

Techniques that are familiar and appropriate in one context may be doubtful in answering a similar question in a different context. Where altogether different statistical approaches may be directed to solving a given problem—and yield different conclusions—how do we justify one over another? The debate embraces, among other issues, (i) the use and meaning of significance tests (how well do these answer the questions posed by the law? what is the relation to any test of practical significance? should the risk of Type I error, and the ratio of Type I to Type II error, be reset for different legal questions?); (ii) multiple regression analysis (direct versus reverse regression; how do we defend the choice of a model, the choice of explanatory variables, the choice of proxy variables? how do we deal with explanatory variables that are correlated with the independent variables of interest, the risk of underadjusted beta weights, or overfitted models?); (iii) time series analysis (all the preceding problems, plus the choice of whether and how much to lag variables and the choice of time periods to compare); and (iv) the proper application of Bayes's theorem.

The message that permeates all these discussions is that the proper application and correct meaning of many if not most statistical analyses is subject to debate. Truth is elusive. The day will be won by the statistician who can reason better, or at least present more persuasive evidence and argument. At the end of the day, is there really anything more than that for us humans to hold onto, in statistics or anywhere else?

As if it were not enough that the legal method compels statisticians to confront the epistemological and the existential, the law also rubs their noses in problems that usually are categorized as ethical. Nearly every chapter hints at or addresses directly the ethical dilemmas that technical people face when they come to court. Here the issues include the partisan climate of litigation, the tensions between the experts' commitment to completeness and balance and the lawyers' commitment to advocacy, confusion of roles (when experts forget that they are witnesses and begin to think of themselves as advocates), limited control over the data and the analyses, and how much to disclose to the other side or to the court. What is disappointing is that these troublesome issues tend to be discussed with a simplicity and unwarranted certainty that contrasts ironically with the complex and subtle discussion of technical matters.

As with ethical issues, many of the chapters offer observations and advice on the difficulties associated with communicating statistical information to legal fact-finders who are not conversant with statistical con-

cepts and need to become so within a few hours or days. Homespun suggestions for how to be understood are offered. The problem is exacerbated by trial forums that favor oral over written or visual presentations of evidence and that elicit that oral testimony by a question-and-answer process. The problem is made still more difficult by statistical techniques that hide their rationales under layers of foundational concepts that are opaque, given only the technique (regression analysis and significance tests being good examples), and that in any event are often inconsistent with human intuition. For example, whereas inferential statistics flies on the wings of the law of large numbers, humans implicitly believe in a law of small numbers (see A. Tversky and D. Kahnemann, *Psychol. Bull.* 76, 105 [1971]). After all, if human statistical intuitions could deliver reasonably accurate estimates, formal statistical analysis would have less to contribute than it does. The chasm between intuitive legal decision-makers and statistical experts may require that both the law and statisticians learn more about human processing of quantitative information than either now knows.

If the law is not yet what Holmes thought it would by now have become, the explanation is not that statistics has nothing to offer. Such advances face hurdles not dreamed of a century ago.

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The Rise of Enumeration

Medicine and American Growth, 1800–1860.

JAMES H. CASSEDY. University of Wisconsin Press, Madison, 1986. xviii, 299 pp., illus. \$39.50; paper, \$19.95. Wisconsin Publications in the History of Science and Medicine, no. 5.

The title of James H. Cassedy's new book has a double meaning. Cassedy is writing, within a medical context, about the period of Manifest Destiny, when national growth obsessed many Americans; he is also writing about the growth of the statistical method and the accumulation of demographic data needed to record and interpret a rapidly changing society. In both respects he has produced a useful and graceful essay.

The first half of the 19th century saw physicians, under the inspiration of the Paris school and especially of Pierre-Charles-Alexandre Louis, beginning to apply statistical method in a systematic way to the phenomena of health and disease. This development accompanied a more general spread of interest in the virtues of enumeration as a guide

to truth (and, more frequently, as a weapon in controversy). Both influences worked on American doctors and placed them among the leaders in a national endeavor whose roots led back to the founding of the Republic and the creation of the federal census as a tool of popular government.

As Cassedy shows, the results were varied and sometimes surprising. The theory that climate caused disease helped to turn Army doctors into the nation's first systematic collectors of weather data, by order of the Surgeon General. Preoccupation with national growth meant a pervasive interest in national fecundity, and hence widespread interest in collecting data on the health of women and, in some cases, fabricating data on the evils of birth control as well. Military adventures in Mexico meant an influx of statistics on casualties. A variety of pressures in government, business, and science produced efforts to create reliable mechanisms at both the national and state level to record accurate vital statistics.

The author is quick to demonstrate that all of this activity led to very spotty results. The bumptious and sectarian age was rarely a friend to objectivity in any form. The supposed dry light of statistics took on a rainbow of hues, political, religious, and personal. Mormons collected statistical information to advance their faith; southern physicians to prove the natural inferiority of blacks; members of the Oneida community to celebrate the virtues of male continence, or sperm retention, and to refute the charge of licentiousness made by the conventional against their practice of complex marriage. Know-Nothings labored to demonstrate the many faults of poor and sickly immigrants; slave owners to prove the good health of their chattels; and Abolitionists to demonstrate the wickedness of slavery. To be sure, such combative uses of statistics are not unknown today, but the lack of reliable data made the early 19th century a sort of golden age for controversialists.

