Drug and Alcohol Dependence 195 (2019) 1–5

Contents lists available at ScienceDirect

Drug and Alcohol Dependence

journal homepage: www.elsevier.com/locate/drugalcdep

Short communication

Shifting characteristics of nonmedical prescription tranquilizer users in the United States, 2005–2014

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ARTICLE INFO

Keywords:
Tranquilizer
Benzodiazepine
Opioid
Geriatric

ABSTRACT

Background: Benzodiazepine overdose rates have increased in the US, largely from concomitant use of other drugs such as opioids. Studies are needed to examine trends in prescription tranquilizer (e.g., benzodiazepine) use—with a particular focus on use of other drugs such as opioids—to continue to inform prevention efforts.
Methods: We conducted a secondary analysis of the 2005–2014 National Survey on Drug Use and Health, a repeated cross-sectional, nationally representative probability sample. Trends in past-year nonmedical tranquilizer use and trends in demographic and other past-year substance use characteristics among nonmedical users were examined (N = 560,099).
Results: Prevalence of nonmedical tranquilizer use remained stable from 2005/06 through 2013/14 at 2%. Prevalence of past-year heroin use and heroin use disorder both more than doubled among nonmedical tranquilizer users between 2005/06 and 2013/14 ($Ps < .001$). Nonmedical opioid use decreased between 2005/06 and 2013/14 ($P < .001$); however, opioid use disorder increased from 13.4% to 16.7% ($P = .019$). Prevalence doubled among those age > 50 between 2005/06 and 2013/14 from 7.9% to 16.5% ($P < .001$), and nonmedical tranquilizer use among racial minorities also increased ($Ps < .01$). Prevalence of nonmedical use also increased among those with health insurance ($P = .031$), and this increase appeared to be driven by a 190.6% increase in nonmedical use among those with Medicare (from 2.6% to 7.4%; $P = .002$).
Conclusions: Characteristics of nonmedical tranquilizer users are shifting, and many shifts are related to past-year nonmedical prescription opioid use and heroin use. Prevention needs to be geared in particular towards older individuals and to those who use opioids nonmedically.

1. Introduction

Benzodiazepines are sedative-hypnotic medications that are primarily prescribed for anxiety disorders and insomnia. While benzodiazepines may provide some short-term benefit for anxiety symptoms and sleep latency (Buscemi et al., 2007; Martin et al., 2007), they are not considered first-line treatment for either condition or recommended for long-term use (Morgenthaler et al., 2007; Qaseem et al., 2016; Reinhold et al., 2011). Benzodiazepine use can have significant health risks, and benzodiazepines are also among the most commonly involved drugs in drug-related fatal overdoses (Warner et al., 2016). In addition, benzodiazepines should be avoided when possible in elderly adults given their association with falls, hip fractures, disability, and cognitive impairment (Billioti de Gage et al., 2014; Gray et al., 2006; Herings et al., 1995).

Despite recommendations to limit benzodiazepine use, studies have shown increases in their use nationally in the U.S. A study of the National Health and Nutrition Examination Survey (NHANES) found significant increases in benzodiazepine use from 2.0% in 1999–2000 to 4.2% in 2013–2014 with large increases of individuals with long-term use (> 24 months) (Kaufmann et al., 2018). Another study using the Medical Expenditure Panel Survey found an increase of 4.1% to 5.6% from 1996 to 2013 in the percentage of adults filling prescriptions for benzodiazepines with an overdose death rate involving benzodiazepines from 0.58 to 3.07 per 100,000 adults and a plateau after 2010 (Bachhuber et al., 2016). Despite the death plateau, benzodiazepine deaths continued to increase among adults age > 65 (Bachhuber et al., 2016).

The concurrent use of benzodiazepines with opioids, alcohol, or other central nervous system depressants is particularly dangerous and

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https://doi.org/10.1016/j.drugalcdep.2018.11.015
Received 20 July 2018; Received in revised form 10 November 2018; Accepted 13 November 2018
Available online 08 December 2018

results in increases in emergency department visits and overdose deaths (Jones and McAninch, 2015; Warner et al., 2016). In 2014, 95% of drug overdoses that involved diazepam or alprazolam also involved other drugs, and oxycodone was the most frequent concomitant drug (Warner et al., 2016). While research has begun investigating trends in opioid use more extensively, more studies are needed to examine trends in nonmedical prescription tranquilizer (e.g., benzodiazepine) use in the US with a particular focus on concurrent opioid use. Focusing on nonmedical tranquilizer use is also becoming increasingly important, as individuals obtaining illegally-manufactured tranquilizers are now at risk for ingesting pills adulterated with fentanyl or its analogs (Arens et al., 2016). Further research on trends of nonmedical tranquilizer use can inform prevention in light of the increasing opioid crisis in the US. The purpose of this study is to inform prevention efforts by examining trends in characteristics of nonmedical tranquilizer users among a nationally representative sample of individuals in the US.

