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Review

Transnational trends in prescription drug misuse among women: A systematic review

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ABSTRACT

Prescription drug misuse (PDM) has been on the rise since early 2000 and is now an international epidemic. Prescription drugs are easily accessible and perceived as less harmful, yet can lead to addiction and death. Women represent half of the world's population and pose a unique risk for PDM, including a greater burden of addiction and relapse. Despite this, no identified studies have methodically reviewed the literature exploring PDM among adult women. The authors searched four EBSCOhost and World Health Organization (WHO) Global Index Medicus databases and identified 93 articles (88 vs. five respectively). Studies with data on the prevalence and correlates of PDM among women around the globe were included. In the EBSCOhost search, over 40% of the studies were secondary data analyses and nearly two-thirds (63.6%) examined opioid analgesics (similar results found in WHO articles). Women were represented in a fraction of all PDM studies yet in over a half (56.1%) of the selected studies, women abused one or more prescription drugs at equal rates or higher than men. For ethnicity, 21 studies reported that White women had higher rates of PDM than other ethnicities and 13 found no differences. Nearly all of the studies (90%) that examined problematic physical and mental health correlates found significant associations. The findings suggest that clinicians may need more inclusive and broaden their consideration of risk for PDM. As prescriptions become more readily available around the world, PDM research should be more representative and monitor unique risk and protective factors among women to better inform prevention and intervention efforts.

Introduction

Prescription drug misuse (PDM) has been on the rise for the past two decades (Blanco et al., 2007; Johnston, O'Malley, Bachman, & Schulenberg, 2007; McCabe, West, & Wechsler, 2007a; Substance Abuse and Mental Health [SAMHSA], 2007). PDM is the intentional or unintentional use of medication(s) without a prescription, in a way other than prescribed, or for intoxication (e.g., euphoria, to get high, etc.; Substance Abuse and Mental Health Services Administration (SAMHSA, 2017). Prescription drugs are misused more often than any other drug, with the exception of the misuse of marijuana and alcohol (Substance Abuse and Mental Health Services Administration (SAMHSA, 2017). According to the National Survey on Drug Use and Health (NSDUH), in 2014, 15 million people aged 12 and older in the U.S. misused prescription drugs in the past year and 6.5 million misused prescription drugs in the past month (Hedden et al., 2015). PDM has led to a significant increase in emergency room visits, overdose, and accidental death in recent years (Centers for Disease Control and Prevention [CDC], 2017; SAMHSA, 2017).

Notably, overdose deaths involving prescription opioids have quadrupled since 1999 and have outnumbered the overdose deaths involving heroin and cocaine since 2002 (CDC, 2017; National Institute on Drug Abuse [NIDA], 2016a). There has also been an increase in treatment admissions for prescription drug use disorders, with 12% of individuals who reported past year PDM meeting criteria for substance use disorders, reflecting the high addictive and dependence potential of prescription drugs (NIDA, 2016a; SAMHSA, 2015a).

PDM is a global juggernaut with prescription drug sales exceeding a trillion dollars in revenue (Statista, 2017). The International Narcotics Control Board (INCB; 2015) reports that prescription drugs are the second most trafficked and consumed drugs globally. Furthermore, while abuse of traditional street drugs, such as heroin and cocaine, have remained stable or showed declines globally, PDM has been increasing (United Nations Office on Drugs and Crime [UNODC], 2013).

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Commonly misused prescriptions

The most commonly misused prescription drug classes in the U.S. and abroad are opioids (usually prescribed to treat pain), central nervous system depressants (including tranquilizers, sedatives, and hypnotics that are usually prescribed to treat anxiety and sleep disorders), and stimulants (most often prescribed to treat Attention Deficit/Hyperactivity Disorder [ADHD]; NIDA, 2016b; SAMHSA, 2015b; UNODC, 2016). The rapid growth of PDM may be precipitated by misconceptions of prescription drug safety and increased availability (Substance Abuse and Mental Health Services Administration (SAMHSA), 2017). Prescription drugs are particularly appealing due to accessibility and low stigma of use. Prescription drugs are easy to obtain for many reasons including insufficient oversight and inappropriate prescribing practices (Substance Abuse and Mental Health Services Administration (SAMHSA), 2017). Accessibility, in conjunction with the belief that prescription drugs are not dangerous despite the growing evidence of harmful and negative PDM consequences, can lead to detrimental outcomes (Substance Abuse and Mental Health Services Administration (SAMHSA), 2017).

Gender differences in prescription drug misuse

For illicit substances, women tend to use fewer drugs than men across most classes of drugs (NIDA, 2016b; Substance Abuse and Mental Health Services Administration (SAMHSA), 2014); however, this pattern is not as clear with PDM. For example, when examining discrepancies in PDM between males and females, research reveals that women misuse prescription pain relievers more than males (Smith, 2014). Moreover, the gender gap for prescription drug abuse is narrowing for younger age groups (Degenhardt et al., 2008; Greenfield, Bond, & Rehm, 2009; Grucza, Norberg, Bucholz, & Bierut, 2008; Johnson & Gerstein, 2000; Kerr, Greenfield, Bond, Ye, & Rehm, 2009; Keyes, Grant, & Hasin, 2008; Pitel, Geckova, van Dijk, & Reijneveld, 2010; Wagner & Anthony, 2007). If this trend continues, gender differences in PDM might diminish across the lifespan.

Men who engage in PDM tend to also abuse other substances whereas women are more likely to solely abuse prescription medications (Elkins, 2015). Additionally, even though men have higher rates of lifetime PDM (Huang et al., 2006), further investigation by drug class demonstrates equivocal rates for past year stimulant, tranquilizer, and sedative misuse for women (Tetrault et al., 2008). This trend is also reflected internationally for women in Australia, Spain, Afghanistan, and Pakistan (Elkins, 2015). Women are also more likely than men to use certain types of prescription drugs and abuse prescriptions for non-traditional reasons including health and beauty (e.g., skin lightening, diet pills; Dayal & Balhara, 2016; Dey, 2014; Hay, Mond, Buttner, & Darby, 2008; Inakanti et al., 2015; Mahar, Mahajan, Agarwal, Kar, & Bhattacharya, 2016). The consequences of drug use are also quite different between men and women. Women have been shown to have more disparate outcomes for substance misuse when compared to men. For example, research has shown that for particular substances, smaller amounts of the same substance used for less amount of time can result in higher rates of substance use disorders (SUDs) in women compared to men (National Institute of Health [NIH], 2015). Women are also more likely than men to be incarcerated for drug-related offenses (Harrison & Beck, 2006). According to Henderson (1998), substance abuse is the primary reason that women enter prison.

Women face unique family implications for substance abuse as well. For example, female offenders are more likely to be the primary caretaker for dependent children (Bloom, Owen, & Covington, 2004). Prenatal substance abuse, such as stimulant use, has been shown to cause challenges in functioning after birth including decreased visual attention (Mick, Biederman, Faraone, Sayer, & Kleinman, 2002). Mothers with a history of substance abuse and psychological instability are also more likely to have children placed outside of the home (Suchman, McMahon, Zhang, Mayes, & Luthar, 2006).

Prescription drug misuse among women

The rates of PDM among women have grown at an alarming rate. According to SAMHSA (2014), 4.6 million adult women abused prescription drugs over the past year. The first decade of this epidemic (1999–2010) resulted in 48,000 overdose deaths among women in the U.S. (CDC, 2017). Women are particularly at risk for PDM for several reasons: women have more doctor's visits, report higher rates of pain, and are more likely to be prescribed pain medication for longer periods of time and at higher doses (Volkow, 2013). Prescription drugs commonly misused and abused among women more so than men include narcotic analgesics and tranquilizers (Simoni-Wastila, Ritter, & Strickler, 2004). There are several subpopulations of women that have been identified as being at higher risk for PDM. Women who have experienced trauma, are younger or older, identify as sexual minorities, and are veterans reporting trauma and/or pain, have all been found to be at an increased risk for PDM (Hemsing, Greaves, Poole, & Schmidt, 2016).

As with other substance misuse and abuse, the consequences of PDM are high among women. Women tend to initiate PDM at a young age (Volkow, 2010). Additionally, misuse escalates more rapidly for women and they are more susceptible to relapse (Becker & Hu, 2008), placing women at an increased risk for adverse and long-term consequences. Similarly, the health consequences of drug misuse and addiction also develop more quickly for women (Becker & Hu, 2008). Substance misuse poses a secondary threat to unborn fetuses (Behnke, Smith, & Committee on Substance Abuse, 2013), which is a unique risk for women. Lastly, women are more likely to attempt suicide using the method of pharmacological drug overdose (Tsirigotis, Gruszczynski, & Tsirigotis, 2011), highlighting the importance of examining the correlates of PDM for women.

Transnational prescription drug misuse

The U.S. leads the research on PDM. The international literature is sparse but points to a burgeoning problem. For example, in Latin America, the increased prescription distribution rates of benzodiazepines are associated with over-usage (Kapczinski et al., 2001). In Africa, there have been significant increases in seeking prescription drug abuse treatment, which has been credited to rises in trauma and/or mood disorders (United Nations Office on Drugs and Crime (UNODC), 2011). Drug transport through West Africa is also linked to growing drug consumption rates (Ndinda, 2013). European countries have taken an alternative approach to examining PDM by testing sewage for biomarkers of amphetamines and methamphetamines. The analyses identified high rates of usage in Europe with the highest rates occurring in North Belgium and the Netherlands (Thomas et al., 2012). Overall, the international data illuminates a need to examine global trends especially since pharmaceutical revenues worldwide exceed one trillion U.S. dollars (Statista, 2017). Consolidated information on PDM among women around the globe is a timely contribution to the literature and the ongoing efforts to address this epidemic in prevention and intervention strategies.

