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# The impact of expert system technology on the delivery of social services

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# THE IMPACT OF EXPERT SYSTEM TECHNOLOGY ON THE DELIVERY OF SOCIAL SERVICES

by

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## Abstract

THE IMPACT OF EXPERT SYSTEM TECHNOLOGY ON THE DELIVERY OF SOCIAL SERVICES

by

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Advisor: Professor Abbe Mowshowitz

The use of expert systems in the delivery of social services is receiving greater attention, due to factors such as constrained agency budgets, staff turnover, and increasing dependence upon paraprofessionals to carry out tasks formerly performed by mental health and social work professionals. This study concentrates on clinical and organizational ramifications expert systems may have on social service delivery, particularly when used by paraprofessionals to provide services. This thesis uses a specific system to examine the effects of expert systems, especially in determining how such systems might be used effectively in the face of the cost and other constraints mentioned.

The particular expert system examined here is called Lifenet, a program designed for the risk assessment of adolescent suicide. An experiment compared the clinical performance of a study group of social service paraprofessionals using Lifenet with a control group of paraprofessionals using a manual instrument; both groups interviewed confederates posing as youthful clients.

The study group using Lifenet made more accurate clinical assessments and in less time than did the control group. The results also showed that paraprofessionals using Lifenet

recorded client data more accurately than did the control group. Conversely, the control group indicated a greater likelihood to disagree with the assessment recommended by the manual procedure; this suggests that paraprofessionals using computer technology for clinical purposes may abdicate some decision-making responsibilities. The results of a post-experiment attitudinal survey indicate that there was no more resistance on the part of the caseworkers to using Lifenet as opposed to a manual assessment procedure.

The experimental results support the clinical and administrative feasibility of incorporating expert systems into social service delivery, but greater understanding of the impact of such systems on the overall agency is required. Similarities between the health care and social service industries suggest an existing trend towards the ascendancy of professional managers in the social service organization, with a concomitant loss of power on the part of professional service providers; additionally, the use of information technology generally tends to reinforce the power of those manage the technology. Computerized expert systems are likely to exacerbate that trend.

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Lastly, I would like to thank Marion Riedel, CSW, for her contributions. Her expertise provided invaluable professional assistance, and her personal support helped me through the entire process.

# DEDICATION

To Peggy and Bill, my mother and father,

and

to Marion, my wife.

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# CHAPTER ONE

# INTRODUCTION

## Computers in Social Service Agencies

Computers are gaining wider use in social service agencies throughout the United States. There are several trends which have contributed to this situation:

- increasing social ills such as homelessness, AIDS and drug addiction are increasing demand for social services.
- the era of Reaganomics has reduced government funds for social services, forcing agencies to find ways to economize (Burghardt & Fabricant, 1981).
- decreasing costs of computer hardware, particularly microcomputers, and the software to run those computers, has made computerization affordable even to small agencies (Schwartz, 1984; Gotlieb, 1985).
- increasing federal government regulation is putting increasing burdens on state and local social service agencies both in terms of finances and regulatory compliance (Hinds, 1992).

These phenomena have led to various responses in social service agencies:

- the declassification / reclassification of staff positions to allow the hiring of caseworkers with less education and

professional training, thus reducing payroll (Pecora & Austin, 1983; Karger, 1983; Millar, 1986). For the purposes of the paper, these personnel will be referred to as "paraprofessionals."

. the increasing use of paraprofessionals to provide direct services, sometimes even clinical assistance, to clients (Lipsky, 1980; Shyne, 1980; Lieberman, Hornby & Russell, 1988).

. In the face of the reduced training level of lineworkers providing direct services, agencies are increasingly "rationalizing" and standardizing the technologies and procedures of service provision (Karger, 1986; Savage, 1987).

. Once this rationalization has occurred, the application of computer technology--especially expert systems--to facilitate the service provision becomes feasible and attractive to agency administrators (Colby, 1980; Schuerman & Vogel, 1986; Hedlund, Vieweg & Cho, 1987; Ferns, 1991).

## Goals of this Research

This dissertation will examine the impact that computer technology has on the delivery of social services. In a more specific vein it will focus on how expert system technology, mostly in the area of clinical assessment and diagnosis, affects that delivery. This dissertation will accomplish this examination in the following ways:

A) Review the organizational aspects of the social service agency in relation to service delivery. This will

include organizational structures and the relationships between professional staff, paraprofessionals, administrators, and clients.

B) Examine the various kinds of computer technologies, especially software applications, which can be utilized in the social service organization, and how the use of this technology can alter the relationships described in A above.

C) Use a specific expert system, called Lifenet, to conduct an experiment testing the effectiveness of a knowledge-based system as opposed to manual interview for the risk assessment of suicide among adolescents. The results will be reviewed in the context of issues raised in B above.

## Current Areas of Research

The introduction of computerization into social service organizations bears similarities to that of most other organizations, especially in terms of using computers for basic administrative tasks, such as payroll, staff scheduling, and record keeping, to name a few; there has been fairly extensive reporting on these areas in the management science and social service literature (for example, Kreuger & Ruckdeschel, 1985; Zawadski & Gee, 1984; Woogh, 1988). Other potential areas of computerizing social service delivery do not have as many analogs in business and governmental areas, such as the use of computers for clinical or therapeutic purposes (although an argument could be made that there are

parallels to be found in business-oriented expert systems). Nonetheless, these applications have also enjoyed a great amount of attention, stimulated in part by the controversy surrounding Weizenbaum's ELIZA program (Weizenbaum, 1966), including areas such as psychological testing, clinical assessment, and psychotherapy.

## The Administrative Task

It is easy to understand why these basic areas, the administrative and the clinical, have received so much attention thus far; these are the two major task areas which most social service agencies (and private therapeutic practices, for that matter) have to tackle. The arguments for computerizing the administrative task include the potential for decreasing costs, increasing productivity, and enhancing accuracy, such as in automating possibly complex procedures comprised of a collection of simple operations. There are also caveats to be considered when computerizing the administrative tasks--centralization of decision-making (Whisler, 1970; Mowshowitz, 1986); consolidation of power for the "owners" of the technology (Kraemer, 1980); the mismatch between an organization's existing structure and the structure assumed by an information system (Markus, 1984); and goal displacement within the organization (Bjorn-Andersen & Eason, 1980). Although the resolution of these oft-unanticipated consequences and their impact is not within the scope of this dissertation, it is worthwhile to examine how information systems have made an impact in other organizational

environments, since information needs often retain their characteristics across industries (Mowshowitz, 1976).

The Clinical Task

The clinical task has unique features not present in administration. These functions include:

- Psychological testing;
- Assessment/diagnosis of developmental disabilities;
- Assessment/diagnosis of psychological dysfunctions;
- Therapy (e.g. psychoanalytical and behavioral);
- Crisis and substance abuse intervention.

One common thread throughout all these, and most clinical activities, is the direct patient interview. Patient reports account for the majority of useful information in diagnosis, and face-to-face interactions account for a large part of the service provider's activities. But often the very humanity of the interviewer may compromise the process in several ways (Greist, Gustafson, Strauss, Rowse, Laughren & Chiles, 1973a; Angle, Ellinwood & Carroll, 1978; Greist, 1982), including introducing factors of personal bias, inappropriate identification of the clinician with the client, and imprecision of terminology. Because of this, computerized clinical tools can help the clinician be more complete and accurate in the gathering and analysis of information from the patient (Lucas, Mullin, Luna & McInroy, 1977; Greist & Klein, 1980). These tools may also increase clinician productivity, if it helps the clinician collect and analyze patient data more quickly. And finally, the clinical task is examined

because it is, depending on one's point of view, alternately an "interesting" problem or a threat to good clinical treatment (Murphy & Pardeck, 1986b).

## Investigating Organizational Impact

One issue missing from much of the discussion concerning computerizing the social service agency is computerization's impact upon the agency's organizational structure and mission. Some specific operational tasks may be measured relatively easily as to whether a computerized system performs those tasks more efficiently and effectively than a non-computerized technique (although not always, if there are conflicting definitions of effectiveness). It is a more difficult problem to measure if computerized tools enhance the overall productivity of a manager or professional (Danziger & Kraemer, 1986). Besides the difficulties in measuring productivity, it is difficult to measure other benefits. Particularly in the public sector, computerized tools may produce benefits that are clearly identifiable, yet unquantifiable, such as Lifenet's risk assessment of adolescent suicide. While these benefits are note-worthy and important, they cannot arbitrarily be quantified (Gotlieb, 1985). And it is much more difficult to measure the effect the addition of computer technology has upon other parts of an agency, such as:

- the power structure of the agency (Kraemer, 1980; Weirich, 1980; Markus, 1984);
- agency staff (Alter, 1985; Carrilio, Kasser & Moretto, 1985; Karger, 1986);

- the delivery of the agency's services (Bloom, 1972; Kling, 1975);
- the clients, who are the recipients of the agency's services (Greist, Klein & Erdman, 1976; Angle et al, 1978; Porter, 1978);
- costs and consumption of resources (Danziger & Kraemer, 1986).

There are some features, organizational and otherwise, of social service agencies which create atypical problems in the introduction of computer technologies into these agencies. The examination of these features and their interaction with computerization will help us further understand how computers affect the social service agency.

One of the aims of this thesis is to help develop a conceptual framework which will include many of the components of this problem. By more clearly defining the problem, this framework will serve as a foundation for further research into the area, and possibly the development of some measuring instruments to gauge how successfully social service agencies integrate computers with their missions.

## A Practical Model for Social Service Delivery

For the purposes of this study, it is necessary to specify a model of social service delivery which will be used for analysis. It should be pointed out that, as in other disciplines, schools of thought which seem to embody separate and distinct approaches can actually coexist in a practical application, and realities often dictate that one approach

alone will not cover all the relevant variables. Thus, what we will examine is a hybrid of the theoretical approaches which will be outlined in the literature review.

The type of social service organization of interest has the following characteristics:

. community-based;

. multi-service;

. private (non-governmental);

. not-for-profit;

. based in an urban setting.

A more unique definition of social service delivery is difficult because the nature of services which agencies provide vary depending upon many things, including

. Demography of targeted clients - age, gender, race, socio-economic status, etc;

. Type of community in which the agency is located - urban, suburban, rural;

. Values of the agency - for example, workers at New York's Covenant House are not allowed to counsel clients on birth control or the use of prophylactics to prevent the spread of disease, since Covenant House has strong ties to the Catholic Church;

. Types of social ills addressed - the services a drug addict receives will be far different from those received by a geriatric client.

**Structural Conflicts Within the Social Service Organization**

One of the areas to be examined will be the organizational nature of our agency model. During this examination, we will:

- identify and characterize the organizational components of the agency, including staffing, power, and influence;
- describe stresses and conflicts between these components;
- analyze the ways in which these stresses may influence or stimulate the introduction of computer technology into the agency;
- assess the ways in which computer technology may affect the agency, either by changing existing relationships within the organization, or by re-enforcing conflicts.

**An Example of Conflict Within the Agency**

A brief hypothetical example of these questions may be helpful.

- Because our agency model is community-based, it attempts to be responsive to the community's demands for services. Often, a community's problems are multi-faceted. This means that the specific services a responsive agency provides may be quite diversified, especially if the agency takes a somewhat "holistic" approach to service delivery (which is entirely in keeping with the psychosocial model of social casework). For instance, an agency which helps homeless adults may have to deal with housing clients, trying to get them employment, counseling clients who may be mentally disturbed from living on the street, and

helping clients who have a substance-abuse problem.

- This diversification of services puts a strain upon the agency's resources, in terms of how much time caseworkers can spend with individual clients, and how much training staff members need in order to function effectively in a setting dealing with several clinical areas. This strain gives rise to new relationships between the agency and lineworkers, and between lineworkers and clients.
- With the diversification of services, the agency is eligible for funding from various sources (since it is not-for-profit, it does not rely on clients' fees for revenue). Different funding sources often require different information, reports and statistics with which to gauge a program's effectiveness. This increases the data collection requirements of the agency's administration and creates the need for a management information system (MIS) within the agency.
- The need for more case workers combined with fiscal limitations increases the use of paraprofessionals as line personnel. Social work professionals may be shifted from direct care functions to functions of management and supervision of the paraprofessional staff. However, one of the problems of social work administration is that most social workers are educated for direct service activities, with very little formal training in administration (Neugeboren, 1987). Whether the social work professional functions well as a "service delivery manager" is left somewhat up to chance. Along with this shift to a

supervisory position, it could be expected that the social work professional will need to utilize the agency's management information system for supervisory and planning purposes. This creates another problem because the professional social work curriculum generally devotes little attention to computer technology (Pardeck, Umfress & Murphy, 1987).

While not an exhaustive description of the relationships and conflicts within the agency, this simple scenario gives some indication of the multifaceted nature of the problem.

## Questions To Be Studied

This study uses the clinical task of assessment of imminent risk of suicide by adolescents to examine some of the aspects of introducing expert systems to social service delivery. It compares several aspects of the performance by social service workers in conducting a suicide risk assessment procedure when an expert system is used as opposed to using a manual instrument. The basic hypothesis is that there will be qualitative and quantitative differences between the performance of the caseworkers who use Lifenet and those who use a manual procedure for evaluating suicide risk in adolescents.

### Efficiency

Some of these aspects are quantitative in nature, and may be used to measure the efficiency of either instrument. These are:

- Time duration of the information-gathering portion of the interview, called the inventory;
- Time duration for evaluation and assessment;
- Overall transaction rate - this includes the information-gathering, the assessment, and other activities involved in the interview;
- Change in duration of screening process with the case-worker's experience.

**Effectiveness**

Other questions which may help gauge the caseworker's effectiveness include:

- The accuracy of the caseworker's decision for treatment--is the diagnosis by a caseworker using Lifenet better than that of a caseworker using the manual screening procedures?
- The quality of the caseworker's communication of the client's problems to a professional clinician--does it improve when the caseworker uses Lifenet? This is one aspect of short-term effectiveness.
- Long-term effectiveness, such as how the caseworker follows up the client's case, will not be examined.

**Attitudinal**

This study will examine the caseworker subjects' attitudinal reactions to the instrument, such as:

- Whether the caseworkers felt the instrument was reliable or enhanced their decision-making.
- Whether the caseworkers liked using the instrument, and

were they satisfied with it.

. Whether the caseworkers felt that the instrument affected the interaction the caseworker had with the client.

There are several other questions which may be relevant but which would not be examined at this time. These questions would address analyzing any statistical differences in the questions above based on the following characteristics in the caseworker-subjects:

. Gender;

. Age;

. Level of education;

. Level of social service experience;

. Level of experience with computers;

. Previous clinical experience with suicide;

. Previous personal experience with suicide.

This data will be collected for analysis at a later date.

## An Overview of the Dissertation

At this juncture it is helpful to present to the reader an overview of the rest of this dissertation, and, in particular, to explain how we plan to accomplish its aims. The remaining chapters of this paper are:

. **Chapter Two - Technology in Social Service Delivery - A Literature Review** - this chapter will discuss the literature of the various areas that need to be investigated, such as:

- organizational theory;

- theories of social casework;

- social service administration;
- the use of computers in both management and clinical tasks.

The theories of organizations and social casework, as they relate to social service administration, are important foundations to understanding the various aspects of service delivery. Once a clear theoretical model is developed, we can then go forward to review in what ways computerization has affected both the administrative and clinical areas of service delivery.

. **Chapter Three - Lifenet: an Expert System for the Risk Assessment of Adolescent Suicide** - in this chapter the dissertation presents a rule-based computerized "expert" system named Lifenet. Lifenet was developed by the author to assist social service youth agencies in identifying high-risk teenagers who are in imminent danger of self-harm and to direct them to one of a continuum of interventions, including support groups, individual therapy, and hospitalization. The use of Lifenet by youth workers will be examined as a potential microcosm of how expert systems may affect social service delivery. As background to this, various aspects of adolescent suicide will be presented; in addition, we will discuss examples of other expert systems in the assessment/intervention area. The knowledge acquisition process for building Lifenet's knowledge base, as well as other design and implementation issues of this interactive expert system, will also be presented in Chapter Three.

. **Chapter Four - Experimental Method** - this chapter will present the design of the experiment used to assess Lifenet in this research. The first part of the chapter will include a review of other experiments in the literature as a foundation for the one used in this study. Then the experiment involving Lifenet will be described. This segment will explain how the performance of social service workers working with the expert system was compared to those working without it. The comparison will include both quantitative measures (i.e., the time it would take to conduct a screening), qualitative measures (i.e., the caseworker's assessment of a client's risk), and self-report items (i.e., the caseworker's attitude towards using the respective instrument used). The discussion of the experimental method will also cover the subjects, who were mostly paraprofessionals currently working in youth services in New York City, how the experiment was administered, the independent and dependent variables to be measured, and how the responses were scored. Moreover, this chapter will address measures used to minimize unwanted variability in the interviewing process, including the use of young actors to portray troubled teenagers, using roles developed by a panel of experts.

. **Chapter Five - Data Analysis** - This chapter will present a description of the statistical procedures used, and the results of using these procedures on the data that is described in Chapter Four. The basic comparisons will be between the group of social service workers who used

Lifenet as opposed to those who used a pen and paper interview. There are two basic aspects of service delivery in which the results will be interpreted. The first will be clinical effectiveness; the various recommendations for action by the caseworkers using Lifenet will be compared to those of the caseworkers working manually. The other is examining Lifenet's operational effectiveness, particularly in the areas of performance and service delivery. Will it enable caseworkers to provide quality service (measured by the clinical effectiveness) while also serving to increase their productivity? Does Lifenet strengthen some areas of service delivery but weaken others? Does the caseworker's perception of productivity using the instrument match the actual level of productivity? This may render some insight as to whether a lineworker would use the system at all. If Lifenet is clinically accurate but does not improve service delivery enough to offset the expense of implementing it, it will not serve its full function. While not exhaustive or conclusive, the examination of these questions will provide some systemic results concerning Lifenet's integration within a social service delivery system.

. **Chapter Six - Conclusions.** The final chapter of the dissertation will present several conclusions suggested by the findings of Chapter Five:

- that both the effectiveness and the efficiency of social service delivery will be enhanced by the use of a computerized expert system for certain types of crisis intervention.

- that paraprofessionals, as opposed to professional clinical staff (Grann, 1982; Hammer & Hile, 1985), will exhibit no more resistance to the use of expert systems than they do to manual structured procedures.
- that the combination of increased effectiveness and efficiency of paraprofessional users of expert systems, and the lack of resistance to such use, will enable a further power shift towards the professional managers of social service organizations, and away from clinical professionals.

It is likely that this analysis of Lifenet can be extended to some other delivery systems which perform similar tasks in related contexts or environments, with similar results within the organization. Some of these areas will be discussed.

## Areas for Future Research

The goal of this study is to start giving some shape and definition to the problem of examining the impact that computerization, particularly the computer-based expert system, has upon social service delivery. Areas outside the scope of this study, but in which this formulation could prove useful, include:

. applying this model to other types of social service agencies;
. assessing inter-agency computerization;
. developing measures of negative and positive impacts of computerizing service delivery;

. performing quantitative analyses of social service delivery using the framework developed here as the basis for building survey instruments.

There is abundant evidence that, during the design and implementation stages of a system development project, careful attention should be paid to the "social system" of which the computer system will form a part. We hope to contribute to this appraisal of the social system in the area of social service delivery. Social service agencies could profit from this approach using well-designed and well-implemented systems.

# CHAPTER TWO

## TECHNOLOGY IN SOCIAL SERVICE DELIVERY

An investigation of the impact of expert systems on social service agencies necessarily requires a review of the literature from some seemingly diverse areas, including organizational theory, theories on social casework, social service administration, and the use of computers in both management information systems and for clinical tasks. Because of the interdisciplinary nature of this study, it is worthwhile to examine the relevant contributions from each of these fields. Yet this wide-ranging purview also offers the possibility of getting lost in a morass of issues. In order to avoid this, an agenda of what will be discussed is helpful. Our basic areas of concern are:

- Characteristics of social service delivery systems: the administrative and service delivery tasks that are performed by social service agencies, their goals, and conflicts which may occur within these agencies.
- Types of general computer technologies available to aid agencies in the delivery of services. These technologies will be discussed in two basic areas - information systems aimed at supporting administrative tasks, and computer systems which assist in the actual service delivery.
- Specific types of computer programs, called expert systems.

Examining social service agencies and understanding some of their issues, regardless of whether or not an agency is computerized, may help clarify current trends in those agencies. These issues include questions of accountability to various constituencies, difficulties in measuring success of service delivery, and the value-laden, normative mission of the agency. The added consideration of computerization of either the administrative or the service delivery sphere, if not both, can help us hypothesize about further trends in this type of agency. And finally we will examine whether expert systems have a place in these trends.

## Components of Social Service Delivery

It is helpful to delineate the task areas of the social service agency before examining how technology can affect service delivery. Social service delivery systems can typically be broken down into two basic components--the administrative component and the direct service component. Mutschler & Hasenfeld (1986) defined the tasks in the administrative component to include:

- program planning;
- utilization of personnel;
- administration of service delivery - in this framework, meaning the allocation of clients to programs, assignment of personnel to services, fees, costs, etc.;
- monitoring and evaluation of the program - assessing the organization's service goals and the clients' needs, evaluating the outcomes, and evaluating whether objectives

were met.

They also divided direct service tasks into two basic areas:

- treatment process - including intake, assessment, treatments and interventions, monitoring treatments and evaluating client outcomes;
- case management - assigning cases, scheduling contacts, and writing case reports. (Mutschler & Hasenfeld, 1986).

## Administration in Social Services

Any discussion of implementing new technologies within an organization must include an examination of how that new technology will help the organization meet its goals; the organization's success in meeting its goals needs to be measurable in some way. While it might be said of any organization that it has both administrative and service-delivery components--the telephone company delivers phone service, General Motors delivers cars--social services, perhaps uniquely, have difficulty in measuring success and effectiveness (Reid, 1987). While a business organization has the profit motive as the final arbiter of success, it is more difficult for the social service agency to decide what makes up its "bottom line." Patti (1985) suggests several possible performance measures which can be used:

- how many services the agency provides, at what cost, and for whom;
- acquisition of resources for growth and development, or in times of retrenchment, minimizing budget cuts;
- satisfaction/involvement of the organization's personnel;

. service effectiveness;

- bringing about desired changes in/for clients;
- quality of the direct service;
- client satisfaction.

The administrative problem arises in that, in some respects, these performance measures, if not mutually exclusive, still frequently come into conflict with each other. Patti (1983) argues that quality of service and service effectiveness should be the criteria sine qua non for performance--that these are the measures most consistent with the basic values and goals of human services. The difficulty for the social service administrator is that "unfortunately, they are also the most difficult, expensive, and time-consuming performance variables to evaluate" (Patti, 1983, p. 165). Also, conditions outside of the administrator's control have created conflicts between the above suggested performance measures. The federal government's political/budgetary agenda of the 1980's required greater agency "accountability", which forced administrators to increase agency output (quantity) to the detriment of outcome (quality) (Demone & Gibelman, 1984; Fabricant, 1985), thus replacing service effectiveness as the measurement of success. In the wake of economic downturns of the past few years, and smaller agency budgets due to federal, state, and city deficits, a policy of "cutback management" forces administrators to either curtail services, or increase caseloads (Pawlak, Jeter & Fink, 1983; Knighton & Heidelman, 1984).

This dichotomy between service effectiveness versus

accountability to monitoring agencies as measures of success blurs the goals of the agency, which in turn makes it more difficult to employ technology properly in order to enhance those goals. This begins to present the dilemma of social service administrators. The problems of running an agency often results in a gulf between the administrator and the direct service personnel, partially because of the conflict between performance measures the administrator wants or needs to use and the measures caseworkers might prefer, and partially because delivery personnel sometimes harbors the belief, at times correctly, that management's agenda is not relevant to service delivery. As Patti (1985) stated:

> Administration has never been fully understood and accepted in social welfare, in part ... because the goals of this method have been perceived to be in conflict with, or only tangentially related to, the field's main business of changing people and social conditions. (pp. 3-4)

This lack of consensus on performance measures is perhaps symptomatic of a more general "identity crisis" in social service administration. About 80% of students in Masters of Social Work programs concentrate on direct service practice (CSWE, 1985), yet many MSWs, once out of school, move directly into supervisory and managerial positions (Neugeboren, 1987). Patti (1983) promoted the perspective that a basic ingredient of human service administration is expertise in direct practice, a perspective which is consistent with the service effectiveness performance measure. While this argument can make sense at an intuitive level, it also reveals a lack of understanding of the administrator's role and the skills

required for that role. After all, a manager does not have "to know how to build the car in order to run the factory" (Neugeboren, 1987, p.59).

The Direct Service Component

On the other end of the spectrum, new pressures for accountability and external pressures from board members, funding sources, and other resource providers, push agencies to manage themselves in a more "business-like" manner (Patti, 1985). This pushes an agency, and the field of human service administration in general, to look at the dominant theories, research, and practices of administration. These technologies come primarily from the business sector (Gummer, 1984). This trend provokes great concern that social work administrators not simply be retooled MBAs or MPAs, since, with no training in direct care, administrators will have different priorities than those of direct care providers (Sarri, 1986).

