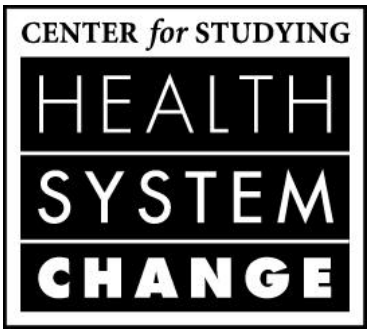

Methods in Case Study Analysis

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The Center for Studying Health System Change

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Preface

This technical report is based on a panel discussion conducted at the 1996 meeting of the Association for Health Services Research. The Center for Studying Health System Change sponsored a session on case study methodology, and invited four noted researchers to share their views:

- Rachel Feldman, Vice President, The Lewin Group, Fairfax, Va.
- Stephen Shortell, A.C. Buehler Distinguished Professor, Health Services Management, Kellogg Graduate School, Northwestern University, Evanston, Ill.
- Shoshanna Sofaer, Associate Professor, Department of Health Care Sciences, George Washington University Medical Center, Washington, D.C.
- Robert K. Yin, President, COSMOS Corporation, Bethesda, Md.

The session was moderated by Paul B. Ginsburg, President of the Center for Studying Health System Change.

The Center's interest in case studies arises from its Community Tracking Study. Recognizing that health care is predominately local, the Center is investigating what is happening in health care financing and delivery at the community level. The Community Tracking Study focuses on changes in the health care system in 60 sites that are representative of the nation. In all 60 sites, surveys are being conducted of households, physicians, employers and health care organizations. In addition, 12 of the communities are being visited by teams of researchers. The goal of the site visits is to obtain an understanding of and insight into the organization and functioning of the local health system. In-depth interviews are being conducted with local leaders in the general community and in the health system. Combining the case study analyses with analyses of survey data will permit an assessment of the relationship between health system characteristics and the effects of change on people.

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Introduction

The use of case studies as a research methodology has grown in recent years because of the rapid changes in the health system today and the inability of traditional data sources to answer important questions. Many users of case study information value the data, but are uncomfortable with the small number of cases included in any given study and the uncertainty associated with interpreting the data. As more researchers pursue this methodology, it is important to recognize that numerous methodological strategies related to implementing such research can enhance the reliability and validity of the findings.

This report addresses a number of methodological issues related to conducting case study analyses. The first section discusses the design of case studies: why they are done, the importance of theory, defining and selecting cases for study and designing the instrument for gathering data.

The second section considers the analysis and interpretation of qualitative data and describes the "horizontal" logic at the core of case study analysis. The use of data displays are described and an example is included. This section also describes the method of replication for analyzing themes across multiple cases.

The Third Section of the paper considers issues related to validity and reliability, and the final section identifies a series of tensions inherent in the case study methodology for researchers to consider as they implement their work.

This report is not intended as a "how-to" for con-ducting case studies, but rather is a recognition of important points to be taken into account by people conducting this kind of research and for people who read the results.

Design of the Study

Purpose of Case Studies

Researchers can use case study methodology for many purposes:

- to *explore* new areas and issues where little theory is available or measurement is unclear;
- to *describe* a process or the effects of an event or an intervention, especially when such events affect many different parties; and
- to *explain* a complex phenomenon.

Although typically associated with exploratory purposes, Yin suggests the methodology may actually be more powerful for explanatory purposes in its ability to answer questions of how and why.

The case study methodology is frequently applied in program evaluation studies or studies that track changes in complex systems. It is also not unusual for researchers to combine case studies with quantitative analyses that use larger data sets. The nature of the problem and the theories of interest dictate the mix of methods used to answer any particular set of questions.

Theory and Logic

Like any research process, quantitative or qualitative, one of the first steps of the case study method is to state the theory and the set of research questions to be answered. Whereas quantitative studies generalize from a sample to a population, Yin notes that case studies must generalize to a theory.

But the researcher does not always have good theory, particularly in exploring new or cutting-edge issues. In those instances, a logic model, or what has also been referred to as a "theory of action" (Patton, 1997), is developed that defines how the researcher expects an intervention, event or process to take a case from point A to point B and, therefore, defines the issues to be examined during the analysis. A theory of action also highlights where the greatest uncertainty about an intervention lies and can thus help focus research on the most critical issues.

Development of the logic model should be done early in the design phase and becomes the "theory" against which rival explanations are tested. Refining the research questions and hypotheses is an important step, and serves as a guide to focus data collection. In large projects, logic models can also facilitate building consensus among many researchers representing different disciplines and serve as a mechanism for involving study participants, particularly in evaluation studies in which an intervention needs to be specified in detail.

