

I HAVE STATED MY HYPOTHESES NOW WHAT DO I DO WITH THEM—PART I

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Dear Reader,

In an earlier letter we discussed the three approaches to research which were: historical, survey, and experimental. Another way of looking at "types" of research is to look at them in terms of levels. And for our purposes we can describe two levels: those studies which describe certain attributes or gather descriptive information about them, and those studies which attempt to discover the merits of previous expectations, or to predict occurrence of certain phenomenon.

"Which comes first, or does it matter?"

It certainly does. If you are researching an area about which you have little knowledge, you must begin at the descriptive level. First of all you identify the phenomena you want to observe then you record carefully your observations and write them up in a verbal descriptive fashion. To express the ideas numerically, you use descriptive statistics, such as the measures of central tendency, percentages, and percentiles. This description of attributes only states "what they are" but does not answer "why are they so" or what is the relationship between two phenomenon you have studied.

Variables

"What are these attributes?"

These attributes or phenomena are called **variables**. You must identify, define and quantify them. In behavioral or social sciences, the data consists of the measurement of attributes of subjects—human being or animals. According to Harshbarger¹ the attributes with respect to which individuals differ are called variables. But if there are attributes with respect to which individuals in a group do not differ, they are called "constants" or "**controlled variables**". For example, if you take all your subjects as students of standard ten the educational level of subjects is constant. Whereas educational levels of

"housewives" may be termed as a variable.

Defining Variables

If your area of interest is delivery of primary health care, you may be interested in assessing what variables support or inhibit the implementation of that model of health care delivery. The question is certainly timely and appropriate. Here the variables are stated but stated broadly.² Let us look at it more carefully.

"What factors influence the implementation of primary health care in rural village setting?"

The variables here are "factors" and "primary health care". Are the variable measureable?

Well, they are stated in very broad terms; the variables here are identified but not defined or quantified.

We have no idea what kind of factors the researcher has in mind. He/she could be referring to community participants, composition of the health team, environmental factors, or the interaction of all these phenomena. What else do you notice about the statement?

Well, primary care, the other variable, is also unclear, but may be I am supposed to know what that term means.

You may have a good definition on primary care. But we are interested in the term as defined by the researcher; that is how primary care is to be viewed in this study. Having general problem statements like this one is not wrong. In fact, it's essential to have broadly conceived areas of concern, at least initially. But it is essential to define the term as variables so that they can be quantified and measured. That is, the variables have to be able to work for you, to operate, or become "operational". Thus you need to spend some time in formulating **operational definitions** of your variables.

For example, in one project by Pradilla,³ et. al., the overall area of concern was the magnitude of health and nutritional problems in South America. The authors then narrowed their focus to an identification of selected "risk factors" within a selected geographical area of South America (in this instance, Costa Rica). They further narrowed their focus to the local level, which they defined as small rural or urban communities, selection of "priority actions" for "specific target groups" (in this instance, rural children in Cavdelaria, Columbia). The authors defined "risk indicators" were: a) infant mortality; b) general mortality; c) excreta disposal (any kind % houses); and d) incomes % population with more than C-5,000-yr. Another excellent example is Peng's study where he operationalizes the "function of traditional birth attendants". These are simple stated as, 1) the recruitment of acceptors; 2) the remotivation of drop-outs; and, 3) the resupplying of pills to continuers.

"So the process is general to specific from an overall area of concern, to a very careful definition of the variables."

I would say for the most part, yes. But in some areas, the process is not as clearly delineated because one may not even know which variables are operating. In their study of medical students, Becker and his associates, authors of the book **Boys in White** noted "We had no well-worked-out set of hypotheses to be tested, no data-gathering instruments purposely designed to secure information relevant to these hypotheses, no set of analytic procedures specified in advance." Furthermore, they noted, "We cocentrated on what students learned as well as on how they learned it. Both of these assumptions committed us to working with an open theoretical scheme in which variables were to be discovered rather than with a scheme in which variables decided on in advance would be located and their consequences isolated and measured."

But in general, the process begins with general ideas, and then narrows in focus.

But let's look at other "areas of concern" possibilities for, say, health services research. Such broad areas being considered could be those outlined in Table 1.

