OBJECTIVE: To assess trends in polysubstance use among pregnant women with opioid use disorder in the United States.

METHODS: We conducted a time trend analysis of pooled, cross-sectional data from the National Inpatient Sample, an annual nationally representative sample of U.S. hospital discharge data. Among 38.0 million females aged 15–44 years with a hospitalization for delivery from 2007 to 2016, we identified 172,335 pregnant women with an International Classification of Diseases, Ninth Revision, Clinical Modification or International Classification of Diseases, Tenth Revision, Clinical Modification diagnosis of opioid use disorder. Polysubstance use among pregnant women with opioid use disorder was defined as at least one co-occurring diagnosis of other substance use, including alcohol, amphetamine, cannabis, cocaine, sedative, or tobacco. We fit weighted multivariable logistic regression models to produce nationally representative estimates, including an interaction between year and rural compared with urban county of residence; controlled for age, race, and insurance type. Average predicted probabilities and 95% CIs were derived from regression results.

RESULTS: Polysubstance use among women with opioid use disorder increased from 60.5% (95% CI 58.3–62.8%) to 64.1% (95% CI 62.8%–65.3%). Differential time trends in polysubstance use among women with opioid use disorder were found in rural compared with urban counties. Large increases in amphetamine use occurred among those in both rural and urban counties (255.4%; 95% CI 90.5–562.9% and 150.7%; 95% CI 78.2–52.7%, respectively), similarly to tobacco use (30.4%; 95% CI 16.9–45.4% and 23.2%; 95% CI 15.3–31.6%, respectively). Cocaine use diagnoses declined among women with opioid use disorder at delivery in rural (−270.5%; 95% CI −280.4% to −255.5%) and urban (−261.9%; 95% CI −267.6% to −255.1%) counties. Alcohol use diagnoses among those with opioid use disorder declined −57% (95% CI −70.8% to −37.7%) in urban counties but did not change among those in rural counties.

CONCLUSION: Over the past decade, polysubstance use among pregnant women with opioid use disorder has increased more rapidly in rural compared with urban counties in the United States, with amphetamines and tobacco use increasing most rapidly.

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Opioid use disorder is a major contributor to maternal and neonatal morbidity and mortality in the United States. Although the prevalence of opioid use disorder and overdose during pregnancy has escalated over the past 20 years, the nature of the opioid epidemic in the population as a whole has continued to evolve over time. Characterized as three distinct waves, the first 10 years of the epidemic was characterized by the rise in overprescribing and overdose deaths among adults caused primarily from prescription opioid use. During the second wave, starting in 2010, heroin replaced prescription opioids as the leading cause of overdose death but was soon surpassed by fentanyl, in the third wave starting in
Although synthetic opioids remain the primary contributor to overdose mortality among adults, the co-occurring rise in polysubstance use over the past decade has received considerably less attention and may represent a fourth wave of the rapidly evolving crisis. In a survey of more than 15,000 people entering treatment for opioid use disorder, 96.4% reported the use of at least one nonopioid drug in the previous month. When co-occurring substance use was evaluated over time, methamphetamine use had the greatest observed increase (85%) among people with opioid use disorder between 2011 and 2018.

More than 89% of women of reproductive age (18–44 years) who use illicit opioids also use at least one nonopioid drug; tobacco, the binge drinking of alcohol, and cannabis are the most common substances used. Despite the rise of polysubstance use among people with opioid use disorder, the effect of this trend on substance use during pregnancy is poorly understood, which hinders the development of effective public health strategies to respond to the changing dynamic of the U.S. opioid epidemic. Further, understanding trends in polysubstance use among women with opioid use disorder has important clinical implications because tobacco, alcohol, and amphetamine use during pregnancy are well-established independent risk factors for adverse maternal and neonatal health outcomes.

To address the gap in our knowledge of how patterns of substance use during pregnancy have changed over time among women with opioid use disorder, we conducted a time trend analysis of nationally representative hospital discharge data from 2007 to 2016 to evaluate for the prevalence of co-occurring substance use. To identify differential patterns in substance use by geographic region, differences in polysubstance use during pregnancy also were evaluated among women residing in rural compared with urban counties.

