

# Hospital care for opioid use disorder in pregnancy: Challenges and opportunities identified from a Minnesota survey

Women's Health  
Volume 16: 1–7  
© The Author(s) 2020  
Article reuse guidelines:  
sagepub.com/journals-permissions  
DOI: 10.1177/1745506520952006  
journals.sagepub.com/home/wh



Alana Dopp<sup>1</sup>, Morgan Zabel Thornton<sup>1</sup>, Katy Kozhimannil<sup>2</sup>,  
Cresta W Jones<sup>3</sup> and Brenna Greenfield<sup>1</sup> 

## Abstract

**Objectives:** The prevalence of opioid use disorder continues to rise in the United States, with a simultaneous increase in the diagnosis of both opioid use disorder during pregnancy and neonatal opioid withdrawal syndrome. Despite these increases in pregnancy-related care, little is known about hospital policy and policy implementation related to opioid use disorder in pregnancy. In addition, it is unknown whether policies might differ in rural or urban hospitals. To better examine these issues, Minnesota hospitals were surveyed regarding the existence and implementation of policies related to opioid use disorder in pregnancy and whether any policy implementation challenges had been identified.

**Methods:** From August to December 2017, the research team contacted all Minnesota hospitals that offered obstetric services ( $n=82$ ) to survey challenges to implementing policies for opioid use disorder during pregnancy, among other questions. Fifty-nine hospitals had respondents (primarily obstetric department supervisors) who provided information about policy implementation challenges for a 72% response rate. Qualitative responses were analyzed using qualitative description and according to hospital location: metropolitan (urban), micropolitan (rural), or non-core (rural).

**Results:** Ninety-one percent of respondents said that they had pregnancies affected by opioid use disorder at their hospital within the last year. Four major challenges to policy implementation were identified in qualitative responses: (1) provider consensus, (2) patient response to policy, (3) lack of resources, and (4) low frequency of occurrence. All four challenges were more frequently identified by respondents at rural hospitals compared to urban hospitals.

**Conclusion:** This study identified challenges in standardizing hospital care for pregnancies affected by opioid use disorder, and these challenges were identified more frequently in rural locations. These non-urban hospitals may require increased state and federal support and funding.

## Keywords

health policy, hospitals, neonatal abstinence syndrome, opioid use disorder

Date received: 16 January 2020; revised: 19 May 2020; accepted: 3 August 2020

## Introduction

As rates of opioid use disorder (OUD) continue to climb in the United States, OUD rates during pregnancy have also increased.<sup>1</sup> Maternal OUD is associated with significant complications for both the mother and the fetus/neonate and can include maternal infectious disease exposure and overdose, premature delivery, and poor fetal growth.<sup>2</sup> In addition, 55%–94% of infants with chronic prenatal opioid exposure may develop withdrawal symptoms after birth, termed as neonatal abstinence syndrome (NAS) or neonatal

<sup>1</sup>Department of Family Medicine and Biobehavioral Health, University of Minnesota Medical School, Duluth, MN, USA

<sup>2</sup>Division of Health Policy & Management, School of Public Health, University of Minnesota, Minneapolis, MN, USA

<sup>3</sup>Department of Obstetrics, Gynecology and Women's Health, University of Minnesota Medical School, Minneapolis, MN, USA

### Corresponding author:

Brenna Greenfield, Department of Family Medicine and Biobehavioral Health, University of Minnesota Medical School, Duluth Campus, 1035 University Drive, Duluth, MN 55812, USA.  
Email: green970@d.umn.edu



opioid withdrawal syndrome (NOWS).<sup>3</sup> Medication-assisted treatment (MAT) has been shown to significantly improve maternal and neonatal outcomes by reducing illicit opioid use and the severity of NAS.<sup>4</sup> However, rural health-care centers may have more limited access to MAT and may encounter more challenges in providing comprehensive care for pregnancies complicated by OUD.<sup>5</sup>

