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Short Communication

Prescription opioid misuse among middle-aged and older adults in the United States, 2015–2016

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ABSTRACT

Adults ≥ 50 years of age have high rates of prescription opioid use. The purpose of this study is to estimate the prevalence and correlates of prescription opioid misuse among middle-aged and older adults in the United States who use prescription opioids. Data from adults age ≥ 50 from the two most recent cohorts (2015 and 2016) of the National Survey of Drug Use and Health were examined ($N = 17,608$). Characteristics of past-year prescription opioid misusers, including demographics, substance use, depression, chronic disease, and emergency department (ED) use, were compared to adults who used prescription opioids as prescribed in the past year and non-users. We used multivariable logistic regression to determine correlates of prescription opioid misuse among adults who used prescription opioids. Among the entire sample, 61.4% reported no past-year prescription opioid use, 36.0% reported past-year prescription opioid use without misuse, and 2.5% reported past-year prescription opioid misuse. Among past-year prescription opioid users, 6.6% reported misuse. Past-year misuse was higher among males, adults age 50–64, misusers of prescription sedatives, stimulants, and tranquilizers, users of other substances (i.e., tobacco, marijuana, cocaine), and those with alcohol use disorder. Past-year misuse was lower among adults with 2 or more chronic diseases. Past-year prescription misuse of sedatives (AOR 4.08 [95% CI 2.05–8.12]), stimulants (AOR 3.88 [95% CI 2.00–7.53]), and tranquilizers (AOR 10.02 [95% CI 6.48–15.50]) were all associated with past-year opioid misuse. Characteristics of opioid misusers determined in this study—particularly misuse of other substances—may help determine middle-aged and older adults at risk for prescription opioid misuse.

1. Introduction

There was a fivefold increase in prescription opioid overdose deaths from 1996 to 2016 in the United States (US) (Center for Disease Control, 2018). While studies have estimated the prevalence and characteristics of younger adults who misuse prescription opioids, little research has focused specifically on middle-aged and older adults. This is imperative because middle-aged and older adults (≥ 50 years of age) use prescription opioids at a higher rate compared to younger adults (B. Han et al., 2017). Due to the physiological changes of aging and increased chronic medical disease burden, older adults are particularly vulnerable to overdose, especially when co-using other prescribed medications (Jones and McAninch, 2015). Understanding prescription opioid misuse among older adults can inform providers of unique risks

and the development of focused interventions.

We used nationally representative data from the National Survey on Drug Use and Health (NSDUH), utilizing its revised and updated questions on prescription psychotherapeutic medication misuse beginning in 2015, to estimate the prevalence of prescription opioid misuse and examine characteristics of misuse by middle-aged and older adults who use prescription opioids. Prior to 2015, NSDUH inquired about “nonmedical use”, defined as when a prescription opioid was used when not prescribed to the user or used for the experience or feeling caused by the drug (Blazer and Wu, 2009; Schepis et al., 2018). However, this definition of nonmedical use can be misleading as it is possible for patients to use as prescribed and still enjoy the feeling from its use. This is the first study to our knowledge that uses the revised misuse definition to investigate recent prescription opioid misuse by middle-

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Table 1
 Characteristics of middle-aged and older adults self-reporting past-year prescription opioid misuse by demographics, substance use, and health status, NSDUH 2015–2016^a.