In the end, a laissez-faire era found its soundest (if still imperfect) employment of demographic information and statistical method appropriately enough in a business venture—the life insurance industry, whose rapid growth began in the 1840s. Even here, southerners suspected the existence of sectional prejudice in the higher rates that the mostly northern companies, relying on the South's reputation as a sickly land, charged their insurees in Dixie. (A perfectly genuine point of southern distinctiveness, according to Cassedy, was the region's indifference to collecting accurate statistics, which enabled the companies to ignore the complaints.) Overall, however, the pressures of competitive business demanded objectivi-

"Vaccinating on an Immigrant Train Going West," *Harper's Weekly*, 10 February 1883. In the 19th century native-born Americans "were particularly upset over the apparent introduction of certain epidemic diseases into their communities by . . . immigrants." The morbidity and mortality rates among immigrants "loomed so conspicuously large that American observers and publicists felt it desirable to differentiate them from those of the native-born populations. This was not really a scientific matter in many cases, but a step considered necessary in order to preserve the sanitary reputations of the respective communities and ensure their attractiveness for commercial development." [From *Medicine and American Growth, 1800-1860*]



ty and made the life insurance industry a major force for expanded and more accurate vital statistics, as it was for public health reform in general.

Cassedy is one of this country's most distinguished medical historians, and *Medicine and American Growth*, like its predecessor volumes *Demography in Early America* (1969) and *American Medicine and Statistical Thinking* (1984), exhibits deep scholarship applied to a recondite subject with a deceptively light touch. The scientific reader should be warned that this is not a book of statistics or an attempt to reanalyze the era's

demographic data. Somewhat ironically, Cassedy's method is the ancient one of literary history. Amid the quantitative preoccupations of much recent historical writing, numbers are notable here mostly by their absence. Intended or not, the result often seems to be an ironic critique of a brash numerical tradition by an older one, which has its own rules for attaining a very different kind of objectivity.

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Agrarian Anthropology

Farm Work and Fieldwork. American Agriculture in Anthropological Perspective. MICHAEL CHIBNIK, Ed. Cornell University Press, Ithaca, NY, 1987. 295 pp., illus. \$39.95; paper, \$12.95. Anthropology of Contemporary Issues. Based on a symposium, 1982.

A volume that focuses on anthropological methods and their potential for understanding agricultural systems in a complex industrial society such as the United States is long overdue. This book provides an overview of some current anthropological work on farmers in the rural United States. Since anthropologists have dealt with agrarian societies in virtually all other areas of the world, in many different kinds of cultural systems ranging from small-scale extensive swidden systems to relatively large and highly intensive systems (with and without irrigation and with and without domesticated animals), and since anthropology as a discipline

encompasses contemporary (ethnographic), historic (ethnohistorical), and prehistoric (archeological) systems of agriculture, it is certainly appropriate for anthropologists to examine agrarian systems in a contemporary complex society. This volume is also part of a larger genre of economic anthropological writing on agrarian economic systems, their organization, and their relationships to social and political structures. At issue here is the nature of the interface between changing forms of agriculture, community organization, and the larger economy in both the rural and the urban areas of nation-states.

As Michael Chibnik points out, one of the distinguishing features of anthropology as a discipline has always been its panhuman scope. Thus anthropology is ideally positioned both to document and to explain cross-cultural similarities and differences, not only for small-scale, so-called exotic societies but for large complex systems as well.

This book's focus upon the rural agrarian parts of complex systems raises important methodological issues, not only for anthropology but for the social sciences generally. For example, how can qualitative case materials be collected and combined with quantitative data covering large numbers of cases? The papers in the book also present some important concerns regarding the choice of analytic and research units. For example, Peggy F. Barlett in her chapter on family farms in Georgia points to the county as the critical political unit with tie-ins to local government, education, and price-support systems. Though the county is certainly the most important locally recognized folk unit in rural America it may not be the most useful analytic unit. That is, depending upon how the research problem is conceptualized, the key analytic unit used by the social scientists for organizing data gleaned from fieldwork in counties may be a type of farm, a region, a state, or an entire nation. Susan Carol Rogers, for example, uses econometric (regression) analysis to test hypotheses without presuming that the folk units constitute analytic units. She begins to specify models for analyzing the relationships between some key variables, among them farm size, degree of specialization, labor-to-land ratio, total investment in farm equipment, and mixed farming versus monocrop production. She points out that some of the results indicate realities that are not unique to the Illinois farm community and thereby opens possibilities for comparative analysis.

Among the substantive issues raised in this collection are questions concerning household economic strategies, community character, demographic trends, family organization, and the division of labor according to age and sex. The topics addressed include the future of family farms and the importance of home-place ties as factors in rural-urban migration patterns, race and ethnicity as factors in farm organization, and policy issues at the local, national, and international levels. Understanding the relationships between subsistence production, cash cropping, and wage labor (income supplementation with off-farm employment, both temporary and permanent) is becoming increasingly important at all levels.

The book is divided into four parts. The first, Economic Strategies, examines changing economic conditions in the rural United States: family farms in Georgia (Barlett), the retention of diversified farming in Illinois (Rogers), and agricultural experimentation in Iowa (Chibnik). The second section contains two chapters dealing with the impact of economic change on the sexual division of labor for Iowa farmers. The first, by Debo-