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Trends in heroin use among women of reproductive age in the United States, 2004-2017

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Abstract

Opioid use during pregnancy has been linked to several adverse outcomes including stillbirth, preterm birth and neonatal abstinence syndrome. Recent data suggest that heroin use has increased in the United States (US) whereas prescription opioid use has decreased. Prevalence estimates for reproductive age women combine heroin and nonmedical prescription opioid use, which might mask the increasing heroin trend. The aim of the current study is to estimate the prevalence of heroin use among US women of reproductive age, stratified by pregnancy status. For each year, a representative sample of the US civilian non-institutionalized population is recruited for the National Survey on Drug Use and Health (NSDUH). Pregnancy status and heroin use were assessed in women 15–44 years of age ($n = 277,333$) using audio computerized-assisted self-interviews. From 2004 to 2017, the prevalence of past 30-day heroin use was 12 per 10,000 reproductive age women (95% confidence interval [CI] = 11, 14). Heroin use has increased from 6 per 10,000 women in 2004–05 to 18 per 10,000 women in 2016–17 (Average percent change = 20.8; 95% 11.2, 31.2). The increase was evident among non-pregnant women, but not among pregnant women. Heroin use remains uncommon among women of reproductive age, yet its prevalence has increased over time. Screening for heroin use might be needed at multiple time

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Contributors

OA conceptualized the study. OA & AV conducted literature searches, statistical analysis and wrote the first draft of the manuscript. OA and MAP revised the manuscript for important intellectual content.

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points including prior to pregnancy to mitigate adverse outcomes associated with use during pregnancy.

Keywords

Heroin; Women; Pregnancy; NSDUH; Prevalence

1. Introduction

In the United States (US), the prevalence of prescription opioid use has decreased in the recent years owing to the more restrictive prescription policies and/or the introduction of abuse-deterrent reformulation (Cheng & Coplan, 2018; Guy et al., 2017). Heroin use, however, has escalated (Compton, Jones, & Baldwin, 2016). Women were disproportionately affected by these trends. Non-medical use of prescription opioids, defined as the use of an opioid pain reliever that was “not prescribed” or that was used “only for the experience or feeling it caused” has decreased at a slower rate among women 12 years and older compared to men within the same age group (Marsh, Park, Lin, & Bersamira, 2018). On the other hand, heroin use has increased at a faster rate among women compared to men (Marsh et al., 2018). Heroin overdose deaths have also increased 915% among women aged 30–64 years from 1999–2017 (VanHouten, Rudd, Ballesteros, & Mack, 2019).

Opioid use is associated with unique concerns particularly among women of reproductive age. Opioid use during pregnancy has been linked to stillbirth, preterm birth, neonatal abstinence syndrome, admission to the neonatal intensive care unit and other adverse outcomes that contribute to infant morbidity and mortality (Reddy, Davis, Ren, Greene, & Opioid Use in Pregnancy, 2017). Prior studies suggest that 45% of pregnancies in the US are unplanned, and the mean time of pregnancy recognition is 6 weeks (Ayoola, Nettleman, Stommel, & Canady, 2010; Finer & Zolna, 2016). Given the potential for lag in prenatal care, primary prevention efforts that include identification of opioid users before pregnancy occurs can be helpful to reduce use and mitigate adverse maternal and fetal outcomes (Patrick & Schiff, 2017).

Several epidemiological studies estimated the prevalence of opioid use among US reproductive age women, combining heroin use and non-medical use of prescription opioids (Jarlenski et al., 2017; Metz, Brown, Martins, & Palamar, 2018). The declining trend in prescription opioid use, however, can mask the increasing heroin use trend observed in the general population. The aim of the current study is to estimate heroin use prevalence among reproductive age women in a series of self-administered surveys of US community residents.

2. Methods

2.1 Data source

The National Survey on Drug Use and Health (NSDUH) is designed to be nationally representative of the US civilian population aged 12 years and older (United States Center for Behavioral Health Statistics and Quality, 2018). The NSDUH sample was drawn from households, non-institutional group quarters (college dormitories, group homes, civilians

dwelling on military installations) and persons with no permanent residence (homeless people in shelters and residents of single rooms in hotels). The survey employed a multistage area probability sample for each of the 50 states and the District of Columbia. The current study sample included women aged 15 through 44 years old ($n = 277,333$), sampled between 2004 and 2017. The institutional review board at Michigan State University ruled this analysis as exempt because data used were from de-identified files made available for public use.

2.2 Variables

The NSDUH assessment was conducted in the participant's dwelling unit. Audio computer-assisted self-interviews were used to collect information on pregnancy status and heroin use. Reproductive age women were asked if they were pregnant at the time of NSDUH interview, and pregnant women were asked the question "How many months pregnant are you?". Ever heroin users were asked how long it has been since they last used heroin. Responses included "Within the past 30 days", "More than 30 days ago but within the past 12 months" and "More than 12 months ago". In the current study, past 30-day and past 12-month heroin use were defined as using heroin in the 30 days and the 12 months prior to NSDUH assessment, respectively.

