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Prescribed Opiate use in Wisconsin from 2008–2016: Findings from the Survey of the Health of Wisconsin (SHOW)

Tanvee Thakur, BPharm, MS [PhD candidate],
UW Madison School of Pharmacy

Jodi H Barnet, MS [Researcher],
Survey of the Health of Wisconsin, UW Madison School of Medicine and Public Health

Tamara LeCaire, MS, PhD [Associate Director, Associate Scientist],
Survey of the Health of Wisconsin, UW Madison School of Medicine and Public Health

Andrew Bersch, MS [Researcher],
Survey of the Health of Wisconsin, UW Madison School of Medicine and Public Health

Paul Peppard, MS, PhD [Associate Professor],
Population Health Sciences, UW Madison School of Medicine and Public Health

Kristen Malecki, PhD, MPH [Director],
Survey of the Health of Wisconsin, Associate Professor, Population Health Sciences, UW Madison School of Medicine and Public Health

D. Paul Moberg, PhD. [Research Professor and Senior Scientist]
Population Health Institute, UW Madison School of Medicine and Public Health

Abstract

Background: The opioid epidemic is a national crisis. The objectives of this report were to describe prescription opioid use in Wisconsin from 2008–2016 using unique population representative data and to assess which demographic, health, and behavioral health characteristics were related to past 30-day prescribed opioid use.

Methods: Data were obtained from the Survey of the Health of Wisconsin (SHOW), a statewide representative sample of 4,487 adults. Prescription medication use was ascertained via in-person interviews that included an inventory of all prescription medications used by the respondent in the past 30 days. The data were weighted to represent the adult population of Wisconsin, aged 21–74. Chi-square, logistic regression and descriptive statistics were used to analyze data.

Results: From 2008 to 2016, 6.4% (CI, 5.5, 7.3) of adults age 21 years or older reported using a prescribed opioid in the past 30 days. Hydrocodone was the most prescribed opioid class followed by oxycodone. People 50 years of age and older, self-identified Black or Hispanic, urban dwellers, those with a high school education or less, and those having incomes below 200% of the federal

Corresponding author: D. Paul Moberg, PhD., Research Professor and Senior Scientist. UW Population Health Institute. 610 Walnut Street, 885 WARF, Building. Madison, WI 53726. 608-263-1304/ dpmoberg@wisc.edu.

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poverty level reported significantly higher rates of prescribed opioid use relative to others. Participants reporting physician diagnosed drug or alcohol abuse, current smokers, and those currently suffering from depression also reported significantly higher use.

Conclusion: These data from 2008–2016 demonstrate concerning levels of prescription opioid use and provide data on which population groups may be most vulnerable. While policies and clinical practice has changed since 2016, ongoing evaluation of prescribing practices, including consideration of behavioral health issues when prescribing opioids, is called for.

Introduction:

Opioids are a class of drugs that include the illegal drug heroin, synthetic opioids such as fentanyl, and pain relievers available legally by prescription, such as oxycodone (OxyContin®), hydrocodone (Vicodin®), codeine, morphine, and many others.[1] Opioids interact with nerve cells to relieve pain; prescription opioids are used to treat moderate to severe pain. They also produce pleasurable effects and are associated with serious risks of addiction, abuse and overdose.[2] Opioid medications are subsequently prone to misuse, that is, taken in a manner or dose other than prescribed; used by other than the person being prescribed, even if for a legitimate medical complaint such as pain; or taken to feel euphoria (i.e., to get high).[2] Roughly 21–29% of patients prescribed opioids for chronic pain misuse them, with 8–12% developing an opioid use disorder.[3]

Every day, on average 130 people in the United States (U.S.) die after overdose on opioids and more than 46 people die from an overdose of prescription opioids.[4] The Midwest, and specifically Wisconsin, is at increased risk. In Wisconsin, the rate of opioid use disorder more than tripled during 2005 to 2016.[4] The Midwestern region as a whole more recently experienced a 70% increase in opioid overdose cases from July 2016 through September 2017.[3] The death rate in Wisconsin attributed to opioid overdose has also been higher than the U.S. overall; in 2016, 15.8 deaths per 100,000 persons occurred in Wisconsin compared to 13.3 deaths per 100,000 nationally.[4]

