

The Ohio Department of Medicaid's Quality-Based Auto- Assignment Measures Methodology

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Risk Adjusted Low Birth Weight

The risk-adjusted percentage of women who delivered live births less than 2,500 grams during the reporting year.

Numerator: Number of resident live births less than 2,500 grams in the denominator. Data from The Ohio Department of Health's Vital Statistics file will be used to determine birth weight.

Denominator: Number of resident live births during the reporting year on the linked Medicaid to Vital Statistics linked file that meet the continuous enrollment criteria. Multiple births (e.g., twins or triplets) are excluded from the denominator (see *Appendix E for the Medicaid to Vital Statistics Data linkage methodology*).

Data Sources: ODM's Encounter Data, ODM's FFS Claims Data, Vital Statistics Data, ODM's Demographic and Enrollment data.

Measurement Period: Rolling annual measurement period updated on a quarterly-basis, based on the latest accurate data available.

Please see Appendix B for the projected** calculation schedule for the Risk-Adjusted Low Birth Weight rate.

Measure Steward: Centers for Disease Control and Prevention (CDC)

MCP- Specific Risk Adjustment Process

In order to make more accurate comparisons between five Managed Care MCPs (MCPs) and to statistically control for demographic factors, adjusted rates were calculated using direct standardization. The adjusted rate answers the question, "what would the rate be if the women giving birth in each of the MCPs had the same demographic characteristics as the overall population of women giving birth in Ohio?" The directly standardized rates were calculated by dividing the population of each study group into 48 subgroups or strata. Each stratum represents a unique combination of the demographic characteristics that are being adjusted (age, race, ethnicity, and marital status). Standardized rates in this report are based on four age brackets, three race categories (black, white, other), Hispanic ethnicity, and marital status as reported on the vital statistics birth files. The vital statistics birth file was used for the low birth weight and risk factor analyses. Once each study population (each individual MCP) was divided into the strata, 48 stratum-specific rates were calculated and each rate was multiplied by the number of people within that corresponding stratum in the standard population. The number this yields is the number of people that would have experienced the event in each study population if each of the study populations had the same age, race, ethnicity, and marital status distribution as the entire population of women who gave birth (the standard population) in the measurement year. The number of expected events for each stratum was then summed and divided by the total number of people in the standard population to yield a directly standardized rate for each study population.

Prenatal and Postpartum Care: Timeliness of Prenatal Care

The percentage of deliveries during the measurement year that received a prenatal visit as a member of the organization in the first trimester or within 42 days of enrollment in the organization.

Denominator: The number of deliveries resulting in one or more live birth during the measurement year.

Numerator: The number of deliveries that have a corresponding prenatal visit that occurred while the member was enrolled in a MCP and was during the first trimester or within 42 days of enrollment. **Hospice Exclusion:** Members in hospice are excluded from the eligible population.

Data Sources:

ODM's Encounter Data, ODM's FFS Claims Data, ODM's Demographic and Enrollment data.

Please see Appendix A for the projected** calculation schedule for HEDIS rates.

Measurement Period: Rolling annual measurement period updated on a quarterly-basis, based on the latest accurate data available

ODM will determine whether the self-reported audited HEDIS results or ODM's encounter data-calculated results will be used. ODM will make this determination based on a review of issues related to the submission of relevant encounters to MITS.

Refer to Appendix C for the appropriate codes to identify deliveries and Appendix D for coding to identify qualifying Primary Care and OB/GYN/Prenatal Care Practitioners.

Refer to HEDIS 2017 for additional information.

Prenatal and Postpartum Care: Postpartum Visits

The percentage of deliveries that had a postpartum visit on or between 21 and 56 days after delivery.

Denominator: The number of deliveries resulting in one or more live birth during the measurement year.

Numerator: The number of deliveries that had a postpartum visit on or between 21 and 56 days after delivery.

Hospice Exclusion: Members in hospice are excluded from the eligible population.

Data Sources:

ODM's Encounter Data, ODM's FFS Claims Data, ODM's Demographic and Enrollment data.

Please see Appendix A for the projected** calculation schedule for HEDIS rates.

Measurement Period: Rolling annual measurement period updated on a quarterly-basis, based on the latest accurate data available

ODM will determine whether the self-reported audited HEDIS results or ODM's encounter data-calculated results will be used. ODM will make this determination based on a review of issues related to the submission of relevant encounters to MITS.

Refer to Appendix C for the appropriate codes to identify deliveries and Appendix D for coding to identify qualifying Primary Care and OB/GYN/Prenatal Care Practitioners.

Refer to HEDIS 2017 for additional information.

Screening for Breast Cancer

The percentage of women 50 to 74 years of age who had a mammogram to screen for breast cancer.

Denominator: Women who meet the continuous enrollment criteria and were 52 to 74 years of age as of the last day of the measurement period.

Numerator: One or more mammograms (Mammography value set) during the 26 months prior to, and including, the last month of the measurement period (i.e. total of 27 months).

- For example, if the last day of the measurement period is February 28, 2017 the numerator evaluation period is December 1, 2014 through February 28, 2017.

Continuous Enrollment: The first day of the 15th month prior to the first month of the measurement period, through the last day of the measurement period (e.g. for the March 1, 2016 – February 28, 2017 measurement period, the continuous enrollment period would start on December 1, 2014 and end on February 28, 2017).

Optional Exclusions: Members who meet optional exclusion criteria are excluded from the measure.

Hospice Exclusion: Members in hospice are excluded from the eligible population.

Data Sources:

ODM's Encounter Data, ODM's FFS Claims Data, ODM's Demographic and Enrollment data.

