MINI-SENTINEL MODULAR PROGRAM 2:

CHARACTERIZATION OF USE OF MEDICAL PRODUCT EXPOSURES AMONG INDIVIDUALS WITH OR WITHOUT CONDITION(S) OF INTEREST

Documentation version 3.1

Prepared by the Mini-Sentinel Operations Center

For use with Modular Program 2 version 3.1

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Modification History

Version	Date	Modification	By
3.1	2/19.2013	• Version incremented due to bug fix in mp3_3.0 program. No changes to documentation content.	Mini-Sentinel Operations Center
3.0	1/25/2012	• Revised former "Pre-existing Condition File" to be the new "Inclusion/Exclusion Conditions File" and updated functionality, file, and output descriptions. • Made clarifications to text based on user feedback.	Mini-Sentinel Operations Center
2.0	10/17/2012	• Original published version	Mini-Sentinel Operations Center

1   Overview

Mini-Sentinel modular programs (MPs) allow rapid implementation of standard queries across the Mini-Sentinel Distributed Database (MSDD). MPs are designed to run against the Mini-Sentinel Common Data Model (MSCDM).[1] They are written in SAS and can be customized using various parameter settings that define exposures, outcomes, date ranges, age ranges, and other implementation details. This document describes the key program specifications and main assumptions underlying each of the query parameters for Modular Program 2 (MP2) version 3.1. Program specification requirements, formats, and default values of all parameters are defined. A sample program specification is provided along with output from a sample scenario.

2   Terminology

For simplicity, the term "scenario" is used throughout this document to refer to a set of parameters and criteria used to execute the MP. The term "requester" refers to an individual (or group of individuals) who issues the MP request and defines the scenarios. The term "request programmer" refers to an individual who creates request Input Files and executes the MP.

The terms "exposure" and "exposure of interest" represent exposure to a medical product or procedure as defined by the MP requester. An exposure can therefore be defined using any set of pharmacy and/or procedure codes found in the MSCDM. For example, exposure to a drug product dispensed in the outpatient setting can be defined as the occurrence of one or more National Drug Codes (NDCs) in the pharmacy dispensing file, whereas exposure to a vaccine can be defined based on observation of specific procedure codes in the procedure file.

The term "condition" is used to represent a medical code (or a group of codes) that identify a medical condition of interest. In MP2, the cohort can be restricted to members with and/or without condition(s).

The term "claim" is used throughout the document to represent either an outpatient pharmacy dispensing or medical encounter/record with any of the codes for the exposure(s) of interest.

The term "member" is used to represent an individual with relevant enrollment and other criteria (as specified by the MP parameters). A member can be further defined as a "user" if evidence of use of exposure(s) of interest is observed. Whenever a user is identified, the service date on the claim of the first exposure of interest observed during the relevant period of interest is labeled the "index date".

The execution of MP2 allows information for multiple scenarios and exposures to be generated at the same time. Results from all scenarios are included in the MP output tables and can be differentiated using "query group names" defined by the requester. This document describes the process for only one scenario to be tested.

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[1] See http://www.mini-sentinel.org/data_activities/ for more information about the MSCDM.

3   Program Summary

MP2 is used to characterize the use of outpatient pharmacy medication(s) and/or medical procedure(s) observed among members during a period defined by a start and end date (*i.e.*, the query period). MP2 also has an optional inclusion/exclusion feature that allows the user to restrict analyses to members with and/or without "conditions" before or after the index date, defined using any combination of diagnosis, procedure and/or NDCs. By default, MP2 generates metrics for both prevalence (*i.e.*, ever exposed during query period) and incidence (*i.e.*, newly exposed during query period) based cohorts of users for each exposure of interest.

Five stratified output tables characterizing the exposures of interest are created for the prevalent and incident cohort: overall for the entire period, by year, by year/month, by age group, and by sex. The metrics reported in all five tables include the number of users, the number of claims with exposures of interest, and the total members and eligible member days used to estimate background rates (Section 9). In addition, tables for incident based cohorts include the number of incident claims. A sixth output table contains results for all possible combinations of strata (*e.g.*, by year/age group/sex). Finally, a seventh table containing denominator information for all strata is generated. Combining the information from the sixth and seventh tables allows the requester to generate population-based background rates (Section 6).

MP2 requires the specification of several parameters to define a scenario. These include program parameters that specify a request identifier, query period, age range(s), and enrollment criteria. The names of input files (built as SAS datasets) containing several other parameters must also be specified. One input file is the Query File that defines exposures of interest. The second file is the Incident Query File; it is optional and is used to refine how incident users are defined. The third file is the optional Inclusion/Exclusion Conditions File; it defines what outpatient pharmacy medications, medical procedures and/or diagnoses should be used to restrict the cohort to members with and/or without conditions of interest.

All parameters and input file specifications are described in Section 4.

4   Program Parameter and Input File Specifications

4.1   Program Parameter Specifications

There are eight main program parameters that may be specified. These include a request identifier, start and end dates for the query period, age stratifications, an allowed enrollment gap used to create continuous enrollment periods, and three input files (the Query File, Incident Query File, and Inclusion/Exclusion Conditions File). Four of these parameters are specified by the requester (query period start and end dates, age stratifications, and enrollment gap); four parameters are specified by the request programmer (request identifier, names of the Query File, Incident Query File, and Inclusion/Exclusion Conditions File). Table 1 contains detailed specifications for each of these required parameters.