Wisconsin providers wrote 69.1 opioid prescriptions per 100 persons (4 million prescriptions) in 2015,[4] similar to the average U.S. rate of 70 opioid prescriptions per 100 persons.[5] Opioid prescribing in Wisconsin has been reduced since 2016 (the last year of data in this study). The number of opiate prescriptions reported to the Prescription Drug Monitoring Program (PDMP) in 2019 declined by 13.7 % since 2016.[6]

While the rate of prescriptions and number of pills per prescription have declined, patients continue to head home daily from hospitals and clinics furnished with opioid pain prescriptions. After they have recovered from their procedures and are no longer in need of opioid-based pain relief, roughly 70% of people hold on to their unused medication. The percentage of stockpiling rises to 86% for older adults.[7] In Wisconsin, as many as 33% of all households may have unused opiates on hand.[8] These unused pills are a primary source of diversion for non-medical use and are a major source of prescription opioid abuse fueling the crisis of opioid addiction in the United States.[9, 10] Thus in addition to potential harm to the individual patient, there is risk for prescribed opioids being diverted and misused.

Specific Aims/ Objectives:

The statewide representative Survey of the Health of Wisconsin (SHOW), which included data on prescription drug use, allowed an analysis estimating population level prescribed opioid use and an examination of the characteristics of those who used these medications. Specifically, we:

1. Describe prescription opioid use in Wisconsin adults aged 21–74 during 2008–2016; and
2. Assess which demographic, health, and behavioral health characteristics were related to past 30-day prescribed opioid use.

Methods:

Study design: SHOW was funded beginning in 2006 by the Wisconsin Partnership Program to establish an infrastructure for annual statewide surveys to monitor the health and health determinants of Wisconsin residents.[11] A probability-based sampling approach is used to randomly select households and gather data on a wide variety of health conditions and exposures, as well as on health care access and utilization. SHOW includes an in-home interview, physical exam and biospecimen collection. The program is modeled after the National Health and Nutrition Examination Survey (NHANES), which has provided key information on the nation's health for over 40 years. With the launch of SHOW, Wisconsin became the first state to monitor the health of its residents with an ongoing examination survey of this magnitude.

Details on SHOW's study design have been published previously.[11] In brief, survey participants are selected from a random sample of households using a probability-based cluster sampling approach. From the household sampling frame, addresses are selected using simple random sampling. Recruitment of SHOW participants begins with in-person contact by study staff at the selected household address.[11] An effort is made during the recruitment process to enumerate all household members, and screen and enroll non-institutionalized adults where the selected household was their place of residence for more than 6 months during that calendar year and who are mentally capable of informed consent and being interviewed.[11] There is no requirement that all eligible members of the household participate. Data collection continues throughout the year.

Data collection is divided into three major components: a private in-home interview; a self-administered questionnaire; and a mobile exam center or fixed clinic visit that includes biospecimen collection. SHOW enrolled participants aged 21–74 years in 2008–2013; beginning in 2014, adults aged 18 years or older were invited to participate. For comparability over time, the analyses here have been restricted to adults ages 21–74 years. All data collection protocols are approved by the University of Wisconsin Health Sciences IRB (IRB ID# 2013–0251).

Survey topics and reporting:

Topics covered in the surveys include demographics such as age, sex, race, BMI, education, employment status, poverty level, and geographical area, as well as information on health and health history, mental health, healthcare, health insurance, behavioral health, and other economic and social determinants. Geographical area divisions followed the health regions defined by the Wisconsin Department of Health Services for data analysis.[12] For data regarding opioid medication use, participants were asked to show all bottles of their prescription medications they personally used in the past 30 days. The interviewer recorded verbatim the names of these medications and reviewed the list with the participant. The participants were also asked to recall any prescription medications taken within the past 30 days for which they no longer had the bottle; these were also recorded. The interviews did not collect data on the use of illicit drugs (including diverted prescribed opioids). For purposes of this analysis, the complete free-text list of all prescription medications recorded by interviewers was reviewed by a pharmacist with training in health services research (TT). Medications that could be classified as opioids were identified. The National Library of Medicine's RxNorm system data for opioid or opioid-containing medications was reviewed and a listing of RxCUI (clinical drug component unique identifier) codes for opioid-containing medications was determined by the pharmacist. Medication names were matched to the specific RxCUI codes for opioid medications. Based on these data, each participant was coded as having used or not used prescribed opioids in the past 30 days.[13]

Analysis:

All analyses were conducted in SAS® 9.4.[14] The descriptive data were analyzed by cross-tabulation; chi-square and logistic regression was used to determine significance in differences of opioid use. All calculations were weighted to represent the population of Wisconsin and to adjust for spatial clustering and survey design-based factors.[11] Raw numbers of cases are reported in the tables, with weighted percentages. To smooth out year to year variation in sampling, three-year intervals (2008–10, 2011–13, 2014–16) were used for comparison over time. Differences in reported frequency of opioid use between the three time periods were assessed using chi-square statistics. Data were also analyzed for time by personal characteristic interactions using logistic regression.