Please Appendix A for the projected ** calculation schedule for HEDIS rates.

Measurement Period: Rolling annual measurement period updated on a quarterly-basis, based on the latest accurate data available.

Refer to HEDIS 2017 for additional information.

Screening for Cervical Cancer

The percentage of women 21 to 64 years of age who were screened for cervical cancer using either of the following:

- *women age 21 to 64 who had cervical cytology performed every 3 years*
- *women age 30 to 64 who had cervical cytology/human papillomavirus (HPV) co-testing performed every 5 years.*

Denominator: Women who meet the continuous enrollment criteria and were 24 to 64 years of age as of the last day of the measurement period.

Numerator: The number of women who were screened for cervical cancer during the measurement year or the two years prior to the measurement year (Cervical Cytology value set), or during the measurement year or the four years prior to the measurement year (Cervical Cytology and HPV Tests value sets). See HEDIS 2017 specifications for additional information.

Continuous Enrollment: The 12-month measurement period.

Optional Exclusions: Members who meet optional exclusion criteria are excluded from the measure.

Hospice Exclusion: Members in hospice are excluded from the eligible population.

Data Sources:

ODM's Encounter Data, ODM's FFS Claims Data, ODM's Demographic and Enrollment data.

Please Appendix A for the projected ** calculation schedule for HEDIS rates.

Measurement Period: Rolling annual measurement period updated on a quarterly-basis, based on the latest accurate data available.

ODM will determine whether the self-reported audited HEDIS results or ODM's encounter data-calculated results will be used. ODM will make this determination based on a review of issues related to the submission of relevant encounters to MITS.

Refer to HEDIS 2017 for additional information.

Appendix A: Calculation Schedule for HEDIS Measures

Quality Based Assignments							
Projected Calculation Schedule							
Measure rates and data source for applicable quarter							
Phase	Year	QBA Assignments for:	Date Assignments Effective	Last Date Assignments Effective	Results	Measurement Period	ODM Rates Calculated With Claims Submitted Through:
Phase I	2016	Quarter 1	1/1/2016	3/31/2016	HEDIS 2015 self-reported	CY 2014	n/a
Phase I	2016	Quarter 2	4/1/2016	6/30/2016	HEDIS 2015 self-reported	CY 2014	n/a
Phase I	2016	Quarter 3	7/1/2016	9/30/2016	ODM- calculated	Oct 2014 - Sep 2015	May 2016
Phase I	2016	Quarter 4	10/1/2016	12/31/2016	ODM- calculated	March 2015- February 2016	August 2016
Phase II	2017	Quarter 1	1/1/2017	3/31/2017	ODM- calculated	June 2015 - May 2016	November 2016
Phase II	2017	Quarter 2	4/1/2017	6/30/2017	ODM- calculated	September 2015 - August 2016	February 2017
Phase II	2017	Quarter 3	7/1/2017	9/30/2017	ODM- calculated	December 2015 - November 2016	May 2017
Phase II	2017	Quarter 4	10/1/2017	12/31/2017	ODM- calculated	March 2016 - February 2017	August 2017
Phase II	2018	Quarter 1	1/1/2018	3/31/2018	ODM- calculated	June 2016 - May 2017	November 2017
Phase II	2018	Quarter 2	4/1/2018	6/30/2018	ODM- calculated	September 2016 - August 2017	February 2018
Phase II	2018	Quarter 3	7/1/2018	9/30/2018	ODM- calculated	December 2016 - November 2017	May 2018
Phase II	2018	Quarter 4	10/1/2018	12/31/2018	ODM- calculated	March 2017 - February 2018	August 2018
Phase III	2019	Quarter 1	1/1/2019	3/31/2019	ODM- calculated	June 2017 - May 2018	November 2018
Phase III	2019	Quarter 2	4/1/2019	6/30/2019	ODM- calculated	September 2017- August 2018	February 2019
Phase III	2019	Quarter 3	7/1/2019	9/30/2019	ODM- calculated	December 2017 - November 2018	May 2019
Phase III	2019	Quarter 4	10/1/2019	12/31/2019	ODM- calculated	March 2018 - February 2019	August 2019
Measures:							
Prenatal and Postpartum Care - Timeliness of Prenatal Care							
Prenatal and Postpartum Care - Postpartum Care							
Screening for Breast Cancer							
Screening for Cervical Cancer							