2.3 Statistical analyses

Prevalence of past 30-day heroin use was estimated for all reproductive-age women, non-pregnant women and pregnant women using Stata v.15 (StataCorp, TX) accounting for NSDUH analysis weights and complex design. Using the Joinpoint Regression Program (version 4.7; National Cancer Institute), we tested for significant changes in trends using a log-linear model and Bayesian information criterion. We produced the average percent change (APC) for each subgroup. We repeated the analyses for past 12-month heroin use. To adjust for potential confounding variables, we additionally ran Poisson regression models with NSDUH survey indicator as the main exposure and heroin use status as the outcome, controlling for age, race/ethnicity, family income, and education.

Results

The number of reproductive age women assessed for NSDUH from 2004–17 ranged from 18,724 to 20,485, among which, 728 to 958 were pregnant at the time of assessment (weighted %: 3.5–4.2). Aggregation of samples across 2004–17 (Table S1) indicates that the majority of the participants were non-Hispanic White and had more than high school education. Among pregnant women, 31% were in Trimester-1, 35% were in Trimester-2 and 33% were in Trimester-3.

Table 1 presents prevalence estimates for past 30-day heroin use, displayed in two-year bins to increase precision. The prevalence of past 30-day heroin use increased from 6 per 10,000 reproductive age women (95% CI = 4, 8) in 2004–05 to 18 per 10,000 reproductive age women (95% CI = 14, 24) in 2016–17 (APC = 20.8; 95% CI = 11.2, 31.2; $p < 0.05$). The prevalence of past 12-month heroin use showed a similar increase, from 17 per 10,000 reproductive age women (95% CI = 12, 23) in 2004–05 to 39 per 10,000 reproductive age

women (95% CI = 33, 47) in 2016–17 (APC = 15.2; 95% CI = 10.5, 20.0; $p < 0.05$, Table S1).

Stratifying by pregnancy status (Table 1), past 30-day prevalence of heroin use increased among non-pregnant women (APC = 22.4; 95% CI = 13.7, 31.7; $p < 0.05$) but not among pregnant women (APC = -15.9; 95% CI = -54.0, 53.9; $p = 0.6$). Similarly, past 12-month prevalence of heroin use increased for non-pregnant women (APC = 15.1; 95% CI = 9.4, 21.0; $p < 0.05$) but not for pregnant women (APC = 10.5; 95% CI = -9.9, 35.5; $p = 0.3$, Table S1). Our conclusions did not change when we additionally adjusted for age, race, education and income (Table 2).

A sensitivity analysis of NSDUH 2004–2014 suggested that non-medical use of prescription opioids has decreased among non-pregnant reproductive age women whereas non-medical prescription opioid use estimates were relatively stable for pregnant women (Tables S3).

3. Discussion

The decrease in prescribed opioid supply has been associated with an increase in heroin use in the US (Compton et al., 2016). In the current study, heroin use increased among reproductive age non-pregnant women from 2004–17. This increase is alarming given that half of US pregnancies are unintended and prenatal care is usually initiated at the end of the first trimester (Ayoola et al., 2010; Finer & Zolna, 2016). As a consequence of unintended pregnancy, reproductive-aged women might continue using heroin in the first trimester because they are unaware of the pregnancy, and thus might increase the risk of adverse maternal and fetal health outcomes. For example, heroin use is associated with increased prevalence of communicable diseases including infection with human immunodeficiency virus (HIV) and hepatitis C virus (HCV, El-Bassel & Strathdee, 2015). In the current study 67% of past 30-day heroin users have injected heroin in their lifetime. HIV infection is associated with maternal mortality and morbidity including post-partum hemorrhage, puerperal sepsis and increased susceptibility to opportunistic infections (McIntyre, 2003). Maternal HIV infection is also associated with preterm birth, low birthweight and stillbirth (Wedi et al., 2016). Without treatment, the rate of vertical HIV transmission can reach up to 45% (Barral et al., 2014). Similarly, maternal HCV infection is associated with adverse maternal and fetal outcomes (Epstein et al., 2018). Vertical HCV transmission is the leading cause of pediatric HCV infection and chronic liver disease (Yeung CY et al., 2014). Screening for heroin use among non-pregnant reproductive age women in primary care settings and prevention and/or management of preexisting infections (for example the use of antiretrovirals) can reduce the risk of vertical transmission as well as other adverse outcomes (Krist and Crawford-Faucher, 2002).