Multivariate logistic regression modeling of opioid use by rural/urban classification was conducted with adjustments for demographic characteristics (gender, age, race), socio-economic factors (education, poverty level), reported drug abuse, reported alcohol abuse, and health region. Interactions between rural/urban classification and the other model parameters were investigated.

Results:

Across all nine years, 6.4% (CI¸ 5.5, 7.3) of participants reported using a prescribed opioid in the past 30 days. Opioids were used by 6.0% (CI¸ 4.6, 7.4) of individuals in 2008–2010 and by 7.3% (CI¸ 5.7, 8.8) in 2014–2016 (Table 1). Differences over time in the percentage of people reporting use of prescription opioids in the past 30 days were not significant (p=0.29) when the three separate time intervals were compared (Figure 1).

Hydrocodone/ Acetaminophen was the most reported opioid medication across time followed by oxycodone, hydrocodone, and oxycodone/acetaminophen (Table 2).

We examined opioid use by a number of participant characteristics. Except for sex, there was a significant ($p < 0.05$) relationship of opioid use in each of the characteristics examined in Table 3. These variables were also examined for interaction with time to assess whether there were shifting patterns in the relationship between individual characteristics and rates of opioid use. The only significant interaction found was with health region by time, with increased use in the north region over this time period.

The mean age for people who reported opioid use (mean=48.1 years, standard deviation (SD) =0.9 years) was higher than that of the overall sample (mean=45.8 years, SD=0.4 years). Prescription opioid use was significantly higher in people ages 50 and above relative to younger age groups. Married individuals had the lowest rate. People with higher BMIs (30+) reported higher rates of opioid use (9.0%) compared to those with BMIs < 30 (4.6%).

A significantly higher rate of prescription opioid was reported by individuals self-reporting as Black (11.5%) or Hispanic (9.8%) compared to White individuals (5.8%). People belonging to other races (8.8%) also showed significantly higher rates of prescribed opioid use.

People with higher education (bachelors or graduate degree) used prescribed opioids at a rate significantly lower than people without a college degree (some college, high school or less) across all 9 years of data collection.

People who were not employed and not looking for work reported a significantly higher percentage of opioid medication use compared to those who were working or looking for jobs. There was a significant difference in opioid use by people who reported lower income levels. We used a cut-point of 200% poverty level; in 2015 this was $23,540 for one person and $8,320 for each additional household member.[15] Among those below 200% of poverty, 10.2% reported opioid use, compared to 4.9% of those who were above 200% of the poverty level. People from urban and suburban Wisconsin reported higher prescription opioid use compared to rural residents. The Southeast and West regions of the state had the highest rates of prescribed opiate use (8.5%; 8.1%).

We also examined health insurance status for its association with prescribed opiate use. There was no difference in use of prescribed opiates among the 93.3% who were insured (6.4% use) and the 6.7% who did not report having any health insurance in the past 12 months (6.9% used opiates). However, type of insurance was associated with prescribed opiate use—those with employer-sponsored health insurance had the lowest rate of opiate use (4.7%), while those with Medicare reported 12.3% opiate use and those with Medicaid reported 13.5% past 30-day opiate use. Since type of insurance is highly related to age, income and chronic conditions, this was not included in multivariate analysis.

A U-shaped relation was observed with significantly more people using prescribed opioids among those not consuming any alcohol (10.4% used opioids) and among those consuming the highest amounts of alcohol (5.9% used opioids), compared to about 4% opioid use

among mild to moderate drinkers. Data were collected beginning in 2010 on whether the participant reported having been medically diagnosed with alcohol abuse or drug abuse. Those medically diagnosed for alcohol abuse (14.8% used opioids) or drug abuse (22.1% used opioids) reported a significantly higher rate of prescription opioid use in the past month compared to those not diagnosed with either of these disorders (6.4% used opioids). Current and former smokers were also significantly more likely to use prescribed opiates than persons who had never smoked.

