Drawing Random Samples in Cross-Cultural Studies: A Suggested Method[1]

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A simple method for drawing a random sample, which must be used to meet the assumptions of inferential statistical tests utilized in cross-cultural studies, is to take a list of the cultural universe and select the sample from it by some random procedure. A problem inherent in this method is that no one has defined the unit, culture, in such a way as to make this practicable. A grid method for drawing random samples is suggested as an alternative that effectively avoids this problem. The advantages and disadvantages of this grid method in comparison with other sampling methods are also discussed. Although the grid method does not produce a completely random sample of cultures, as defined, it seems to conform more closely than other methods now in use to this ideal.

CROSS-CULTURAL studies involving inferential statistics have a history in anthropology nearly as long as that of the discipline itself, and have recently enjoyed a resurgence of interest. Many of the problems involved in the application of descriptive and inferential statistics to cross-cultural research have been attacked with a great deal of success, as in Naroll's work with Galton's Problem for which he and D'Andrade offer five solutions (Naroll 1961a, 1964a; Naroll and D'Andrade 1963), and a statistical methodology to test data for bias (Naroll 1962). In addition, questions of independence and equivalence of statistical units, summarized in Köbben (1952), have had tentative solutions proposed by Naroll (1964b), Ember (1963, 1964), and others.

RANDOM SAMPLING

Despite these encouraging developments, no one has yet proposed a practical method for drawing a random sample of cultures. A random sample is defined for purposes of this discussion as a sample drawn from a population in such a way that all possible samples of size *n* have the same probability of being selected. In other words, the probability of selecting each culture from the population of cultures is equal, and the selection of one culture in no way influences the selection of other cultures. Blalock (1960:392–412) offers a short discussion of sampling from the statistician's point of view, while more extensive consideration may be found in Deming (1950) and Sukhatme (1954). Application of sampling theory to the special problems of anthropology may be found in Driver (1961:322–326) and the same author (1965) offers the most recent summary and list of references on the general application of statistics in all fields of anthropology. In addition, most of the references cited in this paper discuss sampling to some extent. The importance of this problem for anthropology is seen in the fact that the classic Neyman and Pearson theory that underlies a broad class of inferential statistical tests assumes, among other things, that random sampling from a population has been used.

Perhaps an example will make the necessity of meeting this assumption clear. Euclidean plane geometry assumes that all figures are applied to a perfect, flat plane. If this assumption is met, then the shortest distance between two points is a straight line. If, on the other hand, the assumption is changed so that all figures are to be applied to the surface of a sphere, it will be apparent that the shortest distance between two points is an arc—that is, if the assumption of a flat plane is not met, then a straight line is curved (Eisenhart 1947:178, prob. 1). In anthropology, if we do not meet the assumption of randomness, whether we have a dozen cultures or a thousand in the sample, in effect the line will be curved. In the case of the larger sample, it might have less of a curve or even no curve,

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but we will have no way of knowing this unless we can be assured that the assumption of randomness has been met. As Murdock *et al.* observe:

> Innumerable comparative studies have applied statistical techniques to samples of the world's cultures. These samples have been of varying size and have been drawn with varying degrees of care. None, however, has been random, and for two very good reasons. First, a random sample is impossible unless the universe from which each is drawn is clearly delimited, so that any member has an equal chance of being drawn in any given sample. Second, the universe of human cultures has never been analyzed and defined in such a manner as to make possible the drawing of any kind of a genuinely random sample. Under such circumstances, the use of probability statistics in comparative research is unwarranted [1963:249].

Köbben expresses essentially the same point of view when he states, "Hobhouse, Wheeler, and Ginsberg regard the Australians as more than thirty tribes and the Semang as one, although the latter are numerous and live in scattered bands like the Australians; but nobody knows them well enough to enumerate the various groups into which they are divided" (1952:132). Naroll (1964b) makes an effort at defining what ethnographic units are; that he was not entirely successful may be judged by the comments appended to his article. Murdock (1967) describes a similar effort to define the units of the ethnographic universe, an effort that may ultimately be successful (Chaney 1966:1468).

The present study will take a different approach and propose a method of drawing an adequate random sample that does not depend upon the successful definition of an ethnographic unit.