**METHODS**

We used data from the National Inpatient Sample in 2007–2016, which is an annual, nationally representative sample of hospital discharges administered by the U.S. Agency for Healthcare Research and Quality. The National Inpatient Sample includes a 20% stratified sample of discharges from U.S. hospitals, excluding rehabilitation and long-term care hospitals, and includes uniform data elements on diagnosis and procedure codes, diagnosis related groups, severity and comorbidities, and patient characteristics. The National Inpatient Sample provides sample weights so that data can be analyzed to produce nationally representative estimates and appropriate standard errors. To identify delivery hospitalizations, we used diagnosis related group codes and International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) diagnosis and procedure codes for females aged 15–44 years, following an established algorithm. We then cross-checked the ICD-9-CM codes against the International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM) codes for all hospitalizations occurring after October 1, 2015, the date of the U.S. health care system’s transition from ICD-9-CM to ICD-10-CM coding.

Weighted and unweighted counts of delivery hospitalizations were consistent before and after the ICD-9-CM to ICD-10-CM transition. To identify a sample of women with opioid use disorder at delivery, we used ICD-9-CM and ICD-10-CM diagnosis codes to identify diagnoses for opioid use disorder, including a broad range of codes for misuse of or dependence on any opioids. The final analytic sample included a weighted count of 172,335 delivery hospitalizations among women with opioid use disorder.

Our outcome of interest, polysubstance use, was defined as the diagnosis of any additional nonopioid substance use during the delivery hospitalization. We used ICD-9-CM and ICD-10-CM diagnoses for use of or dependence on the following substances: tobacco, alcohol, cannabis, cocaine, sedatives, and amphetamines. Sedatives included any sedatives, hypnotic, or anxiolytic substances. Appendix 3, available online at http://links.lww.com/AOG/B902, shows diagnostic codes used to identify substance use.

Covariates included patient age category (15–18 years, 19–34 years, or 35 years or older), patient race (white, black, Asian, other, missing), patient ethnicity (Hispanic vs not Hispanic), and insurance type (Medicaid vs other insurance). Nearly 12% of hospital discharge data were missing patient race, because some state data sources do not provide race data for privacy or other administrative reasons. Our primary analyses included an indicator of missing race; we also considered analyses that excluded data with missing patient race, and the results were unchanged. The data included a variable classifying the urbanicity of the county of patient residence (although data do not identify specific counties). Patient residence in a rural or urban county was defined by the rural–urban
classification scheme developed by the National Center for Health Statistics to define rural and urban residence.10 The National Center for Health Statistics classifies counties into one of six categories: large metropolitan counties with populations greater than 1 million, fringe counties to large metropolitan areas, medium metropolitan counties with populations of 250,000–999,999, small metropolitan counties with populations of 50,000–249,999, micropolitan counties with urban populations of 10,000–49,999, and non-core counties that are neither metropolitan or micropolitan. Following prior research,11 we dichotomized the National Center for Health Statistics classification into urban counties (large metropolitan, fringe metropolitan, medium metropolitan, and small metropolitan) and rural counties (defined as micropolitan and noncore counties).

All analyses incorporated National Inpatient Sample weights to provide nationally representative estimates and appropriate standard errors. Because the National Inpatient Sample redesign that began in 2012 resulted in some disruptions in trend analyses,12 the National Inpatient Sample developed new discharge-level weights that can be applied to data before 2012 to provide consistent results over time. As recommended, we applied the trend weights to data from 2007 to 2011 to be consistent with weighted data from 2012 to 2016.13

Time trend analyses were conducted considering year as an ordered categorical variable. Because the National Inpatient Sample data are fully de-identified, and it is not possible to follow the same person over time across multiple deliveries, the unit of analysis was each hospitalization. First, we calculated weighted descriptive characteristics of the patients in the study sample, overall and stratified by opioid use disorder only compared with polysubstance use diagnosis, and by rural compared with urban county of residence. Next, we analyzed time trends in the prevalence of any co-occurring substance use diagnosis among women with opioid use disorder. To do this, we fit a multivariable logistic regression model where an indicator of any additional nonopioid substance use diagnosis was the outcome, and included an ordinal variable indicating year, an indicator of rural compared with urban patient county of residence, and an interaction between year and rural residence. Crude and adjusted odds ratios and related 95% CIs from the regression models are shown in Appendix 4, available online at http://links.lww.com/AOG/B902. We used marginal standardization methods to estimate time trends in the prevalence of co-occurring substance use diagnoses among women with opioid use disorder at delivery.14 Under this approach, we derived average predicted probabilities and related 95% CIs of having any co-occurring substance diagnosis for each year, overall and for both rural and urban counties, from the regression models. The percent changes in the outcome from 2007 to 2016 and related 95% CIs, in both rural and urban counties, were also derived from the regression results. We replicated this approach to evaluate for specific changes across each substance among women with opioid use disorder at delivery. The University of Pittsburgh Institutional Review Board determined that this research was exempt because it consisted of secondary data analysis using fully de-identified hospital discharge data.