**The calculation schedule for the HEDIS measures is a projected schedule as of March 2018 and may be subject to change

Appendix B: Calculation Schedule for Risk- Adjusted Low Birth Weight Measure

Quality Based Assignments							
Projected Calculation Schedule							
Measure rates and data source for applicable quarter							
Phase	Year	QBA Assignments for:	Date Assignments Effective	Last Date Assignments Effective	Results	Measurement Period	ODM Rates Calculated With Claims Submitted Through:
Phase I	2016	Quarter 1	1/1/2016	3/31/2016	ODM- calculated	CY 2014	November 2015
Phase I	2016	Quarter 2	4/1/2016	6/30/2016	ODM- calculated	April 2014 - March 2015	January 2016
Phase I	2016	Quarter 3	7/1/2016	9/30/2016	ODM- calculated	July 2014 - June 2015	February 2016
Phase I	2016	Quarter 4	10/1/2016	12/31/2016	ODM- calculated	October 2014 - September 2015	March 2016
Phase II	2017	Quarter 1	1/1/2017	3/31/2017	ODM- calculated	March 2015- February 2016	August 2016
Phase II	2017	Quarter 2	4/1/2017	6/30/2017	ODM- calculated	June 2015 - May 2016	November 2016
Phase II	2017	Quarter 3	7/1/2017	9/30/2017	ODM- calculated	September 2015 - August 2016	February 2017
Phase II	2017	Quarter 4	10/1/2017	12/31/2017	ODM- calculated	December 2015 - November 2016	May 2017
Phase II	2018	Quarter 1	1/1/2018	3/31/2018	ODM- calculated	March 2016 - February 2017	August 2017
Phase II	2018	Quarter 2	4/1/2018	6/30/2018	ODM- calculated	June 2016 - May 2017	November 2017
Phase II	2018	Quarter 3	7/1/2018	9/30/2018	ODM- calculated	September 2016 - August 2017	February 2018
Phase II	2018	Quarter 4	10/1/2018	12/31/2018	ODM- calculated	December 2016 - November 2017	May 2018
Phase III	2019	Quarter 1	1/1/2019	3/31/2019	ODM- calculated	March 2017 - February 2018	August 2018
Phase III	2019	Quarter 2	4/1/2019	6/30/2019	ODM- calculated	June 2017 - May 2018	November 2018
Phase III	2019	Quarter 3	7/1/2019	9/30/2019	ODM- calculated	September 2017- August 2018	February 2019
Phase III	2019	Quarter 4	10/1/2019	12/31/2019	ODM- calculated	December 2017 - November 2018	May 2019

Measures:

Risk-Adjusted Low Birth Weight

*Please note that the measurement periods and claims dates are different for the HEDIS measures and Risk-Adjusted Low Birth Weight Measure given that the low birth weight measure requires an additional process to link Medicaid data with birth certificate data.

**The calculation schedule for the Risk-Adjusted Low Birth Weight measure is a projected schedule as of March 2018 and may be subject to change as necessary.

Appendix C: Codes to Identify Deliveries for Postpartum and Prenatal Care

Use the codes in table 4-A: *Codes to Identify Deliveries prior to October 1, 2015* to identify deliveries with dates of service prior to October 1, 2015. The codes listed in 4-B: *Codes Used to Verify Live Births prior to October 1, 2015* should be used to exclude non-live births for deliveries prior to October 1, 2015. Use the codes in table 4-C: *Codes to Identify Deliveries on or after October 1, 2015* to identify deliveries with dates of service on or after October 1, 2015. The codes listed in 4-D: *Codes Used to Verify Live Births on or after October 1, 2015* should be used to exclude non-live births for deliveries on or after October 1, 2015.

Table 4-A: Codes to Identify Deliveries Prior to October 1, 2015	
ICD-9-CM Procedure Codes	
720, 721, 7221, 7229, 7231, 7239, 724, 7251, 7252, 7253, 7254, 726, 7271, 7279, 728, 729, 7301, 7309, 731, 7321, 7322, 733, 734, 7351, 7359, 736, 738, 7391, 7392, 7393, 7394, 7399, 740, 741, 742, 744, 7499	
ICD-9-CM Diagnosis Codes	
64001, 64081, 64091, 64101, 64111, 64121, 64131, 64181, 64191, 64201, 64202, 64211, 64212, 64221, 64222, 64231, 64232, 64241, 64242, 64251, 64252, 64261, 64262, 64271, 64272, 64291, 64292, 64301, 64311, 64321, 64381, 64391, 64421, 64511, 64521, 64601, 64611, 64612, 64621, 64622, 64631, 64641, 64642, 64651, 64652, 64661, 64662, 64671, 64681, 64682, 64691, 64701, 64702, 64711, 64712, 64721, 64722, 64731, 64732, 64741, 64742, 64751, 64752, 64761, 64762, 64781, 64782, 64791, 64792, 64801, 64802, 64811, 64812, 64821, 64822, 64831, 64832, 64841, 64842, 64851, 64852, 64861, 64862, 64871, 64872, 64881, 64882, 64891, 64892, 64901, 64902, 64911, 64912, 64921, 64922, 64931, 64932, 64941, 64942, 64951, 64961, 64962, 64971, 64981, 64982, 650, 65101, 65111, 65121, 65131, 65141, 65151, 65161, 65171, 65191, 65201, 65211, 65221, 65231, 65241, 65251, 65261, 65271, 65281, 65291, 65301, 65311, 65321, 65331, 65341, 65351, 65361, 65371, 65381, 65391, 65401, 65402, 65411, 65412, 65421, 65431, 65432, 65441, 65442, 65451, 65452, 65461, 65462, 65471, 65472, 65481, 65482, 65491, 65492, 65501, 65511, 65521, 65531, 65541, 65551, 65561, 65571, 65581, 65591, 65601, 65611, 65621, 65631, 65651, 65661, 65671, 65681, 65691, 65701, 65801, 65811, 65821, 65831, 65841, 65881, 65891, 65901, 65911, 65921, 65931, 65941, 65951, 65961, 65971, 65981, 65991, 66001, 66011, 66021, 66031, 66041, 66051, 66061, 66071, 66081, 66091, 66101, 66111, 66121, 66131, 66141, 66191, 66201, 66211, 66221, 66231, 66301, 66311, 66321, 66331, 66341, 66351, 66361, 66381, 66391, 66401, 66411, 66421, 66431, 66441, 66451, 66461, 66481, 66491, 66501, 66511, 66522, 66531, 66541, 66551, 66561, 66571, 66572, 66581, 66582, 66591, 66592, 66602, 66612, 66622, 66632, 66702, 66712, 66801, 66802, 66811, 66812, 66821, 66822, 66881, 66882, 66891, 66892, 66901, 66902, 66911, 66912, 66921, 66922, 66932, 66941, 66942, 66951, 66961, 66971, 66981, 66982, 66991, 66992, 67002, 67101, 67102, 67111, 67112, 67121, 67122, 67131, 67142, 67151, 67152, 67181, 67182, 67191, 67192, 67202, 67301, 67302, 67311, 67312, 67321, 67322, 67331, 67332, 67381, 67382, 67401, 67402, 67412, 67422, 67432, 67442, 67451, 67452, 67482, 67492, 67501, 67502, 67511, 67512, 67521, 67522, 67581, 67582, 67591, 67592, 67601, 67602, 67611, 67612, 67621, 67622, 67631, 67632, 67641, 67642, 67651, 67652, 67661, 67662, 67681, 67682, 67691, 67692, 67801, 67811, 67901, 67902, 67911, 67912, V270, V272, V273, V275, V276	
DRG Codes	
540, 541, 542, 560	
CPT Codes	
59400, 59409, 59410, 59514, 59515, 59610, 59612, 59614, 59618, 59620, 59622	