2. Methods

2.1. Procedure

Data were analyzed from individuals (ages ≥12) surveyed in the 2005–2014 National Surveys on Drug Use and Health (NSDUH; $N = 560{,}099$), which are annual cross-sectional surveys of non-institutionalized individuals in the 50 U.S. states and the District of Columbia. The sampling frame each year was obtained via four stages, and surveys were administered via computer-assisted interviewing conducted by an interviewer and audio computer-assisted self-interviewing to increase honest reporting of sensitive information. Sampling weights were provided by NSDUH to address unit- and individual-level non-response. Additional information on methodology can be found elsewhere (Center for Behavioral Health Statistics and Quality (CBHSQ), 2015). Response rates ranged from 71.2%–76.0%.

2.2. Measures

Respondents were asked about past-year nonmedical use of 17 different prescription tranquilizers which had labeled images of various pills displayed on a card including benzodiazepines such as Xanax®, Klonopin®, Valium®, and various other tranquilizers such as Librium®, Miltown®, and Flexeril®. Nonmedical use was defined as non-prescribed use or use only for the feeling or experience the drug caused. Past-year nonmedical use of specific tranquilizers was not queried; however, respondents were asked about lifetime use (ever-use) of benzodiazepines. Those reporting nonmedical use of any tranquilizers were asked how many days they used, nonmedically, in the past year, and we coded responses into quintiles. Those reporting any nonmedical use were asked whether they used in the past 30 days, and they were asked if they needed treatment or counseling for their use during the past 12 months. Respondents were also asked about past-year use of alcohol, marijuana, cocaine, and nonmedical use of opioids and sedatives, and DSM-IV abuse and dependence criteria were assessed for use of tranquilizers, prescription opioids, and heroin; respondents were considered to have use disorder if abuse or dependence criteria were met. Respondents reported their age, gender, race/ethnicity, educational attainment, annual household income, and marital status. They were also asked whether they have health insurance.

2.3. Analyses

For descriptive purposes, we first estimated the lifetime prevalence of use of benzodiazepines among past-year nonmedical tranquilizer users. We then estimated the prevalence of self-reported past-year nonmedical tranquilizer use over time. Similar to previous analyses (Han et al., 2017; Jones and McAninch, 2015), we collapsed years into pairs—2005/06, 2007/08, 2009/10, 2011/12, and 2013/14—to increase power to detect trends. Analyses could not include data from more recent years, as NSDUH changed the definition of nonmedical use in 2015 (CBHSQ, 2015). We then examined demographic and other substance use characteristics among the subsample of nonmedical tranquilizer users over time and calculated the absolute and relative changes from 2005/06 to 2013/14 for all covariates. We then determined whether there was a linear time trend within each level of each covariate (e.g., each category within race/ethnicity) in the subsample of nonmedical users. This was done using logistic regression models by estimating odds of use as a linear function of time as a continuous predictor (CBHSQ, 2017). Models were adjusted for the complex survey design and used sample weights to account for oversampling of young participants and non-response to derive nationally representative estimates (Heeringa et al., 2010). Data were analyzed using Stata 13 SE (StataCorp, College Station, TX). This secondary analysis was exempt for review by the New York University Langone Medical Center Institutional Review Board.

3. Results

Of those reporting past-year nonmedical tranquilizer use, 93.9% reported lifetime nonmedical benzodiazepine use. 42.1% reported nonmedical use of one benzodiazepine, 27.7% reported nonmedical use of two, 21.5% reported nonmedical use of three, and 2.6% reported nonmedical use of four or more.

