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National Center on Birth Defects and Developmental Disabilities (NCBDDD)

Centers for Disease Control and Prevention (CDC)

Surveillance Network: Maternal, Infant, and Child Health Outcomes Following Medication for Opioid Use Disorder during Pregnancy (MAT-LINK) – Phase II

FINAL REPORT

February 2023

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1. Executive Summary

From 1999 to 2014, the prevalence of opioid use disorder (OUD) among people who were pregnant in the United States quadrupled from 1.5 to 6.5 per 1,000 delivery hospitalizations.[1] In addition to the inherent risks of opioid use to the person who is pregnant (e.g., overdose, relapse, infectious diseases), more cases of neonatal abstinence syndrome (NAS) have occurred.[2,3] Furthermore, recent evidence suggests that children born with NAS may experience developmental delays, although the complexities around the roles that social determinants of health and other prenatal or postnatal exposures may play are not fully understood.[4,5] Additionally, opioid use during pregnancy has been associated with other serious health effects, including poor fetal growth, preterm birth, intrauterine fetal demise, and specific birth defects.[6] The developmental trajectory of children exposed to opioids in utero has not been systematically studied. While medications for OUD (MOUD), such as methadone and buprenorphine, are recommended for people with OUD during pregnancy, there are knowledge gaps regarding the risks and benefits of each MOUD regimen. Also, it is not known if there are improved pregnancy, maternal*, infant, and child health outcomes with certain medications or prescribing patterns.[7]

The Maternal, Infant, and Child Health Outcomes Following Medication for Opioid Use Disorder during Pregnancy (MAT-LINK) project aims to improve understanding of the spectrum of pregnancy, maternal, infant, and child health outcomes associated with OUD during pregnancy, in particular the role of MOUD. MAT-LINK also examines the role of mediating and moderating factors on these outcomes, including exposure to multiple substances, maternal comorbidities, and other psychosocial factors.

Phase I of MAT-LINK consisted of developing a data platform and standard data elements to collect linked maternal-infant data among people treated for OUD during pregnancy at four clinical sites across the US. Phase II of MAT-LINK expanded the network by three clinical sites and extended the period of collection of outcome data for children from 2 years to 6 years of age. This expansion aimed to increase the study population of pregnant people with varied racial, ethnic, and socioeconomic characteristics; expand the geographic reach of MAT-LINK; and allow for a more comprehensive assessment of cognitive and neurodevelopmental delays that may not be apparent in younger children. Initial analysis of more than 5,000 maternal-infant dyads has provided early evidence of the ability of MAT-LINK to inform policies, clinical practice recommendations, and clinical decision-making for this critical population.

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*For clarity in terminology, "maternal" is used to identify the person who is pregnant or postpartum throughout this report; the MAT-LINK team is aware that pregnancy is not equated with the decision to parent nor do all parents who give birth identify as mothers.

2. Introduction

2a. Background

From 1999 to 2014, the prevalence of OUD among people who were pregnant in the United States quadrupled from 1.5 to 6.5 per 1,000 delivery hospitalizations.[1] The American College of Obstetricians and Gynecologists (ACOG) states that for people who are pregnant with OUD, the recommended therapy is opioid agonist pharmacotherapy (e.g., buprenorphine, methadone). MOUD is preferable to medically supervised withdrawal, because withdrawal is associated with high relapse rates that lead to worse outcomes.[8]

There is limited information comparing maternal, pregnancy, infant, and child outcomes associated with different MOUD during pregnancy, especially since people who are pregnant are often excluded from clinical trials. As a result, people who are pregnant with OUD and their healthcare providers are forced to use expert opinion to guide most clinical care decisions. Two of the greatest knowledge gaps are around maternal risks with different medication regimens and longer-term outcomes for children who were prenatally exposed to opioids. There are known risks from opioid use to the person who is pregnant; it is also well established that opioid use during pregnancy increases NAS, and recent evidence suggests that children who were born with NAS may experience developmental delays more often than do those without clinical signs of withdrawal.[4,5,9] However, the developmental trajectory of children prenatally exposed to opioids has not been systematically studied, nor has the impact of MOUD in pregnancy. Additionally, the complexities around the roles that social determinants of health and other prenatal or postnatal exposures may play are not fully understood.

