The Role of Statistics and Sampling in Survey Research

Ihezie Okekwe
Department of Political Science,
Chukwuemeka Odumegwu Ojukwu University,
Igbariam, Anambra State, Nigeria
okekweihezie@gmail.com

Abstract

This work titled, "The Role of Statistics and Sampling in Survey Research," critically examines the place of statistics and sampling in survey research. The data collection was done through secondary sources. Our main objective was to interrogate the vital role played by the two concepts of statistics and sampling in survey research. Thomas Hobbes rightly asserted that lack of knowledge made the life of man "solitary, poor, nasty, brutish and short". It is knowledge that makes the life of man in society worth living and statistics and sampling are two of the most important tools used by man to generate information necessary for him to make and implement rational decisions. Programmes and actions hinged on the outcome of statistical and carefully sampled survey research usually deliver predictable outcomes. This paper looks into the ways statistics and sampling in survey research can be utilized as tools of enquiry and information gathering.

Keywords: statistics, sampling, survey research

Introduction

The world is generally ruled by knowledge. Without knowledge man finds it difficult to live in the world. In fact, the life of man in the world would be akin to the picture painted by Thomas Hobbes who said that the lack of knowledge makes the life of man "solitary, poor, nasty, brutish and short" (2022).

In his quest for knowledge, man employs the method of research. According to Asika (1991), research implies the application of certain techniques of learning in particular areas requiring explanation or exposition. The process of acquiring knowledge involves certain techniques and these techniques are ordered. It is not a haphazard process but follows certain

procedures. It is through the process of research that one acquires knowledge to solve his numerous problems confronting him in society.

The world is full of problems and man must apply his knowledge of research in addressing the problems. Hence research is any organized inquiry that aims at providing information towards the solution of identified problems. It therefore follows from the above that the saying that any identified problem is half solved is very apt here. Research is a problem solving technique and it is useful to man in addressing issues confronting him in society.

This work adopts the analytical framework in this research and the major objective is to underscore the role of statistics and sampling in research. The work is divided into several parts. Part one is the Introduction. This is followed by meaning of concepts where the terms "statistics", "sampling" and "survey research" are explained. Part three is on the role of statistics in survey research while part four deals with the role of sampling in survey research.

Meaning of Concepts

Statistics

Statistics is the mathematical science involved in the application of quantitative principles to the collection, analysis and presentation of numerical data. According to Dudge (2006), statistics is the study of the collection, analysis, interpretation, presentation and organization of data. As a result of the quantum of issues that needed to be studied, it becomes expedient to delineate all those issues into a "manageable" category in order to arrive at conclusions that could stand the test of time. By making use of quantitative principles, information or data obtained would be reliable. And again reliability ensures that the conclusions arrived at would also be valid.

Furthermore, according to Obasi (2007), statistics is a discipline with far-reaching application in the social and behavioral sciences, and it is substantially concerned with the rule-governed translation of facts into numbers or numerals. In some cases, the use of symbols is equally applied in statistical manipulations or

computations. It further involves the determination of relative quantitative attributes of patterned phenomenon and their use in forecasting the outcomes of definite processes, often on the basis of hypothesis or generalizations produced by the samples thereof (Obasi 2007).

It is because one cannot study the universe or the entire population that social scientists usually resort to the delineation of their study into "manageable" levels through the process of "sampling". This work will delve shortly into the role of first Statistics and then Sampling in Survey Research with a view to finding their usefulness in survey research.

Sampling

Sampling is the method of selection of a unit for study. As I stated above, man needs to acquire knowledge in order to solve the numerous problems confronting him in society And because there are a lot of problems and many issues requiring man's attention, and because man does not have enough time and resources to devote adequate attention to all these issues, there is the need to select a sample of the issues or people/things representative of the given issue or subject of enquiry for study. Sampling is a process used in statistical analysis in which a predetermined number of observations will be taken from a larger population. This definition presupposes that because of the limitation of time, resources and vastness of the universe (or entire population) needed to be studied, a sample (which is a part of the universe or a given population) is taken for study.