RESULTS

The final analytic sample included data on a weighted 172,235 delivery hospitalizations in the United States between 2007 and 2016, in which opioid use disorder was diagnosed, 20.4% in which patients resided in rural counties, and 79.6% in which patients resided in urban counties (Table 1). The majority of the patients in the study sample were aged 19–34 years at delivery (88.9%), were non-Hispanic white (74.4%), and had Medicaid insurance coverage (80.5%). Among women diagnosed with opioid use disorder at delivery, 62.2% were diagnosed with any polysubstance use. Overall, the most prevalent nonopioid substances used were tobacco (53.5%), cannabis (9.8%), and cocaine (7.0%). Among those with polysubstance use, women residing in rural counties had higher rates of tobacco and amphetamine use, whereas women in urban areas had higher rates of alcohol and cocaine use. Among women with opioid use disorder, the average predicted probability of having any co-occurring substance use diagnosis at delivery increased significantly in 2016 relative to 2007 (Fig. 1). From 2007 to 2016, polysubstance use among those with opioid use disorder increased from 60.5% (95% CI 58.3–62.8%) to 64.1% (95% CI 62.8–65.3%). After a significant decline from 2007 to 2009, polysubstance use diagnoses remained stable in 2010–2013 and then were statistically significantly greater in 2014, 2015, and 2016 relative to 2007.

The average predicted probability of polysubstance use among those with an opioid use disorder diagnosis at delivery increased at a faster rate in rural counties relative to urban counties (Fig. 2). Increases in polysubstance use relative to 2007 were statistically significantly greater among rural compared with urban residents in 2008, 2013, 2014, and 2016. From 2007 to 2016, the percentage of women with opioid use disorder and any additional substance use
increased from 60.4% (95% CI 55.8–65.1%) to 68.7% (95% CI 66.1–71.3%) among those residing in rural counties and increased from 60.6% (95% CI 58.0–63.2%) to 62.7% (95% CI 61.3–64.1%) among those residing in urban counties. For those in rural counties, polysubstance use diagnosis was statistically significantly greater in 2014, 2015, and 2016 relative to 2007. For those in urban counties, polysubstance use diagnosis was statistically significantly lower in 2008 and 2009 relative to 2007; and was statistically significantly greater in 2015 relative to 2007.

Figure 3 shows the time trends in the diagnoses of specific substances used among pregnant women with opioid use disorder at delivery. The largest relative increase from 2007 to 2016 was in use of amphetamines, which rose from an average predicted probability of 2.4% (95% CI 1.7–3.1%) to 6.6% (5.9–7.2%). Tobacco use diagnoses, in addition to opioid use disorder, also increased markedly over time, from 45.3% (95% CI 43.0–47.6%) to 56.3% (95% CI 55.1–57.6%). Diagnosed use of cannabis and sedatives, in addition to opioid use disorder, were relatively stable over time. Diagnosed use of cocaine, in addition to opioid use disorder, declined from 15.3% (95% CI 13.6–16.9%) to 5.7% (95% CI 5.1–6.3%). Diagnosed use of alcohol, in addition to opioid use disorder, also declined from 2.9% (95% CI 2.1–3.6%) to 1.3% (95% CI 1.0–1.5%).

Figure 4 shows the estimated percent changes from 2007 to 2016 of any polysubstance use diagnosis and the estimated percent change in the diagnoses of specific substances used among pregnant women with opioid use disorder. The rate of any polysubstance use diagnosis among women with opioid use disorder at delivery increased more among those women residing in rural (13.8% increase; 95% CI 4.4–24.1%) compared with urban counties (3.5% increase; 95% CI –1.4% to 8.7%). Diagnosed use of amphetamines and opioid use disorder more than doubled among those residing in rural (255.4% increase; 95% CI 229.7–283.2%) compared with urban counties (172.3% increase; 95% CI 151.8–193.6%).