| Characteristic | Full sample for all adults age ≥ 50 years (n = 17,517), weighted % (95% CI) ^b | Age ≥ 50 years without past-year opioid use (n = 10,791), weighed % (95% CI) ^b | Age ≥ 50 years with past-year prescription opioid use as prescribed (n = 6288), weighted % (95% CI) ^b | Age ≥ 50 years with past-year prescription opioid misuse (n = 438), weighted % (95% CI) ^b | p-Value (opioid use as-prescribed vs opioid misuse) |
|---------------------------------------------------|------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|-----------------------------------------------------|
| Age | | | | | |
| 50–64 | 56.9 (55.9, 58.0) | 55.9 (54.5, 57.3) | 57.1 (55.5, 58.7) | 79.7 (76.1, 82.8) | < 0.001 |
| 65 and older | 43.1 (42.0, 44.1) | 44.1 (42.7, 45.5) | 42.9 (41.3, 44.5) | 20.3 (17.2, 23.9) | |
| Sex | | | | | |
| Male | 46.9 (45.8, 48.0) | 47.9 (46.5, 49.3) | 44.7 (43.0, 46.4) | 54.4 (49.4, 59.4) | 0.001 |
| Female | 53.1 (52.0, 54.2) | 52.1 (50.7, 53.5) | 55.3 (53.6, 57.0) | 45.6 (40.6, 50.6) | |
| Race/ethnicity | | | | | |
| Non-Hispanic White | 73.2 (72.1, 74.4) | 71.8 (70.6, 73.0) | 76.0 (74.2, 77.7) | 69.0 (63.6, 73.9) | 0.02 |
| Non-Hispanic African American | 10.3 (9.7, 11.0) | 10.1 (9.5, 10.8) | 10.4 (9.3, 11.6) | 13.0 (9.5, 17.6) | |
| Hispanic | 10.2 (9.6, 10.8) | 11.4 (10.6, 12.2) | 7.9 (7.0, 8.9) | 13.1 (9.5, 17.8) | |
| Non-Hispanic Asian | 4.0 (3.5, 4.6) | 4.8 (4.0, 5.7) | 2.9 (2.3, 3.6) | 2.2 (0.9, 5.4) | |
| Other | 2.2 (2.1, 2.5) | 1.9 (1.6, 2.2) | 2.8 (2.4, 3.3) | 2.6 (1.5, 4.6) | |
| Total family income | | | | | |
| < \$20,000 | 16.1 (15.3, 16.9) | 15.0 (14.1, 15.9) | 17.3 (16.2, 18.5) | 26.3 (21.5, 31.8) | 0.001 |
| \$20–\$49,999 | 30.2 (29.2, 31.2) | 29.5 (28.2, 30.8) | 31.6 (30.1, 33.2) | 28.8 (24.2, 33.8) | |
| \$50,000–\$74,999 | 17.1 (16.3, 17.9) | 17.4 (16.5, 18.4) | 16.5 (15.3, 17.8) | 16.1 (12.5, 20.5) | |
| ≥ \$75,000 | 36.6 (35.6, 37.7) | 38.1 (36.9, 39.4) | 34.5 (33.0, 36.1) | 28.8 (23.9, 34.2) | |
| Marital status | | | | | |
| Married | 61.9 (61.0, 62.8) | 63.2 (62.0, 64.3) | 60.6 (59.1, 62.2) | 49.7 (44.2, 55.1) | < 0.001 |
| Widowed | 12.3 (11.7, 12.9) | 12.3 (11.5, 13.2) | 12.3 (11.2, 13.4) | 10.4 (7.4, 14.4) | |
| Divorced or separated | 18.2 (17.4, 19.1) | 16.8 (15.8, 17.8) | 20.1 (18.7, 21.6) | 26.8 (22.1, 32.1) | |
| Never married | 7.6 (7.2, 8.0) | 7.7 (7.1, 8.4) | 6.9 (6.2, 7.8) | 13.2 (9.4, 18.2) | |
| Drug and other substance use – past year | | | | | |
| Tobacco use | 22.0 (21.2, 22.8) | 19.1 (18.1, 20.1) | 25.6 (24.3, 27.0) | 40.4 (34.4, 46.6) | < 0.001 |
| Cocaine use | 0.7 (0.5, 0.8) | 0.4 (0.3, 0.5) | 0.8 (0.5, 1.0) | 7.0 (4.5, 10.7) | < 0.001 |
| Marijuana use | 6.4 (5.8, 7.0) | 4.1 (3.7, 4.7) | 8.8 (7.8, 10.0) | 26.0 (21.0, 31.7) | < 0.001 |
| Alcohol use disorder ^c | 3.4 (3.2, 3.7) | 2.8 (2.5, 3.2) | 3.8 (3.2, 4.4) | 14.2 (10.4, 18.9) | < 0.001 |
| Prescription sedative use – past year | | | | | |
| As prescribed sedative use | 9.0 (8.4, 9.7) | 4.7 (4.2, 5.2) | 15.5 (14.4, 16.7) | 21.5 (17.8, 25.7) | < 0.001 |
| Prescription sedative misuse | 0.5 (0.4, 0.6) | 0.2 (0.2, 0.4) | 0.6 (0.4, 0.8) | 4.9 (3.6, 6.6) | |
| Prescription tranquilizer use – past year | | | | | |
| As prescribed tranquilizer use | 16.5 (15.9, 17.1) | 9.4 (8.9, 10.0) | 27.8 (26.6, 29.1) | 27.8 (23.6, 32.4) | < 0.001 |
| Prescription tranquilizer misuse | 1.1 (1.0, 1.4) | 0.5 (0.4, 0.7) | 1.1 (0.9, 1.5) | 15.9 (12.0, 20.7) | |
| Prescription stimulant use – past year | | | | | |
| As prescribed stimulant use | 3.4 (3.0, 3.7) | 1.9 (1.6, 2.3) | 5.3 (4.6, 6.1) | 9.4 (6.6, 13.3) | < 0.001 |
| Prescription stimulant misuse | 0.3 (0.2, 0.4) | 0.2 (0.1, 0.2) | 0.3 (0.2, 0.6) | 4.1 (2.2, 7.5) | |
| 2 or more chronic diseases ^d | 26.0 (25.1, 26.9) | 21.3 (20.5, 22.2) | 33.8 (32.1, 35.6) | 28.4 (24.5, 32.5) | 0.01 |
| All-cause emergency department use past year | 25.9 (25.1, 26.7) | 18.6 (17.8, 19.5) | 37.5 (36.0, 39.0) | 36.9 (31.7, 42.3) | 0.82 |
| Major depressive episode – past year ^c | 4.8 (4.4, 5.2) | 2.9 (2.5, 3.3) | 7.4 (6.7, 8.3) | 13.8 (10.0, 18.7) | < 0.001 |