It must be posited at the onset that the methodology used to sample from a larger population will depend on the type of analysis being performed. There is the Simple Random Sampling method, among other types of sampling methods. When taking a sample from a larger population it is important to consider how the sample will be drawn. To get a representative sample, the sample must be drawn randomly and encompass the entire population. An example may be germane here. A lottery system could be used to determine the average age of students in a university by sampling 10% of the students from each faculty.

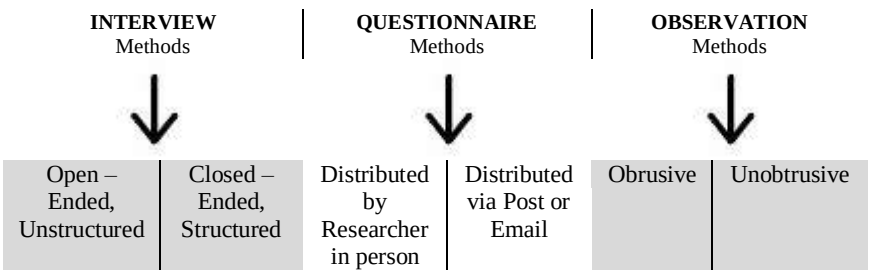
From the above, one can regard sampling as a method of studying a few selected items instead of the totality of given items or units. The small portion of the entire items or units selected for enquiry, study or analysis is called a Sample. The sum total of items of particular characteristics from where the sample is drawn is called the Population. Further examples will suffice. We can take a sample of rice to see whether the rice is well boiled or not. Or, we can check a sample of a given solution to know how much that given solution is concentrated. Thus, from the sample, we can infer about a Population.

Survey Research

Survey Research is a method of research in which a group of people or items is studied by collecting and analyzing data from only few people or items considered to be representative of the entire group. Survey research can also be conceptualized as a method of sociological investigation that uses question-based or statistical survey to collect information about how people think or act. For example, a possible application of survey research to a context might involve looking at how effective the mass media is in the formation of public opinion or in causing a shift in public opinion about a given matter.

In survey research, the sample selected is normally large while the variable(s) studied is (are) limited. When conducting a survey, the researcher utilizes certain instruments, like questionnaire, interviews and personal observations, to collect data. An example of survey research may be a research into the Incidence of Juvenile Delinquency in South Eastern Nigeria.

One can diagrammatically depict the tools to be employed in carrying out the above research thus:



For some social scientists, the survey method of research is limited

to interviews and questionnaire while some others include a third which is observation. Generally, the survey method is used when we want to find out information about a person's opinions, motivations, attitudes, behaviors, feelings, emotions or party political preferences.

Interview Techniques

Interview technique involves a verbal engagement between interviewer and interviewee in which the former tries to elicit information about particular situation or subject. It uses questionnaire but administered by the researcher or trained interviewers.

Types of interview method: There are two types of interview methods: open -ended and closed-ended Methods.

a. Open-Ended (Un-coded) Question: In un-coded questions, the respondent has the choice of expressing his views and opinions freely without any restrictions from the interviewer. This is also referred to as Unstructured Interview.

b. Closed-Ended (Coded) Method: This does not give the respondent the choice of expression, only allows him to respond in an expected or standardized manner. This is also called Structured Interview.

Advantages of the Interview Technique: One of the Advantages is that it allows for greater proportion of the population to be investigated so the question of whether one is educated or not is not a barrier. Again, it makes for a much better sample of the population because most people will like to participate in discussion section.

Furthermore, the interviewee is able to cope with the problem of misunderstanding of the question because the interviewer is there to explain or elaborate on it.

Above all, it is a more effective way for revealing information about complex emotionally laded subject and for probing the sentiments behind an expressed opinion.

Finally, gestures of the interviewee can be rightly interpreted.

Disadvantages of the Interview Technique: According to Akuezuilo et al (2003), the interview technique has some demerits. Apart from the fact that it is time consuming, it is one of the most difficult techniques to apply successfully. Above all, the danger of interview bias is very real and constant.

Questionnaire Method

The questionnaire method is a self-administered interview, so questions must be carefully designed and self-explanatory. This is because there is no interviewer or proctor to interpret the questions to the respondent.

Advantages of the Questionnaire Technique: First, it is relatively less expensive; may involve only travelling expenses. Closely related to the above is that it requires less skill than the interview technique.

