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Co-occurring substance use disorders identified among delivery hospitalizations in the United States

Marian Jarlenski, PhD, MPH¹, Elizabeth E. Krans, MD, MSc²

¹Department of Health Policy and Management, University of Pittsburgh Graduate School of Public Health, Pittsburgh PA USA

²Department of Obstetrics, Gynecology & Reproductive Sciences, University of Pittsburgh School of Medicine and Magee-Womens Research Institute, Pittsburgh PA USA

Abstract

Objectives: Substance use in pregnancy is increasing in the U.S., although little is known about co-occurring substance use disorders in pregnancy. Our objective was to determine the prevalence and patterns of co-occurring substance use disorders identified at delivery hospitalizations among U.S. women.

Methods: Using data from the National Inpatient Sample, a nationally representative sample of hospitalizations in the U.S., we identified females ages 15–44 years with a delivery hospitalization from 2007–2016 (weighted N=38 million). We identified diagnoses for use of any of the following substance use disorders: alcohol, amphetamines, cannabis, cocaine, opioids, sedatives, or tobacco. Using multivariable regression, we calculated the weighted adjusted prevalence of additional substances used within each specific substance use disorder category.

Results: Seven percent of women were diagnosed with any substance use disorder at delivery hospitalization (6.5% tobacco, 1% cannabis, 0.5% opioids, and <1% had amphetamine, alcohol, cocaine, and sedative). Among those with any substance use disorder diagnosis, the adjusted prevalence of any polysubstance use was greatest for those who used alcohol (69%), cocaine (69%), amphetamines (63%), and opioids (62%). Among pregnant women who were diagnosed with cocaine, amphetamines, alcohol or opioid use disorder, tobacco (>45% in all groups) and cannabis (>10% in all groups) were the most common additional substances used. Tobacco and cannabis use disorders were commonly diagnosed together.

Conclusions: Co-occurring substance use disorders are common among women with any substance use disorder in pregnancy. Findings support the need for public health efforts to monitor and address multiple, concurrent use of substances in pregnancy.

Corresponding author: Marian Jarlenski, PhD, MPH, Department of Health Policy and Management, University of Pittsburgh Graduate School of Public Health, 130 DeSoto St, A619, Pittsburgh, PA 15261, Office phone: +1 412 383 5363, Fax: +1 412 624 3146, marian.jarlenski@pitt.edu.

Conflicts of Interest: None.

INTRODUCTION

Substance use during pregnancy is not rare, with 12% of pregnant women in the United States (US) reporting tobacco use, 10% reporting alcohol use, and 5% reporting any illicit substance use including cannabis.¹ Surveillance data have shown an increase in the use of substances during pregnancy in the past decade, including opioids, amphetamines, and cannabis use.²⁻⁴ This increase in substance use in pregnancy is situated in a context of increasing rates of morbidity and mortality from substance use disorders among US adults. Drug overdose persists as a leading cause of death for males and females ages 25-44.⁵

Tobacco, alcohol, amphetamine, cocaine, opioid, and cannabis use during pregnancy are each independently associated with adverse birth and neonatal health outcomes, including fetal growth restriction, preterm birth, low birthweight and abnormal infant neurobehavior.⁶ Polysubstance use in pregnancy is important because it can indicate greater addiction severity and can be more refractory to treatment interventions which are often designed for a single drug of abuse.^{7,8} Among non-pregnant adults with an opioid use disorder, polysubstance use is associated with a lower likelihood of receipt of medication treatment receipt.⁹

While research suggests that polysubstance use among women with an opioid use disorder in pregnancy is prevalent,¹⁰ patterns of co-occurring substance use disorders among the pregnant women with any substance use disorder in the US are unclear. Given the mounting evidence that the US opioid epidemic is evolving to include multiple, concurrent substance use disorders,¹¹ a better understanding of co-occurring substance use disorders during pregnancy is needed and is a critical first step toward informing the development of public health guidelines and clinical interventions to mitigate the related health burdens. Therefore, our objective was to provide updated national estimates on the prevalence of co-occurring substance use disorders identified at delivery hospitalizations among pregnant women in the US. We identified prevalence of use disorders for each of 7 specific categories of substances and quantified additional, co-occurring substance use disorders within each category.

