

Technical Programming Specifications

Mother Infant Identification Technical Programming Specifications

Prepared by: Sentinel Operations Center

Author Affiliations: Department of Population Medicine, Harvard Pilgrim Health Care Institute and Harvard Medical School, Boston, MA.

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I. MODIFICATION HISTORY

Version	Date	Modification	By
1	1/25/2018	Version submitted for public posting	Sentinel Operations Center

II. OVERVIEW

The purpose of this task is to create a program that will identify deliveries of live born infants to mothers and to identify infants. It will create files that will be used by the Data Partner to link deliveries and infants, in order to create a Sentinel Mother-Infant Linkage Table. Specifically, this program will identify women delivering an infant from one year after a Data Partner's Sentinel Distributed Database start date through the end date of the Sentinel Distributed Database (SDD), and children with birth dates during this time period. The files will stay at Data Partners (DPs). Aggregate data only will be sent back to the Sentinel Operations Center (SOC).

The files to be created include:

1. Live Birth Deliveries File:

Using the SDD, deliveries will be identified from one year later than the start date of the Data Partner's data availability to the end of the DP's data. The program will identify encounters, for all encounter types, with a delivery code of interest based on a lookup table of diagnosis and procedure codes, among women ≥ 10 years and < 55 years of age on the admission date of the delivery encounter. It will include a washout period of no evidence of delivery for 180 days prior to any identified delivery. Mothers must have had medical coverage from 180 days prior to date of delivery through the delivery date. A single enrollment gap of up to 45 days within the enrollment period is allowed. More than one delivery per mother may be identified within the DP's SDD. See additional specifications below.

2. Infant File:

Using the Sentinel Distributed Database, the program will identify children with a date of birth from one year later than the start date of the Data Partner's data availability to the end of the DP's data. Additional criteria are that a child have at least one day of enrollment with medical coverage during their first year of life. See additional specifications below.

Additionally, aggregate files will be returned to the SOC and are specified below.

III. SPECIFICATIONS OF FILES THAT STAY WITH DATA PARTNER

A. LIVE BIRTH DELIVERIES FILE

The Live Birth Deliveries file contains one record per MPatID and ADate. This file is created following identification of mothers (via evidence of live delivery by women aged 10-54 inclusive) in the SDD. This file will stay at the Data Partner and will be used to subsequently create a Sentinel Mother-Infant Linkage Table.

Table 1. Live birth deliveries file variables

Variable Name	Variable Type and Length	Format	Label	Values	Definition / Comments / Guideline
MPatID	Char(Site specific length)	\$\$\$.	Mother patient ID	Unique member identifier. Text string; left justified.	Must match mother PatID value in all other SCDM tables. Can appear in more than one row when multiple pregnancies/deliveries for the mother have occurred.
MBirth_Date	Num(4)	MMDDYY10.	Mother birth date	SAS Date	Mother Birth_Date from SCDM Demographic table
Age	Num(3)	\$2.	Mother's age	Integer age: 10-54 inclusive	Mother's age as of ADate
EncounterID	Char(Site specific length)	\$\$\$.	Mother's delivery EncounterID	Unique encounter identifier	EncounterID value from SCDM Encounter table, for mother's delivery encounter
EncType	Char(2)	\$2.	Encounter type	AV = Ambulatory Visit ED = Emergency Department IP = Inpatient Hospital Stay IS = Non-Acute Institutional Stay OA = Other Ambulatory Visit	Based on SCDM Encounter table. If delivery codes on the same ADate are evident in more than one EncType, use this hierarchy to assign a single EncType: IP > IS > ED > AV > OA.
Facility_Code	Char(Site specific length)	\$\$\$.	Servicing provider identifier	Free text	Local facility code that identifies hospital or clinic. Taken from facility claims.
ADate	Num(4)	MMDDYY10.	Admission date for mother's delivery encounter	SAS Date; must be filled	ADate value from SCDM Encounter table, for mother's delivery encounter