^a Data from the 2015 and 2016 US National Survey on Drug Use and Health (NSDUH).

^b All percentages are weighted and percentages have been rounded and may not sum to 100; CI = confidence interval.

^c Based on the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition.

^d Chronic conditions include: asthma, bronchitis/COPD, cirrhosis, diabetes, heart disease, hepatitis, hypertension, HIV/AIDS, cancer, kidney disease.

aged and older adults, a population with the highest rates of prescription opioid use (B. Han et al., 2017).

2. Methods

Using NSDUH, we analyzed cross-sectional, aggregated data from adults age ≥ 50 years of age (n = 17,608) participating in the two most recent survey years of NSDUH: 2015 and 2016. Since the outcome of interest (i.e. prescription drug misuse) was relatively rare, similar to

previous analyses (Blazer and Wu, 2009; B.H. Han et al., 2017; Hasin et al., 2015), we aggregated years into pairs to increase power. NSDUH surveys probability samples of non-institutionalized individuals in the 50 US states and the District of Columbia through four sampling stages. The weighted interview response rates were 69.7% and 68.4%, respectively (Center for Behavioral Health Statistics and Quality, 2018). In 2015, NSDUH revised its terminology for prescription drug misuse to use “in any way that a doctor did not direct you to use them, including use without a prescription of the respondent’s own; use in greater

amounts, more often, or longer than the respondent was told to take them; or use in any other way a doctor did not direct the respondent to use them” (Center for Behavioral Health Statistics and Quality, 2018).

