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Sources of opioid medication for misuse in older adults: results from a nationally representative survey

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INTRODUCTION

As the “Baby Boomer” generation ages into older adulthood, rates of older adult prescription opioid (PO) misuse and prescription opioid use disorders (POUDs) are projected to increase [7]. Perhaps because younger adult PO misuse rates are much higher [5], adults 50 years of age and older have not been a focus of PO misuse research. Nonetheless, National Survey on Drug Use and Health [NSDUH; 35] and poison center data [41] indicated that older adult PO misuse roughly doubled from 2002–03 to 2012–13 and 2006 to 2014, respectively. PO-related mortality and opioid use with suicidal intent increased by 185% between 2006 and 2013 in adults 60 and older [42], and fatal overdose increased by 231% in those 55 and older over the decade to 2015 [6]. These data support Colliver and colleagues [7]: older adult PO misuse and related consequences have increased.

Older adult PO misuse phenomena are underexplored, with commentators calling for research [20; 22; 43]. Older adults are more likely to experience chronic pain [12; 21], are prescribed more opioid and other CNS depressant medication and experience more medication-related problems than younger groups [40]. Older adults may have greater PO access for misuse, heightening the likelihood of dangerous interactions with alcohol or other medication [17; 29; 30]. Research could identify older adult PO misuse characteristics to target via policy and prevention, limiting the likelihood of such misuse.

One target could be sources (i.e., how medications are obtained) of POs misused by older adults. Adolescents often obtain misused POs from peers or family [34], while young adults use peers more often [24; 25]. NSDUH data indicated two primary PO sources across the US population: friends or relatives for free (40.5%) and a single physician (34.0%); no other source exceeded 10% [15]. Preliminary research [27] suggested that older adults were more

likely to use multiple physician sources than younger groups, but little else is known. Identification of older adult PO sources provides two intervention targets: those prescribed POs, as they can receive education on the consequences of PO misuse and diversion; and, individuals using sources associated with greater risk behavior, as they can be targeted for intensive interventions. Evidence from adolescents [34] and young adults [25; 26] suggests that use of purchases or multiple sources is associated with problematic substance use.

Using 2009–2014 NSDUH data, this work aimed to quantify PO misuse sources in adults aged 50 and older, with examination of the 50 to 64 and 65 and older groups separately. Older adults were compared to younger age groups to investigate age-based differences in sources. Further analyses within older adults examined sex differences in sources and the association of specific sources with PO misuse consequences [i.e., DSM-5 POUD symptoms; 2], non-opioid substance use and SUD symptoms. We hypothesized that older adults would make greater use of physician sources than younger groups and that use of multiple PO sources and purchases would be associated with POUD and non-opioid SUD symptoms, given their robust associations in younger groups [26; 34].

METHODS

The NSDUH is representative of the US at the time of the survey, using an independent, multistage area probability sample for all states and DC. Households are selected for screening, with identification of individuals aged 12 and older via in-person screening. Full interviews are conducted on a random sample of household members, per sampling area specifications. The NSDUH uses audio computer-assisted self-interviewing (ACASI) survey methods to ensure privacy and promote data accuracy and completeness, with all sensitive variables (e.g., PO misuse) assessed via ACASI. For ACASI questions, the participant wears headphones to hear all questions and the field interviewer remains out of view of the computer screen. The NSDUH includes automatic skip-outs, consistency checks based on previous answers and imputation to increase data completeness and consistency. Imputation occurred in less than 0.25% of cases for lifetime PO misuse, with PO misuse recency (e.g., past-year, past-month) imputed in between 2.5% and 3.1% of those engaged in lifetime PO; PO sources were not imputed. Weighted screening response rates for the 2009–14 data ranged from 81.9% (2014) to 88.4% (2009 and 2010); weighted full interview response rates ranged from 71.2% (2014) to 75.6% (2009). Please see Research Triangle Institute [32] and SAMHSA [37; 38] for more information on the NSDUH.

Participants

A total of 336,643 responses were included in the 2009–14 NSDUH public use files. Of these, 39,561 were 50 years and older (11.8%), with 24,384 between 50 and 64 years (7.2%) and 15,177 (4.5%) 65 years and older. The sample became more female (48.9% in those 12–17 years, versus 51.7% and 55.9% in the 50–64 and the 65 and older cohorts, respectively) and white (56.0% in those 12–17, versus 72.6% and 79.2% in the 50–64 and the 65 and older cohorts, respectively) with increasing age. Complete data on sociodemographics across age groups is provided in Table 1.