The conflict in perspective with administration on the part of direct service providers and the subsequent increase of MBAs and MPAs in the administrative arena could indicate that social services are losing control of their own work places (Patti, 1983). There is considerable consensus that the purposes and goals of human service provision are not congruent with those of business management, and social service administrators and training programs will have to develop a management technology which preserves client outcome and service effectiveness as the driving goal of the social service agency (Austin, 1983; Gummer, 1984; Patti, 1985;

Sarri, 1986; Neugeboren, 1987).

## A Model for Social Service Administration

In some respects, computer systems, with their data and the procedures to manipulate that data, are supposed to digitally model or represent the real world. A potential problem with any computer system is that the model which it presents does not match the reality that is to be represented. Thus, in any computer system applied to a real world task, it is important to develop as accurate a conceptual model of that task as possible before computerizing.

In order to develop a general model for social service administration, it would be helpful to examine the basic schools of organizational theory. They are:

- The structural approach - Based partially on Taylor's theory of scientific management (Taylor, 1916). This approach assumes that organizations exist primarily to accomplish established and explicit goals, and that for every organization there is a structure most appropriate for that organization.
- The human relations approach - This perspective asserts that organizations are cooperative systems (Barnard, 1938), exist to serve human needs, and that the better the fit between the individual and the organization, the more benefits both receive (Likert, 1961). One of the main contributions of this school is the introduction of behavioral sciences into the theory of organization (Scott, 1961).

These two schools of organizational theory are generally considered to be diametrically opposed, so much so that they have been sarcastically dubbed the "forces of light" (the human relations approach) and the "forces of darkness" (the structural school) (Perrow, 1973). But while these schools present contradictory perspectives, they share one common thread - that organizations have, or should have, explicit and consistent goals. Newer theories have arisen which assume quite the opposite--that typically there is not any one set of goals in an organization, but rather several sets of often conflicting goals. This is represented by:

. The systems, or political, approach - In this theory, a basic assumption is that organizations are made up of a number of individuals and diverse groups, i.e., management, employees, customers, professionals. Many of the individuals and groups in the organization will have different values and different goals, and thus will perceive their needs differently from each other. Also, organizations have to function within an environment, and there will be necessary interactions with other inhabitants of that environment, over which the organization will have marginal control (Katz & Kahn, 1966). Another basic assumption is that most of the important decisions in an organization involve the allocation of scarce resources, and that the making of these decisions combined with the differing agendas in the organization create power and conflicts which are central to the organization (Etzioni, 1960).

. The technological qualification - while not a separate

theory, this concept asserts that the different technologies an organization uses to perform its function will impose different demands of structure and form on both the organization and the individuals in it. The general rule of thumb is that the more routinized the tasks and technology, the more effective the structural approach will be, while on the other hand, the more non-routine and variable the tasks, the more useful the human relations school would be (Woodward, 1958).

. Contingency Theory - Somewhat similar to the technological qualification, this approach asserts that the structure of an organization depends on the level of uncertainty with which the organization deals, particularly in its surrounding environment. A stable, relatively simple organization structure is appropriate in an environment of relative certainty; uncertain, changing environments require an organization's structure to be more complex and flexible. In contingency theory, every environment has a matching organizational structure which is an optimal fit (Lawrence & Lorsch, 1969).

By the 1960s, "the forces of darkness and forces of light had moved respectively from midnight and noon to about 4 a.m. and 8 a.m." (Perrow, 1973, p.318). It had become more feasible for the same organization to use different theories to model different functions within it. But, even with their differences, the above theories of organization, structural, human relations, and systems, shared one common premise--that the behavior of the organization was always rational. This

view is rejoined by:

. The symbolic approach - As opposed to the first three theories, this approach does not assume that the individuals and the groups in the organization will behave in a rational manner, but that rather they are guided by a set of beliefs, myths, and rituals which steer them through uncertain waters. In this school, corporate culture plays a tremendous role in an organization's success--often what is important is not any actual event, as much as the meaning of that event, and that meaning is partially derived by how people interpret the event (Bolman & Deal, 1984).

## Applying Organizational Theory to Social Service Administration

With the above conflicting schools of thought as to organizational theory, how do social service agencies construct a coherent approach to their own administration? The prevalence of any one approach might possibly be due to the personal focus of those analyzing the organization. Perrow (1973) classified the structuralist school as largely the purview of sociologists, the human relations school generally composed of social psychologists, and the systems approach the domain of political scientists.

Granted that these are perhaps argumentative generalizations, is there a specific school towards which social workers tend to gravitate? One of the early structuralists, Mary Parker Follett, was a social worker. She

asserted that every organization's goals set up specific situations from which "orders", or the required actions to meet those goals, naturally flowed. This was a very rationalistic theory, and much of her work was in the area of using psychological methods to determine the optimal structure needed for an organization to achieve its goals (Follett, 1926)

On the other hand, there is a strong affinity in social workers for the human relations school. "Its emphasis is on informal structure, and its core is the observation that there are unplanned-for stresses and emotions in day-to-day organizational life that hinder the efficient functioning of the organization" (Weissman, Epstein & Savage, 1983, p.14). This perspective is consistent with the psychosocial approach to social casework (see below, page 36). The psychosocial approach emphasizes the analysis of the dysfunctional relationships between individuals and the various systems of which they are members, and tries to correct those dysfunctions.

What frequently occurs is that, when applied to social service delivery, no one organizational theory seems a perfect fit. Fabricant (1985) asserts that social work is essentially a "craft", requiring a multiplicity of skills and abilities. He argues against the use of scientific and structural management in social service areas, since the level of fragmentation and specialization which occurs is anathema to the craft nature of social work.

It is problematic to apply to social service

administration any model which requires any assumption of common goals and values. In this case, both the structural and the human relations schools are unsatisfactory models. Structuralism presents unified purpose as explicit in structural designs of organization. The human relations school has tended to implicitly assume that an organization's goals are established and understood--the issue was to achieve those goals in a manner that was cognizant of the needs of the organization's members (Perrow, 1973; Bolman & Deal, 1984). Both schools view conflict within the organization as dysfunctional and would try to correct it. The critics of these approaches posit that any analysis of social service agencies and their organization should assume a lack of a central value system, multiple and unclear goals, and goal conflicts within the constituencies of the organization (Middleman & Goldberg, 1974; Austin, 1983; Weissman et al, 1983).

On the other hand, because of the conflict and political back-and-forth that is intrinsic when many groups use the same organization for different ends [1], the systems approach would appear to be the more appropriate choice for understanding social service administration. This is more striking when considering that a large number of decisions in social service organizations concern the issue of allocating scarce

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[1] Perrow (1978) promotes this view by way of presenting the New York City welfare system as an employment agency for workers who could not be absorbed into private industry--providing financial relief to welfare clients happened to be a sideline function.

resources, a major factor in the systems perspective.

The systems perspective does share a common feature with the structuralist and the human relations schools--the assumption of rationality. They all assume that people will act rationally, at least from the point of view of their own needs. This assumption may not be correct apropos the human service area. Human service organizations, specifically because they are more vulnerable to political pressures, often have unclear goals. And, since many of the technologies for delivering services are uncertain--especially in the areas of psychological diagnosis and counseling--it is hard to devise specific actions to meet whatever goals are clarified. Because of this unclarity of purpose and uncertainty of technology, social service agencies are likely candidates for the symbolic frame of interpretation (Bolman & Deal, 1984). This is easily apparent in some agencies in which some individuals are easily identifiable as the source of many of the beliefs and myths of the organization, for example, Mother Hale of Hale House, Father Flanagan of Boys Town, Bruce Ritter of Covenant House. A downside occurs when the source of the symbolism fosters a "cult of personality"; if the personality suffers a setback, the whole organization suffers. A example of this is the recent troubles of Covenant House. In 1989 and 1990 Fr. Bruce Ritter was accused of both sexual and fiscal improprieties as executive director. As a consequence, donations to Covenant House dropped radically, forcing it to shut down several programs and lay off many youth workers.

The symbolic theory of organization has not attracted

much attention in the literature on social service administration. This is possibly due to several factors:

. There has been a continual struggle for the social work profession in particular to define itself (Beatt, 1985). It is possible that the subconscious nature of the symbolic school is not an attractive area of study to a field struggling with its own identity.

. There is much effort toward making the technologies of social service provision more certain. This is partially exhibited by the increased use of standardized psychiatric classifications such as the Diagnostic and Statistical Manual of Mental Disorders, Third Edition (American Psychiatric Association, 1980), and also by a movement to use a more scientific base for practice (Faver, Fox, Hunter & Shannon, 1986).

. The pressures for increased accountability by social service agencies (Austin, 1984; Fabricant, 1985), and the increased general interest in measures of effectiveness and service delivery (Attkisson, McIntyre, Hargreaves, Harris & Ochberg, 1974; Patti, 1985; Reid, 1987), have led agencies to re-examine their missions and clarify their goals.

Considering the objections raised above, what is the best manner in which to examine the social service agency? Some suggest that the social service worker in the agency has potentially so many roles--therapist, case manager, clinical supervisor, administrative supervisor, employee, to name a few--that the worker should adopt a different form of analysis

depending upon the hat the worker is wearing. "For social workers, the test of a theory is its usefulness" (Weissman et al, 1983, p.15). Jumping from one model to another, however flexible and attractive it may seem to the undecided, is not the way to form a consistent and robust approach to interpreting and working within the social service organization.

A hybrid approach to the social service organization has a strong following in both research and practice. Austin (1983) justifies this hybrid approach partially because of the differences between social service administration and profit-motive administration. Some differences are:

- Greater fiscal restraints - non-profit and government agencies generally have fixed budgets that have to be spent within the time allotted, with little flexibility. Businesses can carry forward or charge back losses, and have greater opportunity to maintain financial reserves.
- Multiple/diffuse accountability - agencies typically have to justify their activities to funding sources, legislative bodies, special interest groups, client constituencies, regulatory agencies, and the organizational policy body (i.e., the Board of Directors).
- Outputs and outcome - most of the production of the organization's outputs requires the active participation of the service user, i.e. client. Also, outcomes typically have the form of changes in the conditions or behaviors of individuals. These outcomes often are ambiguous, difficult to define or measure, and difficult to attribute to any

specific causative factors.

. Interdependence - an agency's outcomes are only achievable through interactions with other groups and organizations which are interdependent parts of an overall programmatic approach. The agency usually has little control over these other elements. Conversely, for-profit organizations usually have leverage based on purchasing power.

Both the number of groups to which the agency is accountable and the level of interdependence suggest the systems approach as a basis for a hybrid design. This design is empirically supported by Havassy (1990) in a qualitative study of twenty-three managers in social service agencies. The managers, who were considered by their peers and supervisors to be particularly effective in their roles, shared an ability to engage diversity, both by maintaining multiple loyalties and by functioning and communicating across various systems within the organization.

It is debatable whether all the characteristics of a human service agency that Austin outlined are exclusive of the profit sector. Many businesses are answerable to different constituencies, such as stockholders, a board of directors, labor unions, government regulatory agencies, and customers (McDonough, 1983). And many other service industries, although possibly not organizations in the manufacturing sector, are dependent upon the co-operation of the customer for the production of effective output; examples could be health spas and for-profit health care facilities. And indeed, several of Austin's assumptions concerning the key

functions of administration in human services do not seem all that radically different from the functions of any manager. These functions are:

. providing effective and efficient services;

. developing and maintaining the organization;

. decision-making.

Whether Austin's construct for the social service agency differs from that of business organizations is not so important as that it is still a construct which can be used. But are there any aspects to the human service organization which do set them apart? Possibly the single most distinguishing aspect is that administration of social services is normative (Mullen, 1983). The raison d'etre of the agency is to enhance the social welfare by some means, "to choose key values and to create a social structure that embodies them" (Selznick, 1957, p.60). The administrator of an agency must develop social values and the structures to promote those values. Effective social service managers are those who set values and promote a mission for their agencies. Thus, decision-making in the social service agency is not only focussed on decisions allocating scarce resources, as in the original systems model. It also takes on a normative aspect, with an eye towards allocating those resources in the manner most befitting the agency's social values.

## Direct Service Provision

Before discussing how computers may affect the provision of services by the social service agency, it is helpful to

develop some model of service delivery. In a similar fashion to the discussion on social service administration, first we will summarize the prevailing theories of social casework, and then apply these theories to a practical model of service delivery.

## Theoretical Foundations of Social Casework

There are several formal schools of thought concerning social casework and the delivery of services. These are:

- The Psychosocial approach - this is a "system theory" approach. The client is treated taking into consideration the multiple social systems in which he/she is involved, such as the family, education, or employment milieu (Fordor, 1976). This approach emphasizes that "treatment must be differentiated according to the need of the client" (Hollis, 1970).
- The Functional Approach - this views casework as a "psychology of growth"; the client is viewed as the agent of growth in a one-on-one relationship with the caseworker. The client is best served by a self-conscious growth process, sometimes in the face of external conditions (Smalley, 1970).
- The Problem-Solving Approach - Views delivery of service as "a forward moving course of transactions between active agents" (Perlman, 1970). The agents are the caseworker and the client, and the transactions are discreet step-by-step solutions to small problems which make up a larger one.

Also there are specific techniques used as methods of

intervention and therapy which have applications in the above theoretical approaches:

- Operant Theory - a caseworker may use behavioral techniques to alter a client's behavior, using various types of reinforcement (Thomas, 1970; Thyer, 1987).
- Family Therapy - a subset to the psychosocial approach, it views the family as a system unit, and works with the client in this context (Scherz, 1970; Minuchin, 1974).
- Crisis Intervention - this is a mode of brief therapy which attempts to minimize the disruption a client may suffer after extreme physical or mental trauma. This is a short-term, better "payoff" model (Rapoport, 1970).

## A Practical Model for Social Service Delivery

For the purpose of this study, it will be helpful to specify a model of social service delivery which will be used for later analysis. Also, as with the application of organizational theory to service administration, the formulation of a model of service delivery is needed before any computer systems can be developed to model that delivery. It should be pointed out that, as in other disciplines, schools of thought which seem to embody separate and distinct approaches will typically co-exist in an actual situation, and realities often dictate that one approach alone will not be robust enough to cover all situations. Thus, like the organizational model of the social service agency, we will examine a hybrid of the above theoretical approaches to casework.

Also, similar to the organizational model, the systems, or psychosocial, approach will serve as the foundation of this model. There are areas of social work, specifically the private practice area, which focus on clinical, mental health concerns, referred to as "soft" functions (Davis, 1988). In these areas, some of other approaches, specifically the functional and the problem-solving, may be more relevant, especially in one-to-one therapeutic relationships.

This preoccupation with clinical and therapeutic modes of treatment is partially an attempt to upgrade and professionalize social work, especially in the area of private practice (Meyer, 1987; Davis, 1988). But, however it may aid the professional standing of the social worker, this soft perspective tends to identify the client as the locus of any pathology, and severely limits any investigation into whether the client's dysfunctional behavior is actually a reaction to some pathology outside the client's individual system (Minuchin, 1974). This limitation contradicts one of the basic tenets of social work--that it strive to improve the interaction between individual and environment (NASW, 1958; Bartlett, 1970; Compton & Galaway, 1984).

This interaction between humans and their environment is the emphasis of "hard" social work--tackling practical problems, performing concrete tasks, and providing resources (Davis, 1988). This is the focus of the social service agency model in this study, and in this context of individual/environment interaction, the systems model of treatment is the most appropriate basis (Taber, 1970; Pincus & Minihan,

1973; Fordor, 1976).

Many of the other modes of treatment can be integrated into this systems base to be used as a continuum of interventions--problem solving for engaging specific obstacles (Compton & Galaway, 1984), crisis intervention to minimize extreme, temporal trauma in the course of longer term service delivery (Rapoport, 1970), and operant theory (Thomas, 1970).

## Application of Systems Theory to the Social Service Organization

The agency model to be presented in this study has several characteristics which are consistent with the application of systems theory to the social service organization. These characteristics combine to set up several sources of structural conflict within the organization. Some of these conflicts are:

- Multiplicity of constituencies - management, caseworkers, clients, board of directors, community. These constituencies will contribute to a systems interpretation of the agency. In practice, sometimes these constituencies, without any central mission, will have missions which hardly overlap (Westhues, 1972).
- Decision-making around allocation of resources - this too is illustrative of a systems interpretation. The legacy of Reaganomics has left social service agencies fewer resources to solve greater problems, while demanding greater accountability by programs (Pawlak, Jeter & Fink, 1983; Knighton & Heidelman, 1984; Demone & Gibelman, 1984;

Austin, 1984; Schilling, Schinke & Weatherly, 1988).

- Disparity within caregivers - often, care providers in the agency span from MSWs to those who have no particular training in a field, with those with degrees in social work (either at the bachelor's or graduate level) in the distinct minority (Shyne, 1980; Lieberman et al, 1988). Some of this is due to reclassification and declassification of social service positions (Millar, 1986; Lieberman, Hornby & Russell, 1988), and some due to efforts to professionalize social work, creating paraprofessional positions to take care of practical, service-oriented functions (Davis, 1988). For many MSWs, the direct care position is an entry-level position on the way to either administrative positions or private clinical practice; for non-MSWs, it is often a terminal position.
- Low level of function integration - the level of integration between service and administrative functions is typically low in the social service sector, and frequently administration is not valued as a necessary and integrative force by practicing service personnel (McDonough, 1983; Compton & Galaway, 1984).

Summary of Aspects of Service Delivery

There is support in the literature for applying systems theory to both the organizational aspects of social service administration and service delivery. From the organizational perspective, systems theory provides a theoretical basis for understanding the roles and goals of players in the

organizational structure--administrators, professional clinical staff, non-professional line personnel, and clients, to name just the more obvious ones. In the area of service delivery, the systems approach, also termed the psychosocial approach, proposes recognizing that the client is part of a larger system--family, school, and workplace, for example--and that dysfunctions on the part of the client may not be entirely because of the client. Applying the systems perspective to both of these areas will aid us in better understanding the role of computers in these areas.

## Technology's Role in the Social Service Agency

An examination of the role and impact of computer technology in the social service agency requires a review of the technology which is available to this sector. In keeping with the previous survey of theories for social work administration and for service delivery, this technology review will examine issues in computerizing the administration function first, and then proceed to examining the use of computers in various clinical/service delivery tasks.

## Computers in the Administrative Function

The arguments for computing the administrative task include the potential for decreasing costs, increasing productivity, and enhancing accuracy, such as in automating possibly complex procedures comprised of a collection of simple operations. The question as to whether or not organizations actually incur these benefits when they

computerize is still unresolved and not within the scope of this dissertation. But because information needs bear similarities across industries (Mowshowitz, 1976), many of the lessons learned in business, health care, and public administration can be directly transferred to the problem of computerizing social service administration.

Management Information Systems in Service Delivery

In following the development of computers in social service administration, many of the trends that have occurred in health care administration can be directly relevant. Data processing technology during the 1960s and 1970s was the first generation of computerization for health care administration. Two of the goals of the data processing system are to streamline administrative costs and increase productivity. Typically, data processing systems could partially achieve this goal by concentrating on augmenting the speed, accuracy, and volume of such clerical tasks such as accounts payable/receivable, payroll, and billing (Amatayakul, 1982). Thus, the streamlining of costs and the increase of productivity could occur at lower levels of administration.

Larger mental health care and social service institutions were able to apply early data processing capabilities to administrative tasks, since they could take advantage of the economies of scale that was necessary to make computerization worthwhile at the basic production level (Laska, Siegel & Bank, 1980; Zawadski & Gee, 1984). For purposes of community-based social service agencies, it was doubtful that reduction

of such clerical tasks would introduce such a marked benefit. This was partially due to the high cost of computer hardware and software (including programming costs) at the time. Rubin (1976), in his case history of the computerization of Jewish Family Services (JSF) in Philadelphia, stated that most of the agencies involved in the Family Service Association of America (FSAA) found the costs prohibitive. Also, at that time, computerization in the business sector was not universally successful; Rubin found that some board members of his agency, based on their previous experience with computerized systems, cautioned the agency against one (Rubin, 1976). Another factor in minimizing the benefits of a data processing system for smaller community mental health centers is that the agency might have a fairly small client base--a long-term group home, for instance--and it may not be worth the effort nor expense of computerizing the data processing tasks (Kling, 1975).

In the 1980's, the introduction of the microcomputer allowed smaller agencies to seriously consider computerization for the first time. The decreasing costs of computer hardware, and increasing emphasis on "user-friendly" software to run those computers, made computerization affordable to even small agencies. Social service providers quickly introduced some components of information systems into their agencies (King, 1984; Alter, 1985; Kreuger & Ruckdeschel, 1985).

The advent of management information systems quickly gave rise to new applications in health care administration. Besides the basic accounting functions, newer MIS systems could aid higher level administrative tasks. Some of these

tasks were:

- patient appointment and scheduling (Mackintosh, Ribotto & Drazen, 1982);
- Staffing by patient classification (Mooney, 1982; Roehrl, Nickel & Lake, 1982);
- Quality assurance (Wilkins, McLean, Anderson, Gatewood & Batalden, 1982);
- Service utilization review (Jones, Peck, Weston & Hemme, 1978; Jones & Coleman, 1982).

Some of these facilities, such as patient and staff scheduling, are basically more non-routine administrative tasks than the ones handled by the earlier DP systems; the use of the computer could bring more flexibility and speed to these longstanding tasks. Others, especially in the area of quality assurance and utilization review, were responses to the "increasing requirements of the government, accrediting groups, third party payers, and specialty board recertification [which] make this type of computerization necessary" (Jones et al, 1978, p.267).

These larger social service agencies have since introduced MIS systems in a large part in response to these same pressures for evaluation and proof of program effectiveness by government and private funders and third party payers (Elpers & Chapman, 1973; Attkisson et al, 1974). Given the current funding milieu in which social service agencies must function, these pressures are difficult to resist, and a computerized data processing system becomes a reasonable alternative, if not a necessity, for information

reporting. Some of the relevant applications provided by a social service agency's MIS are:

- Tracking the number of clients served, the different types of services/treatments clients receive, and the outcome resolution of those treatments;
- Analysis of the productivity of the case workers - how long different types of service take, which workers provide which services, for example;
- Budgeting and job-costing - for example, if the agency is applying for funding to provide a specific service, it is necessary that providing that service does not take more of the agency's resources than that funding provides. A well-functioning MIS may help the administration prepare a fiscally responsible proposal.

At issue is whether an information system which is implemented to serve the information needs of external forces is really helpful to the needs, especially the clinical ones, of the agency itself. There is not any uniform method of evaluating an agency's effectiveness (Reid, 1987). The information demands of funders tend to stress "stats", the quantitative output, as opposed to the qualitative outcome, of the agency's work (Fabricant, 1985). This emphasis on quantity is considered a stopgap metric which is not nearly as desirable as using outcome as a measure of effectiveness (Attkisson et al, 1974; Fabricant, 1985; Patti, 1985; Mutschler & Hasenfeld, 1986).

Thus, the advantages of using an MIS system beg the question of whether it is really necessary--could funding

sources use other criteria for evaluation of effectiveness which would not require the information gathering and reporting aspects of an MIS, but would be equally valid? Similar observations have been raised concerning the use of technology in other areas such as medical care (Mowshowitz, 1976).

## The Medical Record in the Health Care Information System

One of the distinguishing features of these types of information is the place of the medical/clinical record as the cornerstone of both the hospital information system (HIS) (Amatayakul, 1982) and the mental health information system (MHIS) (Mutschler & Hasenfeld, 1986). Whether effectiveness is measured by output or outcome, much of the needed data can be drawn from the medical record, in terms of what kind of services were provided, how often, and the results. Medical records provide a bridge between the administrative and clinical functions because:

- they are the primary vehicles of information for all the interactions between the patient/client and the health care professionals (Mowshowitz, 1976; Amatayakul, 1982).
- they are used to assist in regulation and oversight by internal review committees and outside agencies (Block, 1975).
- they are used to assist in obtaining third-party reimbursement--their use is required even more with the mandated use of "Diagnosis Related Group" (DRG) based reimbursement, in which the actual diagnosis must be

revealed to the insurer, and not merely the services provided (Palley, 1991).

Some of the problems with using paper records for extracting information are:

- illegibility of handwritten records (Moffatt, Heisler, Mela, Alpert & Goldstein, 1978);
- incompleteness of handwritten records (Moffatt et al, 1978; Block, 1975);
- subjectivity of recorders (Stein, 1969; Morgan, Crawford, Frenkel & Hedlund, 1972);
- organized only temporally (Blum, Lindberg, Barnett, Warner, Lenhard & McDonald, 1982);
- redundancy of record notations for protection against litigation and for reporting requirements (Mertz, Ash & Farrell, 1982);
- amount of time spent recording redundant data - nursing staff could typically spend between a quarter and a third of their time recording information (Jacobowitz, Strodtman, Lomas & Truax, 1981);
- due to inaccessibility of medical records, informal verbal communication often became the primary method of information exchange between a health care team (Amatayakul, 1982) and tended to stress a negative patient status (Morgan et al, 1972).