Table 4-B: Codes Used to Verify Live Births Prior to October 1, 2015**ICD-9-CM Diagnosis Codes**

Exclude Deliveries Not Resulting in a Live Birth:

630, 6310, 6318, 632, 63300, 63301, 63310, 63311, 63320, 63321, 63380, 63381, 63390, 63391, 63400, 63401, 63402, 63410, 63411, 63412, 63420, 63421, 63422, 63430, 63431, 63432, 63440, 63441, 63442, 63450, 63451, 63452, 63460, 63461, 63462, 63470, 63471, 63472, 63480, 63481, 63482, 63490, 63491, 63492, 63500, 63501, 63502, 63510, 63511, 63512, 63520, 63521, 63522, 63530, 63531, 63532, 63540, 63541, 63542, 63550, 63551, 63552, 63560, 63561, 63562, 63570, 63571, 63572, 63580, 63581, 63582, 63590, 63591, 63592, 63600, 63601, 63602, 63610, 63611, 63612, 63620, 63621, 63622, 63630, 63631, 63632, 63640, 63641, 63642, 63650, 63651, 63652, 63660, 63661, 63662, 63670, 63671, 63672, 63680, 63681, 63682, 63690, 63691, 63692, 63700, 63701, 63702, 63710, 63711, 63712, 63720, 63721, 63722, 63730, 63731, 63732, 63740, 63741, 63742, 63750, 63751, 63752, 63760, 63761, 63762, 63770, 63771, 63772, 63780, 63781, 63782, 63790, 63791, 63792, 6390, 6391, 6392, 6393, 6394, 6395, 6396, 6398, 6399, 65640, 65641, 65643, 7680, 7681, V271, V274, V277

Table 4-C: Codes to Identify Deliveries on or after October 1, 2015**ICD-10-CM Procedure Codes**

10D00Z0, 10D00Z1, 10D00Z2, 10D07Z3, 10D07Z4, 10D07Z5, 10D07Z6, 10D07Z7, 10D07Z8, 10E0XZZ

CPT Codes

59400, 59409, 59410, 59510, 59514, 59515, 59610, 59612, 59614, 59618, 59620, 59622

Table 4-D: Codes Used to Verify Live Births on or after October 1, 2015**ICD-10-CM Diagnosis Codes**

Exclude Deliveries Not Resulting in a Live Birth:

O000, O0000, O0001, O001, O0010, O0011, O002, O0020, O0021, O008, O0080, O0081, O009, O0090, O0091, O010, O011, O019, O020, O021, O0281, O0289, O029, O030, O031, O032, O0330, O0331, O0332, O0333, O0334, O0335, O0336, O0337, O0338, O0339, O034, O035, O036, O037, O0380, O0381, O0382, O0383, O0384, O0385, O0386, O0387, O0388, O0389, O039, O045, O046, O047, O0480, O0481, O0482, O0483, O0484, O0485, O0486, O0487, O0488, O0489, O070, O071, O072, O0730, O0731, O0732, O0733, O0734, O0735, O0736, O0737, O0738, O0739, O074, O080, O081, O082, O083, O084, O085, O086, O087, O0881, O0882, O0883, O0889, O089, Z371, Z374, Z377

Appendix D: Primary Care and OB/GYN Practitioners

The following provider type and specialty combinations will be used to determine Primary Care Practitioner and OB/GYN/Prenatal Care Practitioners for the purposes of rate calculations. All of the Provider Type and Provider Type/Specialty combinations will be used to identify PCPs. Provider types/specialties that are footnoted designate an OB/GYN Prenatal Care practitioner.

Provider Type (Billing or Rendering Provider)	Specialty	
01 – General Hospital ¹	Any specialty	
04 – Outpatient Health Facility ¹		
05 – Rural Health Facility ¹		
11 – Birthing Center ¹		
12 – FQHC ¹		
24 – Physician Assistant		
50 – Comprehensive Clinic ¹		
71 – Certified Nurse Midwife ¹		
Provider Type (Rendering Provider)	Specialty	
20 – Physician/Osteopath, Individual	and	201 – General Practice
		207 – Family Practice
		209 – Internal Medicine
		212 – OB/GYN ¹
		215 - Pediatric
		219 – Gynecology ¹
		223 – Gynecology oncology ¹
		236 – General Preventive Medicine
		239 – ACA Primary Care
		274 – Internal Medicine/Pediatrics
		275 – Maternal & Fetal Medicine
		282 – Neonatal-Perinatal Medicine
		290 – Obstetrics ¹
		333 - Pediatric Pulmonary Medicine
	342 – Public Health & General Preventive Medicine	
21 – Physician Group	and	021 – Professional Medical Group ¹
65 – Certified Nurse Specialist	and	215 - Pediatric
		216 - Geriatric
		651 – Adult Health
72 – Certified Nurse Practitioner	and	207 – Family Practice
		212 – OB/GYN ¹
		215 - Pediatric
		216 - Geriatric
		651 – Adult Health
		720 – Nurse Practitioner

¹ OB/GYN, prenatal care practitioner

Appendix E: Match of Ohio Department of Medicaid Claims Data to Ohio Department of Health Vital Statistics Data

On an annual and quarterly basis, the Government Resource Center (GRC) acts on behalf of the Ohio Department of Medicaid (ODM) to perform a probabilistic match of Medicaid records and birth certificate data. The match joins mothers and infants enrolled in Ohio's Medicaid program to Ohio birth certificates; this match only includes births that occurred in the state of Ohio.

