals as out-of-pocket spending. Out-of-pocket spending included copays, coinsurance, and deductibles. To account for potential negative payments in the claims, we aggregated costs by enrollee identification, date of service incurred, and medication in accordance with the MarketScan user guide.⁹ Following the 2018 recommendation by Dunn et al,¹⁹ we adjusted all spending for inflation to 2017 US dollars using the Consumer Price Index for prescription drugs.²⁰

Statistical Analysis

We assessed the following outcome variables: whether adult tobacco users received cessation medications, annual number of fills and refills, annual number of days of supply, and total annual spending on cessation medications among enrollees who received cessation medications, both for any cessation medication and by medication type. We estimated changes in these outcomes from 2010 to 2017. Because of small sample sizes, we grouped NRT medications into 2 categories: (1) over-the-counter NRTs (nicotine patch, gum, and lozenge) and (2) prescription NRTs (nicotine inhaler and nasal spray). We conducted analyses separately for bupropion and varenicline, which are available by prescription only.

Following the specification tests for model selection,²¹ we estimated changes in mean annual number of fills and refills and days of supply among enrollees who received any cessation medication using a negative binomial regression. To estimate changes in annual mean spending on cessation medication, including the total amount and the amount paid by employers and out of pocket by enrollees, we used a generalized linear model with log link and inverse Gaussian distribution. In all models, we controlled for age (25-44 and 45-64 vs 18-24), sex (female vs male), location of residence (metropolitan statistical area [MSA] vs non-MSA), and benefit plan (PPO vs non-PPO). We estimated changes in annual mean receipt of cessation medication and related spending from 2010 to 2017 as the difference in estimates between the 2 years. We compared changes in the proportion of adult tobacco users receiving any cessation medication from 2010 to 2017 using *z* tests. We compared changes in fills and refills, days of supply, and spending from 2010 to 2017 using post-estimation of marginal effects with respect to year and

corresponding model-based *t* tests. We assessed significance using 2 thresholds: $P < .05$ and $P < .001$.

Using the spending estimate derived from the 2017 data, we projected total annual spending for cessation medication for adult tobacco users with employer-sponsored health insurance who used cessation medication. First, we derived the number and proportion of smokers who used cessation medication by using the size of the privately insured adult population,⁶ the prevalence of current smoking in the privately insured adult population,²² the proportion of current smokers who made a quit attempt in the past year, and the proportion of smokers who attempted to quit using cessation medication.⁷ Then, we multiplied this estimate by the estimated annual spending for cessation medications to derive approximate estimates for aggregate spending on cessation medications among adult tobacco users who received cessation medications. We also projected total annual spending for adult tobacco users who attempted to quit assuming that they received cessation medication.

We conducted additional analyses to evaluate the sensitivity of the results and conclusions to the criteria used to define tobacco users in the main analysis. In the first sensitivity analysis, we included in the sample only adults who had claims for tobacco use in the current year. In the second sensitivity analysis, we included in the sample adults who had claims for tobacco use or cessation counseling codes in the current year.

Results

From 2010 to 2017, the proportion of adult tobacco users with employer-sponsored health insurance who received any of the 7 FDA-approved cessation medications increased by 2.4%, from 15.7% to 16.1% ($P < .001$) (Table 1). The proportion of adults who received over-the-counter NRTs and bupropion increased significantly during this period, but the proportion receiving prescription NRTs and varenicline significantly decreased ($P < .001$).

Among tobacco users who received any cessation medications, the estimated annual mean number of fills and refills increased by 15.1%, from 2.5 to 2.9 fills and refills ($P < .001$). The estimated annual mean number of days of supply for cessation medication increased by 26.4%, from 81.9 to 103.5 days ($P < .001$) (Table 2). These outcomes were higher among older age groups (25-44 and 45-64) than among people aged 18-24, among female enrollees than among male enrollees, and among enrollees living in MSAs than among enrollees living in non-MSAs.