Prevalence of past-year nonmedical tranquilizer use (Table 1) remained consistent at 2%. However, there were significant shifts across all age groups between 2005/06 and 2013/14; the proportion of users age > 50, in particular, more than doubled ($P < .001$). Nonmedical use decreased among white respondents and increased among all racial/ethnic minority respondents. Nonmedical use also decreased among those with a high school diploma or less and among those with annual family income of $20,000-$49,999 ($Ps < .001$), and it increased among those with a college degree and among those with annual family income of > $50,000 ($Ps < .01$). Nonmedical use increased among those with health insurance ($P = .031$), and this increase appeared to be driven primarily by increases among those with Medicare and Medicaid/CHIP (Children's Health Insurance Program). The proportion of nonmedical tranquilizer users with Medicare nearly tripled ($P = .002$). The proportion of those with private or employer insurance, however, decreased ($Ps < .05$).

There were no shifts in trends in severity of nonmedical tranquilizer use aside from those using nonmedically 17–52 days in the past year decreasing in prevalence ($P = .009$). While the proportion of nonmedical tranquilizer users reporting past-year nonmedical use of opioids decreased ($P < 0.001$), the proportion of past-year heroin use more than doubled between 2005/06 and 2013/14 ($P < .001$). The proportion of past-year opioid use disorder among users increased ($P = .019$), and the proportion with heroin use disorder more than doubled ($P < .001$). Cocaine use and nonmedical sedative use also decreased ($Ps < .05$).

4. Discussion

Despite the steady prevalence of nonmedical tranquilizer user in the U.S., characteristics of users have dramatically shifted. Changes in characteristics of past-year nonmedical tranquilizer users over time included increases among older (e.g., age > 50) and non-white individuals. While results suggest that nonmedical prescription opioid use has become significantly less prevalent among nonmedical tranquilizer users over a decade, nonmedical prescription opioid use disorder increased among nonmedical tranquilizer users. This suggests increasing severity of prescription opioid use despite significantly fewer individuals engaging in nonmedical use. Likewise, alarmingly, both heroin use and heroin use disorder more than doubled among nonmedical tranquilizer users within a decade. Heroin use disorder and

Table 1
Characteristics of Past-Year Nonmedical Tranquilizer Users in the United States, 2005–2014.