METHODS

We obtained data from the National Inpatient Sample (NIS), a nationally representative 20% stratified sample of hospital discharges administered by the U.S. Agency for Healthcare Research and Quality.¹² We included females ages 15-44 years who had a hospital delivery between 2007-2016. To identify delivery hospitalizations, we used Diagnosis Related Group (DRG) codes and ICD-9-CM diagnosis and procedure codes following an established algorithm.¹³ We crosswalked the ICD-9-CM codes to ICD-10-CM codes (weighted counts of deliveries were comparable in 2015 and 2016 (3,742,665 and 3,799,751, respectively).

Next, ICD-9 and ICD-10 diagnosis codes were used to identify diagnoses for abuse or dependence (hereafter called “use disorders”) of alcohol, amphetamines, cannabis, cocaine, opioids, sedatives, or tobacco. The General Equivalence Mapping System (GEMS) published by the US Centers for Medicare and Medicaid Services (CMS) was used to cross-walk diagnosis codes from ICD-9 to ICD-10. Prevalences in 2014 (ICD-9) and

2016 (ICD-10) were comparable. Co-occurring substance use disorders use was defined as the diagnosis of at least 2 of these substance use disorders. Because the NIS includes only information from the hospital stay, the data do not distinguish between abuse of or dependence on prescription medications versus illicit substances, and do not allow for identification of substance use disorders before or after delivery. Therefore, the definitions of amphetamines, opioids, and sedatives indicate abuse/dependence of either prescription medications, illicit substances, or both. A full list of the ICD-9 and ICD-10 diagnosis codes employed, as well as prevalences using ICD-9 vs ICD-10 codes, are shown in Supplemental Appendix Table A1.

We calculated the descriptive characteristics of the study sample, overall and by substance use disorder status. First, we calculated the adjusted prevalence of any co-occurring substance use disorders among pregnant women within each specific substance use disorder category. Next we calculated the adjusted prevalence of additional substances used within each specific substance use disorder category. We employed multivariable logistic regression models, adjusted for maternal age at delivery (<18, 18-34, or >34 years); maternal race/ethnicity (Non-Hispanic White, Black, Asian, Other Race, or Hispanic); rural/urban county of residence; Medicaid coverage; and year of delivery. Adjusted prevalences were derived from regression results using marginal standardization.¹⁴ Analyses incorporated sample weights provided by the NIS to produce nationally representative estimates. The University of Pittsburgh Institutional Review Board determined this study was exempt because de-identified data on hospital discharges were analyzed.

RESULTS

In a weighted sample of 38 million U.S. delivery hospitalizations, 7.3% of women were diagnosed with any substance use disorder (6.5% tobacco, 1% cannabis, 0.5% opioid use disorders; and <1% had amphetamine, alcohol, sedative, or cocaine use disorders) (Table 1). Compared to women without any substance use disorder diagnosis, women who had a substance use disorder were more likely to be White race (63% vs 45%), live in rural counties (24% vs 14%), and to be covered by their state Medicaid program (68% vs 42%). Among women with any substance use disorder diagnosis, the most common was tobacco use disorder (90%), followed by cannabis use disorders (10%), and opioid use disorders (6%).

Table 2 shows the adjusted prevalences of co-occurring substance use disorders at delivery hospitalization, by specific substance use disorder category. In pregnant women with any substance use disorder diagnosis at delivery, the adjusted prevalence of any co-occurring substance use disorders was greatest for those who had sedative (84%), alcohol (69%), cocaine (69%), amphetamine (63%), and opioid (62%) use disorders. Those diagnosed with tobacco use disorder had an adjusted prevalence of any polysubstance use of 11%. Among pregnant women who were diagnosed with cocaine, amphetamine, alcohol, opioid, or sedative use disorders, tobacco (>45% in all groups) and cannabis (>10% in all groups) were the most common additional substances used. Among pregnant women who were diagnosed with a cannabis use disorder, tobacco (46%), opioids (7%), and amphetamines (7%) were the most common additional substances used. Among pregnant women who

were diagnosed with tobacco use disorder, cannabis (7%) and opioids (6%) were the most common additional substances used.

DISCUSSION

Among women diagnosed with a substance use disorder at delivery in the U.S., co-occurring substance use disorders are common. Co-occurring substance use disorders exceeded 55% among women diagnosed with alcohol, amphetamine, cocaine, cannabis, sedative, or opioid use disorders. Co-occurring substance use disorders was 11% among women diagnosed with tobacco use disorder. While tobacco is frequently used among those women with an additional substance use disorder, the use of cannabis and other substances are also common.