Similar to the national increases seen in the United States, Minnesota has also experienced a rise in pregnancies affected by OUD. From 2008 to 2015, the rate of NAS cases in Minnesota increased from 1 per 1000 live births in 2008 to 5.7 per 1000 live births in 2015.<sup>6</sup> In 2018, this prevalence remained high, at 4.8 NAS cases per 1000 live births.<sup>7</sup> To address increasing rates of OUD in pregnancy, national and local specialty organizations including the American College of Obstetricians and Gynecologists and the Minnesota Hospital Association have developed guidelines for recommended standards of care.<sup>8–13</sup> These guidelines address a comprehensive approach to OUD in pregnancy, including universal substance use screening, medication-assisted treatment, and standardized diagnosis and treatment of NAS. However, it is unclear to what degree specific standardized care policies have been implemented by hospitals, what challenges they may encounter, and how policies might differ in metropolitan (urban) and micropolitan/non-core (rural) settings. The aim of this study was to identify challenges that hospitals experience in implementing obstetric OUD policies and protocols in Minnesota and to determine whether challenges differed by hospital location (micropolitan, metropolitan, or non-core).

## Method

### Procedure and participants

The University of Minnesota Institutional Review Board deemed this study exempt from ongoing review. The team identified hospitals ( $n=82$ ) in Minnesota that provided obstetric services at the time of the survey via a list retrieved from the Minnesota Department of Health's Health Care Cost Information System website that was verified via web searches and phone calls. In August 2017, written communication was sent to hospital administration identifying the planned survey and providing research team contact information.

Data collection occurred from August to December 2017. Trained research team members made all telephone calls. Survey communication was initially requested with the obstetric department director or nurse manager and then with the individual most knowledgeable about policies related to opioid-exposed infants and mothers.

### Survey measure

The survey format and questions were created by the research team and designed to examine individual hospital

policies and practices related to pregnancies affected by OUD and to identify local challenges in care implementation related to both maternal OUD and infant NAS.<sup>14–19</sup> At the conclusion of the survey inquiry, respondents were asked an open-ended question that was the primary focus of this examination: "What challenges, if any, does your facility face in implementing the policies we've discussed?" Prior to statewide implementation, the survey was piloted at a Minnesota hospital site.

## Analysis

Quantitative data were summarized using SPSS version 24.<sup>20</sup> Responses to the qualitative question were analyzed using qualitative description. Coders included a clinical psychologist (B.G.) and a medical student (A.D.). Coders read all responses and completed line-by-line coding. Both then compared and discussed their codes. Next, they employed focused coding to identify the most significant, telling, and useful codes representing challenges faced by hospitals in policy implementation. The primary coder then recoded all data using this subset of codes and the secondary coder independently coded 20% of the responses. A coding manual was created to describe coding procedures. The process of coding and verifying 20% of responses was continued until both coders were in agreement and an independent coding of 20% of responses yielded 93% agreement. Qualitative responses were grouped according to hospital location: metropolitan, micropolitan, or non-core. These classifications were determined using the United States Office of Management and Budget guidelines of *metropolitan* as having 50,000 or more inhabitants, *micropolitan* as having a core of 10,000 or more inhabitants, and *non-core* as having less than 10,000 inhabitants.<sup>21,22</sup>

## Results

### Respondents

The overall response rate was 72%, with respondents at 59 of the 82 hospitals completing the phone survey and the question on challenges to policy implementation. These 59 responses were included in analyses and descriptive statistics. Among those hospitals not included, 16% declined to participate ( $n=13$ ), 7% could not be reached ( $n=6$ ), and 5% completed the survey but did not answer the question on policy challenges ( $n=4$ ). Of the included hospitals, 27% were located in non-core counties ( $n=16$ ), 27% were located in micropolitan counties ( $n=16$ ), and 46% were located in metropolitan counties ( $n=27$ ). Forty-eight percent of the hospitals were classified as critical access hospitals ( $n=28$ ).<sup>23</sup> Respondents were department supervisors (64%;  $n=37$ ), nurses (28%;  $n=16$ ), and patient care navigators/managers (9%;  $n=5$ ). Rates of respondents in each role did not differ significantly by hospital location (metropolitan, micropolitan, and non-core).

