مجلة العلوم الاجتماعية والانسانية

المجلد13/ العـدد: 01(2023)،
ص 928- 940

دور اختيار حجم و نوع العينة في ضبط نتائج البحث العلمي

The role of the choice of sample size and type in controlling the results of scientific research

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Reçu le:13/11/2022 **Accepté le:14/05/2023** **Publié le:08/06/2023**

Résumé:

Cette étude visait à mettre en lumière l'importance de déterminer la taille de l'échantillon, ainsi que de choisir son type afin d'atteindre des résultats plus précis et crédibles qui peuvent être généralisés à la population étudiée.

Cette étude a conclu qu'il existe plusieurs façons de choisir la taille de l'échantillon et de déterminer son type. Cette sélection passe par plusieurs étapes et est contrôlée par un certain nombre de facteurs. Cette étude a également révélé que le succès de la recherche scientifique est largement lié au bon choix par le chercheur du type et de la taille de l'échantillon étudié.

Mots clés : L'échantillon, les échantillons aléatoires, les échantillons non aléatoires, la taille de l'échantillon, le type de l'échantillon, les erreurs d'échantillonnage.

Abstract:

This study aimed to shed light on the importance of determining the size of the sample, as well as choosing its type in order to reach more accurate and credible results that can be generalized to the study population.

This study concluded that there are several ways to choose the sample size and determine its type. This selection goes through several stages, and is controlled by a number of factors. This study also found that the success of scientific research is largely related to the researcher's good choice of studied sample's type and size.

Keywords: The sample , random samples, non- random samples, sample size, sample type, sampling errors.

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Résumé en arabe :

هدفت هذه الدراسة إلى تسليط الضوء على مدى أهمية تحديد حجم العينة، و كذا اختيار نوعها من أجل الوصول إلى نتائج أكثر دقة و مصداقية، يمكن تعميمها على مجتمع الدراسة ككل.

و قد خلصت هذه الدراسة إلى أن هناك عدة طرق لاختيار حجم العينة و تحديد نوعها، إذ يمر هذا الاختيار بعدة مراحل ، و يتحكم فيه عدد من العوامل، كما توصلت هذه الدراسة أيضا إلى أن نجاح البحث العلمي يرتبط إلى حد بعيد بحسن اختيار الباحث لنوع و حجم العينة المدروسة.

الكلمات المفتاحية: العينة، العينات العشوائية، العينات غير العشوائية، حجم العينة، نوع العينة، أخطاء العينات.

- Introduction:

Most types of scientific research, especially statistical methods, depend on the study, analysis and interpretation of the data collected during the study, using questionnaire, observation, interview and other scientific research tools. However, the researcher may face many difficulties due to the large size of the community, In order for the results and outputs of his research to be accurate and objective, he must conduct a field research, and here he resorts to the sampling method, and whenever the sample drawn is representative of the study population, it honestly expresses that community. However, the process of choosing the appropriate type and size of the sample to conduct the study is not an easy thing. When the researcher decides to rely on the sample in his study, he finds himself in front of many types of samples, which makes him confused, which type to choose? And will the results of his research live up to the required level? All this and that makes the process of selecting the appropriate sample a difficult decision that requires the researcher to adopt methodology and objectivity in his selection.

Based on the background of the study, the present research processes to resolve the following problem:

Research problem:

Does a good choice of sample size and type lead to the promotion of scientific research results?

The following sub-questions fall under this main question:

- What is a sample, and what are its types?
- What are the steps for selecting samples?
- What are the factors affecting the selection process?
- What errors may the researcher encounter while selecting the sample?

- How can we employ the selected sample in scientific research?

In order to solve this problem, we relied on the following hypotheses:

Hypotheses:

To answer the problematic questions, we propose the following main hypothesis:

The use of samples has a positive effect in enhancing the results of scientific research.

Objectives of the study:

The study aims to shed light on an important topic related to the importance of choosing the appropriate type and size of the sample for conducting quality scientific research, by highlighting:

- Sample concept and its types.
- The stages of sample selection, and the most important factors affecting the selection process.
- Errors in samples.
- Employing the sample in scientific research.

