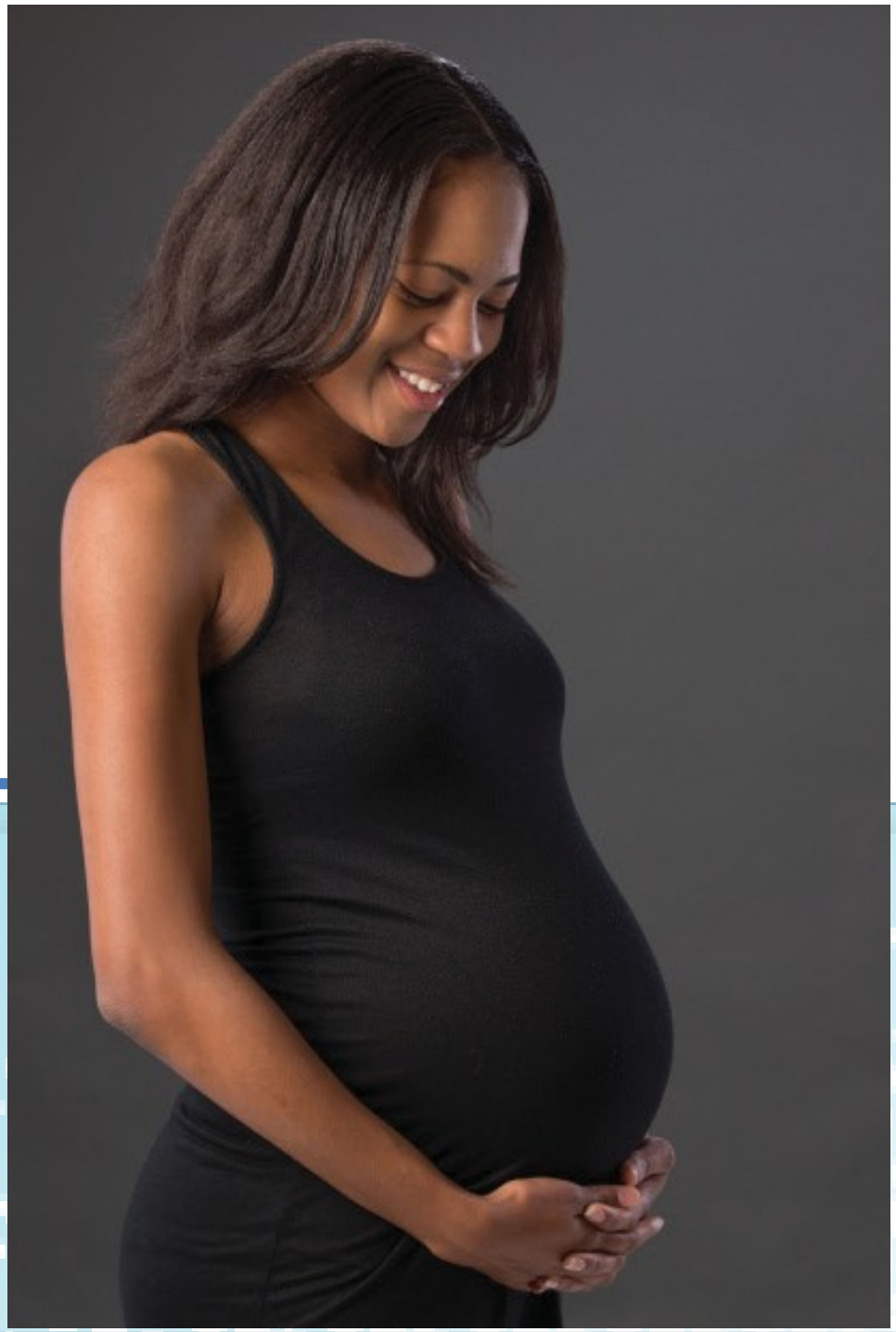
Appendices



Appendix A: Recommendations to Improve Epidemiology Capacity for GDM Surveillance in Ohio

To strengthen GDM surveillance, an annual update and review of data from Vital Statistics and Medicaid is recommended. It would also be beneficial to have an update and review of statistics from BRFSS, OPAS, and OHA every 2 to 3 years.

WIC instituted a GDM-specific system into their system in Fall of 2016. These data should be analyzed and reviewed to identify their usefulness in describing GDM burden in this population and to inform prevention and control strategies.

Furthermore, the use of Medicaid data could be explored to a) assess the timing of prenatal GDM screening, and b) assess ongoing (beyond postpartum) T2DM glucose screening among women with a GDM history. Lastly, it is recommended to better understand the accuracy of Medicaid data related to postpartum glucose screening so that these data can be best applied to program planning and evaluation.