Table 1. Areas of Concern⁶

1. Needs and demands as a basis for planning, programme formulation and management.
2. Approaches to planning and management.
3. Alternative strategies for primary health care delivery supporting infrastructure.
4. Economic aspects of health services.
5. Financing of health services.
6. Monitoring and evaluation, analysis of trends, definition of indicators.
7. Standardization of terminology, methods and procedures.
8. People's behaviour in relation to health and health services, community participation in health action.
9. Traditional practices.
10. Development of appropriate health technology.
11. Health manpower development and management and its integration with health services development.
12. Intersectoral action for health promotion.
13. Disease control.
14. Emergency services.

These are all broad areas which, as stated, are not researchable. In order to create a study on any one of these, one would have to further refine the topics and more clearly define the variables.

"How do I define variables?"

Part of your thinking on this comes from your conceptual model and part from a review of acceptable definitions used by others. The dictionary and other general references are also often useful. Ultimately, the definition is created and remains consistent throughout the study. These variables then must somehow be quantified or measured. For example the variable "traditional practices" may be quantified as the number of rituals related to birth which are carried out by a village religious leader over a specified period of time. "Traditional practices" is too vague an idea, but one could count numbers of specific religious rituals. You ask the question, is this the variable to be tested? As measured by what a frequency count, a test instrument, a survey, an interview, or some other means of gathering data?

Independent and Dependent Variables

Let us examine this example you conduct a health teaching programme for dental care for a group of school children. You measure their improved dental condition by counting the number of tooth caries at an interval of six months. In this example, variables identified are age, sex, socio-economic background of children, and frequency of dental caries. The researcher can manipulate the age, sex and socio-economic background of the children by grouping them or excluding certain groups and holding them constant (e.g., record only male children). These groups of variables are called **independent** variables for they are considered as presumed cause of the **outcome**. Whereas, the variable of "dental caries" is called the **dependent** variable as it is dependent on the independent variables and is considered as the presumed effect.

"They are like 'output' measurements."

You are right. Independent variables are like the input or the stimulus whereas the dependent variables are like the output or response.

Let's examine another example:

"Traditional birth attendants who are exposed to 10 hours of training will show significantly lower infant mortality rates than traditional birth attendants who have not had 10 hours of training."

The independent variable is——?

"Well, its the training that will affect the change in the birth attendants, so the type of training is the independent variable."

Correct. The dependent variable?

"The thing that is being affected by the training is infant mortality, so that is the dependent variable."

Very good. Now why is this important? I mean, what difference does it make. So I have identified them as dependent and independent. After you identify and define the variables, then you ask, now how do I **measure** them. Each variable will then be quantified in some way, so that the information can be collected and counted.

"What about the variables that we do not consider?"

Other Variables

That's a good question. In the above ex-

ample, there are certain variables which may influence the relationship of dental knowledge and practice in the prevention of dental caries, even though they can not be seen. Learning ability, motivation and anxiety are some of the factors that may intervene in child's practice of dental hygiene. These are called **intervening variables**. The researcher's role is to recognize the existence of these variables and incorporate them in discussion of findings.

"You have mentioned in your example of the dental study, the independent variables of age, sex, and socio-economic background. There could be other variables such as religion parents education, father's occupation, and so on, which may have a significant influence on the dependent variable."

"But I cannot manage all of them—what do I do then?"

You rightly guessed the importance of looking at all variables of the design. These independent variables that are not manipulated by the researcher are **extraneous variables**. You cannot ignore them, because your research result may give wrong conclusions. The best idea is to include them in the design if possible. When you design the experimental study, some of these variables remain common to both the control and the experimental group; thus, their effects get neutralized. There are several methods by which influence of extraneous variables can be minimized a subject which can be explored in other texts."

References

1. Harshbarger, T.H., **Introductory Statistics**, N.Y.: The Macmillan Co., 1974.
2. **Ibid**, pp. 27-27.
3. Pradilla, A., "Application and Approach in Community Work" **At Risk Facts and the Health of Young Children**, Cairo, Egypt, 1978, pp. 223-234.
4. Becker, N. S., et.al. **Boys in White Student Culture in Medical School**, Chicago: The University of Chicago Press, 1961, pp. 1717 as reported in George M. Foster and Barbara Anderson, **Medical Anthropology**, N. W. John Willy and Sons, 1978, pp. 183-184.
5. **Ibid**, pp. 183-184.
6. **WHO Efforts in Health Services Research Progress Report**, June, 1978, to May, 1979: ACMR Sub-Committee on Health Services Research, HSR 79.1, Alexandria, Egypt, 26-29, June, 1979, p. 7.
7. Best, J. **Research in Education**, 3rd ed., New Delhi, Prentice-Hall of India, 1977, p. 95.