Research objectives

Research on gender differences in PDM is still in the early stages. Empirical evidence is needed to examine the underlying correlates and mechanisms that propel these differences. Targeted PDM interventions are scarce and additional inquiries will provide rich data to inform their impending development. Despite the risk factors and unique consequences for use among women, no identified studies have systematically reviewed the research on PDM among adult women. The present systematic review aims to investigate the prevalence and correlates

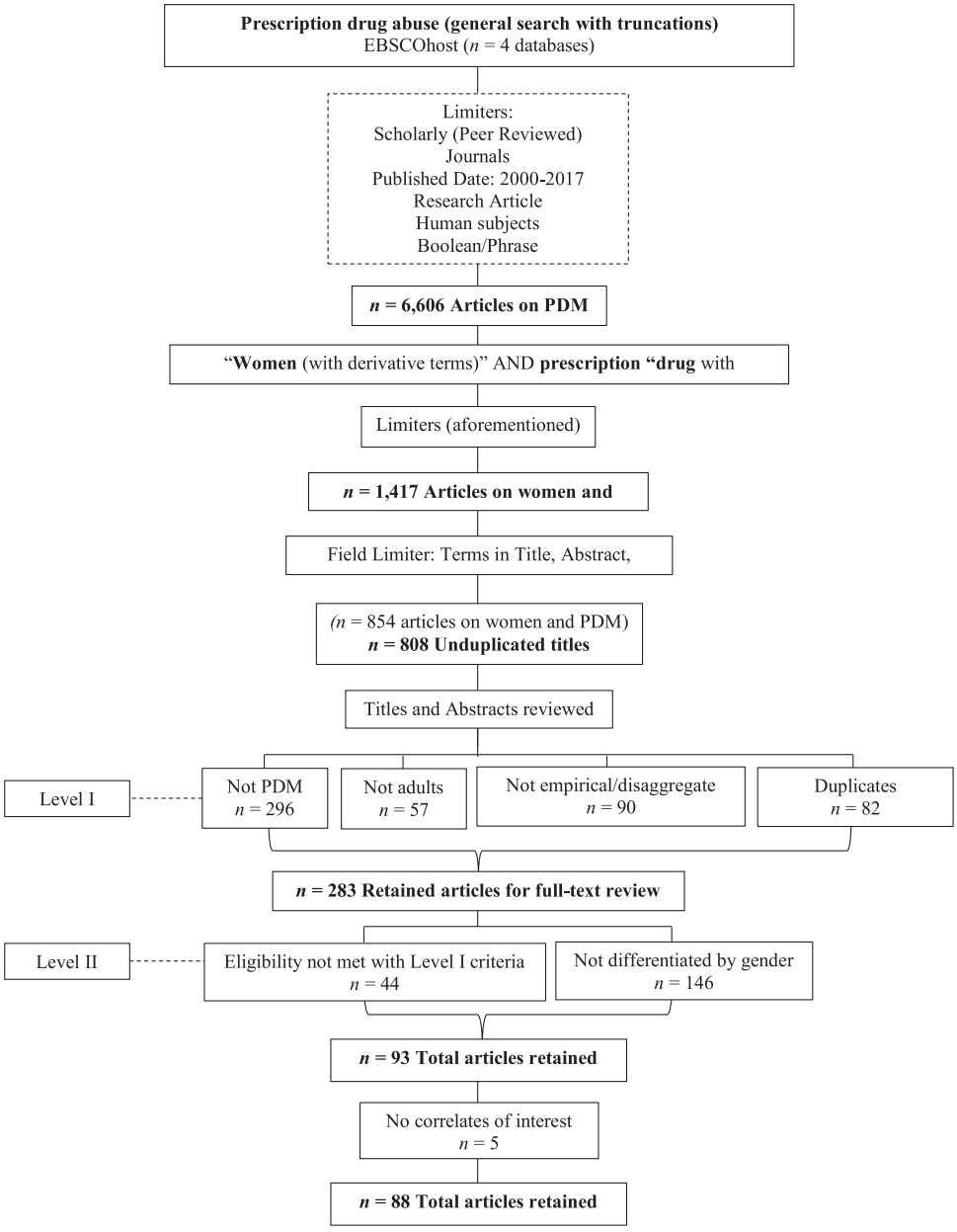

Fig. 1. Flow chart of search results and triage.

of PDM among women around the globe. Examining the existing research and correlates of use are beneficial to improve the design of emerging interventions for PDM. There are two key objectives that frame this review: 1) to summarize the research on PDM among international women, and 2) to identify the correlates of PDM for women.

Method

Ethics statement

The authors' Institutional Review Board deemed the study exempt, as it did not involve human subjects. Upon exemption, the authors initiated the systematic review.

Eligibility criteria

The target population in this review was women who misuse prescription drugs. Both U.S. and international studies were included. Studies must have included women and reported rates or correlates of PDM independent of, or in comparison to males in the sample. Studies that solely focused on adolescents, were non-empirical or were meta-analyses (i.e., to avoid synthesized narratives) were excluded.

Studies were deemed to focus on PDM if the subject was nonmedical use of prescription drugs, taking drugs in other ways than prescribed, sharing medications with others, and abusing prescriptions to get high. Using NIDA's (2016a) definition of commonly abused drugs, the authors examined the following drug categories: opioids (i.e., analgesics), central nervous system (CNS) depressants (i.e., benzodiazepines, non-benzodiazepine sleep aids, barbiturates, sedatives, and tranquilizers, sedatives, and hypnotics) and stimulants.

Information sources

EBSCOhost was used to concurrently search four databases recommended by university library research staff, including; Academic Search Complete (a multidisciplinary research database; EBSCOhost

Information Services, 2018). Cumulative Index to Nursing and Allied Health Literature (CINAHL; nursing and biomedical database), Medical Literature Analysis and Retrieval System Online (MEDLINE/PubMed with Full Text; a free, global, biomedical database), and PsycINFO (EBSCOhost Online Research Databases, n.d.). All are reputable databases for conducting systematic reviews. The EBSCOhost search occurred in March and July of 2018. A secondary search of the World Health Organization (WHO) Global Index Medicus was conducted in September of 2018 to further explore PDM rates and correlates among international samples.

Search strategy

To gather an estimate of the breadth of PDM research, the authors entered "prescription drug abuse," "prescription drug misuse," and "nonmedical prescription drug use" into the thesaurus of each database to identify additional search terms. The databases automatically included the plural variation of each term (i.e., adding an "s"). Lastly, several truncations of the original and thesauri terms were added (e.g., abus*, misus*, addict*, overdos*, medicat*). Truncations enable databases to search different forms of a word, which increases the number of articles identified. Several limiters were included to refine the search (see below; syntax available upon request). The databases were searched simultaneously to reduce overlapping search results. EBSCOhost also provides a link to examine articles retrieved from each database independently and retains all database specific limiters. The iteration yielded 6,606 articles on PDM.

The authors conducted a new search with the aforementioned procedure for identifying synonyms and truncations. For the word "women", a total of 18 additional variations were identified (e.g., transgender, housewives). Terms were also identified for each "drug" class of interest using the same procedure. A research librarian indicated that including all brand names for each drug class would be excessive and redundant and thus the terms were not included. For drugs, 25 thesauri phrases were identified (e.g., adrenergic uptake inhibitors, dopamine agonist, opioids). All alternate terms were linked by the "OR" operator (i.e., record displayed if *any* of the conditions are true). Both cumulative lists for "women" and "drug" were linked using the "AND" operator (i.e., displays the record if *all* of the conditions separately are true). The resulting query yielded 1,417 articles (syntax available upon request). The authors then applied advanced field limiters (i.e., terms found in the title, abstract, subject) to refine the query prior to manual review. The total was reduced to 854 articles. The title and abstracts were downloaded and computer-identified duplicates were removed (n = 808).

At the first level of review (Level I; see Fig. 1), the articles were divided among the five members of the research team to review the titles and abstracts for fit with the inclusion criteria (see Eligibility Criteria above). All questionable articles were brought to the group for majority consensus. After this stage, 283 articles were retained for full text examination. The Level II review further omitted articles based on the Level I criteria and any articles not providing disaggregate data on the prevalence and/or correlates of PDM for women (n = 93).

Limiters

The following limits were set in EBSCOhost: Boolean/Phrase, scholarly, (peer reviewed) journals, and published date: 2000–2017, research article, and human subjects. For CINAHL and MEDLINE, special limiters were set for, research articles, all adults, and human subjects. CINAHL also allowed for the exclusion of redundant MEDLINE articles. Finally, for PsycINFO, special limiters were set for publication year, peer reviewed journals, human populations, adulthood, and excluded dissertations. No additional special limiters for Academic Search Complete were set.

Abstract review

The authors then inspected the titles and abstracts of all of the returned articles and omitted articles that did not center on PDM as operationally defined above. Articles were coded as reject if the topic was not PDM, they did not include data by gender, if they were non-empirical, if they only included adolescents, or if they focused on diversion or motivations only. Duplicate articles were also removed. Labeling conflicts were addressed by group discussion and majority consensus.

Full-text review

The co-authors read the full text of the remaining articles. The authors met to discuss any articles that were unclear and decided by majority vote to exclude or retain articles based on the identified criteria. Prior to data extraction for prevalence and correlates, the article count was 93.

Data extraction

The identified studies used were quantitative or mixed-method designs. The varied methods, measures, and outcomes for PDM precluded the authors from conducting a meta-analysis of the results. The analysis in this review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA; Moher, Liberati, Tetzlaff, Altman, & Group, 2009) guidelines. The PICOS (participants, interventions, comparisons, outcomes, and study design) for each study are described in Table 1. The intervention studies were excluded and thus not a part of PICOS descriptions. Four studies that assessed PDM among women did not describe gender comparisons or demographic correlates and focused on other subpopulations such as club goers, lesbian, gay, bisexual, and transgender (LGBT) individuals, and others (Duryea, Calleja, & MacDonald, 2015; Kelly et al., 2013a; Lund et al., 2013; Prudhomme, Becker-Blease, & Grace-Bishop, 2006; Shannon, Havens, & Hays, 2010). Of the remaining 88 articles, the key findings related to women in the sample are reported where possible in Table 1. The correlates of PDM identified in each study are reported in Table 2.

Results

This section provides a summary of the extant research on women and PDM. The studies are first summarized by the research method, representation of women, country of origin, and measurement. The correlates of PDM are then described including race/ethnicity, age, other substance abuse, education, marital status, income, physical/mental health, and other factors.