In addition, the use of more than one substance of potential abuse is common among people with OUD; however, the individual and combined effects of substances are often difficult to disentangle, and the impact of using multiple substances on the effectiveness of MOUD is not well understood. Therefore, more comprehensive data are needed to monitor the safety, clinical effectiveness, and risks and benefits of MOUD in pregnancy. A small number of studies have compared outcomes between methadone and buprenorphine among people who are pregnant with OUD. However, the majority of these studies had methodologic issues limiting the generalizability of their findings, including not assessing and adjusting for the use of multiple substances and other confounders during pregnancy. In addition to this concern, some of the observed differences in infant outcomes might inherently be due to differences in maternal characteristics that affect the choice of regimen, and differences in timing of entry to care and retention in care. In the absence of clear, individualized clinical recommendations,

MOUD decisions may be driven by other factors, including provider availability and training on a specific MOUD, medication availability, health insurance coverage, patient preferences, transportation issues, and perceived stigma associated with specific medications.

In 2019, CDC received funding from the Office of the Assistant Secretary for Planning and Evaluation's (ASPE) Patient-Centered Outcomes Research Trust Fund (PCOR-TF) to establish MAT-LINK, a surveillance network to examine practice patterns and outcomes associated with MOUD during pregnancy. This surveillance network created a data platform and standard data elements to collect linked maternal and child data about people with OUD during pregnancy at four clinical sites across the United States (Phase I): Boston Medical Center, Kaiser Foundation Research Institute Northwest in Oregon and Washington, The Ohio State University, and University of Utah. In 2020, CDC received additional funding from ASPE to expand MAT-LINK by including three more clinical sites (University of New Mexico, University of Rochester (New York), and University of South Florida) and extending child follow-up through 6 years of age (Phase II). This expansion aimed to increase the study population of pregnant people with varied racial, ethnic, and socioeconomic characteristics; expand the geographic reach of MAT-LINK; and allow for a more comprehensive assessment of cognitive and neurodevelopmental delays that may not be apparent in younger children. Initial analysis of more than 5,000 maternal-infant dyads has provided early evidence of the ability of MAT-LINK to inform policies, clinical practice recommendations, and clinical decision-making for this critical population. The MAT-LINK protocol for data collection meets a uniform standard and can be used by any healthcare system to collect data on an ongoing basis to rapidly evaluate MOUD, other exposures, and outcomes to ensure effective and safe clinical care options are prioritized. This final report shares information and deliverables related to Phase II of MAT-LINK.

2b. Purpose and Objectives

The purpose of MAT-LINK is to establish a health outcomes surveillance network across multiple clinical sites to rapidly collect linked maternal and child data and monitor maternal, pregnancy, infant, and child health outcomes in the context of MOUD during pregnancy.

The project objectives for Phase II are to

1. Increase racial-ethnic and socioeconomic diversity of MAT-LINK network through expanded geographic representation and greater representation of racial and ethnic minority populations;
2. Extend follow-up of children from 2 years to 6 years of age to assess school-age child cognitive and neurodevelopment;
3. Improve knowledge about maternal overdose, maternal infection, and infant outcomes, including NAS, and enhance clinical care of pregnant people with OUD and infants with prenatal opioid exposure; and
4. Participate in a maternal health collaborative that will inform national data standards and further collaborate with other federal agencies to provide subject matter expertise and coordinate programmatic efforts (e.g., data collection and sharing lessons learned).

3. Objectives and Deliverables

Objective #1
Increase racial-ethnic and socioeconomic diversity of MAT-LINK network through expanded geographic representation and greater representation of racial and ethnic minority populations

Deliverable 1.1: Identify clinical sites for expansion

In February 2021, PHII released letters of interest to 20 clinical sites that had previously applied to participate in Phase I of MAT-LINK but were not provided funding. Thirteen clinical sites expressed interest in applying to the MAT-LINK expansion and were provided an application template to complete and submit. Because all applicants had previously submitted comprehensive applications to Phase I of MAT-LINK, a simple Excel template was developed to obtain relevant updated information from each applicant for Phase II review.

Clinical sites were selected for inclusion in MAT-LINK based on the criteria listed in Table 1. Applicants were assessed based on the original criteria from Phase I of MAT-LINK and additional criteria outlined for the Phase II expansion.