**Table 1.** Qualitative challenges to implementing policies for maternal OUD and NAS.

	All hospitals ( <i>n</i> = 59) (%)	Non-core hospitals ( <i>n</i> = 16) (%)	Micropolitan hospitals ( <i>n</i> = 16) (%)	Metropolitan hospitals ( <i>n</i> = 27) (%)
Provider consensus	12 (20)	4 (25)	3 (19)	5 (19)
Patient response to actual or perceived policy	8 (14)	3 (19)	2 (13)	3 (11)
Lack of resources	11 (19)	6 (38)	1 (6)	4 (15)
Low frequency of occurrence	16 (27)	6 (38)	5 (31)	5 (19)

OUD: opioid use disorder; NAS: neonatal abstinence syndrome.

Non-core (<10,000 inhabitants), micropolitan (10,000+ inhabitants), and metropolitan (core of 50,000+ inhabitants).

### Hospital practices

Nearly all hospitals (92%; *n* = 54) identified having policies or protocols related to both OUD in pregnancy and NAS. Respondents were asked to provide their best estimate of the percentage of births affected by OUD in the last 12 months. Most respondents (91%) identified at least one local birth affected by OUD in the past year (range 0%–30%). Sixty-four percent (*n* = 30) said very few or no local women with OUD were treated with MAT at the time of delivery, while 36% (*n* = 17) said that at least one-quarter of local women diagnosed with OUD was treated with MAT at the time of delivery.

### Qualitative results—challenges to policy implementation

Across qualitative responses, four major challenges emerged in implementing policies to care for pregnant women with OUD and infants with NAS. These included (1) provider consensus, (2) patient response to policy, (3) lack of resources, and (4) low frequency of occurrence. The prevalence of these challenges and differences by hospital location are provided in Table 1, with hospitals separated into non-core, micropolitan, and metropolitan county location. Individual challenges are reviewed in detail below, with specific survey responses quoted and identified by hospital location (metropolitan, micropolitan, or non-core) and respondent hospital role.

#### Provider consensus

A key barrier to implementing standardized policies for pregnant women with OUD and their infants was the challenge of obtaining practice consensus among obstetric clinical providers (i.e. agreement with and willingness to implement policies). This was identified as a challenge by 20% of respondents. Compared to 19% of metropolitan and 19% of micropolitan hospitals, 25% of non-core hospitals identified provider consensus as a challenge to standardizing care (see Table 1).

While all providers worked to provide the best patient care possible, some particularly advocated for protection

of infants. A micropolitan department supervisor stated, “The implementation of these policies is recent and part of the delay is due to physician resistance. Providers are having issues buying-in to these policies as they feel that there isn’t enough advocating for the infant.” A department supervisor from a metropolitan hospital said, “Educating nurses on in-rooming has been a challenge as many believe that these infants should be placed right into the nursery.”

Others identified hesitance to identify pregnant patients affected by OUD. A metropolitan department supervisor discussed the issue of “provider resistance. Doctors want to believe the patient wasn’t using even when the test shows a positive drug test.” Nurses often felt pulled in divergent directions during clinical care. A metropolitan department supervisor noted:

Nurses have to do really good documentation. Nurses sometimes make reports to CPS [child welfare] even when doctors don’t want them to. Provider buy in, they really aren’t from there. Doctors don’t see the women and families as much as the nurses. Doctors don’t see the full picture of the patient.

In addition, a lack of provider comfort in discussing OUD with families was also identified as a factor which might negatively influence care. One metropolitan department supervisor said that, “Doctors are very uncomfortable having conversations with mom and family.”

#### Patient response to actual or perceived policy

Respondents noted a sense that patients may be skittish or unsure about seeking care because of the stigma that surrounds drug use during pregnancy. A total of 14% of respondents mentioned this as a challenge. Compared to 11% of metropolitan and 13% of micropolitan hospitals, 19% of non-core hospitals identified this as an obstacle to standardizing care. In general, national guidelines discourage the use of universal urine drug screening because it can negatively affect the patient-provider relationship; written or verbal screening is preferred. The comments shared reflect variation and the fluidity of care in this evolving area, as well as some language that might be seen as stigmatizing.