Secondly, it can be administered to a large proportion of the population at the same time whereas interview technique has to deal with each person at a time. Furthermore, the questionnaire can be sent through post or email unlike the interview method.

More importantly, the impersonal nature of questionnaire, its standardized question plus its standardized instruction for response allows for uniformity of measurement from one situation to the other.

Finally, it provides anonymity for the respondent, allows him to express his feelings and opinions without any inhibitions arising from the presence of an interviewer

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Disadvantages of the Questionnaire Technique: The questionnaire method takes a lot of time and might get lost in transit. If mailed, sometimes they are not returned at all.

This technique can only be used with a population that is highly educated. Furthermore, it has low rate of return from respondents because they have nothing at stake.

Moreover, there is the possibility of the misinterpretation of the question especially when the questions are ambiguous.

Additionally, the validity of the questionnaire depends on the

ability and the willingness of the respondent to provide the information requested.

Finally, it does not provide the researcher with sufficient opportunity for developing interest on the part of the respondent nor the rapport needed to permit him to ask questions of a personal or embarrassing nature.

Observational Method

This is used in eliciting information on the behavioral patternof a group. It is usually used when other methods are impossible. Example is information about children or schizophrenic people

The observational method is divided into two types:

a. Unobtrusive Method: This is also referred to as non-participant observation: here the researcher does not take part in the group being studied.

b. Obtrusive Method: This is also called participant observation.

This is one of the best methods of eliciting information about the behaviour of the population / subject being studied. It involves direct action by the researcher. It is not a simple method but rather it involves a combination of techniques such as direct observation, participant interviewing, informant interviewing, archival study and actual participation.

It involves a lot of stages:

1. Entry Point: The researcher decides on the group he wants to study and makes contact to be admitted. This is the most difficult stage.
2. Establishment of congenial relationship with the members of the group.
3. Compiling and analyzing data; this involves 3 sub-stages, namely: i.Making mental notes about the observed situation.

ii. Jotting down the interactions with the subject.

iii. Writing your formal report or what is called log of observation.

Disadvantages of Observation Method: Since the Observation technique is designed to study the behaviour of the population or subject, it is impossible to provide opinion, feelings, motivations, fear, anxiety, future anticipation etc. Above all, it cannot deal with

future behaviour or private behavior; for example, sexual activity and dreaming which are unfeasible or impossible to observe by the social scientist.

Moreover, there is the problem of bias which arises from two reasons. First the presence of the researcher may alter the behaviour of the subjects. Secondly, there is also the issue of subjective interpretation which the researcher might assign or impute to the observed situation – for instance, normative value. The disadvantages might however be overcome by the researcher cross-checking the various stages; by using ethnographic methods, this may be ameliorated.

The Role of Statistics in Survey Research

According to Montgomery et al (1994), the field of statistics deals with the collection, presentation, analysis and use of data to make decisions and solve problems. In fact, everyone both in professional careers and in everyday life through contact with newspapers, television and other media is presented with information in the form of data. We often need to draw some conclusions from the information in the data and so some understanding of statistics would be helpful to anyone.

From the above, therefore, a major role of statistics in survey research is that it ensures the collection, presentation, analysis and use of data to make decisions and solve problems. It was strongly posited in the introduction of this work that man needs to apply his knowledge to solve his numerous problems. This knowledge is acquired through the process of research.

It was also mentioned in passing that survey research involves the process of one-on-one contact between the researcher and the population (universe) being studied. As a result of this, data generated from the exercise through statistics is more often than not very reliable. Hence, it is again safe to argue that another role of statistics in survey research is that it ensures the production of what one could describe as data that is "trustworthy".

Closely related to the above is the question of validity. Here the question is, will this help answer the research question? (Yates et al 1994). According to Akuezuilo et al (2003), validity refers to the

degree to which an instrument measures what it is supposed to be measuring. Thus a major role of statistics in survey research is validity. Since data obtained through urvey research proves very successful when carefully carried out, the logical outcome is validity. This is a remarkable role played by statistics in survey research. So the first requirement of an experiment is that it is valid. Otherwise it is at best a waste of time and resources or misleading.