Measures

Sociodemographic characteristics included age group, sex, race/ethnicity and family income.

Lifetime prescription opioid misuse was assessed via the following question: “Have you ever, even once, used [opioid medication] that was not prescribed for you or that you took only for the experience or feeling it caused?” This question was repeated for a series of common opioid medications (e.g., Percocet®, Vicodin®) and once asking about “any other prescription pain reliever”. A “yes” answer to any such question endorsing opioid misuse (i.e., without a prescription or solely for the feeling it caused) qualified as *lifetime PO misuse*. To aid recall, participants are shown pictures of all queried medications and an extensive list of brand and generic names are included. These questions on lifetime PO misuse were preceded by instructions to participants to not include over-the-counter analgesic medication (e.g., ibuprofen) use in answers.

Past-year and past-month opioid misuse was assessed in those endorsing lifetime PO misuse through the following question: “How long has it been since you **last** used any prescription pain reliever that was not prescribed for you or that you took only for the experience or feeling it caused?” (emphasis from the NSDUH). Answers are then coded by NSDUH staff into summary variables for *past-year* and *past-month PO misuse*. Lifetime PO misuse has a kappa value of 0.78, and past year has a kappa value of 0.71, with both indicating good reliability [36].

Sources of opioid medication for misuse were assessed by providing a list of 10 specific opioid source options with the question: “how did you get these prescription pain relievers?”. Sources were assessed only in those with past-month PO misuse, and participants were asked to select all of the 10 potential sources they used in the past 30 days. The 10 individual sources were examined separately (text quoted in parentheses, to follow) and aggregated into six categories (bolded), based on previous work [34]: (1) **physician** (“got from one doctor” or “got from more than one doctor”), (2) **stole/fake prescription** (“took from friend or relative without asking,” “wrote fake prescription,” or “stole from doctor’s office, clinic, hospital, or pharmacy”), (3) **free from friend or relative** (“got from friend or relative for free”), (4) **purchased** (“bought from friend or relative,” “bought from drug dealer or other stranger,” or “bought on the internet”), (5) **other** (“got some other way”), and (6) **multiple sources** (use of two or more sources).

For the analyses of substance use correlates of PO source categories (please see Table 4), sources were coded to allow only one, mutually-exclusive, response from the six larger categories above, while source data for other analyses was not mutually-exclusive (i.e., participants could be counted in multiple single source categories and in the multiple sources group).

SUD symptoms were assessed using past-year DSM-IV SUD symptoms [1]. In the NSDUH, the 11 DSM-IV symptoms of substance abuse and substance dependence are assessed, and, the 10 applicable DSM-5 SUD symptoms were retained [2], Legal problems (a DSM-IV criterion) were excluded, and craving, which was not assessed in the DSM-IV, was not available for inclusion. Prescription opioid use disorder (POUD) symptom variables

included both a variable for any symptoms and one for having two or more symptoms; alcohol, marijuana, heroin, cocaine, hallucinogen, inhalant, prescription stimulant or prescription tranquilizer/sedative SUD symptoms were assessed in the same fashion. SUD categories were chosen to highlight initial impairment or distress from opioid misuse [any symptoms; 8] or symptoms consistent with the DSM-5 SUD diagnosis [two or more symptoms; 2], given the relative equality of SUD symptoms found elsewhere [10; 14].

Concurrent substance use included: past 30-day binge alcohol use (i.e., five or more drinks for males and four or more drinks for females in a single occasion); past year marijuana use; and, past year poly-prescription misuse (i.e., endorsement of both past year PO misuse and at least one of past year stimulant, tranquilizer or sedative misuse).

Data Analyses

Data were weighted, clustered on primary sampling units, and stratified appropriately. The Taylor series approximation [33; 44] was used, with adjusted degrees of freedom, to create robust variance estimates. All analyses used an adjusted person-level weight (weight/six) to account for the six years of NSDUH data used and creating nationally representative estimates.