Feldman noted that the following components should be considered in putting together logic models:

- definition of intervention or process, and context surrounding the intervention, such as other important policies or activities;

- who is affected by the intervention and how much of the intervention the affected parties are subject-ed to; and
- what changes are expected.

Projects that aim to track complex systems may also consider such factors as:

- identifying the actors and the roles or functions they perform in the system ("actors" could be people or institutions, and one actor may perform multiple functions);
- the actions, strategies or behaviors of the actors, and the forces driving those behaviors; and
- interactions among the actors.

As these issues surface, information needs are defined and these definitions then provide the basis for constructing the instruments and deciding how many and what type of informants are needed.

Case Definition and Selection

Another major design question faced by the researcher is defining the "case," or unit of analysis. This can be particularly complex in case studies because the case and its context are intertwined, and a single case may have several embedded units. To illustrate, Yin noted that a case maybe a single hospital, with all of its patients being the embedded unit. The researcher may have data on 1,000 patients, but still have only one hospital and, therefore, one case. In a project examining the local health system in different communities, is the case the health system itself and are the embedded units the components of the system, such as hospitals, physicians, health plans, etc., or is the case the local community, of which the health system is a part? The answer to that question will influence how the researcher goes about selecting study sites.

Yin also noted that researchers may incorrectly attempt to select cases that represent some population. However, to emulate statistical sampling would require that a large number of cases be studied, undermining the strength of the case study method. Therefore, choosing cases for statistical representativeness is not recommended in a case study methodology.

How cases are chosen also raises issues of internal and external validity. Shortell noted that greater heterogeneity among the cases may enhance generalizability, and may be useful when combining the case study information with a larger data set. On the other hand, homogeneity enhances internal validity and facilitates replication (see below for a discussion of replication). The question is how much diversity the researcher wants given the specific problem or issue being addressed.

Instrumentation

A tension in case study design is how much structure should be built into the instrument. A very structured instrument, with a lot of closed-ended questions, brings one closer to a survey design that contains fieldwork. It can fail to take advantage of the strength of the case study approach to uncover subtle distinctions and provide a richness of understanding and multiple perspectives that experienced researchers are able to obtain on-site. On the other hand, very large studies with many people involved in data collection may require a relatively greater degree of standardization to ensure consistent implementation and improve reliability.

Sofaer suggested an approach for achieving both standardization and flexibility by building a "modular" protocol for critical components of the study. The case study researcher typically has many topics that he or she would like to cover with many different informants. However, there needs to be some consideration of who can contribute what. Prior to going on-site, the researcher needs to do some preliminary telephoning and screening, or what Sofaer referred to as "reconnaissance," to identify the people who can bring multiple perspectives and will have the most to say about each of the major topics. Some questions may be asked of everyone and others may be asked only of some respondents.

For example, in the case study work being implemented by the Center, the analytic priorities guided the questions that were included in the interview protocol. The questions were broken down into small modules that contained a set of questions (typically 5–10) on a specific issue. For each respondent, an appropriate number and mix of modules was selected to guide the interview and maximize the information obtained over the whole visit.

Analysis and Interpretation

Many researchers view analysis of qualitative data as the most difficult aspect of conducting case studies for several reasons. Typical concerns with conducting case studies are the intensity of the data collection process and the overload of information obtained. Part of the intensity is related to the fact that in case studies, data analysis begins in the field during data collection as notes are recorded, initial interpretations are made during team discussions and tentative hypotheses are tested in subsequent interviews. This is different from quantitative analyses where these activities tend to occur more sequentially.

Data overload is also a common problem with case study analyses, especially in multisite studies. Conducting 50 interviews per site, and writing up just five pages of text notes per interview, a researcher can still end up with a small book on every case. Multiply that for multisite studies and it's clear how case studies can result in an excessive amount of information to sort through for analysis. Yin challenges the assumption that individual interviews should be "written up" at all, believing that the more relevant task is to demonstrate converging evidence from various sources and to document such convergence (and divergence).

Finally, in analysis of case studies, there are inevitably more variables than cases, or data points, so traditional statistical analyses cannot be applied. Therefore, different techniques need to be used to organize and systematically review large amounts of information.