We analyzed key differences between three groups (all age ≥ 50): 1.) adults who did not use opioids in the past-year; 2.) adults who used prescription opioids, but did not report misuse (took as prescribed) in the past-year; and 3.) adults who reported past-year prescription opioid misuse. For the three groups we examined differences regarding sociodemographic characteristics, medical multimorbidity (defined as ≥ 2 concurrent chronic conditions among the following: asthma, bronchitis/COPD, cirrhosis, diabetes, heart conditions, hepatitis, high blood pressure, cancer, kidney disease and HIV/AIDS), past-year substance use (i.e., tobacco marijuana, cocaine), past-year use and misuse of prescription sedatives (zolpidem, eszopiclone, and zaleplon products; the specific benzodiazepine sedatives—flurazepam, temazepam, and triazolam; barbiturates), stimulants (amphetamine products, methylphenidate products, and anorectic stimulants), and tranquilizers (all other benzodiazepines and muscle relaxants) (Center for Behavioral Health Statistics and Quality, 2018), past-year alcohol use disorder (AUD) and past-year major depressive episode (based on Diagnostic and Statistical Manual of Mental Disorders-IV criteria) (American Psychiatric Association, 1994), and all-cause emergency department (ED) use. Comparisons were first conducted using chi-square tests. We then estimated odds of each covariate separately for opioid misuse among only opioid users (opioid misusers vs. as-prescribed opioid users), generating unadjusted odds ratios (ORs), and then fit all covariates simultaneously using multivariable logistic regression to estimate adjusted odds ratios (AORs). The multivariable model was also adjusted for survey year (2016 versus 2015) to adjust for potential secular trends in use over time. Analyses were conducted using Stata SE 13 and weighted to account for the complex survey design. Taylor series estimation methods were utilized to provide accurate standard errors (Heeringa et al., 2010). Secondary analysis of this publically available data was exempt for review by the authors' Institutional Review Board.

3. Results

Of respondents age ≥ 50 , 36.0% (95% CI 35.1–37.0%) reported past-year prescription opioid use as prescribed, and 2.5% (95% CI 2.2–2.9%) reported past-year prescription opioid misuse. By age group: among adults age 50–64, 36.2% (95% CI 34.8–37.5%) reported past-year opioid use as prescribed and 3.6% (95% CI 3.2–4.0%) reported past-year opioid misuse, while among adults age ≥ 65 35.9% (95% CI 34.5–37.2%) reported past-year opioid use as prescribed and 1.2% (95% CI 0.9–1.5%) reported past-year opioid misuse. Among opioid users, 6.6% (95% CI 5.8–7.4%) of opioid users age ≥ 50 reported misuse, 8.9% (95% CI 7.9–10.1%) of opioid users age 50–64 reported misuse, and 3.2% (2.6–4.0%) of opioid users age ≥ 65 reported misuse. Table 1 shows characteristics and correlates of past-year prescription opioid misusers compared to past-year prescription opioid users who used as prescribed. Prescription opioid misusers were mostly age 50–64, male, Hispanic, had lower income, were less likely to be married, more likely to have depression, and reported higher prevalence of tobacco, cocaine, and marijuana use. They also had a significantly higher prevalence of past-year AUD, sedative misuse, stimulant misuse, and tranquilizer misuse. Respondents who reported past-year prescription opioid use taken as prescribed reported a higher prevalence of having 2 or more chronic diseases.

Table 2 presents the multivariable analysis where those age ≥ 65 and with Hispanics (compared to non-Hispanic whites), and those reporting use of marijuana and cocaine were at higher odds for reporting past-year prescription opioid misuse among opioid users. AUD (AOR 1.94 [95% CI 1.24–3.05]), sedative misuse (AOR 4.08 [95% CI 2.05–8.12]), stimulant misuse (AOR 3.88 [95% CI 2.00–7.53]), and tranquilizer misuse (AOR 10.02 [95% CI 6.48–15.50]) were also

associated opioid misuse.

4. Discussion

The use of other substances by older adults who misuse prescription opioids is prevalent. Our estimates for prescription opioid misuse among older adults (3.6% among adults age 50–64 and 1.2% among adults age ≥ 65) using recent survey years of NSDUH with the updated misuse definition are higher compared to studies using NSDUH's previous “nonmedical use” definition. A study of NSDUH from 2005/2006 estimated prescription opioid misuse to be 1.9% among adults age 50–64 and 0.6% among adults age ≥ 65 (Blazer and Wu, 2009), while a more recent study of aggregated 2009–2014 NSDUH data found a prevalence rate of 2.4% among adults age 50–64 and 0.7% among adults age ≥ 65 (Schepis et al., 2018). While these prevalence estimates are not directly comparable, our higher prevalence estimates may reflect a combination of increase prescription opioid misuse by this population and a more accurate inclusion of misusing behaviors with the updated misuse definition.