Applications were reviewed by three independent reviewers and received scores according to the established inclusion criteria. For each applicant, an average score across reviewers was calculated, and applicants were ranked by average score. The top 6 applicants were then asked to participate in an interview to provide additional information on their IT infrastructure. Ultimately, three clinical sites were awarded funding to participate in Phase II of MAT-LINK:

1. University of New Mexico
2. University of Rochester
3. University of South Florida

Table 1. Clinical Site Inclusion Criteria

Phase I Inclusion Criteria	Phase II Inclusion Criteria
• Demonstrate access to clinical data • Demonstrate existing or previously successful linkage • Demonstrate ability to access and review pertinent health records • Provide authorization to access data source • Demonstrate ability to collaborate on public health surveillance activities	• Location in geographically diverse region not currently represented in MAT-LINK • Serve a diverse patient population with representation from Black, Indigenous, Persons of Color (BIPOC) communities • Demonstrate ability to collect data on different treatment regimens, including naltrexone

• Provide data on births that are at least as recent as 2014	• Demonstrate ability to provide follow-up data on children up to age 6 years; and • Demonstrate ability to quickly adapt existing data system to collect data through MAT-LINK's IT infrastructure

Deliverable 1.2: **Updated MAT-LINK organizational chart**

The Steering Committee is composed of CDC leadership charged with providing guidance and oversight of the project. Meetings between the CDC Project Team and Steering Committee occur quarterly; these meetings include updates on ongoing activities and discussion of critical decisions. Membership of the Steering Committee comprises leadership and subject matter experts from CDC's NCBDDD, the National Center for Injury Prevention and Control (NCIPC), and the Deputy Director for Public Health Science and Surveillance (DDPHSS). Individuals who have served or are currently serving on the Steering Committee include Karen Remley, MD, MBA, MPH, FAAP; Coleen Boyle, PhD, MSHyg; Margaret (Peggy) Honein, PhD, MPH; Cheryl Broussard, PhD; Dana Meaney-Delman, MD, MPH; Amanda Cohn, MD; Georgina Peacock, MD, MPH, FAAP; Blythe Ryerson, PhD, MPH; Christopher Jones, PharmD, MPH; Sarah Bacon, PhD; Heather Clayton, PhD, MPH; Robin Wagner, PhD, MS; Carrie Shapiro-Mendoza, PhD, MPH; and Heather Strosnider, PhD, MPH.

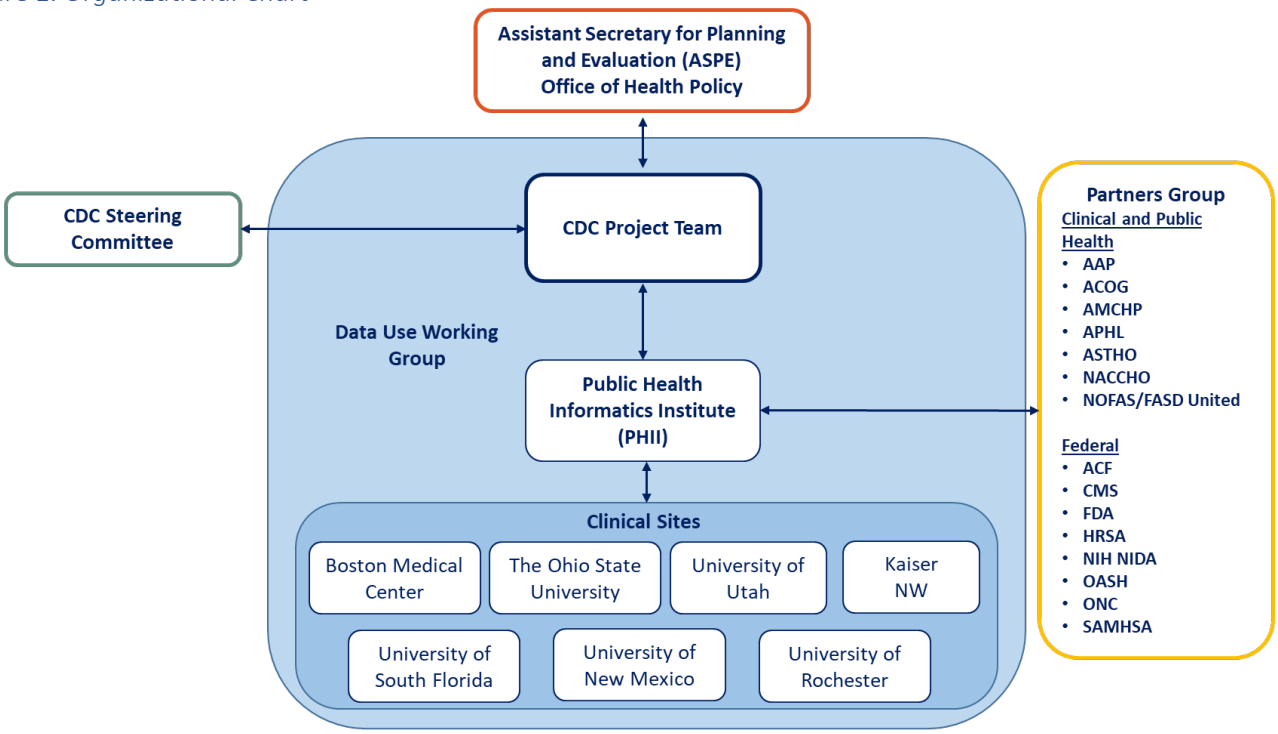
The Public Health Informatics Institute (PHII) facilitates meetings with the Partners Group, which includes representatives from federal agencies and clinical and public health partners. Meetings with the Partners Group occur every 4 months to review high-level MAT-LINK accomplishments, obtain input on MAT-LINK structure and analyses, and share updates on partner activities.