	2005/06 (n = 3249)	2007/08 (n = 3292)	2009/10 (n = 3488)	2011/12 (n = 3177)	2013/14 (n = 2816)	% Absolute Change from 2005/06 to 2013/14	% Relative Change from 2005/06 to 2013/14	*P*-value
Tranquilizer Prevalence	2.1	2.1	2.2	2.2	2.0	−0.1	−4.8	.716
Prevalence Within Users								
Age Group								
Age 12–17	9.9	9.6	8.3	8.1	7.1	−2.8	−28.5	< .001
Age 18–25	35.4	33.1	32.3	28.8	29.2	−6.2	−17.5	< .001
Age 26–34	22.0	21.2	20.8	25.1	26.9	4.9	22.3	.001
Age 35–49	24.8	23.3	22.2	22.2	20.2	−4.6	−18.5	.015
Age > 50	7.9	12.8	16.4	15.8	16.5	8.6	108.1	< .001
Sex								
Male	50.3	48.3	51.5	47.4	50.0	−0.3	−0.6	.722
Female	49.7	51.7	48.5	52.6	50.0	0.3	0.6	.722
Race/Ethnicity								
White	83.0	82.7	81.2	76.3	75.1	−7.9	−9.5	< .001
Black	4.1	5.9	4.9	6.1	7.6	3.5	84.7	.002
Hispanic	10.5	8.2	10.6	13.5	12.8	2.3	21.9	.007
Other	2.4	3.2	3.3	4.1	4.5	2.1	87.0	.001
Education								
High School or Less	49.5	47.0	46.0	45.9	39.8	−9.7	−19.6	< .001
Some College	31.5	31.3	28.1	30.3	32.4	0.9	2.9	.856
College or more	19.0	21.7	25.9	23.8	27.9	8.9	46.8	.001
Income								
< $20,000	57.7	55.5	58.7	60.1	59.0	1.3	2.3	.202
$20,000-$49,999	31.4	32.0	24.7	26.0	25.0	−6.4	−20.4	< .001
> $50,000	10.9	12.6	16.6	13.9	16.0	5.1	46.8	.005
Marital status								
Not Married	73.2	71.3	71.5	72.5	77.3	4.1	5.6	.078
Married	26.8	28.7	28.5	27.5	22.7	−4.1	−15.3	.078
Insurance								
No	27.3	26.7	24.2	26.6	22.4	-4.9	-17.9	.031
Yes	72.7	73.3	75.8	73.4	77.6	4.9	6.7	.031
Medicare	2.6	3.1	4.1	3.7	7.4	4.9	190.6	.002
Medicaid/CHIP	11.4	10.7	13.7	15.2	17.2	5.8	50.9	< .001
Military Health Insurance	2.3	2.0	2.9	2.2	2.8	0.5	20.3	.499
Private Insurance	58.1	59.0	57.4	54.3	54.4	-3.7	-6.4	.022
Employer or Union Plan	52.9	51.6	50.6	49.7	47.4	-5.5	-10.4	.012
Other Health Insurance	2.1	2.6	2.1	2.3	2.9	0.8	35.8	.349
Past-Year Tranquilizer Use Characteristics								
Past-Month Nonmedical Use	35.3	35.0	37.4	35.9	33.6	−1.7	−4.8	.572
Past-Year Abuse	4.1	4.0	3.4	4.8	3.4	−0.7	−17.1	.751
Past-Year Dependence	4.1	4.2	5.5	4.4	4.8	0.7	17.1	.389
Past-Year Use Disorder	8.1	8.2	8.9	9.2	8.2	0.1	1.2	.614
Need for Treatment due to Use	0.8	0.7	0.4	0.7	0.4	−0.4	−50.0	.236
Frequency of Nonmedical Use								
1–2 Days	21.9	20.5	22.1	22.7	24.7	2.8	12.8	.118
3–5 Days	19.8	19.2	17.7	19.5	18.4	−1.4	−7.1	.562
6–16 Days	19.5	20.2	19.7	19.1	18.8	−0.7	−3.6	.533
17–52 Days	22.2	22.0	21.8	19.9	18.7	−3.5	−15.8	.009
53+ Days	16.7	18.1	18.8	18.9	19.4	2.7	16.2	.107
Past-Year Drug Use								
Alcohol	91.5	91.5	91.8	90.9	90.7	−0.8	−0.9	.464
Marijuana	59.9	59.3	59.7	60.9	62.1	2.2	3.7	.206
Cocaine	29.5	26.0	21.8	20.9	23.4	−6.1	−20.7	< .001
Sedatives (nonmedical)	6.7	7.3	7.5	3.8	6.3	−0.5	−7.1	.044
Opioids (nonmedical)	64.8	60.6	60.9	60.7	54.0	−10.8	−16.7	< .001
Heroin	3.7	3.4	5.7	5.1	7.9	4.2	114.1	< .001
Past-Year Opioid Use Disorder	13.4	14.8	15.8	16.4	16.7	3.3	24.6	.019
Past-Year Heroin Use Disorder	2.2	2.0	3.3	3.6	5.6	3.4	151.3	< .001

Note: P-values are for trends, which are not necessarily linear. Education was not queried for individuals ages 12–17. Past-year drug use disorder was defined as abuse or dependence as per DSM-IV criteria. Need for treatment due to tranquilizer use was not dependent on nonmedical use. Frequency of nonmedical tranquilizer use was split into quintiles based on aggregated data. CHIP = Children's Health Insurance Program.

heroin use increasing among tranquilizer users is particularly concerning, as this suggests increases in possible concomitant use of these substances.

Our findings echo similar national trends in nonmedical opioid analgesic use. A study also examining NSDUH data found that, while nonmedical prescription opioid use decreased from 2003 to 2014, there were significant increases in the prevalence of opioid abuse or dependence among users during the same time period (Jones, 2017). In addition, the nonmedical use of tranquilizers or sedatives increased 39.7% among individuals with prescription opioid abuse or dependence (Jones, 2017). So while it appears that nonmedical use of prescription opioids or tranquilizers is decreasing or staying stable, the use of

tranquilizers among people who have an opioid use disorder is increasing.

Although this study was unable to determine whether individuals directly combined drugs, it should be noted that the concurrent use of opioids and benzodiazepines is particularly dangerous for older adults, who are increasingly likely to use tranquilizers nonmedically and are already at high risk for experiencing adverse effects from such substances (Hampton et al., 2014). The more than doubling of older nonmedical tranquilizer users and near doubling of nonmedical tranquilizer use among older opioid users is alarming. National organizations and clinical guidelines need to continue to emphasize the wide range of risks of benzodiazepines for older adults and that they should not be first-line treatment for sleep, agitation, or delirium for older adults (American Geriatrics Society, 2015).