People who reported their health to be 'fair or poor' had significantly higher opioid use (23.1%) relative to those reporting good, very good or excellent general health (4.3%). Consistent with poor health, people who reported having chronic conditions reported higher opioid use.

Multivariate analyses using logistic regression were performed to further investigate the significant results from the bivariate analysis. After adjustment, age, education, drug abuse, poverty level, health region and urbanicity remained significantly related to the odds of prescription opioid use. Race, education, and alcohol abuse were no longer statistically significant at the p=0.05 level. Persons aged 50 and older were more likely to use prescription opioids (OR 1.72, CI: 1.26, 2.34) than younger people. Persons with household income below 200% of poverty were significantly (p=<0.0001) more likely to use prescribed opiates (OR 3.14; CI: 1.30, 7.59). Respondents in the Northeast region had significantly lower opioid use relative to the Southeast (OR 0.44; CI_{95}:0.27, 0.72), while those in the remaining regions did not significantly differ relative to the Southeast. After adjusting for other variables, rural dwellers were significantly less likely to use prescribed opiates (OR 0.60; CI: 0.38, 0.95) than urban respondents. While there were differences in reporting prescription opioid use by race, these differences did not hold after adjustment for the related variables of education, urbanicity and poverty level. Interactions between urbanicity and other variables in the model were examined; no statistically significant interactions were found between urban/rural status and any of the other model parameters.

Discussion:

Between 2008 and 2016, approximately 6.4% of Wisconsin residents reported using prescription opioids in the past 30 days. The prevalence of opioid use varied greatly by demographic factors; individuals of older age, persons of color and lower socio-economic status had higher rates of opioid use. These findings may be reflective of overall health status across the state's population. Use of opioids in the last 30 days is not reflective of abuse, but rather identifies populations at greater or lower risk of potential abuse and opioid diversion potential in households. These population estimates would be much higher if annualized, considering both new and refill prescriptions across the entire population. Another recent study found that 33% of respondents to a Wisconsin-based convenience survey had prescribed opioids in their homes.[8] That study included unused opioids stockpiled in the home, while the SHOW survey specifically asked about prescriptions used in the past 30 days. These data highlight the high diversion risk of plentiful unused but retained prescribed opiates.

Examining levels of use over three-year intervals, the slight increased trend in use over time was not significant at $p < 0.05$. While the rate of prescribed use was thus relatively stable, the Wisconsin's Department of Health Services reported that deaths due to opioid overdose increased in Wisconsin over these years, from 414 deaths in 2008 to 916 deaths in 2017 alone.[4] These rates include both prescribed and illicit opiates.

Several of our results regarding the characteristics of those who use prescription opiates are easily explained. Older individuals (50 and above) suffer from more chronic conditions, have more medical procedures (in particular surgeries), and hence may require use of opioid pain relievers. Given this, seniors are at higher risks of overdose and dependency from opioids.[16–18] In 2017, first responders transported almost 1000 Wisconsin seniors for suspected unintentional opioid overdose.[4] The higher rate of prescribed opioid use reported by individuals who are unemployed and not looking for work is also easily explained. These may be retired older adults or individuals with severe chronic pain leading to unemployment. Similarly, participants who reported being in poor or fair health reported significantly more use of prescription opioids relative to those reporting good to excellent health. In this analysis, we were not able to differentiate opioid prescriptions for chronic versus acute conditions.

Several national studies have reported the existence of racial bias in opioid prescribing and use; African American and Hispanic individuals were perceived by prescribers to use more opioids but were prescribed fewer opioids than White individuals.[19–22] Results from our study point to higher prescribed opioid use by Black and Hispanic individuals. This contrast with evidence in the national literature warrants further investigation. While race/ethnicity became insignificant in our multivariate model, the collinear variables of urbanicity, Southeastern Wisconsin residence, and lower education and income remain as significant correlates of prescribed opioid use. These variables reflect socio-economic determinants of health risk. The insignificance of race in this model likely reflects the strong association of race with residential patterns and socio-economic status in Wisconsin. The association of higher rates of prescribed opioid with this constellation of socio-economic variables warrants further study.