Among tobacco users receiving any cessation medication, the estimated mean total annual spending for any cessation medication increased significantly by 53.6% (from \$286.40 to \$440.00; $P < .001$), the estimated spending paid by employers increased significantly by 94.3% (from \$213.80 to \$415.30; $P < .001$), and out-of-pocket spending decreased

Table 1. Changes in proportion of adult tobacco users receiving cessation medications, United States, 2010 and 2017^a

Cessation medications	2010 (N = 439 865)		2017 (N = 344 567)		Percentage-point change (95% CI) from 2010 to 2017
	No.	% (95% CI)	No.	% (95% CI)	
Any	69 057	15.7 (15.6 to 15.8)	55 418	16.1 (16.0 to 16.2)	0.4 ^{bc} (0.2 to 0.6)
NRT					
Over the counter ^d	1079	0.2 ^e (0.2 to 0.3)	8361	2.4 ^e (2.4 to 2.5)	2.2 ^b (2.1 to 2.2)
Prescription ^f	1226	0.3 ^e (0.3 to 0.3)	746	0.2 ^e (0.2 to 0.2)	-0.1 ^b (-0.1 to 0.0)
Non-NRT					
Varenicline	40 530	9.2 ^e (9.1 to 9.3)	24 337	7.1 ^e (7.0 to 7.1)	-2.2 ^b (-2.3 to -2.0)
Bupropion	29 323	6.7 ^e (6.6 to 6.7)	26 398	7.7 ^e (7.6 to 7.8)	1.0 ^b (0.9 to 1.1)

Abbreviation: NRT, nicotine replacement therapy.

^aData source: IBM MarketScan Commercial Database, 2010 and 2017.⁹ Unweighted sample = 784 432.

^bSignificant at $P < .001$ (2-tailed, 2-sample tests of proportion using z test).

^cThe relative percentage increase was 2.4% (calculated based on exact estimates and then rounded).

^dIncludes nicotine gum, lozenge, or patch.

^eBecause some adults received more than 1 medication in a year, the sum of percentages by medication type exceeds 100% (ie, for any medication).

^fIncludes nicotine inhaler or nasal spray.

significantly by 70.9% (from \$70.80 to \$20.60; $P < .001$) (Table 3). These expenditures were higher among people in older age groups (25-44 and 45-64) than among people aged 18-24 and among people living in MSAs than among people living in non-MSAs, but expenditures were lower among female enrollees than among male enrollees (except for

out-of-pocket spending) and among enrollees in a PPO plan than among enrollees in a non-PPO plan.

The unadjusted mean annual number of fills and refills increased for prescription NRTs, varenicline, and bupropion, whereas the mean annual number of days of supply increased for prescription NRTs and non-NRTs (Table 4). The mean

Table 2. Estimated changes in mean number of fills and refills and days of cessation medication supply among adult tobacco users receiving any cessation medication, United States, 2010 and 2017^a

Parameters	No. of fills and refills ^b		No. of days of supply ^b	
	Mean (95% CI)	Change in mean (95% CI)	Mean (95% CI)	Change in mean (95% CI)
Year				
2010	2.5 (2.5 to 2.5)	Reference	81.9 (81.4 to 82.4)	Reference
2017	2.9 (2.8 to 2.9)	0.4 ^c (0.4 to 0.4)	103.5 (103.0 to 104.3)	21.6 ^c (20.7 to 22.5)
Age group, y				
18-24	2.1 (2.0 to 2.1)	Reference	66.0 (64.4 to 67.6)	Reference
25-44	2.5 (2.4 to 2.5)	0.4 ^c (0.3 to 0.4)	79.8 (79.2 to 80.4)	13.8 ^c (12.2 to 15.5)
45-64	2.8 (2.8 to 2.8)	0.7 ^c (0.7 to 0.8)	100.2 (99.6 to 100.8)	34.3 ^c (32.6 to 36.0)
Sex				
Male	2.6 (2.5 to 2.6)	Reference	85.4 (84.8 to 86.0)	Reference
Female	2.7 (2.7 to 2.7)	0.2 ^c (0.2 to 0.2)	96.4 (95.8 to 97.0)	11.0 ^c (10.2 to 11.8)
Location				
Non-MSA	2.6 (2.6 to 2.7)	Reference	87.1 (86.3 to 87.9)	Reference
MSA	2.7 (2.7 to 2.7)	0.03 (0 to 0.1)	93.2 (92.7 to 93.7)	6.1 ^c (5.1 to 7.0)
Plan type				
Non-PPO	2.6 (2.6 to 2.7)	Reference	92.1 (91.3 to 92.9)	Reference
PPO	2.7 (2.6 to 2.7)	0.02 (0 to 0.1)	91.4 (90.9 to 91.9)	-0.7 (-1.7 to 0.2)

Abbreviations: MSA, metropolitan statistical area; PPO, preferred provider organization.