A non-core department supervisor stated:

We also implemented [universal drug testing] because patients were coming to our hospital because they knew they could avoid drug testing. This new universal testing has helped prevent this kind of “hospital jumping.” We also have challenges due to missed meconium testing of the infant due to many variables such as lack of prenatal records or staff error.

A non-core department supervisor highlighted an additional concern, stating that, “Women jump around, switching providers, and because of this some providers won’t do testing because they don’t want to scare the moms away.”

A metropolitan nurse noted the challenge of “cooperation with mothers when they are actively using.” A micropolitan nurse said, “The problem is dealing with the families. Families are angry when the baby gets transferred or social services gets involved, it is very stressful.”

### *Lack of resources*

Limited hospital resources can lead to issues with diagnosis and treatment of OUD during pregnancy, with more intensive surveillance of infants at risk of NAS during hospitalization and with follow-up with families after discharge.<sup>24</sup> Several respondents (19%) explained that their facilities did not have adequate financial resources to provide treatment for pregnancies affected by OUD. Compared to metropolitan and micropolitan hospitals, for which a lack of resources was mentioned by 15% or less of hospitals, 38% of non-core hospitals cited lack of resources as a challenge to policy implementation (Table 1). This was a notable challenge for non-core hospitals, which already identified challenges related to limited staff and funding. One nurse at a non-core hospital said that “being a rural hospital, there are limited resources . . . and limited external social service resources to follow up.” In addition to financial resources, staff time was also identified as a limiting factor. A non-core department supervisor said, “Being a smaller hospital we don’t see this often. Staffing is a challenge as we staff these moms one-to-one.”

Similarly, hospital staff availability impacted the screening process for women with OUD. A non-core department supervisor stated:

Being a small facility, [we are] not always well staffed at night. At night we only have three nurses on staff, and [we] don’t always have a physician or lab person in house or available when moms come in. There can be a lag time to screen.

### *Low frequency of occurrence*

Twenty-seven percent of respondents identified difficulty with policy implementation because they did not see many pregnancies affected by OUD at their facilities—either because of a lower prevalence of OUD during pregnancy

at their hospital or because of a smaller number of births at their hospital overall. Compared to 19% of metropolitan hospitals, 31% of micropolitan hospitals and 38% of non-core hospitals identified low frequency as a challenge to standardizing care (Table 1). Both situations resulted in fewer cases for learning and standardization. A micropolitan nurse said, “Because we send the few cases that we do have to [larger city], we don’t have much experience.”

Others had to reference policies each time they encountered women with OUD and infants with NAS as it happened so infrequently. A micropolitan department supervisor cited “low numbers, have to refer to policies each time and unfamiliar with state laws, don’t use them that much.” In addition, the multiple components of care for women with OUD and infants with NAS made across-the-board standardization more difficult. A micropolitan department supervisor highlighted the issue of “competency. Since the cases are infrequent, staff is not doing it routinely and therefore there is more variability.”

## **Discussion**

The treatment of pregnancy affected by OUD is an important healthcare issue requiring increasing hospital resources and ongoing modifications to existing policies to provide the best care possible for individuals using opioids during pregnancy and their infants and families. This study served to examine challenges hospitals face in implementing these policies, with attention to differences that might exist in rural versus urban settings. Among the sample of 59 hospitals with obstetric services, 92% had policies or protocols to address maternal OUD and infant NAS, yet many identified challenges in policy implementation. We identified four major challenges to policy implementation for opioid-affected births: (1) provider consensus, (2) patient response to policy, (3) lack of resources, and (4) low frequency of occurrence.

