

# **Building community, infrastructure and insights for perinatal and reproductive health research in OHDSI**

**Alison Callahan<sup>1\*</sup>, Stephanie A. Leonard<sup>2\*</sup>, Louisa Smith<sup>3\*</sup>; The OHDSI Perinatal and Reproductive Health Work Group**

**<sup>1</sup>Center for Biomedical Informatics Research, School of Medicine, Stanford University, <sup>2</sup>Dunlevie Maternal-Fetal Medicine Center, Stanford University, <sup>3</sup>Department of Health Sciences, Bouvé College of Health Sciences, Northeastern University; \*equal contributors**

## **Background**

Despite childbirth being the number one reason for hospitalizations worldwide, pregnancy is understudied. Pregnant people are systematically excluded from most trials and studies, despite often being in greatest need of effective therapies. More than 90% of pregnant patients use at least one medication (1), yet studies of medication safety and effectiveness during pregnancy using traditional approaches such as randomized clinical trials (RCTs) are limited due to concerns for fetal safety (2–4). Observational health data, and specifically data collected during the course of routine care and captured in electronic health records (EHRs), are crucial to filling this evidence gap.

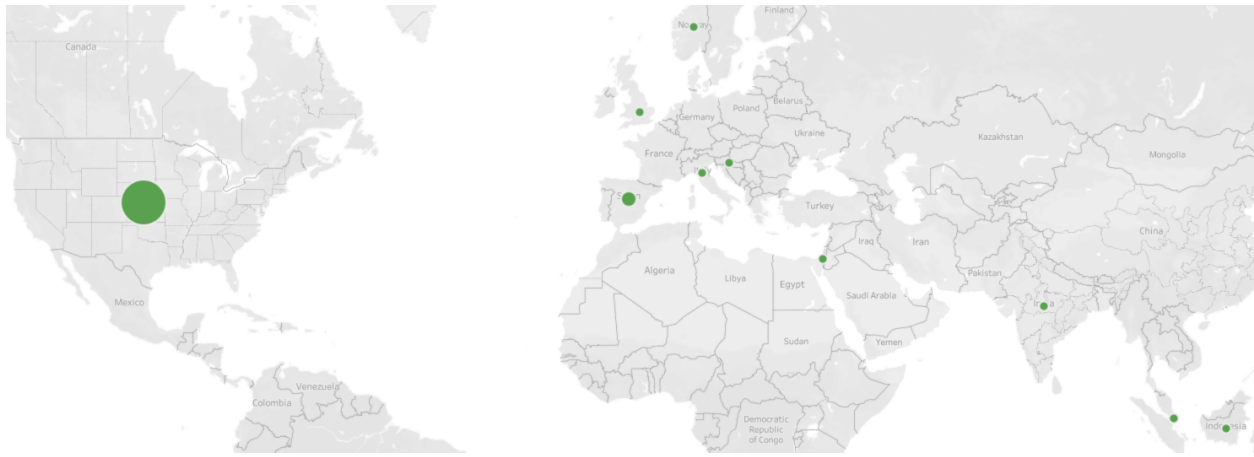
OHDSI has a successful track record of leveraging observational health data from international sources to study medication safety and effectiveness for a variety of diseases and therapies e.g. (5) – it is time to bring these data and methods to perinatal and reproductive health research. We will describe our preliminary work towards this long-term goal, including the founding of a dedicated OHDSI work group, building on prior work to develop infrastructure at multiple sites to represent pregnancy and birth specific data, and early insights derived from this research.

## **Methods**

We founded the Perinatal and Reproductive Health Work Group (PRHeG) in December 2022. Our work group comprises multi-disciplinary investigators with complementary expertise in informatics, data science, maternal-fetal medicine, and perinatal pharmacoepidemiology. In our six monthly group meetings to date, we have presented and discussed research being done internationally within the group to incorporate EHR, claims and registry data specific to pregnancies and deliveries into the OMOP CDM; to identify and link maternal and infant records using USA insurance claims data; and to characterize pregnancies and births in Spain, Norway, Scotland and the USA. We have also initiated collaborations with members of the OMOP CDM and patient-level prediction (PLP) work groups to identify best practices for representing pregnancy and birth specific data in the CDM, and to develop prediction models for pregnancy outcomes.

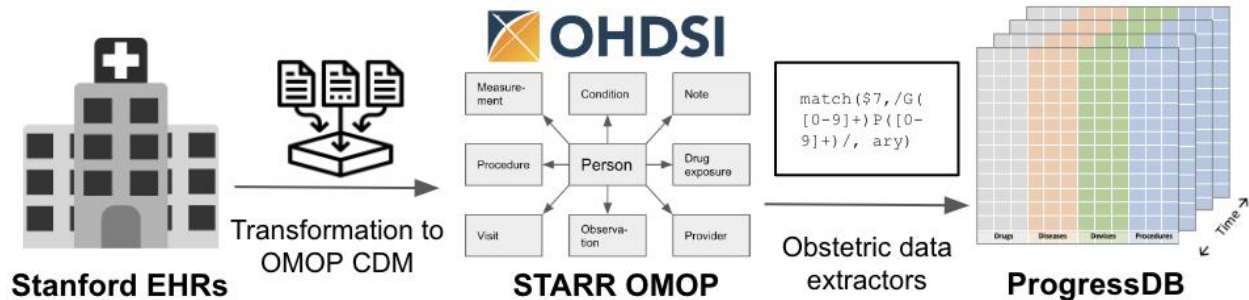
## **Results**

The Perinatal and Reproductive Health Work Group consists of more than 40 investigators across approximately 20 institutions (Figure 1). PRHeG's purpose is to develop tools and standards for pregnancy and reproductive health data to foster collaborative studies within the OHDSI network and advance research in the field. Our objectives are to: 1) improve capture and representation of pregnancy and reproductive health data in the OMOP CDM, 2) create an OHDSI data network of partners interested in pregnancy and reproductive health research and 3) launch at least one network study in our first year.