Table 1: Main Program Parameter Specification

Parameter	Field Name	Description

Parameter	Field Name	Description
Request Identifier	REQUESTID	**Details**: a prefix added to all output to track the various executions of the program. **Note:** Cannot exceed 8 characters. **Defined by:** Request programmer **Input type:** Required **Format:** Alphanumeric **Example**: REQUESTID=mp2r1
Enrollment Gap	ENROLGAP	**Details:** sets the number of days that will be bridged between two consecutive enrollment periods to create a "continuously enrolled" period. For example, if ENROLGAP=30 and a member is eligible for medical coverage in periods 1/1/2007-3/27/2007 and 4/1/2007-12/21/2007 (*i.e.,* a 4-day gap between two consecutive enrollment episodes), the member will be considered continuously enrolled from 1/1/2007 to 12/21/2007. Any gaps in enrollment greater than 30 days will result in a new enrollment period, and all the days in the gap will be considered un-enrolled. **Note1**: A gap of 45-days is recommended for most uses. **Note2:** Multiple continuous enrollment periods per member may be assessed. **Defined by:** Requester **Input type:** Required **Format**: Numeric **Example**: ENROLGAP=45 (gaps less than or equal to 45 days will be "bridged" to form one "continuously enrolled" sequence)
Query Start Date	QUERYFROM	**Details:** date for the start of the query identification period. If QUERYFROM=03/01/2008, only claims with a service date on or after this date will be considered. **Defined by:** Requester **Input type:** Required **Format:** mm/dd/yyyy **Example**: QUERYFROM=03/01/2008
Query End Date	QUERYTO	**Details:** date for the end of the query identification period. If QUERYTO=03/31/2009, claims after this date will not be considered. **Defined by:** Requester **Input type:** Required **Format:** mm/dd/yyyy **Example:** QUERYTO=03/31/2009

Parameter	Field Name	Description
Query File	QUERYFILE	**Details:** name of the SAS dataset defining the query exposure(s) of interest. It lists the codes that define each exposure of interest. The file name, including its extension, must be entered. For specific details on the content of this file, see Section 4.2.1. **Named by:** Request programmer **Input type:** Required **Format: .**sas7bdat or .cport file format **Example:** QUERYFILE=query.sas7bdat or query.cport
Incident Query File	INCQUERYFILE	**Details:** name of the SAS dataset refining the incident exposure definition(s). It contains additional codes and various parameters to further refine how incident use of each exposure must be defined. The file name, including its extension, must be entered. For specific details on the content of this file and for an example of when this file is used and how it is different from the QUERYFILE, see Section 4.2.2. **Named by:** Request programmer **Input type:** Optional **Format: .**sas7bdat or .cport file format **Example:** INCQUERYFILE=incquery.sas7bdat or incquery.cport
Inclusion/Exclusion Conditions File	CONDFILE	**Details:** name of the SAS dataset defining the inclusion or exclusion of condition(s) of interest. It lists the codes of interest and various parameters to specify how each code must be queried. The file name, including its extension, must be entered. For specific details on the content of this file, see Section 4.2.3. **Named by:** Request programmer **Input type:** Optional **Format: .**sas7bdat or .cport file format **Example:** CONDFILE=cond.sas7bdat or cond.cport

Parameter	Field Name	Description
Age Groups	AGESTRAT	**Details:** age group categories for reporting. Specifying this parameter will (1) restrict to certain age groups and (2) specify how age groups will be stratified in the result tables. For example, to have results stratified by 20 year increments for members 40-99 years of age, AGESTRAT=40-59 60-79 80-99 would be entered. **Note 1:** age is determined at the index date. **Note 2:** various units of time can be used. Valid values are: • **D**: days • **W**: weeks • **Q**: quarters • **M**: months • **Y**: years (default value) **Note 3:** lower value is binding. If AGESTRAT=0-5 5-10, then all 5 year olds will be placed in the second age group. If AGESTRAT=0-5 6-10, then all 5 year olds will be placed in the first age group. For example, to have results stratified by 6 month increments for the first two years of life and then by 2 year increments until the age of 6, AGESTRAT = 00M-05M 06M-11M 12M-17M 18M-23M 02Y-03Y 04Y-05Y needs to be entered. **Defined by:** Requester **Input type:** Optional (default value is **00**-**01 02**-**04 05**-**09 10**-**14 15**-**18 19**-**21 22**-**44 45**-**64 65**-**74 75+ in years**) **Format:** AA-AA BB-BB ZZ-ZZ **Example:** AGESTRAT=**40-59 60-79 80-99**

4.2 Input File Specifications

In addition to the eight main program parameters, several required and optional parameters need to be specified in the Query File, Incident Query File, and Inclusion/Exclusion Conditions File.

4.2.1 Query File

The Query File is required. It contains the comprehensive set of codes used to define the exposure(s) of interest. National Drug Codes (NDCs), ICD-9-CM procedure codes, or Healthcare Common Procedure Coding System (HCPCS) codes can be used to define exposures of interest. Exposure(s) of interest can be defined using any mix of allowed code types.

The structure of the Query File must reflect how codes should be queried to define a unique exposure. The GROUP field is used to group all codes pertaining to a given exposure of interest. For example, a group for "Exposure1" could be defined by all NDCs for any oral forms of anti-diabetic medications, a

group for "Exposure2" by a mix of NDC and HCPCS codes for certain insulin products, and another group for "Exposure3" by only those NDCs for a recently approved oral form of anti-diabetic medication.
There are five required parameters that must be specified in the Query File; three must be specified by the requester.

Table 2 below describes specifications for this file.

Table 2: Query File Specification

Parameter	Field Name	Description
Name of Query Group	GROUP	**Details:** standardized name used to refer to a query GROUP for exposure(s) of interest to be queried. **Note**: multiple exposures/query groups can be defined within the same query file. In this case all exposures are queried independently and results are reported separately and labeled using each query GROUP name specified. **Named by:** Request programmer **Input type:** Required **Format:** Alphanumeric; SAS character $30; no special characters (*e.g.*, commas, periods, hyphens, etc) allowed, and underscores must be used to mark spaces. **Example:** Insulin1
Query Code Type	CODETYPE	**Details:** type of each code value included in the CODE field (below) of this file. Valid values are all those allowed by the MSCDM: • **RX11**: 11-digit NDC • **RX09**: 9-digit NDC • **PX09**: ICD-9-CM procedure • **PX10**: ICD-10-CM procedure • **PX11**: ICD-11-CM procedure • **PXC4**: CPT-4 procedure (*i.e.*, HCPCS Level I) • **PXHC**: HCPCS procedure (*i.e.*, HCPCS Level II) • **PXH3**: HCPCS Level III procedure • **PXC2**: CPT Category II procedure • **PXC3**: CPT Category III procedure **Defined by:** Request programmer **Input type:** Required **Format:** Alphanumeric; SAS character $4. **Example:** See valid values