Strengths of the study include the large nationally representative sample and the standardized data collection procedures across NSDUH years. The NSDUH does not require long-term recall compared to retrospective studies where drug use information is collected postpartum. We could not estimate prescription opioid use trends during the same time interval as a method change has rendered prescribed opioid use estimates incomparable between 2015–17 NSDUH and earlier NSDUH years (United States. Substance Abuse and

Mental Health Services Administration, 2018). Yet a sensitivity analyses of NSDUH 2004–14 suggested that non-medical prescription opioid use has decreased among non-pregnant reproductive age women consistent with findings from the general population (Guy et al., 2017). Additionally, NSDUH excludes some small subpopulations that may have different heroin use estimates, including prisoners and residents of drug use treatment facilities.

Findings show that among pregnant women, heroin use prevalence remained relatively stable in NSDUH. Most heroin use occurred in Trimester-1. This might reflect a pre-pregnancy recognition estimate and pregnant women might quit using heroin or enroll in medication-assisted treatment program once pregnancy status is confirmed. In addition, pregnant women might be unwilling to disclose heroin use status compared to non-pregnant women. In some states, maternal heroin use carries the risk of substantive legal penalties (Stone, 2015). Previous studies suggest that biospecimen drug testing is preferred to self-report in monitoring drug use among pregnant women (Garg et al., 2016).

4. Conclusion

In conclusion, our study shows that from 2004–17 heroin use has increased among non-pregnant reproductive age women. Screening for heroin use by primary care providers might be needed at multiple time points, including prior to pregnancy. As a primary prevention strategy, this might help mitigate the consequences of prenatal heroin use. Public health efforts to reduce social stigma and legal consequences might improve identification of heroin users and increase access to treatment.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Highlights

- From 2004–2017, less than 1% of US reproductive age women used heroin in the past 30 days.
- Heroin use prevalence has increased over time among non-pregnant women.
- Similar increase was not observed among pregnant women.

Table 1:

Trends in past 30-day heroin use among women 15–44 years old ($n = 277,333$), stratified by pregnancy status. Data from the US National Surveys on Drug Use and Health, 2004–2017

	All women		Non-pregnant		Pregnant	
Prevalence % ^a
	Year		Unweighted n	Prevalence % ^a (95% CI)	Unweighted n	Prevalence % ^a (95% CI)
	2004–05	40,419	38,593	0.06 (0.04, 0.08)	1,826	0.14 (0.04, 0.46)
	2006–07	39,103	37,277	0.08 (0.05, 0.13)	1,826	0.07 (0.01, 0.49)
	2008–09	40,086	38,178	0.12 (0.08, 0.18)	1,908	0.12 (0.02, 0.68)
	2010–11	40,903	39,195	0.11 (0.07, 0.19)	1,708	0.25 (0.06, 1.03)
	2012–13	39,259	37,731	0.12 (0.09, 0.17)	1,528	0.22 (0.05, 0.90)
	2014–15	38,900	37,357	0.16 (0.12, 0.22)	1,543	0.06 (0.01, 0.43)
	2016–17	38,663	37,202	0.18 (0.14, 0.24)	1,461	0.05 (0.01, 0.20)

^aWeighted prevalence % presented

APC: Average biennial percentage change

Table 2:

Trends in prevalence of heroin use among women 15–44 years old (n = 277,333), stratified by pregnancy status. Data from the US National Surveys on Drug Use and Health, 2004–2017

Heroin use	Crude PR (95% CI) ^a	Age-adjusted PR (95% CI) ^b	Multivariable adjusted PR (95% CI) ^c
Past 30-day use			
All reproductive age women	1.08 (1.05, 1.12)	1.08 (1.05, 1.12)	1.10 (1.06, 1.13)
Pregnant (n = 11,800)	0.98 (0.88, 1.08)	0.98 (0.88, 1.09)	0.99 (0.89, 1.11)
Non-pregnant (n = 265,533)	1.09 (1.05, 1.13)	1.09 (1.05, 1.13)	1.10 (1.06, 1.14)
Past 12-month use			
All reproductive age women	1.07 (1.05, 1.10)	1.07 (1.05, 1.10)	1.09 (1.06, 1.12)
Pregnant (n = 11,800)	1.07 (0.96, 1.18)	1.07 (0.97, 1.18)	1.09 (0.99, 1.20)
Non-pregnant (n = 265,533)	1.07 (1.05, 1.10)	1.07 (1.05, 1.10)	1.09 (1.06, 1.12)

PR: prevalence ratio

Poisson regression is used. NSDUH survey indicator is modelled as a continuous variable.

^aEstimates are adjusted for NSDUH complex survey design.

^bEstimates are additionally adjusted for age (15–25 years/ 26–44 years).

^cEstimates are additionally adjusted for race/ethnicity (non-Hispanic White/non-Hispanic Black/Hispanic/all others), education (<high school/high school/>high school) and total family income (<\$20000/\$20000-\$49999/\$50000-\$74999/\$75000+).