The sources of data for this match are as follows:

- (1) Medicaid Managed Care Plan (MCP) and Medicaid Fee-For-Service (FFS) claims data
- (2) Birth Certificate data files from the ODH Bureau of Vital Statistics
- (3) Enrollment files from ODM

The data sources involved in this linkage do not share a common identifier, such as Social Security Number, therefore other available information must be used to perform the match process. Some of the unique identifiers used in the current probabilistic match include date of birth, first, middle, and last names, sex, race/ethnicity, and zip code. Multiple probabilistic matching strategies are used to maximize the matching of infants and mothers with birth certificates; no one algorithm finds matches for all mothers and infants.

The matching process is initiated by the identification of a delivery and/or birth claim. Using billing codes from ODM's claims records, mothers and infants of interest are identified by a delivery claim or a birth claim, respectively. Next, comparing personal identifiers found in ODM's enrollment records to personal identifiers found on the birth certificate, both mothers and infants are independently matched to a birth certificate record. Once the personal identifiers from the birth certificate have been iteratively matched across the file of potential Medicaid infants and the file of potential Medicaid mothers, the mother and infant files are joined using the birth certificate file number to generate a mother-infant-birth certificate match file. Although a match between mother and infant is achieved for most records, a mother may not have a matched infant and vice versa.

The billing code lists are based on the CHIPRA Initial Core Set Technical Specifications Manual 2013 developed by the Centers for Medicare & Medicaid Services (CMS): Center for Medicaid, CHIP and Survey & Certification, and the Children and Adults Health Programs Group. This methodology was updated to reflect the release of ICD-10-CM diagnosis and procedure codes, which were effective on October 1, 2015. Data predating the implementation of ICD-10 codes is no longer run; **Appendix E Part 2** lists the ICD-9-CM diagnosis and procedure codes used in earlier iterations of the matching process. The process is currently run using SAS version 9.4.

Step 1: Identify Births. For the reporting period at hand, claims are extracted for all members containing any of the codes listed in Table 1.

Table 1: Codes Used to Identify Births

ICD-10-CM Diagnosis Codes
Z37.0, Z37.2, Z37.3, Z37.59, Z37.50, Z37.51, Z37.52, Z37.53, Z37.54, Z37.69, Z37.60, Z37.61, Z37.62, Z37.63, Z37.64, Z38.00, Z38.2, Z38.01, Z38.1, Z38.30, Z38.5, Z38.31, Z38.4, Z38.61, Z38.63, Z38.65, Z38.68, Z38.8, Z38.62, Z38.64, Z38.66, Z38.69, Z38.7

Step 2: Identify Deliveries. For the reporting period, claims are used to identify all delivery encounters (Fee-For-Service and Managed Care) containing any of the codes listed in Table 2.

Table 2: Codes Used To Identify Deliveries

ICD-10-PCS Procedure Codes
10D00Z0, 10D00Z1, 10D00Z2, 10D07Z3, 10D07Z4, 10D07Z5, 10D07Z6, 10D07Z7, 10D07Z8, 10EOXZZ
ICD-10-CM Diagnosis Codes
O80, O10.92, O10.42, O10.12, O10.22, O10.32, O60.12X0, O60.12X1, O60.12X2, O60.12X3, O60.12X4, O60.12X5, O60.12X9, O60.13X0, O60.13X1, O60.13X2, O60.13X3, O60.13X4, O60.13X5, O60.13X9, O60.14X0, O60.14X1, O60.14X2, O60.14X3, O60.14X4, O60.14X5, O60.14X9, O60.22X0, O60.22X1, O60.22X2, O60.22X3, O60.22X4, O60.22X5, O60.22X9, O60.23X0, O60.23X1, O60.23X2, O60.23X3, O60.23X4, O60.23X5, O60.23X9, O26.62, O26.72, O99.354, O99.89, O98.12, O98.22, O98.32, O98.02, O98.62, O98.52, O98.42, O98.52, O98.72, O98.82, O99.214, O99.834, O98.92, O24.02, O24.12, O24.32, O24.82, O24.92, O99.284, O99.02, O99.324, O99.314, O99.344, O99.42, O24.420, O24.424, O24.429, O99.814, O25.2, O99.52, O99.62, O99.824, O9A.12, O9A.22, O9A.32, O9A.42, O9A.52, O68, O77.0, O77.1, O77.8, O77.9, O75.5, O63.2, O69.0XX0, O69.0XX1, O69.0XX2, O69.0XX3, O69.0XX4, O69.0XX5, O69.0XX9, O69.1XX0, O69.1XX1, O69.1XX2, O69.1XX3, O69.1XX4, O69.1XX5, O69.1XX9, O69.2XX0, O69.2XX1, O69.2XX2, O69.2XX3, O69.2XX4, O69.2XX5, O69.2XX9, O69.81X0, O69.81X1, O69.81X3, O69.81X4, O69.81X5, O69.81X9, O69.82X0, O69.82X1, O69.82X2, O69.82X3, O69.82X4, O69.82X5, O69.82X9, O69.3XX0, O69.3XX1, O69.3XX3, O69.3XX4, O69.3XX5, O69.3XX9, O69.4XX0, O69.4XX1, O69.4XX2, O69.4XX3, O69.4XX4, O69.4XX5, O69.4XX9, O69.5XX0, O69.5XX1, O69.5XX2, O69.5XX3, O69.5XX4, O69.5XX5, O69.5XX9, O69.89X0, O69.89X1, O69.89X2, O69.89X3, O69.89X4, O69.89X5, O69.89X9, O69.9XX0, O69.9XX1, O69.9XX2, O69.9XX3, O69.9XX4, O69.9XX5, O69.9XX9, O70.0, O70.1, O70.2, O70.3, O70.9, O74.0, O74.1, O74.2, O74.3, O74.4, O74.5, O74.6, O74.7, O74.8, O74.9, O75.0, O75.1, O82, O75.81, O75.89, O75.9, O86.4, O88.02, O88.12, O88.22, O88.32, O88.82, O10.02, O11.4, O12.04, O12.14, O12.24, O13.4, O14.04, O14.14, O14.24, O14.94, O16.4, O24.42, O24.425, O60.20X1, O60.20X2, O60.20X3, O60.20X4, O60.20X5, O60.20X9, O69.3XX2, O69.81X2, O70.20, O70.21, O70.22,

