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INTRODUCTION

My first glimpse of how evaluation methods can illuminate understanding came in studying industrial democracy. At the time it was fashionable to institute worker participation programs to encourage greater ownership of the work process and, it was hoped, greater productivity. Many companies followed suit, and all appeared to be rosy. Management assumed that if they gave the workers a chance to participate in decisions about the conditions that affected their work lives and behavior, they would jump at the opportunity. This would supposedly result in positive outcomes for the organization as well as enrich workers' lives. This expectation proved to be shortsighted, however, and management relations often became difficult. A close analysis of some of these attempts revealed patterns among the attitudes and desires of the workers that were unanticipated. Having the opportunity to participate in decision-making did not always automatically result in the predicted worker attitudes; other attitudes (e.g., whether or not one *desired* to participate) had an effect on the outcomes of the study.

Like light shining on a prism, the power of evaluation can help reveal hidden patterns in data when these data are exposed to the right methods. New understanding can emerge from a careful and disciplined examination of even "mundane" practices that we take for granted. Ultimately, using evaluation methods can help illuminate the world

The Program Evaluation Prism: Using Statistical Methods to Discover Patterns,
by Martin Lee Abbott

around us in a different light so that we see different sides of the same realities we face in everyday life. By using careful methods, a company might avoid difficulties and increase the chances for positive outcomes by becoming more aware of the underlying patterns of meaning that influence work.

The power of evaluation methodology is the power of discovery and understanding. Peter Berger (1963) once defined sociological discovery as "culture shock minus geographical displacement," (p. 23) emphasizing how we can be surprised at the seemingly "ordinary" reality we inhabit by looking at it through the lens of the sociological perspective. In the same way, utilizing appropriate evaluation strategies can lead to enlightening discoveries that are "right in front of our faces." Collecting and analyzing data may allow us to make observations and reflections that will cast an entirely different light on the nature of a problem. We may be shocked at what we find because it may be different from our initial expectations, or may reveal new program directions.

My experience after 30 years of teaching and conducting evaluation research is that most practitioners and students do not fully take advantage of evaluation methods and therefore cannot partake of the insights they provide. In the case of evaluators hired by a company to produce research, many may be unfamiliar with research and statistical processes and seek to subcontract parts of the work to "experts" who can help them in their work or who can provide simple analyses that may support their overall observations. In other cases, evaluation work may not be well served by powerful methodological processes because these processes are not well understood or because the appropriate conditions are not present that are required for their use.

In a wider sense, the public misunderstands and avoids evaluation processes for several reasons. "Math phobia" is probably the stock answer given to why most people avoid the statistical tools of evaluation, which make use of numbers and symbols that appear arcane and inscrutable. Statistics also has a bad reputation for being used incorrectly to support whatever the researcher promotes. This popular notion is most readily recognized in the book *How to Lie with Statistics* (1993). To be sure, there continues to be a great deal of abuse when statistical processes are used as divining rods by practitioners who either do not understand the processes or are simply unscrupulous. It is easy to "lie with statistics." But we must also recognize that, in some sense, numbers do not lie; the issue is not the numbers but the interpretation of the meaning of the numbers.

This book explores the nature of evaluation and how evaluation measures can be used to illuminate hidden patterns of meaning.

Like the sculptor's chisel, evaluation tools can reveal patterns in data, which, when interpreted correctly, lead to facets of understanding not readily apparent. I hope these reflections help you better grasp the tools so that you can build a more informed perspective from apparent "ordinary" data. In so doing, you will find the mystery of evaluation disappears, and you will use the tools to greater advantage in your work.

Along the way to developing an understanding of the tools of evaluation, we will explore several examples of how "discovery learning" can illuminate understanding. I use discovery learning as a primary theme of this book indicating the new insights that can emerge from carefully applied evaluation methods. For example, student achievement has shown itself to be intractable to various remedies. Can our evaluation methods help us see what factors might be productive determinants of student learning? Along similar lines, can educational technology assist the educator and the school district in their work to improve teaching and learning? Beyond education, the world of work is becoming a global environment. Can our evaluation approach help to illuminate the processes that govern a productive work community?

Evaluation methodology can certainly be complex, but it is also very straightforward. At the simplest level of our lives, we recognize correlations, a central evaluation tool. The higher the heat, the more quickly the food cooks; the more our neighbor's dog barks, the more our irritation level grows; the older our cars, the less they are worth; the higher our income, the better we feel about life! But are these seemingly simple intuitions accurate? Aside from the first example, there can be other considerations that might lend themselves to differing interpretations. (Although even the first example is open to new insight if one considers that the altitude can affect how long it takes to cook certain food, and even its quality!) Some neighbors get irritated at dogs barking, but does it depend on other factors like the extent to which we know our neighbor (and the dog), or how "community oriented" our neighbors and ourselves are? Cars get older and lose value, but if they get really old, they gain value. High incomes might lead to greater satisfaction, but not if you live alone—married couples across all income levels generally report they are happy despite how wealthy they are (although it may be desirable to be happily married and wealthy!).

These mundane examples point out that we make observations about our own lives, but we do not necessarily take into account all the factors that might be relevant to a complete understanding. In many cases this is not problematic, although greater insight into our social experience might be helpful to us for greater personal and

interpersonal adjustment. Other examples of unexamined correlations are more problematic, however. These are the ones that evaluation methodology can help clarify, and therefore are the focus of this book. Complex programs have far-reaching outcomes and consequences that require specific skills and methods to unravel. The following are the central features in pursuing discovery learning through statistical analysis:

1. Social life presents itself in patterned behavior and thinking.
2. Social behavior and thinking are not determined but predictable.
3. Social research and evaluation studies seek certainty, but must be content with probabilistic conclusions.
4. Evaluation methodology has evolved toward specialization and quantification, both of which contribute to discovery learning.
5. The heart of discovery learning in evaluation is revealed by correlational methods.
6. Many salient insights into social behavior could be more readily discovered by understanding the statistical processes that could illuminate them.
7. Discovery learning insights can better prepare researchers and program evaluators to manage the difficult political and social pressures that often accompany decision-making in the "real world."
8. Evaluation methods cannot eliminate the need for informed judgment.