During a long term and seminal project involving computerized medical records at the Institute of Living in Hartford, Connecticut, Rosenberg and Glueck presented eight principles in the development of Automated Nursing Report System

(Rosenberg, Glueck & Bennett, 1967a; Rosenberg and Glueck, 1967b). These principles are:

1) an Automated Nursing Report System makes the recording and transmitting of information more efficient;
2) Automated Nursing Reports improve staff observations of patients;
3) Automated Nursing Notes retain all of the information present in the traditional form of charting;
4) Automated Nursing Notes provide standard terminology meaningful to personnel;
5) Automated Nursing Notes provide standard terminology to minimize inter-hospital differences;
6) Automated Nursing Notes provide data for statistical analysis;
7) Automated Nursing Notes can be placed in an acceptable format and size for different medical personnel;
8) Automated Nursing Notes assist in the education of hospital personal at all times.

Many of Rosenberg's and Glueck's principles of Automated Nursing Notes have been borne out empirically (Mertz, Ash & Farrell, 1982; Moffatt et al, 1978; Glueck, Gullotta & Ericson, 1980). But other aspects of automating medical records are not addressed in these principles.

## Problems with the Automation of Medical Records

While much of the literature reflects a positive response to automating medical records, due mostly to improvements to the clerical (legibility, completeness) and logistical

(access, communication) aspects of the medical record, there remain issues that need addressing, and in which the results are not so clear cut.

## Emphasis on the Problem-Oriented Record

Increasingly, the Problem-Oriented Record (POR) has been used to standardize the medical record into an information tool that is more practical and useful, both for clinical treatment and administrative accountability. The use of a recording format similar to the POR has found increasing popularity in the social service field for many of the same reasons (Kane, 1974). The POR is essentially designed for identifying specific dysfunctions and prescribing suitable interventions, and is particularly helpful when using behavioral models (Hay, Hay, Angle & Ellinwood, 1977). This increases an agency's abilities to standardize and monitor services and decision-making by care-givers. The move to the POR represents a shift from the use of process recordings, which are basically transcriptions of clinical interviews. This movement also is indicative of the trend in social service agencies to focus on intervention strategies for specific and limited problems, as opposed to more open-ended therapies (Vogel, 1985), a trend which some have argued to be to the detriment of any real measurement of social service effectiveness (Fabricant, 1985; Karger, 1986).

## Confidentiality

Confidentiality of client records is one problem. There

is somewhat of a paradox in the fact that much of the information which needs to be disseminated throughout the system for better client care, improved utilization review, and better resource control, is also information which is supposed to be privileged and kept private as much as possible. Any balance between these two conflicting needs is possibly even more threatened in some social service areas, due to the mix of services and the longevity of treatment that clients may receive. Effective coordination of services is needed, but the recordkeeping involved in this coordination poses an ever greater risk to the client's privacy and right to confidentiality (Guthrie, Heighton, Kerran & Payne, 1976).

It can be argued that the handwritten medical record represents a much greater threat to privacy since client information is written in more anecdotal or narrative form, possibly including intimate details of the client's past (Hedlund, Sletten, Evenson, Altman & Cho, 1977). The automated record, on the other hand, can use codes and encryption to make it much harder for any unauthorized access to yield meaningful information (Hedlund et al, 1977; Mutschler & Hasenfeld, 1986). Other recommendations in regards to safeguarding privileged information is decentralizing access of information based on decision making needs (Mutschler & Hasenfeld, 1986) and limiting access to the clinical facility of origin for the information, and physically securing information in a central database.

Decentralizing access for needs of decision makers ignores that what has typically happened in business

organizations is that the introduction of MIS gathered more information and decision-making power in the hands of upper management. Thus upper management centralized its power and squeezed out many of the decentralized decision makers, middle management (Mowshowitz, 1976). Another problem with relying on decentralization, especially in the area of mental health, is that there is empirical evidence that social workers as a profession are more likely to disclose confidential information than either psychiatrists or psychologists (Lindenthal, Jordan, Lentz & Thomas, 1988). This may be because of several factors: lack of legal "privileged communications" between social worker and client, the dual responsibility of a social worker to both client and community. Whatever the reasons, this does not indicate as strong a shield of confidentiality as may be desired. This situation is somewhat exacerbated by the fact that in some fields, such as child welfare, trained social work professionals are a minority of case workers (Lieberman et al, 1988), yet most staff would have access to confidential information on the basis of the decentralized decision-making described above.

The approach of physically centralizing data has become an obsolete security measure with the advent of more advanced telecommunications. If a computer is attached to a modem, that is often enough to compromise access, as has been witnessed by the ease in which "hackers" have been able to break into confidential databases at institutions such as Sloane Kettering Hospital in New York City. Limiting access

to the originating facility is impossible in those systems where the coordination of clinical data between different care facilities is a major goal (Kling, 1975; Moffatt et al, 1978; Oppenheim, 1982; Woogh, 1988). Also, limiting access in this fashion is in direct conflict with Rosenberg's and Glueck's principle that automated nursing notes should minimize inter-hospital differences; the only reason these differences will be a concern is precisely when other facilities have access to the information.

User Resistance

Another issue is user resistance to automated record keeping. Resistance may come from all professional levels, but for different reasons. Line personnel may feel that the drive for numbers on the part of management has little bearing on the actual effectiveness of their own cases (Kling, 1975; Mutschler & Hasenfeld, 1986). Line personnel may also harbor fears that management will use the information system for surveillance purposes, to keep track of how much work is being done. Concerns in this area may lead workers to count phone contacts as in-person interviews, or purposefully miscode records, in order to improve productivity in the race of unrealistic managerial expectations (Kling, 1975; Weirich, 1980; Carrilio et al, 1985). Some professional staff resist the use of the automated record because of the lack of latitude it gives them. Doctors sometimes prefer the freeform record in order to explain their logic pertaining to a specific clinical decision and record thoughts about the

patient's general condition and alternative treatments (Stead, Hammond & Straube, 1982). Also, professionals will admit privately that they will use labels that are not correct, in order to make the client eligible for benefits (Kutchins & Kirk, 1987), to protect clients from social stigma related to their condition (Quarton, Knesper, Murray & Clay, 1978; Kutchins & Kirk, 1987), or simply to protect the client-caseworker relationship (Weirich, 1980). It is arguable that, in social service areas such as mental health or AIDS care, the mere presence of records about an individual in an agency's database can be stigmatizing (Guthrie et al, 1976).

## The Trend Toward Centralization in the Social Service Organization

From both the perspective of organizational theory and treatment delivery, there are conflicts between centralization and decentralization--essentially over where the core of decision-making in the service delivery organization should take place. The assertion that social service delivery, particularly clinically-oriented tasks, is generally comprised of non-routine tasks with indeterminate outcomes (Fabricant, 1985; Austin, 1983) would lend weight to the assertion that SSOs should have decentralized structures and decision-making (Aldrich, 1978; Patti, 1983). Conversely, movement in several different areas have tended to standardize at least some of the procedures and technologies used in service delivery. The desire to "professionalize" the mental health field has led to the development and use of the Diagnostic and Statistical

Manual of Mental Disorders (APA, 1980), which has led to standardization of diagnostic procedures (Karger, 1986; Kutchins & Kirk, 1988; Kutchins & Kirk, 1989). Demands for accountability from funding sources has created a need for standardizing at least some of the procedures of service delivery, for the sake of more measurable outputs (Austin, 1983; Fabricant, 1985; Karger, 1986) or improved data collection concerning services provided (Attkisson et al, 1974; Patti, 1983). The complexities of many clients' social problems along with a staff's overburdened caseloads create situations where SSOs need to formulate basic procedures for caseworkers to follow in order to ensure a fair distribution of resources (Gordon, 1975; Aldrich, 1978). While this movement comes from diverse directions, for whatever reasons, this increasing formalization and routinization makes the application of a centralized organizational and decision-making structure more feasible for the SSO (Woodward, 1958; Patti, 1983; Karger, 1986).

That this standardization is due to a combination of organizational forces which are working in their own best interests instead of in concert is not surprising (Perrow, 1978), but these paths still create a situation which makes the SSO seemingly ripe for centralization. This actuality flies in the face of the preferred organizational model from contingency theory--that complex and indeterminate technologies, combined with uncertain environments, which most social service delivery systems exist in, generally suggest that less formalized and more decentralized structures are

more appropriate (Woodward, 1958; Patti, 1983). Thus it is arguable that centralizing the SSO is a case of the square peg being forced into a round hole. While standardization and formalization may be the goals for which some organizational "players" are striving, for their own self-interested reasons (Perrow, 1978), there is ample basis for resistance to this direction: codifying clinical diagnostic tools such as the DSM-III may not be helpful to clinical outcomes and is basically a tool for routinizing service delivery (Karger, 1986; Kutchins & Kirk, 1988; Kutchins & Kirk, 1989; Murphy & Pardeck, 1986b); replacing outputs with outcome may not be an adequate measure of effectiveness (Patti, 1985; Karger, 1986); and SSOs which formalize procedures may run into staff resistance and low moral (Hage & Aiken, 1970; Finch, 1976; Patti, 1983; Karger, 1986). Thus, while the movement to routinize and standardize may be the prevalent direction of SSOs, there is not enough evidence that this is the appropriate direction to take.

One common thread that runs through all of the above is that the centralization of control and the formalization of procedures as an organizational context for SSOs is occurring whether or not the SSO uses computer technology. The increasing demands for services and decreasing resources have sent SSOs scurrying for ways to increase their productivity, and many have accepted centralization and formalization as at least short-term solutions. This search for greater productivity, efficiency, and consistency represents the increasing influence of bureaucratic rationalism (Mowshowitz,

1978) in the SSO. The solutions based in bureaucratic rationalism then create an organizational environment of highly structured decision processes, which is very amenable to computerization. Thus "to blame technology per se is to confuse substance with appearance" (Karger, 1986, p.119). The introduction of information technology to SSOs did not occur in a vacuum, but within the much larger context of social relations in the society in which SSOs find themselves. A Marxist perspective would argue that the introduction of technology is not the cause, but the result of the struggle for control of production inherent in capitalism (Mowshowitz, 1976; Karger, 1986); there is no reason that this same struggle, first played out in the business arena, would not eventually also occur in the social services (Burghardt & Fabricant, 1981; Fabricant, 1985; Karger, 1986). The movement of MBAs, and to a lesser degree, MPAs, into the field of social service administration (Patti, 1983; Sarri, 1986) is indicative that the lines of battle have perhaps been drawn. Consolidation and centralization of power has long been the trend in business and government; with MBAs and MPAs entering social administration in growing numbers, there is no reason to expect any different direction.

Thus, one may argue that the "industrialization" of SSOs would occur whether or not computer technology existed, and that the use of computer technology is an outgrowth of this trend (Karger, 1986). The fact that similar shifts of power have taken place in many other industries points out that the similarities in how organizations behave transcend the

differences of services those organizations render. Shifts of power within organizations typically occur either by the shift of decision-making from one group to another, or by the formalization of rules and procedures (in other words, bureaucratic rationalization) which replaces the decision-making authority of an individual or group (Simon, 1965; Mowshowitz, 1977; Mowshowitz, 1986). The increasing presence of professional administrators in SSOs illustrates the first kind of power shift--mental health providers have less and less say in organizations in which the administrators are likely to know more about budget lines and service utilization rates than about intervention theories and client assessment. The existence of bureaucratic rationalism in social service delivery can be illustrated with the existence of such diagnostic tools as the DSM-III and the Minnesota Multiphasic Personality Inventory (MMPI) (Fowler, 1980; Johnson, 1984). For whatever the reasons for these tools--to professionalize the mental health field by trying to make it more scientific, to codify expertise and limit the possibilities of errant assessments, to standardize terminology throughout the field--these tools represent a rationalism, or a routinization, depending upon the point of view, which has moved much authority from the hands of individual therapists and more into the hands of licensing boards and professional groups. At the same time as shifting the power elsewhere, the actual casework becomes deprofessionalized, because the codification of the field allows paraprofessionals with less training <u>ostensibly</u> to perform more of the direct service provision

(Karger, 1983; Karger, 1986; Millar, 1986).

These trends in the social service arena are due to forces which are similar to forces in the medical industry. At a surface level, both industries provide services that are considered, on the whole, to be important to the general public's well-being. Care providers in both industries may be either for-profit, private not-for-profit, or public organizations. Both fields typically started out with smaller organizations built around an individual or small group of care givers (Germain, 1970; Alford, 1975). With escalating costs, growing demand, and new technologies, there has been an increase of both the size and complexity of these care-giving organizations, and of the government's involvement with them (Alford, 1972; Alford, 1975; Weissman et al, 1983).

An examination of the medical industry from Alford's "structural interest" perspective may help us understand similar forces in the field of social service delivery. Structural interests are not necessarily an interest group, but a segment of an institution whose interests are served or not served according to how that segment fits the institution; these interests are labeled as "dominant", "challenging", and "repressed." Dominant interests are those served by the structures of the various institutions of the day and do not have to be organized in order to have their needs met, since the institutional structure implicitly meets their needs. In the health care profession, the dominant interest is the "professional monopoly" of the medical profession--mostly physicians and biomedical researchers--who have achieved their

dominant position by several means: limiting the number of new doctors entering the field, thus artificially limiting supply, retaining control of professional accreditation within the profession's own associations, and controlling the categorization of specialists within the field.

Challenging interests are those created by the changing structure of institutions, and they represent the major challenge to the power of the dominant interests. As with the dominant interests, challenging interests may need to organize very little, since it is the structural changes themselves within the institution which serve these interests. Alford labels these interests "corporate rationalization"; it is basically the same as the concept of bureaucratic rationalism presented above. In the health care industry, these challenging interests include hospital administrators, public health officials, insurance companies, and medical school administrators. The growth of this interest is in response to several factors: changes in technology, need to control costs, and the growth of the medical center (as opposed to hospital) as a social institution. Growing demands of coordination of services has led to the increasing size and complexity of health care organizations, a growth which partially serves the interests of the corporate rationalizers; the primary source of professional gratification for the challenging interests is the growth in size and influence of their organizations. The larger the organization the more rigorous is the medical staff organization, thus challenging professional monopoly's dominance.

The last interest group, the repressed interests are generally those who receive the ostensible services of the institution, but have little control over it. In the health care industry, the repressed interests are contained within the community which the health care organization serves. These interests are extremely heterogeneous, and the individual interests within the community are based upon a number of factors such as the ability to pay for service, the extent and quality of insurance coverage, the specific health care needs of individuals, the socio-economic class, and the general level of dysfunction in the community. Generally, the repressed interests have as much at stake as the other two interests in the effectiveness of the health care organization, but are not as powerful, and they cannot be organized without great difficulty; the structures of the institutions work <u>against</u> serving these interests. Typically, the repressed interests are those who are marginally represented in the social, economic, and political institutions: the poor, people of color, and struggling working and middle class families, to name a few.

Alford predicted that the dynamics of power would eventually shift towards the rationalist view (Alford, 1972), a view supported elsewhere (Simon, 1965). But it is also likely that, no matter how the power may shift between the dominant and challenging interests, which generally represent elite groups and classes, repressed interests still will not get their needs met. Thus, whether the monopolists or the rationalizers gain the control of production and distribution

of health care services, it is unlikely that the industry will provide equal, or even adequate, health care for all (Alford, 1972; Alford, 1975; Mowshowitz, 1976).

Alford's framework can be applied to social service provision as an industry for the purpose of better understanding how power may be shifting in that field. The dominant interests would be those of the professional mental health clinicians--psychiatrists, clinical psychologists, and social workers with advanced degrees who operate professionally as mental health clinicians. The challenging interests' composition is similar to that in the health care industry--government officials, insurance companies, agency administrators, who may be MBAs and MPAs, and psychologists and social workers with advanced degrees who do not work professionally in a clinical capacity, but in an administrative one. These challenging interests are similar to Alford's corporate rationalizers, in that they seek to incorporate new technologies to streamline service delivery and both to minimize costs, as well as reorganize SSOs. Lastly, the repressed interests in this industry are those who are provided services. Because the need for social services implies the inability to provide for those needs oneself, those receiving services are more likely to be disenfranchised from structural power. The other structural interests will probably work even more against the repressed interest than in the health care industry, where a sizeable number of patients are middle-class.

The structural interest perspective assists us in

understanding how power has shifted in the SSO. While the structural interests are roughly parallel across the two industries, the power seems to have shifted towards the bureaucratic rationalizers more quickly in the social service industry; if professional clinicians are used at all, they are more likely to be used as consultants (Bunker & Singer, 1978) and not viewed as integral to the organization (Weissman et al, 1983). There are several possible reasons for this:

1) Unlike the health care industry, which has been and still is focused on the practice of medicine, mental health provision is only a fraction of social service delivery. Other problems such as homelessness, unemployment, and substance abuse all have mental health aspects--the professional clinician is not the sole provider of services in these area. Thus, as opposed to medical doctors, mental health practitioners did not have a professional monopoly on the provision and distribution of services. Structurally, their interests could not be protected as well.

2) Professional clinicians could not maintain the monopoly even over mental health provision. Those at the highest tier of the profession are psychiatrists, who are medical doctors. However, psychiatrists tend to be the least well-regarded within the medical profession itself; it is possible that they could not muster the prestige to keep other professionals, such as psychologists and clinical social workers, out of the profession. In some states, a social worker with an MSW, generally the low person on

the mental health profession totem pole, can accept third-party billings, which allows them to bill insurance companies and Medicaid directly. More and more, the only difference between the highest and the lowest tier of the profession is the ability of the psychiatrist to prescribe drugs.

3) Both the dominant and challenging interests in the social service industry contain social workers with advanced degrees--as clinical professionals in the dominant interests, and as social welfare administrators in the challenging. Like the medical profession, social workers have been able to gain control over their own accreditation in many states. This has served social workers in both interest groups by giving clinical social workers more power vis-a-vis psychiatrists and psychologists in providing mental health services, and by shifting more power to the rationalizers by weakening the professional monopoly.

4) The dominant interest in the health care industry has retained its power partially through the support it gains from the general public, and by consistently framing discussion of health care provision around the issue of quality of care (Alford, 1975). The dominant interests in social service delivery have not been nearly as successful, for they do not enjoy the same level of public support, possibly because the people who receive these services have less social, economic, or political influence. Thus, structural forces do not serve the

mental health professions interests nearly as well. Still, even with these differences, there is one similarity--that institutions of either area will work against their respective repressed interest structures.

The fact that there is not a perfect analogy between the health care and social service industries does not in any way weaken the structural interest perspective. Quite the opposite, for while these industries do differ in their institutional structures, the structural interest perspective will enable us to understand the struggles for power in both. This perspective may, in turn, help us to understand how the use of information technology affects the structural interests of social service delivery.

## Some Effects of Information Technology on the Social Service Organization

The above discussion only presents half of the social equation of which SSOs are a part. Just as social institutions, and the members of those institutions, affect the development of technology, technological changes will in turn affect social organizations (Mowshowitz, 1976). With this in mind, we can see that the introduction of information technologies to SSOs may be a spiraling situation; it can be argued that the demands of accountability and greater productivity are partially coming from government and other large funders who may themselves be computerized. Thus, the funders' demands for more data of accountability are perhaps predicated upon their own use of computer technology.

Accordingly, if these funders did not have access to this technology, they may not have demanded the same number and categories of treatments and interventions. Being capable of absorbing only smaller amounts of data, the funding organizations might have had to decentralize some of their decision-making and grant-giving procedures. This scenario has been posited for most growing organizations; in the absence of computer technology, control would have to be spread throughout the organization (Weizenbaum, 1976).

While SSOs may have experienced centralization of decision-making before the introduction of computer technology, the use of computers in these institutions has possibly led to even greater centralization. The word "possibly" is pivotal here; while there have been investigations which point to the movement of decision-making to higher levels of management (Mumford & Banks, 1967; Whisler, 1970), others suggest that the evidence is not so conclusive (Stewart, 1971; Mowshowitz, 1986). This ambiguity also exists in SSOs' use of MIS. Some suggest that computerization has led to greater consolidation of power in the hands of agency managers while at the same time alienating line personnel (Weirich, 1980). But there is contradictory evidence that information technology can help increase effective decentralized decision-making, especially if the basic information is not integrated for central management (Alter, 1985). Most likely, these ambiguities arise because the best that can be said is that technologies used for different organizational goals will have different impacts

(Stewart, 1971). However, we have seen that many SSOs are turning to bureaucratic rationalism to increase productivity. Since it has been argued that formalization, or bureaucratic rationalization, tends to centralize control (Mowshowitz, 1977; Mowshowitz, 1978), any technology aimed at increasing the efficiency of bureaucratic rationalization will increase that centralization even further (Karger, 1986). Furthermore, empirical evidence suggests that controlling an organization's computing resources is more important than having access to the information produced, and that those organizational segments which control the organization's computing benefit considerably more than those which only have access to the information (Kraemer, 1980). Alford's structural interest perspective can now be used to extrapolate from this point: combining the reinforcement of power for the computing resources "owners" with the likelihood that in the SSO these owners are the bureaucratic rationalists, the institutional structures will alter so that more power shifts towards these challenging interests.

With this in mind, it is easy to see why the preponderance of opinion is that MIS stratifies organizations and move decision making upward; the increasing reliance on bureaucratic rationalism has created a fertile environment for this trend in many SSOs, and these agencies are just as susceptible to the centralizing impact of information systems as are organizations in the for-profit sector. It is evident that the phenomena mentioned in the previous section above--centralization of the SSO, shifts of power away from

professional practitioners and towards professional administrators, the rationalization of the mental health field--did not occur because of computerization, but once introduced into the equation, computerization does push these trends even further. Bureaucratic rationalism first creates a fertile terrain for computerization, and then the needs of a computer system to have all of its operations put into rational form creates a demand for even more activities to be analyzed and designed for the sake of computerization (Simon, 1965; Bjorn-Andersen & Eason, 1980). Also, with increasing use of computers, especially for communications within and between agencies, there will be an increasing dependence upon professional administrators and technicians who can manage this equipment (Mowshowitz, 1977).[2] This reliance further exacerbates the shift of power outlined above by increasing the ranks of management with people who may have little knowledge or concern about the actual service or product of the organization, by increasing the likelihood of an organizational structure which is slow to adapt due to vested interests, and by creating sub-goals which are not consistent with that of the organization (Bjorn-Andersen & Eason, 1980; Mowshowitz, 1977).

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[2] One may argue this view is inconsistent with the increase of user-friendly systems, specifically in the microcomputer area, but a more accurate view is that, while the human-machine interface may have improved at the user level, information systems have only increased in complexity as technological advances and their organizational applications develop. This is analogous to the automobile in 1992, which is much easier to drive than the car of 1910, but it is also much more difficult to design and build, because of all the added functions that come built into the modern day vehicle.

Computers in the Service Delivery and the Clinical Functions

The use of computers in service delivery and clinical applications is subjected to particular scrutiny because these areas have unique features not present in administration. The tasks for which computer applications have be designed include:

- Case Management and Placement - factors including the client's demographic, family, and economic profile, the client's presented problem, legal and political constraints, and community resources create a vast array of information for case workers to use in making decisions of long-term case management and placement (Schwab, Bruce & McRoy, 1986; Schuerman & Vogel, 1986; Blazyk, Wimberly & Crawford, 1987; Wick & Schoech, 1988).
- Psychological testing - a hierarchy of psychological testing tasks include simple scoring programs, programs that both administer and score tests, and programs that produce descriptive interpretations of the results (Biskin & Kolotkin, 1977; Fowler, 1980; Labeck, Johnson & Harris, 1983; Roid & Gorsuch, 1984).
- Assessment/diagnosis of psychological dysfunctions - the multitude of factors, and the complexity with which they interact, makes accurate assessment a difficult task. This is compounded by the inconsistencies in information gathering by different human interviewers using different techniques (Angle et al, 1978), and by the reality that frequently, a clinician's knowledge is either incomplete, out-of-date, or forgotten (Greist, 1982). Applications of

computerized assessments have included depression (Angle et al, 1978), risk for suicide (Greist et al, 1973a; Ferns, 1991), phobias (Carr & Ghosh, 1983a; Carr & Ghosh, 1983b) and sexual dysfunction (Angle et al, 1978). Empirical evidence indicates that diagnostic computer programs frequently perform at least as well, if not better, than trained clinicians (Greist et al, 1976; Angle et al, 1978; Miller, 1984).

. Therapy - computerized therapeutic techniques have been most successful in behavioral and cognitive therapies, including applications in language development with disturbed children (Colby, 1968), desensitization of snake phobias (Lang, Melemed, & Hart, 1970), impulse control in adolescents (Clarke & Schoech, 1984), and sex therapy for couples (Servan-Schreiber & Binik, 1989). Other therapeutic modalities have had more mixed results, particularly psychoanalysis, which is much more dependent upon transference and counter-transference between the therapist and the patient (Colby, Watt & Gilbert, 1966; Murphy & Pardeck, 1986a).

. Crisis and substance abuse intervention - these programs, consistent with the social casework model presented earlier (Rapoport, 1970), target a very specific crisis or self-destructive behavior and either try to intervene in that behavior, or at least minimize the disruption to the client. Examples include alcohol counseling (Lucas et al, 1977), drug treatment (Sells & Simpson, 1979), suicide intervention (Greist et al, 1973a; Greist & Klein, 1980;

Petrie, 1988; Ferns, 1991), and emotional crisis intervention (Hedlund et al, 1987).