Appendix B: Data Source Descriptions, Strengths and Limitations

Ohio Hospital Association (OHA)

OHA represents 13 health systems and 233 hospitals in Ohio (www.ohiohospitals.org). OHA provides claims information on individuals who were admitted and discharged from the hospital. Hospital discharge data were collected by OHA and provided to ODH for analysis. Data requested from OHA for this data book were as follows:

- Women with Gestational Diabetes (ICD-9 Codes: 6488, 64880, 64881, 64882, 64883, 64884; or ICD-10 Codes beginning with 244XX but excluding Z8632)
- Obstetrics
- Inpatients
- Ohio Residents

Record identification with diabetes was based on discharge ICD-9-CM codes without knowledge of the criteria used to make the diagnosis. In general, studies that use ICD-9-CM codes to describe disease trends may suffer from bias, depending on the validity of the code from the condition being examined. A previous study that evaluated ICD-9-CM codes in hospital discharge data for one in obstetric research reported high positive predictive values (96 percent) and moderate sensitivity (64 percent) for the full spectrum of diabetes codes (Yasmeen, 2006). Similar results were reported in another study that assessed the validity of hospital discharge data for identifying diabetes-complicated births (Delvin, 2009). This result suggests the potential for underestimation rather than over reporting in our numbers but would not deter from our conclusions regarding the impact of diabetes among pregnant women in the U.S. Similarly, because of the nature of the data, we also cannot rule out improvement in reporting quality over time as a partial explanation for the temporal increased. Population based studies of laboratory-based diagnosis of GDM over similar time intervals; however, also documented increasing trends similar to what we report (Delvin, 2009; Yasmeen, 2006). Another limitation of the hospital discharge data is that a woman may be counted more than once if she had multiple pregnancies complicated by GDM within the time period examined.

Furthermore, the charges represent the total amount billed, not the actual amount collected and while this is sufficient information to assess overall trends of disease-related cost burden, it is inadequate for measuring the financial impact in absolute terms within various demographic groups. Currently, no data on GDM-associated complications – including Cesarean sections, high birth weight in previous delivery or hypoglycemia – are

available from OHA to examine reasons for longer hospital stay and associated increased charges. However, further analysis of hospital data showed a difference in the prevalence of several GDM complications.

Additionally, women with GDM may also have higher rates of indirect costs resulting from increased time off work and psychological stress (Yasmeen, 2006).

Behavior and Risk Factors Surveillance Survey (BRFSS)

The BRFSS is a state-based system of health surveys that collects information on health risk behaviors, preventive health practices and health care access primarily related to chronic disease and injury in the adult population (18 years of age or older) living in households. The CDC established BRFSS in 1984. Currently, data are collected monthly in all 50 states, the District of Columbia, Puerto Rico, the U.S Virgin Islands, and Guam. More than 350,000 adults are interviewed each year, making the BRFSS the largest telephone health survey in the world. States use BRFSS data to identify emerging health problems, establish and track health objectives, and develop and evaluate public health policies and programs (www.cdc.gov/brfss). The Ohio BRFSS has some state-added questions, which includes questions pertaining to Gestational Diabetes Mellitus. The state-added GDM questions were asked in 2012, 2013, 2014, and 2016.
All data collected from BRFSS are self-reported, which is subject to recall bias, social desirability bias, and measurement bias resulting from wording and questionnaire design (Choi, 2005). Despite this, the accuracy of self-reporting for diabetes is reasonably high in population surveys (Saydah, 2004).

Another limitation is that GDM question in BRFSS is not specific to a current or recent pregnancy, and includes all women who had GDM in the past 10 years, regardless of age, resulting in more a cumulative prevalence estimate, rather than a cross-sectional estimate.

Vital Statistics

In 2006, Ohio adopted the revised National Center for Health Statistics 2003 birth certificate. Under the section on the birth certificate titled "Risk Factors for Pregnancy" the following options for diabetes are available:

- Pre-pregnancy (Diagnosis prior to this pregnancy)
- Gestational (Diagnosis in this pregnancy)

These data should come from the mother's prenatal care records, labor and delivery records, as well as infant's medical record (each of which contributes to the facility worksheet). If the mother's prenatal care record is not in her hospital chart, Ohio Vital Statistics recommends that the doctor and/or clerical staff contact her prenatal care provider to obtain the record or a copy of the prenatal care information.

Birth certificates only allow for one diabetes response to be chosen. This change was implemented after 2004 in most states (in 2006 in Ohio), and increases the validity of GDM reporting on birth certificates (Hoslet, 2010). The Ohio Perinatal Quality Collaborative (OPQC) in 2008 introduced a charter that would prevent unnecessary scheduled births without proper medical indications between 36 and 38 weeks. As a result of this initiative many births have been moved beyond 39 weeks, decreasing the amount of NICU admissions annually. In mid-2013, OPQC began promotion and training on accurate reporting of 13 key birth registry variables. Gestational diabetes was one of the 13.