INITIAL CONSIDERATIONS

Why does the world need a book that investigates evaluation procedures? The simple answer is that the *concept* of evaluation is largely intuitive, but many people use technical evaluation procedures even when they may not completely understand how to use them to their fullest potential. Few people in a position to need evaluation really understand how powerful it is for illuminating the complexity embedded in programs of interest and thereby avoiding misunderstanding and misdiagnosis. The primary reason for looking at the concept of evaluation is to provide a way to develop better "intuitive insight" into evaluation processes so that we can understand better the social experience we need to examine.

I feel there is an ongoing need for program evaluation in every social program. I state it this boldly, and by doing so, I reveal my bias at the outset. Not only is evaluation mandated for certain federal and private grants, but the "spirit" of evaluation points toward improvement of programs and better service delivery. Even where evaluation studies are not mandated, many educational leaders, business managers, social service delivery agencies, and others, have come to recognize that understanding how well you are doing at your tasks will only be positive for introducing changes that can increase efficiency.

Several factors may constrain a program leader from using solid evaluation processes. First, it requires working knowledge of evaluation methods that can illuminate embedded patterns. This is intimidating to some leaders. Second, it can be costly. Evaluation processes may be viewed as unnecessary, or at best, a luxury, especially when they are not mandated. Third, previous, negative, evaluation efforts may be a barrier to using evaluation for subsequent efforts. In many cases the negative attention is due to ineffective methodology or the political dissension stemming from the findings. For these and other reasons many program managers and leaders are reluctant to engage in comprehensive evaluation efforts. This book is devoted to those leaders and to the evaluator who seeks to understand the methods that will improve their attempts at recognizing embedded patterns of meaning. At the very least it will put forward a range of avenues for evaluators to use in their quest to provide understanding and equip leaders with useful information.

BOOK PLAN

The plan of this book is to look at the concept and practice of evaluation as a way to understand human relationships and to discover "patterned actions" in our personal and social lives. In this discussion I will introduce several statistical techniques that, when used properly, will help the evaluator to understand these patterned actions that impact work, education, and other contexts. Most of the statistical tools we will examine are based in correlation and therefore somewhat intuitive. Beyond correlation, we will spend a good bit of time discussing the technique of multiple regression, which is a technique that allows the evaluator to examine several influences on a particular outcome at the same time.

A book on these topics can be extremely detailed or may only provide basic coverage of key concepts. I want this book to provide depth of understanding on the key areas of regression analysis that

emerge from studies in which people work with real data. As such, this book is not a comprehensive mathematical treatment of the procedure, but neither is it a sketchy overview. Understanding what we will cover assumes that the reader has taken an introductory statistics course and understands the basic elements of descriptive and inferential statistics.

This book will not introduce detailed examinations of the various research designs that evaluators use. As we will discuss below, (quasi-) experimental designs and survey approaches are commonly used by evaluators to generate data. While appropriate designs are critical for evaluators, a detailed exposition of research design is beyond the scope of this book. Rather, I will concentrate on the tools the evaluator can use to understand data regardless of the design used to generate the data. The following are some of the tools addressed in subsequent chapters:

- Correlation
- Single predictor regression
- Multiple correlation
- Part and partial correlation
- Detection of extreme scores
- Multiple regression
- Regression with continuous predictors
- Coding of categorical data
- Regression with categorical predictors
- Methods for entering predictors in multiple regression
- Interaction in multiple regression

REAL EXAMPLES

I have integrated actual databases into the main sections of the book as examples of how to use and interpret correlation and regression results. This decided applied focus to the analyses hopefully will be useful to evaluation researchers as well as to the readers who are new to advanced statistical methods. In all cases I emphasize the point that "discovery learning" can be the result of using statistical processes to understand the unobserved patterns that exist in data.

Before we begin a discussion of correlation and regression methods, I will describe the actual databases that I use to demonstrate the regression procedures. These are not simply collections of data to show how

to perform the analyses but examples of actual data that evaluators have used to make policy decisions. I can think of no better way of preparing readers to understand statistical procedures than to provide real data analyses that can cast light on meaningful social issues.

Using Statistical Programs

Along with extended discussions of the statistical procedures, I describe the use of SPSS® (SPSS® for Windows) as a vital tool for understanding statistical patterns. I show in a practical way how to use the menus in SPSS® to organize and analyze data. SPSS® is a powerful tool that has been used for many years by evaluators and researchers at all levels to extract meaning from data. The calculations and examples in this book require at least a basic familiarity with SPSS®.

The Evaluator's Journey

Welcome to the journey of developing evaluation skills for discovery. Readers will gain the most from this book if they have a basic understanding of introductory statistical concepts. With this baseline information the book will serve as a guide for evaluation work in many areas of program operation. The book is designed for consultants, evaluators, and other practitioners who are in a position to conduct statistical analyses with data they encounter in their funded (and unfunded) investigations. The methods we explore will assist anyone who seeks to develop a more complete understanding of evaluation processes and how they can illuminate the social world.

Not everyone who reads this book will become an expert in evaluation methods. However, my hope is that all readers will realize that using proved methods appropriately will assist their efforts at discovering crucial patters in evaluation data that will enlighten and improve the programs they are examining.