Education is a well-established indicator of overall health and health literacy. The data show that as educational attainment went from high school graduate to some college to college graduate, the frequency of prescribed opioid use decreased. People with higher levels of education may be better informed about risks of opioids, may be healthier, have more access to preventative care and/or may participate in conversations about pain management and opioid use with their health providers, which might lead to less prescribed opioid medication use than those with lower levels of education.[23] This suggests a gap in knowledge, attitudes and medication use practices of people related to their education level, a factor addressed in the health literacy literature as well as in literature on prescribed opioid use.[24–27] It may also reflect a difference in provider prescribing patterns related to characteristics of the patient.

The bi-variate data indicate significantly lower use of opioids in rural and suburban regions than in urban areas. This may reflect less access to providers in rural areas. After adjustment for urbanicity and other demographic variables, the Northeast health region tended to yield

lower prescribed opioid use than the Southeast regions. Higher rates in the Southeast are consistent with the DHS reports of highest ambulance runs due to opioid overdose in that region in 2018.[4] Due to the interaction of urbanicity, health region, and other population characteristics, these results are tentative. A limitation of our data is the lack of information on illicit (non-prescribed, diverted or illegal) opiate use in this population.

Participants with diagnosed alcohol use disorders had significantly higher rates of prescription opioid use. Alcohol can interact with opioids leading to adverse reactions including respiratory depression and can be fatal.[28] The CDC recommends providers warn patients about risks of alcohol consumption when prescribing an opioid medication.[1] Pharmacists in the state of Wisconsin are mandated by law to counsel patients on new and refill medications on current use, adverse effects, risks and drug interactions every time the patient fills a prescription at the pharmacy.[29] Patients who are heavier alcohol users warrant more caution for clinicians prescribing opioids and enhanced counselling about medication interactions and risks. One of the more alarming findings of this study was the significantly higher rates of opioid use in people reporting doctor-diagnosed alcohol abuse and drug abuse. These findings are worrisome as they depict an acute need for communicating potential risks of opioids to these patients, which has been demonstrated in other nationwide studies as well.[30–32] It is possible that these patients were prescribed opioids without knowledge of their medical history and diagnoses.[33] Of some further concern in the behavioral health arena is the higher use of opioids in people reporting clinical depression, given that opioids have been shown to aggravate depression.[34]

Limitations:

Although a rigorous sampling frame for inviting household participation was used, those agreeing to participate in SHOW may be a biased segment of the population. To overcome measurable bias, a weighting protocol was used to reflect the demographics of the population of the state. The results are limited to the household dwelling population ages 21–74 years. While the actual prescription bottles were examined in most cases, a few participants self-reported the medications in absence of a pill bottle which might have led to misreporting the medications used. Further, these results do not reflect non-prescribed opioid use, including illicit and diverted medications. The SHOW interview protocol did not include questions regarding illicit drug use; analysis of bio-specimens would be necessary to assess the role of illicit opiate use. The data are limited to 2008 through 2016 interviews, so do not reflect recent changes in prescribing practices and policies, most notably limiting the total number of pills prescribed. Finally, the multivariate models are suggestive of patterns but due to multi-collinearity of variables--in particular race, low income and geographic location—these models are difficult to interpret.

Real time tracking of opiate prescribing behavior, and forward extension of the time series data we reported here, should continue to assess the impact of changing policies and clinical practice. The SHOW data can be further exploited to provide population-level data on multiple health issues in Wisconsin in more depth than can be gleaned from administrative records. Analysis of SHOW data can provide professional and lay audiences with a more comprehensive understanding of the epidemiology of many health concerns.

Conclusion:

This study is unique because the analysis reports on opioid prescription use based on representative respondent surveys and actual names of medications from pill bottles, rather than relying on medical records, self-report surveys or administrative data such as the Prescription Drug Monitoring Program. A 2019 report[6] indicates a recent reduction in opioid prescribing (including reduced number of pills prescribed). However, the rate of prescribed opiate use remained fairly constant over the nine years of SHOW data with no significant reduction as of 2016, and in 2019 3.3 million prescriptions were written for opioids in Wisconsin.[6] The recent reduction is unlikely to be sufficient to resolve the epidemic. The association of higher rates of prescribed opiates among individuals with behavioral health issues suggests the need for enhanced counseling and communication with patients about risks of these medications. Health providers should be vigilant of patient's health history, especially behavioral health issues, when prescribing opioids; should apply the CDC guidelines, and communicate with patients about risks of opioids. Patients with chronic conditions and behavioral health issues need to be given particular attention to assure adequate pain relief and that alternative approaches to pain management are also considered. Clinical practice modification and public health and community initiatives, especially in the counties and areas reporting more opioid prescribing and use, should be undertaken to control the problem of prescription opioid overdose in the state.

