Research Design and Statistical Procedures Used in The Journal of Family Practice

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To determine whether articles published in The Journal of Family Practice *contain statistical content that is easily understood by the general reader, all original articles published during a two-year period were reviewed to determine the frequency of use of different research designs and statistical procedures. Eighty-eight percent of the articles used the cross-sectional design. No statistical methods were reported in 46 percent of the articles; 13 percent reported descriptive statistics only. The chi-square statistic and* t *test were the most commonly used statistical procedures. Readers of* The Journal of Family Practice, *therefore, needed only an elementary knowledge of statistics to understand the statistical content of three quarters of the original articles.*

The Journal of Family Practice is a publication of importance to both clinicians and academicians. It is, according to Geyman,[1] "the only monthly journal in the field primarily devoted to publication of the literature of record." When members of the Society of Teachers of Family Medicine were asked to rank journals according to the importance of their content, *The Journal of Family Practice* ranked in the top ten more often than any other journal.[2]

To find out whether articles published in *The Journal of Family Practice* were accessible to the general reader in terms of understanding statistical content, and whether an increased knowledge of statistical techniques would provide a corresponding increase in accessibility, *The Journal of Family Practice* was reviewed for a two-year period to determine the frequency of statistical procedures and research designs. Emerson and Colditz[3] found that during a two-year period over one half the original articles in *The New England Journal of Medicine* were accessible to readers possessing only an elementary knowledge of statistics. It was not known whether this finding was true also for *The Journal of Family Practice*.

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This information regarding a journal that is highly relevant to family medicine may be useful for those planning courses in research methods and statistics and for all health professionals interested in continuing education through reading the medical literature.

METHODS

All original articles published in *The Journal of Family Practice* during the two-year period from January 1982 to December 1983 (volumes 14 through 17) were reviewed by each of the two authors. Editorials, Letters to the Editor, Family Practice Grand Rounds, Communications, and Family Practice Forum were not reviewed. A pilot study of two 1981 issues of *The Journal of Family Practice* was first conducted to verify methodology and reliability. There was 100 percent agreement on reported statistical procedures; there were two disagreements regarding study design. The methods section and all tables and figures were read thoroughly; other sections were scanned. Each article was classified according to research design and statistical procedures. Only procedures actually conducted by the authors were classified; those cited from other studies were not considered. No attempt was made to assess the appropriateness of either the research design or the statistical procedures. A statement regarding statistical significance without a corresponding statistical procedure could not be classified.

Articles were reviewed independently, and disagreements in classification of research design or

TABLE 1. STATISTICAL CONTENT AND ACCESSIBILITY OF ARTICLES

Procedure	Articles Containing Procedure* No. (%)	Accessibility by Article No. (%)
No statistical methods	102 (46)	102 (46)
Descriptive statistics only	29 (13)	131 (58)
Contingency tables	55 (25)	153 (68)
t Test	34 (15)	171 (76)
Pearson correlation	16 (7)	178 (79)
Analysis of variance	13 (6)	181 (81)
Reliability analysis	11 (5)	188 (84)
Nonparametric statistics	8 (4)	193 (86)
Epidemiologic analysis	7 (3)	199 (89)
Power/sample size	5 (2)	203 (91)
Adjustment/standardization	5 (2)	208 (93)
Other methods	5 (2)	212 (95)
Regression analysis	4 (2)	216 (96)
Multiple comparisons	4 (2)	218 (97)
Multivariate analysis of variance	3 (1)	221 (99)
Survival analysis	3 (1)	224 (100)

**Total > 100% because an article may report more than one procedure*

TABLE 2. CLASSIFICATION OF ARTICLES BY RESEARCH DESIGN

Research Design	Number of Articles	Percentage
Cross-sectional	197	88
Longitudinal	17	8
Case-control	5	2
Experimental	5	2
Total	224	100

statistical procedure were discussed until consensus was reached. Provision had been made for a third party to act as arbitrator, but this was never necessary.