Variable Name	Variable Type and Length	Format	Label	Values	Definition / Comments / Guideline
DDate	Num(4)	MMDDYY10.	Discharge date for mother's delivery encounter	SAS Date; may be null	DDate value from SCDM Encounter table, for mother's delivery encounter
Birth_Type	Num(3)	1.	# of babies born	0 = Unspecified # of live births 1 = 1 live birth 2 = 2 live births 3 = 3 live births 4 = 4 live births 5 = 5 live births 8 = Multiple live births, unspecified number 9 = Conflicting code(s) for number of live births	Based upon ICD-9-CM/ICD-10-CM codes in the health plan data for the delivery admission. Will be "0" for non-specific codes Logic for assigning this value is below.
Birth_Type_Primes	Num(8)	comma15.	All birth types	2+	Multiplication of prime numbers assigned to all Birth_Types found in delivery codes within the selected encounter: <u>Birth_Type</u> <u>Prime Number</u> 0 2 1 3 2 5 3 7 4 11 5 13 8 17

B. DELIVERY CODES FILE

Description: This file contains all delivery clinical codes identified in the Encounter in which a delivery occurred. Non-delivery clinical codes that occurred in the Encounter will not be included in this table.

Table 2. Delivery codes files variables

Variable Name	Variable Type and Length (Bytes)	Format	Label	Values	Definition / Comments / Guideline
MPatID	Char(Site specific length)	\$##.	Mother member ID	Unique member identifier. Text string; left justified	Must match mother PatID value in all other SCDM tables. Can appear in more than one row when multiple pregnancies/deliveries for the mother have occurred or when there are more than one delivery code per EncounterID
EncounterID	Char(Site specific length)	\$##.	Mother's delivery EncounterID	Unique encounter identifier	EncounterID value from SCDM Encounter table, for mother's delivery encounter. Can appear in more than one row when there are more than one delivery code per EncounterID
Birth_Type	Num(3)	1.	Birth Type	0, 1, 2, 3, 4,5, 8, and 9	Indicate number of live births
CodeCat	Char(2)	\$2.	Code category	DX = Diagnosis PX = Procedure	Clinical code category
CodeType	Char(2)	\$2.	Code Type	09 = ICD-9-CM 10 = ICD-10-CM C4 = CPT-4/HCPCS Level I	Clinical code set type
ClinCode	Char(7)	\$7.	Clinical code	Valid clinical codes, in concordance with CodeCat and CodeType	Clinical code

METHODS

1. Create a list of PatIDs from the SCDM.Demographic table for Sex="F". Save the following variables: PatID and Birth_Date only when both are not missing.
2. Link the delivery codes lookup table, as specified in **Appendix A – Live Birth Delivery Codes**, using Lookup.CodeCat for determining links with either the SCDM.Diagnosis and SCDM.Procedure tables, for all values of EncType. Identify EncounterIDs from these links and keep only those encounters whose PatIDs are found in the list from step 1. Use only rows from the Diagnosis and Procedure tables where ADate is greater than or equal to the date one year later than the SDD minimum date as found in the Data Partner's metadata for their ETL refresh.
 - 2.1. After linking, save a temporary file consisting of these variables: PatID, EncounterID, Birth_Date, EncType, ADate, DDate, CodeCat, CodeType, ClinCode, and Birth_Type.
3. Link the table from step 2 with the SCDM. Enrollment table, on PatID. Identify the first EncounterID, per PatID, from the step 2 table where the following conditions are met:

