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Professor Koch's able presentation addresses three fundamental (one might say eternal) questions encountered by statistical practitioners in all fields of application. First is the distinction between the study population and the target population. To provide a crude but common example, what are the implications of relying on statistics for persons of black and other races (excluding whites) as the only available substitute for statistics on the black population? Second, there is the distinction between the variables under study and the concepts they are operationally assumed to represent. To pursue the preceding example, if our interest is in the relationship between education and income among blacks, what are the implications of utilizing data on "years of school completed" as a proxy variable for education, "median personal or family income per year" as a proxy for income and a study population comprising perhaps 90 percent black persons and 10 percent persons of wide but indeterminate ethnic or racial heterogeneity in place of our "target" population of blacks? Third, Koch addresses the role of technical assumptions pertaining to the research design, existing state of knowledge and the statistical objectives to which a particular research design is fitted. A basic question here is the extent to which the underlying assumptions and data requirements of a given research procedure are in fact satisfied by the data available.

Koch recognizes a common theme in these three questions -- the need for a contextual perspective for evaluating the validity of the use of a particular statistical method by examining the specific nature of its given applications in relation to the interpretation of the results obtain -ed in that application. What this seems to mean is that no statistical method is equally valid in all situations or contexts in which it may be applied mechanically. This interpretation is supported by Koch's argument that the proper application of any statistical methodology to practical problems demands a critical re-examination of the research design and the underlying model at each stage of the research process, so as to incorporate the "feedback" information that is yielded by each stage.

In the several papers he has drawn upon in his presentation, Koch offers some useful guidelines to the statistical practitioner for obtaining the optimal amount of information to meet given research objectives under given constraints of time and resources. He provides illustrations of alternative research strategies for obtaining limited information on a given subject at reduced cost and for obtaining more detailed information from the same body of data but at greater cost. In these examples, Koch stresses the importance of retaining a clear understanding of the research objective -- not only what is the problem or the hypothesis being tested, but how much information is required to satisfy that objective at minimum?

The common 'theme' linking these three questions can perhaps be expressed in plainer English: how poor or imperfect can statistics be before they fail to provide any useful information? As Koch recognizes, any attempt to answer such a broad question must be strongly contextual; the illustrative examples he provides only begin to illuminate the enormous range and diversity of statistical applications and the real-world situations wherein these applications are made. In the face of this contextual diversity, any general advice is bound to be of the sort attributed to the Delphic oracles -- e.g., "Collect all the data you can and use good judgment" -equivalent to the successful stock investor's advice, "Buy low and sell high!"

It is evident that the need for an "interface" between statistical methodology and statistical practice arises out of the imperfect correspondence between statistics as bodies of data drawn from the real world and statistics as a set of methodological principles derived from probability theory and related mathematical concepts. Koch's contribution properly addresses precisely that "interface." But in doing so, he fails to consider a number of constraints that commonly operate in the context of the practitioner's work. First are the resource and time constraints. Nobody ever has, or ever will measure everything that is ideally required; conclusions must invariably be reached on the basis of incomplete or imperfect information. The methodologist can offer useful guidelines for obtaining the minimum information required with maximum efficiency, as Koch does, but he or she cannot provide general guidelines as to how much information is needed or what precision of measurement is required. These issues must be decided by the practitioner in consultation with the client. Second are constraints on communication. If some (many?, too many?) practitioners are less sophisticated statistically than methodological experts, their clients may often be far less sophisticated than the practitioners. To use current jargon, the practitioner must "interface" with a variety of clients whose familiarity with statistical language and concepts is rudimentary at best. This implies that the practitioner must deal with a double problem of translation -- he or she must first adapt the methodologists' guiding principles to the particular context and must then convert the research findings into language that can be understood by the client. This second "interface," between practitioner and client, is at least as important as that between practitioner and methodologist, since it alone assures that statistical findings can be allowed to play a role in public and private policy decisions.

A third set of constraints relates to the decision process itself. The classic portrayal of the statistical practitioner at work is closely similar to that of the practicing scientist: the problem is given by the client and the use

made of the findings obtained is likewise up to the client. Between these limits, the practitioner is expected to utilize the most appropriate techniques within the context of "value-free" principles of objectivity. But for some practitioners, the above delineation of roles often breaks down. The client may have a problem, but the problem may turn out to be different from the one originally expressed. For decisionmakers in particular, a common problem is that a decision has already been reached and the statistical practitioner is expected to provide a veneer of "objective" validation for that decision. Such cases obviously involve basic ethical principles: statistical practitioners cannot legitimately serve as advocates for particular positions unless these positions are supported by objective statistical evidence. But between the ideal of the objective researcher and the outright demand for a hired statistical gun, there is a vast gray area wherein the practitioner must redefine a problem, adjust its requirements to meet the limitations of the available data and resources, and interpret the research findings in order to best serve the client's needs. To be effective in this latter task, the practitioner must try to see the world as the client sees it; yet in doing so, he or she must carefully avoid seeing the data as the client would presumably like to see them. Few methodologists can offer useful counsel in dealing with this kind of communications problem.

Finally, there are the innumerable situational constraints to which Koch makes occasional reference. Here again, the methodologist can only illustrate by a few well-chosen examples the enormous range of phenomena to which statistics find application and the great diversity of circumstances affecting particular applications. By situational constraints we mean the need to recognize and consider the changing social, cultural and historical context from which our statistical observations are obtained. This contextual meaning is insignificant in the many fields of application so favored by the methodological experts -- grain fields, mice in laboratories, and the like. But it is highly significant in the realm of socioeconomic applications, where each statistical observation is subject, in principle, to an interpretation that reflects an historically unique context. A familiar example may suffice to illustrate this point: the rate of unemployment in country A may be strictly comparable with that in country B insofar as both measures employ the same concepts and measurement procedures. But its interpretation may be quite different because of differences in the historical meaning and experience of unemployment in the two countries. The same problem may arise in interpreting identical measures of unemployment in the same country at two widely separate points in time. It is arguable that such interpretations move us far beyond the legitimate purview of the statistical practitioner, but to admit this is to seriously restrict the role of the statistician in addressing complex social problems.

We cannot all be statisticians, and the statist-

statisticians among us cannot all possess equal abilities. Hence the "interfaces" between methodological experts and practitioners, and between practitioners and clients are likely to persist as major problem-areas. Koch offers some useful and well-illustrated guidelines for coping with the interface between methodologist and practitioner. Perhaps only the practitioner can develop corresponding guidelines for dealing with the more demanding "interface" between practitioner and the ultimate user of statistical information.