Summary of studies

Research methods utilized

Almost three quarters (n = 61; 69.3%) of the studies were quantitative and two (2.3three (4.8%) used mixed methods. Based on the methods described and databases used, 36 (40.9%) of the studies were secondary data analyses. Three studies used longitudinal methodology [11, 31, 52]. Over one quarter (27.3%) of the studies measured PDM with researcher generated survey items. The Addiction Severity Index (ASI) was used in eight studies, followed by the Composite International Diagnostic Interview (CIDI) used in five and the Structured Clinical Interview for DSM–IV Axis I Disorders (SCID) used in two studies (see Table 1 for study summaries).

Representation of women

There has been an upward trajectory of PDM research since the onset of the epidemic in the early 2000's. Overall, the number of PDM

Table 1
Summary (modified PICOS) of studies on PDM among women.

#	Author(s)	Design & Sample Size	Country	Drug(s) Studied	Primary (Substance Abuse) Measures	Key Findings
1	Argento, Chettiar, Nguyen, Montaner, and Shannon, (2015)	Cross-sectional; *n* = 692; 100% women	Canada	O	Researcher generated	One fifth of sex workers reported recent opioid misuse.
2	Arria et al. (2013)	Quantitative; *n* = 984 freshman; 52.1% women	US	ST	College Student Life Survey	38% of freshman reported using stimulants PDM to study.
3	Ashrafioun, Edwards, Bohnert, and Ilgen, (2014)	Secondary; *n* = 369 dental emergency patients; 65.6%women	US	O	Current Opioid Misuse Measure (COMM)	37.9% of dental emergency patients reported taking more analgesics than prescribed in the prior 30 days.
4	Assanangkornchai, Sam-Angsri, Repngpongpan, and Edwards, (2010)	Quantitative; *n* = 26,633; 55% women	Thailand	AM, AN, other	National Household Survey on Substance and Alcohol Use (NHSSA)	Women were twice as likely as men to use anxiolytics and hypnotics in the past 30 days. The average age of 1 st PDM was 33-36.
5	Back, Payne, Simpson, and Brady, (2010)	Quantitative; *n* = 55,279; 51.6% female	US	O	National Survey on Drug Use and Health (NSDUH)	Among women, serious psychological distress and other drug use were significantly associated with opioid non-medical use and abuse/ dependence.
6	Barth et al. (2013)	Quantitative; *n* = 127; 54% women	US	O	Non-Medical Use Questionnaire (NMU)	Opioid dependent patients reported a history of chronic/current pain and more affective distress than controls.
7	Bramness, Furu, Engeland, and Skurtveit, (2007)	Secondary/Quantitative; *n* = 83,713; 64.4% women	Norway	B, O	Norwegian Prescription Database	Misusers of a muscle relaxant had double the use of benzodiazepines and opiates.
8	Chen et al. (2014)	Quantitative; *n* = 55, 583; 48.7% women	US	ST, other	NSDUH 2009-2011	3.1% of adults in a national sample engaged in PDM.
9	Cochran et al. (2014)	Secondary; *n* = 2,841,793; 55.8% female	US	O	ICD-9 diagnosis in Commercial Claims and Encounters (CCAE) database	Individuals with opioid use disorders were more likely to have emotional/ health issues and be younger and male.
10	Cole and Logan (2010)	Quantitative; *n* = 756, 100% women with protective orders	US	O, SE	Addiction Severity Index (ASI)	40.9% and 70.8% reported lifetime use of sedative-hypnotics and opiates respectively.
11	Cropsey et al. (2015)	Longitudinal/Quantitative; *n* = 28,570; 24.6% women	US	O, B	ASI	For individuals under community corrections supervision, concurrent and independent opioid use increased whereas benzo misuse did not.
12	Currie, Wild, Schopflocher, Laing, and Veugelers, (2013)	Quantitative; *n* = 381; 58.6% women	Canada	O, SE, ST	Researcher generated	Low educational attainment, current unemployment, greater life course poverty, and racial discrimination were risk factors for PDM.
13	Dayal and Balhara (2016)	Quantitative study; *n* = 31 women in inpatient drug treatment	India	B, O	Record review	The average age of 1 st opioid abuse was 29.7 years.
14	Dollar and Ray (2013)	Quantitative, *n* = 38,067; 53% women	US	AN, SE, ST	NSDUH	Younger and White respondents were more likely to engage in PDM and other drug use was the strongest predictor of PDM.
15	Fiellin, Tetrault, Becker, Fiellin, and Hoff, (2013)	Quantitative; *n* = 55,215; 49.7% women	US	O, other	NSDUH 2006-8	The use of alcohol and other substance before the age of 18 was a predictor of prescription opioid abuse in young adulthood.
16	Ford (2008)	Quantitative; *n* = 11,000 college students; 74% women	US	O, SE, ST, other	College Alcohol Study (CAS)	17% reported lifetime PDM. Female athletes were less likely to engage in PDM that female non-athletes.
17	Fresán, Minaya, Luis Cortes-Lopez, and Ugalde, (2011)	Quantitative; *n* = 150 outpatients; 70% women	Mexico	B	Structured Clinical Interview for DSM–IV Axis I Disorders (SCID–I)	Men had significantly higher rates or benzo dependence.
18	Gee, Delva, and Takeuchi, (2007)	Cross-sectional; *n* = 2217 Filipino Americans; 50.7% women	US	AN, SE, ST, T	Filipino American Community Epidemiological Study (FACES)	Perceived unfair treatment was associated with inhalant and other illicit drug use.
19	Gibbs et al. (2016)	Quantitative; *n* = 448; 100% women	US	ST	Researcher generated	Greater eating disorder pathology poorer psychological well-being was associated with an increased likelihood of stimulant misuse.
20	Goodwin and Hasin (2002)	Quantitative; *n* = 8098; % women unclear	US	SE	National Comorbidity Study	Non-prescription sedative use was correlated with psychopathology (individual and familial) and suicide ideation/attempts.
21	Grattan, Sullivan, Saunders, Campbell, and Von Korff, (2012)	Quantitative; *n* = 1191; 69% women	US	O	Researcher generated	Increased opioid misuse among individuals receiving chronic opioid therapy was correlated with being male, increased pain, being younger, and increased reports of depression.
22	Griffin et al. (2014)	Quantitative; *n* = 653 opioid abusers; 53% women	US	O	Composite International Diagnostic Interview (CIDI); Pain and Opioid Analgesic Use History; ASI	Women are 1.6 times more likely than men to have co-occurring psychiatric disorder.
23	Gros, Milanak, Brady, and Back, (2013)	Quantitative; *n* = 90; 50.6% women	US	O	ASI-lite	Prescription opioid dependent participants with comorbidity were more likely to endorse alcohol dependence and sedative dependence.
24	Gureje et al. (2007)	Quantitative interviews; *n* = 6752; 46.5% women	Nigeria	SE	CIDI v3	The misuse gap for male vs. female was lowest for prescription sedatives.

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Table 1 (*continued*)

#	Author(s)	Design & Sample Size	Country	Drug(s) Studied	Primary (Substance Abuse) Measures	Key Findings
25	Hall, Golder, Higgins, and Logan, (2016)	Quantitative; *n* = 406; 100% women	US	O	Researcher generated	Non-prescription opioid misusers were significantly more likely to experience psychiatric distress, report poor health and be younger, White, and using other illicit substances.
26	Hardt et al. (2013)	Secondary; *n* = 169 death records of pregnant women	US	B, O	Record review	54% of deaths involved prescription drug use, primarily opioids.
27	Hartung et al. (2013)	Quantitative; *n* = 1153 students; 65.2% female	US	AM	Researcher generated	Men are more likely to participate in medical misuse of AM than women
28	Havens et al. (2007)	Quantitative; *n* = 1525 rural and urban probationers; 31.1% women	US	O	Researcher generated	20.7% of probationers engaged in PDM in the past three months.
29	Herman-Stahl, Krebs, Kroutil, and Heller, (2007)	Quantitative; *n* = 23,645; 49% women	USA	ST	National Survey on Drug Use and Health (NSDUH)	Mental health and other drug use was associated with higher stimulant PDM.
30	Hermos, Winter, Heeren, and Hingson, (2008)	Secondary; *n* = 12,958; % women unclear	US	SE, ST, AN	National Epidemiological Survey on Alcohol and Related Conditions (NESARC)	Earlier age-of-onset for alcohol and marijuana and current alcohol problems were associated with PDM. People of color and women had lower odds for PDM.
31	Jamison, Butler, Budman, Edwards, and Wasan, (2010)	Longitudinal/Secondary; *n* = 622 chronic pain patients, 54.8% women	US	O	Prescription Drug Use Questionnaire (PDUQ); Aberrant Drug Behavior Index	Females reported more RX misuse behaviors than men and were more likely to endorse a history of psychological distress and physical/ emotional abuse.
32	Jiraporncharoen et al. (2016)	Quantitative; *n* = 3204; 77.1% female	Thailand	SE	Alcohol, Smoking, and Substance Involvement Screening Test (ASSIST)	Older age, being female, job position, depression, alcohol use and lower mental quality of life were all independently associated with harmful sedative use.
33	Johansson, Berglund, Hanson, Pöhlén, and Persson, (2003)	Quantitative; *n* = 250 alcohol rehab patients	Sweden	B, other	Researcher generated	20% of female participants were misusers of prescription drugs.
34	Johnson (2006b)	Quantitative; *n* = 56 women offenders	Australia	AM, B	Drug Use Careers of Offenders (DUCCO)	Abuse of prescription drugs was one predictor of drug and alcohol dependency.
35	Johnson (2006a)	Quantitative; *n* = 461 women offenders;	Australia	AM, B, other	Researcher generated interview	Misusing amphetamines, benzodiazepines or morphine were predictors of regular drug use.
36	Katz, El-Gabalawy, Keyes, Martins, and Sareen, (2013)	Qualitative; *n* = 34,653; 52.1% women	Canada/ US	O	National Epidemiological Survey on Alcohol and Related Conditions (NESARC)	Comorbid physical and mental disorders predicted PDM abuse and/or dependence.
37	Kelly and Parsons (2007)	Quantitative; *n* = 400 young adult club-drug users; 50% women	US	O, ST, SE, other	Club Drugs and Health Project	Women reported higher lifetime use rates for sedatives/tranquilizers, stimulants, and painkillers with highest rates of misuse occurred among bisexual and lesbian women.
38	Kelly et al. (2013b)	Quantitative; *n* = 1207 club go-ers, 51.6% women	US	AN, SE, ST	Researcher generated	44.1% reported lifetime PDM with 20.3% in the past month.
39	Kelly, Vuolo, Pawson, Wells, and Parsons, 2015)	Mixed method; *n* = 404 club goers	US	O, SE, ST	Compton and Volkow, 2006 adapted items	18.1% of the sample reported smoking prescription drugs.
40	Kerr et al. (2015)	Secondary; *n* = 42,986 mixed sexual orientation women	US	ST, SE, other	American College Health Association-National College Health Assessment (ACHA-NCHA-II)	Lesbians had greater odds of misusing Rx than heterosexual women. Bisexual women had greater odds of misusing certain Rx than heterosexual and lesbian women.
41	Khosla, Juon, Kirk, Astemborski, and Mehta, (2011)	Quantitative; *n* = 1320 injection drug users; 33% female	US	O, B	Researcher generated	20.9% reported past 6 month PDM
42	Kurtz, Surratt, Levi-Minzi, and Mooss, (2011)	Quantitative; n = 521; 40.9% women	US	B	Researcher generated	7.9% of club users met criteria for benzo dependence.
43	Lanier and Farley (2011)	Quantitative; *n* = 599 undergraduates, 55% female	US	A, SE, ST	Delaware School Survey-adapted	Women, upperclassmen, and non-Greek members were less likely to participate in PDM.
44	Liebschutz et al. (2010)	Quantitative; *n* = 240 headache patients; 83.8% female	US	O, SE	CIDI	18.4% of chronic pain patients met criteria for a substance use disorder.
45	Lo, Monge, Howell, and Cheng, (2013)	Archival; *n* = 5241 college students, 53% female	US	O, SE, ST	NSDUH	14% engaged in PDM only and 6% exhibited alcohol and PDM abuse comorbidity.
46	Mackesy-Amiti, Donenberg, and Ouellet, (2015)	Quantitative, *n* = 570, 38.1% women	US	O	PRISM semi-structured clinical interview	Among people who inject drugs, Post-traumatic Stress Disorder (PTSD) was a significant predictor of prescription opioid misuse among women and men.
47	Martel, Dolman, Edwards, Jamison, and Wasan, (2014)	Cross-sectional; *n* = 82; 39% women	US	O	Researcher generated	73.2% of the sample reported at least one incident of opioid prescription misuse.