Some of these applications are relatively simple programs which basically prompt the client for data and store it for later use and analysis (Lucas et al, 1977). Others take on some of the aspects of decision support systems and expert systems, combining a knowledge base of rules, actuarial information, and heuristics with an inferencing program to produce fairly sophisticated responses (Vogel, 1985; Petrie, 1988; Ferns, 1991). Some of these programs are computerized versions of already existing tests, such as the Minnesota Multiphasic Personality Inventory (MMPI) (Fowler, 1980; Johnson, 1984). Others are new programs that did not have non-computerized forerunners (Hedlund et al, 1987).

One common thread throughout all these, and most clinical activities, is the direct patient interview. Patient reports account for the majority of useful information in diagnosis. But "clinician training, recent experience, immediate distractions, and foibles of memory are among the factors that may compromise our competence as diagnosticians" (Greist, 1982, p.193). Computerized clinical tools can help the clinician be more complete and accurate in the gathering and analysis of information from the patient (Angle et al, 1978; Greist, 1982). These tools may also increase clinician productivity, if they help the clinician collect and analyze patient data more quickly. Thus, it is crucial to examine the effects that the computerized interview has upon any clinical process. And finally, the clinical task is examined because

it poses, depending on one's point of view, alternately an "interesting" problem for integration of computer and mental health technologies, or a threat to good clinical treatment (Murphy & Pardeck, 1986b).

## The Clinical Interview

The initial interview and taking of the client's history is considered by many clinicians as arguably the most important transaction of the clinical process (Slack & Van Cura, 1968a; Angle et al, 1978). The information acquired has two important roles in the client's treatment. First, the clinician requires the information in order to make an accurate assessment and to render the most efficacious treatment possible (Angle, 1981). Secondly, accurate baseline information is required for ex post facto assessment as to whether the correct treatment was selected, and whether that treatment led to an improvement in the client's condition (Hay et al, 1977; Angle, 1981).

There are several factors that weaken the effectiveness of the clinical interview when done by a human clinician. Human interviewers have great flexibility in interviewing. This flexibility allows the clinician great leeway in pursuing salient patient facts and "customizing" the interview to the individual patient. However, it is exactly this flexibility that creates a problem of inconsistency in the interviewing process--it is unlikely that different interviewers seeing the same patient will collect the same information from the patient (Angle, 1981). The lack of consistent data has

serious repercussions upon many other clinical activities, both in areas of diagnosis and treatment, and in later research advancing the field (Slack & Van Cura, 1968a; Angle et al, 1978; Angle, 1981). This inconsistency carries over to the diagnostic task, many categories of which indicate a lack of uniformly high reliability (Spitzer & Fleiss, 1974). Sources of unreliability are an ambiguous terminology of diagnosis, different methods of eliciting and evaluating client information, the lack of systematic information-gathering procedures, and the absence of consistent databases upon which clinical judgement can be based (Spitzer & Fleiss, 1974).

Some of the other areas in which the clinical interview suffers are the same that affect medical records in general--the traditional illegibility of the interviewer's handwriting (Slack & Van Cura, 1968a) and the incompleteness of information (Hay et al, 1977; Angle et al, 1978). The incompleteness of clinical recording suffers additionally in social service agencies where only a small fraction of personnel providing direct service are professionally trained (Shyne, 1980; Lieberman et al, 1988). Some paraprofessionals, embarrassed by poor writing skills, would tend to minimize entries into clients' charts, thus hindering later evaluations (Weiner, 1980).

Clinician bias is another confounding aspect to the clinical interview (Angle et al, 1978). Some of the nature of clinician bias may also have parallels in the medical profession. A certain amount of narcissistic investment in a

client's progress may be expected in any human clinician, but this investment may either alter reporting of that progress, or discourage clinicians away from long-term, slowly progressing cases, such as developmentally disabled children (Colby, 1968), or resistant clients (Kadushin, 1983). Other biases may intrude upon the clinical interview simply because of the clinician's own training. Interventions strategies are sometimes selected, not because they are the most appropriate to meet the needs of the client, but because they encompass the skills that are already in the practitioner's repertoire (Chinsky, 1975; Kadushin, 1983). The clinician's training bias and discomfit with alternative methods may lead a clinician to ignore a client's cries for help, especially in stressful areas such as suicide (Greist et al, 1973a). Clinicians may harbor personal prejudices towards the client, embarrassment and reluctance to grapple with the client's distress, a desire not to meddle in the patient's life, fear of hostility from the client, and anxiety due to subject matter which is too "close to home" for the clinician (Greist et al, 1973a; Kadushin, 1983). Moreover, experienced interviewers may interview ineffectively merely out of boredom (Kadushin, 1983).

Another source of bias somewhat unique to mental health therapies is the issue of countertransference. Countertransference is the situation in which the client is associated with some significant person from the clinician's past, and the clinician develops positive or negative feelings about the clinical relationship because of that association

(Kadushin, 1983). The presence of countertransference in the clinical relationship is generally perceived as a hindrance to the overall therapeutic process (Greist et al, 1973a; Kadushin, 1983).

Efforts have been made to remove at least some of the undesired variability of the interviewing process. Much of this work has been in the area of rationalizing the clinical interview--changing it from the unstructured discourse that may occur between a client and a therapist, and replacing it with a very structured and thorough procedure. A structured interview procedure would often include a specific pool of questions, and specific directions to the interviewer for branching to different questions depending upon the client's response, and simple rules for assessment (Derogatis, Rickels & Rock, 1976; Angle et al, 1978; Fowler, 1980; Hedlund et al, 1987; Rotheram-Borus & Bradley, 1988). This structured approach will increase the likelihood that appropriate information will be covered. In many instruments, questions are constructed so that the client may answer in a quantifiable format, thus minimizing inconsistencies. In situations in which answers are checked off instead of written, the problem of illegibility decreases. A side affect of the rationalization of the interview is that often a paraprofessional can record, and even summarize the data taken from the client (Fowler, 1980; Hedlund et al, 1987), freeing up the clinician for other tasks. While this rationalization has been introduced into many interviewing instruments, perhaps the two most well-known are the Diagnostic and

Statistical Manual of Mental Disorders, Third Edition (APA, 1980), known as the DSM-III, and the Minnesota Multiphasic Personality Inventory (Fowler, 1980), referred to as the MMPI.

The Computer and the Clinical Interview

The rationalization of the interview introduces different conflicts into the interviewing process. Angle et al (1978) argued that the need for accurate interviewing may be in direct conflict with the human clinician's interest in conducting the interview because:

- most clinicians' training is not aimed at interview consistency;
- the formal interview structure can be tedious, boring, and too rigorous for the clinician's approach to interviewing, especially with repeated administrations;
- any resistance the human clinician may have to the rigorous procedures of the structured interview can provide an undesirable subtext to the clinical interaction;
- the clinician can still skip questions and neglect to record data.

Thus, in trying solve one set of problems that occurs with the unstructured interview, another set, which may be equally deleterious, is created.

While the rationalization of the clinical interview may sow seeds of discontent among human interviewers, it also creates a fertile environment for the introduction of the computer-mediated interview. "The computer functions best in areas where human interviewers are prone to reliability

failure" (Angle et al, 1978, p. 138). Just as the creation of paved roads led to the increased use of automobiles which could only travel on flat surfaces, thus obviating the need for horses which could traverse unpredictable terrains (Simon, 1965), the creation of the structured interview basically "leveled the terrain" of the interview. This minimized the need for the human's flexible manner of questioning and replaced it with the consistency of the machine.

The introduction of computerized interviewing and testing (CIT) produced an array of positive outcomes in several areas. Administratively, CIT provided for:

- Lower costs - with the decreasing costs of computer hardware, the cost per interviewing session is minimal (Greist et al, 1973a), and any research and development costs are amortized over the number of interviews, making each interview less expensive. On the other hand, clinicians often get more expensive per interview, since they are more "experienced" and thus can command higher salaries.
- Data recording - as in the earlier discussion of medical records, CIT improves the legibility, standardization, and transmission of the client's data (Angle et al, 1978).
- Staffing - a comprehensive interview can take a full day to administer, with the number of questions running into the thousands (Angle, 1981)! And this does not include the time the assessment can take. Even at one interview a day, CIT can free a full-time staffer for other clinical activities, thus easing the shortage of skilled workers

(Angle et al, 1978).

. Availability of services - the use of CIT can assist in providing more services to clients, by making basic screening and testing more available (Greist et al, 1973a), by reducing long waiting lines patients may have to endure (Angle et al, 1978), and by providing services in remote areas where skilled workers are scarce (Hedlund et al, 1987).

CIT also presents positive results in several clinical areas as well:

. Minimization of biases - the various roots of biases--countertransference, prejudice, clinician anxiety--are easily removed from a CIT instrument (Angle et al, 1978).

. Consistency of data for decision-making - frequently, the clinician making a diagnosis or providing treatment will not be the same as the one who performed the initial interview. CIT provides the diagnosing clinician more complete and consistent data upon which to make a decision (Slack & Van Cura, 1968a; Greist, Klein, & Van Cura, 1973b; Hedlund, Evenson, Sletten & Cho, 1980).

. Development of clinical databases - the completeness and standardization of CIT allows for faster, more comprehensive development of clinical databases, which in turn can be used to support computerized diagnostic programs (Angle et al, 1978).

. Infinite patience - in light of how time-consuming the interviewing process can be, CIT exhibits the "virtue" that has been attributed to all levels of automation - the

inability to become bored or impatient. This has proved to be an asset whether dealing with developmentally disabled children (Colby, 1968), or with patients who are clearly psychotic (Greist et al, 1973b).

. Sensitive data - consistently, and across categories of dysfunctions, patients convey more ease and honesty with a CIT instrument than with human clinicians when discussing personally sensitive issues, especially concerning socially "aberrant" behavior (Slack & Van Cura, 1968b; Greist, Klein, Gurman & Van Cura, 1977; Lucas et al, 1977; Angle et al, 1978).

CIT is not a panacea for easing the shortage of mental health services. Different modes of therapy have different levels of "computerability." Behavioral and cognitive techniques have been very amenable to effective computerization, while other modalities, such as psychoanalysis, have been less so (Zarr, 1984). New administrative issues arise such as whether it is feasible to require the client to go through a CIT session on an earlier date than the first consultation with a clinician, and whether the costs of CIT should be considered basic operating costs, or billed directly to the client or third-party payer (Greist, Klein & Erdman, 1978).

## On Reliability, Robustness, and Reification

The use of computerized tools in clinical practice is not without its critics. Some concern has been raised over the possibility that computerized testing tools will be both developed and used inappropriately. Frequently, automated

clinical tools are put into use, not because they have been rigorously validated, but simply because they "work" (Lundsgaarde, 1987). Examples of misuse include the development of substandard software, inexperienced users misinterpreting results, and unsophisticated users administering the test in inappropriate situations (Johnson, 1984). This is a valid worry concerning even common computer tools--how many novice users have utilized spreadsheets for database applications? At issue here though is not an inherent shortcoming of computer technology; most of these criticisms and their solutions fall within the purview of the developer and the user (the user in these cases being the clinician giving the test) setting and maintaining responsible standards for applying the technology (Zachary & Pope, 1984).

It is possible that, for ease of administration, an agency will standardize on a limited number of clinical systems which may represent only a narrow sample of possible methodologies. This standardization may exclude alternative techniques which may be appropriate for different clients (Gripton, Licker & deGroot, 1986). However, in the context of social service agencies' growing reliance on paraprofessional workers, which is discussed below, there is already a tendency to standardize therapeutic procedures. It is unlikely that paraprofessionals will be previously acquainted with the alternative methodologies which may be excluded.

Of greater concern is the inertial impact that the computerization of clinical tasks may have. The general resistance to change on the part of organizations which have

computerized has been outlined above (Mowshowitz, 1977; Bjorn-Andersen & Eason, 1980). This resistance will probably also exist in clinical functions which agencies have computerized. Agencies may be unable, or simply unwilling, to invest in revising computerized clinical systems, especially in light of budgetary constraints and limited resources. This resistance to change may result in clinical systems which are out-of-date with newer clinical developments, and may also force new clinical developments to fit into older computerized models, instead of the reverse (Gripton et al, 1986). While this is true of any standardized tool, computerized or not--the DSM-III dates from 1980, and yet is still the Bible of mental health diagnosis--this tendency is noticeably stronger in computerized systems, due to the greater investment of resources required to implement such systems.

## The Robust Nature of the Person-to-Person Interview

Much of the debate over whether computers are useful tools in the clinical interview reveals much deeper divisions over whether interviewing is an art or a science. Detractors of computerized clinical tasks attack computer usage from several perspectives. One of these is the belief that human clinicians process and filter many more variables implicitly than it is feasible to program into a computer application (Spiesel, 1978). Also, the human interviewer can gather more robust information from the client, due to the human's flexibility to branch to different topics and to adjust the interview to the particular patient (Angle et al, 1978).

There is no doubt that a CIT instrument is currently unable to detect non-verbal cues which a human clinician might take into consideration during an assessment. But evidence suggests that most people, including expert interviewers, are not particularly good at correctly interpreting non-verbal cues, especially when the interviewee is being deceptive (Ekman & O'Sullivan, 1991; Goleman, 1991). Thus, it is arguable as to how much is really lost in terms of using non-verbal language in assessing a client. Moreover, despite assertions that the human clinician can integrate and filter far more information that CIT, this is not supported by empirical evidence; CIT instruments are more likely to be successful at gathering accurate information about a client (Lucas et al, 1977; Angle et al, 1978) and more likely to use that information for a correct diagnosis than the human clinician (Gustafson, Greist, Strauss, Erdman & Laughren, 1977; Hedlund et al, 1980).

## Rationalism, Reification, and the Human Patient

A more philosophical critique of the use of computers in the clinical task is that the conversion process of the client's state of mind into the "rational" data format required by computers "reifies" the client by creating a computerized model of the client which is not complete nor accurate (Murphy & Pardeck, 1986b). This is partly because the process of classifying and coding information about the client obscures the "lived-meaning" of the client's actions, and partly because "the language used by persons to organize their everyday lives [is] made to conform to the technical

strictures imposed by computerization" (Murphy & Pardeck, 1986b, p.1105). While at first one may find this position philosophically sympathetic, it falls short in two ways. First, a tremendous amount of coding and classification of symptoms and disorders already exists--many of the structured psychological tests and the Diagnostic and Statistical Manual of Mental Disorders (DSM-III) attest to this. This classification process is the clinical equivalent of the bureaucratic rationalism discussed above, and these non-computerized clinical technologies have already drawn their share of criticism (Karger, 1986; Kutchins & Kirk, 1988; Kutchins & Kirk, 1989). If any reification of the client exists, it occurred before the automation of methodical manual procedures.

Secondly, the concern that "language cannot be treated as an algorithm that provides interpersonal understanding through the manipulation of linguistic structures" (Murphy & Pardeck, 1986b, p.1106) is an argument that gets stuck in time. This argument is based upon the premise that computer technology cannot completely succeed at some task (in this instance, natural language processing and understanding) at this time, so it is assumed that computerization will always fail at the task. While the scope of this paper does not include a discussion on the future or likely success of natural language processing in therapeutic situations, it is safe to say that this argument does not take into account possible technological advances. Any enterprise requires a continuum of tasks ranging from the very structured and routine to the

unstructured and non-routine (Woodward, 1958), and the more structured routine tasks are more likely candidates for automation (Simon, 1965). As technology improves and becomes more flexible, many tasks which at one time were on the unprogrammable end of this continuum begin to move to the other end (Simon, 1965). Just as computer systems in industry are programmed with capabilities that were once presumed to be the sole domain of human managers, so technology can improve to minimize the language barriers that currently face CIT.[3]

## Morality and Computerized Clinical Tools

Some argue that the issue is not whether computer technology can be as effective as humans in performing clinical tasks, but whether the use of computers in areas such as psychotherapy is simply immoral, of which "the very contemplation ought to give rise to feelings of disgust in every civilized person" (Weizenbaum, 1976, p.269).[4] It is possible that such indignation is more indicative of one's professional rather than moral position. There is telling evidence that patients are more honest in a computerized interview (Slack & Van Cura, 1968b; Greist et al, 1977; Lucas

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[3] A more extreme example of this lack of technological foresight was the condemnation of computerized clinical applications because at the time they required more memory than was available on microcomputers (Spiesel, 1978)!

[4] It is ironic that Weizenbaum's development of ELIZA, which was intended as a natural language exercise using a Rogerian therapy model, laid the foundation for much research into psychoanalytic computer models. Even his report on ELIZA (Weizenbaum,1965), which aimed to debunk the mystery behind this program, served to fan the flames of future development.

et al, 1977; Angle et al, 1978), find computerized interviews more interesting and relaxing (Coddington & King, 1972; Greist et al, 1973a; Skinner & Allen, 1983), and at times prefer computerized interviews to human interviewers (Slack & Van Cura, 1968c; Angle et al, 1978; Porter, 1978). The reactions of patient interviewees was such in one study that a researcher projected that "the doctor-patient relationship may be more important to the doctor than to the patient ... [and] may not be helpful to the patient. It tends to perpetuate paternalism in medicine" (Porter, 1978, p.237). Also, such condemnation on moral grounds does not address the fact that, while demand for mental health services has increased, the number of professional mental health workers has decreased. For instance, the number of medical students specializing in psychiatry has dropped from 20-25% to 5-8% (Colby, 1980). So while one can question "the propriety of asking a frightened, alienated patient to interact with a mechanical marvel of unfeeling, uncaring, stupid rigidity" (Spiesel, 1978, p.10), one should also question the rectitude of delaying treatment to a client because a human clinician is not available. Computerized clinical programs may offer a means by which services can be provided to those who may rarely have a chance to see a trained human clinician; the loss of the human aspect may be more than offset by the overall clinical value CIT may deliver.

Non-clinical impacts of clinical systems

What is much more helpful is to examine what technological tasks computers do correctly now, but which are not desirable due to some negative impact upon the surrounding milieu. Much of the focus of discussion on how the computerization of clinical tasks affects social service delivery is on the impact on social service and mental health professionals (Weirich, 1980; Karger, 1986; Murphy & Pardeck, 1988a), yet the tendency in many agencies is for these professionals to move out of front-line work and into either supervisory positions or private practice (Turem, 1986; Chess, Norlin & Jayaratne, 1987). On the other hand, perhaps indicative of the field's focus on professionalization, very little discussion is aimed at the impact upon those likely to use computerized clinical applications, the paraprofessional line personnel. Indeed, scant discussion at all is focussed upon the paraprofessional as a service provider.

The Paraprofessional in the Social Service Organization

The non-professional has been the main caretaker in mental health service organizations from times dating before the professionalization of the field. With the evolution of psychiatry as a medical subspecialty, the mental health field has witnessed increasing professionalization, with its concomitant development of a hierarchical "caste" structure--psychiatrists with medical degrees at the top, psychologists with professional degrees, social workers, nurses, and at the bottom rung, paraprofessionals. In the community-based mental

health organization, this may be collapsed somewhat with the manager at the top, the expert worker who is a professional and functions more or less autonomously, and then the paraprofessional (Bayes & Kirby, 1978).

Paraprofessionals fulfill many tasks in the social service agency; they typically hold minor therapeutic but major care-taking roles in an agency. They can develop informal relations with clients for whom the professional does not have time, and can reduce the need for the professional's interaction with a demanding client population. The paraprofessional who engages in therapeutic tasks may serve as a "dumping ground", getting a caseload of clients whom the professional deems are not promising cases. The paraprofessional is the one who must control troublesome clients and perform the tedious, time-consuming work that the professionals do not want to do, such as intake interviews and providing basic services (Bayes & Kirby, 1978).

Several factors have contributed to the increase of paraprofessionals in the social service delivery field:

- There has been a boom in demand for mental health services since World War II, and as well as more emphasis on community services and preventive measures (Bayes & Kirby, 1978). An increasing demand in the 1960s fostered an increase in paraprofessional roles in which the range of skills were fairly narrow in order to train people more rapidly (Bunker & Singer, 1978).
- There has been a sharp decrease in psychiatrists coming out of medical schools (Colby, 1980).

- The Economic Opportunity Act of 1964, in fostering more community-based social service agencies, dictated that members of the community be hired as staff and swelled the ranks of the paraprofessionals. This was consistent with Perrow's perspective that social service agencies have a latent goal of providing employment that may be more important than their official goals (Perrow, 1978).
- The social retrenchment of the 1980s and the subsequent cutbacks in social service allocations led to agencies pursuing many ways to manage costs. One common approach was to declassify lineworker positions with lower education levels or to accept experience as a substitute for professional education. This allowed agencies to hire non-professional caseworkers at lower salaries to fill direct service positions (Pecora & Austin, 1983; Karger, 1983; Millar, 1986).

In the model of the urban, community-based, multi-service agency which is examined in this dissertation, the agency typically cannot afford to have professional social service workers in line personnel positions; the labor-intensive nature of the face-to-face communication, which social service delivery systems rely on heavily, advances the case for putting less expensive labor in these positions. The large size of caseloads and the relatively low pay discourages professionals from anything but higher-paid supervisory positions in this type of agency. Thus, a great deal of the counseling and intervention is performed by personnel who have little or no professional training. In the child welfare

field, a recent study indicates that only about one-eighth of direct service personnel have professional social work degrees, and this study excluded New York, California, Florida, and the District of Columbia--regions with large urban populations (Lieberman et al, 1988).

While many people may have had little skills coming to paraprofessional positions, they have often developed considerable competence within a limited domain (Bunker & Singer, 1978) and assumed positions of power and responsibility far beyond their training (Lipsky, 1980). Line personnel can enjoy a wide latitude in their decision-making. They have tended to be the main conduits of information between the client and the agency; much of what the agency knows about the client's needs came through the line worker, as did much of the information about the agency's services and policies that the client received (Hasenfeld, 1983). Because of the constant interaction with clients, the worker's personal attitudes may have a significant impact on the services the client receives, and the worker personally can markedly affect the client (Lipsky, 1980).

In these positions, paraprofessionals have comparative independence and discretion. However, since whatever training the paraprofessional has received has been brief and limited, and service delivery tends to be unstructured, non-determinate, and non-routine, the caseworker is often called on to make decisions outside of his domain. The combination of individualistic (face-to-face) interaction, the worker's latitude in decision-making, and the lack of training,

reinforces the perceived need for bureaucratic rationalism in the social service field. The need to develop consistency of service, partially for reasons of accountability, and partially to provide equal service to all clients, has led to the growing use of formalized procedures and technologies in social service delivery.

This trend would seemingly remove a great deal of discretion from the paraprofessional worker, but it appears at times to have quite the opposite effect! Sometimes rules proliferate to the degree that no one can possibly know them well, and because no one person knows every procedure or policy, the individual worker can only interpret the rules as best as she can. Thus, discretion and latitude is returned to the front line (Rossi, 1978). But as laudable as this returning empowerment may be for the line personnel, it may not be in the best interests of the client. Increasingly complex decisions requiring knowledge of the best treatment for the client, the legal ramifications for the client, and various political and bureaucratic pressures make the task of making a correct determination unfortunately difficult (Schuerman & Vogel, 1986). These factors, plus the need to avoid seriously compromising agency procedures, increase the decision load with which the caseworker must deal (Caputo, 1988), and make the possibility of consistently good treatment even more remote.

There is little doubt that, considering all the factors involved, the paraprofessional does need assistance in developing appropriate treatment plans for clients.

Unfortunately, there has been little research so far into this specific area. The social work profession has displayed much ambivalence towards paraprofessionals (Bayes & Kirby, 1978; Bunker & Singer, 1978), and perhaps this ambivalence, along with the fact that most researchers in the area are professionals themselves, is the reason for the scant coverage. Some discussion of general information systems indicate that line personnel do not find these systems helpful, mostly because they must do much of the data preparation, but they get little feedback from the systems (Alter, 1985; Carrilio et al, 1985; Schuerman & Vogel, 1986). However, there is some evidence that there is a more favorable response on the part of line personnel when using decision support or expert systems. In a case study of microcomputer applications in a local office of a state social service agency, Alter found that applications developed for decision support purposes were received favorably by line personnel, and that the applications fostered a higher skill level in some staff (Alter, 1985). Interestingly, in a survey of staff members of all professional levels making patient scheduling decisions in a hospital, the greatest resistance was from the highly educated professional staff. There was a much more positive response from line personnel who were not college graduates (Grann, 1982). It is in this context that it will be worthwhile to investigate further whether the use of expert systems or decision-support tools will affect the paraprofessional.

# CHAPTER THREE

## LIFENET: AN EXPERT SYSTEM FOR THE RISK ASSESSMENT OF ADOLESCENT SUICIDE

In order to investigate some of the impacts that expert systems may have on social service delivery, we will examine one such expert system, namely, Lifenet. This system was developed by the author to assist social service youth workers in assessing and intervening in suicide attempts by teenagers. Part of this discussion will delineate some of the factors driving the application of expert systems in social service delivery and will present a survey of some expert systems specifically targeted for clinical or social service use.

In later chapters we will discuss the results of a controlled experiment designed to assess some of the effects Lifenet may have on such delivery. It will not be feasible nor would it be responsible to generalize too much from one such experiment using one specific expert system for one specific social problem. Nevertheless, the study of both Lifenet's advantages and foibles should help us formulate some guidelines for applying expert systems to social service delivery systems.