Initial analyses employed weighted cross-tabulations to estimate prevalence and 95% confidence intervals (95% CIs) by age cohort of PO sources for misuse (Table 1), and lifetime, past year and past month PO misuse, prescription opioid misuse-related SUD symptoms and non-opioid SUD symptoms (Table 2). Primary analyses used design-based Rao-Scott chi-square tests of homogeneity [31]. When the initial chi-square test was significant, *post hoc* pairwise comparisons using design-based logistic regression were employed, with *p*-values Bonferroni-corrected for multiple comparisons. Secondary analyses used data from only adults aged 50 and older and examined three outcomes: (1) sex differences in PO sources (Supplemental Table C); (2) prevalence of POUD symptoms by PO source (Table 3); and, (3) the substance use correlates of PO sources (Table 4). As noted above, in the analyses of substance use correlates (Table 4), sources were coded to allow only one, mutually-exclusive, source, while source data for other analyses was not mutually-exclusive (i.e., participants could be counted in multiple single source categories and in the multiple sources group). All regression analyses included sex and race/ethnicity as control variables to create adjusted odds ratios. Analyses were performed in Stata 15.0 (StataCorp, 2017).

RESULTS

Source of Opioid Medication for Misuse by Age Group

Data on prevalence of PO misuse, POUD symptoms and other SUD symptoms by age group are provided in the online-only Supplemental Table A.

Use prevalence of the six aggregated PO source categories, including use of multiple sources, and pairwise comparisons are captured in Table 2; online-only Supplemental Table B includes data on the 10 individual sources. Physician source use rose with increasing age, with significant differences between individuals in the both the 50 to 64 year old (39%) and

65 and older (48%) groups from both adolescents aged 12–17 years (24%) and young adults aged 18–25 years (22%). Those aged 65 years and older were the most likely group to use physician sources.

As seen in Table 2, use of theft or a fake prescription to obtain POs for misuse generally decreased through the aging process, though a spike in theft/fake prescription source prevalence was seen in those aged 50 to 64 years. Obtaining a PO for misuse from a friend or relative for free demonstrated a non-linear progression in prevalence through aging, with lower rates in adolescents (37%), followed by sharp elevations in young adults (57%) and those aged 26 to 34 years (58%), and then declines to the 65 and older group (23%). The 65 and older group had the lowest rates of obtaining POs from friends or relatives for free, and both they and adolescents had significantly lower rates than those in the three age groups covering 18 to 49 years. Adults aged 50 to 64 years were intermediate in prevalence (48%) and did not significantly differ from other age groups.

A similar pattern was observed in prevalence of purchases to obtain POs for misuse, with low rates in adolescents, a spike in the young adult and 26 to 34 age groups (37% and 34%, respectively), followed by progressive declines. Those aged 65 and older were again the least likely to purchase POs (9%). As captured in Supplemental Table B, use of the internet to purchase POs for misuse was rare across ages, with no significant differences were found.

The lowest prevalence rate of multiple source use was found in adults aged 65 years and older (5%), though they did not significantly differ from any other group. Adolescents had the second lowest prevalence rate (21%), followed closely by adults aged 50 to 64 years (24%). Use of “other” sources did not significantly differ between any age groups. Examination of sex differences in PO source within adults who were 50 years of age and older revealed no significant differences. The data on sex differences are captured in online-only Supplemental Table C.

Prescription Opioid Use Disorder Symptoms by Opioid Medication Source in Adults Aged 50 and Older

In adults aged 50 and older, use of three sets of PO sources were significantly associated with higher rates of POUD symptoms, as compared to those engaged in PO misuse but not using that source: physician sources (52%, $p = 0.03$), purchases (68%, $p = 0.0003$) and use of multiple sources (65%, $p = 0.01$; please see Table 3). For physician sources, use of one physician appeared to primarily account for the significant difference, as shown in online-only Supplemental Table D. Of those with POUD symptoms, 75/150 (50.4% [weighted]) used physician sources, 11/150 used theft/fake prescription (7.9%), 59/150 used friends/relatives for free (39.7%), 41/150 used purchases (29.4%), 12/150 used other sources (7.4%) and 39/150 used multiple sources (29.7%). Data on the association of aggregated PO sources and PO-related SUD symptoms are captured in Table 3 (for the six, larger source categories) and in Supplemental Table D (for all 10 individual sources).