This study highlighted unique issues that rural hospitals may face when addressing challenges related to pregnancies affected by OUD. In the qualitative responses, non-core respondents disproportionately identified lack of financial and staffing resources as a barrier to implementing policies. Hospital obstetric units in rural communities, especially in non-core counties, have been closing at a steady pace over the past decade. This will only further limit local access to care, and we must prioritize new methods to support women with OUD and infants with NAS in areas where resources remain scarce.<sup>25</sup>

Clear guidelines for deciding when to initiate neonatal transfer would benefit these hospitals and might also identify methods to support families during this process. Transfer rates could be reduced via telemedicine, teleconsultation, and collaborations with larger centers on protocols and procedures. Teleconsultation could also address the identified issue of remaining up-to-date in providing

care when yearly cases are low. Even though there may be fewer cases in rural areas, women live in these communities and not in larger cities and will return to these communities to raise their families. In addition, the use of ECHO programming enables videoconferencing to conduct virtual clinics, consultation, and education. In Minnesota, a rural hospital, CHI St. Gabriel's Health, and a metropolitan safety net hospital, Hennepin County Medical Center, are partnering with Project ECHO out of New Mexico to make use of this programming and create and provide high-quality, evidence-based, and timely education and consultation on OUD and other substance use disorders and associated conditions (e.g. Hepatitis C, mental health) for Minnesota hospitals and beyond.<sup>26,27</sup>

Partnerships between larger tertiary healthcare programs and smaller rural and non-core healthcare centers will better allow patients access to best practice, regardless of where they reside. Clear guidelines for deciding when to initiate neonatal transfer can be developed and may include individualized telehealth consultations with larger pediatric and neonatal intensive care unit (NICU) programs.

These collaborations can also identify methods to support families during this process and work to develop patient support through such services as visiting nurse programs and county social workers.

The issue of opioid-affected pregnancies is emotionally charged, and providers often receive limited training on substance use disorder treatment despite their significant influence on patient outcomes.<sup>28</sup> A clear theme in the qualitative responses was providers' complex beliefs and emotions around this issue. When OUD is suspected, healthcare providers may avoid conversations with women about their substance use, not report OUD when indicated, and/or separate women and infants. Such issues are more likely to surface in situations of stress and uncertainty, which may be present for hospitals that lack resources or are unfamiliar with best practices due to limited clinical exposure. Emotional reactions and personal values are not generally taken into account in designing hospital policies. It would be beneficial to have training for providers to identify personal beliefs and how they influence actions, and/or include information on this issue in the policies themselves.<sup>29</sup>

In addition, patient behavioral changes in response to policies (and subsequent effects on care) must also be considered. Women may experience stress and fear during pregnancy related to care for opioid-affected pregnancies, particularly in the face of potential separation from their infants. There is a need for increased education on maternal OUD and NAS, as well as on the potential benefits of social services engagement throughout pregnancy. Qualitative results found that women with OUD may switch hospitals to avoid being drug testing based on their perception of hospital policies. It is important to discuss this concern at both the state and national level. This can

be done by reinforcing national organization recommendations for universal screening using verbal or written screening tools, rather than urine drug screen. Urine drug screening may undermine the relationship between a pregnant patient experiencing untreated substance use and the providers and organizations that are best positioned to help the patient access treatment.

## Strengths and limitations

A robust hospital response rate increases validity of the study results. In addition, speaking with staff members at each hospital allowed identification of on-the-ground challenges as compared to an analysis of administrative-level policies. Strong representation of both urban and rural hospitals provided the ability to compare data on unique challenges facing different hospital settings. Hospital records and specific policies were not reviewed; this is an area for future investigation.

## Conclusion

This study highlights a need for statewide care standards for opioid-affected pregnancies coupled with patient-centered approaches, which can be tailored to address the unique issues present in both urban and rural hospitals. There are currently national and statewide efforts to address this need. The Minnesota Hospital Association recently developed a road map for healthcare systems utilizing evidence-based best practices for prevention and treatment of opioid-affected pregnancies.<sup>13</sup>

Given the identified differences in barriers to optimal management of opioid-affected pregnancies in different hospital types, ongoing collaboration with both urban and rural hospitals could help agencies design location-specific adaptations of national practice recommendations. In addition, research and education are needed to address provider and patient attitudes related to opioid-affected pregnancies and policy implementation. Overall, with ongoing collaboration, care for women with OUD and infants with NAS can be standardized, effective, compassionate, and available. Understanding and addressing the challenges to policy implementation, including different approaches that might be required based on hospital location, is a first step in this process.