### Expert Systems - What They Are and How They Work.

Expert systems are computer programs which attempt to emulate the judgement and decision-making of human experts,

often in the absence or unavailability of those experts. The problem area, or domain, of an expert system tends to be narrow, focussing on one problem area. Waterman (1986) outlines several aspects of expert systems which set them apart from other types of computer systems:

- the knowledge should be explicit and accessible - an expert system should contain a body of knowledge that can be disseminated by alternative means, such as oral or written communication.
- an expert system contains high-level expertise - the value of an expert system is in the availability of the knowledge of an expert when the expert herself is not available.
- an expert system has predictive modeling power - it should allow the user to present alternative data in order to explore how an expert would alter decisions based on a changing situation.
- an expert system provides an institutional memory - if an expert system is based upon the expertise of key people within an organization, this expertise may be retained after those personnel leave the organization.
- an expert system provides a training facility - non-expert workers in a domain can benefit from having a considerable store of expertise readily available for exploring the procedures, strategies, and policies an expert may use.

Not only does the expert system provide support and expertise in the same ways a human expert would, but the process of building the expert system creates an accumulation and codification of knowledge that can be accessed repeatedly when

the expert is not available.

Expert Systems Concepts

While a full discussion of expert systems is not within the scope of this study, it will be helpful to review some of the basic expert system concepts and terminology as a point of reference for later discussion. These include:

- Knowledge Base - the collection of domain knowledge that the expert system contains. Part of the knowledge base will contain facts. For example, a fact in Lifenet might specify that depressed teenaged males are in greater imminent danger of committing suicide than are depressed females. The knowledge base also contains knowledge representation of procedures that use those facts to make decisions. While there are several different techniques for representating knowledge, the rule-based method used in Lifenet is the most popular.
- Rule-based methods - essentially, rule-based methods focus on the use of the IF *condition* THEN *action* structure of third generation programming languages. Rules represent knowledge by testing a certain premise as the IF part, and then specifying an action or decision with the THEN clause. One typical rule in Lifenet will examine a series of symptoms and decide whether the client should be considered depressed.
- Inference Engine - despite the mechanical sound of its name, the inference engine is software which contains general problem-solving knowledge. The inference engine

processes the information in the knowledge base to develop new decisions. Some expert system development tools such as PROLOG (Clocksin & Mellish, 1981), OPS5 (Brownston, Kant, Farrell & Martin, 1985) and EMYCIN (van Melle, Shortliffe & Buchanan, 1984) have an inference engine built into the language; the use of lower-level languages such as LISP (Winston & Horn, 1981) or third generation languages requires that the inference engine be constructed along with the knowledge base.

- Heuristics - some domain areas, such as the clinical domain, may resist traditional algorithmic solutions. Heuristics are the equivalent to the human expert's rules-of-thumb; they assist the expert system in simplifying its search for a solution. Heuristic methods may not produce an optimal solution every time, but they tend to produce acceptable solutions quickly (Waterman, 1986).
- Certainty Factors - as the use of heuristics may indicate, facts and rules in expert systems are not absolute, and there may be some degree of uncertainty as to how valid the rule may be. A certainty factor indicates the level of this doubt; on a range from 0 to 1, the higher the factor, the greater certainty that the rule is correct (Waterman, 1986). Despite its similarity in numeric value to probabilities, certainty factors are not manipulated or combined in the same way as probabilities (Winston, 1984; Keller, 1987).

While this list is by no means exhaustive, it is sufficient for the reader's understanding of the later discussions on

expert systems in general, and Lifenet in particular.

## Why Expert Systems in Social Service Delivery?

In discussing the use of expert systems in the delivery of social services, there are two general areas in which the factors for such use fall--the "environmental" factors of the agency, such as staffing, demands for services, and paucity of resources, on one hand, and the nature of the knowledge base needed for clinical and service provision, on the other. The former category addresses the need for and usefulness of expert systems in social services at an operational and economic level, while the latter deals with the methods of service delivery and the feasibility of incorporating them into knowledge-based systems.

## Environmental Factors Promoting Clinical Expert Systems

Social service organizations are faced with a variety of challenges, many of which are constantly changing. This situation makes the use of expert systems for service delivery attractive.

- Increasing Demand for Services - The increase of social problems such as homelessness and substance abuse, coupled with newer problems such as crack-cocaine addiction and Acquired Immuno-Deficiency Syndrome (AIDS), has created an ever-growing demand for more social services, straining the "social safety net" to the breaking point. Some examples are the almost two-fold growth of the teenaged homeless rate over the 10 year period 1976-1986 (Opinion Research

Corporation, 1976; Health and Human Services, 1987), a 50% increase in active syphilis cases between 1985 and 1988 (Center for Disease Control, 1989), and the onset of AIDS in the general population, from non-existent in 1980 to over 200,000 cases by 1991 (NYC Department of Health, 1992).

- Decreasing Funding for Services - Between the federal government's withdrawal of financial support during the 1980s (Burghardt & Fabricant, 1981), increasing federal government regulation which puts more financial burdens on state and local social service agencies (Hinds, 1992), and recessionary pressures decreasing state and local revenues, many social service agencies must face increasing demand with shrinking budgets.
- Lack of Domain Skills of Direct Service Staff - As observed in earlier chapters, social service agencies are increasingly turning to the increasing use of paraprofessionals to provide direct services, sometimes even clinical assistance, to clients (Lipsky, 1980; Shyne, 1980; Lieberman et al, 1988). Frontline staffing typically suffers from a lack of professional training specific to the field and high turnover partially caused by staff "burnout" (Shyne, 1980). Thus, the workers who provide direct services may not be so highly trained or experienced, and thus will not have the expertise on which to rely in providing appropriate services (Schuerman & Vogel, 1986).
- Complexity of Decision-Load - In the context of social

service delivery, the concept of decision load describes the degree of decision-making required to properly provide services (Caputo, 1988). The decision load of social service workers is increasing both in the breadth of the domain knowledge required, and the complexity of factors involved. Typically, social service organizations are multi-service agencies, offering services such as drug treatment, housing, and health care, to name just a few. Many paraprofessionals will have detailed knowledge of a few of the service domains, but they cannot be intimately familiar with ALL the issues that present themselves--the knowledge required is simply too extensive. Secondly, there may be many individual, legal and social factors that must be considered before making any determination as to an appropriate service plan, and these factors can interact with each other in many complex and different ways.[5] But the paraprofessional lineworker with a tremendous caseload and clerical workload may have time to consider only a few of the ways factors may interact.

. Labor-intensive Nature of Service Delivery - While

[5] One actual case from an agency providing services to people with AIDS may provide an example of such an interaction. A young teenager was kept out of school to care for a dying parent. The caseworker wanted to work with the family to develop some alternative means of both caring for the parent and schooling for the child; however, in New York State, this caseworker was also a mandated reporter to the local child welfare authorities, and possibly was legally required to report the child's absence from school as a case of neglect. It is unlikely that the caseworker could make such a report and maintain a fruitful therapeutic relationship with the family as a whole.

different models of service delivery require different staffing levels, it is not uncommon for a program that provides housing to have a recommended staffing level of one worker for every three to five clients. In the context of exploding demand for services and severe budgetary constraints, such staffing requirements are simply unaffordable.

## The Technological Feasibility of Expert Systems in Service Delivery

There are several factors that indicate that the use of expert systems for clinical applications and service delivery are technologically feasible.

- Clinical Modalities with Well-Defined Methods - Some modes of clinical therapies have developed well-defined and objective methods of operations and evaluation in their application. These include cognitive and behavioral therapies and psychological assessment. It has been argued that any therapy with well-defined operations and measurable outcomes can be implemented as an expert system (Colby, 1980).
- Rationalization of Service Delivery - As observed in the literature review, various forces have led to the increasing rationalization of service delivery, partially for quality assurance and the fair distribution of services, and partially for cost-effectiveness and greater administrative control. This formalization has made service much more of a deductive process; once there are

systematic, rational, and identifiable procedures for providing services, expert systems are appropriate tools (Schuerman & Vogel, 1986).

- Increased Availability of Computing Resources - The declining costs of computing hardware and software, greater availability of programming staff, and increasing familiarity with knowledge-based systems make implementation of such systems at the small agency level very feasible.

The trends of budgetary pressures and increased demand have illustrated how service agencies have had to increase utilization of paraprofessionals in line positions. The heavy caseload and lower pay (which is why agencies used paraprofessionals in the first place) lead to a high degree of turnover of experienced line-level personnel. This turnover, coupled with the generally lower level of training of paraprofessionals, has raised concerns about quality assurance. In response to these concerns as well as general demands for greater accountability, and to guide line-level personnel in decision-making, many agencies have formalized procedures for service delivery. These procedures make the implementation of expert systems relatively straightforward. The feasibility of implementation coupled with the relatively low cost of computing resources, and the economic pressures of reduced budgets and high staffing costs, make the use of such systems economically and administratively attractive.

## Examples of Expert Systems in Service Delivery

There are many examples of expert systems which are aimed at clinical or service delivery applications. While a full survey of such systems is not feasible and is doomed to be out-of-date as soon as it is published, a small representative sample can help illustrate how robust this area of application already is. Some representative systems fall in the area of clinical mental health applications, such as:

- Psychiatric Diagnoses - Systems designed to act as interviewing tools and produce diagnosis within the categories outlined by the Diagnostic and Statistical Manual (DSM-III) of the American Psychiatric Association include the DIAGNO series (Spitzer & Endicott, 1969), and several developed at the University of Wisconsin (Greist et al, 1973b; Greist et al, 1977).
- Dilemma Counseling - PLATO DCS (Dilemma Counseling System) was designed to counsel a client and teach the client a generic method of personal problem-solving applicable to psychological dilemmas (Wagman, 1982). In this system, the client interacts directly with the computer.
- Emotional Crises - Concerned about the repercussion of emotional crises of crew members on submarines, the U.S. Navy sponsored the development of the "Computer-Supported Assessment and Treatment Consultation for Emotional Crises" (CATCEC). CATCEC's purpose was to assist an enlisted medical specialist, who is typically the only medical specialist available on a submarine, in diagnosing and treating crew members' emotional and behavioral problems

(Hedlund, Vieweg & Cho, 1987). The targeted user is the enlisted medical specialist.

- Psychopharmacology - Based on the EMYCIN model (van Melle, Shortliffe & Buchanan, 1984), the Blue Box program was developed as a psychopharmacological expert system aimed at the treatment of depression (Mulsant & Servan-Schreiber, 1984).
- Sex Therapy - Designed for direct interaction with couples, an expert system called Sexpert combines an "intelligent tutoring" model with a knowledge-based approach to assessment and treatment suggestions (Servan-Schreiber & Binik, 1989).
- Suicide Prediction & Intervention - Such systems are designed to interview psychiatric patients and determine whether they are likely to be suicide attempters (Greist et al, 1973a; Greist, Gustafson, Strauss, Rowse, Laughren & Chiles, 1974; Petrie, 1988).
- Child Placement - Child placement into foster homes and programs is fraught with familial, economic, and political pitfalls. MATCH (Schwab et al, 1986) and PLACECON (Schuerman & Vogel, 1986) are two expert systems used by child placement caseworkers. MATCH is based on the expertise of admissions personnel and guides placement workers in optimal client-to-program matching, while PLACECON is based upon a series of rules constructed by researchers in Child Welfare.
- Family Therapies - The Personal Consultant Decision Support System (PCDSS) is designed to advise the family therapist

as to how to deal with difficult family cases (Gripton et al, 1986). Despite its name, PCDSS is actually an combination of decision-support and expert system techniques, which the authors prefer to call "consulting systems."

. Learning Disabilities Diagnosis - Many students classified as learning-disabled are mis-diagnosed (Shephard, Smith & Vojir, 1983); the major problem is that students classified as learning disabled often have less serious dysfunctions. CLASS.LD and CLASS.LD2 are expert systems designed to give individuals responsible for making diagnoses second opinions as to the appropriateness of the diagnosis (Hofmeister & Lubke, 1988).

The systems outlined above have diverse audiences--some are aimed at trained professionals seeking additional consultation, others at paraprofessionals who may be ill-equipped to deal with all the complexities of the task at hand, and yet a third group is aimed at direct interaction with the targeted client. Also, the above systems range over a continuum of statistical and knowledge-based models, frequently merging some of both approaches.

## Are Expert Systems in Service Delivery Inappropriate?

Chapter Two reviewed some of the arguments against the use of computers in clinical applications. Some of these same arguments--dehumanization (Weizenbaum, 1976; Spiesel, 1978), the codification of discourse (Murphy & Pardeck, 1986b), and the likelihood that expert systems may make organizations

resistant to changing therapeutic or programmatic procedures (Gripton et al, 1986)--apply in particular to expert systems used in clinical applications.

Another argument is that true expertise is unquantifiable; expertise may not be as precise or logical as is presumed by any formalizing of procedures (Dreyfus 1972; Murphy & Pardeck, 1988b). And because there is not an isomorphic relationship between human thought processes and computer processes, this position holds that expert systems will never be as good as experts.

Some of these arguments have been addressed previously. Despite concerns of dehumanization, empirical studies show consistently that human beings like, and even prefer, interacting with well-designed computer systems (Slack & Van Cura, 1968c; Coddington & King, 1972; Greist et al, 1973a; Angle et al, 1978; Skinner & Allen, 1983). Arguments against codification of discourse are slowly eroded by increasingly more powerful hardware, more sophisticated software, and deeper human understanding of the nature of language and discourse.

The possibility that expert systems may promote rigidity in approaches to therapies and programs within organizations is not unique to expert systems; the tendency towards rigidity has been observed elsewhere in connection with management information systems (Bjorn-Andersen & Eason, 1980). The development of an expert system should be viewed as a continual process, with the expert system passing from an apprenticeship stage to a consulting colleague stage until it

reaches the expert level (McDermott, 1981; Davis, 1985). Yet, once an expert system is implemented, an agency may be reluctant to support further development (Gripton et al, 1986). Moreover, despite assertions that because of their individual narrow domains expert systems should be able to avoid organizational politics (Schoech, Jennings, Schkade & Hooper-Russel, 1985), we have seen that organizational politics in general are often based on struggles to control resources (Etzioni, 1960; Perrow, 1973). This is equally true of organizational decisions to implement computer technologies (King, 1983). Thus, there will be organizational pressures not to invest any further in an expert system that seems to work, especially in the case of the social service agency facing ever-present budgetary constraints. This exclusion of later expertise is not so much an inherent failing of expert system technology, which anticipates that an expert system must have the facility to be updated and modified with new expertise; it is instead, like many undesirable aspects of computerization, the result of an unanticipated ill-fit with the organization's structure and goals.

Concerns such as the incompatibility of human expert reasoning and machine processing ignores growing research into the use of fuzzy logic and certainty factors to model some of the imprecision a human expert brings to decision-making. Additionally, arguing that an expert system will never be as good as a human expert misses the point of using expert systems in social service delivery--demand for expertise is great, but that expertise is scarce. Well-designed expert

systems typically perform better than human non-experts, and many critical decisions are made by paraprofessionals who are clearly non-experts due to lack of training and experience. Thus, positions of moral or ethical rectitude against the use of expert systems begs the question of the morality of letting ill-trained line-level personnel make important decisions about their clients without the guidance expert systems may provide.

One question which requires future investigation is whether, notwithstanding the morality or competence of individual expert systems, the systemic use of expert systems in a social service agency will change the overall nature of social services. While often posited as a solution to low budgets and high demand, the availability of such systems may actually be part of a problem--that our current society feels that it does not have to devote more resources to solving social problems, because the current resources can be used more "efficiently", partially through the rationalization of service delivery, and partially through the automation of clinical tasks through computerized expert systems. It is likely that, in the absence of such efficient systems, the structures of social service delivery would have to be altered into what may be more productive and effective organizations. This argument has been put forward in other areas such as the health care industry (Mowshowitz, 1976) and the growth of bureaucracy in general (Weizenbaum, 1976). Other strategies for allocating resources, such as trying to prevent societal problems as opposed to simply ameliorating them, may be just

as likely to provide more benefits as any further rationalization and computerization; "these (proposals) all involve long-term programs whose chances for success are largely a matter of speculation" (Mowshowitz, 1976, p.135).

## A General Description of Lifenet

Lifenet is a rule-based computerized expert system that the author has developed to assist social service youth agencies in assessing and intervening in suicide attempts by teenagers. The primary goal of Lifenet is to identify high-risk teenagers who are in imminent danger of self-harm and to direct them to one of a continuum of interventions, including support groups, individual therapy, or hospitalization. Lifenet leads a case-worker through an interviewing session with a client and makes one of the following recommendations for treatment in response to that youth's risk level for committing suicide:

- No further action or intervention concerning self-harm is necessary;
- The youth should be recommended to a therapy group - there is potential risk, but it is minor;
- The youth is at risk for self-harm, and the case worker should perform a more thorough, intense IMMINENT DANGER ASSESSMENT which will determine whether the youth should be hospitalized immediately, or if close monitoring by service personnel with individual counseling is sufficient.

This interviewing process is called a screening session--screen being a term used in human services, and in this

proposal, to mean an interview used for the sake of identifying or filtering out interviewees meeting certain criteria.

Adolescent Suicidality

Recently the United States has been experiencing an alarming increase in the rate of teenage suicides. The rate of teenage suicides doubled between, 1961 and 1975 (Hollinger, 1979). In the 10 years between 1975 and 1985, this rate has increased threefold (Frazier, 1985) and suicide is the third leading cause of death in adolescents (Robbins & Alessi, 1985). Suicide accounts for 5,000 deaths each year in the 15-to-24-year olds bracket (Health & Human Services, 1989).

Concurrent with this phenomenon has also been an increase in the number of homeless and runaway youth in the United States. The number of homeless teenagers serviced by agencies funded by the federal government jumped from 23,755 in 1986 to 39,817 in 1987 (Health & Human Services, 1987); this is only the tip of the iceberg, for the total number of homeless and runaway youth in the U.S. is estimated at between 519,000 and 635,000 (Shaffer & Caton, 1984). The gravity of these statistics is compounded by two studies of homeless youth which found that 30% had previously attempted suicide, and about 25% had current thoughts about it (Shaffer & Gould, 1984; Rotheram-Borus & Bradley, 1990).

Social service agencies that minister to teenagers are acutely aware of the developments mentioned above. Many are including questions in their intake interviews that attempt to

identify suicidally high-risk teenagers. Despite the fact that many people, especially adults, find suicide a difficult topic to discuss, and feel that its causes are somewhat intangible, there are in fact several specific factors that can contribute to a teenager's desire to attempt suicide. Some are:

- major problems in personal lives /families;
- poor school achievement;
- poor peer relationships;
- drugs and alcohol abuse;
- history of family / peer suicide (Rotheram-Borus & Bradley, 1988).

## The Need for Lifenet

While there already exist expert systems for suicide prediction (Greist et al, 1973a; Petrie, 1988), Lifenet fulfills an unmet need at two important levels:

- The Targeted Client Base - Lifenet is designed specifically to assist in the assessment of imminent danger of self-harm in adolescents, while other systems are for use in the general population. Suicidality in different populations is indicated by different risk factors--the reason a 35-year-old female attempts suicide may not at all be the same reason an adolescent male makes such an attempt--and systems predicting suicide in different populations require different databases and knowledge bases (Greist et al, 1974). Lifenet's knowledge base is geared specifically towards interventions with adolescents.

. The Targeted User Base - Most other systems (Greist et al, 1973a; Petrie, 1988) are designed for use by a professional clinician after the patient responds to a computerized interview. The targeted user of Lifenet is a paraprofessional youth worker who most likely has limited clinical training.

Because of the increasing demands for youth services, the complexity of factors involved in adolescent suicide, and the critical nature of the problem, a paraprofessional has less time to make more complicated decisions. Because of these factors, the use of an expert system to help in this process is appropriate (Keller, 1987).

If a client is found to be "at risk" for self-harm, the caseworker is then instructed to administer an intensive but time-consuming therapy referred to as an IMMINENT DANGER ASSESSMENT (IDA). One should bear in mind that Lifenet is a triaging tool--its purpose is not to cure clients of whatever feelings they may have about suicide, but specifically to identify those youth who are the most at risk for suicide, and focus resources on helping them. Because of this restriction of the system's objectives, Lifenet's development has definitely been attainable.

Increasing the caseworker's ability to identify suicidal clients can help avert tragedies that may have stark emotional and legal consequences for both remaining clients and caseworkers. But besides helping the caseworker correctly identify youth who are at risk, Lifenet should also be able to reduce the number of false positives--clients who a caseworker

may be concerned about, but are not seriously in danger. Especially in the case of minimally-staffed shelters and youth programs, such incorrect assessments misdirect valuable agency resources--a caseworker may take a long time on an unneeded Imminent Danger Assessment, or may have to leave the program to bring the client to the hospital for further evaluation. Either situation steers the worker's time and energies away from other activities which may be more beneficial to clients.

Knowledge Acquisition for Lifenet

The theoretical and programmatic foundations of Lifenet are the combined experiences of researchers in adolescent studies and professional child care and psychiatric social workers with whom the author has had personal contact and who have provided materials based upon their own research (Rotheram-Borus, 1987; Rotheram-Borus & Bradley, 1990). One professional is currently the Deputy Director of Programs for the Aids Resource Center (ARC) of New York City, a program which provides supportive housing for people with AIDS. One of the researchers is on staff at the New York State Psychiatric Institute at Columbia University College of Physicians and Surgeons; another, formerly at the Psychiatric Institute, is the director of a program for mentally ill homeless in Portland, Maine. All train professional and paraprofessional case workers in other agencies in the area of suicide intervention.

Two of these experts developed a suicide assessment screen which is currently administered using pen and paper

recording methods (Rotheram-Borus & Bradley, 1988). This manual interviewing form (Appendix A) is currently administered in several New York City shelters. It is essentially a questionnaire which asks the client various questions in the areas of:

. Current thoughts of suicide;

. Family and peer history of suicide;

. Depression / Anger;

. Substance Abuse;

. Anti-social behavior;

. History of previous suicide attempts;

. Self-image.

While the current screen does suggest some rules for a case worker to use in assessing a client, those rules tend to be simple and do not cross-reference as many factors as an expert human interviewer would. Lifenet's basic program architecture consists of an interviewing process to fill a data base of these specific factors specified on the manual form and the implementation of rules from the manual form for assessing risk; moreover, additional knowledge and rules were developed in Lifenet with the aid of all three experts.

Presenting Advice

The basic Lifenet interview consists of the caseworker asking the client a series of questions. The questions are divided into sections covering each of the following risk factors:

. Ideation - this helps assess the degree to which the

teenager may be contemplating suicide, which is generally referred to as ideation. Presumably the more developed and current the ideation, the greater the risk that the client will engage in self-harm.

- Mood - This group of questions addresses the teenager's general attitude. This is distinct from the following group of depression-assessment questions.
- Gender - Statistically, males have a greater capacity for severe self-harm than females, but females seem to contemplate and attempt such actions more frequently than males. Thus, gender is considered a risk factor; knowing the client's gender helps predict the likelihood of self-harm.
- History of Self-Harm - Previous attempters are more likely to make another attempt. The number of previous attempts, the method used, and whether the client was alone are factors in judging the likelihood of another attempt.
- Family History of Suicide - A family history of suicide or suicide attempts is considered an indicator of susceptibility. Statistically, the greater the number of suicide attempts in one's family history, the higher the risk of self-harm.
- Peer History of Suicide - the suicide of a peer is hard-hitting. Thus, as with family, a profile of peer suicide is developed.
- Depression - The teenage experience is one filled with normal moments of depression, and many caseworkers use this fact to overlook some telltale signs of self-harm. This

section looks at several subtle indicators of depression in order to develop an extensive depression profile. The general symptom areas explored include the client's depressed mood, feelings of worthlessness or hopelessness, and loss of sleep or appetite.

The items in the depression section are derived from the Center for Epidemiological Studies' Depression Scale (CES-D), which is a commonly used self-report depression inventory (Radloff, 1977). The scale is made up of 16 items; most of the items describe negative symptoms, while three are stated in a positive manner to avoid a response bias (Bellack & Hersen, 1988). Unfortunately, this attempt to avoid client response bias creates a survey artifact that may lead to interviewer error in scoring the scale--the interviewer is responsible for reversing the scores of the positive questions. This source of error is eliminated by Lifenet, which reverses the scores automatically when scoring the depression scale.

. Anti-social Behavior - the questions here look primarily at the client's anti-social behavior towards others, either persons or institutions.

The caseworker then records the client's responses on the computer. Most of the questions require a "yes - no" or a numerical answer. The purpose of this inventory-taking is to develop an attitudinal, behavioral and background profile of the interviewed teenager. Lifenet then uses this profile to help the interviewer make a risk assessment of the teenager's potential for suicide.

