Power Program V3.0

This file contains important information about the Power program.

0. Enhancements for V.3.0.0

POWER V.3.0.0 has been upgraded to include:

- Power/sample size for one exposure (binary or categorical with multiple levels)
- For two exposures, the specification of a dependent joint probability distribution for exposures
- Entry of values for either marginal odds ratios or main effects odds ratios for the specification of the alternative hypothesis
- Improved handling of log and output files; and minor bug fixes

I. Introduction

The Power program permits you to determine the power or the sample size for epidemiological studies testing interactions between two factors or testing a null odds ratio or a trend in the odds ratio for a single exposure.

II. Installation

To install the Power program run the "install.exe" file. This must be done from Windows, and it is recommended that all Windows programs are closed before doing so. Follow the instructions given to complete the installation.

Note: If your computer is running under the Windows 2000 operating system, the install program must be run from an account with installation privileges (i.e., Power User or Administrator). If you are not sure what privileges you have, please contact your System Administrator.

III. Running the Program

To launch the Power program, select and run the file Power.exe. This may be done through Explorer or an icon on the desktop or in a program group.

Please note that the calculation engine (PowerCalc.exe) is not intended to be run independently of the interface (Power.exe). The interface facilitates selection of analysis options and it ensures that all parameters are properly specified. It then launches the calculation engine appropriately.

IV. Power and Sample Size Calculations

POWER bases calculations on the prospective binary response model:

P(D|x,y) = [exp(a) X OR(x,y)]^D / [1 + exp(a) X OR(x,y)],

where P(D=1|0,0) = exp(a)/[1 + exp(a)] is the probability of disease at baseline, and where the odds ratio (OR) for joint exposures under the alternative hypothesis may be derived from a multiplicative (i.e., logistic model),

OR(x-x_0,y-y_0) = OR(1,0)^(x-x_0) * OR(0,1)^(y-y_0) * theta^[(x-x_0)(y-y_0)],

or an additive,

OR(x-x_0,y-y_0) = 1 + [OR(1,0)^(x-x_0) - 1 + OR(0,1)^(y-y_0) - 1] * gamma^[(x-x_0)(y-y_0)] relationship.

Power/sample size is based on the OR for interaction (theta) or the excess OR for interaction (gamma), and a test of the null hypothesis theta = 1 (or gamma = 1), when the true theta (or gamma) is a specified value (alternative hypothesis).

For one exposure, the current version of POWER bases calculations on a prospective binary response model, where the odds ratio (or trend in odds ratio with exposure) is linear in the log-odds,

P(D|x) = [exp(a) X OR(x)]^D / [1 + exp(a) X OR(x)] where OR(x-x_0) = OR(1,0)^(x-x_0).

Power/sample size is based on the null hypothesis that OR(x)=1 for all x.

Definitions

theta	OR for interaction; the proportional interaction parameter at unit increases in each exposure. For a multiplicative model and for scores, x_0,...,x_K-1, theta = OR(1,1) / OR(1,0) * OR(0,1)
OR^tb	"top-to-bottom" OR; the OR for the highest category relative to the lowest category. For scores, x_0,...,x_K-1, OR^tb = OR(x_K-1,0) / OR(x_0,0) = OR(1,0)^(x_K-1 - x_0)
theta^tb	"top-to-bottom" interaction OR; the proportionality factor at the highest categories for each exposure relative to the lowest categories. For Exposure1 with K categories and Exposure2 with L categories, theta^tb = theta^[(x_K-1 - x_0) * (y_L-1 - y_0)]
gamma	Excess OR for interaction; the proportional interaction parameter at unit increase of the excess OR in each exposure. For an additive model, gamma = [OR(1,1)-1]/[OR(1,0)-1 + OR(0,1)-1]
EOR^tb	Excess "top-to-bottom" OR; the excess OR for the highest category relative to the lowest category. For scores, x_0,...,x_K-1, EOR^tb = OR(x_K-1,0) / OR(x_0,0) - 1 = OR(1,0)^(x_K-1 - x_0) - 1

gamma^tb	Excess "top-to-bottom" interaction OR; the proportionality factor at the highest categories for the excess ORs for each exposure. For Exposure1 with K categories and Exposure2 with L categories, gamma^tb = [OR(x_K-1- x_0,y_L-1 - y_0) - 1]/[OR(x_K-1 - x_0,y_0)-1 + OR(x_0,y_L-1 - y_0) - 1]

V. Results

V.A. Log File - A log file is created to which the description of the results and the parameters are added. This file is appended with each subsequent run. It is displayed at the completion of a run. It is a simple text file that may be saved for later use.

V.B. Data File - In addition to the log file, a file listing the relevant values for each run is created. This data file contains a header row with column titles at the beginning of each run. The fields are separated by commas. The columns included are as follows:

Column Title	**Description**
Run	Number of a given run. This count is reset each time the application is started
Power	Power
Cases	For case control studies this is the number of cases or the sample size. For cohort studies this is the number of events.
Total Subjects	Total subjects
OR1	Odds ratio for exposure 1
OR2	Odds ratio for exposure 2
Theta/Gamma	Odds ratio interaction term
Study	Study type (CC=case/control, CO=cohort)
Model	Model type (A=additive, M=multiplicative)
E1_1	1st score value for exposure 1
E1_2	2nd score value for exposure 1
…	
E1_K	Kth score value for exposure 1

Column Title	Description
P1_1	1st probability for exposure 1
P1_2	2nd probability for exposure 1
P1_K	Kth probability for exposure 1
E2_1	1st score value for exposure 2
E2_2	2nd score value for exposure 2
...	
E2_L	Lth score value for exposure 2
P2_1	1st probability for exposure 2
P2_2	2nd probability for exposure 2
...	
P2_L	Lth probability for exposure 2

This file is also appended with each subsequent run and may be saved for later use. It is a text file but may also be read into any spreadsheet program that will handle comma-delimited files.

VI. Contacting the Developers

Send requests to Ms. Holly Brown (Brownh@exchange.nih.gov).

VII. References

Lubin JH, Gail MH. On power and sample size for studying features of the relative odds of disease. *Am J Epidemiol* 1990;131:552-566.

Garcia-Closas M, Lubin JH. Power and sample size calculations in case-control studies of gene-environmental interactions: Comments on different approaches. *Am J Epidemiol* 1999;149:689-693.