This study also estimated higher prevalence of unhealthy alcohol use, tobacco use, marijuana use, cocaine use, and other prescription psychotherapeutic drug misuse (sedatives, stimulants, and tranquilizers) among older adults who misuse prescription opioids compared to non-misusers. The strong association between prescription opioid misuse and misuse of other prescribed psychotherapeutic medications and alcohol use disorders in this population is concerning, and not been noted in previous studies among older adults (Blazer and Wu, 2009). Nationally, there is an increase of psychotherapeutic medication use (Maust et al., 2017) by older adults who are at highest risk for adverse drug events especially from both benzodiazepine and non-benzodiazepine sedative-hypnotics and anxiolytics (Hampton et al., 2014), including the concomitant prescribing of opioids and benzodiazepines (Hwang et al., 2016). In addition, there have been dramatic increases in unhealthy alcohol use by older adults (B.H. Han et al., 2017). The concurrent use of opioids and other substance use, especially benzodiazepines and alcohol, are particularly dangerous for older adults placing them at high risk for overdose and other adverse events (Jones and McAninch, 2015). The U.S. Food and Drug Administration (FDA) has issued its strongest warning regarding the risks and death when combining opioid medications with benzodiazepines (U.S. Food and Drug Administration, 2016). The association of prescription stimulant misuse and opioid misuse for older adults requires further study. Studies on the concurrent use of stimulants and opioids have focused on younger adults with attention-deficit/hyperactivity disorder, but not specifically for older adults (Wei et al., 2018; Zulauf et al., 2014). The co-use of stimulants and opioids, particularly if misused, could have potential harms (Calcaterra et al., 2013; Trujillo et al., 2011). While our study could not determine whether drugs were used concomitantly, our findings of past-year misuse of both prescription opioids and other psychotherapeutic prescription medications and unhealthy alcohol use has important public health implications.

This study also found a correlation of middle-aged and older Hispanic adults and prescription opioid misuse. Data from 2015 NSDUH for all adults age 18 and older found that Hispanic adults who took prescription opioids had a high prevalence of misuse at 14.1% (B. Han et al., 2017). The racial and ethnic differences for risks of prescription opioid misuse in general have not been well-studied, especially for middle-aged and older adults. Future work is needed to explain the association of prescription opioid misuse among Hispanic populations to better delineate risks for and ensuring equitable treatment for prescription opioid misuse. We also found a higher prevalence of past-year major depressive episode among adults reporting opioid misuse. Previous studies show the relationship between depression and increased risk for nonmedical opioid use for adolescents and adults (Fink et al., 2015; Sullivan, 2018), but none have focused on older adults. While the association between depression and prescription opioid misuse was lost

Table 2
Multivariable model revealing correlates of opioid misuse among opioid users, NSDUH 2015–2016^a.