A modified version of the design classification described by Bailar and colleagues[4] was used. A study was classified as case-control if cases and controls were identified by their outcomes (ie, case is person with disease, control is person without disease) and if information regarding exposure was sought retrospectively. A study was classified as longitudinal if either the element of time or change over time was crucial to the intent of the author. A study was classified as experimental if it was longitudinal and if random assignment was used. All other studies were descriptive in nature or studied relationships during a single time period; these were classified as cross-sectional.

Statistical procedures were classified into 16 categories (Table 1). "No statistical methods" implied either no statistical content or the use of only percentages or histograms. Studies in which only measures of central tendency or variability were reported were classified as "descriptive statistics only." These two categories were the only ones defined so that no overlap existed with any other category. "Nonparametric statistics" included all nonparametric tests except those considered separately under "contingency tables." "Other" included statistical procedures, used in one article only, that could not be classified into an existing category; these were factor analysis, discriminant analysis, sensitivity analysis, model fitting, and cost-benefit analysis.

RESULTS

There were 224 original articles published in *The Journal of Family Practice* during the two-year study period. There was agreement on the research design classification for 93 percent of the articles; 75 percent (12 out of 16) of the disagreements concerned longitudinal vs cross-sectional designs. There was 88 percent agreement on the classification of statistical procedures; nearly all the disagreements involved overlooking a procedure.

There was considerable uniformity in choice of study design (Table 2). Eighty-eight percent of the articles were cross-sectional; the remainder were longitudinal (8 percent), case-control (2 percent), and experimental (2 percent).

The percentage of articles using each statistical procedure is displayed in Table 1 in decreasing order. Nearly one half (46 percent) of the articles employed no statistical methods whatsoever; another 13 percent used descriptive statistics only. Contingency table methods, usually the chi-square statistic, were used in one quarter of the articles. The *t* test, either paired or unpaired, was used in 15 percent. There were 15 articles reporting a P value without any specified statistical procedure.

Also listed in Table 1 is each procedure according to the number of articles made accessible by knowledge of that procedure. For an article to be considered accessible, the reader has to understand all the statistical procedures used in that article. One hundred two (46 percent) of the 224 articles were accessible to everyone; no knowledge of statistics was required. One hundred thirty-one articles (58 percent) were accessible to those who understood descriptive statistics, such as means and standard deviations. Familiarity with contingency table analysis, such as the chi-square procedure, provided access to 153 articles, raising total accessibility to 68 percent. If knowledge of the *t* test procedure was also present, accessibility increased to 76 percent. Thereafter, each new statistical

procedure increased the accessibility of articles by small increments.

DISCUSSION

This study is supported by those of Emerson and Colditz[3] and Feinstein,[5] who reported that most medical research articles they reviewed used only elementary statistical procedures. Feinstein stated that "a physician who comprehends standard deviations, standard errors, *t* tests, and chi-square tests will be ready for about 3/4 of the statistical procedures that confront him." *The New England Journal of Medicine* study reports a similar figure of 73 percent.[3] Statistical comprehension of *The Journal of Family Practice* requires knowledge of procedures similar to those needed to understand *The British Medical Journal, Canadian Medical Association Journal, Journal of the American Medical Association, Lancet,* and *The New England Journal of Medicine*.[3,5]

Fletcher and Fletcher[6] studied three journals *(Journal of the American Medical Association, Lancet, The New England Journal of Medicine)* for a 30-year period, 1946 to 1976, to follow trends of different research designs. They were concerned about the increased frequency of "weak" designs; for example, cross-sectional studies increased from 25 percent to 44 percent over the 30-year period. Experimental studies, the strongest research design, increased from 13 percent to 21 percent; however, longitudinal studies, also a strong design, declined from 59 percent to 34 percent.

The findings of this study indicate that those who publish in *The Journal of Family Practice* tend to use the weaker, cross-sectional design; 88 percent of the articles reviewed employed this design. A few commonly used procedures, such as descriptive statistics, the *t* test, and the chi-square test, are sufficient to provide the general reader with statistical access to most original articles published in *The Journal of Family Practice*.

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