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Responsibilities in Research: Evidence-Based Biostatistical Methods Yusuf ÇELİK^a, Goksu ÇELİK PEKERSEN^b

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Abstract

Statistical methods have been developed to provide the best evidence in scientific research. The branch of statistical science, which originates from terms such as "STATE METHODS" and "SCIENCE of STATE" and now "(STATE-TISTICS)" - "STATISTICS", consists of evidencebased methods developed with the logic of "MAKING THE RIGHT DECISION". It is mandatory for this training to be given by an expert in all health schools and universities from the beginning of the training. Otherwise, it is certain that errors cannot be overcome and stopped.

Biostatistical methods are used extensively in health field research. It is mandatory to use these methods to make the right decision. The answers to research hypotheses are found by using statistical methods, of course. If the methods are used incorrectly, it is not possible for the results and related interpretations to be correct. Mistakes made in the health field are at the forefront of human health dangers.

Keywords: Biostatistics, Statistics, Evidence-Based, Research, Right Decision



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Introduction

The Statistical methods have been developed to provide the best evidence in scientific research. The branch of statistics, which originates from terms such as "STATE METHODS" and "SCIENCE OF STATE", consists of evidence-based methods developed with the logic of "MAKING THE RIGHT DECISION". It is mandatory for this training to be given by an expert in all health schools and universities from the beginning of the training. Otherwise, it is certain that errors cannot be overcome and stopped.

Research is really a job that requires great attention, seriousness and virtue. Its accuracy should be checked step by step from beginning to end. It should not be forgotten that the results to be presented in health field research will be used by everyone for human health. Considering this responsibility, it is mandatory to comment with the right results.

Research is making the unknown known, solving complex problems by reducing them, then writing it very simply and clearly and publishing it with your name on it

The important stages in the research process are:

- Choosing a new topic;
- Developing a research question and hypothesis;
- Effective design and planning of the research;
- Being organized and methodical while conducting the research; and
- Reporting it carefully.

We need more research that improves knowledge in the field of health. Research needs to be increased to solve critical problems in hospitals and to correct mistakes.

Validity, Reliability

Validity and reliability are two basic terms in the evaluation of measurement devices such as surveys. Measurement is a basic concept in science. Validity means that a measurement tool is only sensitive to what it measures. If we take this definition into account and give an example, we can say that an IQ test will be valid only if it measures differences in intelligence. Accordingly, it means that it will not matter how tired or angry you are during the test, but only that your intelligence affects the score. When considered in terms of research, it can be said that validity is a concept related to the accuracy of research results.



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Reliability and validity are important criteria for sound scientific research. The reliability of a study is a function of accuracy and the consistency with which variables are measured. The more accurately and consistently variables are measured, the more likely it is that strong results will be obtained. In explanatory research, a high level of reliability means that the explanation provided is accurate; in descriptive research, it means that there is no distortion; whereas in a descriptive study, it means that the results can be used (under the same conditions) to make firm and clear recommendations that will have an unquestionable effect. As noted, the first element of reliability is accuracy (2).

According to Adams KA, et all. Reliability and Validity are the cornerstones of good research. Reliability means consistency, and validity means accuracy. Both reliability and validity are critical factors in research. There are two types of validity. Internal validity applies when the researchers are interested in examining a causal relationship. If a researcher wants to determine that A causes B, then he or she must manipulate A, measure B, and control for all the other extraneous variables that could have an effect on B. External validity refers to the ability to generalize the results of a study to other settings, other samples, and other methods (3).

Correct Decision

The source about the use of p-value as 0.05 in publications; Ronald Aylmer Fisher, the father of statistics, is shown. He is referred to as the scientist who introduced hypothesis testing. It is known that Ronald Aylmer Fisher simply defined the chance of error, 0.05, and made it an important habit to use this probability value. The p-values are measures of probability that occurs due to chance. These values are set as a reference value of 0.05 or 1 in 20. They are also measures of statistical significance.

The first type and second type error probabilities α and β , are probabilities that reveal the goodness of a statistical test. The small of these two probabilities indicates that the test is so sensitive. There is an inverse relationship between α and β . Generally speaking, β gets smaller when α gets bigger, and α gets smaller when β gets bigger. There is a strong correlation between α , β and sample size n. The only way to reduce both α and β can be achieved by increasing the sample volume n. The larger the sample size n, the smaller the probability of both undesirable errors α and β .

Another important issue with hypothesis testing is the concept of test power. Power is known as the probability of rejecting the null hypothesis when it is false or the probability of



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	H _o Hypothesis	
Decision	Ho True (No differenc	Ho False (There is difference)
H _o Accept	Correct decision	II . Type Error (β)
H _o Reject	I. Type Error (α)	Correct decision (Power= 1-β)

Table 1. Correct Decision and Errors in Decision Making

The power is a numerical value indicating the sensitivity of a test. Every investigator is anxious to keep both Type I and Type II errors at the lowest but it is not possible to reduce both the errors simultaneously. For a given sample size, if one is reduced, the other automatically increases. Usually, the Type I error is fixed at a tolerable limit and the Type II error is minimised. After fixing the Type I error, the Type II error can be decreased by increasing the size of the sample (4). When there is a significant difference in the population but we fail to find this difference (Type II error), our study is said to lack power (5).

It should not be forgotten that there is an important relationship between the hypothesis test to be performed and type I and type II errors. It is necessary to be careful about test assumptions. We need to be careful that confounding variables are controlled. It should not be forgotten that confounding variables that are not controlled will bias the results. The solution to incorrect statistical reporting will be prevented by researchers better learning the methods and terminology of Biostatistics science. Unfortunately, although the importance of statistical tests is emphasized, statistical errors continue to appear in serious scientific journal articles (6).

The key to preventing errors was the need for more opportunities for interdisciplinary training. It is also important to have a background in other disciplines, such as statistical methods (7).

Biostatistical methods are used extensively in health field research. It is mandatory to use these methods to make the right decision. The answers to research hypotheses are found by using statistical methods, of course. If the methods are used incorrectly, it is not possible for the results and related interpretations to be correct. Mistakes made in the health field are at





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