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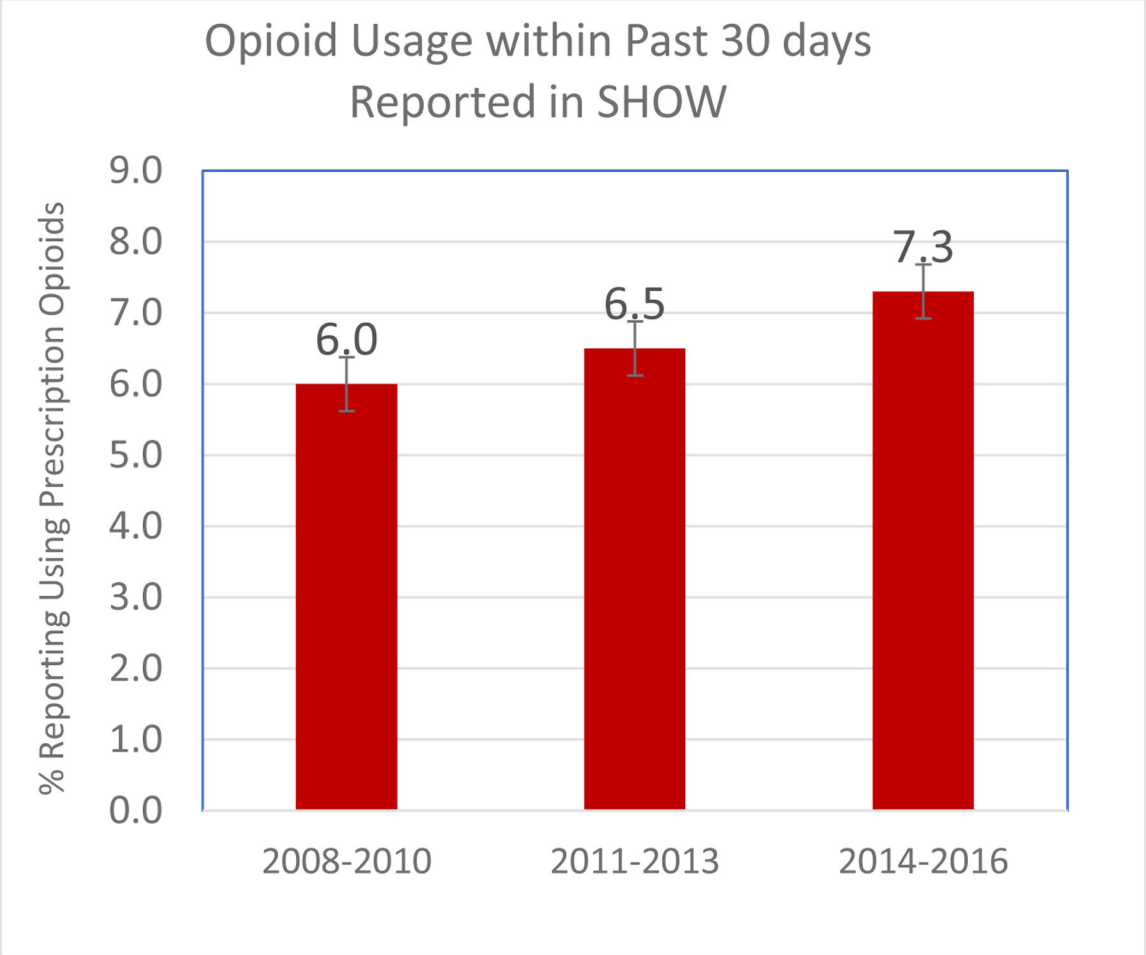

Figure 1. Prescribed Opioid Usage within the Past 30 Days as Reported in SHOW

*Total n= 4487; data weighted to reflect Wisconsin population ages 21 to 74. Differences between time periods were not significant at $p < .05$.

Table 1.

