SENTINEL SAS MACRO TOOLKIT:

Incidence Rate Ratio Tool

(%MS_IRR)

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Prepared by the Sentinel Operations Center

For use with the Incidence Rate Ratio Tool version 1.0

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Incidence Rate Ratio Tool

1. Introduction

The incidence rate ratio (IRR) tool introduces an automated comparison of two cohorts and their incidence rates. Cohorts are identified by the user specified Cohort Identification and Descriptive Analysis (CIDA) Tool input and the tool utilizes the output from the CIDA output dataset. The tool is useful in quickly assessing both the crude and adjusted incidence rate ratios for the two groups by producing the incidence rate ratio estimates and their corresponding 95% confidence intervals. The user also has the capability to control for age, sex, year, number of medical encounters, combined Charlson-Elixhauser comorbidity score, and data partner within the adjusted rate ratio calculations. Please note that the IRR tool utilizes a Poisson regression and a large sample approximation for calculation of the IRR; the tool may not be robust against samples with small event rates.

2. Program Objectives

This program uses as input the "&runid._t2_cida.sas7bdat" SAS dataset that is produced after execution of a “Type 2” CIDA cohort identification strategy, in order to output both .SAS7BDAT and .CSV files that provide the user with the breakdown of the number of new users, person-years of follow-up, number of events, incidence per 1,000 persons, incidence rate per 1,000 person-years and both the crude and adjusted incidence rate ratio including their corresponding 95% confidence interval.

3. Parameter Specifications

Program Macro Variable Name	Short Description	Long Description
DATAPATH	File path of CIDA data	**Details:** The file path of the location of the .SAS7BDAT datasets output by CIDA. ***Important notes:*** ***[a] This tool requires as input a SAS dataset with the name “&RUNID._t2_cida”*** ***[b] The DATAPATH location requires that the results be in the following folder structure: &datapath/&DPID/msoc/*** **Input type:** Required, directory path **Format**: text **Example**: *C:/cida/output*

Program Macro Variable Name	Short Description	Long Description
OUTPATH	Output file	**Details**: The desired file path of the location of the .SAS7BDAT and .CSV output datasets. Internal SAS library is titled "OUTDATA" for this path. **Input type:** Required, directory path **Format**: text **Example**: *C:/IRR/output*
DPLIST	List of data partners	**Details**: List of abbreviated data partner names used in CIDA analysis. Abbreviated names are separated by a space with no quotations or punctuation. **Input type:** Required **Format**: text **Example**: *DP1 DP2 DP3*
RUNID	RUNID identifier	**Details**: RUNID identifier. Requires the title of the Run ID used in CIDA analysis. The tool will only evaluate one Run ID at a time. The user must run separate iterations of the tool if they desire IRRs for several different CIDA runs. **Input type:** Required **Format**: text **Example**: *Mpr1r1*
TREATMENT	Treatment group indicator	**Details**: Treatment group of interest. Uses group name output from CIDA. Input is not case sensitive. User can specify one treatment group of interest from CIDA output. For calculation of IRR, the treatment group incidence rate per 1,000 person-years is divided by the control group's incidence rate per 1,000 person-years. **Input type:** Required **Format**: text **Example**: *Varenicline*
CONTROL	Control group indicator	**Details**: Control group of interest. Uses group name output from CIDA. Input is not case sensitive. User can specify one control group of interest from CIDA output. For calculation of IRR, the treatment group incidence rate per 1,000 person-years is divided by the control group's incidence rate per 1,000 person-years. **Input type:** Required **Format**: text **Example**: *Bupropion*

Program Macro Variable Name	Short Description	Long Description
EVENT_VAR	Name of event variable	**Details**: There are two event variables on the input dataset. This parameter indicates which one to use. **Input type:** Required **Format**: text **Example**: *AllEvents*
ADJUSTVARS	Variables for adjusted IRR	**Details**: List of variables to be used in the calculation of the adjusted incidence rate ratio. Note that the crude IRR is automatically output. User has the ability to adjust for any combination of the following variables: age, sex, year, number of medical encounters, combined Charlson-Elixhauser comorbidity score, and data partner. Variables are defined as agegroup, sex, year, numvisits, ccielixgrp, and dpid, respectfully. Variables are separated by a space with no quotations or punctuation. One IRR will be output that is adjusted for each of the variables entered. **Input type:** Optional **Format**: text **Example**: agegroup sex dpid
OUTDATA	Output file names	**Details**: User specified title for .SAS7BDAT and .CSV output. Both output files are output to the user specified *outpath* location. **Input type:** Required **Format**: text **Example**: *MPR1r1_Varen_Bup*

4. Outputs

The .SAS7BDAT and .CSV output files contain a Run ID identifier, a parameter ratio identifier (output as treatment/control), the number of new users, person-years of follow-up, number of events, incidence per 1,000 persons and incidence rate per 1,000 person-years for each treatment and control cohort. Both the unadjusted and adjusted incidence rate ratios, including the 95% confidence intervals are also output. Variables corresponding to treatment group are denoted with a "trt" prefix. Variables corresponding to control group are denoted with a "cntrl" prefix. Incidence per 1,000 persons is calculated as number of events divided by the number of new users (standardized to 1,000 persons). The incidence rate per 1,000 person-years is calculated by the number of events divided by the person-years of follow-up (standardized to 1,000 person-years). Table 1 demonstrates a condensed sample output:

Table 1. Sample Output

MPR_RunID	parameter_ratio	trt_new_users	cntrl_new_users	adjusted_irr	adjusted_lower_CI	adjusted_upper_CI
MPR1r1	Varenicline/ Bupropion	24,555	59,736	0.91	0.58	1.38

5. Examples

The %MS_IRR macro below is used to estimate the IRR for varenicline and bupoprion. The IRR is calculated using a Poisson regression that is modeled by the treatment indicator, age, gender and data partner site on the number of events and offset by the number of person-years of follow-up. The tool utilizes data from 17 data partners and the CIDA output from the modular program request 1, run 1 (MPR1r1). The output .SAS7BDAT and .CSV files are titled MPR1r1_Varen_Bup.SAS7BDAT and MPR1r1_Varen_Bup.CSV, respectfully. The following parameters are used in the macro call:

```
%ms_irr(DATAPATH=C:\cida\output,
        OUTPATH=C:\IRR\output,
        DPLIST= DP1 DP2 DP3,
        MPRID=mpr1r1,
        TREATMENT=varenicline,
        CONTROL=bupropion,
        EVENT_VAR = NumEvents,
        ADJUSTVARS==AgeGroup sex dpid year ccielixgrp numvisits,
        OUTDATA= MPR1r1_Varen_Bup
);
```