Parameter	Field Name	Description
Query Codes of Interest	CODE	**Details:** NDC and/or procedure code values for the exposure(s) of interest. **Note 1**: for NDCs, either 9 or 11 digit codes can be entered. **Note 2:** any decimal points in the code value should be removed. **Note 3**: CODETYPE must be consistent with the expected format of the CODE value (*e.g.*, MP2 will not find any valid matches in the data for CODETYPE=RX11 and a 9-digit NDC value). **Note 4**: duplicate CODETYPE-CODE combinations in a given query GROUP are removed by the MP2 algorithm. **Defined by:** Requester, with support from the MSOC as needed **Input type:** Required **Format:** Alphanumeric; SAS character $11. **Example:** 12345678911

Parameter	Field Name	Description
Query Incidence Type	WASHTYP	**Details:** selects how incidence will be defined. As detailed in Section 5, the incidence type can take the following values: • **MIN**: minimum incidence -- identifies and reports metrics only for the *first* valid incident exposure during the query period, and uses ALL prior observed claims to define incidence. That is, incidence is defined as the first exposure during the query period with no evidence of prior exposure using all available data. **MULT**: multiple incidence -- identifies and reports metrics for *all* valid incident exposures during the query period, and uses claims observed during the specified WASHPER days to determine incidence. That is, incidence is defined as any exposure during the query period with no evidence of exposure during the prior WASHPER days. **Note 1:** WASHTYP parameter is used in conjunction with the Query Washout Period (WASHPER; below) to define a valid incident claim. **Note 2:** the MP2 algorithm may use days before QUERYFROM to ensure incidence criteria are met. **Note 3**: MIN setting should be used with caution as interpretation is complex. An exposure that meets the MIN criteria must occur during the query period and cannot be preceded by a disqualifying exposure at *any time* during enrollment; that is, the look-back period to define incidence is not limited to the washout period. See Section 5.3.1 for details. **Defined by:** Requester, with support from the MSOC as needed **Input type:** Required **Format:** Alphanumeric; SAS character $4; case sensitive (upper case only). **Example:** See valid values

Parameter	Field Name	Description
Query Washout Period	WASHPER	**Details:** length of washout period in days. The washout period is a period before an incident exposure index date during which a member cannot have any evidence of exposure(s) of interest or any other exposure(s) specified in the Incident Query File. The washout period is also used to ensure that appropriate enrollment requirements are met (See Section 5.1). In conjunction with the ENROLGAP parameter, if fewer than WASHPER days of continuous enrollment are identified before the index date, incidence cannot be determined and thus the exposure is excluded from output metrics. **Note 1**: length of washout period days must be the same within a given GROUP. **Note 2**: used in conjunction with any Query Incidence Types (WASHTYP; see above). **Note 3:** the MP2 algorithm may use days before QUERYFROM to determine if continuous enrollment and incidence criteria are met. **Note 4:** When WASHTYP=MIN, WASHPER is only used to assess continuous enrollment eligibility. **Defined by:** Requester **Input type:** Required (0 must be entered if no washout is required) **Format:** Numeric **Example:** 183

4.2.2 Incident Query File

The Incident Query File is optional. If defined, the file contains the comprehensive set of codes used to refine the incidence definition of the exposure(s) of interest. Just like the Query File, exposure(s) of interest can be defined using any mix of the following allowed code types: National Drug Codes (NDCs), ICD-9-CM procedure codes, or Healthcare Common Procedure Coding System (HCPCS) codes.

The GROUP structure of the Incident Query File must match that of the Query File. That is, for each GROUP defined in the Incident Query File a matching GROUP must be found in the Query File.

By default, for a given query GROUP MP2 uses the list of codes included in the Query File to determine the incident status of identified exposures (as of the index date). That is, incidence is defined as no exposure of interest in the WASHPER days before the exposure claim date. The Incident Query File is used to refine incidence based on a set of codes different than those used to define the exposure of interest in the Query File. For example, a requester may be interested in examining the use of Drug A, but wants all incident users of Drug A to be free of Drug A, B and C in the 183 days before the Drug A index date. In this case, the list of codes for Drug A would be included in the Query File, and the list of codes for Drugs B and C would be included in the Incident Query File.

There are three required parameters that must be specified in the Incident Query File; one must be specified by the requester.

Table 3 describes specifications for the Incident Query File.

Table 3: Incident Query File Specification

Parameter	Field Name	Description
Name of Query Group	GROUP	**Details:** standardized name used to refer to a query GROUP for exposure(s) of interest to be queried. **Request Programmer Note**: in many cases value must match GROUP values from the Query File. In the case where all codes in the Incident Query File are used to assess incidence for *all* GROUPs in the Query File, this field may be left blank. **Named by:** Request programmer **Input type:** Required **Format:** Alphanumeric; SAS character $30; no special characters (*e.g.*, commas, periods, hyphens, etc) allowed, and underscores must be used to mark spaces. **Example:** Insulin1
Incident Only Code Type	CODETYPE	**Details:** type of each code value included in the CODE field (below) of this file. Valid values are all those allowed by the MSCDM: • **RX11**: 11-digit NDC • **RX09**: 9-digit NDC • **PX09**: ICD-9-CM procedure • **PX10**: ICD-10-CM procedure • **PX11**: ICD-11-CM procedure • **PXC4**: CPT-4 procedure (*i.e.*, HCPCS Level I) • **PXHC**: HCPCS procedure (*i.e.*, HCPCS Level II) • **PXH3**: HCPCS Level III procedure • **PXC2**: CPT Category II procedure • **PXC3**: CPT Category III procedure **Defined by:** Request programmer **Input type:** Required **Format:** Alphanumeric; SAS character $4 **Example:** See valid values

Parameter	Field Name	Description
Incident Only Query Codes	CODE	**Details:** NDC and/or procedure codes to be used to refine the incident definition for the exposure(s) of interest. For example, if a requester is examining exposure to DRUG A but wants incidence of DRUG A to be defined with respect to DRUG A *and* DRUG B, the Incident Only Query Code fields would include DRUG B codes. **Note 1**: for NDCs, either 9 or 11 digit codes can be entered. **Note 2:** any decimal points in the code value should be removed. **Note 3**: CODETYPE must be consistent with the expected format of the CODE value (*e.g.*, MP2 will not find any valid matches in the data for CODETYPE=RX11 and a 9-digit NDC value). **Note 4**: duplicate CODETYPE-CODE combinations in a given query GROUP are removed by the MP2 algorithm. **Defined by:** Requester, with support from MSOC as needed **Input type:** Required **Format:** Alphanumeric; SAS character $11 **Example:** 12345678922

4.2.3   Inclusion/Exclusion Conditions File

The Inclusion/Exclusion Conditions File is optional. It is used to 1) include in the cohort only those members having evidence of certain conditions; 2) exclude from the cohort those members having evidence of certain conditions; or 3) combine inclusion and exclusion criteria to define the cohort. If defined, this file contains the comprehensive set of codes used to define the inclusion and exclusion condition(s) of interest.