**Figure 1.** PRHeG has more than 40 members at institutions spanning the USA, Spain, Norway, and other countries in Europe and Asia. The size of each circle represents the number of members from that country.

Toward these objectives, PRHeG members at Stanford University have developed ProgressDB, a database of ~100,000 pregnancies and ~30,000 live births (6) from 2016-2022 using Stanford Medicine’s OMOP CDM instance (STARR OMOP; Figure 2), using validated methods to extract pregnancy- and birth-specific information including gravidity, parity, gestational age, plurality, and fetal presentation at birth from a combination of notes, flowsheets and coded data. They have also completed preliminary work to incorporate additional records about pregnancies and deliveries from the Epic Stork module. These data have been used as part of a pilot study of antihypertensive medication usage during pregnancy at 3 OHDSI sites - Stanford University, Columbia University and MaineHealth. PRHeG members at Janssen Research and Development have developed and evaluated an algorithm for linking mothers and infants in two USA commercial healthcare claims databases for pharmacoepidemiology research (7). PRHeG members at IDIAPJGol in Spain, the University of Oslo in Norway, the University of Oxford in England, and the University of Dundee in Scotland, funded by the European Health Data & Evidence Network (EHDEN), have developed a perinatal expansion for the OMOP CDM, have implemented it at two OHDSI sites in Europe, and are using this unique resource to study COVID-19 vaccine uptake and effectiveness in pregnancy.



**Figure 2.** Overview of the process to create ProgressDB from Stanford University’s STARR OMOP CDM instance, using validated obstetric data extractors.

These ongoing studies and infrastructure efforts have been presented and discussed at our PRHeG monthly meetings, towards the shared goal of a common approach for representing pregnancy and birth specific data across OHDSI sites and identifying opportunities for future network studies. Similarly, our guest presentations by members of the OMOP CDM and PLP work groups have identified best practices for representing perinatal health data in the OMOP CDM that have been implemented at Stanford and

are planned for implementation and evaluation at other OHDSI sites. These discussions have also identified potential collaborations to develop predictive models for pregnancy-related events including hypertension in pregnancy and stillbirth.

## Conclusion

In its first 6 months, the Perinatal and Reproductive Health Work Group has brought together more than 40 international investigators to improve capture and representation of pregnancy and reproductive health data in the OMOP CDM and create an OHDSI data network of partners interested in pregnancy and reproductive health research. Much of this progress is the result of work by long-standing and new members of the OHDSI community who have come together through PRHeG. With PRHeG, we aim to provide a platform as well as a growing body of infrastructure, tools and data for future studies towards improving health care for pregnant people around the world.

## References

1. Wesley BD, Sewell CA, Chang CY, Hatfield KP, Nguyen CP. Prescription medications for use in pregnancy-perspective from the US Food and Drug Administration. *Am J Obstet Gynecol.* 2021 Jul;225(1):21–32.
2. Illamola SM, Bucci-Rechtweg C, Costantine MM, Tsilou E, Sherwin CM, Zajicek A. Inclusion of pregnant and breastfeeding women in research - efforts and initiatives. *Br J Clin Pharmacol.* 2018 Feb;84(2):215–22.
3. Dinatale M, Roca C, Sahin L, Johnson T, Mulugeta LY, Fletcher EP, et al. The Importance of Clinical Research in Pregnant Women to Inform Prescription Drug Labeling. *J Clin Pharmacol.* 2020 Dec;60 Suppl 2:S18–25.
4. Igbinosa I, Miller S, Bianco K, Nelson J, Kappagoda S, Blackburn BG, et al. Use of remdesivir for pregnant patients with severe novel coronavirus disease 2019. *Am J Obstet Gynecol.* 2020 Nov;223(5):768–70.
5. Suchard MA, Schuemie MJ, Krumholz HM, You SC, Chen R, Pratt N, et al. Comprehensive comparative effectiveness and safety of first-line antihypertensive drug classes: a systematic, multinational, large-scale analysis. *Lancet [Internet].* 2019 Oct 24; Available from: [http://dx.doi.org/10.1016/S0140-6736\(19\)32317-7](http://dx.doi.org/10.1016/S0140-6736(19)32317-7)
6. Callahan A, Murugappan G, Main EK, Leonard SA. Constructing a cohort of nulliparous, term, singleton, vertex births from electronic health records. *Am J Obstet Gynecol.* 2022 Jan 1;226(1, Supplement):S521–2.
7. Weaver J, Hardin JH, Blacketer C, Krumme AA, Jacobson MH, Ryan PB. Development and evaluation of an algorithm to link mothers and infants in two US commercial healthcare claims databases for pharmacoepidemiology research [Internet]. *bioRxiv.* 2022. Available from: <http://medrxiv.org/lookup/doi/10.1101/2022.12.13.22283418>.