These findings are consistent with prior research indicating a high prevalence of co-occurring substance use disorders among women with opioid use disorders, and reinforce the need for public health efforts to monitor patterns of substances used rather than focusing on single substance use disorder in isolation.¹⁵ It is notable, for example, that while use of opioids, methamphetamine, and cannabis in pregnancy has been increasing, tobacco use during pregnancy has remained relatively unchanged over time.¹⁶ Our findings highlight the need to further investigate the effects of co-occurring substance use disorders on pregnancy outcomes and how pregnancy affects substance use behaviors. Finally, more research is needed to develop multi-dimensional treatment approaches that incorporate interventions for multiple, concurrent substances of abuse.

Limitations

Our findings should be interpreted in light of certain limitations. First, we relied on diagnosis codes to identify substance use disorders during the delivery hospitalization, which likely underestimates the true prevalence of substance use disorders. However, although our prevalence estimates are likely low, we have no reason to believe that the patterns of co-occurring substance use disorders would differ in clinical settings. Second, the NIS data do not include data on treatment for substance use disorders in pregnancy, which might alter the patterns of co-occurring substance use disorders. Third, we are unable to follow the same individual over time in the dataset, so we were unable to study time trends in different substance use disorder patterns within the same person. Finally, we were unable to distinguish between misuse of prescribed medications vs illicit substances in the dataset. We note that our measurement of substance use disorders included diagnosis codes only for abuse and dependence, so results are not generalizable to persons who use medications as prescribed in pregnancy.

Conclusion

These nationally representative estimates indicate that among women diagnosed with substance use disorders other than tobacco at delivery, co-occurring substance use disorders are high. Findings suggest that research is needed to investigate the effects of multiple, concurrent substances on pregnancy outcomes.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table.

Weighted descriptive characteristics of females ages 15-44 with delivery hospitalizations in the U.S., 2007-2016

	Overall	Any Substance Use Disorder	No Substance Use Disorder
Unweighted N	7,830,363	569,060	7,261,303
Weighted N	37,972,275	2,770,489	35,201,785
Age at delivery, %			
15-17 years	4.4	4.4	4.4
18-34 years	80.6	85.8	80.6
35-44 years	15.1	9.9	15.1
Race/Ethnicity, %			
White	46.4	63.4	45.0
Black	12.5	13.0	12.5
Asian	5.6	2.3	5.8
Hispanic	19.5	6.1	20.5
Other	4.2	2.0	4.4
Unknown	11.8	13.1	11.7
County of residence, ^a %			
Urban	85.7	76.3	86.4
Rural	14.3	23.7	13.6
Insurance coverage, ^b %			
Medicaid	43.7	67.9	41.8
Private or Other	56.3	32.1	58.2
Substance use disorders, ^c %			
Any	7.3	100.0	0.0
Alcohol	0.1	1.5	--
Amphetamines	0.2	2.4	--
Cannabis	1.0	10.4	--
Cocaine	0.2	2.6	--
Opioids	0.5	6.2	--
Sedatives	0.03	0.4	--
Tobacco	6.5	89.5	--

^aBased on the National Center for Health Statistics urban/rural classification scheme

^bPrivate or other includes private insurance, military health insurance, or uninsured/charity care

^cSubstance use based on ICD-9 or ICD-10 diagnoses of abuse or dependence at delivery hospitalization

Adjusted prevalence of co-occurring substance use disorder diagnoses at delivery hospitalization in the United States, by specific substances

Table 2.

	Specific additional substance use disorders, %							
	Alcohol	Amphetamines	Cannabis	Cocaine	Opioids	Sedatives	Tobacco	
Any co-occurring substance use disorder, %	69.0	--	8.0	23.2	15.9	7.3	1.0	50.3
Alcohol	63.4	3.4	--	26.2	4.1	15.0	2.0	49.3
Amphetamines	55.7	2.1	6.6	--	4.5	6.9	1.2	46.3
Cannabis	69.1	8.4	7.2	31.9	--	25.8	2.6	54.5
Cocaine	62.1	1.4	5.7	10.6	5.6	--	2.5	57.2
Opioids	83.7	3.9	11.9	31.9	17.2	38.9	--	48.5
Sedatives	10.7	0.80	2.0	7.4	1.2	6.0	0.22	--
Tobacco								

Notes: From weighted logistic regression models adjusted for maternal age, race/ethnicity, rural/urban county of residence, Medicaid insurance, and year of delivery; marginal standardization was used to derive adjusted prevalence estimates. Analysis of the National Inpatient Sample, 2007-2016. Weighted N=2,770,489 delivery hospitalizations.