Substance-related Correlates of Opioid Sources in Adults Aged 50 Years and Older

For these analyses (outlined Table 4), larger source categories were coded in a mutually exclusive fashion, allowing participants 50 years and older to be coded as using one specific

source (e.g., purchases) or multiple sources in the past month, but not both. Relatively few significant differences were found when comparing these mutually-exclusive source groups to use of physician sources exclusively. Purchases were associated with elevated odds of past year marijuana use and past year poly-prescription drug misuse (i.e., misuse of opioids and at least one of stimulants, sedatives or tranquilizers), and use of multiple sources was associated with elevated odds of past year marijuana use. Those using “other” sources were less likely to have engaged in binge alcohol use in the past month than those using physician sources, and those obtaining POs for misuse from friends or relatives for free had lower odds of POUD symptoms than those using physician sources.

DISCUSSION

These results strongly suggest that older adults, especially those 65 years of age and older, are a unique group in terms of PO misuse sources. These results also suggest that adults 50 and older who use physician sources, purchases or multiple sources had elevated levels of POUD symptoms, as compared to those not using those sources. Those 65 years and older had the highest use of physician sources, including use of one or multiple physicians, and the lowest prevalence of theft/fake prescription, purchases, obtaining the opioid for free from friends and relatives or multiple PO source use. Nearly half (47.7%) of older adults 65 and older reported physicians as their source for misused POs. Those aged 50 to 64 years were somewhat intermediate between the 65 and older cohort and those aged 35 to 49, on physician source use (39.2%) and use of other sources (e.g., theft); conversely, the 50 to 64-year-old cohort were often more like those aged 35 to 49 in terms of use of these sources.

Adults who were 65 years of age and older had the lowest prevalence rates of PO misuse and PO or non-opioid SUD symptoms across any timeframe; adults aged 50 to 64 were generally the second lowest prevalence group on these outcomes. Analyses restricted to the 50 years and older group indicated that use of purchases, physician and multiple PO sources were associated with increased PO-related SUD symptom rates as compared to those not using the source. When compared to those obtaining POs for misuse from physician sources, use of a very limited set of sources increased odds of marijuana (purchases, multiple sources) or poly-prescription misuse (purchases). This result may partially stem from the association between physician source and significantly higher rates of POUD symptoms among older adult PO misusers, versus those not using the source. Unlike adolescents using physician sources, with their lower odds of other substance use and lower odds of frequent PO misuse than those using non-physician sources [32], this work highlights older adults using physician sources as a higher-risk group.

These data also underline the increasing importance of clinician PO prescribing as a misuse source as individuals age. Use of peer or family sources is found in roughly two-thirds or more of adults under the age of 50 engaged in past-month PO misuse (adolescents had a lower rate), while under one-third (30.2%) of adults aged 65 and older did so. In contrast, nearly half (47.7%) of those aged 65 and older used physician sources, while no more than 30% of those under the age of 50 did so. Increasing use of physician sources in older adults may reflect higher utilization of healthcare and a greater prevalence of chronic pain [12; 21], joint replacement surgery [19] and cancer [18], all of which may involve PO therapy.

Older adult use of physician sources provides prescribers an opportunity to carefully monitor patients for misuse and intervene in those with strong signals of misuse (e.g., early refill requests, doctor shopping). Along with proper storage and disposal recommendations (e.g., medication take-back efforts, mixing with coffee grounds in a sealed bag before disposing), monitoring and intervention efforts are necessary, given evidence of increased polypharmacy in older adults receiving POs for a pain-related diagnosis [23]. Monitoring should include POUD symptom screening [39], as symptoms were elevated in those using one physician source, and some traditional misuse screening tools (e.g., prescription drug monitoring databases) would not flag these individuals. The 2016 CDC guidelines for chronic pain-related opioid prescribing can help clinicians balance adequate pain management with appropriate PO oversight [11]. The guidelines recommend non-opioid treatment of chronic pain initially, and they emphasize the need for even greater caution and more frequent oversight when POs are prescribed to those 65 years and older, given this population's increased risks for consequences from PO use [11]. Careful monitoring and heightened screening, oversight and (in cases of potential misuse) intervention are all crucial in adults aged 50 and older, especially as use of physician sources was associated with a higher likelihood of PO-related SUD symptoms.

