

**MedCalc<sup>o</sup> for Windows. MedCalc Software. Mariakerke (Belgium), 1996. Price: US\$399.**

MedCalc is a computer program for statistical data analysis, running under the Windows Operating System on an IBM compatible computer with at least 80386 (with a math co-processor) or 80486 processor, 4 MB of memory, and 2 MB of space on the hard disk. There are two different variants of the latest MedCalc 4.15 version, one for Windows 3.x and another for Windows 95. Installation on hard disk is fast and safe.

After starting the program, the basic window appears with several menu options at the top, including File, Edit, Data, Statistics, Graphs, Tests, and Sampling utilities. Program control over them comes through the usual Windows input/output screens with all their advantages. Basic and more extensive online help is available through the standard Windows search strategy, which is also upgraded with a context sensitive search.

Both numerical (quantitative) and categorical (qualitative) data may be entered directly into the common two-dimensional spreadsheet table, even without the previous specification of variable names and characteristics, or they can be imported from some standard file formats. For ASCII files, unformatted comma delimited and formatted space delimited options are available.

During the use of the program utilities, working windows on the screen are opened one upon the other, but only the top one is active. Apart from using *cut*, *copy* and *paste* utilities, the content of the active window can be exported into a separate file using Export functions, an ASCII one when the content is a text, or a Windows metafile when the content is a graphical presentation. Associated to the spreadsheet data window Notes, there is a text window for entering all the comments regarding data, variables, statistics, or anything else (finally there is no need for scraps of paper attached to files, usually lost on a crowded desk). The notes are saved and always opened with the data sheet.

The basic part of the software is composed of the statistical utilities. Divided into separate and logical program sections, they cover the majority of methods, tests and statistical techniques used in everyday medical research. For that purpose, the authors of the software analyzed several articles reporting statistical content of original papers published in the major medical journals (1). As the authors stated in their own report (2), the intention of MedCalc was not to cover all the methods used in biomedical statistics. It was rather designed to closely correspond to the statistical knowledge of a medical researcher, incorporating the most frequently used statistical techniques reported in the published medical literature. This aim was certainly accomplished by the program. Descriptive statistics is included with the incorporated calculation of mean and median, 95% confidence intervals and data normality test, simple and multiple regressions with scatter diagrams and curve fitting to five usual mathematical equations, parametric and rank correlations, paired and unpaired t-tests, one-way and two-way ANOVA, basic nonparametrics including Wilcoxon and Kruskal-Wallis tests, analysis of contingency tables, calculation of Kaplan-Meier survival curves with logrank test, etc. Different data comparison graphs, scatter diagrams, box-and-whisker plots, as well as Bland and Altman plots are available. Fortunately, three-dimensional bars are not included in the program.

Other computations can be performed. One of them is the receiver-operating characteristics (ROC) curve analysis. Depending on the options set throughout the input window, the program calculates the area under the ROC curve with a standard error and 95% confidence interval limits, sensitivity, specificity, positive and negative likelihood ratios, and positive and negative predictive estimates for different cutoff values of the basic parameter. The ROC curve can be displayed, as well as graph presenting the accuracy of a diagnostic test. The comparison of two curves related to two different diagnostic procedures/tests can also be estimated. Calculations of the relative risk in prospective medical studies and odds ratio in retrospective case control studies are also available.

Also valuable is the sampling statistics, answering the common researcher's question of what minimal sample size is required in resolving a problem. The statistics takes into account the magnitude of differences occurring and their successful detecting, as well as the probabilities of making a correct or false conclusions based on  $\alpha$  and  $\beta$  levels of null hypothesis. The sample size for an investigation can

be calculated on the basis of a single mean or a single proportion, and comparing two means or two proportions.

The MedCalc manual, distributed with the disk, consists of more than 160 pages of text, including appendices, subject index and literature references. All methods and procedures incorporated in the program software are clearly discussed, using simple examples. Moreover, additional texts illustrate how the results of an analysis should be interpreted, and how they should be elaborated in a scientific report. Medical scientists can sometimes benefit from such examples much more than from books with pure theory and equations.

Some minor disadvantages are evident. There is no possibility of changing the font type in histograms, "not" logical operator in spreadsheet functions is missing, and Kaplan-Meier analysis is limited to assigning the cases from the study to only two groups (more would be advantageous). Nevertheless, MedCalc software fulfills its aim. It is an efficient, practical and useful statistical program which any medical researcher, not specially trained in statistical analysis, can easily and successfully use. My suggestion to the reader is to test its efficiency by downloading the demo version from the Internet <http://allserv.rug.ac.be/~fschoonj/> and to apply it to her/his own data.

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## References

- 1 Emerson JD, Colditz GA. Use of statistical analysis in the New England Journal of Medicine. In: Bailer JC, Mosteller F, editors. Medical uses of statistics. Boston (MA): NEJM Books; 1992. p. 45-57.
- 2 Schoonjans F, Zalata A, Depuydt CE, Comhaire FH. MedCalc: a new computer program for medical statistics. *Comput Methods Programs Biomed* 1995;48:257-62.