At the end of each section, the assessment rules, which are basically a system of thresholds and weights applied to the client's responses, provide the basis for the recommended assessment. The assessment for a particular section is displayed in the middle of the computer monitor, in a window using a different background color than the rest of the display, so that the user's attention is drawn to the assessment. The assessment for each section typically falls into three categories -

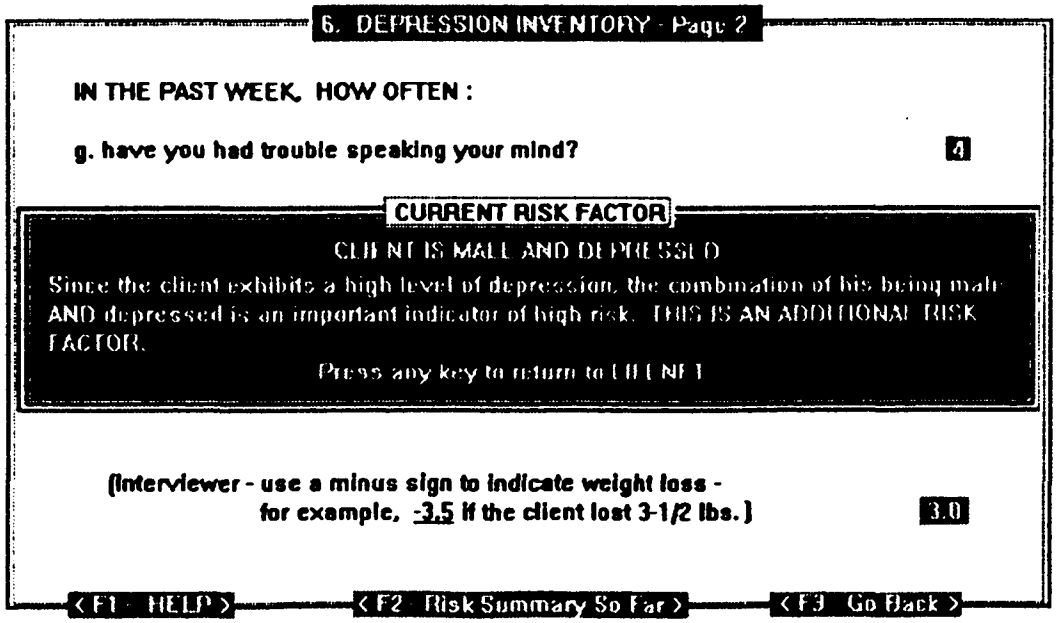
. high positive risk factor;

. moderate risk factor;

. negligible risk factor.

There is also a brief explanation of how Lifenet reached its conclusion for that section (Figure 1).

Figure 1.- Lifenet's Risk Assessment of Depression as an Indicator of Risk



The final risk assessment displays a list of positive risk factors which Lifenet has identified in the client in the individual sections. Each factor which resulted in a risk assessment that was more than negligible is displayed on the monitor, and a TOTAL RISK INDEX is computed. A recommendation is then displayed on the monitor, which may be one of the following actions:

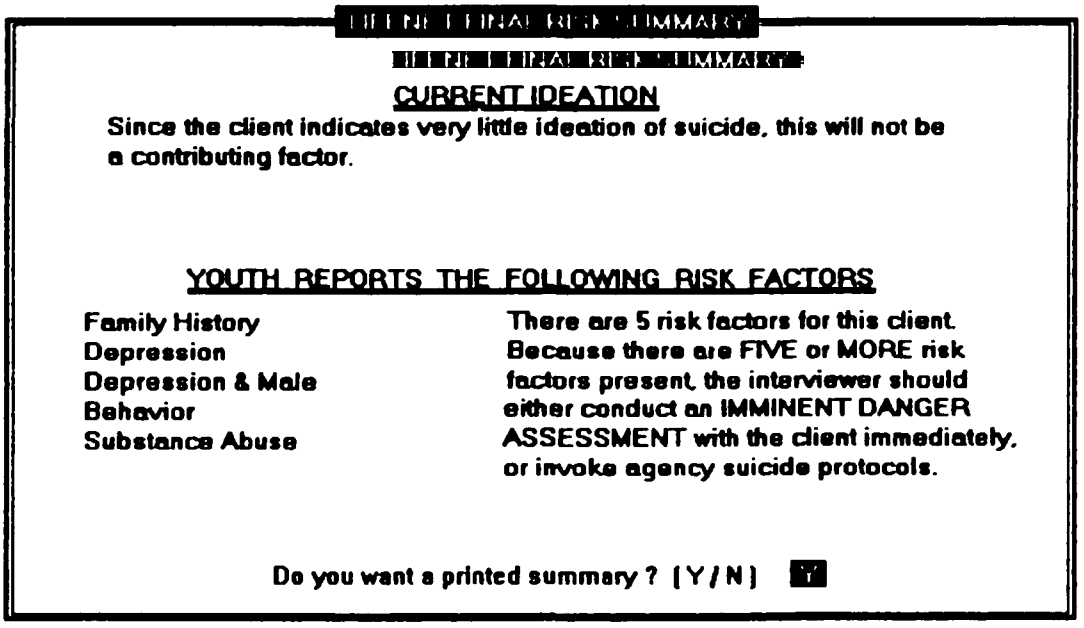
- refer the client to immediate intensive counseling, with the possibility of hospitalization;
- refer the client to a counseling group;
- do not take any extraordinary actions.

Since Lifenet is currently positioned as an "assistant" to the caseworker, if there is any conflict between the caseworker's personal assessment and Lifenet's recommendation, the caseworker is cautioned to follow the assessment which indicates the highest risk and not take any chances.

Some factors, such as a youth's strong ideation of suicide, weigh so heavily that, no matter what the results are in any other factors, the client is still considered at very high-risk and is given immediate therapy. However, even moderate responses in many areas might still produce a positive risk assessment, with some immediate intervention recommended (Figure 2).

Lifenet alters the questions it asks depending upon the responses an interviewee gives. For example, in the IDEATION section, if the teenager says he has not had any history of self-harm, it would be nappropriate to then ask by what method the client had attempted suicide - instead, the rest of

Figure 2.-A Sample of a Lifenet Final Risk Assessment as Displayed on the Screen.




that section is skipped and the system goes on to investigate whether there are more subtle indications of danger in other sections.

## Design and Implementation Issues of Lifenet

Because of the severe budget constraints under which most youth shelters operate, the choice of software and hardware for development of the system was also necessarily constrained; yet, it was necessary to develop a system that was fairly flexible, and could be used as a foundation for later improvement as Lifenet followed the traditional evolution from "assistant" through a "colleague" to finally an "expert system" (Davis, 1985). Also, since many line personnel are novice users, a fairly robust interface would be required.

Lifenet's Prototype Development

Taking all these issues into account, a prototype of Lifenet was programmed in Turbo PROLOG (Borland, 1986) for several reasons:

- Turbo PROLOG could run on PC-compatible computers, even those with limited internal memory and an Intel 8088 processor.
- Programs in TURBO PROLOG could be compiled into .EXE files, thus minimizing software and licensing costs to agencies.
- The use of pattern matching and object-oriented programming techniques in PROLOG made the prototype very easy to modify (Sciore & Warren, 1988).

As mentioned above, Lifenet is a rule-based expert system; this may seem a contradiction in light of the fact that PROLOG is usually associated with logic-based, or declarative, knowledge representation, where processing is performed more on the basis of matching statements which prove to be true. However, the parts of a PROLOG predicate very closely match those of an expert system rule, with the result that the direct implementation of rules into PROLOG predicate statements is a relatively straightforward task (Figure 3). Because of the pattern matching and backtracking features which come built into PROLOG, there was no need to develop a separate inference engine for the Lifenet prototype.

The panel of experts reviewed the Lifenet prototype. After numerous trial runs, the prototype appeared to perform adequately at a clinical level, but there was a general consensus that the user interface needed more development.

**Figure 3 - Converting an expert system rule into Prolog form.**

Expert System Rule:
IF (*condition-1*) AND (*condition-2*) AND ... AND (*condition-n*)
THEN *true-decision.*

Prolog Predicate:
*predicate :- predicate-body.*

In Prolog, the operator :- is the same as the IF statement; the predicate is evaluated as true if all the statements in the predicate body are true. Thus, the expert system rule above can be implemented in Prolog as:

```
true-decision :- condition-1,
                 condition-2,
                      :
                 condition-n.
```

Since Lifenet was designed to be used by people with little or no computer training, it was important to make the interface as consistent and deterministic as possible in order to minimize user confusion. At the time of Lifenet's prototyping, Turbo PROLOG had minimal screen handling and error-trapping procedures. Because these features are necessary in any interactive system, many of them were built from scratch for Lifenet.

Taking these issues into consideration, PROLOG facilities such as the CUT clause and the FAIL predicate were used to minimize unanticipated searching and branching and to enforce some procedural control over PROLOG's built-in depth-first/ backward-chaining inference engine. These techniques resulted in what may seem a peculiar approach to writing PROLOG code. Even though PROLOG is conventionally viewed as a declarative language, in this case the resulting Lifenet code forced

PROLOG more into a more procedural mold, where processing occurred by following a sequence of programming instructions.

A fuller discussion of the development of Lifenet's prototype and the source code will be found in Appendix B.

Revising Lifenet for Field Use

While the revised prototype was well-received by the domain experts at a clinical level, there was a realization that Lifenet had three different tasks with which to deal--a basic inventory-taking of the client's responses, the assessment of those responses to determine whether the client is at risk for self-harm, and the retrieval of the client's responses at a later date for case review. While PROLOG was well-suited for the assessment task, it left something to be desired in the other areas. The version of PROLOG available at the time offered only the ability to read from, but not write to, industry standard dBase III+ compatible data files. This made it difficult to develop a database of client interviews for later retrieval. Moreover, while the revised prototype's interface was more deterministic and had better error-trapping, the experts and developer all felt that the screens were unaesthetic, due partially to the limitations of the PROLOG version available at that time.

For this reason, the current version of Lifenet was re-written in Foxpro, an Xbase database management system (Fox Software, 1989). Foxpro allows a developer much flexibility in designing an application's user interface, which typically takes up a large portion of development time (Shortliffe,

1976; Smith, 1984; Rauch-Hindin, 1986). All the information retrieval tools that were needed in Lifenet came built-in. Lastly, it was easier in Foxpro to build an explicit reasoning system for Lifenet. This approach allowed Lifenet to offer to the user better explanations than the typical explanation facility in expert systems packages; such built-in facilities are often simply a retracing of production rules, requiring the user to infer what the actual knowledge is (Clancy, 1983). The fact that Foxpro is a procedural language does not change the expert system character of Lifenet; there is a natural fit between procedural languages and rule-based expert systems.

The revised version of Lifenet offers both screen and hardcopy output of the assessment (the prototype had only provided an assessment on the monitor) and stores the client's responses to a database for later retrieval. Other improvements to the final version of Lifenet include an online "Help" system which explains to the user the clinical reasons for asking a question, and a facility for seeing a running assessment of the client's level of risk. At any time during the interview, the caseworker can see this running assessment to check whether Lifenet's assessment matches her own. Besides offering expert advice, it has been suggested that such systems may also prove to be valuable training tools (Hedlund et al, 1987).

## Suggested Areas of Lifenet's Impact

The impact of expert systems on some aspects of service delivery is difficult to measure. This difficulty stems in

part from points raised in Chapter Two--there is little agreement as to what constitutes overall measures of effectiveness in social service delivery (Patti, 1983; Reid, 1987). Thus, while it is feasible to gauge the impact an expert system may have in several specific areas, this lack of consensus makes it difficult to create a baseline metric against which the broad application of expert systems in service delivery can be thoroughly compared.

There are several areas in which a system such as Lifenet may have an impact on the social service organization. They span clinical, organizational, and legal areas:

- Lifenet's obvious goal is to reduce the number of clients who are at risk for attempting suicide but receive insufficient interventions. Besides the devastating effect such attempts may have on the morale and emotional state of both clients and caseworkers, they also expose the agency to undesirable publicity, legal liability, and possible loss of funding.
- Lifenet may also help at limiting the number of false-positive assessments--clients who are assessed as being at risk, but actually are not. As observed earlier, such incorrect evaluations result in staff resources being used where they are not needed. But it is likely that most misdiagnosis in this area tends to be underassessment, and not overassessment; thus, the frequency of such false-positives may be few in the first place, and not a consideration.
- Lifenet may help caseworkers communicate the client's

problems. Often, if a client is deemed at risk, the caseworker must bring the client to a local hospital or psychiatric unit and explain the client's problem to the clinical staff there. A clear and consistent assessment from Lifenet may help the caseworker convey the problem in accurate clinical terms, so that the client may receive assistance more quickly.

- Lifenet may provide for less time-consuming interviews and assessments. Some agencies use an unstructured interview format, although, as in general clinical assessments, more and more are adopting the structured format. The structured format still requires certain coding tasks of the caseworkers, and the caseworker must perform the necessary evaluations manually. Lifenet may provide for shorter interviews, thus increasing the service output possible.
- There are questions as to whether Lifenet will generate worker empowerment or worker resentment. The answer probably depends on how much decision-making power the caseworker actually has in the absence of a system such as Lifenet, and if the expert system fits organizationally (Markus, 1984). It is possible that clinical professionals would resent using Lifenet more than paraprofessionals; this is consistent with the empirical evidence that non-professionals adapt better to computerization than do clinical professionals (Grann, 1982).
- There are also issues as to whether Lifenet will engender client relief or client resentment. There is no empirical

evidence that clients have negative reactions to computerized interviews. However, if the interviewer is acting awkwardly or apprehensively due to the computer interviewing process, then this may have a negative affect upon the client.

. A social service agency may be able to reorganize service delivery around several expert systems such as Lifenet to provide more frequent counseling in high-risk areas such as substance abuse and HIV transmission. This in turn may free its staff to provide more concrete services in other areas such as housing and job placement.

While some of the latter questions are not within the scope of this study, they are research questions which do require further investigation on the use of expert systems in social service delivery.

# CHAPTER FOUR

# EXPERIMENTAL METHODS

This chapter describes a controlled experiment to compare several aspects of the performance by social service workers in conducting a screening process for suicide intervention. The experiment compared the performance of caseworkers using Lifenet as opposed to those using a similar manual screening instrument. The experiment was conducted from April, 1991, through September, 1991, and was essentially a simulation of the use of both Lifenet and the pen-and-paper interviewing instrument (Appendix A) described in Chapter Three.

The methods described are: the source of data, the data collection procedures, the collection instruments, data treatment, and data analyses procedures that were used for the purposes of this study.

## Source of Data - Subjects

The subject population of the study were paraprofessional line personnel at various social service agencies throughout New York City. These agencies all have programs directed at helping undomiciled youth, and the majority of direct services at these agencies are performed by non-professional personnel. The subjects were randomly drawn from nineteen different

programs and placed in either the study or control groups. The subjects answered basic demographic questions, such as gender, age, years of experience in social service, and education, in order to measure whether these may be uncontrolled variables which affected the experiment's results. The demographic characteristics of the sample, broken down into the study and control groups, and in aggregate, are presented in the findings in Chapter Five.

## Experts

A panel of three experts in the field of adolescent suicide were recruited to assist in the experiment. Some of their tasks included the training of the caseworker-subjects, the development of the "client" roles, and the evaluation of the subjects' decisions. Each of these experts met the following criteria:

- is a published author or invited speaker at a national conference concerning teenaged suicide;
- Has several years experience as a clinician in the field of adolescent suicide;
- Has experience training other caseworkers in the field of adolescent suicide;
- Has an advanced degree (Ph.D., MSW, or DSW) and is licensed to perform therapeutic mental health functions.

The sets of results from both groups of caseworker subjects will be compared to the recommended actions this panel deemed appropriate for each client role.

## Client-Accomplices

The harm that could be caused by experimenting with potentially suicidal adolescents made it ethically unacceptable to use actual clients in the research. Moreover, the use of such clients would have posed difficulties in excluding uncontrolled variables. For these reasons, the research design excluded the use of actual clients for the caseworker-subjects to interview. Instead, trained confederates were used to role-play the "youth clients." Role play assessment in which a confederate is trained in a role with a narrow range of multiple responses is a recommended model which gives more consistency and control to the experiment (Bellack & Hersen, 1988), and the use of confederates is not uncommon in psychological experimentation (for example, Kumar & Pepinsky, 1967). These confederates, or accomplices, were given one of two scripted roles to play:

- one role in which the supposed "client" was exhibiting signs of depression, but was not at risk for suicide. This client role was code-named "Nadine", for "non-suicidal."
- another role in which the youth was at risk, but not obviously so in terms of recent ideation or recent attempts; the assessment of risk would not be immediately apparent to the caseworker-subject. This role was code-named "Sondra", for "suicidal."

The roles had specific gender and ethnic features to them in order to achieve as much consistency as possible, taking into account the differences from one actor to another. One of the experts involved in the experiment developed the profiles for

these roles, with the other two experts approving them. Each role had scripted answers for various questions, and the client-confederates had to memorize these answers.

Several drama students were screened to portray the clients to be interviewed by the caseworker-subject. The finalists were selected on the basis of their availability, interest, absence of deviant personality or behavior patterns (which may have introduced uncontrolled variables into the experiment), and an ability to project the demographic and socio-economic characteristics of the client roles. One of the experts advised the actors who were chosen of the various issues concerning suicide that would be raised during the experiment, and later rehearsed them in their roles. To ensure their continued interest and participation over the course of the experiment, the client-confederates were paid for their services.

## Independent Variables

There was basically only one independent variable in the experiment. This variable was whether or not the caseworker-subject used the manual screening form or Lifenet to interview the client-confederate and determine the potential risk for suicide. Efforts to exclude uncontrolled variables are discussed in the Procedures section.

## Procedures

The experiment had several parts to it. Every subject went through a four-hour group training session on suicide

intervention with adolescents. Separate training sessions were given for the study and the control groups. The subjects then returned at a later date to perform interviews with the client-confederates.

Assignment to Groups

The subjects were randomly assigned to be part of the study group (using Lifenet) or part of the control group (using the manual instrument) depending on which training session they attended. Subjects were scheduled for the training sessions by supervisors at their respective agencies who did not know the nature of the experiment. Thus, there was virtually no experimenter bias in the assignment of subjects to groups.

A total of 73 subjects started the experiment--41 in the study group, and 32 in the control group. For various reasons, 16 of the subjects did not finish the experiment, leaving 33 subjects in the study group, and 24 in the control group. The size of the sample was considerably larger than similar experiments found in the literature (Colby, 1968; Lang et al, 1970; Angle et al, 1978; Carr & Ghosh, 1983b) and the study and control groups' sizes more balanced (Carr & Ghosh, 1983a).

Training Sessions

Each training session lasted four hours for each group of subjects; they all received the same training for the first two hours. This part of the training dealt with general issues

concerning adolescent suicide. For the final two hours, the trainees received further instruction on adolescent suicide and engaged in practice interviews using role-playing techniques. During this second segment, the caseworker-subjects used the specific instrument and method upon which they would be tested. The same expert performed all of the training sessions for both groups to minimize trainer bias between groups. Since the subjects used only one assessment instrument, the order effect which may be present in other experiments (Lucas et al, 1977) was minimized.

Pre-Testing

During the training sessions, the subjects were given an Informed Consent form (Appendix C) to fill out before taking part in the study. They also filled out a questionnaire providing demographic information along with their experience with computers, and clinical or personal experience with suicide (Appendix D). Subjects were given identification numbers to use on their questionnaires; the ID numbers were used only for matching the subjects' demographic forms with their responses to questionnaires given later on in the experiment.

Interviews and Assessments

Each subject interviewed the two client-confederates, "Nadine" and "Sondra." The subjects were told that the "clients" were volunteers who would get subsequent counseling from a clinical therapist. This was to ensure that the

caseworker-subjects would not suffer any emotional or psychological distress during the testing in dealing with what they thought was a suicidal client. The caseworker-subjects used either Lifenet (the study group) or the manual instrument (the control group) during the interview-assessments.

First, the interviewer engaged in an "inventory-taking" interview, asking the client-confederate questions on the instrument. After the interview, the subject either scored the manual instrument, or received a recommendation from Lifenet, depending upon the group to which the subject belonged. After the interview, the caseworker-subject would note on the assessment form the recommendation of the specific screening instrument as to the client's degree-of-risk and the recommended action. This was to measure how well the caseworker-subject understood the screen's scoring and recommendation, and to see if the caseworker's perception was markedly different from what the screen actually recommended. Then, using the inventory, the screening recommendation, and personal judgement, each subject made his or her own assessment of the client, and gave a recommendation for further treatment (Appendix E). This was to help measure the effectiveness of the respective screening instrument, and also to see how the perceived screen recommendation affected the subject's recommendation.

Also, during the interview-assessment, the following data was recorded for administrative measures:

. the length of the inventory-taking process;

. the length of the decision-making process;

. the entire length of the interview.

The written assessment of the client's condition was collected to see whether either instrument influenced the quality of the subject-caseworkers' descriptions of the client's condition. This is to be used for later evaluation against the experts' assessments.

Post-Test

After completing both interviews, subjects were surveyed as to their attitudes towards whichever instrument they used in the screening process (Appendix F). This survey contained five-point Likert scales, and subjects in both groups received identical questionnaires. Some of the areas surveyed were:

. subjects' satisfaction with the instrument;
. subjects' self-confidence using the instrument;
. subjects' trust of the instrument;
. subjects' liking the instrument;
. subjects' level of personal connection with the client using the instrument.

While these were self-report items, and were possibly affected by the Hawthorne effect (where subjects answer or perform in ways that will win the experimenter's approval), it is reasonable to assume that this effect would cross the study-control group barriers. Thus, even if the subjects' overall approval ratings were high, differences between groups would still be noteworthy.

## Treatment of Data

The client inventories recorded by the interviewers using Lifenet were automatically recorded into a Foxpro database file, with each record identified by the subject's identification number and the name of the "client" the caseworker-subject interviewed. The researcher entered the inventories by the control group interviewers, along with the pre-test, post-test, and assessment forms for both groups, into Foxpro databases files. The inventory data from each interview was combined with the caseworker-subject's assessment for that interview. The screening data was also copied into files separating the "Sondra" (suicidal) interviews from the "Nadine" (non-suicidal) interviews, to examine more easily how the caseworker-subjects could assess the two different levels of risk these roles represented.

There were two basic factors contributing to the caseworker-subject's assessment--the quality of the inventory-taking, and the accurate scoring of the inventory. In order to examine these, additional fields were computed for each interview in order to compare these factors between the two groups. One field, called LIFE_EVAL, contained the number of risk factors that Lifenet found based on the inventory, while the other, called MANUAL_EVAL, contained the number of risk factors a correctly scored manually-administered screen would find.

## Statistical Analyses

In choosing the correct statistical procedures to use, two factors were considered:

- no assumption of a normal distribution could be made, and
- the sample sizes ( $n_{study} = 33$, $n_{control} = 24$) were not large enough to override non-normality.

Because of these factors, simple hypothesis testing (t-test) and analysis of variance (ANOVA) procedures could not be used. Instead, non-parametric procedures for comparing variables in the samples were used.

### Rank-Testing

Rank testing was utilized to determine whether or not the medians of some variables differed between the study and the control groups. The specific tests utilized were the Mann-Whitney U (Unsigned) test and the Kruskal-Wallis One-Way Analysis by Ranks. These tests were mostly utilized in comparing the demographic information on the subjects, in order to verify that the groups were similar in makeup. Rank tests were also used to compare differences between the two groups in terms of:

- the length of time the subject took to interview the client;
- the length of time the subject took to perform the assessment;
- the total time of the screening process;
- the various attitudinal questions asked in the post-test questionnaire.

Also measured with the rank testing procedure were the differences in time from the first interview to the second interview, to examine whether there was a noticeable improvement of administration time with increasing familiarity with the instrument in question.

Contingency Tables

Contingency tables and chi-square approximations were used to compare the other measures of the caseworker-subjects' performances. These comparisons were:

- contingency tables to compare the caseworker's perception of the instrument's recommendation versus the client's condition;
- contingency tables to compare the caseworker's own recommendations versus the client's condition;
- contingency tables to compare the scoring of the inventory (LIFE_EVAL and MANUAL_EVAL) versus the client's condition;
- contingency tables to compare the scoring of the inventory (LIFE_EVAL and MANUAL_EVAL) versus the subject's assessment;
- contingency tables to compare the scoring of the inventory (LIFE_EVAL and MANUAL_EVAL) versus the subject's perception of the instrument's recommendation.

These various contingency tables helped determine whether or not differences between certain dependent variable were related to the independent variable of group membership.

Other Procedures

The use of contingency tables produced some data groupings in which the number was too small to rely solely on the standard contingency table results. To reinforce some of the findings on tables which produced small populations in some groupings, the variables were collapsed into 2x2 tables, and recalculated with Fisher's Exact Test, which is more precise in measuring the probability of row versus column independence in small data groupings (Hays, 1981).

Selection of the Statistical Package

The statistical analyses was performed using Statgraphics Version 5 (STSC,Inc, 1991). Statgraphics contained all the statistical procedures required for this study. Additionally, Statgraphics could easily import data files conforming to the dBase III+ standard. The Foxpro data files used in this study conform to that standard.

# CHAPTER FIVE

# FINDINGS

This chapter reports on the findings of the study. The chapter includes a description of the sample, the findings for each research question, and a summary of the major findings of the study.