Efficiency is the next significant role of statistics in survey research. Is the experiment the correct size, making best use of resources? Surely, the use of experimental resources to get the most precise answer to the question being asked is not an absolute requirement but it is certainly desirable. Statistics (and statisticians) help to identify misleading abuses of data that may be portraying an inaccurate account of a situation.

Statistics is the science of learning from data and of measuring, controlling and communicating uncertainties; and it hereby provides the navigation essential for controlling the course of scientific and societal advances. This depicts that correct application of statistics helps through survey research to generate meaningful scientific discoveries and advancement; in this way, societal advancement and development, all things being equal, is maximized. There is then no doubt that man's avowed claim as an agent of societal change and development is greatly realized and enhanced through the role played by statistics in survey research.

Finally, Kadituwakk (2010) observed that statistical methods and analysis are often used to communicate research findings and to support hypotheses and give credibility to research methodology and conclusions. It is important for researchers and consumers of research to understand statistics so that they can be informed, and evaluate the credibility and usefulness of information and make appropriate decisions. Statistics plays a vital role in researches. For example, statistics can be used in data collection, analysis, interpretation and presentation. Use of statistics will guide researchers in research, for proper characterization, summarization, presentation and interpretation of the result of research, either to consider a sample or the whole population.

The Role of Sampling in Survey Research

Although sampling has been defined by many people, we need to note this definition by Obasi (2007) who defined sampling as:

> the careful and systematic selection of a smaller number of units from a universe or general population such that in terms of characteristics the smaller is a proportionate representation of the latter and may therefore be an effective basis of a study from which generalization can be needed to cover the whole.

Another important role of sampling in survey research relates to its usefulness with respect to coverage, cost savings and its effect on response rates (Iannacchione 2011). In fact, on the issue of saving time and money, Obasi (2007) did not agree less. He argues thus: "Clearly then sampling is a means of saving time and money, averting excess scope or over-distension, maintaining a practical span of control, minimizing problems and negative contradictions with the environment and achieving speedy results."

Before delving into the different types of sampling available to the researcher, it is instructive to highlight that sample facilitates the task facing the survey researcher by making it possible for him to study an acceptable population without indulging in the daunting task of studying the entire population or universe. This important role of sampling in survey research must not be lost because it would appear an effort in futility if the survey researcher is faced with unpleasant but challenging scenario of studying the whole universe.

Another role sampling plays in survey research is that it reduces considerably the element of bias in social science research. Because in sampling one or more techniques may be combined the chances are that the issue of bias that may occur from the researcher's opinion, motive, attitude, etc., will be drastically reduced or eliminated altogether.

Through the use of sampling, researchers are able to generate primary data (as opposed to secondary data) which are highly regarded in social science research. For instance, a researcher who wants to study community development in Ukpor, headquarters of Nnewi South Local Government Area, must come in contact with the people he wants to study. This is different from library research

which elicits only secondary data.

At this juncture, we look at the types of sampling technique social science researchers use. Broadly, there are two types of sampling, namely, probability sampling and non-probability sampling.

Under probability sampling, we have the following types:

1. Simple random sampling
2. Cluster (area) random sampling
3. Stratified random sampling

Under non-probability sampling there are:

1. Quota sampling
2. Accidental sampling
3. Purposive (or judgmental) sampling
4. Snow-ball sampling

The difference between non-probability sampling and probability sampling is that in the latter (that is probability), the researcher can specify the probability that each element of the population being studied are included in the sample. In other words, we can actually calculate that a particular unit of a particular element of the population being studied is included in the study.

On the other hand, in non-probability sampling, there is no way the researcher can determine that each or all of the elements of the population are included in the sample. However, the advantage of non-probability sample is simply a matter of convenience and economy. These advantages over-weigh the risk involved in ensuring that all elements of the population are included in the sample. This paper would have discussed the various types of sampling in greater detail but for lack of space.

Conclusion

Thus far, this work has been x-raying the role of statistics and sampling in survey research. The analysis points to the fact that these two variables have far-reaching effect on survey research. There is no doubt that the role played by these variables (of statistics and sampling) contribute greatly to the advancement of survey research and research generally. It also goes a long way in

utilizing these variables for acquisition of knowledge and effectively applying research to advance the course of knowledge

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