THE GRID METHOD

A grid method, frequently utilized by cultural geographers who deal with much the same sorts of data as those used by anthropologists, provides a technique whereby the problem of unit definition associated with drawing a representative sample can be avoided. It should be stated at the outset that the procedure described below for sampling from a universe of cultures does not provide a true random sample of cultures as defined previously. However, it does enable an investigator to obtain a sample of cultures that is free of many of the biases inherent in other commonly used sampling techniques, and from this sample generalizations to all known human cultures can be made with some degree of confidence.

A similar method has been used previously in anthropology by Naroll (1961b:4) but was not known to the authors at the time the present method was developed. Naroll's sample utilizes two randomly located arcs divided into segments rather than a world-wide grid.

A large equal-area projection map of the world should be secured, along with a grid sufficient in size to cover the map. The spacing on the grid lines should be approximately the same as five degrees of longitude along the equator of the map. This grid is randomly placed on the map and secured. Beginning at the upper left hand corner, all grid lines are numbered in succession from zero along both the horizontal and vertical axes. A random number table such as that of Fisher and Yates (1963) is entered and the first two numbers taken for the horizontal axis, the second two for the vertical axis. The coordinates of the two axes define a point on the map. Numbers not on the grid are discarded. The next two numbers are drawn, and so on, until about twice as many points have been chosen as the number of cultures desired in the sample. Drawing twice as many points insures that the sample will be adequate in size even though many points do not touch upon land and others are not close enough to any known culture to be used. Blocks consisting of the four grid squares adjacent to each chosen point are drawn upon the map.

McNett found in an earlier variation of this method that about one-third of the squares will not be on the map or will not touch upon some land mass. Every culture within the remaining squares should be located by latitude and longitude. As a start, sources such as Murdock (1957) and Murdock *et al.* (1962–67) can be consulted. These sources provide more than a thousand cultures for which degree locations are given. In addition, it is suggested that specialized sources for each square be consulted, preferably those offering the finest division of cultures. After all cultures have been located, the one closest to the chosen point is selected for the sample. Some squares may remain blank and adequate references for others may not be available. In the former case, the square is discarded; in the latter, the next closest culture is taken. Ties of distance are solved by flipping a fair coin.

There is nothing sacrosanct about a five-degree grid or a ten-degree block around the point, although these have been found convenient to use. The main requirements are an equal-area projection map and a randomly oriented grid used in conjunction with a random number chart. However, the size of the square around the chosen point should not be too large or too small. If too large, there would be a greatly increased amount of work necessary to locate all cultures; if too small, too many blocks will remain unfilled.

PRACTICALITY

One may ask, "Will this system provide a practical random sampling procedure for selecting cultures?" In order to answer this question several issues must be examined. In the first place, the grid is an entirely arbitrary set of lines oriented at random. We may be fairly sure, then, that the locations of the intersections of grid coordinates represents a uniform, nonbiased set of points upon the surface of the earth. When we apply a random number chart to this grid, again arbitrarily assigning numbers on the horizontal and vertical axes, we are drawing a truly random sample of points on the map, any of which has an equal chance of being selected. Consequently, the cultures closest to these random points will themselves be a random selection of the cultures located on the map from the sources used and all other cultures that could have been placed on the map around other, unchosen points.

A consideration of conventional methods of sampling and the difficulties found in applying them to anthropological data will point up the advantages of the grid method. For example, a nonrandom, opportunistic sample is one in which cultures are selected on the basis of the availability of published reports. Descriptive statistics may be useful in summarizing the results of opportunistic samples, but the results cannot be generalized beyond the sample actually employed. Samples of this type were drawn by Tylor (1889) and Hobhouse, Wheeler, and Ginsberg (1930). Murdock (1949) and Whiting and Child (1953) also used this kind of sample but applied inferential statistical tests to it. They, therefore, violated one of the assumptions of inferential statistics —that the sample is random.