Reasons for choosing this topic: This subject has been chosen for several purposes such as:

- Shedding light on the factors that drive people to share at the local level.

- Highlighting the effectiveness of investment in the local capacities of citizens and their participation in the development process, as they are an important link in this chain which requires the collaboration of many actors and social institutions.

- Making a survey of social practices and representations of the inhabitants on participatory work in urban neighborhoods, based on the Algerian reality.

Study approach:

To cover the various aspects of the subject, the descriptive and analytical approach was used, which corresponds to the nature of the subject, by describing the phenomenon under study, by relying on a list of scientific references that touched on the same subject and analyzed it to reach the desired goal of this study.

Study Structure:

To answer this main problem, this research was divided into the following main axes:

First axis: the concept of the sample and its types.

Second axis: the selection of the sample.

Third axis: sampling errors

Fourth axis: Employing the sample in scientific research.

1-The concept of the sample and its types:

1-1- The concept of the sample:

Several definitions were provided to define the concept of the sample. The sample was defined as the subgroup on which the researcher applies his study, as it represents the characteristics of the total study community (Salatniyah Belkacem, 2009, p. 128). It is also defined as a subset of a society that has the same original characteristics as it belongs to, its purpose is to obtain information related to the community by selecting a number of people to study representing that community. (AbouSaleh, 1983).

The researcher resorts to the sampling method for the following reasons: (Zerouatti, 2002, p. 192)

- ✓ It is used in research whose goal is not comprehensive inventory.
- ✓ When it is impossible to study society as a whole.
- ✓ When there is homogeneity in the research community, so that the sample can express it efficiently.
- ✓ Limiting the study to a relatively small number, which enables the researcher to collect a larger number of data
- ✓ The possibility of training the respondents, as the need for a large number of them decreases when using the research by sample.

1-2- Sample types:

There is almost complete agreement among specialists on dividing samples into two main types: **random samples (probability)**, and **non-random samples (non-probability)**, which in turn are divided into other types that we summarize as follows:

1-2- 1-Random samples (probability):

In which individuals are chosen randomly, and each member of the original community is given the opportunity to appear without interference from the researcher in the selection process, and there are several types of random sampling:

- **Simple random sample:** It depends on the principle of random selection of vocabulary so that all elements of the population have the same probability of selection. If the size of the population is (N), the probability of selecting any element in the sample is (1/N), and the selection process is either by return, which means that the item that was withdrawn in the first step is returned and

can be withdrawn for a second and third time, and so on, or it is without return, meaning that the item that was chosen is not returned again. (Mahmoud El bayatti, 2008, p. 157)

- **Regular Random Sample:** The disadvantage of a simple random sample is that it depends on long and tedious procedures in the case of a large sample size, especially when using scraps of paper or tables of random numbers. Regular samples are one of the random samples that are characterized by ease and simplicity of use, especially in the case of large samples. (Idriss, 2003, p. 461)
- **Stratified sample:** The stratified sampling method is based on selecting a sample that represents the subgroups in the study population with the same proportions, it can also be used to select equal samples from all subgroups if the research aims to compare them. The objective of stratified sampling is to ensure the desired representation of the sub-populations, in which the researcher divides the research community into categories according to the purposes of the research, for example: according to gender (males/females), according to age, according to the level of education, and according to any variable that the researcher sees as having an impact on the objectives and results of the research. Then the sample items are selected randomly from each of the categories, taking into account the percentage of their presence in the research community in some of the research variables and its results. (Medini Othmane, 2019, p. 234)
- **Cluster sampling (multi-stage sampling):** In the cluster sampling, the sample units are selected from the total sum of the units of the community into several stages, provided that the total community is divided first into groups of units, and they are considered elementary units from which a sample is chosen. This is the first stage, then the primary units in the selected sample are re-divided into secondary units from which a new sample is selected, and this is the second stage, and so on. (Zerouatti, 2002, p. 196)