## Acknowledgements

The authors thank the providers who completed the survey. This work would not have been possible without the UMN-Duluth data collection team (Riley Beskar, Melissa DeVerney, Jessica Raines, and Morgan Zabel Thornton). Rahul Koranne and Robert Levy reviewed earlier paper drafts and provided helpful input. The Minnesota Hospital Association and the Minnesota Department of Health graciously made state hospital data available for sample description.

## Author contributions

B.G. is the guarantor of integrity for this study and takes responsibility for the entire research project. B.G. and M.Z.T. conceptualized the study design with critical input from Kozhimmanil. M.Z.T. gathered study data. B.G. and A.D. conducted data analyses. B.G., M.Z.T., and A.D. drafted initial versions of the article. All authors provided critical feedback and edits on the article, including approving the final version.

## Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

## Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This research was supported by the University of Minnesota Medical School, Duluth Campus, Medical Student Summer Research Program (Dopp and Zabel Thornton and Supervisor: Dr Greenfield).

## ORCID iD

Brenna Greenfield  <https://orcid.org/0000-0003-4173-939X>

## References

1. Winkelman TNA, Villapiano N, Kozhimannil KB, et al. Incidence and costs of neonatal abstinence syndrome among infants with medicaid: 2004–2014. *Pediatrics* 2018; 141: e20173520.
2. Mozurkewich E and Rayburn W. Buprenorphine and methadone for opioid addiction during pregnancy: clinical key. *Obstet Gynecol Clin* 2014; 41: 241–253.
3. McQueen K and Murphy-Oikonen J. Neonatal abstinence syndrome. *N Engl J Med* 2016; 375: 2468–2479.
4. Jones HE, Finnegan LP and Kaltenbach K. Methadone and buprenorphine for the management of opioid dependence in pregnancy. *Drugs* 2012; 72: 747–757.
5. Lenardson J and Gale J. Distribution of substance abuse treatment facilities across the rural-urban continuum, <http://muskie.usm.maine.edu/Publications/rural/pb35bSubstAbuseTreatmentFacilities.pdf> (2008, accessed 3 August 2018).
6. Minnesota Department of Human Services. Maternal opiate use and opiate-affected newborns. In: *Proceedings of the children's justice initiative conference*, Bloomington, MN, [http://www.mncourts.gov/mncourtsgov/media/scao\\_library/CJI/10a-Prenatal-Exposure-Maternal-Opiate-Use-\(Cain\).pdf](http://www.mncourts.gov/mncourtsgov/media/scao_library/CJI/10a-Prenatal-Exposure-Maternal-Opiate-Use-(Cain).pdf) (2015, accessed 24 July 2018).
7. Minnesota: opioid-involved deaths and related harms national institute on drug abuse (NIDA), <https://www.drugabuse.gov/opioid-summaries-by-state/minnesota-opioid-involved-deaths-related-harms> (accessed 18 May 2020).
8. Johnston A, Mandell T and Meyer M. Treatment of opioid dependence in pregnancy, Vermont guidelines, [www.med.uvm.edu/vchip](http://www.med.uvm.edu/vchip) (2010, accessed 8 June 2018).
9. American College of Obstetricians and Gynecologists. *ACOG committee opinion*. Washington, DC: American College of Obstetricians and Gynecologists, 2017.
10. American College of Obstetricians and Gynecologists. Patient safety bundle-obstetric care for women with opioid use disorder. Council on Patient Safety in Women's Health Care. <https://safehealthcareforeverywoman.org/wp-content/uploads/2017/11/Obstetric-Care-for-OUD-Bundle.pdf> (2017, accessed 24 July 2018).