A second possibility is a simple random sample which can be obtained by a variety of methods. It may be drawn from a list of cultures, for example, by use of a random number table or by rolling a die or flipping a coin. Ember (1963) drew such a sample from the World Ethnographic Sample (WES) list (Murdock 1957), and quite clearly states that his results can be generalized to the WES and no further. Murdock (1957:665) objects to simple random sampling because it "would yield only a percentage of all the world's cultures without reference to their distribution by types" and continues that "purely random sampling would inevitably omit many of the truly unique cultures of the world, each the sole known representative of a distinctive type." One advantage claimed for the grid method is that it will result in representation of all the diversity that exists in the cultural universe if the sample is adequate in size. One may caution that an attempt to introduce diversity into any sample will destroy the representatives of the sample. Cochran, Mosteller, and Tukey observe, "It is clear that many . . . groups fail to be represented in any particular sample, yet this is not a criticism of that sample. Representation is not, and should not be, by groups. It is, and should be, by individuals as *members* of the sample population" (1954:18). They go on to note that types can only be considered in devising the sampling plan, which would involve some kind of stratification. As discussed below, stratified samples in cross-cultural surveys are impractical. Thus, an attempt to assure absolute diversity through their use creates more problems than it solves, especially when one considers that any kind of random sampling satisfies one of the major requirements of inferential statistics. From a statistical point of view it is not important that every single cultural type be represented in a sample but rather that every culture has an equal probability of being represented in the sample. One may question whether any unique culture from a universe of thousands ought to be assured representation in any given sample.

As stated above, we feel that the basic argument against the simple random sample is that it may be drawn from a list in which some areas are represented by a great many finely subdivided cultures, while other areas have only a few undivided cultures on the list. The result is that the former will be over-represented in the sample; the latter underrepresented.

A stratified sample is another type that has been widely used in anthropology. In disproportionate stratified sampling, the cultural universe is divided into a number of sections or strata, and representatives are chosen at random from each of these. In order to apply standard inferential statistics, it is necessary to know how many cultures actually occur in each stratum so that the results may be weighted accordingly. The other possibility is the use of proportionate stratified sampling, in which one chooses cultures for the sample in the same proportion for each area as the number in the area is to the totality of cultures in the universe. The lack of a clear definition of "culture" makes this impossible here, as it does with the simple random sample.

A disproportionate stratified sampling approach has been used by Murdock (1957) to draw the World Ethnographic Sample. His procedure was to divide the world into six regions and the regions into ten areas each. Between five and 15 cultures were chosen from each area without regard to the proportion of known cultures. The sole criterion for the number chosen was the desire to secure representatives of as many different and distinct types as possible. Consequently, one must ascertain the proper weight to represent the known cultures in each of the 60 areas. If the number cannot be determined, then inferential tests cannot be carried out.

Naroll (Naroll and D'Andrade 1963:1059) suggests that a stratified sample be drawn which consists of "one randomly chosen member from each of the sixty culture areas in the World Ethnographic Sample." This method will produce results which cannot even be generalized to the WES unless they are weighted according to the number of cultures Murdock used for each area. Thus, this method will yield only a biased estimate of all known cultures.

More recently, Naroll (1967) has described a proposed "Quality Control Sample" to be drawn for the Human Relations Area Files (HRAF). In describing this sample he says, "These files are to be 60 in number—one for each major culture cluster of the world" (Naroll 1967:70). Cultures from each of these 60 cultures were listed if they had adequate bibliographic references, and one culture from each cluster was randomly chosen to represent it. In only one case was the culture chosen not already in the HRAF, and a substitution was made (Naroll 1967:75–76). The same objections outlined above apply, although Naroll has made an effort to list all sources of bias in this sample and to control for them. (His procedures will be described later, since they are generally applicable.)

A final alternative is the cluster sample. Following this procedure, the universe of known cultures is divided into segments and some of these clusters are drawn at random. Such a method, while yielding a probability sample (i.e., one for which the probability of being selected may be determined for each cluster), does not produce a random sample. Concerning this problem Blalock states, "Errors introduced by using simple random sampling formulas for data collected from cluster samples can be extremely serious" (1960:409). The only solution to this problem is to find some way of equalizing probabilities, in much the same way that this is accomplished for stratified samples. Mueller and Schuessler (1961:357) caution that when it is absolutely necessary to use cluster samples without weighting, one must be careful to assure as much diversity as possible within each cluster.

The application of cluster sampling in cross-cultural studies has been proposed recently by Murdock *et al.* (1963) and Murdock (1967). The universe would be divided into approximately 400 culture types, each composed of one distinctive type-culture and, possibly, others that are highly similar to it. A sample of any size could be drawn from this universe and then one culture from each selected cluster would be picked to represent it. Equal weighting of probabilities using this method is complicated by the fact that a second stage is added, that is, the clusters are further subdivided by choosing only one member to represent each without regard to the number in the cluster. Furthermore, the procedure results in the reverse of Mueller and Schuessler's restriction, since high uniformity, rather than diversity, is Murdock's criterion for cluster formation.