^aData source: IBM MarketScan Commercial Database, 2010 and 2017.⁹ Unweighted sample = 214 475.

^bModels estimated using negative binomial regression.

^cSignificant at $P < .001$ using a 2-tailed test of significance.

Table 3. Estimated mean and changes in spending (in 2017 US dollars) among adult tobacco users receiving any cessation medication, United States, 2010 and 2017^{a,b}

Parameters	Total spending ^c		Employer spending ^c		Out-of-pocket spending ^c	
	Mean (95% CI)	Change in mean (95% CI)	Mean (95% CI)	Change in mean (95% CI)	Mean (95% CI)	Change in mean (95% CI)
Year						
2010	286.4 (283.8 to 289.0)	Reference	213.8 (211.6 to 216.0)	Reference	70.8 (69.9 to 71.7)	Reference
2017	440.0 (433.5 to 446.5)	153.6 ^d (146.5 to 160.6)	415.3 (409.0 to 421.6)	201.5 ^d (194.8 to 208.2)	20.6 (20.1 to 21.1)	-50.2 ^d (-51.3 to -49.1)
Age group, y						
18-24	209.3 (201.2 to 217.3)	Reference	183.2 (175.1 to 191.3)	Reference	33.3 (31.1 to 34.5)	Reference
25-44	319.4 (315.2 to 323.6)	110.1 ^d (101.4 to 118.8)	270.1 (266.1 to 274.1)	86.9 ^d (78.3 to 95.5)	45.8 (44.5 to 47.0)	12.5 ^d (9.9 to 15.1)
45-64	385.8 (381.6 to 390.0)	176.5 ^d (167.8 to 185.3)	332.1 (328.1 to 336.1)	148.9 ^d (140.2 to 157.5)	51.0 (50.0 to 52.0)	17.8 ^d (15.3 to 20.2)
Sex						
Male	366.4 (362.4 to 370.4)	Reference	310.9 (307.0 to 314.6)	Reference	47.1 (46.0 to 48.2)	Reference
Female	347.2 (342.9 to 351.5)	-19.2 ^d (-24.6 to -13.8)	300.1 (296.0 to 304.2)	-10.7 ^d (-15.8 to -5.5)	49.4 (48.4 to 50.4)	2.3 (0.5 to 4.2)
Location						
Non-MSA	340.8 (335.5 to 346.1)	Reference	292.0 (287.0 to 297.0)	Reference	44.0 (42.6 to 45.4)	Reference
MSA	360.8 (357.0 to 364.5)	20.0 ^d (13.8 to 26.1)	309.4 (305.8 to 312.9)	17.4 ^d (11.6 to 23.2)	49.7 (48.9 to 50.4)	5.7 ^d (3.7 to 7.5)
Plan type						
Non-PPO	371.8 (366.5 to 377.1)	Reference	321.8 (316.8 to 326.8)	Reference	50.6 (49.0 to 52.2)	Reference
PPO	347.9 (344.3 to 351.6)	-23.9 ^d (-29.9 to -17.8)	296.3 (292.9 to 299.8)	-25.5 ^d (-31.1 to -19.8)	47.6 (46.7 to 48.3)	-3.0 ^e (-5.0 to -1.0)

Abbreviations: MSA, metropolitan statistical area; PPO, preferred provider organization.

^aData source: IBM MarketScan Commercial Database, 2010 and 2017.³ Unweighted sample = 214 475.

^bAll spending is adjusted to 2017 US dollars using the Consumer Price Index for prescription medications.²⁰

^cModels estimated using generalized linear model with log link and inverse Gaussian distribution.

^dSignificant at $P < .001$ using a 2-tailed test of significance.