The MP2 Inclusion/Exclusion Conditions File allows the following code types: NDCs, ICD-9-CM, ICD-10-CM and ICD-11-CM diagnosis codes, ICD-9-CM, ICD-10-CM and ICD-11-CM procedure codes, or Healthcare Common Procedure Coding System (HCPCS) codes. Condition(s) can be defined using any mix of these allowed code types. A different lookback period can be defined for each condition code specified. Values of the GROUP fields must match between the Query File and the Inclusion/Exclusion Conditions File.

There are eight parameters that must be specified in the Inclusion/Exclusion Conditions File; six must be specified by the requester.

Table 4 describes specifications for the Inclusion/Exclusion Conditions File.

Table 4: Inclusion/Exclusion Conditions File Specification

Parameter	Variable Name	Description

Parameter	Variable Name	Description
Name of Query Group	GROUP	**Details:** standardized name used to refer to a query GROUP for exposure(s) of interest to be queried. **Note**: must match GROUP values from the <u>Query File</u>. **Named by:** Request programmer **Input type:** Required **Format:** Alphanumeric; SAS character $30; no special characters (*e.g.*, commas, periods, hyphens, etc) allowed, and underscores must be used to mark spaces. **Example:** Insulin1
Condition Code Type	CODETYPE	**Details:** type of each code value included in the CODE field (below) of this file. Valid values are all those allowed by the MSCDM: • **RX11:** 11-digit NDC code • **RX09:** 9-digit NDC code • **DX09**: ICD-9-CM diagnosis • **DX10**: ICD-10-CM diagnosis • **DX11**: ICD-11-CM diagnosis • **PX09**: ICD-9-CM procedure • **PX10**: ICD-10-CM procedure • **PX11**: ICD-11-CM procedure • **PXC4**: CPT-4 procedure (*i.e.*, HCPCS Level I) • **PXHC**: HCPCS procedure (*i.e.*, HCPCS Level II) • **PXH3**: HCPCS Level III procedure • **PXC2**: CPT Category II procedure • **PXC3**: CPT Category III procedure **Defined by:** Request programmer **Input type:** Required **Format:** Alphanumeric; SAS character $4 **Example:** PXHC

Parameter	Variable Name	Description
Condition Code	CODE	**Details:** drug, diagnosis or procedure code values to define condition(s) of interest. **Note 1:** any decimal points in the code value should be removed. **Note 2**: CODETYPE must be consistent with the expected format of the CODE value (*e.g.*, MP2 will not find any valid matches in the data for CODETYPE=PXC4 and a 3-digit CODE value). **Note 3**: duplicate CODETYPE-CODE combinations in a given query GROUP are removed by the MP2 algorithm. **Defined by:** Requester **Input type:** Required **Format:** Alphanumeric; SAS character $11 **Example:** J3490
Inclusion/Exclusion Indicator	INCLUSION	**Details:** indicates whether each condition CODE specified is for an inclusion (=1) or exclusion (=0) criterion. **Named by:** Requester **Input type:** Required **Format:** Numeric **Example:** 1
Lookback Period Start	CONDFROM	**Details:** used in combination with CONDTO to define the start of the lookback period for each condition code specified, expressed in terms of "days from Index Date". For example, if Index Date=01/08/2009 and CONDFROM for a given condition code is set to -7, the MP algorithm will start looking for that condition code on 01/01/2009. **Note 1**: individual condition codes within a same Query GROUP are allowed to have different lookback periods and therefore have different CONDFROM and CONDTO values. **Note 2**: the index date is "day zero". Therefore, if zero is included in the CONDFROM-CONDTO interval for a given condition code, the index date is included in the lookback period. **Note 3**: if CONDFROM > 0 then the lookback period will start after the index date. **Named by:** Requester **Input type:** Required **Format:** Numeric **Example:** -180

Parameter	Variable Name	Description
Lookback Period End	CONDTO	**Details:** used in combination with CONDFROM to define the end of the lookback period for each condition code specified, expressed in terms of "days from Index Date". For example, if Index Date=01/08/2009 and CONDTO for a given condition code is set to -1, the MP algorithm will look for that condition code between the CONDFROM date through 01/07/2009. **Note 1**: individual condition codes within the same Query GROUP are allowed to have different lookback periods and therefore have different CONDFROM and CONDTO values. **Note 2**: the index date is "day zero". Therefore if zero is included in the CONDFROM-CONDTO interval for a given condition code the index date is included in the lookback period. **Named by:** Requester **Input type:** Required **Format:** Numeric **Example:** -1
Condition Care Setting	CARESETTING	**Details:** contains the care settings considered for the individual condition diagnosis or procedure codes. If all care settings are wanted, leave the field blank. The following are valid entries; all entries must be quoted and separated by a space: • **IP:** inpatient hospital stays • **IS:** non-acute institutional stays • **ED:** emergency department visits • **AV:** ambulatory visits • **OA:** other ambulatory visits. **Note:** CARESETTING is allowed to vary between CODEs within the same GROUP. For example, CARESETTING is allowed to equal 'IP' for one diagnosis code and 'IP' 'ED' for another diagnosis code *in the same GROUP*. **Defined by:** Requester **Input type:** Optional **Format:** Alphanumeric; SAS character $20. **Example:** 'IP' 'ED'