The CDC Project Team is responsible for day-to-day management of MAT-LINK, including developing the surveillance network design, clinical site inclusion criteria, data collection protocol, and tools and guidance documents, as well as coordinating with PHII as the implementation partner.

PHII serves as the implementation partner and oversees the funding and contract deliverables with the awarded clinical sites. PHII also manages the data collection and surveillance infrastructure, providing technical assistance to the clinical sites and ensuring the safeguarding of the data.

Figure 1 displays an updated organizational chart with Phase II sites (University of New Mexico, University of Rochester, and University of South Florida).

Figure 1. Organizational Chart



Abbreviations:
AAP: American Academy of Pediatrics
ACOG: American College of Obstetricians and Gynecologists
AMCHP: Association of Maternal and Child Health Programs
APHL: Association of Public Health Laboratories
ASTHO: Association of State and Territorial Health Officials
NACCHO: National Association of County and City Health Officials
NOFAS/FASD United: National Organization on Fetal Alcohol Syndrome/FASD United
ACF: Administration for Children and Families
CMS: Centers for Medicare & Medicaid Services
FDA: Food and Drug Administration
HRSA: Health Resources and Services Administration
NIH NIDA: National Institutes of Health National Institute on Drug Abuse
OASH: HHS Office of the Assistance Secretary for Health
ONC: Office of the National Coordinator for Health Information Technology
SAMHSA: Substance Abuse and Mental Health Services Administration

Deliverable 1.3: Summary of dyads
Prior to the expansion, the Phase I clinical sites were representative of the pregnancies affected by OUD in their catchment areas but had no representation from the South or Southwest regions of the US and low representation from more diverse populations. The addition of the MAT-LINK Phase II sites improved representativeness with respect to geography, race and ethnicity, and insurance status, and increased the pregnant person-infant dyad count to nearly 6,000.

Objective #2

Extend follow-up of children from 2 years to 6 years of age to assess school-age child cognitive and neurodevelopment

Deliverable 2.1: Child follow-up variables
The MAT-LINK expansion included the extension of child follow-up through 6 years of age. Additional variables to capture information through this time were included for data collection across both Phase I and Phase II clinical sites. These variables included

- Child follow-up encounters
- Primary care provider visits
- Dental care
- School-readiness information
- Referrals to specialists
- Maternal, infant, and child vaccines
- Developmental and behavioral screening and evaluation results
- Data completeness

Deliverable 2.2: Final child follow-up data dictionary
All child follow-up variables were added to the MAT-LINK data dictionary, which will be available for researchers on the MAT-LINK webpage after datasets are finalized and available for external researchers to request access.

