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Comment: Psychiatric Statistics and Clinical Information

Juan E. Mezzich and Chul Woo Ahn

The role of statistics in psychiatry is broad and emerging, attributes also applicable to psychiatry itself, a clinical science with biological and psychosocial underpinnings. It may be helpful to give attention to historical perspectives and informational complexity in order to understand the current role of statistics in psychiatry as well as to be prepared to appraise its future directions.

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Early endeavors to use quantitative methods in clinical and epidemiological psychiatry are best illustrated by the pioneering works of Philippe Pinel, Jean Etienne Esquirol, and J. B. M. Parchappe in the late seventeenth century and first half of the eighteenth century. Their guiding principles were careful observations of clinical events and a critical and quantitative investigative approach. These French pathfinders are responsible for what is probably the earliest documented use of statistics in psychopathology and psychiatric care. Of particular interest here is Parchappe (1839) who, in his *Recherches Statistiques sur les Causes de l'Aliénation Mentale*, not only presented frequency analyses of patients and patient-related events, but also ascertained relationships between complex domains, i.e., physical and moral causes and

types of psychopathology. The categorical concepts developed by Esquirol and Parchappe strongly influenced the way hospitalized populations were analyzed later in Europe and America, as exemplified by the 1844 report on lunacy in England and Wales referred to by Everitt.

Although the proportion of psychiatric reports in which statistics are used has been generally increasing over the past decades, such use has been typically restricted to a few basic classical techniques, predominantly χ^2 and t tests (DeGroot and Mezzich, 1985).

Along with this constriction to elementary approaches, a ritualistic focusing on testing for statistical significance appears to be widespread, as well pointed out by Everitt. The failure to report research findings which are not statistically significant, i.e., p value $>$ 0.05, should be noted among the important sources of bias reporting. This appears to arise from the often justified fear that journal editors will judge papers presenting such results as not worthy of publication. Rosenthal (1979) gave a name to this concern by describing unreported results as sitting in the "file drawers" of the researchers who performed the studies. It appears important to estimate the minimum number of unreported studies needed to overturn a conclusion reached from reported studies. If the number of unreported studies required to reverse the conclusion is large, the possibility that the conclusion is an artifact of censoring would be small.

The above mentioned limitation to classical techniques additionally reflects psychiatry's isolation from many of the recent methodological developments in statistics, such as time series analysis, survival analysis, exploratory data analysis, discrete multivariate analysis, Bayesian methods, and stochastic modeling. An illustrative word about some of these developments in addition to those discussed by Everitt may be helpful here.

One of these techniques is logistic regression analysis, which is eminently pertinent to many research questions and data structure situations in psychiatry, such as those involving demographic, diagnostic, and treatment categorical variables and requiring the combination of such variables for prediction purposes. Fleiss, Williams and Durbo (1986) have noted that while logistic regression analysis has become widely adopted in such specialties as cardiology and epidemiology, this has not happened in psychiatry as yet.

Random effects or hierarchical models (e.g., Morris, 1983) have great promise for dealing with intersubject variability, a prominent problem in psychiatric data. In hierarchical models, variation *within* a subject is distinguished from variation *between* subjects. If an attempt were made to estimate parameter values for each subject using only his/her data, a large variance for these estimators would be obtained since limited data are available from a number of subjects. However, parameter estimates corresponding to a single subject's data can be improved by appropriately using the data of remaining subjects. Hierarchical models enhance the estimation of individual parameters and of the distribution of parameters of a population of subjects. Given the often large intersubject variability in psychiatric data, attempts should be made to introduce more powerful analytic tools such as hierarchical models for the analysis of specific psychiatric data sets and to examine the applicability and properties of these models.

Statistical modeling can also have a distinct role in dealing with sampling and selection factors affecting the representativeness of a data set. For example, the demographic and psychopathological profile of a patient population may be strongly influenced by help-seeking attitudes and access to care barriers. In many studies it would be imperative to ascertain the probability of being in the sample for various patient types and to correct for selection bias. A detailed discussion and references of statistical models that deal with nonrandomness or bias factors are presented in Bayarri and DeGroot (1986).

Among the emerging areas in psychiatry presenting the greatest methodological challenges and opportunities for statistical contributions is clinical information systems. Issues such as the formalization and quantification of psychiatric concepts to make them amenable to efficient information processing are fundamental here (e.g., Mezzich et al., 1986). Also of crucial importance is methodology for the longitudinal use of clinical information in order to monitor systematically the patient care process and to study course of illness in a naturalistic setting. Techniques such as time series, survival analyses, and hierarchical linear models are clearly relevant. Some issues and proposals in this arena have been discussed by Strauss et al. (1985), ten Horn et al. (1986), and Bryk and Raudenbush (1987). A related line of work with significant potential impact at local, national, and international levels is mental health diagnosis and service statistics (Gulbinat, 1983; Kramer and Anthony, 1983). This involves the development of more effective indicators of mental illness and well-being and of new models of information support.

The development and enhancement of collaborative relationships between statisticians and psychiatric clinicians and researchers is of utmost importance for successful work in this interface and for advancement of the whole field as cogently argued by Everitt. Many psychiatrists still think of statistics as a computational activity to be carried out at the end of a project, thus missing the opportunity for the statistician to contribute to project planning and implementation. This professional should work as a colleague with the psychiatrist to keep preconceived ideas in proper perspective, articulate research questions as clearly as

possible, and discuss data collection procedures and analytic techniques vis-à-vis their pertinence to the research objectives and to logistical circumstances. On the other hand, it is essential that the statistical consultant be familiar with the substance of psychiatric theory and practice and possess pertinent interpersonal communication skills.

A topic related to the latter is the teaching of statistics for the psychiatrist, a need well emphasized and examined by Everitt. Additionally, it would seem advisable to consider, from a content stand point, discussion of methods for formalizing and quantifying psychiatric concepts as well as of the value and limitations of various data collection strategies. More generally, didactic effectiveness may be enhanced by integrating this teaching of statistics within the context of educational programs on research design and methodology, and by emphasizing practical and thoughtfully supervised exercises with actual research cases.

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Comment

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Professor Everitt argues that statisticians can and will play a major role in the development and advancement of psychiatric research. By developing close working relationships with investigators in psychiatry, I have found that there are several levels of involvement where a statistician can make important contributions. On the most basic level, and because "psychiatry is a relatively young science," this relationship will often begin with helping an investigator to carefully articulate a set of research questions, including discussions of what kind of data are available or need to be collected to answer these questions, or whether the questions can be answered at all. Of course, this includes developing protocols which will answer these questions. This activity could formally fall under the heading of the principles of experimental design, but as Professor Everitt has suggested, experimental design in the broader sense of including how to think about and do research, with a strong emphasis on the principles of the philosophy of science. For the statistician, it is an activity which is often time consuming, and, since it may not yield a tangible product, may be difficult to document professionally. Sometimes, in the early stages of an investigation, it results in a fundable grant proposal with the statistician listed as a consultant or even as a co-investigator. More often than not, it results in a psychiatrist who thinks more clearly about research and recognizes and appreciates the collaborative role of a statistician.

By far, the most exciting aspects of consulting in psychiatry are encountering new problems, unique to psychiatric research, that lead to interesting statistical and methodological research. Professor Everitt discusses two examples of the use of Cox's proportional hazards model to problems in psychiatry. Although no new problems are discussed here, the application of this methodology clearly was superior to the initial analyses considered and contributed to a deeper understanding of the problems. It is interesting to note that although a standard methodological tool in other

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