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Table 1 (*continued*)

#	Author(s)	Design & Sample Size	Country	Drug(s) Studied	Primary (Substance Abuse) Measures	Key Findings
48	Martin et al. (2009)	Quantitative; n = 111 opioid dependent pregnant women	US	O	SCID; Mini International Neuropsychiatric Interview (MINI)	Opioid-dependent pregnant women had high rates of psychiatric illness.
49	Martins et al. (2015)	Secondary; n = 36,781; % women unspecified	US	O, ST	NSDUH	Lower education was associated with PDM. Females with less education had higher risk of past year opioid overdose. But were significantly less likely to report past-year nonmedical stimulant use than females with college education.
50	McCabe, Teter, and Boyd, (2005)	Qualitative; n = 9161 college students; 51% women	US	AN, O	Researcher generated	A cumulative GPA below 2.5, being a senior, and living off campus were risk factors for illicit use of prescription pain medication among women.
51	McCabe, Teter, Boyd, and Teter, (2006)	Quantitative; n = 21,294; 56% women	US	AM, ST	Student Life Survey	8.1% of undergrads reported stimulant PDM. Multiple sociodemographic factors including being White and male, predicted illicit use of stimulants in college populations.
52	McCabe, Teter, and Boyd, (2006)	Longitudinal; n = 9161; 56% women	US	O, SE, ST	Student Life Survey	Undergraduate women were significantly more likely to report medically prescribed use of any abusable medication.
53	McCabe, West, Morales et al. (2007)	Secondary; n = 43,093; 53% women	US	O, SE, ST	Structured diagnostic interviews	Early (13 yrs.) onset of Rx misuse predicted Rx abuse/dependence at 21 yrs. old.
54	McCabe et al. (2007c)	Secondary; n = 3639 college students; 53.6% female	US	ST	Researcher generated	Past year PDM was associated with ethnicity, family income, living arrangement, fraternity/sorority membership, and other drug use.
55	McCabe et al. (2013)	Secondary; n = 4572; 50% female	US	ST	Monitoring the Future (MTF)	No gender differences in lifetime nonmedical use of Rx stimulants. White students had higher rates of misuse. Lifetime history of prescription stimulant use was significantly associated with problem substance use behaviors.
56	McCauley et al. (2009)	Archival; n = 3001 women	US	SE, ST, O	National Women's Study replication	5.5% of the sample reported PDM in the last year.
57	McCauley et al. (2011)	Quantitative; n = 2000 women	US	O, SE, ST, other	National Women's Study modules	7.8% of participants reported PDM.
58	Meltzer et al. (2012)	Cross-sectional; n = 264; 56% women	US	AN, O	CIDI	Participants with Rx dependence were more likely to have PTSD, depression, be a smoker, have a history of jail time, and a family history of substance abuse.
59	Messina et al. (2014)	Quantitative; 1016 college students; 70% female	US	ST	Adapted items from McCabe, Boyd, & Teter 2009	No significant difference between male and female past year prescription sedative use.
60	Morioka, Howard, Caldeira, Wang, and Arria, (2017)	Quantitative; n = 929 college students; 53.8% women	US	SE, ST, O	NSDUH 2002-adapted	Male and White college students used more prescription analgesics than female and minority students.
61	Novak, Kroutil, Williams, and Van Brunt, (2007)	Qualitative; n = 11,200; 56.8% women	US	AM	Researcher generated	Those abusing illicit drugs were most likely to abuse4 prescription stimulants.
62	Parks, Frone, Muraven, and Boyd, (2017)	Quantitative, n = 1755 students; 50% female	US	A, AN, ST	Researcher generated	Sexual victimization was correlated with non-medical PDM among women.
63	Pletcher, Kertesz, Sidney, Kiefe, and Hulley, (2006)	Secondary; n = 3163; 56% female	US	O	The Coronary Artery Risk Development in Young Adults Study (CARDIA)	White men were more likely than other gender/ethnic groups to initiate non-medical prescription opioid use. It was also more common among illicit drug users and those with severe depressive symptoms.
64	Price, Ilgen, and Bohnert, (2011)	Quantitative; n = 351, 23.9% female	US	O	Research generated	Gender was not a predictor of opioid PDM.
65	Qato, Manzoor, and Lee, (2015)	Quantitative; n = 2975; 51.4% women	US	AN, SE	Researcher generated	Analgesics and other drugs (e.g., antidepressants) were the most commonly used alcohol-interacting medications in regular drinkers.
66	Rigg and Monnat (2015)	Quantitative; n = 47,440; 49.2% women	US	O	NSDUH	Urban adults have a higher risk for PDM due to reports of other substance use.
67	Rojas et al. (2013)	Quantitative; n = 316 women	US	SE	Drug Use Frequency (DUF)	Daughters who were older, used illicit drugs, or did not have health insurance reported more non-prescription stimulant use. Insured mothers and those who engaged in illicit drug use had daughters who reported more stimulant misuse.
68	Satre, Sterling, Mackin, and Weisner, (2011)	Quantitative; n = 154, 62.4% women	US	SE	ASI	Gender did not predict sedative misuse.
69	Schepis (2014)	Quantitative; n = 174,677; 58% women	US	All Rx	NSDUH 2009-2011	PDM was associated most strongly associated with mental health and other substance abuse.
70	Shadick, Dagirmanjian, Trub, and Dawson, (2016)	Quantitative; n = 4428; 63.1% women	US	AN, O, ST,	Core Institute Survey	No gender differences for any of the drugs of interest.

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Table 1 (*continued*)