Previous studies have shown that birth certificates underreported GDM. The accuracy of the birth certificate data relies on both the medical provider's accurate completion of the health history and proper training of clerical staff. Without review by clinicians and little incentive for quality improvement (Northam, 2006; Devlin,

2009; Deitz, 1998), it is difficult to assess the quality of the birth certificate data, which may vary by state. For example, birth certificates in New York State showed high validity when compared to medical charts (Roohan, 2003). However, in Minnesota, hospital discharge data performed better in identifying GDM and pre-pregnancy diabetes than birth certificates (Devlin, 2009). Validity of birth certificates to report GDM in Ohio has not been quantified.

Some of the height, weight and BMI values were considered biologically implausible and hence, had to be removed from the analyses. This could be due to the fact that individuals could have been asked for their height, weight and BMI instead of actually being assessed at the health facility. Possible self-reporting of these values is therefore, a possible contribution to the discrepancy and biological implausible values that were witnessed in the dataset. Efforts to improve quality improvement in data collection can be considered for future work.

Pregnancy Risk Assessment Monitoring System (PRAMS)

PRAMS is a population-based survey that asks about maternal behaviors and experiences before, during, and after a woman's pregnancy and during the early infancy of her child. Center for Disease Control (CDC) developed PRAMS in 1987. Currently, 37 states and New York City participate in PRAMS (including Ohio since 1999). Findings are used to develop and assess public health programs and policies to reduce adverse pregnancy outcomes. The PRAMS sample includes women who have had a recent live birth. A stratified sample of such women is selected each month from the state's birth certificate files. Ohio PRAMS sampling strata include mothers of low birth weight infants and African-Americans. Selected women are first contacted by mail 2-4 months postpartum. If there is no response to repeated mailings, women are contacted and interviewed by telephone (www.cdc.gov/PRAMS).

Overall, the accuracy of self-reporting for diabetes is reasonably high in population surveys (Saydah, 2004). Data collected from PRAMS is completely self-reported, which is subject to recall bias, social desirability bias, and measurement bias resulting from working and questionnaire design (Choi, 2005). Additionally, PRAMS does not include fetal deaths or still births, which could have an association with gestational diabetes (Racusin, 2012). Although the question asks about GDM history in the most recent pregnancy, respondents may answer based on any past pregnancy. There is some reporting bias in regards to diabetes in PRAMS, a small proportion of women report having both GDM and pre-pregnancy diabetes. However, the proportion of misreporting has decreased in recent years.

PRAMS ended in Ohio following 2015 births.

Ohio Pregnancy Assessment Survey

The Ohio Pregnancy Assessment Survey (OPAS) is a statewide, ongoing, targeted population-based survey that utilizes the CDC Pregnancy Risk Assessment Monitoring System (PRAMS) methodology to collect information on and attitudes of residential women who give birth in Ohio. OPAS began fielding in 2016, and provides information not available from other sources about pregnancy and the first few months after birth. OPAS questions are group to reflect experiences before, during and after pregnancy. This information can be used to identify groups of women and infants at high risk for health problems, to monitor changes in health status, and to measure progress towards goals in improving the health of mothers and infants. Additionally, the OPAS provides data to measure progress in Ohio's maternal and infant health (MIH) initiatives and is used by researchers to investigate emerging issues in the field of reproductive health.

The OPAS is a stratified mixed collection mode random survey of residential women who gave birth in Ohio. Relevant populations of interest, such as the nine Ohio Health Equity Institute (OEI) counties, are oversampled to facilitate analysis of Ohio's MIH initiatives and ongoing program development. Sampled women are contacted approximately 2-4 months after delivery and can participate by completing a mailed survey, online survey, or telephone survey.

Medicaid

The database from which Medicaid data originate contains eligibility, demographic and transactional data for all Medicaid recipients. Data are uploaded monthly and can be obtained either at a summary level, or at the record level. Even if a mother is enrolled as a Medicaid recipient, if the service is not paid for by Medicaid, there is no record of the service in the Medicaid claims database. Only services billed to Medicaid for enrollees are included. Although probably rare, Medicaid enrolled individuals could be receiving care though a non-Medicaid provider.

Additionally, some subgroups had small sample sizes, so subgroups with denominators less than 30 were suppressed to maintain respondent confidentiality. These lead to gaps in the analysis reflected on the tables as NA.

