

Statistics in Applications

– Book Review

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HENDL, J. et al. *Statistika v aplikacích (Statistics in Applications)*. 1st ed. Prague: Portál, 2014. ISBN 978-80-262-0700-9.

The publication follows the *Overview of Statistical Methods* and demonstrates a wide usage of statistics and statistical methods in various fields and spheres of human life. It consists of 21 chapters, each devoted to applications of statistics in a different branch of science. The book is co-written by 14 authors who



did not count with deeper knowledge of mathematics among readers than that taught at the secondary school. There are sample applications to make it easier for readers to understand more difficult parts; they have been chosen to clarify material relationships in a concrete problem situation by figures and charts. Moreover, for the reader not to be bogged down in a stream of information there are also pictures that are merely illustrative and do not lack humour. Supplements contain not only statistical tables but also recommendations for teaching of statistics, fundamental principles of official statistics, and principles of work with files of Big Data type.

Opening chapters deal with the basics of statistics. However, it is not a typical textbook-type text; the author strives to underline issues that usually make problems to students in the Czech Republic. It results from the PISA 2012 international research that it is namely data analysis, which is the problematic part. Today, we can no longer operate just with the simplest concepts such as the average, median, and mode; classical analytical methods comprise estimation methods and hypothesis testing; nowadays, with a growing

need to make analyses of big multi-dimensional data sets, more and more coming into focus are cluster analysis, factor analysis, canonical analysis, discriminant analysis, and regression analysis; really big sets of data are worked with more and more often. Many times, all the time more frequently available statistical software does our work; however, it is not enough to simply press a button and wait for the result. A user has to possess knowledge of what data a particular method can be applied on and has to be able to deal with the results properly. Therefore, attention is briefly paid also to interpretation problems in statistics.

It is namely contemplation on interpretation of statistical results that makes chapter five. Reading any piece of statistical data one should sceptically ask oneself the following questions: Who says that? How does he know it? Does it make sense? Who is it good for?

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A chapter about Czech official statistics presents in detail mainly websites of the Czech Statistical Office (the CZSO). Readers are informed about the types of statistics (in the sense of statistical surveys) the CZSO produces. They will find many pieces of information about the volume and types of outputs. It is not only the Statistical Yearbook of the Czech Republic that is published by the CZSO once a year; the CZSO publishes lots of data from various areas of the economy, industry, and life of the society, it carries out various sample surveys, approximately once in a decade also the largest statistical event on the territory of the Czech Republic: Population and Housing Census. Unlike many other statistical offices all over the world it also processes results of all types of elections that are held in the CR.

Those who have problems with English and are not familiar with German or French either can find in a chapter devoted to the European Statistical Office (Eurostat) a detailed guide that will enable them to go through Eurostat databases and to generate their own tables in a required breakdown.

In chapter eight, we can get familiar with a concrete application of statistics for the first time – namely, population statistics. Statistics is used there as a term also in the sense of record keeping. The reason is that demographic statistics is based on keeping of records of births, deaths, immigrants, emigrants, recorded are also marriages, divorces, and abortions. As for practical applications, calculation of life tables and demographic projections are presented.

Another chapter informs the reader what gross domestic product and gross national product are, it explains how to calculate inflation, and what situation has to occur for us to speak about deflation as well as that not all persons without work are counted as the unemployed.

Further, attention is paid to availability of data from social researches. Having a big amount of various surveys many of which work with big volumes of data, new methods and approaches to work with data emerge; actually, a brand new branch is founded called computational science, which combines mathematics, various branches of social sciences, and information sciences.

Despite sociology belongs to social sciences, those devoted to it cannot avoid statistics. Although sociologists usually use simple classification to frequency tables or contingency tables, to be able to interpret the results correctly they often need to know also regression or factor analysis.

Quantitative statistical methods can be applied also when studying media communication. It does not have to apply only to measurement of viewer ratings, page traffic, weekly/daily reach, and visiting rate of the media, but also content analysis and analysis of media communications.

Two chapters deal with statistics in education. The former explains international classifications of types of education. The latter introduces to the reader various databases, in which data on education can be obtained.

Chapter fifteen deals with usage, acquisition, and analysis of statistical data in the health sector. The importance of statistics in that area is confirmed also by many articles in various biomedical databases.

Sport and statistics. Does it seem that it does not marry? Statistics in sport – it is not mere keeping of records on placing or the number of passes or goals; researchers acquire also original data via statistical surveys or use biographical database systems. The latest trend is to analyze big volumes of data that are generated by electronic recording apparatuses right during sport performances.

Do you know what kinanthropology and anthropometrics are? That is what an introduction to chapter seventeen deals with. Usage of statistics in those fields is demonstrated on case studies, which show possibilities of usage of analysis of variance and explorative or confirmative factor analysis.

Also in medicine we can meet statistics. Applications of statistics in medicine can lie in simple calculations such as the average or median or in complex analyses for which wide theoretical knowledge is expected. Complexity and difficulty of statistical procedures in epidemiological studies are illustrated by a commented study of British physicians. The authors also described statistical principles of clinical studies. Essentials of a clinical study as for its statistical part are already a specific branch of statistics. The ethical part of clinical studies has not been set apart, either.

Today, a statistical analysis is part of almost every biological study. It is proved by research works, which have been chosen to show how from usually complicated data of biological character (that were recorded often under difficult and experimentally unrepeatable conditions) one should obtain maximum gain. Selected examples thus presented the potential of statistics in biological disciplines.

The last chapter, twenty-one, is devoted to statistics and control of processes. Methodology of statistical taking delivery of goods enables to impartially evaluate whether a delivery satisfies (or not) requirements for quality as agreed upon by the supplier and the receiver.

A chance plays an irreplaceable role in our lives and therefore statistics plays such an important role in cognition and our lives. Nowadays, statistical data surround us everywhere. A study of statistics or at least awareness of where we can meet statistics, how we should understand it, but also the fact that we cannot overestimate it, can help us be better oriented in all the time enlarging amount of information.