#	Author(s)	Design & Sample Size	Country	Drug(s) Studied	Primary (Substance Abuse) Measures	Key Findings
71	Shannon, Havens, Mateyoke-Scrivner, and Walker, (2009)	Quantitative; n = 2786 women in substance abuse treatment	US	O, SE	Government Performance and Results Act (GPRA)	Appalachian women had high rates of opiate, sedative/tranquilizer use than non-Appalachian women.
72	Shield, Ialomiteanu, Fischer, and Rehm, (2013)	Quantitative; n = 2015; 49.5% women	Canada	O	Centre for Addiction and Mental Health Monitor survey	Women had significantly higher odds of non-medical opioid use than men.
73	Sigmon (2006)	Retrospective; n = 75 methadone patients; 52.7% women	US	O	ASI	Prescription opioid users reported fewer family and social problems and less income from illegal sources than heroin users.
74	Simoni-Wastila et al. (2004)	Quantitative; n = 3,185, 56.4% women	US	A, ST, SE	National Household Survey on Drug Abuse	Women are at a higher rate of PDM for analgesics and tranquilizers.
75	Smith, Costello, and Yonkers, (2015)	Quantitative; n = 2748 pregnant women	US	AN, O	CIDI; Anatomical Therapeutic Chemical Code (ATC)	6% of women used opioid analgesics during pregnancy. More women who used during pregnancy met criteria for specific psychological disorders and reported illicit drug use.
76	Snipes et al. (2015)	Quantitative; n = 767 college students; 62.7% women	US	A, AN, SE, ST	Researcher generated	Ethnic minorities were less likely to report PDM, being a member of a fraternity/sorority was a risk factor for PDM, and religiosity was a protective factor. Marginal effect suggests males may be more likely misuse Rx.
77	Steinmiller and Greenwald (2007)	Retrospective; n = 208; 31% women	US	O	Drug Use History Questionnaire; urine sample	Lifetime nonmedical opioid use was associated with a history of legitimately using prescription opioids, having ever sought treatment for heroine, and other health and mental health problems.
78	Stock, Litt, Arlt, Peterson, and Sommerville, (2013)	Quantitative; n = 555 university students; 55.9% women	US	ST	Researcher generated survey	Friends' non-prescription stimulant use, perceived vulnerability, negative health and positive academic beliefs were associated with willingness to use stimulants.
79	Stone and Merlo (2012)	Quantitative; n = 383; 59.2% women	US	B, ST	Researcher generated	Stimulant misusers were more likely to have health insurance, have sought help for a mental health issue, and know someone who had misused a stimulant. Benzodiazepine misusers were more likely to be White and know someone who had misused a benzodiazepine.
80	Teter, McCabe, Cranford, Boyd, and Guthrie, (2005)	Quantitative; n = 9161 undergraduates; 56.2% women	US	ST	Student Life Survey	Among students, women use stimulants at lower rates than men.
81	Tetrault et al. (2008)	Mixed methods; n = 55,023; 52% women	US	O	NSDUH	For women, past-year PDM of opioids was associated with onset of illicit drugs after age 24, serious mental illness, & cigarette smoking.
82	Tominaga et al. (2009)	Quantitative; n = 887; 52.8% women	Japan	O, SE, ST	Researcher generated	PDM was significantly more common among middle-aged respondents and those who were married/cohabitating.
83	Uosukainen et al. (2014)	Cross-sectional; n = 475; 29.1% female	Finland	AM, AM	ASI-modified; Treatment Demand Indicator (TDI)	Factors associated with buprenorphine abuse (vs. amphetamine abuse) were male gender, past year drug use and treatment variables. Factors associated with amphetamine abuse were psychotic symptoms when using drugs and older age.
84	Vietri, Joshi, Barsdorf, and Mardekian, (2014)	Quantitative; n = 233 opioid users, 58.4% women	US	O	National Health and Wellness Survey	Medications most abused were non-opioid pain relievers with hydrocodone and oxycodone.
85	West, Severtson, Green, and Dart, (2015)	Quantitative; n = 184,136; 56% women	US	O	Researcher generated	Misuse rates lower for older adults than younger adults.
86	Wunsch, Nakamoto, Goswami, and Schnoll, (2007)	Quantitative, n = 233, 25% female	US	B, O	ASI	Females were more likely to engage in abuse of prescription opioids and benzodiazepines.
87	Yen et al. (2015)	Quantitative; n = 208 elderly patients; 60.4% female	Taiwan	SE	Researcher generated	Significant depression and a variety of hypnotics were correlated with misuse.
88	Zullig and Divin (2012)	Archival; n = 22,783 college students, 69.5% women	US	A, SE, ST, other	ACHA-NCHA	Women with suicidal ideation or attempts had a significantly higher rate of painkiller abuse.

Note. Abbreviations are as follows: AM = Amphetamine, A = Analgesic, AN = Anxiolytic, B = Benzodiazepine, O = Opioid, Rx = prescription(s), SE = Sedative, ST = Stimulant, and T = Tranquilizer.

Table 2
Demographic correlates of PDM among women.

#	Author	Gender	Racial Minority	Age	Other Drug Abuse	Lower Education	Unwed	Uninsured	Unemployed	Low Income	Health/ Emotional Issues
1	Argento et al. (2015)	∀	–	ns	–	–	–	–	–	–	α
2	Arria et al. (2013)	M	W	–	α	–	–	–	–	±	–
3	Ashrafioun et al. (2014)	ns	ns	ns	α	–	–	–	ns	–	–
4	Assanangkornchai et al. (2010)	F	–	↔	α	–	–	–	–	–	–
5	Back et al. (2010)	F	–	–	α	–	–	–	–	–	α
6	Barth et al. (2013)	ns	ns	ns	α	α	–	–	α	–	α
7	Bramness et al. (2007)	F	–	–	α	–	–	–	–	–	–
8	Chen et al. (2014)	M	–	↔	–	α	α	α	–	α	α
9	Cochran et al. (2014)	M	–	YA	α	–	–	±	–	–	α
10	Cole and Logan (2010)	∀	W	YA	–	ns	–	–	ns	ns	–
11	Cropsey et al. (2015)	F	ns	–	α	α	±	α	±	–	–
12	Currie et al. (2013)	ns	–	ns	–	α	ns	–	α	α	ns
13	Dayal and Balhara (2016)	F	–	–	–	α	α	–	α	–	α
14	Dollar and Ray (2013)	ns	W	50+	α	–	α	–	–	–	α
15	Fiellin et al. (2013)	ns	ns	18-23	α	ns	–	ns	ns	ns	–
16	Ford (2008)	F	–	–	–	–	–	–	–	–	–
17	Fresán et al. (2011)	M	–	–	–	±	–	–	–	–	α
18	Gee et al. (2007)	ns	–	ns	–	–	–	–	–	–	α
19	Gibbs et al. (2016)	∀	–	–	–	–	–	–	–	–	α
20	Goodwin and Hasin (2002)	↔	α	↔	–	↔	α	–	–	α	α
21	Grattan et al. (2012)	M	–	YA	–	–	–	–	–	–	α
22	Griffin et al. (2014)	F	–	ns	α	ns	ns	–	ns	–	α
23	Gros et al. (2013)	ns	ns	–	α	ns	ns	–	ns	–	α
24	Gureje et al. (2007)	M	–	–	–	–	–	–	–	–	–
25	Hall et al. (2016)	∀	W	YA	α	–	–	–	–	–	α
26	Hardt et al. (2013)	∀	–	–	α	–	–	–	–	–	–
27	Hartung et al. (2013)	M	–	–	α	–	–	–	–	–	–
28	Havens et al. (2007)	M	W	YA	α	α	–	–	α	–	–
29	Herman-Stahl et al. (2007)	F	–	–	α	α	–	–	–	α	α
30	Hermos et al. (2008)	M	W	YA	α	–	–	–	–	–	–
31	Jamison et al. (2010)	F	–	–	–	–	–	–	–	–	α
32	Jiraporncharoen et al. (2016)	F	–	YA	α	–	–	–	–	–	α
33	Johansson et al. (2003)	F	–	unspecified	–	–	–	–	unspecified	–	–
34	Johnson (2006b)	∀	–	α	α	–	α	–	–	–	–
35	Johnson (2006a)	∀	–	α	α	α	α	–	–	α	α
36	Katz et al. (2013)	M	ns	YA	–	–	α	–	–	–	α
37	Kelly and Parsons (2007)	F	–	–	–	–	–	–	–	–	–
38	Kelly et al. (2013b)	M	W	YA	–	–	–	–	–	–	–
39	Kelly et al. (2015))	M	–	–	α	ns	–	–	–	–	α
40	Kerr et al. (2015)	∀	–	–	–	–	–	–	–	–	–
41	Khosla et al. (2011)	ns	W	YA	α	–	–	–	–	ns	α
42	Kurtz et al. (2011)	ns	ns	ns	α	ns	–	–	–	–	α
43	Lanier and Farley (2011)	M	ns	YA	α	–	–	–	–	–	–
44	Liebschutz et al. (2010)	M	W	–	α	–	–	–	–	–	–
45	Lo et al. (2013)	ns	W	ns	α	–	ns	–	–	–	α
46	Mackesy-Amiti et al. (2015)	∀	–	–	–	–	–	–	–	–	α
47	Martel et al. (2014)	ns	–	–	–	–	–	–	–	–	α
48	Martin et al. (2009)	∀	–	–	–	–	–	–	–	–	α
49	Martins et al. (2015)	F	–	–	–	α	–	–	–	–	–
50	McCabe et al. (2005)	F	–	–	–	–	–	–	–	–	–
51	McCabe, Teter, Teter et al. (2006)	M	W	–	α	–	–	–	–	–	–
52	McCabe, Teter et al. (2006)	F	W, H	–	α	–	–	–	–	–	–
53	McCabe, West, Morales et al. (2007)	F	–	α	–	–	–	–	–	–	–
54	McCabe et al. (2007c)	ns	W	–	α	–	–	–	–	α	–
55	McCabe et al. (2013)	ns	W	–	α	–	–	–	–	–	–
56	McCauley et al. (2009)	∀	–	18-34	α	–	α	–	–	↔	α
57	McCauley et al. (2011)	∀	ns	ns	α	–	–	–	–	ns	α
58	Meltzer et al. (2012)	ns	ns	ns	α	ns	–	–	–	–	α
59	Messina et al. (2014)	ns	–		α	–	–	–	–	–	–
60	Morioka et al. (2017)	M	W	–	–	–	–	–	–	–	α
61	Novak et al. (2007)	ns	ns	18-25	α	ns	–	ns	–	–	–
62	Parks et al. (2017)	F	–	–	–	–	–	–	–	–	α
63	Pletcher et al. (2006)	M	W	–	α	–	–	–	–	–	α
64	Price et al. (2011)	ns	–	–	–	–	–	–	–	–	–
65	Qato et al. (2015)	F	B, H, O	ns	α	↔	–	↔	–	↔	ns
66	Rigg and Monnat (2015)	ns	±	YA	α	α	α	±	α	α	α
67	Rojas et al. (2013)	∀	–	OA	α	±	–	↔	–	–	↔
68	Satre et al. (2011)	ns	–	–	–	–	–	–	–	–	–
69	Schepis (2014)	↔	W	↔	α	±	–	–	–	↔	α
70	Shadick et al. (2016)	ns	W	–	–	–	–	–	–	–	–

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Table 2 (*continued*)

#	Author	Gender	Racial Minority	Age	Other Drug Abuse	Lower Education	Unwed	Uninsured	Unemployed	Low Income	Health/ Emotional Issues
71	Shannon et al. (2009)	∀	W	ns	–	ns	–	–	ns	–	α
72	Shield et al. (2013)	↔	–	30-54	α	±	–	–	–	–	–
73	Sigmon (2006)	ns	ns	ns	ns	–	–	–	ns	ns	ns
74	Simoni-Wastila et al. (2004)	F	W	17 +	α	–	α	α	–	↔	α
75	Smith et al. (2015)	∀	ns	–	α	ns	–	–	–	–	α
76	Snipes et al. (2015)	M	W	ns	–	–	–	–	–	–	–
77	Steinmiller and Greenwald (2007)	ns	ns	–	ns	–	–	–	–	–	ns
78	Stock et al. (2013)	ns	–	ns	α	–	–	–	–	–	–
79	Stone and Merlo (2012)	ns	↔	ns	–	–	–	±	–	–	α
80	Teter et al. (2005)	M	–	–	α	–	–	–	–	–	–
81	Tetrault et al. (2008)	F	↔	–	α	ns	α	α	α	α	α
82	Tominaga et al. (2009)	ns	–	35-49	α	–	±	–	–	–	α
83	Uosukainen et al. (2014)	M	–	OA	α	–	–	–	–	–	α
84	Vietri et al. (2014)	M	B, H, As	YA	α	–	–	–	±	±	α
85	West et al. (2015)	F	–	ns	–	–	–	–	–	–	–
86	Wunsch et al. (2007)	F	–	–	–	–	–	–	–	–	–
87	Yen et al. (2015)	ns	–	ns	–	–	–	–	–	–	α
88	Zullig and Divin (2012)	F	–	–	–	–	–	–	–	–	α

Notes: Key: ∀ = all female sample; F = female, M = male; ns = not significant; α= significant; ↔ = mixed results; ± = opposite result; - = not measured; As = Asian; B = Black/African American; H = Hispanic/Latino; W = White; O = other; YA = younger adult; OA = older adult. For age, range is provided when specified.