Our study also identified significant increases in nonmedical tranquilizer use among non-White individuals, while White individuals reported a significant decrease in nonmedical tranquilizer use. While one study found that White individuals who are prescribed benzodiazepines have a higher relative rate of benzodiazepine abuse compared to other races, perhaps due to non-Whites being given fewer benzodiazepine prescriptions (Cook et al., 2018), few other studies have focused on racial or ethnic differences in nonmedical benzodiazepine use. Research to better understand differences in nonmedical benzodiazepine use by racial and ethnic groups is needed, particularly given the national increase in nonmedical use by non-White individuals.

Finally, nonmedical tranquilizer use increased among those with insurance—particularly among those with Medicare. In 2003, The Medicare Modernization Act (MMA) created outpatient prescription drug coverage through Medicare Part D, beginning in 2006, which was changed in 2013. The MMA excluded benzodiazepines from Medicare Part D coverage due to potential harms of benzodiazepines for older adults. A study of non-Medicaid individuals aged ≥65 enrolled in a national Medicare Advantage plan from 2005 to 2007 found a decrease in benzodiazepine use (Ong et al., 2012). However, our study, stratified by insurance type, found significant increases in nonmedical tranquilizer use from 2005/06 to 2013/14 among adults with Medicare. The increase between 2011/12 to 2013/14 among Medicare patients could possibly be explained by the change in MMA in 2013, making benzodiazepines more widely available. However, the increase during the exclusion of benzodiazepines from Medicare Part D (2006–2012) we found in our study is consistent with a study examining trends in use of benzodiazepine and non-benzodiazepine hypnotics in multiple waves of NHANES, which found that prevalence of use of these medications increased between 1999 and 2014 (Kaufmann et al., 2018). However, that study examined all use and not specifically nonmedical use. For patients on Medicare, between 2006 to 2012, benzodiazepines must have been obtained through out-of-pocket costs, through other co-insurance, or illegally through other sources. Further research on the MMA and how its change in benzodiazepine coverage in 2013 influenced nonmedical tranquilizer misuse among older adults is needed.

4.1. Limitations

Institutionalized individuals were not surveyed by NSDUH, which may have affected the generalizability of findings. Changes in drug availability (e.g., due to changes in prescribing practices) and potential shifts regarding who was included in the survey (e.g., potential shifts in homelessness or incarceration related to drug use) could have affected generalizability of findings. A limitation is that we could not include newer data (collected after 2014) in our trend analyses, as NSDUH updated its definition of nonmedical use in 2015 and changed its questions regarding nonmedical prescription drug use. Another limitation is that NSDUH does not specifically ask about past-year benzodiazepine use but groups benzodiazepines into the tranquilizer category, which also includes prescription muscle relaxants and other anti-anxiety agents. We did, however, estimate that 93.9% of past-year nonmedical tranquilizer users have used benzodiazepines nonmedically in their lifetime, but we could not determine which tranquilizer(s) was used in the past year.

5. Conclusions

Results suggest that potential high-risk nonmedical tranquilizer use has increased. While prevention and treatment efforts should consider shifting demographic characteristics of nonmedical users, focus on concomitant use of tranquilizers and opioids and use by older adults is needed.

Role of the funding source

Research reported in this publication was supported by the National Institute on Drug Abuse of the National Institutes of Health under Award Numbers K01DA038800 (PI: Palamar), K23DA043651 (PI: Han), and R01DA037866 (PI: Martins). The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health. The authors would like to thank the Inter-university Consortium for Political and Social Research for providing access to these data (http://www.icpsr.umich.edu/icpsrweb/landing.jsp).

Contributors

All authors are responsible for this reported research. J. Palamar conceptualized and designed the study and conducted the statistical analyses. S.S. Martins mentored J. Palamar with regard to analyses. All authors drafted the initial manuscript, interpreted results, and critically reviewed and revised the manuscript. All authors approved the final manuscript as submitted.

Conflict of interest

No conflict declared.

Acknowledgments

The authors would like to thank the Inter-university Consortium for Political and Social Research for providing access to these data (http://www.icpsr.umich.edu/icpsrweb/landing.jsp).

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