Parameter	Variable Name	Description
Principal Diagnosis Indicator	PRINCIPAL	**Details:** for a diagnosis CODETYPE (*e.g.,* DX09, DX10, DX11), if PRINCIPAL is set equal to YES, only principal diagnoses in the IP and ED settings will be chosen. However, if PRINCIPAL is set equal to NO, all diagnoses for the specified care settings will be chosen. For codes other than diagnosis codes, PRINCIPAL must be set equal to NO. **Defined by:** Requester **Input type:** Required **Format:** Alphanumeric; SAS character $3. **Example:** YES

5 Key Definitions

5.1 Enrollment Type Requirements

The type of coverage required (e.g., drug and medical) is determined by the code types used to define input files. If all input files specified (*e.g.,* Query File, Incident Query File, and Inclusion/Exclusion Conditions File) include only NDCs, MP2 will only consider claims that occur during enrollment periods where a member has drug coverage. For incident claims a specified WASHPER of 183 days in this instance would only look for 183 days of continuous enrollment in drug coverage prior to claim date to determine enrollment eligibility.

However, if any input file includes diagnosis or procedure codes, MP2 will only consider claims that occur during enrollment periods where a member has both drug *and* medical coverage. For incident claims a specified WASHPER of 183 days in this instance would only look for 183 days of continuous enrollment in drug *and* medical coverage prior to claim date to determine enrollment eligibility.

Note that MP2 always requires drug coverage even if the input files contain only procedure or diagnosis codes.

5.2 Prevalence-based Cohort

The prevalence-based cohort is composed of all members meeting inclusion/exclusion conditions criteria who have at least one claim that qualifies as an exposure of interest during the query period, delimited by the QUERYFROM to QUERYTO dates as illustrated in Figure 1. The claim date for each exposure of interest considered must fall during a continuous enrollment period of relevant type (See Section 5.1).

Figure 1: Prevalence-based Cohort
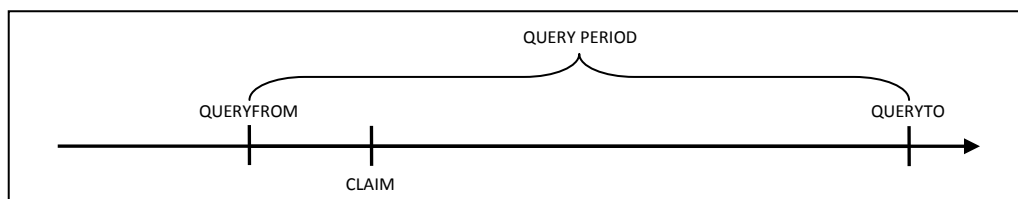
5.3   Incidence-based Cohort

The incidence-based cohort is a subset of the prevalence-based cohort that represents members who meet the incidence definition during the query period. When generating metrics for the incidence-based cohort, the MP2 algorithm allows members to have one of the two following options: (1) minimum incidence, where only one claim can be considered incident (specified using the WASHTYP=MIN option) or (2) multiple incidence, where multiple claims can be considered incident (specified using the WASHTYP=MULT option).

5.3.1   Minimum Incidence (MIN)

Under the minimum incidence option, members can have only one incident claim during the query period and that claim must be the first one observed for that member in all enrollment periods of relevant type considered by the program. Minimum incidence is thus defined as evidence of one query group claim observed during the query period that satisfies the following three conditions:

1. Query Group claim date falls during a continuous enrollment period of relevant type.
2. Member is continuously enrolled WASHPER days (specified by the Washout Period parameter in the Query File) before the Query Group claim date.
3. Member has no evidence of another claim with a Query Group code or Incident Query File code during any considered enrollment period before the Query Group claim date. That is, the MP2 algorithm queries the set of data available before the query claim date (regardless of the specified Query Period) to ensure that no claim with a Query Group code or Incident Query File code is observed during enrollment periods of relevant type under consideration.

This option should be used with caution as interpretation can be complex (*i.e.*, incidence is a function of the length of the member's available enrollment history).

5.3.2   Multiple Incidence (MULT)

Under the multiple incidence option a member can have multiple incident claims as long as each claim meets the following incidence conditions. This definition is commonly used on epidemiologic assessments as it limits the period used to define incidence to the washout period that is equal for all members.
1. Query Group claim date falls during a continuous enrollment period of relevant type.
2. Member is continuously enrolled during the WASHPER days (specified by the Washout Period parameter in the Query File) prior to the Query Group claim date.
3. Member has no evidence of a claim with a Query Group code or Incident Query File code during the WASHPER days prior to the Query Group claim date.

5.3.3   Examples

The following examples illustrate the implications of incidence type options. While the MP2 algorithm can evaluate multiple enrollment periods per member, for simplicity, each scenario depicted here includes members with only one enrollment period. The following examples also assume that the MP2 algorithm has already restricted the cohort to members with and/or without a condition of interest (as

specified in the Inclusion/Exclusion Conditions File) and that no additional codes have been included in the Incident Query File to refine the incidence definition.

Figure 2A illustrates how the MP2 algorithm identifies a claim using the minimum incidence option.

Figure 2A: Incident Claim Identification Using the Minimum Incidence Option*
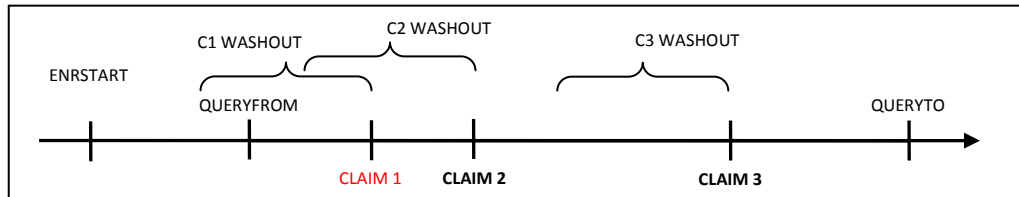

*Incident claim in bold red

In the scenario depicted in Figure 2A, ENRSTART indicates the member's start of enrollment in drug and/or pharmacy benefits (depending on the CODETYPEs used in the input files). CLAIM 1 would be selected as the incident claim in this scenario, as the member satisfies enrollment criteria and has no exposure claim before CLAIM 1. CLAIMs 2 and 3 also satisfy enrollment criteria, but prior claims exclude them from being considered incident using the minimum incidence option.
Figure 2B depicts a scenario where a member does not have an incident claim under the minimum incidence option.