Case Versus Variable

All the researchers noted that the analytic focus in case studies is on the overall pattern of variables *within* a case, looking at the parts in relationship to the whole and then, if there are multiple cases, looking across them. In quantitative analyses, analyses are usually variable-oriented. Variable-oriented analyses examine predictor variables, their relationship to each other and their effect on the outcome. For example, if the columns in a table are the variables and the rows are the cases, a variable oriented analysis reads down the columns. The results may or may not fit any given case, but typically they establish an "average" case that is nonexistent in real life. On the other hand, case-oriented analyses examine the interrelationship among variables *within* each case first, and then make comparisons across the cases, looking for similarities and patterns. In the same table, a case-oriented analysis reads across the rows. The researchers noted that this "horizontal" logic is at the core of case study analysis.

Some researchers may combine variable- and case-oriented approaches. For example, the researcher may use variable-oriented analyses to look for recurrent themes, then do a case-oriented analysis to develop types or "families" of cases (Miles and Huberman, 1994). The primary focus of case study analysis, however, is on the level of the overall case.

Data Displays

Data displays can be used as a means of organizing and summarizing large amounts of information so the researcher can analyze it. Data displays can be in the form of matrices or networks, and can be developed to analyze a single case or multiple cases.

One frequently used example is a truth table using Boolean algebra to classify certain events and look for patterns within and across cases. Shortell provided the following example of a hypothetical truth table to examine the relationship between high levels of managed care penetration and presence of other factors.

Dependent Variable:

Areas with managed care penetration in excess of 50 percent

Independent Variables:

Factor A	Factor B	Factor C	Managed Care Penetration	# of Cases
0	0	0	0	9
1	0	0	1	2
0	1	0	1	3
0	0	1	1	1
1	1	0	1	2
1	0	1	1	1
0	1	1	1	1
1	1	1	1	3

Factor A = Presence of strong employer
Factor B = Presence of preexisting HMO
Factor C = Presence of low regulation

In this instance, the truth table is quite enlightening in that if this were done with a larger data set using regression analysis, all three variables would be found to be significant. However, in this truth table, we can see that the presence of only one of the variables is sufficient.

Replication

A key analytic method used in analysis of multiple cases is replication. The primary focus of the analysis is on the overall pattern of results and the extent to which the observed pattern of variables matches a predicted one. The researcher examines a single case for the pattern and, if it is found, then looks to see if it is found in sub-sequent cases. If the pattern is not found, the original hypothesis has to be re-examined. If *identical* results are predictably obtained over multiple cases, literal replication has been achieved. If *different* results are obtained over multiple cases, but for predictable reasons, theoretic-cal replication has been achieved (Yin, 1994).

Yin noted that a common problem that many people encounter in conducting cross-case analyses is the attempting to say that some event was seen in 8 of 12 cases, for example. However, there is no way of knowing if 8 of 12 cases is different from 9 of 12, or 7 of 12. In the case study method, because the researcher does not use statistical generalization, but rather, generalizes to theory, the goal is to obtain replication, not enumeration. In analyzing multiple cases, replication can be achieved within the types or "families" of cases, with predicted variation observed across groups.

Case study analysis is, by nature, argumentative, so it is critical that the researcher be fair in laying out the arguments and consider competing hypotheses and evidence that would disconfirm what is being sought. Sofaer stated, "As case study researchers, we have to be willing to be proven wrong; that means you're a scientist."

Validity and Reliability

As in quantitative analysis, qualitative analysis must also consider threats to reliability and validity. In case study analysis, reliability and validity can be affected, in part, by problems of data overload. For example, researchers may recall the most interesting or unique incidents, rely on first impressions or assume correlation between simultaneous events. While multiple cases help improve external validity, they also exacerbate problems of data overload.

Some of the basic threats to reliability should be addressed during the design phase. Interviewers need to be adequately trained in using the instruments to ensure consistency in data collection. The documentation tools should be flexible enough to capture the local story, but structured enough to build in consistency and quality control.

Internal validity is a concern for analysis of single and multiple cases; external validity is a concern only for analysis of multiple cases. As Yin noted, external validity in the case of survey analysis refers to the statistical representativeness and generalizability of find-ings, whereas in case study analysis and its smaller number of cases, external validity refers to the ability to generalize results to some broader theory. External validity in case study analysis is achieved through the replication methods described above. If results are replicated in multiple cases, the findings are considered more robust.

Shortell described a number of potential biases to guard against during analysis. Holistic fallacy is the tendency to interpret things as more similar than they are and to ignore outliers. This is especially likely to happen later in the project when the researcher has looked at multiple cases already and still has more to do. The researcher may be inclined to say something is "yet another example" of an event already seen. This can be guarded against by working in teams so there are multiple interpretations and "raters." Another approach is to take a later case, start anew as if it's the first case and look for new patterns. Then the researcher can go back to the original first case and see if a different picture appears or if the same results are produced.