The relative lack of concurrent substance use correlates in older adults purchasing POs, using theft or fake prescriptions or using multiple sources for POs was notable. In adolescents [34] and young adults [26], those using theft/fake prescriptions or purchases consistently had greater odds of binge alcohol, marijuana and heavier opioid misuse than those using physician sources; furthermore, in young adults, individuals using multiple sources had greater odds of these risks than those using only physician sources [26]. The limited differences in concurrent substance use in older adults using different PO sources may signal that different processes promote PO misuse at different ages, with clustering of deviant behaviors (including PO misuse) in younger misusers and perhaps greater use of POs to treat physical pain in older adults. Conversely, risk associated with sources may change through the aging process, such that those using physician sources may engage in greater risk behavior as they age. A third option is that long-term PO use may lead to neuroadaptations that produce reduced efficacy and tolerance [13] and result in PO-seeking behavior and misuse. Further work should investigate how aging interacts with long-term PO use, PO source selection and risk engagement to clarify these processes.

Limitations

Six limitations of this work should be noted. First, the data are both cross-sectional and self-report in nature, so no causal inferences should be drawn and the possibility of self-report bias needs to be considered. Past work suggests that self-report of substance use is a reliable and valid method to assess such behavior, though some degree of underreporting and misclassification of participants is likely [16; 28]; use of medication pictures, a variety of both trade and generic medication names and ACASI self-interview methods should also reduce self-report bias for prescription opioid variables [3; 4]. Second, self-selection bias was also likely to have occurred, given that some of those selected for screening and a full interview refused participation. Third, the NSDUH does not assess pain or pain conditions, and given that the primary indication of opioid medication is analgesia, this is a limitation.

Fourth, the wording of the question on medical sources in the NSDUH only specifically references “physician(s)”, and those receiving POs from another prescribing clinician may not have been properly classified. Fifth, while the NSDUH makes extra efforts to sample older adults in assisted living or other controlled access dwellings, it is likely that older adults in non-household settings were somewhat undersampled [9]. A final limitation is the relatively narrow timeframe of sampling for sources, with only those endorsing past-month opioid misuse sampled; other sources of information (e.g., prescription drug monitoring programs) provide a longer timeframe for data, and the NSDUH timeframe limits comparisons to these sources.

Conclusions

These findings strongly suggest that older adults are a unique population in terms of prescription opioid misuse. Their pattern of sources for prescription opioid misuse is different than patterns seen in younger adults, with increasing use of physician sources in the 50 to 64-year group and the highest rates in those 65 years of age and older (47.7%). Older adults who misused opioids and obtained them from one physician had an increased likelihood of POU symptoms, highlighting those using physician sources as a higher-risk subgroup. Those 65 and older are roughly half as likely to use peer or family sources for misused opioids as those under the age of 50. Furthermore, and as compared to adolescents or young adults, their pattern of substance use correlates is much less robust in those using purchases, theft or multiple sources versus those using physician sources.

These results suggest measures that can limit older adult PO misuse, including education on proper medication storage and disposal, education on the risks of PO medical misuse (i.e., misusing one’s own prescription), heightened monitoring for signs of concurrent other substance and PO use, enhanced screening for potential SUDs, and heightened monitoring for behaviors associated with PO misuse in older adults. Also, the CDC guidelines for opioid use in chronic pain [11] can aid clinician decision making when considering POs for older adults; while not strictly contraindicated, the guidelines suggest use of non-opioid therapy prior to opioid initiation and urge cautious and judicious PO use in older adults, given their heightened potential for negative outcomes.

These findings indicate that the evolving literature on opioid misuse in young adults and adolescents cannot simply be applied to older adults. While PO misuse prevalence rates were lowest in those 50 years and older, with the lowest rates in those 65 and older, increasing numbers of such older adults engaged in opioid misuse, with greater potential consequences, are reason for concern about opioid misuse in older adults [7; 29; 40]. Combined with the evidence presented here that older adults engaged in opioid misuse differ significantly from younger individuals engaged in misuse, the elevated potential for opioid misuse consequences in this age group highlight the need for further research into opioid misuse in this understudied population.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1