3-Year Groupings of Overall Reported Use of Prescription Opioids in the Past 30 Days

		Opioid Use	
	N all	n	% (95% CI)
OVERALL	4487	321	6.4 (5.5, 7.3)
2008–2010	1368	89	6.0 (4.6, 7.4)
2011–2013	1591	115	6.5 (5.0, 8.0)
2014–2016	1528	117	7.3 (5.7, 8.8)

Table 2.

Specific Opioid Use within the Past 30 Days by 3-Year Groupings

Type of Opioid	2008–10 % (95% CI) n=1368	2011–13 % (95% CI) n=1591	2014–16 % (95% CI) n=1528	Overall % (95% CI) N=4487
Hydrocodone / Acetaminophen	2.19 (1.30, 3.09)	2.59 (1.58, 3.59)	3.40 (2.33, 4.48)	2.55 (1.96, 3.14)
Oxycodone	1.11 (0.41, 1.81)	1.81 (1.00, 2.61)	1.69 (1.25, 2.12)	1.49 (0.87, 1.86)
Hydrocodone	1.59 (0.67, 2.51)	1.27 (0.57, 1.97)	1.01 (0.60, 1.43)	1.37 (0.87, 1.86)
Oxycodone / Acetaminophen	0.31 (0.00, 0.66)	0.54 (0.17, 0.91)	0.71 (0.05, 1.38)	0.47 (0.23, 0.71)
Propoxyphene[1]	0.53 (0.19, 0.87)	-	-	0.23 (0.08, 0.37)
Acetaminophen / Codeine	0.41 (0.03, 0.78)	0.54 (0.13, 0.95)	0.32 (0.07, 0.57)	0.45 (0.21, 0.37)
Morphine sulphate	0.28 (0.00, 0.62)	0.12 (0.00, 0.26)	0.28 (0.05, 0.51)	0.21 (0.05, 0.37)
Fentanyl	0.05 (0.00, 0.15)	0.17 (0.00, 0.36)	0.19 (0.00, 0.39)	0.12 (0.02, 0.22)
Others[2]	0.21 (0.04, 0.37)	0.24 (0.00, 0.47)	0.48 (0.23, 0.73)	0.26 (0.13, 0.39)

Abbreviation: CI = confidence interval

[1]Propoxyphene was banned from market in 2010 by the FDA.

[2]'Others' were reported by fewer than five participants over the entire time period and included:

acetaminophen/propoxyphene, aspirin/butalbuital/caffeine/codeine, cheratussin AC, codeine, codeine/phomethazine, hydrocodone/ibuprofen, hydromorphone, and norco.

Table 3.

Characteristics Associated with Prescribed Opioid Use in the Past 30 Days

		Opioid Use - Yes[5]					
Characteristic	**Level**	**N all**	**n**	**%**	**LCL**	**UCL**	
OVERALL	OVERALL	4487	321	6.4	5.5	7.3	
Sex	Male	1956	135	6.4	4.9	7.9	
	Female	2531	186	6.4	5.2	7.6	
Age (years)	21–49	2214	133	5.4	4.3	6.6	*
	50–74	2273	188	7.7	6.3	9.1	
BMI (kg/m^2)	<=29	2626	143	4.6	3.6	5.6	*
	30+	1802	169	9.0	7.1	11.0	
Racial and Hispanic Status	White (non-Hispanic)	3863	255	5.8	4.9	6.8	*
	Black (Hispanic, non- Hispanic)	235	28	11.5	6.6	16.3	
	Hispanic (not Black)	138	12	9.8	3.1	16.4	
	Other (none of the above)	251	26	8.8	3.9	13.7	
Marital Status	Single / never married	721	52	6.1	4.2	7.9	*
	Married / living with partner	3048	182	5.4	4.4	6.4	
	Widowed	156	18	10.0	3.7	16.3	
	Divorced / separated	557	69	12.5	8.7	16.2	
Education Level	High School or less	1182	115	8.7	6.6	10.8	*
	Some College or Associate Degree	1708	143	7.4	5.7	9.0	
	Bachelor’s degree or more	1595	63	3.6	2.1	5.2	
Smoking Status	Current	774	101	11.9	8.9	14.9	*
	Former	1216	100	7.3	5.5	9.0	
	Never	2424	112	4.1	3.1	5.1	
Employment Status	Employed	2955	146	4.8	3.8	5.7	*
	Not Employed & looking for work	270	20	6.5	2.8	10.1	
	Not Employed & not looking for work	1248	152	11.3	9.0	13.7	
200% Poverty Level	Below	1212	141	10.2	8.1	12.3	*
	Above	3102	167	4.9	3.9	5.8	
Any Health Insurance in the Past 12 Months	No	302	25	6.9	3.7	10.1	
	Yes	4175	296	6.4	5.4	7.4	
Rural/Urban Classification	Urban	2298	183	7.5	6.1	9.0	*
	Suburban	735	49	6.1	3.7	8.6	
	Rural	1454	89	4.5	3.1	6.0	
Region of WI (DHS health regions)	Southeast	1349	123	8.5	6.5	10.5	*
	South	843	39	4.1	2.5	5.7	
	West	873	71	8.1	5.3	10.8	
	North	551	35	6.0	3.7	8.2	