1-2- 2 -Non-random sample (non-probability):

In turn, non-random drawing is a scientific method that many researchers resort to due to the lack of availability or difficulty in obtaining the database, i.e. the list of the study community, they are called non-probability sampling because they do not depend on the law of probability or draw on the way of random sampling. In this case, the information cannot be generalized to the entire population as it is in a random drawing. However, the information and results that are available from this drawing remain specific to the

study sample only. Especially since there is a type of research that is not concerned with representing all societies as case studies, or research on the study of specific behaviors (Angers, 2006, p. 309)

This model of samples has types, including:

- **Intentional sample**: it is specific and intended by the researcher because he believes that it is a true representative of the original community and is used in:
  - Public opinion research
  - Studying the political positions of an audience in the event of a demonstration, it is difficult for the researcher to obtain a list of the names of individuals.
  - When choosing one village that represents the rural community, considering that this village represents the characteristics of the different villages. (Azzouz, 2019, p. 93)
- **Quota sample:** is very similar to the stratified random sample, because the researcher divides the study population into categories, and then chooses a number from each category that is proportional to the size of the category. However, the main difference between the two types is that the researcher in the quota sample does not choose its vocabulary in a random way, and does not depend on the percentage of each group in the total community.

  Quota preview depends on some features of the research community, some numerical data must be known, and knowing the proportions of each category and respecting them in the drawing that is not made according to the probability drawing. (Angers, 2006, p. 316)
- **Purposive sample:** Purposive sample is generally used in exploratory studies that require measurement, or testing of specific hypotheses, especially if the research complex is not dimensionally controlled, and therefore there is no accurate framework that enables the sample to be tested at random. In such research, the researcher resorts to selecting groups of units that fit the purposes of his research. (Zerouatti, 2002, p. 198)
- **Snowball sample:** It is also called the network sample, and the method used here in obtaining the sample is to interview a small number of people, and after the end of the interview, each person is asked to name other people who have the same characteristics in question, and so on until the sample size specified by the researcher is reached. (Monder, 2007, p. 171)

2 -Sample selection:

The source from which the sample is taken is called the sampling frame, and it is a comprehensive inventory of all the vocabulary of the study community,

the sampling frame can be divided into sections to facilitate the selection process. Each section is called the sampling unit. The size of the study community affects the selection of the sample items. If the community size is very small, it is possible not to obtain a sufficient number of items, but if the community size is large, the problem is how to choose the sample among them. (Beladjal, 2021, p. 170). In order to be able to choose the appropriate sample, the researcher must follow a number of steps.

2 -1- Design and sample selection steps: (Ahmed, 2010, pp. 198-199)

2 -1-1-Defining the problem :

In the beginning, the objective of the survey or the problem to be studied must be clearly defined, and it requires defining the studied problem and the goal of its study. So that the required statistical problem can be distinguished, and then we search for the different possible designs or for the questions that we want to find answers to, as well as identify the possible sources from which we will get the answers to the questions prepared to achieve the objectives of the required study.

2 -1-2-Selection of the community you want to take sample from:

It is necessary to define and define the society to be examined accurately and to know the elements involved in it so that it is possible to judge the affiliation of an element to the society or not easily and conveniently.

2 -1-3- The data to be collected in light of the research objectives and hypotheses, the methods of analysis to be followed, the nature of the units and the community, and this is done by consulting the data user and the researcher who analyzes it.

2 -1-4- Determining the degree of accuracy required:

There may be some doubts about the results of studies that are carried out using samples, because the sample did not include some important units, that is, only a part of the population was studied. In addition to measurement errors that occur during the study, Accuracy can be increased by taking larger samples and using more accurate measuring devices, which results in increased costs, in order to complete any research, it is necessary to determine the degree of accuracy required that allows an acceptable error rate that does not affect the research objectives.