Table 1. Weighted Descriptive Characteristics of Females Age 15–44 Years With Opioid Use Disorder at Delivery, 2007–2016

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>All OUD</th>
<th>OUD Only</th>
<th>Polysubstance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Rural*</td>
<td>Urban*</td>
</tr>
<tr>
<td>Weighted n</td>
<td>172,235</td>
<td>13,490</td>
<td>25,545</td>
</tr>
<tr>
<td>Age group (y)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15–18</td>
<td>1.0</td>
<td>1.1</td>
<td>1.2</td>
</tr>
<tr>
<td>19–34</td>
<td>88.9</td>
<td>90.9</td>
<td>91.3</td>
</tr>
<tr>
<td>Older than 34</td>
<td>10.1</td>
<td>8.1</td>
<td>7.6</td>
</tr>
<tr>
<td>Race and ethnicity†</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Hispanic white</td>
<td>74.4</td>
<td>77.4</td>
<td>80.2</td>
</tr>
<tr>
<td>Non-Hispanic black</td>
<td>6.0</td>
<td>2.2</td>
<td>1.7</td>
</tr>
<tr>
<td>Non-Hispanic Asian</td>
<td>1.8</td>
<td>3.3</td>
<td>2.7</td>
</tr>
<tr>
<td>Other race</td>
<td>1.7</td>
<td>1.1</td>
<td>1.4</td>
</tr>
<tr>
<td>Hispanic ethnicity</td>
<td>9.5</td>
<td>11.3</td>
<td>10.9</td>
</tr>
<tr>
<td>Socioeconomic status</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Medicaid insurance coverage</td>
<td>80.5</td>
<td>81.3</td>
<td>85.2</td>
</tr>
<tr>
<td>Reside in low-income area‡</td>
<td>36.4</td>
<td>49.6</td>
<td>52.0</td>
</tr>
<tr>
<td>Substance use diagnoses</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>OUD and other substance use§</td>
<td>62.2</td>
<td>0.0</td>
<td>100</td>
</tr>
<tr>
<td>Tobacco</td>
<td>53.5</td>
<td>—</td>
<td>89.0</td>
</tr>
<tr>
<td>Alcohol</td>
<td>1.8</td>
<td>—</td>
<td>1.7</td>
</tr>
<tr>
<td>Cannabis</td>
<td>9.8</td>
<td>—</td>
<td>15.9</td>
</tr>
<tr>
<td>Cocaine</td>
<td>7.0</td>
<td>—</td>
<td>6.4</td>
</tr>
<tr>
<td>Sedatives</td>
<td>2.5</td>
<td>—</td>
<td>4.5</td>
</tr>
<tr>
<td>Amphetamines¶</td>
<td>4.1</td>
<td>—</td>
<td>6.2</td>
</tr>
</tbody>
</table>

OUD, opioid use disorder.

Data are % unless otherwise specified.

* Rural and urban areas defined according to the National Center for Health Statistics classification scheme for U.S. counties.

† Race not available from some state data sources.

‡ Defined as residing in the lowest income quartile of U.S. ZIP codes.

§ Defined as diagnosis of OUD in addition to at least one of the following: tobacco, alcohol, cannabis, cocaine, sedatives, amphetamines.

║ Includes diagnoses related to use of, dependence on, or misuse of sedatives, hypnotic, or anxiolytic substances.

¶ Includes diagnoses related to use of, dependence on, or misuse of amphetamines.
CI 90.5–562.9%) and urban counties (150.7% increase; 95% CI 78.2–252.7%). Similarly, diagnosed tobacco use and opioid use disorder increased among those residing in rural (30.4% increase; 95% CI 16.9–45.4%) and urban counties (23.2% increase, 95% CI 15.3–31.6%). Diagnosed use of alcohol and opioid use disorder did not change among those residing in rural counties, although a decline was observed among those residing in urban counties (57.4% decline; 95% CI −70.8% to −37.7%). Diagnosed use of cocaine and opioid use disorder declined in both rural (70.5% decline, 95% CI −80.4% to −55.5%) and urban counties (61.9% decline; 95% CI −67.6% to −55.1%).

