I / A Brief Overview of Base Rates

The term "base rate" refers to the prevalence of an event, such as a symptom, sign or disorder, within a given population. For example, the base rate of dementia in the general population of individuals over age 85 is approximately 20% (American Psychiatric Association, 1994). The base rate of self-reported memory problems at seven years post-injury in a sample of hospital patients admitted following closed head injury was 38% (Oddy, Coughlin, Tyerman, & Jenkins, 1985). The importance of base rates in the clinical sciences is fundamental. Variations and covariations in symptom base rates among various populations (including the lack of symptoms, or a base rate of 0%) inform the definitions and the diagnosis of diseases and disorders. This aspect of the application of base rate information in clinical decision-making is commonly recognized. Even if a clinician is not thinking "base rates" *per se*, he or she is aware that certain symptoms are more likely to be observed in certain disorders, whereas other symptoms typically are not associated with the disorder. There are, however, additional ways in which base rates can and should inform clinical decision-making that are less generally recognized or applied. These applications of base rate information are related to the interpretation of the significance of diagnostic test findings, such as the differentiation between findings of statistical versus clinical significance and the determination of the predictive value of diagnostic tests. This chapter will provide a brief overview of some of these considerations, but will begin with a brief discussion of symptom base rates, classification of diseases and disorders, and the process of clinical decision-making.

SYMPTOM BASE RATES, DISORDERS AND CLINICAL DECISION-MAKING

There is no universally agreed-upon approach to the classification of diseases and disorders (Millon, 1991; Sokal 1974). The lack of consensus is particularly striking regarding the classification of psychiatric and neuropsychiatric disorders (Finn, 1982; First, Frances, Widiger, Pincus, & Davis, 1992; Follette & Houts, 1996; Millon, 1991; Grove, 1985; Morey & McNamara, 1987; Robins & Guze, 1970; Widiger, Frances, Warner, & Bluhm, 1986). In general, however, the classification of diseases and disorders will, with varying degrees of emphasis, consider the condition's phenomonology (including signs and symptoms), etiology, course, and response to treatment.

Although many conditions are easily identified by structural pathology or other biological or organic markers, many conditions are predominantly identified, if not defined, by their symptom picture. This may be a single striking or pathognomonic clinical feature or, more often, a combination or cluster of signs and symptoms thought or "known" to be associated with one another. Regardless of whether a condition is predominantly defined by its symptom picture or is capable of being defined by "objective" organic pathology or other systemic markers, the starting point for most clinician decision-making is the consideration of a patient's symptomology. Based on the patient's symptoms, together with other relevant information typically obtained in a clinical interview such as demographic data, family history, and so on, the clinician begins to form differential diagnoses and a strategy to rule these diagnoses in or out. As indicated above, even if a clinician is not thinking "base rates" *per se*, he or she is aware that certain symptoms are more likely to be observed in certain disorders, whereas other symptoms are typically not associated with the disorder. In some

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cases, the presence or absence of a single or just a few symptoms can clinch a differential diagnosis.

In attempting to make a diagnosis, the clinician is often faced with a variety of signs and symptoms obtained from client report, medical charts, and testing. The tendency is to be drawn to dramatic or unusual features (Nisbett, Borgida, Crandall, & Reed, 1976). However, striking features frequently do not carry greater diagnostic value than mundane ones (Chapman & Chapman, 1967, 1969). To increase the likelihood of accurate diagnosis, it is critical to be aware of the validity of the signs or symptoms. Validity refers to whether a true relationship exists between a clinical feature and a diagnosis, that is, whether the symptom and diagnosis covary. The cluster of valid features is included in the defining phenomonological features of a condition (and sometimes form the *sole* basis for the definition of the condition). Ultimately, the goal is to determine the cardinal features of a disease or disorder and base diagnostic decisions on the presence or absence of these cardinal features rather than on associated features (Faust, 1986; Faust & Nurcombe, 1989).

BASE RATES AND THE INTERPRETATION OF DIAGNOSTIC TEST FINDINGS

Clinical Significance of "Abnormal" Findings

Although a test finding may be of statistical significance, the frequency of its occurrence in a population (i.e., its base rate) may render questionable its clinical significance. For example, this situation is commonly encountered by neuropsychologists examining the discrepancy between Wechsler Adult Intelligence Scale (WAIS) Verbal and Performance IQ scores. For individuals age 25 or over, a discrepancy of 9 points between Verbal and Performance IQ on the WAIS-R (Wechsler, 1981) is statistically significant. Nonetheless, the base rate for a discrepancy of that size or greater was 45.5% in the normative sample of individuals with IQs in the average range (Matarazzo & Herman, 1985). The base rates of findings such as this renders questionable their clinical significance (Kaufman, 1990). As another example, Palmer, Boone, Lesser, and Wohl (1998), addressing the base rates of "impaired" neuropsychological test performance among healthy older adults, found that most tests had some proportion of subjects scoring in the borderline or impaired range, and that across tests 73% of subjects scored in the borderline range on at least one test and 20% scored in the impaired range on two or more tests. As these examples illustrate, one needs to consider the base rates of statistically or normatively "abnormal" findings in the populations with whom one works when interpreting test results.

Base Rates and Diagnostic Effectiveness

The study of clinical judgement in psychology began in earnest in the 1950's with the work of Meehl and Rosen and the resulting controversy over "clinical versus statistical" decision-making (Meehl, 1954, 1957; Meehl & Rosen, 1955; Rosen, 1954). Central to this early discussion was the fact that the diagnostic utility of a sign (i.e., for the purpose of this discussion, a symptom, test finding, or a set of test findings) is relative to the base rate of the diagnosis in the population of interest. (Much of this discussion is presented in terms of a sign's usefulness in predicting the presence of a *disorder*. The same principles apply, however, to a test finding's usefulness in predicting the presence of a *symptom*,