^eSignificant at $P < .05$ using a 2-tailed test of significance.

total annual spending and spending paid by employers increased for prescription NRTs and varenicline but decreased for bupropion. Annual mean spending paid by employers increased for over-the-counter NRTs. In contrast, mean annual out-of-pocket spending for tobacco users decreased across all medication categories, ranging from a decrease of 32.4% for bupropion to 85.9% for over-the-counter NRTs. The percentage of tobacco users who received cessation medication with no copay increased by 163.1%, from 24.9% to 65.5% ($P < .001$).

Projected total spending on cessation medications among adult tobacco users who received cessation medications was \$937.6 million in 2017. This spending included \$885.0 million paid by employers and \$43.9 million in out-of-pocket spending. If all smokers who attempted to quit in the past year received cessation medications at the same rate and spent the same average amount, total spending would be approximately \$3.1 billion, including \$3.0 billion paid by

employers and \$147.0 million paid out of pocket by tobacco users.

Sensitivity Analyses

When we identified tobacco users only by claims in the current year, the adjusted mean estimates from 2010 to 2017 increased significantly by 15.5% (from 2.4 to 2.8; $P < .001$) for number of fills and refills, by 27.2% (from 78.1 to 99.3; $P < .001$) for number of days of supply, by 59.8% (from \$280.30 to \$448.00; $P < .001$) for total spending, and by 103.4% (from \$208.80 to \$424.70; $P < .001$) for spending paid by employers. The estimate for out-of-pocket spending fell by 72.2% (from \$70.10 to \$19.50; $P < .001$). When we identified tobacco users by tobacco-use and/or counseling codes in the current year, the adjusted annual mean estimates from 2010 to 2017 increased by 12.6% (from 2.4 to 2.7; $P < .001$) for number of fills and refills, by 22.2% (from 78.0 to

Table 4. Unadjusted changes in annual mean receipts and spending (2017 US dollars)^a among adult tobacco users receiving any cessation medications, by type, United States, 2010 and 2017^b

Cessation medications	2010	2017	Change from 2010 to 2017	
	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)	% ^c
Receipts				
No. of fills and refills				
NRT				
Over the counter ^d	2.4 (2.3 to 2.6)	2.5 (2.5 to 2.6)	0.1 (-0.1 to 0.2)	3.0
Prescription ^e	2.2 (2.1 to 2.4)	2.6 (2.5 to 2.8)	0.4 ^f (0.2 to 0.7)	18.4
Non-NRT				
Varenicline	2.0 (1.9 to 2.1)	2.3 (2.3 to 2.3)	0.3 ^f (0.3 to 0.4)	17.2
Bupropion	3.0 (3.0 to 3.0)	3.3 (3.2 to 3.3)	0.3 ^f (0.2 to 0.3)	9.3
No. of days of supply				
NRT				
Over the counter ^d	61.2 (57.3 to 65.2)	66.8 (65.3 to 68.4)	5.6 (1.0 to 10.1)	9.1
Prescription ^e	63.2 (58.6 to 67.8)	76.3 (70.3 to 82.4)	13.1 ^f (5.6 to 20.7)	20.8
Non-NRT				
Varenicline	57.0 (57.0 to 57.8)	68.3 (67.7 to 68.9)	10.9 ^f (10.2 to 11.6)	19.0
Bupropion	109.3 (108.1 to 110.5)	140.5 (139.1 to 142.0)	31.2 ^f (29.3 to 33.1)	28.5
Spending				
Total				
NRT				
Over the counter ^d	178.7 (161.5 to 195.9)	177.6 (169.9 to 185.3)	-1.1 (-23.4 to 21.2)	-0.6
Prescription ^e	465.8 (429.1 to 502.5)	858.8 (772.3 to 945.3)	393.0 ^f (310.8 to 475.2)	84.4
Non-NRT				
Varenicline	290.8 (288.4 to 293.2)	843.6 (835.9 to 851.3)	552.8 ^f (546.0 to 559.5)	190.1
Bupropion	243.0 (238.5 to 247.5)	120.9 (111.2 to 130.6)	-122.1 ^f (-132.4 to -111.8)	-50.3
By employer				
NRT				
Over the counter ^d	147.1 (131.5 to 162.7)	170.3 (163.2 to 177.4)	23.2 (2.7 to 43.7)	15.8
Prescription ^e	371.7 (340.3 to 403.2)	821.6 (740.0 to 903.2)	449.8 ^f (374.6 to 525.1)	121.0
Non-NRT				
Varenicline	206.5 (204.5 to 208.5)	826.4 (818.8 to 834.0)	619.9 ^f (613.5 to 626.3)	300.2
Bupropion	195.3 (191.3 to 199.3)	84.2 (75.4 to 93.1)	-111.0 ^f (-120.4 to -101.6)	-56.9
Out of pocket				
NRT				
Over the counter ^d	31.5 (28.4 to 34.6)	4.5 (4.0 to 4.9)	-27.0 ^f (-28.8 to -25.3)	-85.9
Prescription ^e	92.8 (80.3 to 105.3)	18.5 (11.8 to 25.2)	-74.3 ^f (-91.1 to -57.5)	-80.1
Non-NRT				
Varenicline	83.5 (82.4 to 84.53)	12.8 (11.9 to 13.7)	-70.0 ^f (-72.2 to -69.1)	-84.6
Bupropion	45.9 (45.1 to 46.8)	31.0 (30.5 to 31.6)	-14.9 ^f (-15.9 to -13.8)	-32.4
Percentage with no copay	24.9 (24.6 to 25.3)	65.5 (65.1 to 65.9)	40.6 ^f (40.1 to 41.1)	163.1