Elite bias is the risk of giving greater weight to high status or more articulate informants. The researcher should make sure there is not an over-reliance on accessible informants to avoid generalizing from exceptional events or nonrepresentative informants. This is especially problematic when conducting a site visit in only a couple of days rather than over an extended period of time. Continuing contact with the site through monitoring can help alleviate the potential for such bias.

"Going native" refers to the risk of being co-opted by respondents so that the researcher loses objectivity and distance. This can happen during program evaluation, especially when the researcher wants the program and the individuals to succeed. Researchers should also make every effort to avoid providing technical assistance while interacting with the informants, although they may want to provide timely and user-friendly feedback on their findings.

One of the main methods used for validation, discussed by all the researchers, is triangulation. The concept of triangulation dictates that the researcher use multiple methods for collecting and analyzing data so that all sources converge on the facts of a case. This means that multiple kinds of data sources and multiple respondents need to be built into the design of the study, including interviews, focus groups, records, documents, secondary data, observation and even survey data. Each study should aim to get not only the views of the people directly involved in or affected by an intervention, but also those of the "outsiders," even though it can take a lot more effort to locate those perspectives. From an analytic perspective, replication is a method of triangulation in that each case is viewed as an independent measure.

Other techniques also are available (Miles and Huberman, 1994):

- Look explicitly and intentionally for outliers, contrasting cases, negative or opposite findings or extreme cases that do not fit with the findings.
- Consider rival explanations within single cases and when doing cross-case comparisons. What information opposes or is inconsistent with the conclusion? What else is plausible? Is it possible there is an intervening variable?
- Test your conclusions with "if-then" statements ("if I see x, then I should also see y"). This may suggest additional analyses to pursue.
- Get feedback from others and test your conclusions. Researchers often go back to their informants to do this and can also consult with other researchers.

Questions for Researchers

A number of tensions are inherent in the case study methodology that researchers should be aware of when conducting this kind of research. A few are summarized here.

1) Is the researcher learning about the event or the person?

The question here is, where is the "truth"? Have you learned about the event or the person commenting on the event? Shortell and Sofaer both note that, in reality, one may be learning about both and both can represent a "truth." For example, if a researcher is examining the effects of an organizational

merger, is he or she learning about the facts of the merger or about a CEO who might have gained or lost a job through the merger? The researcher is advised to avoid believing there is a right or wrong interpretation or thinking. Instead, such information can be used to conclude that at different levels of an organization or market, things may be interpreted differently, which can have implications for what the researcher is examining.

2) How can the researcher be adequately prepared yet remain flexible?

Like any kind of research study, the researcher does not go into the field without extensive theorizing, prior preparation and knowing as much as possible in advance. But researchers can also be criticized for being closed-minded and unwilling to learn in the field. As Yin stated, "You need to prepare, but also prepare to discover." A structured interview protocol can improve reliability and help researchers recognize the unique when it stands out. But one can never fully anticipate all possibilities. The researcher needs to build in the flexibility to pursue new avenues of information as they arise in the field, but not abandon the original design and purpose of the study.

3) Can the researcher influence informants?

One must recognize the interaction between the researcher and the informants at the site. Sofaer cautions that questions alone will focus respondents' attention, as will interim feedback especially in evaluative work. But because it can take a long time before people get information back, especially in longitudinal studies, it is important to keep the informants at the site engaged. The interactions during the course of a study also help the researcher check on the information obtained and how it is interpreted. Therefore, the advantages outweigh the disadvantages, but caution must be exercised.

4) Is the analysis of qualitative data an art or a science?

The most common answer to this question is yes. There is a science in the design and analysis of case study research that should not be skipped over any more than a researcher would skip over it in conducting a survey. However, it is also true that observant researchers are often able to have those "intuitive insights" based on impressions of what's been seen on-site and perceptions of what is unique and meaningful given prior knowledge of the field being researched. The bottom line, however, is that sound findings depend on sound design, and case study research is no exception to this.

References

Miles, Matthew B., and A. Michael Huberman, *Qualitative Data Analysis,* Newbury Park, CA: Sage Publications, 1994.

Patton, Michael Quinn, *Utilization-Focused Evaluation: The New Century Text,* 3rd ed. Thousand Oaks, CA: Sage Publications, 1997.

Yin, Robert K., *Case Study Research, Design and Methods,* 2nd ed., Newbury Park, CA: Sage Publications, 1994.