2 -1-5- Determining the method for collecting and measuring data:

There are several methods like indirect communication, such as: mail, telephone, fax...etc, and direct communication methods such as personal interviews conducted by the enumerators. Direct communication is the best in terms of reducing the rate of non-response, as well as wrong answers, but this method is costly in view of other methods.

2 -1-6- Frame: A frame must be created on the sampling units so that the sample can be selected, without this frame the population coverage cannot be complete.

2 -1-7- Determining the sampling unit and sample type, determining its size and knowing its costs.

2 -1-8- Field work arrangement: It includes preparing the necessary maps for the survey location, training enumerators, and a review mechanism to control the weaknesses in the questionnaire. It also includes making a special arrangement in case of non-response.

2 -1-9- Conducting a previous test before field use of the questionnaire:

The completed questionnaire is tested by carrying out an empirical research on a group of individuals as a test sample from the units of the community under study. Based on this pilot test, the form can be modified if necessary, it is also possible to benefit from this test experiment, and that is the possibility of using it to obtain the sample size, and the different estimates and variances.

2 -1-10- The last step is to summarize and tabulate the obtained data, and analyze them to obtain estimates of the community parameters and measure their accuracy.

Despite the aforementioned points and their practical importance, a number of factors must be taken into consideration in order to determine the type and size of the sample to be studied.

2 -2-Factors determining the type and size of the sample:

2 -2-1- Factors Determining Sample Type:

The most important determinants of sample type are the following: (Mohamed Farid Sahn, 1998, pp. 162-163)

- ✓ The nature of the characteristics that the research aims to identify in the target community of the study.
- ✓ The level of representation required in the sample for all the vocabulary of the target population of the study

- ✓ The number and characteristics of the vocabulary of the research community, which must be included in the sample
- ✓ The objectives achieved by the secondary sources of data collection, and the nature and level of the role played by the primary sources of the required data.
- ✓ The sampling frame, which is a list that includes all the sampling items that are available to choose from at each stage of the sampling process, where the lack of it makes it impossible to choose random samples, which requires resorting to non-random samples.
- ✓ The nature of the study community, the more homogeneous the community, the more extensive the selection of the sample type, and vice versa if it is not homogeneous, which narrows the selection to only a few types.

2 -2-2- Factors Determining Sample Size: (Mohamed Farid Sahn, 1998, pp. 166-168)

There is a set of determinants that affect the researcher's attitudes when determining the sample size in practice, the most important of which are:

- **The aim of the research:** The sample size depends to a large extent on the expected results of the study, and the level of accuracy desired in these results. There is a direct relationship between the required level of accuracy and the sample size that is selected.
- **The cost of the study (budget):** Although study-related conditions should not be the main or only factor in determining the sample size, this does not mean that the approved assignments for studies and research do not influence the decision to determine the sample size. Accordingly, the decision maker must strike a balance between accuracy considerations on the one hand and cost considerations on the other.
- **Time considerations associated with the study:** Time is one of the factors affecting the selection of the sample size, and it may sometimes conflict with the accuracy of the results, For example, choosing a large sample size in order to increase the accuracy of the results requires more time to conduct the study.
- **Analytical Methods Considerations:** There is no doubt that the data analysis requirements for one variable are different from the data analysis requirements for two or more variables, these requirements also differ according to the nature of the analysis required for the same variables. Accordingly, data analysis methods affect the sample size selected.

3- Sampling errors:

The expected errors when using the sampling method as a method of data collection are called total sampling errors, and they can be divided into two main types: (Chaar, 1997)

3-1- Sample error:

The difference between the properties of the statistical sample and the properties of the statistical population from which that sample is drawn is called the sample error, it is the result of studying part of the community, not the whole community, to estimate the parameters of this community, and the sample error depends on: the sample size, the variance of the sample vocabulary, the method of designing the sample, and it consists of:

3-1-1- Chance error(random error):

This is due to the nature of random selection, where the results of the sample may differ from the results of the population, and the amount of chance error depends on the sample size, the population variance, and the method of selecting the sample.