Abbreviation: NRT, nicotine replacement therapy.

^aAll spending is adjusted to 2017 US dollars using the Consumer Price Index for prescription medications.²⁰^bData source: IBM MarketScan Commercial Database, 2010 and 2017.⁹ Unweighted sample = 214 475.^cThe percentage change was calculated using the exact estimates and then rounded.^dIncludes nicotine gum, lozenge, or patch.^eIncludes nicotine inhaler or nasal spray.^fSignificant at $P < .001$ using the 2-tailed, paired t test.

95.3; $P < .001$) for number of days of supply, by 62.2% (from \$280.70 to \$455.40; $P < .001$) for total spending, and by 106.9% (from \$209.30 to \$432.90; $P < .001$) for spending paid by employers. The estimate for out-of-pocket spending decreased significantly by 73.4% (from \$70.10 to \$18.60; $P < .001$).

Discussion

We found that, in 2017, 16.1% of adult tobacco users with employer-sponsored health insurance received cessation medications, an increase of 2.4% from 2010. The annual average number of fills and refills and days of supply of cessation medication in 2017 also increased 15.1% and 26.4%, respectively, compared with 2010. Moreover, average total spending and spending by employers on cessation medications in 2017 increased 53.6% and 94.3%, respectively, compared with 2010. In contrast, average out-of-pocket spending on cessation medications in 2017 decreased 70.9% compared with 2010, with the proportion of adults who received cessation medication with no copay in 2017 (65.5%) increasing 163.1% compared with 2010. Furthermore, we estimated that spending on cessation medications among adult tobacco users with employer-sponsored health insurance who received these medications in 2017 totaled approximately \$944.6 million, and if all smokers who made a past-year quit attempt were to receive cessation medications, this spending would total approximately \$3.2 billion. Taken together, our findings indicate that opportunities exist to further increase the use of cessation medications among US adult tobacco users covered under employer-sponsored health insurance.

Our findings of increases in receipt of tobacco cessation medications (number of fills and refills and days of supply) and in the spending paid by employers suggest that the use of these medications may have improved from 2010 to 2017, with some of the associated costs shifting from tobacco users to health insurers, given that out-of-pocket spending by tobacco users decreased substantially. The increases in the number of fills and refills and days of supply could be the result of improved coverage of cessation medications and reductions in patient cost sharing because of Affordable Care Act coverage.¹⁰ Improved cessation coverage and removal of patient cost sharing can increase the use of NRTs and the likelihood that a quit attempt is successful.^{2,23} The estimated average number of days of supply observed across the cessation medications were within the recommended durations of use of these medications.¹⁴ The increase in total spending on cessation medications could result from increases in receipts as well as increases in unit price, especially for bupropion and varenicline.²⁴