- 3.1. The PatID has 180 days or more of enrollment with medical coverage prior to the ADate. A single gap of 45 days in enrollment is permitted.
- 3.2. This first encounter is defined as that where no other EncounterIDs exist with delivery codes 180 days earlier than a filled DDate in prior encounters (or an ADate in prior encounters where DDate is null), for the encounter row being observed.
- 3.3. The age must be ≥ 10 years and < 55 years. Use Birth_Date to calculate the Age, in integer years, as of the ADate. Use the Kreuter method.¹
- 3.4. If more than one EncType are found for a single ADate, use the following hierarchy to set a single EncType value and to identify the EncounterID for that single EncType: IP > IS > ED > AV > OA. Set the DDate based on the EncType value resolved. For example, if EncType = IP or IS, then DDate should have a value. If EncType = ED or AV, DDate can be null.
 - 3.4.1. When a delivery code with any other EncType occurs during the same ADate – Ddate interval of an IP EncType, then recode the EncType from the other non-IP delivery code as IP, and recode the EncounterID as the EncounterID from the IP encounter.
- 3.5. If EncType= IP or IS, then look forward for 90 days and select the last IP/IS found within those 90 days.
- 3.6. If EncType= AV, ED, or OA, then look forward for 90 days for the next delivery encounter.
 - 3.6.1. Select the last EncType= IP or IS within the 90 days
 - 3.6.1.1. If no EncType= IP or IS delivery is found in the same 90-day look forward period, then look for the last AV/ED/OA Step 3.6 above.
 - 3.6.1.2. If any subsequent AV/ED/OA delivery encounter is found within the same 90-day look forward period, then use the latest one found as the encounter for this delivery.
 - 3.6.1.3. If no subsequent AV/ED delivery encounter is found, use the AV/ED/OA delivery encounter identified earlier in Step 3.6 above, as the encounter for this delivery.
- 3.7. If a subsequent delivery is identified as the “last IP/IS found” within the 90 day look forward period or as per Step 3.6.1, then perform the following:
 - 3.7.1. Recheck the mother’s Age as of that subsequent ADate, and keep this identified delivery when the mother’s integer Age is in between 10 and 54 years inclusive. If the Age is outside of these limits, then drop the delivery, even if the Age calculated in step 3.3 was within the limits.
 - 3.7.2. With a later subsequent delivery than the one originally identified earlier, be sure to apply the 180-day washout period as per the same rules in step 3.2.
 - 3.7.2.1. For delivery encounters identified with a filled DDate, the start date for an additional/subsequent 180-day washout review must begin as of the day after the DDate of that encounter.
 - 3.7.2.2. For delivery encounters with a null DDate, the start date for an additional/subsequent 180-day washout review must begin as of the day after the ADate of that encounter.
- 3.8. A PatID can have more than one EncounterID in the resulting table. This will be for mothers who have given birth more than one time within the Data Partner’s SDD.

¹ <http://www.pauldickman.com/teaching/sas/age.php> accessed June 25, 2016

4. From the step 3 file, save a codes-level table that meets the requirements of the Delivery Codes File specified in the second data dictionary above. Sort the file by PatID, EncounterID, CodeCat, CodeType, and ClinCode. Save the file to the DPLocal data library as **Delivery_Codes**.
5. From the step 3 file, create a PatID/Encounter level table that meets the requirements of the Live Birth Deliveries Files specified above, following these rules:
 - 5.1. Fill the following variables: PatID (renamed to MPatID), Birth_Date (renamed to MBirth_Date), EncounterID, and ADate.
 - 5.2. Birth_Type: Use the following specific rules to set a value of 0-5, 8, or 9:
 - 5.2.1. If there is one or multiple codes within an PatID/EncounterID and they have the same birth type code, then the encounter will be assigned the code specifying that birth type (e.g., "1" for 1 live birth).
 - 5.2.2. If a PatID/EncounterID has a birth type code of 0 and any other value of 1-8, then the encounter will be assigned the non-zero code.
 - 5.2.3. If a PatID/EncounterID has a single birth type code in the range of 1-5 and also one or more codes with a value of 8, then the encounter will be assigned the single non-8 code.
 - 5.2.4. Only if within a PatID/EncounterID, there are multiple birth type codes within the range of 1-5 and they differ, with or without the presence of a code with an 8, will the encounter be assigned the value of 9.
6. Set the variable Birth_Type_Primes:
 - 6.1. From among all distinct Birth_Type values found within the selected encounter (see step 3.4), assign the prime number to each Birth_Type value as shown in the data dictionary above.
 - 6.2. Multiple all prime numbers assigned, to obtain a single product; this becomes the value for Birth_Type_Primes.
7. Fill the variables as per the first data dictionary above. Obtain the ETL number from the DP's SDD metadata and save it as the label for the file, following the pattern of "ETL#", "ETL##", as necessary and left-justified. Note that there are no delimiters.
8. Sort the file by MPatID, EncounterID, and ADate. Save the file to the DPLocal data library as **Mother_Deliveries**.

C. INFANT FILE

The Infant File contains one record per CPatID. This file is created following identification of children with a date of birth during the specified time period in the Sentinel Distributed Database (SDD). This file will stay at the Data Partner and will be used to subsequently create a Sentinel Mother-Infant Linkage Table.