3-1-2- Bias error:

This error does not depend on the element of randomness, and it usually occurs in one direction, either by increase or decrease, and it cannot be limited or limited to it. Bias may occur when choosing or estimating.

3-2- Non-sample error:

An error that is not related to the type of sample or the method of drawing it is called non-sample error, and it is considered more serious than a sample error. This error increases with the increase in the sample size, and is related to each stage of the research processes, which may be represented in the poor design of the questionnaire or the interview, or errors in conducting the interview or coding.

Among the most important of these errors are:

- ✓ Inability to clearly define the purpose of the study.
- ✓ The existence of an incorrect statistical framework.
- ✓ The difficulty of clearly defining the community.
- ✓ Drop some units when collecting data.
- ✓ Errors resulting from non-response.
- ✓ Errors resulting from not choosing a representative sample of the study population.

In general, **the total error of the study = sample error + non-sample error.**

4-Employing the sample in scientific research: (Zerouatti, 2002, pp. 199-200)

The researcher must employ the type of the sample and the method of its selection in the research, by demonstrating the suitability of the type of sample chosen for the research. For example, to clarify the close relationship between the specificity of the type of the selected sample, and the research axes, with proof that these axes are suitable for this type of sample without the other types or better than other types, indicating this as follows:

First: the identification of the sample.

Second: the method of selecting the sample.

Third: Employing the sample.

Fourth: Specifications of the sample: It is preferable that the specifications of the sample be included after the definition of the sample and the method of selecting it and employing it in the research. Specifications of the sample are taken from the first axis in the form. This axis is in the interview, in the observation, in the documents and administrative records, or in the official statistics and reports. Usually we find the sample specifications under the heading: general data or personal data. It generally includes:

- sex.
- Age.
- Family status.
- Educational level.
- Other.....

The general data on the sample must also be linked to the axes of the research topic, which means linking it to the empty data in tables, shapes, graphs, or maps, and the rest of the questionnaire or observation axes that are in close relationship with the topic axes and research hypotheses.

Conclusion:

Our study concluded that if the aim of the research is to reveal or prove the truth, it is necessary that the steps taken should be systematic according to a scientific method and using research tools that are accurate and objective. In the case of research in which it is not possible to obtain information from all members of the community due to the large number, the use of the sample is the most appropriate way to collect data and information about the phenomenon studied. It helps researchers in various economic,

political, social, legal, and other fields to prepare their field studies on the basis of which decisions are taken rationally and objectively.

This study enabled us to reach a number of conclusions, including:

- ✓ The sample is divided into two main types, the random sample (probability), and the non-random sample (non-probability), which in turn is divided into other types.
- ✓ Selection of the sample is carried out according to stages and steps to reach the appropriate sample that suits the study community and corresponds to the cost and budget of the research.
- ✓ - The type of sample is chosen depending on a set of factors, including the nature and characteristics that the research aims to identify in the community, and the nature of the study community as a whole.
- ✓ Determining the sample size depends on many factors, including the objectives of the research, and time considerations associated with the study.
- ✓ There is a direct relationship between the required level of accuracy and the sample size that is selected, as increasing the sample size is an effective way to reach more accurate results that can be generalized to the study population.
- ✓ The researcher must pay attention to the sites of error in choosing the sample, which was divided into two types, sample errors and non-sample errors, which together constitute the total error of the study.
- ✓ The researcher must employ the type of the sample and the method of selecting it in the research, as well as linking the general data about the sample to the axes of the research topic.

From the above, it becomes clear the importance of using sampling methods to enhance the results of scientific research. If the researcher is able to determine his sample, the set of information that he will obtain from this sample will be sufficient, and it is much better than what the researcher obtains from the total sum of the members of the community.

Based on the results, there are a number of recommendations suggested by the study, which are summarized as follows:

- ✓ It is necessary to pay attention to the sample and choose the appropriate type and size, which represent the community the most faithfully to reach accurate results.

- ✓ It is necessary to know how to use and apply sampling methods, and then compare between these methods in order to make the right decision.

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