DISCUSSION

In this nationally representative study, we found that polysubstance use diagnoses are common among pregnant women with opioid use disorder and have increased at a faster rate in rural counties (13.8% increase) relative to urban (3.5% increase) counties. The changing trends in polysubstance use among pregnant women with opioid use disorder inform efforts to improve screening for substance use disorders during pregnancy by emphasizing the need to screen pregnant women for all licit and illicit substances inclusive of tobacco, alcohol, marijuana and nonopioid illicit substances. Among pregnant women with opioid use disorder, evolving trends in substance use behaviors during pregnancy reinforce the urgency to expand the scope and intensity of treatment services for pregnant and parenting women with beyond opioid-specific interventions, such as medications for opioid use disorder, to comprehensively address substance use in the United States. Medications for opioid use disorder, such as methadone and buprenorphine, are already underused during pregnancy, and our findings highlight not only the need to expand access to opioid-specific medications, but the need to take a comprehensive approach to substance use treatment that incorporates medical, psychosocial, and behavioral interventions to address co-occurring substance use and associated factors (i.e., life stressors, poverty, co-occurring psychiatric disorders). Further, because this study and others have shown that the primary source of insurance for women with substance use disorders is Medicaid, state Medicaid programs have an important role in improving access to comprehensive treatment services by developing payment structures that provide reimbursement for services beyond medications for opioid use disorder.
to address co-occurring substance use (ie, tobacco session, intensive outpatient therapy, cognitive behavioral therapy).18–20

The prevalence of polysubstance use during pregnancy in our sample increased disproportionately in rural counties compared with urban counties, with the largest increases found in amphetamine use (250%) among pregnant women living in rural counties. Although rural–urban disparities in substance use across the United States have been well documented in prior research, current findings highlight the need to expand the content of physician training initiatives to include the management of co-occurring substance use and the need to increase the number of physicians trained to care for pregnant women with co-occurring substance use in underserved, rural areas.2

The largest increases in polysubstance use among pregnant women with opioid use disorder occurred among those in rural counties where amphetamine use increased more than 250%. Over the past decade, methamphetamine use has been increasing across the United States and, in western parts of the country, has developed into a parallel epidemic.21 From 2011 to 2017, methamphetamine use among people with opioid use disorder increased from 18.8% to 34.2%, with more significant increases observed among women (+97.8%) compared with men (+81.8%).21 Similarly, the prevalence of amphetamine use among pregnant

Fig. 3. Adjusted prevalence in diagnoses of specific substance use among those with opioid use disorder at delivery in the United States, 2007–2016. Tobacco (A), cocaine (B), cannabis (C), amphetamines (D), sedatives (E), and alcohol (F). Average predicted probabilities and 95% CIs are derived from a weighted logistic regression controlling for rural or urban residence, age, race or ethnicity, and Medicaid insurance coverage. Rural and urban areas defined according to the National Center for Health Statistics classification scheme for U.S. counties. Tobacco and amphetamine diagnoses were statistically significantly greater in 2016 relative to 2007. Alcohol and cocaine diagnoses were statistically significantly lower in 2016 relative to 2007. There were not statistically significant changes over time for cannabis or sedative diagnoses.

women without opioid use disorder also has been on the rise. From 2014 to 2015, 1% of deliveries in the rural West were complicated by amphetamine use, which exceeds the incidence of opioid use disorder during pregnancy in many parts of the country.\textsuperscript{22}

Methamphetamine exposure in utero are both independently associated with an increased risk of growth restriction, placental abruption, and preterm birth\textsuperscript{23–26} and may exacerbate high rates of adverse birth outcomes among women with opioid use disorder.\textsuperscript{27,28} Polysubstance use among pregnant women with opioid use disorder has also been associated with increased neonatal abstinence syndrome severity.\textsuperscript{29} In an evaluation of factors that contribute to neonatal abstinence syndrome severity,\textsuperscript{29} in co-occurring illicit substance use (ie, methamphetamines, cocaine, marijuana) was the most significant predictor of neonatal abstinence syndrome severity.\textsuperscript{30} Despite these findings, the effects of polysubstance use on short- and long-term maternal and neonatal health outcomes is largely unknown and warrant increased attention to the both the additive and cumulative effects of co-occurring substance use on health outcomes for pregnant women and children. Additional research is also needed to identify more effective pharmacologic and nonpharmacologic interventions for amphetamine and other stimulant use disorders.