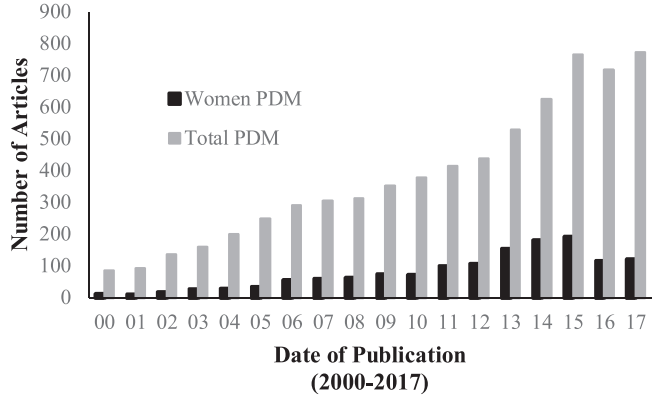

Fig. 2. Frequency of PDM articles on women fitting inclusion criteria compared to total number of PDM articles published from 2000 to 2017.
Note. Articles may not be unduplicated.

studies on women has remained steadily low. Based on population estimates where women represent half, few studies have representative samples of women. Fig. 2 depicts the contrast between annual total articles published on PDM and those including adequate samples of women.

Country of origin

North America dominated the identifiable research on PDM. Over three quarters (80.7%) of the studies were on U.S. samples, three were conducted in Canada, and one was conducted in Mexico. Asia had the second highest number of studies (n = 5; 5.7%), with samples in Thailand, Taiwan, Japan, and India. In European nations, Norway, and Finland each had one study. Australia had two studies on PDM. Lastly, Africa had one study on PDM that was conducted in Nigeria. Fig. 3 depicts a world map of this information.

Drugs of interest

The search included commonly abused prescription drugs. Most studies on PDM included multiple drugs (n = 46; 52.3%). Pain relievers, described in studies as opioids and analgesics, were the most commonly investigated prescription drug of abuse and were included in over half (n = %) of the identified studies. Sedatives and tranquilizers were also frequently included and were reported in 39 (.3%) of studies. Stimulant drugs were reported in 28 (31.84%) studies. Lesser-studied drugs in samples of women included benzodiazepines (n = 12), amphetamines (n = 8), anxiolytics (n = 14) and other unspecified prescription drugs (n = 10). While sedatives, tranquilizers, anxiolytics, and benzodiazepines could be grouped together in a single class, the articles examining these drugs did so separately, or only reported on one of these drugs, therefore, the authors left them as separate categories in this review (see Table 3).

Measurement

PDM was most often captured in researcher-generated survey instruments (n = 24; 27.3%). Data on PDM from the old and the newly revised National Survey on Drug Use and Health surveys were used in eleven studies. Other commonly used instruments included the American College Health Association survey with two studies utilizing the database and the Student Life Survey with four studies utilizing the survey. Diagnostic and evaluative instruments such as the Addiction Severity Index (ASI), the Diagnostic and Statistical Manual of Mental Disorders version 5 (DSM-5), and the Composite International Diagnostic Interview (CIDI) were used in 12 (13.6%) studies.

Correlates of PDM

Women

All of the studies that were retained made gender comparisons. The findings were mixed. Over a quarter (n = 23; 26.1%;) of the studies found that females reported abuse of certain prescriptions more than men (see Table 2). Gender differences in PDM were not significant in 26 (29.5%) of the studies. Twenty-one studies (23.9%) found that men engage in more PDM. Among these studies that found that men reported more PDM, seven studies reported that men misuse stimulants more often [2, 8, 38, 43, 51, 76, 80].

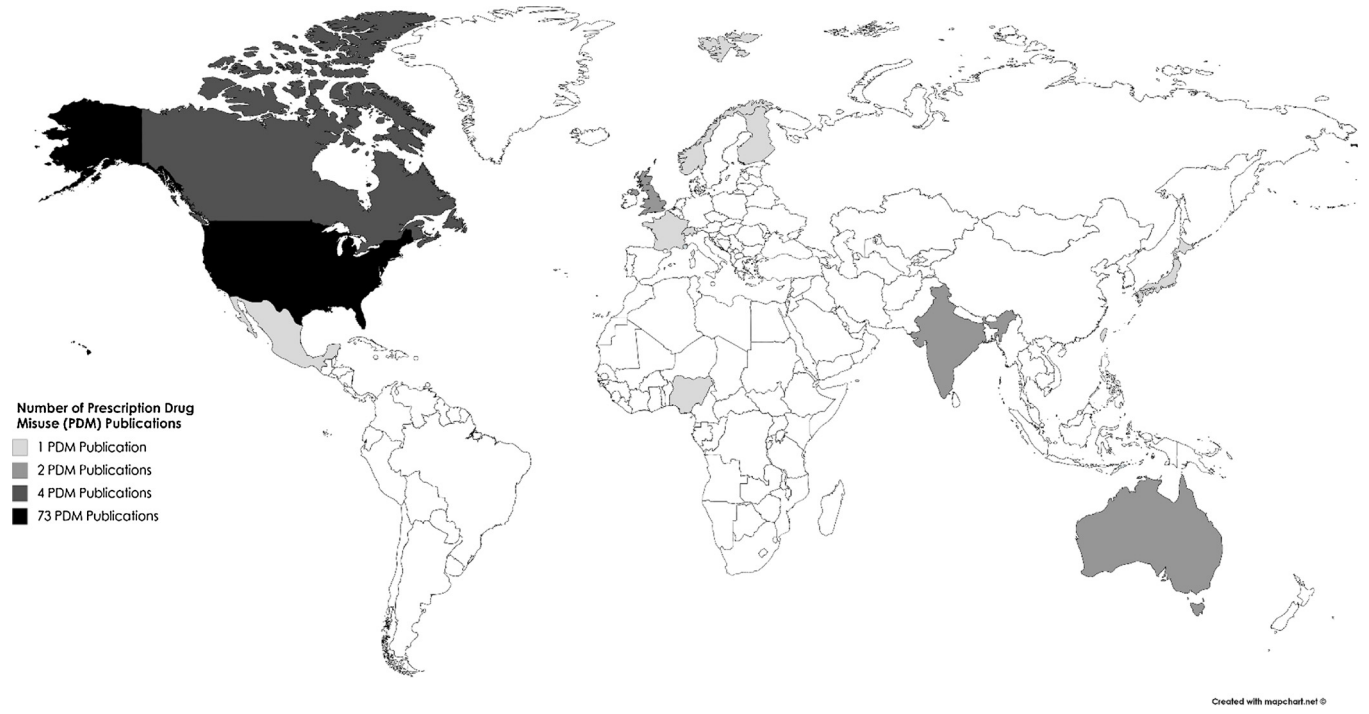

Fig. 3. Global representation of international PDM publications (2000–2017).

Table 3
Frequencies of drug class included in PDM studies with women.

Drug Class	Total Number of Articles	Percentage (%) of Articles
Analgesics and Opioids	60	64.5
Anxiolytics	15	16.1
Amphetamines	10	10.8
Benzodiazepines	14	15.1
Sedatives	41	44.1
Stimulants	28	30.1
Tranquilizers	1	1.1

Note: Many studies included multiple drugs and thus the tally does not equal 100%.

Race and geographical differences

Forty-two (47.7%) studies examined race/ethnicity as a correlate of PDM. Twenty-one indicated that Whites engaged in PDM more than other races (see Table 2). Thirteen found no significant differences by race/ethnicity. Two studies found mixed results when race was examined [79, 81]. Lastly, five studies noted higher rates of PDM for racial minorities (i.e., Asians [84], African Americans [65, 84], Hispanics/Latinx [52, 65, 84], other/unspecified [20, 42]).

Three studies examined regional differences and found that rural populations of women experienced more PDM than urban populations [10, 28, 71]. For example, Cole and Logan (2010) found that rural women were 1.74 times more likely to engage in the non-medical use of sedative-hypnotics and opiates than women from the urban community (OR = 1.74).

Age

Over half (n = 47, 53.4%) of the studies examined age as a correlate. Age was measured continuously and categorically in varied groupings across the studies, making it difficult to summarize the results. Age was not a significant correlate in eighteen of the studies (see Table 2). The remaining studies reported mixed results. Thirteen studies reported that "younger" adults engaged in PDM at higher rates (see Table 2) whereas three found that older individuals were more likely to abuse prescriptions [14, 67, 83].

Other substance abuse

Fifty-two (59.1%) of the studies investigated the misuse of other drugs concurrently with prescription drugs. Nearly all of the studies (n = 50) found that other substance abuse was correlated with PDM (see Table 2). Dollar and Ray (2013) found that those who abuse other drugs were 11 times more likely to report PDM (OR = 10.60). Other substance abuse was a constant predictor of PDM across the samples reviewed. Misuse of substances such as marijuana, sedatives, and alcohol were shown to significantly predict PDM among women [43].