O70.23, O70.4, O72.0, O72.1, O72.2, O72.3, O73.0, O73.1, O75.5, O75.8, O75.82, O76, O99.72, O99.844.
CPT Codes
59400, 59409, 59410, 59510, 59514, 59515, 59610, 59612, 59614, 59618, 59620 59622

Step 3: Collection of Infants’ and Mothers’ Claims. The pool of potential infants and mothers are separated into distinct files based on the type of claim—birth (infant) or delivery (mother). The identification of live births is based on the birth certificate data file from ODH.

Step 4: Join Personal Identifiers from Medicaid Records. Using the unique Medicaid ID from the delivery or birth claim, the member’s demographic information from the Medicaid enrollment records is joined to the Medicaid claims files which were set in Step 3 to obtain unique personal identifiers used in the match process (Table 3).

Table 3. Personal Identifiers from Medicaid Enrollment Records

Member’s First Name	Member’s Middle Initial	Member’s Date of Birth
Member’s Last Name	Member’s Gender	Member’s Race

Step 5: Validate Pool of Mothers and Infants. The separate files for mothers and infants are further validated using members’ calculated age at the beginning of the calendar year. Mothers are members whose age (from demographic information) is between 10 and 65 years at the start of the reporting period. Infants are identified by a date of birth during the reporting period. The mother and infant files are saved and reused for the remainder of the process.

Step 6: Merge Medicaid Claims and Birth Certificate Records. After mother and infant files have been validated, the process of matching Medicaid claims to vital statistics information begins. The first round of matching is deterministic, whereby the personal identifiers listed in Table 4 are used to identify the same infants from two separate data sources: 1) a file of infants derived from an analysis of Medicaid claims and enrollment files (created in Step 5) and 2) a file of birth certificate records. Likewise, the second round of matching attempts to find the same mothers in 1) the file of mothers created from Medicaid claims and enrollment files (created in Step 5) and 2) the same file of birth certificate data mentioned above. This step generates an output file that, where possible, includes a Medicaid ID matched to a birth certificate file number. For mothers with multiple births in a reporting year, it is expected that the mother’s information will match to each infant’s record on the birth certificate file, although this is not always the case due to missing or incomplete data. Using this file, an initial match rate of mothers to infants is generated.

Table 4: Personal Identifiers from Birth Certificate Records

Certificate Number	Mother's Middle Initial	Child's Date of Birth	Plural Birth Indicator
Child's First Name	Mother's Last Name	Child's Gender	Birth Order
Child's Middle Initial	Mother's Race	County of Birth	Indicator of Live Birth
Child's Last Name	Mother's Maiden Name	Father's Last Name	-
Mother's First Name	Mother's Date of Birth	Birth weight	-

Step 7a: Match Records Using Probabilistic Algorithm Using "The Link King." The respective files of merged Medicaid claims and birth certificate records for infants and mothers are loaded into a well-documented, iterative matching algorithm called "The Link King." This software was originally developed for the Substance Abuse and Mental Health Services Administration (SAMHSA) to integrate Medicaid and treatment databases.¹ The program and documentation can be downloaded from www.the-link-king.com. In short, "The Link King" operates within SAS in either a batch-mode or interactive session. The algorithm requires a minimum set of variables to link two datasets; the variables used for the match process are listed in Table 5. The iterative algorithm incorporates Approximate String Matching techniques, and also allows the user to modify the default variable weights to adjust the accepted level of certainty or uncertainty of a string match. The process is performed separately for infants and for mothers, however the same fields are used for both matching processes.

Table 5: Variables Used in Probabilistic Matching Algorithm

Available Fields for Algorithm	Match Process Input Variables
Client Identifier	Medicaid ID or VS File Number
First Name	First Name
Middle Name	Middle Initial
Last Name	Last Name
Maiden Name	Blank
Social Security Number	Blank (either SSN or birthdate may be used)
Birthdate	Birthdate
Gender	M or F
Race/Ethnicity	Digit
"Flex" Variable ²	Zip Code or Birth Year

Step 7b: Upon completion of the probabilistic matching process, the software produces a file of Medicaid members' Medicaid IDs matched to a unique birth certificate file number. Scores are assigned to each matched pair of records so that only those matches that have received a score above a certain threshold are kept in the match file. The file also yields match validity statistics which aid in de-duplicating members who have matched to more than one birth certificate file number or vice versa. Given that mothers may match to more than one infant

¹ Campbell, K. M. (2009) "Impact of record-linkage methodology on performance indicators and multivariate relationships," *Journal of Substance Abuse Treatment*, 36:110-117.