Tobacco use diagnoses also increased significantly over time, although less dramatically than amphetamine use, and tobacco use remains a leading modifiable cause of adverse pregnancy and birth outcomes.\textsuperscript{25} Notably, the rate of tobacco use diagnoses (53.5%) in our analysis is significantly greater than the rate of tobacco use in the general population of pregnant women which has been relatively stable at about 12%, with no significant changes over time.\textsuperscript{31} Although the true prevalence of tobacco use may be underestimated in our sample owing to undercoding at the delivery hospitalization, these findings are consistent with high rates of tobacco use (more than 50%) found among pregnant women with opioid use disorder in prior studies.\textsuperscript{32,33} Owing to the high prevalence of co-occurring tobacco use during pregnancy, evidence-based pharmacologic and nonpharmacologic interventions to decrease tobacco use during pregnancy and postpartum should be universally employed in both prenatal and substance use treatment settings.

Findings from this study should be interpreted in light of certain limitations. First, the National...
Inpatient Sample data rely on diagnoses recorded in hospital discharge data, which may underestimate the true prevalence of substance use at delivery. Such codes are dependent on screening for and documentation of substance use during prenatal care or at delivery, which are not universal. Additionally, patients may not report substance use. In the National Inpatient Sample, it is not possible to differentiate prescribed medication use from illicit substance use. Nevertheless, the National Inpatient Sample data provide a unique opportunity to obtain nationally representative estimates of time trends in opioid use disorder and other substance use at the time of delivery. Diagnostic codes are often dependent on screening for and the documentation of substance use during pregnancy, which is not consistent across institutions. Even when substance use screening occurs, limitations in the sensitivity and specificity of screening using both validated self-reported screening instruments and biological testing may limit an accurate assessment of the true prevalence of substance use.\textsuperscript{34–36} Second, it is possible that the time trends in substance use we observed may be related to secular trends in hospital-based screening and diagnosis of such conditions. However, this limitation may be mitigated in the population of women diagnosed with opioid use disorder at delivery, as health care professionals who diagnose opioid use disorder are perhaps more likely to consistently diagnose other substance use behaviors in women with a disorder. Third, it is not possible to differentiate prescribed medication use from illicit substance use in National Inpatient Sample data sets, and it remains unknown how much, if any, the increase in amphetamine use in pregnancy is attributable to prescription amphetamine use. However, in spite of this limitation, this misclassification error does not likely differ by rural and urban county of residence and our results mirror rural–urban differences in substance use during pregnancy in other published research.\textsuperscript{22} Fourth, data limitations precluded us from following an individual patient over time, so we were unable to study different substance use patterns in the same person over time. Fifth, we were unable to assess differences in trends between specific states because the National Inpatient Sample is not designed to produce state-specific estimates. Sixth, because the sample for this study is drawn from hospital discharge data, results should not be generalized to those women who delivery outside of a hospital setting. An estimated 1.4% of U.S. births occur outside of hospitals, with out-of-hospital births occurring more commonly among non-Hispanic white women.\textsuperscript{37}

Findings of the present study highlight the need to take a more holistic view of substance use in the United States to effectively confront the evolving nature of the U.S. opioid epidemic. Current public health efforts to expand treatment services for pregnant women with opioid use disorder should include system (ie, comprehensive screening), health care and social services professional (ie, education and training), and payer-level (ie, reimbursement) initiatives that allow for the effective identification and management of polysubstance use during pregnancy. Despite the increases we observed, particularly in amphetamine use among pregnant women with opioid use disorder, remarkably few data are available on the effects of co-occurring substance use on maternal and neonatal health outcomes prompting the need for more clinical research. Finally, effective treatments for amphetamine and other stimulant use disorders are limited and research designed to develop addition pharmacologic and nonpharmacologic interventions is critically needed. Most people with a substance use disorder, including those who are pregnant, do not use substances in isolation.\textsuperscript{5,17} As such, we must take a more comprehensive view of substance use behaviors, beyond a particular substance used, to fully understand the social, economic, medical and behavioral health interventions that are necessary to mitigate the current public health crisis.

REFERENCES


PEER REVIEW HISTORY

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