Objective #3

Improve knowledge about maternal overdose, maternal infection, and infant outcomes, including NAS, and enhance clinical care of pregnant people with OUD and infants with prenatal opioid exposure

Deliverable 3.1: Presentations

The MAT-LINK team shared progress and achievements at various meetings and conferences over the timespan of the project. A comprehensive list of all presentations is listed under the Presentations and Publications section of this report.

Deliverable 3.2: Manuscripts

Data collection will conclude in 2023, and manuscripts are being developed and published as clinical sites continue submitting data. A list of all manuscripts that are under development is included in the

Presentations and Publications section of this report. Many manuscripts being developed utilize advanced analytics learned as part of a data science upscaling program in which CDC staff participated utilizing MAT-LINK data as a priority test case.

Deliverable 3.3: Publicly available data

After data collection is completed, a restricted MAT-LINK dataset will be hosted at the National Center for Health Statistics' (NCHS) Research Data Center (RDC). External researchers may submit a proposal to request access to the dataset, then go to the RDC's physical locations near Washington, D.C., and Atlanta, or analyze the data within the RDC's virtual data enclave (currently in pilot phase). External researchers may also submit a proposal to access the data from within the CDC firewall. CDC is exploring other ways to make a portion of the data publicly available. Access to these data will be controlled via the tiered database structure (See Section 4b). A document describing the methods for requesting access to MAT-LINK data has been developed and will be posted on CDC's MAT-LINK webpage after data collection is completed and a dataset is publicly available.

Deliverable 3.4: Final data dictionary

CDC's MAT-LINK webpage will be updated to include the final MAT-LINK data dictionary and the abstraction guide as soon as data collection is completed, and a dataset is publicly available.

Objective #4
Participate in a maternal health collaborative that will inform national data standards and further collaborate with other federal agencies to provide subject matter expertise and coordinate programmatic efforts (e.g., data collection and sharing lessons learned)

Deliverable 4.1: Participation in Maternal Health Consortium
MAT-LINK, along with other PCOR-TF projects, participates in monthly Maternal Health Consortium meetings that seek to develop standards that promote reuse of clinical record data to support research on maternal health and pregnancy-related conditions, outcomes, and procedures. MAT-LINK-specific presentations during these meetings included an overview of the project and a deeper dive into MAT-LINK data tools, such as the XML generator, validator, REDCap, and SharePoint site.

4. Lessons Learned

MAT-LINK is the first surveillance system to collect comprehensive, longitudinal data on pregnant person-infant dyads with child outcomes associated with MOUD during pregnancy from multiple clinical sites. Due to thorough piloting and validation of data collection instruments with the Phase I clinical sites, minimal changes were required for the expansion, and the new clinical sites were added to MAT-LINK with relative ease.

4a. Communication and Collaboration

Consistent communication and collaboration between CDC, PHII, MAT-LINK clinical sites, and the MAT-LINK Partners Group has been essential to the success of this expansion. After the Phase II clinical sites joined the MAT-LINK network, monthly calls between CDC and the PIs were established to share experiences with data collection, facilitate site-to-site troubleshooting and collaboration, and discuss ongoing analyses and manuscript development. Notably, discussions from these monthly calls inspired a proposal to summarize the best practices for the provision of care to people with OUD in pregnancy across the MAT-LINK clinical sites and inform other institutions seeking to develop similar programs. Each clinical site presented on their best practices during a PI call to showcase their program as well as highlight opportunities and challenges in developing their care models. This information has been combined into a presentation about best practices in developing a program for providing care to people with OUD in pregnancy with the hope of presenting at various conferences in 2023 and 2024. Adding monthly PI calls served to create a learning collaborative for PIs to share data analyses as they are conducted, innovate clinical strategies, and build a network of clinicians and researchers. A manuscript of best practices from the MAT-LINK clinical sites is being written and will inform the work of others who care for this critical population.

The continuation of quarterly calls with federal, clinical, and public health partners allowed for sharing updates on relevant activities being conducted across agencies. After the MAT-LINK expansion, the format of the calls with the Partners Group was adapted to include a presentation from a partner at each call for a deeper overview of a program at their agency. Changing the format to include these presentations facilitated richer conversation across partners and identified opportunities for cross-agency collaboration.