Table 3. Infant file variables

Variable Name	Variable Type and Length	Format	Label	Values	Definition / Comments / Guideline
CPatID	Char(Site specific length)	\$##.	Child patient ID	Unique member identifier. Text string; left justified.	Must match child PatID value in all other SCDM tables.
CBirth_Date	Num (4)	mmddyy10.	Child birth date	SAS Date	Birth_Date value from SCDM Demographic table

Variable Name	Variable Type and Length	Format	Label	Values	Definition / Comments / Guideline
Sex	Char(1)	\$1.	Child sex	A = Ambiguous F = Female M = Male U = Unknown	Sex value from the SCDM Demographic table
CEnr_Start	Num(4)	mmddy10.	Earliest infant enrollment start date	SAS Date	Earliest Enr_Start from Enrollment table

METHODS

1. Create a list of PatIDs from the SCDM. Demographic table where Birth_Date is greater than or equal to the date one year later than the SDD minimum date. Save the variables PatID, Birth_Date, and Sex.
2. Link these PatIDs with the SCDM.Enrollment table. Keep PatIDs that meet the following criteria:
 - 2.1. Using Birth_Date to calculate the date that an infant turns 1 year of age, there is one or more days of medical coverage enrollment between the Birth_Date and the date that they turn 1 year of age.
 - 2.2. Identify the earliest Enr_Start, with Med_Cov="Y" for the PatID from the SCDM.Enrollment table, and assign this to the CEnr_Start variable.
3. Fill the following variables: PatID (renamed to CPatID), Birth_Date (renamed to CBirth_Date), and Sex.
4. Fill the variables as per the third (Infant) data dictionary above. Obtain the ETL number from the DP's SDD metadata and save it as the label for the file, following the pattern of "ETL#", "ETL##", as necessary and left-justified. Note that there are no delimiters.
5. Sort the file by CPatID. Save the file to the DPLocal data library as **Infants**.

IV. SPECIFICATIONS OF FILES THAT ARE RETURNED TO SOC

A. HIGH-LEVEL COUNTS FILE

Provides summary counts of deliveries and infants identified.

Table 4. High-level counts file variables

Variable Name	Variable Type and Length	Format	Label	Values	Definition / Comments / Guideline
Level	Char(3)	\$3.	Person type	001-Deliveries 002-Mothers 003-Infants	Categorizes the counts in this table
Count	Num(8)	comma14.	Count	0+	Comma separated counts

METHODS

1. From the DLocal **Mother_Deliveries** file, create a count of rows. Set Level to "Deliveries".

2. From the DLocal **Mother_Deliveries** file, create a count of unique MPatIDs. Set Level to “Mothers”.
3. From the DLocal **Infants** file, create a count of rows. Set Level to “Infants”.
4. Combine the three rows and fill the data dictionary above. Sort by PersonType. Save the file to the MSOC data library as **MotherDeliveries_Infants_Counts**.

B. DELIVERIES AGGREGATION FILE

Provides aggregates of factors related to deliveries that are identified.

Table 5. Deliveries aggregation file variables

Variable Name	Variable Type and Length	Format	Label	Values	Definition / Comments / Guideline
Level	Char(3)	\$3.	Aggregation level	000 = Total counts 001 = By AgeGroup 002 = By Year 003 = By EncType 004 = By AgeGroup and Year 005 = By AgeGroup and EncType 006 = By Year and EncType 007 = By AgeGroup, Year, and EncType 008 = By Birth_type 009 = By Birth_type and AgeGroup 010 = By Birth_type and Year 011 = By Birth_type and EncType 012 = By Birth_type and Year and AgeGroup and EncType	
AgeGroup	Char(9)	\$9.	Age group	10-19, 20-24, 25-29, 30-34, 35-39, 40-44, 45-54	Categorizes the counts in this table by age group
Year	Num(3)	4.	Year	20##	Year of delivery

Variable Name	Variable Type and Length	Format	Label	Values	Definition / Comments / Guideline
EncType	Char(2)	\$2.	Encounter type	AV = Ambulatory Visit ED = Emergency Department IP = Inpatient Hospital Stay IS = Non-Acute Institutional Stay OA = Other Ambulatory Visit	Based on SCDM Encounter table
Birth_Type	Num(3)	1.	# of babies born	0 = Unspecified # of live births 1 = 1 live birth 2 = 2 live births 3 = 3 live births 4 = 4 live births 5 = 5 live births 8 = Multiple live births, unspecified number 9 = Conflicting code(s) for number of live births	Based upon ICD-9-CM/ICD-10-CM codes in the health plan data for the delivery admission. Will be "0" for non-specific codes Logic for assigning this value is below.
Count	Num(8)	comma14.	Count	0+	Comma separated counts