Sociodemographics by age group

	12–17 years (adolescents)	18–25 years (young adults)	26–34 years	35–49 years	50–64 years	65 and older
Sample Size	103,920	106,845	36,446	49,871	24,384	15,177
	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)
Female Sex	48.9 (48.5–49.3)	49.7 (49.3–50.2)	50.5 (49.8–51.2)	51.1 (50.4–51.7)	51.7 (50.8–52.3)	55.9 (55.0–56.9)
Race/Ethnicity						
White	56.0 (55.4–56.6)	57.6 (57.0–58.1)	58.3 (57.4–59.3)	62.9 (62.1–63.7)	72.6 (78.3–80.0)	79.2 (65.3–66.2)
African-American	14.3 (13.9–14.7)	14.2 (13.8–14.6)	12.6 (12.0–13.3)	12.1 (11.7–12.6)	11.1 (10.5–11.7)	8.6 (8.0–9.3)
Hispanic/Latino	21.4 (21.0–21.9)	20.1 (19.7–20.6)	20.4 (19.7–21.1)	17.1 (16.6–17.6)	10.2 (9.7–10.7)	7.2 (6.7–7.8)
Asian-American	4.7 (4.4–4.9)	5.1 (4.8–5.4)	6.3 (5.9–6.8)	5.8 (5.4–6.3)	4.0 (3.7–4.5)	3.1 (2.6–3.6)
Native American-Alaskan Native	0.6 (0.5–0.7)	0.6 (0.6–0.7)	0.5 (0.5–0.6)	0.5 (0.4–0.6)	0.5 (0.4–0.6)	0.4 (0.3–0.5)
Hawaiian-Pacific Islander	0.4 (0.3–0.4)	0.4 (0.4–0.5)	0.4 (0.3–0.5)	0.4 (0.3–0.5)	0.3 (0.2–0.4)	0.2 (0.1–0.3)
Multiracial	2.7 (2.5–2.8)	1.9 (1.8–2.0)	1.4 (1.2–1.5)	1.2 (1.1–1.3)	1.2 (1.1–1.4)	1.3 (1.1–1.6)
Family Income						
< \$20,000 USD	17.4 (17.1–17.8)	31.8 (31.1–32.5)	17.6 (17.0–18.1)	14.2 (13.7–14.7)	14.6 (14.0–15.2)	20.6 (19.7–21.4)
\$20,000–49,999 USD	30.4 (30.0–30.9)	33.4 (32.9–33.9)	35.7 (35.0–36.5)	27.9 (27.4–28.5)	27.8 (27.1–28.4)	41.7 (40.8–42.6)
\$50,000–74,999 USD	16.7 (16.3–17.1)	13.7 (13.4–14.0)	19.0 (18.4–19.6)	17.1 (16.7–17.6)	17.8 (17.2–18.5)	16.2 (15.4–17.0)
> \$75,000 USD	35.4 (34.9–36.0)	21.2 (20.6–21.7)	27.7 (27.0–28.4)	40.8 (40.0–41.5)	39.8 (39.0–40.7)	21.6 (20.6–22.6)

Source: NSDUH, 2009–2014 cohorts.

Note: USD = United States Dollars

Table 2

Prevalence of sources of opioid medication for misuse among those engaged in past-month prescription opioid misuse by age group

	12-17 years (adolescents)(a)	18-25 years (young adults)(b)	26-34 years(c)	35-49 years(d)	50-64 years(e)	65 and older(f)	Pairwise Comparisons
Sample Size	6,074	10,558	2,554	2,027	597	109	
	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	
Prescription Opioids							
Physician	23.5 (21.8-25.3)	21.8 (20.1-23.5)	27.4 (23.9-31.2)	29.9 (25.8-34.3)	39.2 (32.4-46.5)	47.7 (30.4-65.6)	a, b < d, e, f
Theft/fake prescription	13.6 (11.9-15.5)	11.6 (10.4-12.9)	8.9 (6.6-11.8)	7.2 (5.4-9.6)	10.2 (6.0-17.0)	5.3 (1.7-14.8)	c, d < a
Free from friend/relative	37.22 (34.7-39.8)	56.8 (54.5-59.1)	56.7 (52.6-60.8)	54.4 (50.6-58.2)	48.1 (40.8-55.4)	23.2 (11.9-40.4)	a, f < b, c, d
Purchased	15.5 (13.7-17.5)	36.6 (34.7-38.5)	33.9 (30.2-37.9)	21.8 (18.3-25.7)	20.8 (15.2-27.7)	8.5 (3.1-21.5)	a, d, e, f < b, c
Other source	11.9 (10.4-13.5)	8.9 (7.8-10.2)	6.3 (4.7-8.6)	7.9 (5.8-10.8)	5.6 (2.7-10.6)	14.5 (5.3-34.1)	no differences
Multiple sources	20.9 (18.4-23.6)	31.4 (29.6-33.3)	30.1 (26.1-34.5)	23.1 (19.6-27.1)	23.5 (17.8-30.4)	5.3 (0.9-24.7)	a < b, c; d < b