4b. Data Modernization

Machine Learning

In alignment with CDC's prioritization of data modernization efforts, two MAT-LINK CDC team members were accepted into the 2022 and 2023 cohort of CDC's Data Science Upskilling program. This 10-month program provides training in Python and R through three week-long virtual trainings, access to curated online curriculum and learning resources, and one-on-one technical assistance and support from data science subject matter experts. Selected CDC employees are trained in advanced analytics and data visualization and apply these skills to a specific project. For MAT-LINK, this involved learning and implementing unsupervised machine learning techniques, specifically clustering analyses, to discover patterns in MAT-LINK's diagnostic codes that would otherwise require time-intensive manual review. Clinical and pharmaceutical subject matter expertise, existing reference lists for diagnostic code groupings, and raw diagnostic code data were used to guide the clustering analysis approaches, and results will inform future explanatory and predictive modeling analyses. As a next step, clustering analysis and additional machine learning approaches will be explored for categorizing medication data in MAT-LINK. Participating in this program was fruitful in training key MAT-LINK analysts on machine learning processes that will considerably reduce analysis time and improve accuracy when reviewing MAT-LINK diagnostic codes and other related data. These analysts are now using the skills they learned to train others on the team and have had an opportunity to showcase their work during numerous internal presentations, elevating the visibility of MAT-LINK and establishing the expertise of the MAT-LINK team with regard to data modernization and advanced analytics.

Data Tiers

To ensure that MAT-LINK data are protected while maximizing their utility for public health surveillance, multiple levels of data, called tiers, were created to control the quality, granularity, and accessibility of the data. This approach also improves the efficiency of data ingestion, processing, and sharing.

There are four data tiers located on MAT-LINK's SQL server. Tier 1 data is the raw, validated data. Tier 2 is de-duplicated data from Tier 1. Tier 3 is Tier 2 data that is enriched with data from look-up tables, calculated measures, and complementary datasets; this is the database on which most analyses are performed. Tier 4 data is a subset of Tier 3 that may be sharable to external researchers with no trace of patient identifiable information. Overall, as the tiers ascend in numerical order, the quality of the data improves and the accessibility to the data increases.

Tier 1 is the source database for the proceeding tiers 2, 3, and 4. The clinical sites provide the data and are responsible for data abstraction (a manual process) and extraction (an automated process). During submission, the file must pass several checkpoints run by an application program interface (API) broker. Once the data are verified, they are loaded onto Tier 1. These data are reviewed by subject matter experts on the MAT-LINK team, and any data issues are communicated back to clinical sites for resolution and resubmission as needed.

Tier 2 contains pristine data with all duplicated data removed. Access is granted to guest researchers who are trained under the Assurance of Confidentiality and to clinical sites. Participating clinical sites can view based on their data submission for Tier 1.

Tier 3 will contain data that are masked, aggregated, and weighted. This also includes calculated variables and data from look-up tables and external datasets that are linked by geography or interoperable codes. Based on requests from external researchers through the RDC, a curated subset of Tier 3 will be provided as a static dataset. Certain potentially identifiable data will be omitted from the static datasets such as ZIP codes, unmasked dates, and site identifiers.

Tier 4 will contain limited data from Tier 3. It contains no trace of patient identifiable information and serves as a sharable dataset reserved for public-facing dashboards that can be used by external researchers.

5. Future Considerations

5a. Sustainability

Electronic health record surveillance infrastructure is critical to rapidly informing clinical practice, particularly around emerging threats to pregnant people and their infants (e.g., Zika, COVID-19, prenatal substance exposure). MAT-LINK aligns well with CDC and US government public health surveillance modernization plans and provides CDC access to meaningful EHR data. With the Phase II expansion, all MAT-LINK clinical sites are collecting data on children through 6 years of age, which will require continued data collection beyond the PCOR-TF contract and funding period (e.g., for a child born in 2020 who will not be 6 years old until 2026). CDC is committed to continuing this important work and to funding and sustaining MAT-LINK through internal program support and other CDC centers' interest and collaboration. Further, because of the flexibility of the system, future iterations of MAT-LINK could include expanding data collection for existing clinical sites beyond August 2021 pregnancy outcomes,

following children beyond 6 years of age, and adding additional clinical sites. Sustaining and expanding MAT-LINK data collection may support additional research and continued monitoring of pregnancies complicated by OUD.