Education

Of the 88 articles, 26 (29.5%) reported information on high school education as a correlate of PDM. Ten found that a lack of high school education predicted PDM [6, 8, 11, 12, 13, 15, 28, 29, 35, 49, 66]. These patterns remained consistent across various international samples as well, where individuals with lower educational attainment also reported PDM. Higher education was correlated with PDM in three studies [17, 67, 69]. Two studies reported mixed findings [20, 65].

Marital status

Seventeen (19.3%) studies reported marital status as a predictor of PDM. Eleven found that unmarried women were more likely to engage in PDM [8, 13, 14, 20, 34, 35, 36, 56, 66, 74, 81]. Two studies reported that married women had higher rates of PDM [11, 82].

Insurance status

Eleven (12.5%) studies reported insurance status as a predictor of PDM. The findings were mixed. Four found that uninsured women were more likely to engage in PDM [8, 11, 74, 81] whereas three studies found that insured women had higher rates of PDM [9, 66, 79].

Table 4
Supplemental findings on PDM among women from WHO library search.

Author(s)	Design & Sample Size	Country	Drug(s)	Substance Abuse Measure	Key Findings/Correlates
Gladstone, Smolina, Weymann, Rutherford, and Morgan, (2015)	Retrospective/Quantitative; *n* = 1172; 35% women	Canada	O	Death records	45% of women who died from prescription opioids did not have an active prescription in the past 60 days. Correlate/category: Male/gender
Holloway and Bennett (2007)	Quantitative; *n* = 3135 arrestees; 14% women	UK	B, AM, O, Other	Urinalysis	Women were significantly more likely to test positive for BZ and opiates than men. Correlate/category: Mixed/gender
Moschetti et al. (2015)	Chart review/Quantitative; *n* = 1664 inmates; 8.5% women	Switzerland	SE, O, Other	ICD-10	Incarcerated women had higher rates or opioid, sedative, and other drug use than men. Correlate/category: Women/gender
Roussin, Bouyssi, Pouché, Pourcel, and Lapeyre-Mestre, (2013)	Quantitative; *n* = 295 pharmacy patients; 68.5% women	France	AN, SE	DSM-IV	Headache pain was the most common cause of PDM. Correlate/category: Women/gender
Sanaullah, Gillian, and Lavin, (2006)	Quantitative; *n* = 150 pregnant women	UK	AM, B, O, Other	Urinalysis	All of the participants denied misusing drugs, but 10% tested positive for prescription and other drugs. Correlate: Other Drug Use

Note: Abbreviations for drugs of interest are as follows: AM = Amphetamine, AN = Anxiolytic, B = Benzodiazepine, O = Opioid, and SE = Sedative.

Employment status

Fifteen studies described information on employment status as a correlate of PDM. Six studies found that unemployment predicted PDM [6, 12, 17, 28, 66, 81], and two studies reported that having a job was correlated with PDM [11, 84]. Vietri and colleagues (2014) found that working women who engaged in PDM had increased work impairment and absenteeism. Employment status was not a significant correlate of PDM in seven studies [3, 10, 15, 22, 23, 71, 73]. Among the studies that did not find employment status as a significant correlate of PDM, the samples were predominately White.

Income

Twenty studies (22.7%) examined income as a correlate (see Table 2). Eight studies found that lower income predicted PDM [8, 12, 20, 29, 35, 54, 66, 81], while five studies reported that income was not a significant predictor of PDM [10, 15, 41, 57, 73]. Three studies found that higher income predicted PDM [2, 72, 84] and focused on opioid abuse. Four studies found mixed results [56, 65, 69, 74].

Physical health and emotional issues

Over half (n = 50, 56.8%) of the studies examined physical and mental health as a correlate (see Table 2). The majority (90.0%, n = 45) of the studies found that physical and mental health issues significantly predicted PDM. Gibbs et al. (2016) found that PDM correlated with greater eating disorder pathology, depressive symptoms, perceived stress, and trait anxiety. Physical/mental health was not a significant correlate in four studies [12, 65, 73, 77].

Other correlates

Several studies examined a variety of other variables that were significant predictors of PDM in women. Two studies examined the rates of prescriptions issued to men and women and found that women obtain more prescriptions than men [7, 52]. Three studies found that sexual orientation predicted PDM in women [37, 40, 70]. For example, Kerr, Ding, Burke, and Ott-Walter, (2015) found that lesbian and bisexual women had greater odds of misusing prescription drugs than heterosexual women (*OR* = 1.30–2.07). Greek life affiliation was examined as a correlate of PDM in four studies, and the results showed that being a member of a sorority/fraternity significantly predicted PDM [45, 51, 54, 76]. In addition, two of those studies also found that having no religious affiliation was predictive of PDM [51, 76]. Other correlates were noted, but conclusions could not be drawn due to insufficient evidence.

Pregnancy

Though not identified as a correlate in the studies reviewed, some studies included pregnant women. Specifically, three included study samples of pregnant women [26, 48, 75]. All of these studies were conducted in the U.S. For example, Smith and colleagues (2015) sampled 2748 pregnant women in Connecticut and Massachusetts and found that 6% engaged in PDM. The women also had higher rates of psychiatric disorders than non-users. In another study, prescription drugs were found in 54% of non-natural deaths among pregnant women.

Additional search of international studies

To expand the search for international articles, the authors also searched the World Health Organization (WHO; n.d.) library. In the database for scientific and technical literature, the authors entered "prescription drug misus* abus* women" to be searched in the title,

abstract, or subject. Thesaurus terms from the primary search were attempted but reduced the number of results (e.g., addict*, female). Operators were also entered (i.e., AND) and also limited the results. In total, the maximum number of articles retrieved was 259. The results were then filtered by: human, female, adult, and year (2001–2016 options available) and resulted in 190 articles. Lastly, the authors selected the limiter for affiliated countries that were outside of the U.S. in order to hone in on international studies (n = 49). A review of the abstracts indicated that the majority of the articles did not focus on PDM (n = 39). The text of the remaining 10 articles was reviewed and half met the inclusion criteria (n = 5; see Table 4). Four of five were conducted in Europe and one in Canada. Opioids were studied in four (80%) of the studies and two (40%) collected urinalysis. Gender was an identified correlate in three studies but the results were mixed.

Discussion

The authors examined four research databases and retained 88 articles to summarize the research and investigate the correlates of PDM among women. A supplemental search exploring international studies, conducted in the WHO library, resulted in an additional five articles meeting inclusion criteria. International Narcotics Control Board (INCB) (2015)) indicated that prescription drugs are the second most trafficked drugs in the world. The accessibility coupled with the low stigma makes women particularly vulnerable to this epidemic. The present review further illuminated the nature of this trend. The review had two aims: first, to summarize the research on PDM among women around the globe and second, to identify the correlates of PDM in this group.

Summary of research on prescription drug misuse and women

The majority of the studies on PDM among women were quantitative. Conducting additional qualitative studies may provide more details about the needs, underlying causes, and strengths and weaknesses associated with PDM among women. The measurement of PDM across studies was inconsistent and relied heavily on researcher-generated surveys. This inhibits assessing for measurement equivalence. As the field moves toward designing interventions, normed measurement instruments may be useful.

In the past, clinical researchers excluded women from research for two reasons: 1) biological complexity, and 2) caregiver obligations that impeded inclusion. In 1993, NIH mandated the inclusion of women in research studies and today women represent half of the participants in NIH-funded research (Clayton & Collins, 2014). The limitation of this mandate remains evident in the disproportionate representation of women in PDM research. The exclusion of women contributes to gaps in clinical knowledge about women and their unique needs. Perhaps Institutional Review Boards should have inclusionary mandates since their oversight extends beyond federally-funded research.

The findings elucidate a global PDM epidemic. The U.S. makes up only 4.4% of the world population (U.S. Census Bureau, 2017), but accounted for the overwhelming majority of the identified research studies. Internationally, 1 in 20 adults abuse drugs and 12.4% of deaths are associated with drugs, alcohol, and tobacco (United Nations Office on Drugs and Crime (UNODC), 2016). In developing countries, the disease model of addiction and treatment access lags (UNODC, 2016). As a world leader, the U.S. should work to serve as a role model in prescription drug prevention and intervention practices with special emphasis on the interconnectedness between social and economic development and its impact on the world drug crisis.

Based on the findings, prescription opioids were the most commonly studied drug. This may be due to the addiction and overdose potential. However, other more accessible drugs could potentially serve as gateways to opioid abuse. McCabe, West, Morales, Cranford, and Boyd, (2007) suggest that even a history of simply taking prescribed medicines can predict future opioid misuse. Thus, for clinicians, assessing the use of other prescriptions may be important.

The measurement and definition of PDM is ever evolving. A large portion utilized secondary databases. Researchers also used a variety of standardized and researcher-generated instruments to measure PDM in the identified studies. Consistent measurement would assist in quantifying the scope of PDM in various subpopulations of women. Moreover, the field needs clearer operational definitions of drug behaviors. Broader terms like “misuse” should be the gold standard when studying prescriptions since it has greater breadth and inclusivity than “abuse.” Prescription drugs are dangerous whether they are misused or abused. The absence of medical oversight is the core of the risk. Individuals who misuse drugs may have a legitimate prescription, but do not take the drug as directed. Misusers may enjoy the effects and seek out the drug more often, leading to abuse. Addressing the problem before misuse turns into abuse may be key in reducing the prescription drug epidemic.

The correlates of prescription drug misuse among women

Relatively few PDM studies included equivalent sample sizes of women or made gender comparisons (see Fig. 2). Of those that made appraisals, over a quarter (26.1%) indicated higher abuse of certain types of prescriptions among women and nearly a third (29%) reported no gender differences. Drug misuse is often stereotyped as a problem among males (Simoni-Wastila et al., 2004; United Nations Office on Drugs and Crime (UNODC, 2016), but men and women differ in drugs of choice and drug-related outcomes. Failure to recognize these differences can lead to gaps in the continuum of care and damage strides towards gender equality and female empowerment around the world (United Nations Office on Drugs and Crime (UNODC, 2016).

