UNIVERSITI TEKNOLOGI MARA

ENHANCEMENT OF SYSTEMATIC SAMPLING FOR CLINICAL SURVEY: SYSTEMATIC SAMPLING WITH CONSECUTIVE APPROACH

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ABSTRACT

Survey is a one of the common primary data collection approaches in research in various fields including the clinical field. Findings from clinical surveys are important because recommendations from the findings will have a direct impact towards public's health. Data collection process in clinical survey usually involves an ordered sampling frame and has become very challenging for clinical researchers, who need to handle multiple tasks in their clinical service whereby the clinical service is their top priority. Therefore, due to time constraints, the general practice of data collection in clinical survey is to adopt non-probability sampling such as consecutive sampling. The consequence of this kind of practice would produce results that can be invalid since the results could be influenced by sampling bias. In order to reduce sampling bias and to obtain more precise results is to promote the use of probability sampling technique in a clinical survey. The motivation behind this study is to introduce a modification on systematic sampling. The existing approach in selecting sample based on systematic sampling is to take only one unit sample in each interval selection. So far, none of the researchers have attempted to investigate the possibility of selecting more than one unit sample in each interval selection with respect to modified systematic sampling. Therefore, the purpose of this study is to explore the possibility of recruiting more than one unit sample in each interval selection with respect to modified systematic sampling. The main objective of this study is to develop a newly modified systematic sampling that allows more than one unit sample to be collected in each interval, and to prove such selection is able to derive an unbiased estimator for the population mean. Comparisons in terms of sampling efficiency and consistency of the estimator were made between the newly modified systematic sampling and systematic sampling based on simulation analysis and real-life datasets. This study has successfully developed the terms and condition for selection of the newly modified systematic sampling and most importantly, the estimator that is derived from this sampling technique has been proved to be unbiased, efficient and also consistent. This modified systematic sampling is named as "Systematic Sampling with Consecutive Approach" or in short SSC. Preliminary evaluation for relative efficiency from two simulated datasets have produced relative efficiency between 1.26 and 2.06 which indicates SSC is more efficient. Testing relative efficiency on focusing data with normal distribution showed that SSC is more efficient with 12 out of 15 different datasets with relative efficiency ranges from 1.030 to 19.563. Simulation analysis with iteration of 1000 times was conducted from 25 different populations has also showed SSC is more efficient with 20 out of 25 different data. Other evidences were derived from testing 2 published datasets and 2 real-life clinical datasets. Results shown SSC is more efficient for at least 1 from published dataset and 1 from real life dataset. Besides efficiency, SSC is also consistent where the sample statistic is similar to the parameter when testing from small to large sample size. This newly modified systematic sampling in indeed an innovation in sampling by the virtue of combining two sampling techniques, consecutive sampling and systematic sampling. The main contribution through the outcome of this study is to enable clinical researchers to utilize SSC to ensure the acquisition of valid results in clinical survey in an ordered sampling frame.

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CHAPTER ONE
INTRODUCTION

1.1 BACKGROUND OF STUDY

This chapter begins by describing the background of this study which consists of four subsections: (a) the extent of research in clinical research and its emphasis on the methodology, (b) conducting surveys for clinical research and the importance of a representative sample for a survey in an ordered sampling frame, (c) the ideal sampling procedure for obtaining a sample for a clinical survey in an ordered sampling frame and the extent of its application, (d) the need to seek for further improvement from the usual consecutive sampling by the incorporation of the principles of probability sampling. These have lead to the condition of the problem statement, then followed with research objectives, scope of study and also significance of study.

1.1.1 The Extent of Research in Clinical Research and its Emphasis on the Methodology

People from all walks of life will require healthcare services from time to time, and therefore a good healthcare system is of prime importance to the entire human society. To this end, it is very important that healthcare research will grow and develop in tandem with the fast changing healthcare landscape. Due to the various societal factors which contribute to the busy and modern lifestyle we are having nowadays, it has been found that human diseases have now become more complex than before. These complex human diseases will therefore require more advanced clinical research for finding new ways of treating and preventing them. A constant effort to achieve better clinical outcomes by searching for new ways to fight against all these complex human diseases have made it mandatory for clinical researchers to continuously seek improvement for all their research methods.

There is a very broad scope of clinical research which spans the entire spectrum of clinical medicine. This has been manifested by a large number of published scientific and medical manuscripts available worldwide. Taking PubMed