Finally, bringing the clinical sites together has established a community of practice to share evolving outcome data, to innovate clinical strategies, and to build a strong collaborative network. Currently, MAT-LINK has extensive support from CDC, across HHS, and the clinical and public health community. These efforts have allowed our clinical sites to share their best practices and ultimately inform clinical management of pregnant people with OUD and their children.

6. Presentations and Publications

6a. Presentations

- **May 28, 2021**—Rachelle Jones and Madhusudan Chaganthi presented an overview of MAT-LINK data tools ASPE's PCOR-TF Maternal Health Consortium meeting.
- **July 19, 2021**—Shin Kim and Nisha George presented an overview of MAT-LINK and its expansion at ASPE's PCOR-TF Maternal Health Consortium Webinar.
- **January 20, 2022**—Lucas Gosdin presented "Intro to MAT-LINK for IMMPaCt" to the International Micronutrient Malnutrition Prevention and Control Team (IMMPaCt) at CDC's Division of Nutrition, Physical Activity, and Obesity to share background and current progress on MAT-LINK.
- **April 25, 2022**—Suzanne Gilboa presented a comparison of MAT-LINK and SET-NET to the center director of CDC's NCBDDD.
- **June 7, 2022**—Emmy Tran presented an overview of the MAT-LINK expansion to the AcademyHealth Annual Research Meeting.
- **July 27, 2022**—Amy Board and Kathryn Miele presented "Harnessing machine learning to develop clinical constructs for maternal and infant outcomes in pregnant people-infant linked longitudinal surveillance platforms" to the Data Science Upskilling Symposium.
- **September 21, 2022**—Lucas Gosdin presented on MAT-LINK data related to sexually transmitted infections among pregnancies to the STD Prevention Conference.
- **October 5, 2022**—Amy Board and Kathryn Miele presented "Harnessing machine learning to develop clinical constructs for maternal and infant outcomes in pregnant people-infant linked longitudinal surveillance platforms" during CDC's Data Viz Day.
- **November 4, 2022**—Amy Board and Kathryn Miele presented "Harnessing machine learning to develop clinical constructs for maternal and infant outcomes in pregnant people-infant linked longitudinal surveillance platforms" to CDC's Division of Birth Defects and Infant Disorders' Science in Progress meeting.
- **December 20, 2022**—Shin Kim presented a year-end summary of MAT-LINK's Phase II successes and lessons learned to the Maternal Health Consortium.

6b. Publications

Upcoming Manuscripts

- *Longitudinal Surveillance for Maternal and Child Health Outcomes Associated with Use of Medications for Opioid Use Disorder during Pregnancy: MAT-LINK.* The purpose of this report is to provide a detailed description of the MAT-LINK surveillance methods including data sources, types of variables, secure data transfer and storage, and making data available for future analyses. In addition, a surveillance evaluation of MAT-LINK is described as well as a description of some population characteristics by MOUD status from Phase I clinical sites. (Planned *Morbidity and Mortality Weekly Report* Surveillance Summary, 2023)
- *Medication for Opioid Use Disorder During Pregnancy.* This analysis provides a description and comparison of the demographic, clinical, and MOUD regimen characteristics for the MAT-LINK surveillance population by MOUD type, including methadone, buprenorphine, and no MOUD. MOUD regimen characteristics include information on the dose, frequency, and timing of MOUD during pregnancy. (Under development)
- *Hepatitis C Screening and Management during Pregnancy and Postpartum Among People with Opioid Use Disorder*. This analysis describes the population characteristics, frequency, and timing of hepatitis C virus (HCV) screening, management of HCV infection, and screening for other infections during pregnancy and postpartum among people with OUD. (Under development)
- *Factors Associated with Overdose During and After Pregnancy Among People with an Opioid Use Disorder.* This analysis examines data on overdose, naloxone prescription, naloxone administration, substance use, and mediating factors during pregnancy and postpartum stratified by MOUD type. (Under development)
- *Characteristics of Pregnant People with Comorbid COVID-19 Infection and Opioid Use Disorder.* This paper will describe the population characteristics and outcomes following SARS-CoV-2 infection among pregnant and postpartum people with OUD. (Under development)
- *Gestating A Perinatal Opioid Use Disorder Program.* This paper will describe the best practices for the provision of care to people with OUD in pregnancy across the MAT-LINK clinical sites and inform other institutions seeking to develop similar programs. (Under development)

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