Figure 2B: No Incident Claim Using the Minimum Incidence Option
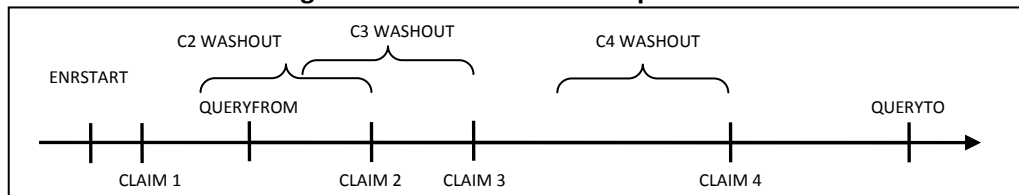
In this scenario CLAIM 1 is not considered incident since it did not occur within the query period. While CLAIMs 2, 3, and 4 satisfy the enrollment period condition, the presence of CLAIM 1 prior to the query period, but during the member's history excludes these as incident claims under the minimum incidence option.

Figure 3 illustrates how the MP2 algorithm identifies a claim using the multiple incidence option.

Figure 3: Incident Claim Identification Using the Multiple Incidence Option*
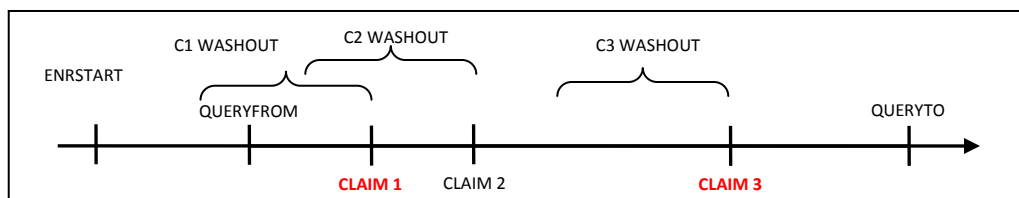
*Incident claims in bold red

In Figure 3, CLAIMs 1 and 3 will be considered incident using the multiple incidence option since a washout period free of any claim (query or from the incident only list) is observed and both satisfy the enrollment condition. CLAIM 2 is not considered incident since it does not meet the washout criteria (*i.e.*, CLAIM 1 occurs during the CLAIM 2 washout period).

5.4 Cohort Inclusion or Exclusion Based on Conditions of Interest

The requester can restrict the cohort using inclusion and/or exclusion criteria using the optional Inclusion/Exclusion Conditions File. Members can be included or excluded from the cohort if certain conditions are recorded during a specific lookback period. Conditions can be defined by any combination of valid diagnoses, procedures and/or NDCs.

The condition lookback period is defined by a combination of start and end dates (expressed in terms of days from index date, where day zero refers to the index date). Note that the start and end dates can include and go beyond the index date (Day 0 of the interval). For example, if start =-30 and end=30 the MP2 algorithm will search for conditions in the period starting 30 days before the index date and ending 30 days after.

The lookback period can also be defined at the code level. For example, the requester could require members to have a code for diabetes in the 183 days before index date OR a code for AMI in the 365 days before index date.

The presence of a claim with one of the desired inclusion condition codes is a sufficient condition to meet the inclusion criterion. However, in the case of exclusions, the absence of any claims with one of the desired exclusion condition codes is a necessary but not sufficient condition to meet the exclusion criterion. To fully satisfy the exclusion criterion the member also needs to be continuously enrolled for medical and/or drug coverage for the complete exclusion lookback period. For example, if a member is free of an exclusion claim in the -180 to -90 days before the index date, but was only enrolled from days -120 to -90, the MP algorithm cannot classify this member "free of the exclusion claims" since there is no way to know whether an exclusion claim would have been recorded during days -180 to -121.

6 Denominators and Background Rates

In addition to metrics on use of exposure(s) of interest, all output tables include metrics on denominators associated with each result stratum. Denominator metrics include (1) count of members and (2) eligible member days. These metrics are different for the prevalence-based vs. incidence-based cohort. The members included in any denominator metrics are all the "eligible" members, *i.e.,* members who can potentially be identified by the MP algorithm as a user (*i.e.*, either prevalent or incident) of the exposure(s) of interest defined in the query group.

Prevalence-Based Cohort: Eligible Members and Member-Days

The denominator member count for the prevalence-based cohort is composed of all members with at least one enrollment day (of relevant type; see Section 5.1) during the query period. If inclusion/exclusion conditions are specified, the member must also satisfy the condition requirements

to be included. Eligible member days for this cohort are simply the sum of all such enrollment days during the query period for the aforementioned members included in the denominator.

Incidence-Based Cohort: Eligible Members and Member-Days

The denominator member count for the incidence-based cohort is composed of all members enrolled for one period (or more) of continuous enrollment (of relevant type) of at least WASHPER+1 days (*i.e.*, WASHPER days for incidence requirement and one day to allow for exposure to be observed) overlapping but prior to the end of the query period and meeting any specified inclusion/exclusion conditions criteria. These members may be different depending on what Incidence Type is chosen.

For the minimum incidence type the following will be reported:

1. Members to be reported must be free of query claims or claims from exposure(s) found in the Incident Query File during all prior enrollment periods of relevant type in the member's history.
2. Eligible member days reported are equal to the number of days of enrollment (of relevant type) falling during the query period that are (1) preceded by a period of at least WASHPER days and b) prior to a query claim date or a claim for an Incident Query File code.

If, however, the multiple incidence option is chosen, the following will be reported:

1. Members to be reported must be free of query claims or claims from exposure(s) found in the Incident Query File during the washout period only.
2. Eligible member days reported are equal to the sum of all days of enrollment (of relevant type) falling during the query period that are preceded by a period of at least WASHPER days free of any query claims or claims from exposure(s) found in the Incident Query File.