METHODS

1. From the DLocal **Mother_Deliveries** file, extract the following variables: MPatID, EncounterID, ADate, MBirth_Date, EncType, and Birth_Type.
2. Use MBirth_Date to calculate the Age, in years, as of the ADate. Use the Kreuter method.² Then set a new variable AgeGroup based on the groupings in the data dictionary above.
3. Use ADate to create the variable Year.
4. Summarize counts by the following variables: AgeGroup, Year, EncType, and Birth_Type.
5. Then combine the counts from step 4 to create the different combinations as specified by the Level variable in the data dictionary above. Set the value of Level for the different combinations.
6. Combine all sets of counts into a single file and fill the data dictionary above. Sort by Level, AgeGroup, Year, and EncType. Save the file to the MSOC data library as **Deliveries_Counts**.

² <http://www.pauldickman.com/teaching/sas/age.php> accessed June 25, 2016

C. INFANTS AGGREGATION FILE

Provides aggregates of factors related to infants that are identified.

Table 6. Infants aggregation file variables

Variable Name	Variable Type and Length	Format	Label	Values	Definition / Comments / Guideline
Level	Char(2)	\$2.	Aggregation level	00 = Total counts 01 = By Sex 02 = By Year 03 = By EnrollDays 04 = By Sex and Year 05 = By Sex and EnrollDays 06 = By Year and EnrollDays 07 = By Sex, Year and EnrollDays	
Sex	Char(1)	\$1.	Child sex	A = Ambiguous F = Female M = Male U = Unknown	Based on SCDM Demographic table
Year	Num(3)	4.	Year	2###	Year of delivery
EnrollDays	Char(7)	\$7.	Enrollment days category	0-30, 31-60, ..., 301-330, 331-365	Groupings of medical coverage enrollment days in the 1 st year of life
Count	Num(8)	comma14.	Count	0+	Comma separated counts

METHODS

1. From the DLocal **Infants** file, extract all variables.
2. Create the variable Year, based on the CBirth_Date.
3. Link CPatID with the SCDM.Enrollment table, for rows with Med_Cov="Y". Count the number of days between Enr_Start and Enr_End that are between the CBirth_Date and the date on which the infant turns one year of age, inclusive. Do not count any days where there are gaps of Enr_End from one enrollment span to Enr_Start of a later span.
 - 3.1. Using this value, create the variable EnrollDays, based on the groupings found in the data dictionary above.
4. Summarize counts by the following variables: Sex, Year, and EnrollDays.
5. Then combine the counts from step 4 to create the different combinations as specified by the Level variable in the data dictionary above. Set the value of Level for the different combinations.

Combine all sets of counts into a single file and fill the data dictionary above. Sort by Level, Sex, Year, and EnrollDays. Save the file to the MSOC data library as **Infants_Counts**.

V. APPENDIX A – LIVE BIRTH DELIVERY CODES

Table 7. Live Birth delivery codes variables

Variable Name	Variable Type and Length (Bytes)	Format	Label	Values	Definition / Comments / Guideline
CodeCat	Char(2)	\$2.	Code Category	DX= Diagnosis PX = Procedure	
CodeType	Char(2)	\$2.	Code Type	09 = ICD9 10 = ICD10 C4 = CPT/HCPCS Level 1	
ClinCode	Char(7)	\$7.	Clinical code	Left-justified text; decimal point removed	Valid values for codes as specified by CodeCat and CodeType
Birth_Type	Num(3)	1.	Number of live babies born	0 = Unspecified number of live births 1 = 1 live birth 2 = 2 live births 3 = 3 live births 4 = 4 live births 5 = 5 live births 8 = Multiple live births, unspecified number 9 = Conflicting code(s) for number of live births	
Description	Char(50)	\$50.	Description	Free text	

Sample Rows

CodeCat	CodeType	ClinCode	Birth_Type	Description
DX	09	650	0	NORMAL DELIVERY
DX	09	65101	2	TWIN PREGNANCY, DELIVERED
DX	09	65111	3	TRIPLET PREGNANCY, DELIVERED
DX	09	65121	4	QUADRUPLET PREGNANCY, DELIVERED
DX	09	65131	1	TWIN PG W/FETAL LOSS&RETENTION 1 FETUS DELIV