Additional changes from the original 2011-2013 ODH data book include:

- The original team who conducted the analysis discovered that the previously published tables for 2011-13 did not restrict the female population to women of reproductive age (WRA) as previously indicated.
- Some of the estimates that were previously reported no longer met the reliability criteria for reporting.
- A change from ICD-9 codes to ICD-10 codes was required due to the federally mandated conversion that occurred on October 1, 2015.

References

American College of Obstetricians and Gynecologists. Gestational diabetes mellitus. ACOG Practice Bulletin No. 190. *Obstet Gynecol* 2018;131:e49–64.

Choi BCK, Pak AWP. A Catalog of biases in questionnaires. *Prev Chronic Dis* 2005;2(1):A13.

Coustan DR. Methods of screening for and diagnosing of gestational diabetes. *Diabetes in Pregnancy* 1993;20:593-602.

Devlin H, Desai J, Walaszek A. Reviewing performance of birth certificate and hospital. discharge data to identify births complicated by maternal diabetes. *Matern Child Health J* 2009;13(5):660-6.

Deitz P, Adams M, Kendrick J, et al. Completeness of ascertainment of prenatal smoking using birth certificates and confidential questionnaires. *Am J Epidemiol* 1998;148:1048-1054.

Dietz PM, Vesco KK, Callaghan WM et al. Post-partum screening for diabetes after a GDM-affected pregnancy. *Obstet Gynecol* 2008;112(4):868-74.

Hoslet AS, Nayak SG, Radigan AM. Agreement between self-report and birth certificate for gestational diabetes mellitus: New York State PRAMS. *Matern Child Health J* 2010;14(5):786-9.

Kim C, Newton KM, Knopp RH. Gestational diabetes and the incidence of type 2 diabetes: a systematic review. *Diabetes Care.* 2002; 25(10)1862-8.

Kjos SL, Buchanan TA, Greenspoon JS, et all. Gestational Diabetes mellitus: the prevalence of glucose intolerance and diabetes mellitus in the fi st two months postpartum. *Am J Obstet Gynec* 1990;163:93-8.

Ko JY, Dietz PM, Conrey EJ, Rodgers LE, Shellhaas C, Farr S, Robbins CL. Strategies associated with higher postpartum glucose tolerance screening rates for gestational diabetes mellitus patients. *Women's Health* 2013a;22(8):681-6 (10.1089/ jwh.2012.4092).

Ko JY, Dietz PM, Conrey EJ, Rodgers LE, Shellhaas C, Farr S, Robbins CL. Gestational Diabetes Mellitus and Postpartum Care Practices of Nurse-Midwives. *Midwifery Women's Health* 2013b;58(1):33–40.

Northam S, Knapp T. The reliability and validity of birth certificates. *J Obstet Gynecol Neonatal Nurs* 2006; 35, 3-12.

O'Sullivan JB et al. Screening criteria for high-risk gestational diabetic patients. *Am J Obstet Gynecol* 1973;116:985-900.

Oza-Frank, Ko JY, Wapner A, Rodgers L, Bouchard J, Conrey EJ. Improving care for women with a history of gestational diabetes: A provider perspective. *Child Health* 2014;18(7):1683-

1690(10.1007/s10995-013-1410-y).

Racusin D, Stevens B, Campbell G, et al. Obesity and the risk and detection of fetal malformations. *Semin Perinatol.* 2012;36:213-21.

Rodgers L, Conrey EJ. Wapner A, Ko JY, Dietz P, Oza-Frank R. Primary Healthcare Providers' Knowledge and Attitudes Regarding Care for Women with Histories of Gestational Diabetes. *Preventing Chronic Disease* 2014;11:140308. DOI: http://dx.doi.org/10.5888/pcd11.140308.

Roohan P, Josburger R, Acar J, et al. Validation of birth certificate data in New York State. J Comm Health 2003;28: 335-346.

Saydah SH, Geiss LS, Tierney E, et al. Review of the performance of methods to identify diabetes cases among vital statistics, administrative, and survey data. Ann Epidemiol 2004; 14(7):507-516.

Shellhaas C, Conrey E, Crane D, Lorenz A, Wapner A, Oza-Frank R, Bouchard J. The Ohio Gestational Diabetes Postpartum Care Learning Collaborative: Development of a Quality improvement initiative to improve systems of care for women. *Matern Child Health J* 2016 [Epub ahead of Print] DOI: 10.1007/s10995-016-2170-2.

Yasmeen S, Romano PS, Schembri ME, et al. Accuracy of obstetric diagnoses and procedures in hospital discharge data. *Am J Obstet Gynecol* 2006;194;992-1001.

Ziegler AG, Wallner M, Kaiser I, Rossbauer M, Harsunen MH, Lachmann L. Long-term protective effect of lactation on the development of type 2 diabetes in women with recent gestational diabetes mellitus. *Diabetes* 2012;61:3167–3171.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