## Demographic Characteristics

The subject population of the study were paraprofessional line personnel at various social service agencies throughout New York City. These subjects were randomly drawn from nineteen different programs and placed in either the study or control groups. A total of 73 subjects participated in the training; of these, 41 were in the study group, and 32 in the control group. Sixteen subjects--eight from each group--did not return for the follow-up interviews, leaving 33 subjects in the study group and 24 in the control group for the data analyses.

Table 1 presents the frequency distributions for the demographic characteristics of the subjects.

Table 1.-Demographic Characteristics of the Subjects

| Characteristic | STUDY GROUP n | % | CONTROL GROUP n | % | TOTAL N | % |
|---|---|---|---|---|---|---|
| Sample Size | 33 | 57.9 | 24 | 42.1 | 57 | 100.0 |
| Gender | | | | | | |
| - Female | 13 | 22.8 | 14 | 24.6 | 27 | 47.4 |
| - Male | 20 | 35.1 | 10 | 17.5 | 30 | 52.6 |
| Age | | | | | | |
| - Average Age | 33.8 | | 32.9 | | 33.4 | |
| 25 and under | 4 | 7.0 | 6 | 10.5 | 10 | 17.5 |
| 26 - 35 | 14 | 24.6 | 9 | 15.8 | 23 | 40.4 |
| 36 - 45 | 13 | 22.8 | 6 | 10.5 | 19 | 33.3 |
| 46 - 55 | 1 | 1.8 | 2 | 3.5 | 3 | 5.3 |
| 56 - 65 | 1 | 1.8 | 1 | 1.8 | 2 | 3.5 |
| Education - Highest Level | | | | | | |
| Some High School | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 |
| High School Diploma | 1 | 1.8 | 1 | 1.8 | 2 | 3.5 |
| Equivalency Diploma | 2 | 3.5 | 1 | 1.8 | 3 | 5.3 |
| Some College | 20 | 35.1 | 10 | 17.5 | 30 | 52.6 |
| Bachelor's Degree | 4 | 7.0 | 3 | 5.3 | 7 | 12.3 |
| Some Graduate School | 1 | 1.8 | 2 | 3.5 | 3 | 5.3 |
| Graduate Degree | 5 | 8.8 | 7 | 12.3 | 12 | 21.1 |
| Social Service Experience | | | | | | |
| - Average Experience | 5.3 Years | | 6.3 Years | | 5.7 Years | |
| 1 year or less | 5 | 8.8 | 1 | 1.8 | 6 | 10.5 |
| 2 - 3 years | 7 | 12.3 | 5 | 8.8 | 12 | 21.1 |
| 4 - 5 years | 5 | 8.8 | 6 | 10.5 | 11 | 19.3 |
| 6 - 7 years | 5 | 8.8 | 2 | 3.5 | 7 | 12.3 |
| 8 - 10 years | 3 | 5.3 | 8 | 14.0 | 11 | 19.3 |
| 10+ years | 3 | 5.3 | 2 | 3.5 | 5 | 8.8 |
| Clinical Experience With Suicide | | | | | | |
| - Average Experience | 2.15 | | 2 | | 2.09 | |
| 1 = None | 12 | 21.1 | 6 | 10.5 | 18 | 31.6 |
| 2 = A Little | 6 | 10.5 | 12 | 21.1 | 18 | 31.6 |
| 3 = Some | 13 | 22.8 | 6 | 10.5 | 19 | 33.3 |
| 4 = A Lot | 2 | 3.5 | 0 | 0.0 | 2 | 3.5 |
| Personal Experience With Suicide | | | | | | |
| - Average Experience | 2.30 | | 1.75 | | 2.07 | |
| 1 = None | 8 | 14.0 | 11 | 19.3 | 19 | 33.3 |
| 2 = A Little | 10 | 17.5 | 8 | 14.0 | 18 | 31.6 |
| 3 = Some | 12 | 21.1 | 3 | 5.3 | 15 | 26.3 |
| 4 = A Lot | 3 | 5.3 | 1 | 1.8 | 4 | 7.0 |

Note - Percentages are tablewise

Group Similarities in Demographic Characteristics

The demographic characteristics of the study and control groups were compared in order to assess whether any of these characteristics would serve as confounding variables in the subjects' performance. As stated in Chapter Four, nonparametric ranking procedures were used for these comparisons, since no assumption of a normal distribution could be made, and the sample size was not large enough to compensate for the sample's potential non-normality. Also, the hypotheses to be tested required two-tailed tests; the median in one group for any demographic characteristic could be either greater or less than the median in the other. Because of these restrictions, the Mann-Whitney U (Unpaired) procedure was used to test whether the two groups were the same in respect to their demographic characteristics.

The results of this procedure are presented in Table 2. In each comparison, the null hypotheses (H0) was that the demographic characteristic was the same for each group. In general, the larger the absolute value of the test statistic, the greater the likelihood that there was a difference between the two groups (H1), and that the null hypotheses would be rejected. The p-value in Table 2 is the smallest level of significance that would have allowed the null hypothesis to be rejected. Normally, a p-value of .05 or less indicates that there is enough of a difference to reject a null hypothesis; any p-value that is greater than that will indicate that the best decision is to not reject the null hypothesis.

As is evident from Table 2, the two groups of subjects

Table 2.-Mann-Whitney U Tests on Demographic Characteristics

| Characteristic | Average Rankings Study Group | Control Group | Test Statistic | *p*-value | Decision |
|---|---|---|---|---|---|
| Gender | 31.27 | 25.88 | -1.3921 | 0.1639 | Not Reject H0 |
| Age | 29.06 | 25.39 | -0.8406 | 0.4005 | Not Reject H0 |
| Education | 26.58 | 32.33 | 1.3995 | 0.1617 | Not Reject H0 |
| Social Service Experience | 24.11 | 29.29 | 1.2253 | 0.2205 | Not Reject H0 |
| Clinical Experience with Suicide | 30.00 | 27.63 | -0.5536 | 0.5798 | Not Reject H0 |
| Personal Experience with Suicide | 32.99 | 23.52 | -2.2224 | 0.0263 | Reject H0 |

Note: The term "Average Ranking" is found in this and several other tables in this chapter. They are part of the output received from the Statgraphics package and are for informational purposes only. The reader is cautioned not to draw any statistical significance from these figures. Non-parametric ranking procedures compare the medians of groups, not the average ranks.

were similar in their demographic composition; the only characteristic that reflected any difference between the two groups was the level of personal experience with suicide. Regression models helped determine afterwards whether this, as well as the other demographic characteristics, had any influence on the subjects' performance. These findings are discussed later in this chapter.

Because the gender variable could only have two values--female or male--the use of the Mann-Whitney ranking procedure on this specific variable was somewhat of a forced fit. To ensure that the proportions of females to males was the same

in each group, a phi-coefficient ($\phi$) was calculated. Although the phi-coefficient is generally considered a measure of association in 2x2 contingency tables, it is also appropriate for testing that two populations contain the same proportion *p* (Iman & Conover, 1983). The Spearman Rank Order Correlation, or rho, can be used on dichotomous data to calculate the phi-coefficient (Bordens & Abbott, 1991). In this case, the phi-coefficient rendered a p-value > .16, large enough to not reject the null hypothesis that the proportions of female to male were the same for both groups.

## Comparing Timed Variables

One of the areas in which Lifenet's impact must be measured is in efficiency, for even if it shows great promise as a tool to improve clinical effectiveness, it may be too inefficient and time-consuming for regular operational use. To measure Lifenet's efficiency, the following research questions were examined:

- whether subjects using Lifenet took the same amount of time to conduct the inventory-taking as those using the manual procedure;
- whether subjects using Lifenet took the same amount of time to conduct the assessment as those using the manual procedure;
- whether the combined lengths of the inventory-taking and the assessment were the same for both groups.

Table 3 contains the mean and standard deviation for the time length of each portion of the interview along with the total

interview, broken down by group membership. Again, because of the assumption of non-normality of the data, nonparametric procedures were used to statistically compare the respective groups' times. With each null hypothesis (H0) that the subjects of the two groups showed the same performance, the alternative hypothesis (H1) was that the subjects in the Lifenet group would perform the respective task more quickly. Since H1 was a one-way test, the Kruskal-Wallis One-Way Analysis by Ranks procedure was used; this procedure is slightly more powerful than the Mann-Whitney U test (Bordens & Abbott, 1991).

Table 3.-Comparisons of Interviewing Times

Descriptive Statistics of Interview Times

| Variable | STUDY GROUP Mean | STUDY GROUP Std. Dev. | CONTROL GROUP Mean | CONTROL GROUP Std. Dev. | POOLED Mean | POOLED Std. Dev. |
|---|---|---|---|---|---|---|
| Inventory | 19.51 | 8.99 | 21.54 | 11.28 | 20.37 | 10.01 |
| Assessment | 9.53 | 4.65 | 13.21 | 6.76 | 11.08 | 5.63 |
| Total Interview | 29.05 | 11.05 | 34.75 | 13.32 | 31.45 | 12.05 |

Kruskal-Wallis One-Way Analyses by Ranks on Interviewing Times

| Dependent Variable | Average Rankings: Study Group | Average Rankings: Control Group | Test Statistic | $p <$ | Decision |
|---|---|---|---|---|---|
| Inventory-Taking | 55.21 | 60.65 | 0.7536 | .5000 | Not Reject H0 |
| Assessment | 48.35 | 70.08 | 12.0891 | .0010 | Reject H0 |
| Total Interview | 50.26 | 67.46 | 7.5390 | .0100 | Reject H0 |

Length of Time Conducting the Interview

The research question investigated here was whether subjects using Lifenet took the same amount of time to conduct the inventory-taking as those using the manual procedure. The hypotheses were:

H0: The length of the inventory-taking process was the same for both groups;

H1: The length of the inventory-taking process was shorter for the subjects in the Lifenet group.

The Kruskal-Wallis One-Way Analysis by Ranks was applied to the interview times to test these hypotheses. There was no significant difference in the times of this task between the two groups, and thus the null hypothesis (H0) was not rejected (Table 3).

Length of Time Assessing the Client's Imminent Danger

The research question investigated here was whether subjects using Lifenet took the same amount of time to conduct the assessment as those using the manual procedure. The hypotheses were:

H0: The length of the assessment process was the same for both groups;

H1: The length of the assessment process was shorter for the subjects in the Lifenet group.

Again, the Kruskal-Wallis One-Way Analysis by Ranks was applied to the interview times to test these hypotheses. In this case, there was a considerable difference in the assessment times, with the Lifenet group's times being

shorter. The null hypothesis that the assessment times were equal was rejected; the difference was significant with $p < .001$ (Table 3).

Overall Time of Interview and Assessment

The combined times of the inventory-taking and the assessment were compared. Although the assessment times of the Lifenet group were in themselves statistically shorter, it was possible that in the context of the full interview the shorter assessment times would not make much difference. Any differences in the combined times would be much more indicative of the time efficiencies that Lifenet could provide. The research question investigated here was whether subjects using Lifenet took the same amount of time to conduct the total interview, including the inventory-taking and the assessment, as those using the manual procedure. The hypotheses were:

H0: The combined times of the inventory-taking and assessment was the same for both groups;

H1: The combined times of the inventory-taking and the assessment was shorter for the subjects in the Lifenet group.

The Kruskal-Wallis One-Way Analysis by Ranks was applied to the interview times to test these hypotheses. The null hypothesis that the combined times of the two groups would be equal was rejected; the subjects using Lifenet had shorter overall interview times than did the control subjects. This difference was significant with $p < .01$ (Table 3).

Measuring Order Effect

There was the possibility that a change in the lengths of the inventory-taking, the assessment, or both may occur from the first to the second interview. Comparisons were made between the times of each segment of the first interview and the corresponding segment of the second interview. These comparisons were made for the entire sample group and within each of the experimental groups, the study and the control. In none of these tests was there any significant difference between the times for the first and second interviews. The only noteworthy item was in comparing the first and second assessment times between the study and control groups. As noted above, the assessment times of the study group were significantly shorter than those of the control group. When comparing the first assessments only, $p$ was less than .05; when comparing the second assessments only, $p < .005$. Thus, the difference between the study and control groups became more significant. However, it must be pointed out that the assessment times did not show any statistical difference between the first and second interviews.

## Measures of Effectiveness

In examining the clinical effectiveness of Lifenet, there were several basic factors in the caseworker-subjects' performance to consider:

. the instrument assessment, i.e., the assessment that the instrument would have generated as long as the instrument's rules were correctly applied to the inventory data. In the

case of the study group, this value was automatically computed at the end of the inventory-taking process, using Lifenet's expert system rules; for the control group, this value was computed using the rules specified by the manual instrument. This comparison may show that there is a difference between the accuracy of the assessment of the specific instruments, either because of better data collection, or improved rule processing of that data.

- the perceived assessment, i.e., the caseworker's perception of what recommendation the screen had made; one measure of an instrument's effectiveness is whether it's recommendation is clear to the caseworker. Lifenet makes an explicit recommendation that is displayed on both screen and hardcopy, whereas the manual instrument requires that the caseworker calculate the total risk assessment from the various items from the inventory. It is possible that this requirement may cause caseworkers to apply incorrectly the rules provided by the manual procedure, and arrive at an inaccurate interpretation of the screen's assessment. Thus, one area where the group using Lifenet may perform differently is in understanding the full extent of the instrument's recommendation.
- the caseworker assessment, i.e., the subject's own recommendations regarding the client's condition; this variable was examined to see how the caseworker-subjects would combine their personal impressions from the interview with the perceived assessment to make a final assessment. There was the possibility that, despite any differences

between the groups in the perceived assessments, the caseworker assessments would be similar in terms of the client's level of risk.

Also, these three variables were juxtaposed to develop additional measures of effectiveness. For the purposes of this study, these measures are termed:

. the perception dissonance, i.e., the difference between the perceived assessment and the instrument assessment. This measure helped determine whether any between-group differences in the perceived assessments were due mostly to the between-group differences shown to exist in the instrument assessments, or due partially to the manner in which the caseworkers extracted the perceived assessment from the instrument. To derive this variable, the value of the instrument assessment was subtracted from the value of the perceived assessment for each interview; thus, if the result was a negative number, the perceived assessment underassessed the client risk indicated by the instrument assessment. If the result was 0, the perceived assessment was the same as the instrument assessment. Finally, if the result was a positive number, then the perceived assessment overassessed the client risk indicated by the instrument assessment. These three categories of perception dissonance could be termed Underassessment, Same Assessment, and Overassessment.

. the compliance dissonance, i.e., the difference between the caseworker assessment and the perceived assessment. This measure would indicate how much the caseworker agreed or

disagreed with the perceived assessment, and complied with the assessment. This value was calculated by subtracting the perceived assessment from the caseworker assessment. As in the perception dissonance, this results in three categories of compliance dissonance, termed Underassessment, Same Assessment, and Overassessment.

. the assessment dissonance, i.e., the difference between the instrument assessment and the caseworker assessment. It was possible that, after going through the interview, the caseworker could make an assessment similar to the instrument's, no matter what the perceived assessment was. This value was calculated by subtracting the instrument assessment from the caseworker assessment. As in the perception dissonance, this results in three categories of assessment dissonance, termed Underassessment, Same Assessment, and Overassessment.

These factors were compared between the study and the control groups. Also, the statistical procedures were applied separately for the interviews conducted with the Sondra (suicidal) role and the Nadine (non-suicidal) role. It was important to see if the caseworker-subjects performed differently in relationship to each role's level of imminent danger.

## Presenting the Statistical Findings

For each measure of effectiveness, the following information will be presented:

. the null hypothesis, H0, which will hypothesize that there

is no between-group difference in the measure being tested.

- the alternative hypothesis, H1, which will hypothesize that the study group displayed better performance for that measure than the control group.
- a contingency table showing the frequencies of each response for that measure by row and the experimental group (study or control) by column.
- the ranking of the responses performed by the Kruskal-Wallis Analysis of Variance by Rank. Since H1 is that the study group performed better, this one-way test is preferred. Also shown are the test statistic for this procedure and the *p*-value, which is the smallest level of significance at which the null hypothesis would not be rejected.
- a chi-square approximation in order to test the strength of association between the responses for the measure and group membership. If the test statistic is large enough and the *p*-value < .05, one can infer that there is a strong association between the performance measure and group membership.
- Because the chi-square approximation may be artificially inflated in cases where cell frequencies are less than five, the tables were collapsed into 2x2 groupings appropriate to the measure, and Fisher's Exact Test was used. This is not an approximation, and a *p*-value < .05 would indicate that there is a strong association between the performance measure and group membership.

Also, these factors were compared in relationship with each

other in contingency tables to measure how strong their association may be.

Assessment Measures of the Sondra Role

The results from the interviews with the Sondra (suicidal) role will be presented first. These present some of the strongest differences between the study and the control groups.

Instrument Assessments for the Sondra Interviews

A comparison of the instrument assessments for the Sondra interviews was performed. In this case, the following hypotheses were made:

H0: There would be no difference between the experimental groups in the instrument assessments made for the suicidal client;

H1: The instrument assessment of the study group would assess the suicidal client was in imminent danger to a greater degree than would the control group's instrument assessment.

The classification of the three potential recommendations (No Risk, Moderate Risk, Imminent Danger) by Lifenet and the manual instrument is presented in Table 4. The results of the Kruskal-Wallis One-Way Analysis by Ranks showed that Lifenet had assessed the client as being in a generally higher level of risk ($p < .02$). Based on these results, the null hypothesis was rejected; the data indicated that that Lifenet produced a more accurate assessment.

Table 4.-Crosstabulation of Instrument Assessment by Group Membership

| Assessment | STUDY GROUP N | % | CONTROL GROUP N | % | TOTAL N | % |
|---|---|---|---|---|---|---|
| No Risk | 0 | 0.0 | 2 | 8.3 | 2 | 3.5 |
| Moderate Risk | 15 | 45.5 | 16 | 66.7 | 31 | 54.4 |
| Imminent Danger | 18 | 54.5 | 6 | 25.0 | 24 | 42.1 |

| | | | Test Statistic | $p <$ |
|---|---|---|---|---|
| K-W Ranking Overall | 32.73 | 23.88 | 5.0692 | .02 |
| Chi-Square Approximation | | | 6.7802 | .05 |

Note: Percentages are columnwise

In measuring the degree of association between the instrument assessment and group membership, the chi-square statistic would suggest that the two variables are relatively dependent, with $p < .05$ (Table 4). Because of the low frequencies in some of the cells, the data were regrouped into a 2x2 table, where the instrument assessments were categorized as No Risk/Moderate Risk and Imminent Danger. When comparing specifically for an assessment of imminent danger for the Sondra role, Lifenet more frequently assessed that the client was in imminent danger, significant at $p < .03$ (Table 5). In addition, with this regrouping Fisher's Exact Test indicated that there is a strong association between the instrument assessment of imminent danger and group membership, significant at $p < .03$ (Table 5).

Table 5.-Regrouped 2x2 Table of Instrument Assessment by Group Membership - Sondra Interviews

| Assessment | STUDY GROUP N | % | CONTROL GROUP N | % | TOTAL N | % |
|---|---|---|---|---|---|---|
| No Risk / Moderate Risk | 15 | 45.5 | 18 | 75.0 | 33 | 57.9 |
| Imminent Danger | 18 | 54.5 | 6 | 25.0 | 24 | 42.1 |

| | | | Test Statistic | p < |
|---|---|---|---|---|
| K-W Rank: Imminent Danger | 32.55 | 24.13 | 4.8884 | .03 |
| Fisher's Exact Test | | | | .03 |

Perceived Assessments for the Sondra Interviews

A comparison of the perceived assessments for the Sondra interviews was performed. For this measure, the following hypotheses were made:

H0: There would be no difference between the experimental groups in the perceived assessments for the suicidal client;

H1: The study group would report perceived assessments indicating a greater degree of danger to the suicidal client than would the control group.

The classification of the three potential recommendations (No Risk, Moderate Risk, Imminent Danger) by study and control group is presented in Table 6. The results of the Kruskal-Wallis One-Way Analysis by Ranks showed that the study group more consistently perceived that Lifenet had assessed the client as being in a generally higher level of risk, significant at $p < .0001$ (Table 6).

Table 6.-Crosstabulation of Perceived Assessments by Group Membership - Sondra Interviews

| Assessment | STUDY GROUP N | % | CONTROL GROUP N | % | TOTAL N | % |
|---|---|---|---|---|---|---|
| No Risk | 1 | 3.0 | 9 | 37.5 | 10 | 17.5 |
| Moderate Risk | 14 | 42.4 | 13 | 54.2 | 27 | 47.4 |
| Imminent Danger | 18 | 54.5 | 2 | 8.3 | 20 | 35.1 |

| | | | Test Statistic | p < |
|---|---|---|---|---|
| K-W Ranking Overall | 36.28 | 19.02 | 17.7251 | .0001 |
| Chi-Square Approximation | | | 18.2715 | .0005 |

Note: Percentages are columnwise

In measuring the degree of association between the perceived assessment and group membership, the high chi-square statistic would indicate a high level of association. However, because of low frequencies in two of the cells, it was possible that the chi-square approximation was inflated. The data were regrouped by whether or not the perceived assessment indicated imminent danger (Table 7).

The Kruskal-Wallis procedure showed that the study group more consistently perceived that Lifenet's recommendation was specifically that the client was in imminent danger, with $p <$ .0005. Furthermore, Fisher's Exact Test reinforced the likelihood of a strong association between the perceived assessment and group membership, significant at $p <$ .0005 (Table 7).

Based on these results, the null hypothesis was rejected; the data indicated that that subjects using Lifenet would more accurately understand its recommendation.

Table 7.-Regrouped 2x2 Table of Perceived Assessments by Group Membership - Sondra Interviews

| Assessment | STUDY GROUP N | % | CONTROL GROUP N | % | TOTAL N | % |
|---|---|---|---|---|---|---|
| No Risk / Moderate Risk | 15 | 45.5 | 22 | 91.7 | 37 | 64.9 |
| Imminent Danger | 18 | 54.5 | 2 | 8.3 | 20 | 35.1 |
| | | | | Test Statistic | | p < |
| K-W Rank: Imminent Danger | 34.55 | | 21.38 | 12.7995 | | .0005 |
| Fisher's Exact Test | | | | | | .0005 |

Note: Percentages are columnwise

Caseworker Assessments for the Sondra Interviews

A comparison of the caseworker assessments for the Sondra interviews was performed. For this measure, the following hypotheses were made:

H0: There would be no difference between the groups in the caseworker assessments for the suicidal client;

H1: The caseworker assessments of the study group would report a greater degree of imminent danger to the suicidal client than would the control group.

The classification of the three potential recommendations (No Risk, Moderate Risk, Imminent Danger) by study and control group is presented in Table 8. The results of the Kruskal-Wallis One-Way Analysis by Ranks showed that the study group more consistently assessed the client as being in a generally higher level of risk, significant at $p < .0005$.

Again, because of low frequencies in two of the cells, it was possible that the chi-square approximation would not be a

Table 8.-Crosstabulation of Caseworker Assessments by Group Membership - Sondra Interviews

| Assessment | STUDY GROUP N | % | CONTROL GROUP N | % | TOTAL N | % |
|---|---|---|---|---|---|---|
| No Risk | 1 | 3.0 | 5 | 20.8 | 6 | 10.5 |
| Moderate Risk | 17 | 51.5 | 18 | 75.0 | 35 | 61.4 |
| Imminent Danger | 15 | 45.5 | 1 | 4.2 | 16 | 28.1 |
| | | | | Test Statistic | | $p <$ |
| K-W Ranking Overall | 34.97 | | 20.79 | 13.6005 | | .0005 |
| Chi-Square Approximation | | | | 13.8700 | | .0010 |

Note: Percentages are columnwise

strong indicator for measuring the degree of association between the caseworker assessment and group membership. The data were regrouped by whether or not the caseworker assessment specifically indicated imminent danger, as shown in Table 9. The Kruskal-Wallis procedure showed that the study group more consistently assessed that the client was in imminent danger, significant at $p < .001$, and Fisher's Exact Test reinforced the likelihood of a strong association between the caseworker assessment and group membership, with $p < .0005$ (Table 9).

Based on these results, the null hypothesis was rejected; the data indicated that the subjects using Lifenet would more accurately assess the suicidal client.

## Perception Dissonance in the Sondra Interviews

An examination of the relationship between the instrument assessment for the Sondra role and the perceived assessment

Table 9.-Reqrouped 2x2 Table of Caseworker Assessments by Group Membership - Sondra Interviews

| Assessment | STUDY GROUP N | % | CONTROL GROUP N | % | TOTAL N | % |
|---|---|---|---|---|---|---|
| No Risk / Moderate Risk | 18 | 54.5 | 23 | 95.8 | 41 | 71.9 |
| Imminent Danger | 15 | 45.5 | 1 | 4.2 | 16 | 28.1 |
| | | | | Test Statistic | | $p <$ |
| K-W Rank: Imminent Danger | 33.95 | | 22.19 | 11.5254 | | .0010 |
| Fisher's Exact Test | | | | | | .0005 |

Note: Percentages are columnwise

was performed; it was possible that any differences in the subjects' perceptions were due mostly to the differences shown to exist in the actual assessments. To investigate this measure, the following hypotheses were developed:

H0: There would be no difference between the experimental groups in the perception dissonance for the suicidal client;

H1: There would be less perception dissonance in the study group than in the control group.