Background Rates

Once denominator metrics are available, MP2 allows for the calculation of background rates for each Query GROUP specified. For example, the requester can calculate the proportion and rate of new users of exposures in Query GROUP Z. The *proportion of new users* would be defined as the number of new users (*i.e.*, the numerator) per X enrolled members (*i.e.*, the denominator), whereas the *rate of new users* would be defined as the number of new users per Y person-time (*e.g.*, person-years, member-days). For MP2, Background proportions and rates are calculated for members meeting any specified inclusion/exclusion conditions criteria.

7   Program Steps

The general program steps are:

1. Extract claims of interest from the MSDD outpatient pharmacy/procedure tables to create exposure dates for each member.
2. Identify members with conditions of interest according to the specifications of the Inclusion/Exclusion Conditions File.
3. For each Query GROUP, assess prevalent and incident status, and extract all claims of interest during query period to calculate utilization by member and Query GROUP.
4. For each Query GROUP, calculate denominator member counts and days enrolled.

5. Calculate age at index date and extract sex for each cohort member using the MSDD demographic file.
6. Create output tables for both prevalent and incident users along with denominators and member days.

8   Program Execution

When implementing modular programs within the MSDD, the Mini-Sentinel Operations Center (MSOC) uses a uniform folder structure across Data Partners to facilitate communications between MSOC and Data Partners and to streamline file management.

Each request distributed by MSOC is assigned a unique Request ID. Upon receipt of the request, Data Partners create a folder named after the Request ID and several subfolders to organize program inputs and outputs. One of the folders contains output to be sent to MSOC and another contains intermediate files that remain with the Data Partner, but could be used to facilitate follow-up queries if necessary. Appropriate retention policies apply.

Table 5 defines the local environment variables that must be initialized by the user to execute the program (i.e., defined by the Data Partner prior to execution of the program). Please note that these values cannot be left blank. Each Data Partner is required to enter user inputs at the beginning of the SAS Program sent with each request. These inputs are unique to each Data Partner.

Table 5: Environment Variable Definitions

Label	Field Name	Description
Data Partner ID	DPID	Two character Partner ID
Site ID of Data Partner	SITEID	Two character Site ID
Enrollment Table Name	ENRTABLE	Name of the Data Partner's MSCDM Enrollment table
Demographics Table Name	DEMTABLE	Name of the Data Partner's MSCDM Demographics table
Dispensing Table Name	DISTABLE	Name of the Data Partner's MSCDM Dispensing table
Procedure Table Name	PROCTABLE	Name of the Data Partner's MSCDM Procedure table
Diagnosis Table Name	DIATABLE	Name of the Data Partner's MSCDM Diagnosis table
Input file folder	INFOLDER	Path where the input files will be saved
Output file folder	MSOC	Path where the shared output tables will be saved
Local data folder	DPLOCAL	Path where the local SAS datasets will be saved
Libname of the MSCDM	INDATA	Path where the local MSDD data is saved

9   Output Tables

Twelve output tables are created by MP2 and each are output in both .sas7bdat and .csv formats. Five output tables each are created for the incident-based cohort and the prevalence based cohort and a numerator and denominator table are also output containing the full query summary statistics. The numerator and denominator tables contain all data necessary to calculate incident and prevalent rates stratified by month/year, age and gender. Tables can be identified by the following suffixes:

- _ITABLEX

- _PTABLEX
- _DENTABLE0
- _NUMTAB0

The "I" and "P" correspond to incident and prevalent tables, respectively, and the "X" corresponds to the table number and takes the values 1 to 5. There is only one denominator table (DENTABLE0) and one numerator table (NUMTAB0). Below are examples of the incident and prevalent output tables, produced using the multiple incidence option.

ITABLE1 - Counts of Members and Claims over the Query Period

Group	Users	Incident Claims	Claims	Days of Supply	Eligible Members	Eligible Days
DRUGGROUP1	10,132	10,910	35,053	1,639,188	512,592	257,978,008
PROCGROUP1	51,994	55,525	60,525	60,525	512,584	257,978,008

First row interpretation of ITABLE1: Within the QUERYFROM to QUERYTO period, 10,132 members (users) had at least one incident claim for any drug within the DRUGGROUP1 category. For these members, 10,910 exposures (incident claims) and 35,053 individual claims were observed for a total of 1,639,188 days of supply. Finally, 512,592 members could potentially have been included as incident users (eligible members) for a total of 257,978,008 eligible days.

PTABLE1 -Counts of Members and Claims over the Query Period

Group	Users	Incident Claims	Claims	Days of Supply	Eligible Members	Eligible Days
DRUGGROUP1	12,152	---	50,042	1,999,192	695,412	322,866,001
PROCGROUP1	59,888	---	60,991	60,991	695,412	322,866,001

First row interpretation of PTABLE1: Within the QUERYFROM to QUERYTO period, 12,152 members (users) had at least one prevalent claim for any drug in DRUGGROUP1. For these members there were 50,042 individual claims, for a total of 1,999,192 days of supply. Finally, 695,412 members could potentially have been included as prevalent users (eligible members) for a total of 322,866,001 eligible days.

ITABLE2 - Counts of Members and Claims over the Query Period Stratified by Year/Month

Group	Claim Year	Claim Month	Users	Incident Claims	Claims	Days of Supply	Eligible Members	Eligible Days
DRUGGROUP1	2007	6	206	206	210	8,451	154,258	4,617,269
DRUGGROUP1	2007	7	256	256	265	9,907	237,408	7,343,258
PROCGROUP1	2007	6	931	931	939	939	151,368	4,512,364
PROCGROUP1	2007	7	1,468	1,468	1,478	1,478	232,771	7,161,371

First row interpretation of ITABLE2: In June 2007, 206 members (users) had at least one incident claim for any drug in DRUGGROUP1. In the same month for these members, 206 exposures (incident claims) and 210 individual claims were observed for a total of 8,451 days of supply. Finally, 154,258 members could potentially have been included as incident users in June 2007 (eligible members) for a total of 4,617,269 eligible days. The explanation above can also be applied for prevalent table interpretations. Replace "incident" with "prevalent" in the above explanation and set the value of "Incident Claims" to missing as this is irrelevant for prevalent rates. Note that counts should be higher for prevalent tables relative to incident tables.