Some authors have questioned how “White males became the gold standard of research” (Institute of Medicine (US), 1994). Much of the discussion on the abuse of prescriptions has focused on White Americans (Peteet, 2017). The few studies that included data on race/ethnicity, indicated higher rates of PDM among Whites. However, the gap has narrowed for some groups. For example, African Americans have similar rates of past year prescription opiate misuse as Whites (4.4% versus 4.8% respectively) and the second highest rate of opioid overdose deaths (Substance Abuse and Mental Health Services Administration (SAMHSA), 2016). Further, the outcomes may be more detrimental for people of color. Existing health inequity research suggests that African Americans bear a greater burden of substance use disorders due to lower treatment access, lower quality care, and higher social, ecological, and socioeconomic threats (Burlew, Peteet, Ahuama-Jonas, & McCuistian, 2015). These factors coupled with low representation of women elucidate a significant research gap particularly for women of color.

For the younger generation, the gap in PDM use among males and females is also shrinking (Pitel et al., 2010). PDM is thought to be very common among youth because of the accessibility from family and friends, though half the findings herein suggest no significant differences across the lifespan. The mixed findings suggest that older adults are also at risk. Due to exposure in young adulthood and lack of access to treatment, PDM may progress throughout the lifespan contributing to an increasing rate of PDM among the older adult female population.

PDM was exceedingly common among misusers of other substances. Prescriptions have sometimes been considered gateway drugs (i.e., less dangerous drugs that lead to the abuse of harder drugs; Bellum, 2012). While some prescriptions may warrant this label, opioids, which were commonly abused, should not be considered gateway drugs given the dangers associated with their abuse. The risks associated with experimenting with prescription opioids can reach dangerous levels more quickly than other “traditional” gateway drugs such as cigarettes. Clinicians and researchers should inquire about PDM when working with substance abusing populations.

Other sociodemographic correlates yielded varied results. There

were no consistent patterns across education. The finding was inconsistent with other research that a lack of high school education predicts drug abuse (Townsend, Flisher, & King, 2007), which suggests that traditional substance abuse prevention interventions targeting students may not be appropriate for addressing PDM.

Contrary to other studies, where marriage was a protective factor against substance abuse (Rocque, Posick, Barkan, & Paternoster, 2015), in the present study marriage was an inconsistent protective factor in PDM with both married and unmarried women engaging in PDM. Despite inconsistent results, few studies have explored deeper facets of marriage (e.g., social support, financial stability, family stressors) or how being unmarried influences drug misuse. This suggests the need for additional research regarding the influence of relationships on PDM.

Previous literature suggests that unemployment predicts general substance use and relapse both in the U.S. and internationally (Henkel, 2011; Lee et al., 2015; Peck & Plant, 1986). This relationship was not consistent in this review. The present study showed that in some cases unemployment was correlated with PDM, which is consistent with previous literature. However, in other cases, either having a job was a correlate of PDM, or there was no relationship at all. When having a job was associated with PDM, these women still reported work impairment and absenteeism, suggesting that PDM is still impacting women's functionality while on the job. This suggests that having a job does not necessarily protect women from engaging in PDM.

There were also inconsistent and varied relationships between income levels and PDM. This was consistent with previous literature examining, more generally, socioeconomic status and substance abuse (Buka, 2002; Karriker-Jaffe, 2011). While international studies examining income and PDM found that low income was a correlate, several studies conducted in the U.S. did not find this pattern. This suggests that there might be unique protective factors that combat the development of PDM among lower income women in the U.S. or the problem is inextricably linked to prescription drug access. The relationship between higher income and opioid PDM might be explained by the rising costs of prescription drugs in the U.S. (National Academy for State Health Policy, 2016). The inconsistent findings reveal that PDM among women is problematic for both lower income and higher income women, further highlighting the need for future research examining intersectionality (interconnected social categories) and development of PDM among women.

Mental illness was also strongly associated with PDM in many of the studies. This is consistent with previous literature indicating that concurrent substance abuse and mental health problems are prevalent (Becker, Fiellin, & Desai, 2007). The problem can be cyclical where those with mental illness may self-medicate or those who abuse drugs may develop mental health symptoms. Women are more likely to seek mental health treatment (Koenen, Goodwin, Struening, Hellman, & Guardino, 2003) and be prescribed psychotropics (Jacobson, 2014). These drugs can also become a source of abuse as evidenced by the prevalence of anxiolytic and sedative abuse in study participants. In recent decades, over prescribing practices for physical health problems such as pain have also contributed to the epidemic (Jacobson, 2014). Patients can become dependent on opioid analgesics and take more than prescribed for longer than needed. These behaviors have contributed to the uptick in heroin abuse (Jones, 2013; Muhuri, Gfroerer, & Davies, 2013). Trauma also appears to be a golden thread linking the female population and PDM, which calls for efforts to increase risk reduction among women who co-report PDM and traumatic events (McCauley et al., 2009). Overall, clinicians working with women with mental or physical health problems should consider assessing for PDM, since these populations show an increased risk.

Other correlates of PDM revealed high-risk female populations. Consistent with the literature, PDM was higher among women who identified as lesbian and bisexual and members of college Greek life. Bisexual and lesbian women face discrimination and other challenges that increase negative health behaviors such as substance abuse (Medley et al., 2016). Scott-Sheldon, Carey, and Carey, 2008) found that Greek life rituals and socialization give rise to risky drug behaviors. Future PDM studies may want to investigate the influence of discrimination and social networks. The findings may also inform campus health/prevention activities.

Pregnant women are a particularly high-risk group engaging in PDM. The research is clear on the damaging health effects of licit (e.g., prescriptions, alcohol) and illicit (e.g., crack) drugs on unborn fetuses. Policy-makers should promote treatment over criminalization (e.g., loss of custody) for pregnant substance misusers (Lester, Andreozzi, & Appiah, 2004).

The findings of this review suggest that PDM is a major problem among women around the world. Women who abuse other substances and have mental or physical health problems are particularly at risk. Other high-risk groups include bisexual, lesbian, and pregnant women. These findings dispel the myths that PDM is a young and/or male problem. However, the studies are not without limitations.

Limitations of the studies

Methodological limitations were revealed in the reviewed studies. The search process showed that the definition of PDM is inconsistent. Articles described behavior ranged from medication sharing, using more than prescribed, and recreational abuse. Around a fourth of the studies used the same or a revised version of the same dataset and were secondary data analyses. The growing interest and abundance of PDM since 2000 highlights a need for more current data, in addition to asking more complex research questions. Research on prescription drug abuse is fundamentally restricted due to polysubstance abuse in participants. Teasing apart the effects of PDM alone can be challenging. The studies that utilized self-report should be interpreted with caution. In drug abuse research, consideration should always be given to problems with memory, underreporting, and social desirability.

The international studies present unique challenges when drawing conclusions. Culture and gender roles in societies across the world should be considered. Collectivist cultures value 'sharing', and in parts of the world where many ascribe to this view (e.g., Asia), sharing medication may be seen as less problematic. Few studies were identified that compared PDM across cultures. The U.S. may pose undue influence over future rates of PDM in other countries. Moreover, there is a need for longitudinal research across different cultures due to the limited knowledge on the long-term effects of PDM, both in the U.S. and internationally.

Limitations of the review

This review also has limitations. The authors may not have utilized the most comprehensive search and using alternative terminology and research databases may have uncovered additional articles. The authors did not include the vast array of brand name and generic drugs for each drug class in the search. However, articles describing a particular drug traditionally indicate the class. Twenty-five were included.

Dissertations/theses, conference proceedings, and unpublished/not peer-reviewed studies, also known as "grey literature", were not included. This practice can introduce publication bias, but conversely, peer review adds credibility, impartiality, accuracy, and validity to the research findings (Solomon, 2007). International studies and those not in English may have been less accessible than those in mainstream journals. While MEDLINE is a global database, the authors conducted a supplemental search of the WHO library to identify additional international studies.

In other limitations, applicable works may have been excluded by limiting the search to the past 17 years. However, the early 2000's have been identified as the onset of the PDM epidemic (Center for Disease Control and Prevention (CDC) (2013)). Finally, it is possible that the authors may have been biased in identifying inclusion and exclusion

criteria. Despite these limitations the search process is described in full detail to permit replication (syntax available upon request).

Policy and practice implications and future research

The results indicate that more evidence is needed on the prevalence, risk and protective factors for women engaging in PDM. Future research should work towards inclusivity and oversample for underrepresented groups of women (i.e., pregnant, rural, sorority members, bisexual/lesbian, ethnic minorities, etc.). Given the shifting trends in misuse among younger women, targeted studies are also needed on specific subgroups such as adolescents, young adults, and college students. These high-risk groups may need more screening and education about the dangers of PDM. The risks of PDM among various populations of women are undeniable and substantial. As an international leader, the U.S. may set the example for inclusivity and effort to address this epidemic among women.

Despite the limitations in the literature, the current review highlights some areas of focus for prevention and/or intervention strategies. First, various studies suggest that correlates of misuse for women differ than those for men. This suggests that gender-specific approaches for decreasing PDM may be appropriate. Furthermore, women who abuse other substances or have physical or mental health concerns are high risk. These correlates in particular should be targeted for additional assessment or screening and specialized interventions.

Conclusions

Women have distinctive risk and protective correlates of PDM suggesting that a reframe in defining risk is needed. Women account for half of the world population and too many are struggling with this often hidden and potentially deadly practice. The findings should be considered in screening, prevention, and intervention efforts to address PDM among women.

Several strategies can be used to address this international epidemic. More updated information on drug trafficking and prescribing practices is needed to fully understand how women are acquiring medications with abuse potential. Public campaigns should promote awareness of the dangers associated with PDM. Researchers and clinicians should consider the risk factors identified in this study to properly study and assess prescription drug abusing women. Finally, additional international studies are necessary to grasp the degree to which this epidemic has a hold on the global community. Taking these steps will contribute to diminishing the transnational impact of the PDM among women.

Conflicts of interest

None.

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