

ON THE MATHEMATICS OF THE REPRESENTATIVE METHOD OF SAMPLING¹

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1. Introduction. This paper is designed to present certain topics in mathematical statistics which find application in some of the problems that arise in what has been termed the representative method of sampling.

For descriptive purposes, it seems convenient to consider two aspects of the representative method. The first of these may be called the method of *purposive selection*. This method can be roughly characterized by saying that it is the method employed when the samples are chosen in such a way that each sample will possess one or more characters, say certain averages, which are identical with the corresponding characters in the population from which the samples are drawn. The mathematical conditions which underlie this method are rather stringent, and both theoretical and practical investigations seem to have proved that in general no great amount of confidence can be placed in the results obtained.

The second aspect of the representative method has been styled the method of *random sampling*. This method can take either of two forms which we may call the method of *unrestricted random sampling* and *stratified random sampling*. The first of these is the classical method of procedure. That is, a sample is drawn at random from a given population and on the basis of these data inferences are made concerning the nature of the population. On the other hand, when the method of stratified random sampling is used, the population is first separated into a large number of parts, called strata, and the sample consists of an equally large number of "partial samples," each partial sample being drawn from a different stratum. It appears, both from theoretical and practical results, that this method of stratified random sampling enjoys many advantages not shared by the other methods.

We now turn to the main purpose of this paper, namely that of enumerating some of the theorems and methods of mathematical statistics which serve useful purposes in this theory. Discussion of how these theorems find application in the method itself has been reserved for other participants on this program.

2. Estimates. From our preliminary remarks, it is apparent that the representative method is much concerned with the problem of estimating certain

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