| Characteristic | Odds ratio | (95% CI) | Adjusted odds ratio ^b | (95% CI) |
|---------------------------------------------------|------------|----------------|----------------------------------|---------------|
| Age | | | | |
| 50–64 | 1.00 | | 1.00 | |
| 65 and older | 0.34 | (0.27, 0.42) | 0.46 | (0.36, 0.58) |
| Sex | | | | |
| Male | 1.00 | | 1.00 | |
| Female | 0.68 | (0.54, 0.84) | 0.70 | (0.51, 0.97) |
| Race/ethnicity | | | | |
| Non-Hispanic White | 1.00 | | 1.00 | |
| Non-Hispanic African American | 1.38 | (0.99, 1.92) | 1.24 | (0.84, 1.83) |
| Hispanic | 1.83 | (1.28, 2.61) | 2.02 | (1.33, 3.07) |
| Non-Hispanic Asian | 0.85 | (0.31, 2.34) | 1.30 | (0.52, 3.26) |
| Other | 1.02 | (0.56, 1.86) | 0.92 | (0.49, 1.71) |
| Total family income | | | | |
| < \$20,000 | 1.00 | | 1.00 | |
| \$20–\$49,999 | 0.60 | (0.43, 0.83) | 0.78 | (0.55, 1.09) |
| \$50,000–\$74,999 | 0.64 | (0.46, 0.89) | 0.87 | (0.55, 1.38) |
| ≥ \$75,000 | 0.55 | (0.39, 0.76) | 0.73 | (0.48, 1.10) |
| Marital status | | | | |
| Married | 1.00 | | 1.00 | |
| Widowed | 1.03 | (0.68, 1.57) | 1.37 | (0.84, 2.26) |
| Divorced or separated | 1.62 | (1.27, 2.08) | 1.07 | (0.76, 1.50) |
| Never married | 2.32 | (1.60, 3.37) | 1.30 | (0.80, 2.12) |
| Drug and other substance use - past year | | | | |
| Tobacco use | 1.96 | (1.50, 2.57) | 1.16 | (0.81, 1.65) |
| Cocaine use | 9.87 | (5.55, 17.55) | 2.52 | (1.21, 5.25) |
| Marijuana use | 3.62 | (2.71, 4.84) | 2.15 | (1.44, 3.20) |
| Alcohol use disorder ^c | 4.22 | (2.91, 6.13) | 1.94 | (1.24, 3.05) |
| Prescription sedative use – past year | | | | |
| As prescribed sedative use | 1.58 | (1.24, 2.02) | 1.26 | (0.91, 1.74) |
| Prescription sedative misuse | 9.98 | (6.93, 14.38) | 4.08 | (2.05, 8.12) |
| Prescription tranquilizer use - past year | | | | |
| As prescribed tranquilizer use | 1.26 | (0.97, 1.64) | 1.13 | (0.79, 1.61) |
| Prescription tranquilizer misuse | 17.49 | (11.82, 25.89) | 10.02 | (6.48, 15.50) |
| Prescription stimulant use - past year | | | | |
| As prescribed stimulant use | 1.93 | (1.22, 3.04) | 1.47 | (0.83, 2.58) |
| Prescription stimulant misuse | 13.39 | (5.68, 31.59) | 3.88 | (2.00, 7.53) |
| 2 or more chronic diseases ^d | 0.77 | (0.63, 0.95) | 0.89 | (0.68, 1.16) |
| All-cause emergency department use past-year | 0.97 | (0.78, 1.22) | 0.90 | (0.70, 1.17) |
| Major depressive episode – past year ^c | 1.99 | (1.34, 2.96) | 1.25 | (0.83, 1.90) |

^a Data from the 2015 and 2016 US National Survey on Drug Use and Health (NSDUH).

^b Multivariable model adjusted for all variables including survey year to adjust for potential secular trends in use over time.

^c Based on the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition.

^d Chronic conditions include: asthma, bronchitis/COPD, cirrhosis, diabetes, heart disease, hepatitis, hypertension, HIV/AIDS, cancer, kidney disease.

in our adjusted models for older adults, the role of depression for opioid misuse among older adults needs further study.

This study has limitations. NSDUH relies on self-report and therefore is subject to social-desirability bias and recall bias, although the survey attempts to limit the former via audio computer-assisted self-interviewing. Second, because NSDUH samples the civilian, non-institutionalized population, it does not include active members on the military, homeless, incarcerated, or institutionalized adults (including nursing homes) who may have different prescription opioid use patterns. However, NSDUH does sample individuals living in retirement residences, residential care, and assisted living residences thereby including older adults living in such locations ([Substance Abuse and Mental Health Services Administration, 2018](#)). Finally, the survey is cross-sectional; therefore, this study cannot establish causality.

5. Conclusions

This study indicates there is a population of high-risk older adults who engage in potentially dangerous polysubstance use. Focus needs to be placed on screening at-risk older adults for substance use and

prescription drug misuse, and to minimize the overall use of opioids, sedatives, and tranquilizers. Emphasis should be on educating providers to decrease potentially inappropriate medications for older adults who are at high risk for adverse events from prescription drug misuse. Education is also needed to inform patients of the risks of overdose from concurrent use of these drugs and with alcohol. While unhealthy substance use by older adults is often overlooked, substance use including misuse of other prescribed medications by older adults who misuse prescription opioids needs to be recognized as a serious public health issue.

Declaration of interest

The authors declare no conflict of interest and have no financial disclosures.

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