11. Krans EE, Bobby S, England M, et al. The Pregnancy Recovery Center: a women-centered treatment program for pregnant and postpartum women with opioid use disorder. *Addict Behav* 2018; 86: 124–129.
12. Montana Healthcare Foundation. Strategies to address perinatal substance use disorders, [https://mthcf.org/wp-content/uploads/2018/02/MHCF-Strategies-to-Address-Perinatal-Substance-Use-Disorders\\_FINAL.pdf](https://mthcf.org/wp-content/uploads/2018/02/MHCF-Strategies-to-Address-Perinatal-Substance-Use-Disorders_FINAL.pdf) (2018, accessed 24 July 2018).
13. Minnesota Hospital Association. Neonatal abstinence syndrome (NAS) road map, 2019. <https://www.mnhospitals.org/Portals/0/Documents/patientsafety/Perinatal/Neonatal-Abstinence-Syndrome-Road-Map.pdf>
14. Zellman GL, Fair CC, Houbé J, et al. A search for guidance: examining prenatal substance exposure protocols. *Matern Child Health J* 2002; 6(3): 205–212.
15. Oral R and Strang T. Neonatal illicit drug screening practices in Iowa: the impact of utilization of a structured screening protocol. *J Perinatol* 2006; 26(11): 660–666.
16. World Health Organization. *Guidelines for identification and management of substance use and substance use disorders in pregnancy*. 2014. Geneva: WHO.
17. Substance Abuse and Mental Health Services Administration. A collaborative approach to the treatment of pregnant women with opioid use disorders and practice and policy considerations for child welfare, collaborating medical, and service providers. Rockville, MD, [https://ncsacw.samhsa.gov/files/Collaborative\\_Approach\\_508.pdf](https://ncsacw.samhsa.gov/files/Collaborative_Approach_508.pdf) (2016, accessed 26 July 2018).
18. Bogen DL, Whalen BL, Kair LR, et al. Wide variation found in care of opioid-exposed newborns. *Acad Pediatr* 2017; 17(4): 374–380.
19. Minnesota Hospital Association. Neonatal abstinence syndrome (NAS) toolkit risk factors, assessment and treatment, <https://www.mnhospitals.org/Portals/0/Documents/patientsafety/Perinatal/Neonatal%20Abstinence%20Syndrome%20Toolkit.pdf> (2018, accessed 26 July 2018).
20. IBM Corporation. *IBM SPSS statistics for windows* (version 24). Armonk, NY: IBM Corporation.
21. Minnesota Department of Health. Minnesota's metropolitan, micropolitan & rural counties, <https://www.health.state.mn.us/data/workforce/docs/2017cbsa.pdf> (2017, accessed 31 July 2018).
22. United States Census Bureau. Metropolitan and micropolitan, <https://www.census.gov/programs-surveys/metro-micro/about.html> (2018, accessed 30 July 2018).
23. Minnesota Department of Health. Critical access hospitals, <https://www.health.state.mn.us/facilities/ruralhealth/flex/cah/index.html>

24. Kozhimannil KB, Chantarat T, Ecklund AM, et al. Maternal opioid use disorder and neonatal abstinence syndrome among rural US residents, 2007-2014. *J Rural Heal* 2019; 35: 122–132.
25. Hung P, Kozhimannil KB, Casey MM, et al. Why are obstetric units in rural hospitals closing their doors? *Health Serv Res* 2016; 51: 1546–1560.
26. ECHO: CHI St. Gabriel's health, <https://www.chistgabriels.com/echo/> (accessed 12 April 2020).
27. Project ECHO: Hennepin healthcare, <https://www.hennepinhealthcare.org/project-echo/> (accessed 12 April 2020).
28. Braithwaite V and Nolan S. Hospital-based addiction medicine healthcare providers: high demand, short supply. *J Addict Med* 13: 251–252.
29. Roth CS and Burgess DJ. Changing residents' beliefs and concerns about treating chronic non-cancer pain with opioids: evaluation of a pilot workshop. *Pain Med* 2008; 9(7): 890–902.