Source: NSDUH, 2009-2014 cohorts.

Notes: Pairwise comparisons controlled for sex and race/ethnicity and were Bonferroni-corrected for multiple comparisons, with comparisons only noted when they differ at a p -level of 0.05 or less; columns add up to greater than 100%, as individuals could endorse multiple motives (and be included in the multiple sources group).

Table 3

Sources of opioid medication for past-month misuse as a function of prescription opioid use disorder (POUD) symptoms in adults aged 50 and older

	POUD symptoms among misusers who did not use diversion source	POUD symptoms among misusers who used diversion source	<i>p</i> -value
	% (95% CI)	% (95% CI)	
Opioid Sources			
Physician	35.7 (27.0–45.3)	52.2 (39.3–64.9)	0.03
Theft/fake prescription	43.1 (34.6–52.0)	36.4 (16.2–62.3)	0.63
Free from friend/relative	44.9 (35.4–54.9)	39.2 (27.8–51.8)	0.43
Purchased	36.7 (29.1–45.0)	68.1 (51.3–81.1)	0.0003
Other source	42.4 (34.5–50.7)	43.2 (20.1–69.6)	0.95
Multiple sources	37.9 (29.6–46.9)	64.5 (44.6–80.4)	0.01

Source: NSDUH, 2009–2014 cohorts.

Notes: Of those with POUD symptoms, 75/150 (50.4% [all percentages weighted]) used physician sources, 11/150 used theft/fake prescription (7.9%), 59/150 used friends/relatives for free (39.7%), 41/150 used purchases (29.4%), 12/150 used other sources (7.4%) and 39/150 used multiple sources (29.7%)

Table 4
Sources of opioid medication for past-month misuse and substance-related correlates in adults aged 50 and older

OPIOID SOURCES	30-day Binge Alcohol Use AOR (95% CI)	Past Year Marijuana Use AOR (95% CI)	Past Year Poly-Prescription Misuse AOR (95% CI)	Presence of Opioid SUD Symptoms AOR (95% CI)	Any Non-Opioid SUD Symptoms AOR (95% CI)
50 years and older (Older Adults)	---	---	---	---	---
Physician only	---	---	---	---	---
Theft/fake prescription only	0.88 (0.18–4.33)	3.94 (0.87–17.89)	0.65 (0.11–3.93)	0.23 (0.05–1.10)	0.97 (0.20–4.61)
Free from friend/relative only	0.85 (0.35–2.05)	1.46 (0.65–3.31)	1.80 (0.77–4.23)	0.41 (0.19–0.87)	1.05 (0.46–2.40)
Purchased only	1.21 (0.40–3.67)	4.44 (1.39–14.14)	3.36 (1.01–11.17)	1.49 (0.51–4.39)	1.29 (0.43–3.56)
Other source only	0.06 (0.01–0.56)	3.07 (0.54–17.33)	0.47 (0.07–2.96)	0.53 (0.12–2.39)	0.65 (0.16–2.71)
Multiple sources	0.75 (0.29–1.94)	3.58 (1.42–9.03)*	2.65 (0.95–7.39)	2.01 (0.72–5.60)	2.09 (0.76–5.72)

Source: NSDUH, 2009–2014 cohorts.

Notes: AORs controlled for race/ethnicity and sex; all categories, except for the multiple sources group, include individuals who used only that source in the past 30 days.

Poly-Prescription Misuse denotes both prescription opioid misuse and at least one of stimulant, tranquilizer or sedative misuse in the past year.

Bold denotes significant differences ($p < .05$) from the reference group; * denotes significant differences at a $p < .01$ level.