² The "flex" variable allows a user to use a customized numeric or character variable in the matching process. For example, zip code of residence is the "flex" variable used in the annual match and birth year is used for the quarterly match.

either from the same pregnancy (i.e. twins) or two pregnancies within the same year, the resulting file must be de-duplicated only when appropriate. Such cases are considered valid matches 1) if the dates of birth for the infants are more than 210 days apart, or 2) if the infants share the same date of birth but have different first names. If neither criterion is met, the statistics generated during the matching process are used to determine which match has a higher probability of being valid.

Step 8a: Hybrid Match Approach. To increase the certainty of the match, a hybrid matching process is also conducted on the files of all potential Medicaid mothers and infants created in *Step 5*. The term “hybrid” reflects the use of both deterministic (exact) and probabilistic (inexact) matching methods in the same algorithm. Similar to the approach presented in *Step 6*, the personal identifiers listed in Table 3 are used to match Medicaid members to a birth certificate record based on the identifiers listed in Table 4. The process yields a file containing members’ Medicaid ID and the birth certificate file number.

The key difference between the approach in *Step 6* and the hybrid process described here, is that the variables listed in Table 6 requiring an *exact* string match (deterministic) are not weighted—the match is considered valid only if the variable from the Medicaid record is an exact match to the variable from the birth certificate.

Table 6: Hybrid Matching Variables from Vital Statistics

Variable Name	Match Method
Child’s First Name	Inexact
Child’s Middle Initial	Exact
Mother’s Last Name	Inexact
Mother’s First Name	Inexact
Mother’s Middle Initial	Exact
Mother’s Race	Exact
Child’s Gender	Exact
Mother’s Maiden Name	Inexact
Father’s Last Name	Inexact

Step 8b: Generate a Certainty Threshold for an Inexact Match. Variables that are permitted to have an inexact match are matched based on a string similarity score. After the matching process is complete, a histogram of similarity scores is generated in order for the programmer to identify a threshold for the minimum score that yields a match. The histogram will have a bimodal distribution reflecting the higher and lower levels of match certainty; between the high and low values of certainty is the local minimum, this is the default value for the minimum score threshold. The value of the threshold will depend on the data, and the goal of the threshold is to include true matches while excluding false matches. If more than one birth certificate file number matches to a Medicaid ID, the match with the highest final similarity score is kept.

Step 9: Combining Results of Both Matching Processes. The matches resulting from the probabilistic and hybrid matching processes are set together and a flag indicating which process generated the match is created. The mother and infant datasets are first sorted by Medicaid ID and birth certificate file number, and then unduplicated by the birth certificate file number. Any records without a Medicaid ID are removed. In the event that a Medicaid ID is matched to

multiple birth certificates (or vice versa), the flag representing “The Link King” algorithm denotes the match that is retained. Peer-reviewed literature supports selecting matches generated by the “The Link King” algorithm over those from the hybrid method if the level of uncertainty is the same due to the iterative processing and unique features of the probabilistic algorithm.³

Step 10: Joining Mothers and Infants by Birth Certificate File Number. Using the birth certificate file number as a common identifier, the two matched files created in *Step 9* are joined to create an overall matched file that contains mother’s Medicaid ID, infant’s Medicaid ID, and the birth certificate file number. A full outer join is used and allows records missing either the mother’s or the infant’s Medicaid ID to remain in the final match file. As in *Step 6*, the match rate of mothers to infants is generated.

Step 11: Implementing the Final Match File in Analyses. The birth certificate number used to create the overall matched file in *Step 10* is also the unique identifier used to join the matched Medicaid birth file to all of Ohio’s infant birth and death records. Ultimately, Medicaid records, and birth and death certificate records can be joined by the common identifiers within the Medicaid matched file to generate a rich source of health information.

Step 12: Using Case Number to Complete Partial Matches. A certain number of birth certificate matches will only contain a baby or mother. For these incomplete matches, the case number is identified in Medicaid eligibility data in order to assess whether the case number corresponds with an infant (for matches containing only a mother) or a woman age 19-65 (for matches containing only the infant). Age 19 is the cutoff in order to exclude cases which contain an infant’s female siblings.

Step 13: Performing QA Checks on Final Linked File.

After the completion of the final linked dataset, the following quality assurance checks are conducted. Any issues or anomalies that are deemed non-errors are reported to ODM along with the match rate.

BIRTHS:

- Compare the number of births by month/year of birth between current and historical file
- Join the historical file with the current file by fileno to determine how many births from the historical file are not present in the current file
- If a member is present in both historical and current files, check to see if the memid is consistently populated in both files
- If a member is present in both historical and current files, check to see if the babyid is consistently populated in both files

DEATHS:

- Compare the number of deaths by month/year of birth between the historical and current files after limiting files to members with dates of death present
- Compare the number of deaths by month/year of death between the historical and current files
- Join the historical file with the current file by fileno to see how many deaths from the historical file are not present in the current file
- Check if any dates of death occurred before dates of birth

³ Campbell, K. M., Deck, D., Krupski, A. (2007) “Record linkage software in the public domain: a comparison of Link Plus, The Link King, and a ‘basic’ deterministic algorithm,” *Health Informatics Journal*, 14(1): 5-15

