

Preface

ONE OF THE VERY FIRST STATISTICAL APPLICATIONS ON which Dr. Good worked was an analysis of leukemia cases in Hiroshima, Japan following World War II; on August 7, 1945 this city was the target site of the first atomic bomb dropped by the United States. Was the high incidence of leukemia cases among survivors the result of exposure to radiation from the atomic bomb? Was there a relationship between the number of leukemia cases and the number of survivors at certain distances from the atomic bomb's epicenter?

To assist in the analysis, Dr. Good had an electric (not an electronic) calculator, reams of paper on which to write down intermediate results, and a prepublication copy of Scheffe's *Analysis of Variance*. The work took several months and the results were somewhat inconclusive, mainly because he could never seem to get the same answer twice—a consequence of errors in transcription rather than the absence of any actual relationship between radiation and leukemia.

Today, of course, we have high-speed computers and prepackaged statistical routines to perform the necessary calculations. Yet, statistical software will no more make one a statistician than would a scalpel turn one into a neurosurgeon. Allowing these tools to do our thinking for us is a sure recipe for disaster.

Pressed by management or the need for funding, too many research workers have no choice but to go forward with data analysis regardless of the extent of their statistical training. Alas, while a semester or two of undergraduate statistics may suffice to develop familiarity with the names of some statistical methods, it is not enough to be aware of all the circumstances under which these methods may be applicable.

The purpose of the present text is to provide a mathematically rigorous but readily understandable foundation for statistical procedures. Here for the second time are such basic concepts in statistics as null and alternative