The grid method avoids the problems listed above because it draws a random sample of grid points and chooses the nearest culture to represent each point. This effectively overcomes the difficulty of the usual methods, which represent well-known areas at the expense of less extensively studied cultures.

It also avoids the problem of unknown weights that must be applied to members of stratified and cluster samples before inferential statistical tests may be applied. As an example, the occurrence of a point within an area of highly refined subtypes, say Australia, negates the advantage of sheer numbers, since only one subtype can be picked. If the point falls within the area inhabited by the Semang, they now have as much chance as any one Australian tribe of being represented.

DISADVANTAGES

The grid method has some possible disadvantages. Although we consider each culture to exist at only one point, no matter what its actual area, it is apparent that cultures extending over a large area will prevent the existence of other cultures near the same grid point, thus increasing slightly the large culture's chances of selection in the sample. The culture, however, can be closest to only one point and no more. Conversely, small areas of enormous diversity may be penalized in that only one of the different cultures existing can be selected. This is another argument for keeping the block size relatively small, since this would allow as many cultures as possible to occur in separate blocks.

The location of the one point at which a culture is considered to exist is somewhat arbitrary, since boundaries of cultures are often hard to define. Inability to delimit cultures is not important in the grid sampling method because the area can be ascertained for either a grossly or finely divided culture.

McNett found, using an earlier version of the grid method, that the number of cultures in blocks varied from one to 69. It might be argued that picking one culture from each block discriminates against cultures in blocks that contain many cultures. In this connection it can be noted that we have no way of knowing whether the block that contains one culture, for example, could not also be subdivided into 69 cultures—as the Semang-Australian example demonstrates. Moreover, the grid has an infinite number of possible locations before placement and several thousand thereafter. We maintain that any culture, however finely subdivided, has an equal opportunity of being closest to a grid point before placement and that each block has an equal chance of being drawn. It seems to us, therefore, that the number of cultures in a given block is not a major issue in the grid sampling method, although it is a major issue in stratified and cluster sampling procedures.

Another disadvantage of the proposed grid sampling procedure, shared by all other methods, is that a sample can only contain cultures which have been listed in a reference source. Thus, only known cultures for which adequate references exist can be chosen. In a cross-cultural study using data rarely gathered by ethnographers, it might be difficult to find enough cultures with adequate references. This could lead to prohibitive bibliographic costs. In such a case, some other method of sampling might be more economical. Naroll (1967:76–79) has described a number of tests that may be made for a sample to insure against bibliographic bias. These tests could be applied to data from any kind of sample, including the grid method, if the researcher desires. According to the grid method a known culture is selected that is closest to a grid point, and, because contiguous cultures tend to be highly similar, this procedure is probably satisfactory from a descriptive point of view.

As we have seen, the selection of a sampling method depends to some extent on the particular problem under investigation, but it is our belief that the procedure here outlined represents a more practical approach to drawing random samples in most cross-cultural studies than any heretofore used. It has the advantage of minimizing sources of bias inherent in other sampling procedures in common use and, in addition, is in keeping with the recommendations of Blalock:

> Although social scientists and others who use applied statistics have sometimes tended to ignore assumptions [underlying statistical tests], thereby reaching unwarranted conclusions, it is also possible to be overly perfectionistic. Since we never deal with situations as simple as coin flipping or drawing cards from a perfect deck, it is always possible to question every procedure as falling short of the ideal. One can be so much afraid of violating assumptions that he refuses to use any statistical technique at all. Especially in a discipline characterized by exploratory studies and relatively imprecise scientific techniques, it is necessary to make compromises with reality. The most sensible procedure would seem to be to make as few compromises as possible within the limits of practicality [1960:111–112].

NOTES

[1] The grid method outlined in this paper was originally proposed by Roger E. Kirk and developed

by Charles W. McNett, Jr. An earlier version of the method was used by the senior author in a thesis for the Ph.D. degree at Tulane University. Arden R. King, Robert Wauchope, and Thomas Ktsanes, members of his committee, provided many helpful comments, as did Ward H. Goodenough and Raoul Naroll. Finally, Frank W. Moore, executive director of the Human Relations Area Files, provided a copy of the article on the HRAF sample prior to publication. The authors, however, remain responsible for the contents.

[2] This article was written while the senior author was a member of the faculty of Baylor University, Waco, Texas.

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