		Opioid Use - Yes[5]					
Characteristic	**Level**	**N all**	**n**	**%**	**LCL**	**UCL**	
	Northeast	871	53	4.3	2.7	5.9	
Post-Traumatic Stress Disorder Diagnosis[1,2]	No	3321	213	6.2	5.2	7.2	*
	Yes	451	63	10.9	7.6	14.2	
Number of Alcoholic Drinks per Week	0	1525	162	10.4	8.4	12.5	*
	1–7	1724	85	4.3	3.2	5.5	
	8–14	477	26	4.0	2.3	5.6	
	15+	370	20	5.9	2.1	9.7	
Doctor-Diagnosed Alcohol Abuse[1]	No	3797	260	6.4	5.4	7.4	*
	Yes	155	28	14.8	7.5	22.0	
Doctor-Diagnosed Drug Abuse[1]	No	3880	271	6.4	5.4	7.4	*
	Yes	72	17	22.1	9.5	34.7	
SF12: General Health Fair/Poor	No	3879	181	4.3	3.5	5.1	*
	Yes	531	131	23.1	18.8	27.3	
Any Chronic Condition[3]	No	2506	102	4.3	3.3	5.4	*
	Yes	1897	214	9.5	8.0	11.1	
Depression[4]	No	3465	213	6.0	5.0	7.1	*
	Yes	304	58	14.5	9.9	19.0	

Abbreviations: LCL = 95% lower confidence limit, UCL=95% upper confidence limit

[1]This question was first asked starting in 2010.

[2]Post-Traumatic Stress Disorder (PTSD) diagnosis is based on scoring 14 or higher on the 6-item PCL-C Civilian version.

[3]Any chronic condition includes: heart attack or angina, stroke or TIA, diabetes, asthma, chronic bronchitis or emphysema, rheumatoid arthritis or osteoarthritis, or cancer.

[4]Depression is determined from the first two items from the PHQ-9 depression screener which asks about the frequency of depressed mode and anhedonia over the past two weeks.

[5]Individuals with more than 1 opioid prescription in the last 30 days were counted only once

*Chi-square p-value < 0.05 for comparison of opioid use within participant characteristic

Table 4.

Multivariate Model of Prescribed Opioid Use

Characteristic	Level	Odds Ratio	LCL	UCL	P-value
Gender (ref=men)	Women	1.12	0.75	1.69	0.58
Age (ref=21 –49 years)	50–74 years	1.72	1.26	2.34	0.0007
Education[1]		0.80	0.63	1.03	0.08
Race (ref=white)	Black	0.82	0.42	1.60	0.56
	Hispanic (not black)	0.94	0.38	2.35	0.89
	Other (not black or Hispanic)	0.89	0.47	1.67	0.71
Drug Abuse (ref=no)	Yes	1.57	0.75	3.28	0.23
Alcohol Abuse (ref=no)	Yes	3.14	1.30	7.59	0.011
Poverty Level (ref=above 200%)	Below 200%	2.29	1.59	3.31	<0.0001
Health Region (ref=Southeast)	South	0.61	0.36	1.03	0.064
	West	0.82	0.49	1.36	0.43
	North	1.19	0.69	2.03	0.52
	Northeast	0.44	0.27	0.72	0.001
	Suburban	0.95	0.61	1.47	0.81
Rural/Urban Classification (ref=urban)	Rural	0.60	0.38	0.95	0.029

[1]Education was coded as a 3-level ordinal variable (high school to some college to college graduate).

Abbreviations: ref=reference group, LCL=95% lower confidence limit, UCL=95% upper confidence limit