Our findings of a large decrease in out-of-pocket spending and an increase in the proportion of adults with no copays may be due, in part, to the provision in the Affordable Care Act that requires that many health insurance plans cover

certain recommended clinical preventive services without cost sharing when provided in-network.^{9,25} The average out-of-pocket spending of \$20.60 and 65.5% of adults who had no out-of-pocket spending in 2017 could be due to several factors, including some enrollees being enrolled in grandfathered plans²⁶ and some services being provided out of network. The differences in over-the-counter and prescription NRT out-of-pocket spending are likely due to differences in drug costs. For example, the over-the-counter forms of NRT are available as generic drugs, whereas the prescription-only forms of NRT and varenicline are not.²⁷ The substantial percentage increases in receipt of over-the-counter NRTs observed were likely due in part to the black box warning for serious adverse neuropsychiatric events that the FDA placed on varenicline in 2009, which remained in effect until December 2016.²⁸ These increases may also be due in part to changes in the types and characteristics of nicotine lozenges available on the market, which potentially made these products more palatable, appealing, and easier to use than traditional nicotine lozenges, including the FDA's approval of nicotine mini-lozenges for over-the-counter use for smoking cessation in 2009.²

Despite a slight increase in the number of tobacco users receiving cessation medication during the study period, fewer than 1 in 5 tobacco users had claims for cessation medication in 2017. The observed gap in cessation medication use is consistent with previous research.²⁸⁻³⁰ This relatively low receipt of cessation medications might stem, in part, from a large proportion of smokers not receiving advice to quit when they saw their health care professional.²

Quitting smoking at any age has substantial health benefits,² some of which begin to accrue quickly. However, because tobacco dependence is a chronic and relapsing condition, quitting smoking is difficult, and most people make multiple quit attempts.² Most adult smokers want to quit, and more than half make a quit attempt each year.² However, fewer than one-third use proven cessation treatments when trying to quit; as a result, fewer than 1 in 10 succeed in quitting smoking each year.^{2,7} In conjunction with population-based tobacco control interventions that have been shown to be effective (eg, price increases, smoke-free policies, and high-impact tobacco education media campaigns that motivate smokers to quit and create a supportive environment for them to do so), comprehensive, barrier-free coverage of proven cessation treatments can help more smokers quit.^{1,2,31}

Limitations

This study had several limitations. First, because the MarketScan data are largely based on a convenience sample of large US employers with self-insured plans, the results may not reflect smaller employers with fully insured coverage,^{9,32} and large employers are likely to offer more generous health insurance coverage than smaller employers.²⁶ Second, the study was limited to adults enrolled in FFS benefit plans;

therefore, the results may not be representative of people in capitated plans. However, in the assessed sample, adults who were fully enrolled in FFS plans comprised more than 85% of all fully enrolled adults. Third, the overall spending on cessation medications was likely underestimated because it did not include over-the-counter medications obtained without a prescription. Spending estimates also did not reflect spending associated with cessation interventions.

Fourth, the identification of tobacco users is subject to the accuracy of ICD codes and coding errors in claims data. However, research indicates that these codes are accurate in identifying tobacco users.^{12,33} Fifth, spending estimates understate the total costs associated with cessation use, because the costs of counseling, transportation, and time spent in accessing and receiving cessation counseling and obtaining cessation medication were not taken into account. Finally, because bupropion is prescribed to treat both depression and smoking cessation, the reported estimates of bupropion use for cessation could be overestimated or underestimated. However, this measurement error was reduced by including claims only for the 150 mg formulation of bupropion, which is the form most commonly used for smoking cessation.

Conclusions

From 2010 to 2017, the proportion of US adult tobacco users covered by employer-sponsored health insurance who received FDA-approved cessation medications increased slightly. Among tobacco users who received cessation medication, out-of-pocket spending decreased, but the number of fills and refills, days of supply, and spending (both overall and the portion of spending paid by employers) increased. Opportunities exist to further increase the use of tobacco cessation among US adult tobacco users and to continue monitoring trends related to the use of and spending on cessation medications across all types of health insurance.

Disclaimer

The findings and conclusions in this article are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention. Preliminary results were presented (in the form of an e-poster) at the Society for Research on Nicotine and Tobacco's Annual Meetings, March 11-14, 2020.

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ORCID iD

Sundar S. Shrestha, PhD  <https://orcid.org/0000-0001-6984-3522>

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