Appendix E: Part 1. Glossary of Terms

Billing Code	Alphanumeric code that identifies a diagnosis or diagnoses on a medical claim submitted for reimbursement.
Birth Certificate	Legal, certified record of an infant birth. Note that the record is unique for each infant per calendar year and per State.
Calendar Year	Twelve consecutive months starting with January and ending with December.
Deterministic Match	A comparison of values for all of a given party's critical data elements with those of another, taking into account the presence, absence, and content of the values, and results in a matching score. ⁴
Enrollment Records	Verification of a Medicaid member's own demographic information and enrollment in the Medicaid program, including the specific Managed Care Plan that the recipient is enrolled.
ICD9, 10	The International Classification of Diseases, which is a standard set of billing codes maintained by the National Center for Health Statistics (NCHS) and the CMS.
Infant	An individual who, at the time of delivery, breathes or shows any other evidence of life such as beating of the heart, pulsation of the umbilical cord, or definite movement of voluntary muscles. ⁵
Infant Death	The death of an infant anytime between delivery and up to one year of age.
Match	Identifying records in a data set that refer to the same entity across different data sources that may or may not share common unique identifiers.
Match Score	Statistical analysis of the information relating to individuals from multiple sources of data to determine the likelihood (certainty) of a match.
Medicaid Claims	Documentation of services rendered or diagnoses given from a healthcare provider individual or entity for the purposes of third party reimbursement.
Mother	Female aged 10 - 65 whose pregnancy resulted in the delivery of an infant or any product of conception.

⁴ Obtained from IBM Knowledge Center on 03 August 2017; [URL](#)

⁵ Ohio Revised Code 3705.01 Vital Statistics Definitions

Personal Identifiers	Unique information that, alone or combined, can identify a specific individual.
Probabilistic Match	A comparison of values for all of a given party's critical data elements with those of another, taking into account the frequency of the occurrence of a data value within a particular distribution, and results in a matching score. <small>Error! Bookmark not defined.</small>
Quarter	One-fourth of a consecutive calendar year.
Rolling Year	A period of twelve consecutive months that may or may not span multiple calendar years.
The Link King	A public domain application for record linkage and un-duplication. ⁶
Vital Statistics	Legal records maintained by the Ohio Department of Health, Bureau of Vital Statistics used to monitor public health. Records may document births, deaths, fetal deaths, marriages and divorces.

⁶ Obtained from <http://www.TheLinkKing.com> 03 August 2017

Appendix E: Part 2. ICD-9 Billing Codes used to Identify Live Births

Table 1-A: Codes to Identify Live Births
January 1, 2015 – September 30, 2015

ICD-9-CM Diagnosis Codes
V27.0 - Single liveborn
V27.2 - Twins, both liveborn
V27.3 - Twins, one liveborn and one stillborn
V27.5 - Other multiple birth, all liveborn
V27.6 - Other multiple birth, some liveborn
V30 - Single liveborn
V31 - Twin, mate liveborn
V32 - Twin, mate stillborn
V33 - Twin, unspecified
V34 - Other multiple, mates all liveborn
V35 - Other multiple, mates all stillborn
V36 - Other multiple, mates live- and stillborn
V37 - Other multiple, unspecified
V39 - Unspecified

Table 2-A: Codes Used To Identify Deliveries
January 1, 2015 – September 30, 2015

<u>ICD-9-CM Procedure Codes:</u>
72.x - Forceps, vacuum, and breech delivery
73.x - Other procedures inducing or assisting delivery
74.0 - Cesarean section and removal of fetus; Classical cesarean section
74.1 - Cesarean section and removal of fetus; Low cervical cesarean section
74.2 - Cesarean section and removal of fetus; Extraperitoneal cesarean section
74.4 - Cesarean section and removal of fetus; Cesarean section of other specified type
74.99 - Cesarean section of unspecified type
<u>ICD-9-CM Diagnosis Codes:</u>
640.x1, 641.x1, 642.x1, 642.x2, 643.x1, 644.21, 645.x1, 646.x1, 646.x2, 647.x1, 647.x2, 648.x1, 648.x2, 649.x1, 649.x2, 650, 651.x1, 652.x1, 653.x1, 654.x1, 654.02, 654.12, 654.32, 654.x2, 655.x1, 656.01, 656.11, 656.21, 656.31, 656.51, 656.61, 656.71, 656.81, 656.91, 657.01, 658.x1, 659.x1, 660.x1, 661.x1, 662.x1, 663.x1, 664.x1, 665.01, 665.x1, 665.x2, 666.x2, 667.x2, 668.x1, 668.x2, 669.x1, 669.x2, 670.02, 671.x1, 671.x2, 672.02, 673.x1, 673.x2, 674.x1, 674.x2, 675.x1, 675.x2, 676.x1, 676.x2, 678.x1, 679.x1, 679.x2
<u>CPT Codes:</u>
59400 Routine obstetrical care including antepartum and postpartum care and vaginal delivery
59409 Vaginal delivery (with or without episiotomy and/or forceps)
59410 Obstetrical care for vaginal delivery only, including postpartum care
59510 Cesarean delivery
59514 Cesarean delivery only
59515 Cesarean delivery only; including postpartum care
59610 VBAC delivery
59612 Vaginal delivery only, after previous cesarean delivery (with or without episiotomy and/or forceps)
59614 VBAC care after delivery; vaginal delivery only, after previous cesarean delivery, including postpartum care
59618 Attempted VBAC delivery
59620 Cesarean delivery only, following attempted vaginal delivery after previous cesarean delivery
59622 Attempted VBAC after care, cesarean delivery only, following attempted vaginal delivery after previous cesarean delivery, including postpartum care