

Introduction

This submission demonstrates SAS code and an Excel spreadsheet for finding the absolute risk assuming there is only one competing risk. The absolute risk of an event occurring is the chance that the event will occur in a given interval. This method uses coefficients from a logistic regression model to estimate hazards in order to find absolute risk. In the given example there are three states: healthy, disabled, and dead. The absolute risk of a hazard (say disability) tells us the probability that the hazard will occur for an individual in a given time frame in the presence of the competing risks (in this case, death). Computations of hazards ratios often yield numbers greater than 1, which is counter to our conception of probability. We approximate the hazard ratios with odds ratios found through logistic regression, ensuring that the probability of a hazard occurring is between 0 and 1. Absolute risk of a desired outcome, assuming a simple exponential model of time to event is given by:

$$\pi(t_1, t_2) = h_1(h_1 + h_2)^{-1} * [1 - \exp\{-(h_1 + h_2)t\}]$$

where h_1 is the hazard of interest and h_2 represents all competing hazards collectively. The simple exponential model assumes that every hazard has a constant value in the time interval. We use the simple exponential model rather than a continuous model, because it simplifies the problem significantly.

To find the odds ratios, we create a logistic model for each of the competing outcomes. So we need a model for independent, independent to disabled, disabled to healthy, healthy to dead, and disabled to dead. Then we find the probability of each transition, given by

$$p = \exp(a + b_1X_1 + \dots + b_nX_n) / [1 + \exp(a + b_1X_1 + \dots + b_nX_n)]$$

and use these probabilities to approximate the hazards in the first equation. Plugging the hazards ratios into the model above yields the probability of the hazard h_1 occurring in the presence of the other hazards h_2 in the time interval t_1 to t_2 .

The SAS code fits three models: two for the transition from healthy to disabled and one for the transition from healthy to death. After entering the coefficients into excel, a couple of sample computations are given in the excel file. To find the absolute risk with covariates not used in the examples, follow the format of the examples.

Keyword Categories:

Clinical:	Aging, Disability, Death
Genetics:	N/A
Statistical:	Logistic Regression, Absolute Risk
Software:	SAS
Related:	N/A

References

Benichou, Gail (1990), "Estimates of Absolute Cause-Specific Risk in Cohort Studies."

Component Files

- a. Summary
- b. sample data
- c. SAS dataset for testing code
- d. SAS program
- e. SAS output

Optimal Use

1. Read this summary
2. Set up a data file in the format of the sample data
3. Modify the SAS code and run it
4. Copy-paste the coefficients into Excel in appropriate cells

Prerequisites

Basic knowledge of SAS code.

Basic knowledge of Excel.

Potential Applications

In competing risk situations, absolute risk provides the crude probability of a specific outcome, in a unit interval of time, while adapting for competing risks.