ITABLE3 - Counts of Members and Claims over the Query Period Stratified by Age Group

Group	Age Group	Users	Incident Claims	Claims	Days of Supply	Eligible Members	Eligible Days
DRUGGROUP1	10 to 19	660	677	1,000	22,511	91,828	41,772,749
DRUGGROUP1	20 to 39	1,229	1,280	2,688	80,320	168,623	67,572,698
DRUGGROUP1	40 to 55	2,682	2,877	8,523	335,332	161,300	78,439,389
DRUGGROUP1	56+	5,586	6,076	22,309	1,178,290	123,135	70,193,172
PROCGROUP1	10 to 19	8,247	8,794	9,450	9,450	91,512	40,292,790
PROCGROUP1	20 to 39	15,739	16,706	18,328	18,328	167,595	64,641,268
PROCGROUP1	40 to 55	15,008	15,909	17,259	17,259	161,522	76,633,096
PROCGROUP1	56+	13,221	14,116	15,374	15,374	124,179	70,189,592

First row interpretation of ITABLE3: 660 members (users) have at least one incident claim for any drug in DRUGGROUP1 within the QUERYFROM to QUERYTO period while being in the 10 to 19 year age group. For these members, 677 exposures (incident claims) and 1,000 total claims for a total of 22,511 days of supply were counted. Finally, 91,828 members in the 10 to 19 year age group could potentially have been included as incident users (eligible members) for a total of 41,772,749 days eligible when in the age group. The explanation above can also be applied for prevalent table interpretations. Replace "incident" with "prevalent" in the above explanation and set the value of "Incident Claims" to missing as this is irrelevant for prevalent rates. Note that counts should be higher for prevalent tables relative to incident tables.

ITABLE4 - Counts of Members and Claims over the Query Period Stratified by Sex

Group	Sex	Users	Incident Claims	Claims	Days of Supply	Eligible Members	Eligible Days
DRUGGROUP1	F	6,687	7,201	23,135	1,081,864	338,311	170,265,485
DRUGGROUP1	M	3,445	3,709	11,918	557,324	174,281	87,712,523
PROCGROUP1	F	34,316	36,647	39,947	39,947	338,305	170,265,485
PROCGROUP1	M	17,678	18,878	20,578	20,578	174,279	87,712,523

First row interpretation of ITABLE4: In the QUERYFROM to QUERYTO period, 6,687 female members (users) had at least one incident claim for any drug in DRUGGROUP1. For these members, 7,201 exposures (incident claims) and 23,135 total claims were observed for a total of 1,081,864 days of supply. Finally, 338,311 members could potentially have been included as incident users (eligible members) for a total of 170,265,485 eligible days. The explanation above can also be applied for prevalent table interpretations. Replace "incident" with "prevalent" in the above explanation and set the value of "Incident Claims" to missing as this is irrelevant for prevalent rates. Note that rates should be higher for prevalent tables relative to incident tables.

ITABLE5 - Counts of Members and Claims over the Query Period Stratified by Year

Group	Claim Year	Users	Incident Claims	Claims	Days of Supply	Eligible Members	Eligible Days
DRUGGROUP1	2007	660	677	1,000	22,511	91,828	29,772,749
DRUGGROUP1	2008	1,229	1,280	2,688	80,320	168,623	52,572,698
PROCGROUP1	2007	8,247	8,794	9,450	9,450	91,512	29,292,790
PROCGROUP1	2008	15,739	16,706	18,328	18,328	167,595	52,641,268

First row interpretation of ITABLE5: In 2007, 660 members (users) had at least one incident claim for any drug in DRUGGROUP1. In the same year for these members, 677 exposures (incident claims) and 1,000 total claims were observed for a total of 22,511 days of supply. Finally, 91,828 members could potentially have been included as incident users in 2007 (eligible members) for a total of 29,772,749

eligible days. The explanation above can also be applied for prevalent table interpretations. Replace "incident" with "prevalent" in the above explanation and set the value of "Incident Claims" to missing as this is irrelevant for prevalent rates. Note that counts should be higher for prevalent tables relative to incident tables.

10   Example

Table 6, Table 7, and Table 8 below show examples of a Query File, an Incident Query File, and an Inclusion/Exclusion Conditions File (*e.g.*, queryfile.sas7bdat, incqueryfile.sas7bdat, condfile.sas7bdat):

Table 6: Example of Query File

Group	Code	CodeType	WashPer	WashTyp
Group1	11111111100	RX11	180	MIN
Group1	111111112	RX09	180	MIN
Group2	99999	PXC4	360	MULT
Group2	99998	PXC4	360	MULT

Table 7: Example of Incident Query File

Group	Code	CodeType
Group1	11111111101	RX11
Group2	77777	PXC4

Table 8: Example of Inclusion/Exclusion Conditions File

Group	Code	CodeType	Inclusion	CondFrom	CondTo	CareSetting	Principal
Group1	WWW	DX09	1	-180	-1		NO
Group2	YYY	DX09	1	-360	-1		NO

In this example, the requester specifies that, in addition to the codes listed in the Query File, the codes from the Incident Query File for the Group1 and Group2 Query Groups need to be considered to determine incidence. Additionally, the Inclusion/Exclusion Conditions File requires that each Query Group be restricted to members with a code for a condition of interest in the WASHPER days prior to the index claim.

In the example above, the requester additionally instructed the request programmer to use the following SAS macro parameters:

- Any enrollment gap of less than 45 days is considered administrative and must be ignored;
- The query period spans the years 2007 to 2010; and
- The results should be segmented according to 5 year age groups from 10 to 49 years old.

For this request, the program could be executed using the following SAS Macro call:

%ModularProgram2(
          REQUESTID=mpr_ex2,
          ENROLGAP=45,
          QUERYFROM=01/01/2007,
          QUERYTO=12/31/2010,

QUERYFILE=queryfile.sas7bdat,
INCQUERYFILE=incqueryfile.sas7bdat,
CONDFILE=condfile.sas7bdat,
AGESTRAT=10-14 15-19 20-24 25-29 30-34 35-39 40-44 45-49);