The classification of the three potential recommendations (Underassessment, Same Assessment, Overassessment) by study and control group is presented in Table 10.

Several interesting effects became evident. One, the level of overassessment was negligible for both groups, and there was no statistical difference there--a perception dissonance leaning towards overassessment was not evident. Secondly, the higher ranking of the study group's perception

Table 10.-Crosstabulation of Perception Dissonance by Group Membership - Sondra Interviews

| Perception Dissonance | STUDY GROUP N | % | CONTROL GROUP N | % | TOTAL N | % |
|---|---|---|---|---|---|---|
| Underassessment | 2 | 6.1 | 12 | 50.0 | 14 | 24.5 |
| Same Assessment | 30 | 90.9 | 10 | 41.7 | 40 | 70.2 |
| Overassessment | 1 | 3.0 | 2 | 8.3 | 3 | 5.3 |
| | | | | Test Statistic | | $p <$ |
| K-W Ranking Overall | 33.55 | | 22.75 | 9.1468 | | .005 |
| Chi-Square Approximation | | | | 16.5558 | | .001 |

Note: Percentages are columnwise

dissonance (33.55) as opposed to the control group's (22.75) suggested that the control subjects tended to underassess the instrument assessment. The results of the Kruskal-Wallis One-Way Analysis by Ranks verified this, showing that in general the study group showed less perception dissonance than did the control group, significant at $p < .005$ (Table 10).

Lastly, subjects in the control group were more likely to exhibit perception dissonance, i.e., a difference between the perceived and instrument assessments, in either direction. The perception dissonance values were recoded into 2 groups--No Dissonance and Dissonance. The Kruskal-Wallis Procedure verified that subjects in the study group more often exhibited no perception dissonance, significant at $p < .0001$ (Table 11).

In order to measure the strength of association between the perception dissonance and group membership, Fisher's Exact Test was applied to this regrouped data. It showed that there

Table 11.-Regrouped 2x2 Table of Perception Dissonance by Group Membership - Sondra Interviews

| Presence of Dissonance | STUDY GROUP N | % | CONTROL GROUP N | % | TOTAL N | % |
|---|---|---|---|---|---|---|
| Dissonance | 4 | 12.1 | 14 | 58.3 | 18 | 31.6 |
| No Dissonance | 29 | 87.9 | 10 | 41.7 | 39 | 68.4 |
| | | | | Test Statistic | | $p <$ |
| K-W Ranking for Dissonance | 34.91 | | 20.88 | 15.8155 | | .0001 |
| Fisher's Exact Test | | | | | | .0001 |

Note: Percentages are columnwise

was a very strong association between the existence of perception dissonance and group membership, significant at $p < .0001$ (Table 11).

Based on these results, the null hypothesis was rejected; the perceived assessments by the study group were more consistent with the instrument's actual assessment, and this consistency was associated with group membership.

## Compliance Dissonance in the Sondra Interviews

Compliance dissonance has been defined earlier as the difference between the caseworker assessment and the perceived assessment. An examination for the compliance dissonance for the Sondra role was performed to measure the caseworker-subjects' level of agreement with the perceived assessment. To investigate this measure, the following hypotheses were developed:

H0: There would be no difference between the experimental

groups in the compliance dissonance for the suicidal client;

H1: There would be less compliance dissonance in the study group than in the control group.

The classification of the three potential recommendations (Underassessment, Same Assessment, Overassessment) by study and control group is presented in Table 12.

In general, a sizeable majority of subjects in each group showed no compliance dissonance, i.e., the caseworker assessment was the same as the perceived assessment. Whatever difference that existed between the two groups' compliance dissonance was not statistically significant. On the basis of these findings, the null hypotheses was not rejected.

Table 12.-Crosstabulation of Compliance Dissonance by Group Membership - Sondra Interviews

| Compliance Dissonance | STUDY GROUP N | % | CONTROL GROUP N | % | TOTAL N | % |
|---|---|---|---|---|---|---|
| Underassessment | 4 | 12.1 | 2 | 8.3 | 6 | 10.5 |
| Same Assessment | 28 | 84.8 | 17 | 70.8 | 45 | 78.9 |
| Overassessment | 1 | 3.0 | 5 | 20.8 | 6 | 10.5 |
| | | | | Test Statistic | | $p <$ |
| K-W Ranking Overall | 26.68 | | 32.19 | 3.0227 | | .1 |
| Chi-Square Approximation | | | | 4.7188 | | .1 |

Note: Percentages are columnwise

On closer examination of the data in Table 12, a considerably larger proportion of control subjects (20.8%)

showed a compliance dissonance towards overassessment than did study subjects (3%). To examine this effect, the following set of hypotheses concerning the compliance dissonance were tested:

H0: There would be no difference between the experimental groups at the overassessment level of compliance dissonance for the suicidal client;

H1: There would be smaller proportion of overassessment in compliance dissonance in the study group than in the control group.

The compliance dissonance values were recoded into 2 groups--Under/Same Assessment for one group, and Overassessment for the other. The Kruskal-Wallis procedure found that the difference in compliance dissonance was statistically significant at $p < .05$ (Table 13). Additionally, Fisher's Exact Test indicated that there was a strong association between overassessment in compliance dissonance and group membership, with $p < .05$. Based on these findings, the null hypothesis was rejected; the data indicated that the study group exhibited less compliance dissonance towards overassessment.

## Assessment Dissonance in the Sondra Interviews

Assessment dissonance has been defined earlier as the difference between the caseworker assessment and the instrument assessment. An examination for the assessment dissonance for the Sondra role was performed to measure the caseworker-subjects' level of agreement with the instrument

Table 13.-Regrouped 2x2 Table of Compliance Dissonance by Group Membership - Sondra Interviews

| Compliance Dissonance | STUDY GROUP N | % | CONTROL GROUP N | % | TOTAL N | % |
|---|---|---|---|---|---|---|
| Same/Underassessment | 32 | 97.0 | 19 | 79.2 | 51 | 89.5 |
| Overassessment | 1 | 3.0 | 5 | 20.8 | 6 | 10.5 |
| | | | | Test Statistic | | p < |
| K-W Rank: Overassessment | 26.86 | | 31.94 | 4.5939 | | .0500 |
| Fisher's Exact Test | | | | | | .0500 |

Note: Percentages are columnwise

assessment when assessing a suicidal client. To investigate this measure, the following hypotheses were developed:

H0: There would be no difference between the experimental groups in the assessment dissonance for the suicidal client;

H1: There would be less assessment dissonance in the study group than in the control group.

The classification of the three potential recommendations (Underassessment, Same Assessment, Overassessment) by study and control group is presented in Table 14.

The Kruskal-Wallis procedure reported that, with $p < .2$, the difference of compliance dissonance was not statistically significant (Table 14). Based on these findings, the null hypothesis was not rejected; the level of assessment compliance was the same for both groups.

Table 14.-Crosstabulation of Assessment Dissonance by Group Membership - Sondra Interviews

| Assessment Dissonance | STUDY GROUP N | % | CONTROL GROUP N | % | TOTAL N | % |
|---|---|---|---|---|---|---|
| Underassessment | 6 | 18.2 | 8 | 33.3 | 14 | 24.6 |
| Same Assessment | 25 | 75.8 | 15 | 62.5 | 40 | 70.2 |
| Overassessment | 2 | 6.1 | 1 | 4.2 | 3 | 5.3 |

| | | | Test Statistic | $p <$ |
|---|---|---|---|---|
| K-W Ranking Overall | 30.98 | 26.27 | 1.7441 | .2 |
| Chi-Square Approximation | | | 2.5529 | .5 |

Note: Percentages are columnwise

Assessment Measures of the Nadine Role

The results from the interviews with the Nadine (non-suicidal) role follow. Even though the Nadine role did not present a case of imminent danger, it still exhibited a moderate risk factor, and the client-confederate should have been referred to a group. These findings are not as striking as those for the Sondra interviews, but the combination of the two sets of interviews may shed some light on how the status of the client affected the caseworker-subjects' use and interpretation of the respective assessment tool.

Instrument Assessments for the Nadine Interviews

A comparison of the instrument assessments for the Nadine interviews was performed. In this case, the following hypotheses were made:

H0: There would be no difference between the experimental

groups in the instrument assessments made for the non-suicidal client;

H1: The instrument assessments of the study group would assess the non-suicidal client as a moderate risk and make a referral to a group more consistently than would the control group's instrument assessments.

The classification of the three potential recommendations (No Risk, Moderate Risk, Imminent Danger) by Lifenet and the manual instrument is presented in Table 15. The results of the Kruskal-Wallis One-Way Analysis by Ranks showed that Lifenet had assessed the client as being in a generally higher level of risk ($p < .05$). However, the small chi-square statistic indicated that this difference between the two groups was not based on any specific association between the instrument assessment and group membership (Table 15).

Table 15.-Crosstabulation of Instrument Assessment by Group Membership - Nadine Interviews

| Assessment | STUDY GROUP N | % | CONTROL GROUP N | % | TOTAL N | % |
|---|---|---|---|---|---|---|
| No Risk | 2 | 6.1 | 5 | 20.8 | 7 | 12.3 |
| Moderate Risk | 29 | 87.9 | 19 | 79.2 | 48 | 84.2 |
| Imminent Danger | 2 | 6.1 | 0 | 0.0 | 2 | 3.5 |
| | | | | Test Statistic | | $p <$ |
| K-W Ranking Overall | 31.35 | | 25.77 | 3.9122 | | .05 |
| Chi-Square Approximation | | | | 4.0489 | | .15 |

Note: Percentages are columnwise

Although Lifenet rated the Nadine role at a higher level of risk, this did not mean necessarily that it was more accurate at detecting moderate risk and making a group referral. In order to measure this, the data were regrouped into a 2x2 table, where the instrument assessments were categorized as No/Imminent Danger and Moderate Risk. When comparing specifically for an assessment of moderate risk for the Nadine role, there was no difference between the two groups, with $p < .5$ (Table 16). This was verified by Fisher's Exact Test, which showed that the instrument assessment for Nadine and group membership were relatively independent of each other (Table 16).

Based on these results, the null hypothesis was not rejected; there was no difference in the instrument assessments for the client at moderate risk.

Table 16.-Regrouped 2x2 Table of Instrument Assessment by Group Membership - Nadine Interviews

| | STUDY GROUP | | CONTROL GROUP | | TOTAL | |
|---|---|---|---|---|---|---|
| Assessment | N | % | N | % | N | % |
| No / Imminent Danger | 4 | 12.1 | 5 | 20.8 | 9 | 15.8 |
| Moderate Risk | 29 | 87.9 | 19 | 79.2 | 48 | 84.2 |
| | | | | Test Statistic | | $p <$ |
| K-W Rank: Moderate Risk | 30.05 | | 27.56 | 0.7793 | | .5 |
| Fisher's Exact Test | | | | | | .5 |

Note: Percentages are columnwise

Perceived Assessments for the Nadine Interviews

A comparison of the perceived assessments for the Nadine interviews was performed. For this measure, the following hypotheses were made:

H0: There would be no difference between the experimental groups in the perceived assessments for the non-suicidal client;

H1: The study group would report perceived assessments assessing the non-suicidal client as a moderate risk and make a referral to a group to a greater degree than would the control group's instrument assessment.

The classification of the three potential recommendations (No Risk, Moderate Risk, Imminent Danger) by study and control group is presented in Table 17. The results of the Kruskal-Wallis One-Way Analysis by Ranks showed that the study group more consistently perceived that the instrument had assessed the client as being in a generally higher level of risk, significant at $p < .005$ (Table 17).

As with the instrument assessment, a perceived assessment indicating a higher level of risk was not necessarily appropriate for the Nadine role. In order to measure whether the study group's perceived assessments more accurately rated Nadine at moderate risk, the data were regrouped into a 2x2 table, where the perceived assessments again were categorized as No/Imminent Danger and Moderate Risk. When comparing specifically for an assessment of moderate risk for the Nadine role, the study group consistently scored more accurately, with $p < .05$ (Table 18). This was verified by Fisher's Exact

Table 17.-Crosstabulation of Perceived Assessments by Group Membership - Nadine Interviews

| Assessment | STUDY GROUP N | % | CONTROL GROUP N | % | TOTAL N | % |
|---|---|---|---|---|---|---|
| No Risk | 1 | 3.0 | 9 | 37.5 | 10 | 17.5 |
| Moderate Risk | 27 | 81.8 | 13 | 54.2 | 40 | 70.2 |
| Imminent Danger | 5 | 15.2 | 2 | 8.3 | 7 | 12.3 |

| | | | Test Statistic | $p <$ |
|---|---|---|---|---|
| K-W Ranking Overall | 33.30 | 23.08 | 8.1369 | .005 |
| Chi-Square Approximation | | | 11.4501 | .005 |

Note: Percentages are columnwise

Test, which showed a strong association between the perceived assessment for Nadine and group membership, significant at $p < .05$ (Table 18).

Table 18.-Regrouped 2x2 Table of Perceived Moderate Risk Assessments by Group Membership - Nadine Interviews

| Assessment | STUDY GROUP N | % | CONTROL GROUP N | % | TOTAL N | % |
|---|---|---|---|---|---|---|
| No / Imminent Danger | 6 | 18.2 | 11 | 45.8 | 17 | 29.8 |
| Moderate Risk | 27 | 81.8 | 13 | 54.2 | 40 | 70.2 |

| | | | Test Statistic | $p <$ |
|---|---|---|---|---|
| K-W Rank: Moderate Risk | 32.32 | 24.44 | 4.9870 | .05 |
| Fisher's Exact Test | | | | .05 |

Note: Percentages are columnwise

Another aspect of the subjects' responses for this variable was the level of underassessment that the control group exhibited. The data were regrouped into a 2x2 table where the perceived assessments again were categorized as No Danger and Moderate/Imminent Danger. The control group showed a greater level of underassessment for the Nadine role, with $p < .001$. Fisher's Exact Test validated that this underassessment was associated with group membership, with $p < .005$ (Table 19).

Table 19.-Regrouped 2x2 Table of Perceived Assessments of No Risk by Group Membership - Nadine Interviews

| Assessment | STUDY GROUP N | % | CONTROL GROUP N | % | TOTAL N | % |
|---|---|---|---|---|---|---|
| No Risk | 1 | 3.0 | 9 | 37.5 | 10 | 17.5 |
| Moderate/Imminent Danger | 32 | 97.0 | 15 | 62.5 | 47 | 82.5 |
| | | | | Test Statistic | | $p <$ |
| K-W Rank: No Risk | 33.14 | | 23.31 | 11.2122 | | .001 |
| Fisher's Exact Test | | | | | | .005 |

Note: Percentages are columnwise

Based on these results, indicating more consistent perceived assessments of moderate danger by the study group and greater underassessment by the control group, the null hypothesis was rejected; the data indicated that subjects using Lifenet for assessing the Nadine role would more accurately understand the recommendation.

Caseworker Assessments for the Nadine Interviews

A comparison of the caseworker assessments for the Nadine interviews was performed. For this measure, the following hypotheses were made:

H0: There would be no difference between the experimental groups in the caseworkers' assessments for the non-suicidal client;

H1: The caseworkers of the study group would assess the non-suicidal client as a moderate risk more consistently than the control group's caseworkers.

The classification of the three potential recommendations (No Risk, Moderate Risk, Imminent Danger) by study and control group is presented in Table 20.

Table 20.-Crosstabulation of Caseworker Assessments by Group Membership - Nadine Interviews

| Assessment | STUDY GROUP N | % | CONTROL GROUP N | % | TOTAL N | % |
|---|---|---|---|---|---|---|
| No Risk | 1 | 3.0 | 4 | 16.7 | 5 | 8.8 |
| Moderate Risk | 27 | 81.8 | 18 | 75.0 | 45 | 78.9 |
| Imminent Danger | 5 | 15.2 | 2 | 8.3 | 7 | 12.3 |

| | | | Test Statistic | $p <$ |
|---|---|---|---|---|
| K-W Ranking Overall | 31.18 | 26.00 | 2.6786 | .20 |
| Chi-Square Approximation | | | 3.5533 | .20 |

Note: Percentages are columnwise

The results of the Kruskal-Wallis One-Way Analysis by Ranks showed that there was no significant difference between the caseworker assessments between the two groups, with $p <$

.20 (Table 20).

Regrouping the data into the possible 2x2 crosstabulations did not render significantly different results. Thus, the null hypothesis was not rejected; there was no difference in caseworker assessment between the two groups.

Perception Dissonance in the Nadine Interviews

An examination of the relationship between the instrument assessment for the Nadine role and the perceived assessment was performed; it was possible that any differences in the subjects' perceptions were due mostly to the differences shown to exist in the actual assessments. To investigate this measure, the following hypotheses were developed:

H0: There would be no difference between the experimental groups in the perception dissonance for the non-suicidal client;

H1: There would be less perception dissonance in the study group than in the control group.

The classification of the three potential recommendations (Underassessment, Same Assessment, Overassessment) by study and control group is presented in Table 21.

As in the Sondra interviews, several interesting effects occurred in this measure. First, the level of overassessment in each group was small, and there was no statistical difference present--a perception dissonance leaning towards overassessment was not evident. Secondly, the Kruskal-Wallis procedure indicated that, with $p < .25$, the perception

dissonance between the two groups were similar. Nonetheless, the relatively large chi-square approximation indicated that there was an association between perception dissonance and group membership, with $p < .05$ (Table 21).

Table 21.-Crosstabulation of Perception Dissonance by Group Membership - Nadine Interviews

| Perception Dissonance | STUDY GROUP N | % | CONTROL GROUP N | % | TOTAL N | % |
|---|---|---|---|---|---|---|
| Underassessment | 1 | 3.0 | 6 | 25.0 | 7 | 12.3 |
| Same Assessment | 28 | 84.8 | 14 | 58.3 | 42 | 73.7 |
| Overassessment | 4 | 12.1 | 4 | 16.7 | 8 | 14.0 |
| | | | | | Test Statistic | $p <$ |
| K-W Ranking Overall | 30.85 | | 26.46 | | 1.6298 | .25 |
| Chi-Square Approximation | | | | | 8.1634 | .05 |

Note: Percentages are columnwise

Because the chi-square approximation can be inflated with small sample sizes, the data were regrouped into 2x2 tables to measure whether the similarity of overassessment between the two groups was obscuring other differences. First, the perception dissonance values were recoded into 2 groups--No Dissonance and Dissonance. The Kruskal-Wallis procedure verified that subjects in the study group more often exhibited no perception dissonance, with $p < .03$. Moreover, Fisher's Exact Test showed that the absence of perception dissonance was dependent upon group membership, with $p < .03$ (Table 22).

Lastly, subjects in the control group were more likely to exhibit perception dissonance towards underassessment. The

Table 22.-Regrouped 2x2 Table of No Perception Dissonance by Group Membership - Nadine Interviews

| Perception Dissonance | STUDY GROUP N | % | CONTROL GROUP N | % | TOTAL N | % |
|---|---|---|---|---|---|---|
| Perception Dissonance | 5 | 15.2 | 10 | 41.7 | 15 | 26.3 |
| No Dissonance | 28 | 84.8 | 14 | 58.3 | 42 | 73.7 |
| | | | | Test Statistic | | $p <$ |
| K-W Rank: No Dissonance | 32.18 | | 24.63 | 4.9495 | | .03 |
| Fisher's Exact Test | | | | | | .03 |

Note: Percentages are columnwise

perception dissonance values were recoded into 2 groups--Underassessment and Same/Overassessment--and the Kruskal-Wallis procedure verified this tendency, with $p < .02$ (Table 23). When Fisher's Exact Test was applied to this regrouping, it indicated that the level of underassessment was associated with group membership, significant at $p < .02$ (Table 23).

Table 23.-Regrouped 2x2 Table - Perception Dissonance of Underassessment by Group Membership - Nadine Interviews

| Perception Dissonance | STUDY GROUP N | % | CONTROL GROUP N | % | TOTAL N | % |
|---|---|---|---|---|---|---|
| Underassessment | 1 | 3.0 | 6 | 25.0 | 7 | 12.3 |
| Same/Overassessment | 32 | 97.0 | 18 | 75.0 | 50 | 87.7 |
| | | | | Test Statistic | | $p <$ |
| K-W Rank: Underassessment | 31.64 | | 25.38 | 6.1164 | | .02 |
| Fisher's Exact Test | | | | | | .02 |

Note: Percentages are columnwise

Based on these results, indicating less perception dissonance by the study group and greater underassessment by the control group, the null hypothesis was rejected; the data indicated that the perceived assessments by the study group were more consistent with the instrument's actual assessment of the non-suicidal client.

Compliance Dissonance in the Nadine Interviews

Compliance dissonance has been defined earlier as the difference between the caseworker assessment and the perceived assessment. An examination of the compliance dissonance for the Nadine role was performed to measure the caseworker-subjects' level of agreement with the perceived assessment. To investigate this measure, these hypotheses were developed:

H0: There would be no difference between the experimental groups in the compliance dissonance for the non-suicidal client;

H1: There would be less compliance dissonance in the study group than in the control group for the non-suicidal client.

The classification of the three potential recommendations (Underassessment, Same Assessment, Overassessment) by study and control group is presented in Table 24.

In general, a sizeable majority of subjects's in each group showed no compliance dissonance, i.e., the caseworker assessment was the same as the perceived assessment. The difference in the two groups' compliance dissonance was not statistically significant ($p < .2$). On the basis of these

Table 24.-Crosstabulation of Compliance Dissonance by Group Membership - Nadine Interviews

| Compliance Dissonance | STUDY GROUP N | % | CONTROL GROUP N | % | TOTAL N | % |
|---|---|---|---|---|---|---|
| Underassessment | 3 | 9.1 | 2 | 8.3 | 5 | 8.8 |
| Same Assessment | 27 | 81.8 | 15 | 62.5 | 42 | 73.7 |
| Overassessment | 3 | 9.1 | 7 | 29.2 | 10 | 17.5 |
| | | | | Test Statistic | | $p <$ |
| K-W Ranking Overall | 26.73 | | 32.13 | 2.4736 | | .20 |
| Chi-Square Approximation | | | | 3.9049 | | .20 |

Note: Percentages are columnwise

findings, the null hypotheses was not rejected.

On closer examination of the data in Table 24, a considerably larger proportion of control subjects (29.2%) showed a compliance dissonance towards overassessment than did study subjects (9.1%). This may explain the higher ranking, meaning a higher level of overassessment, in the control group. To examine this effect, the following subset of hypotheses concerning the compliance dissonance were tested:

H0: There would be no difference between the experimental groups at the overassessment level of compliance dissonance for the suicidal client;

H1: There would be a smaller proportion of overassessment in compliance dissonance in the study group than in the control group.

The compliance dissonance values were recoded into 2 groups--Under/Same Assessment for one group, and Overassessment for

the other. The results are listed in Table 25. The Kruskal-Wallis procedure reported that the difference between the two groups is not statistically significant, but with $p = .0512$, it is just slightly so. Additionally, the results from Fisher's Exact Test were such that one could not conclusively say that there was a strong association between overassessment in compliance dissonance and group membership, since the $p$-value was again slightly larger than .05 (Table 25).

Table 25.-Regrouped 2x2 Table of Compliance Dissonance of Overassessment by Group Membership - Nadine Interviews

| | STUDY GROUP | | CONTROL GROUP | | TOTAL | |
|---|---|---|---|---|---|---|
| Compliance Dissonance | N | % | N | % | N | % |
| Under/Same Assessment | 30 | 90.9 | 17 | 70.8 | 47 | 82.5 |
| Overassessment | 3 | 9.1 | 7 | 29.2 | 10 | 17.5 |
| | | | | Test Statistic | | $p$ = |
| K-W Rank: Overassessment | 26.59 | | 32.31 | 3.8033 | | .0512 |
| Fisher's Exact Test | | | | | | .0538 |

Note: Percentages are columnwise

Based on these findings, the null hypothesis could not be rejected; there was no statistical difference in compliance dissonance between the two groups for the Nadine interviews. Still, it should be noted that the decision was quite close, and the tendency towards overassessment on the part of the control group here was not inconsistent with how the control group behaved for the Sondra interviews.

Assessment Dissonance in the Nadine Interviews

Assessment dissonance was defined earlier as the difference between the caseworker assessment and the instrument assessment. An examination for the assessment dissonance for the Nadine role was performed to measure the caseworker-subjects' level of agreement with the instrument assessment when assessing a non-suicidal client. For this purpose, the following hypotheses were developed:

H0: There would be no difference between the experimental groups in the assessment dissonance for the non-suicidal client;

H1: There would be less assessment dissonance in the study group than in the control group.

The classification of the three potential recommendations (Underassessment, Same Assessment, Overassessment) by study and control group is presented in Table 26.

As suggested by the average ranks, the two groups appeared quite similar in assessment dissonance, verified by the very low test statistic from the Kruskal-Wallis procedure, with $p > .8$ (Table 26). Regrouping the data into the possible 2x2 crosstabulations did not render significantly different results. Thus, the null hypothesis was not rejected; there was no difference in assessment dissonance between the two groups for the Nadine interviews.

Table 26.-Crosstabulation of Assessment Dissonance by Group Membership - Nadine Interviews

| Assessment Dissonance | STUDY GROUP N | % | CONTROL GROUP N | % | TOTAL N | % |
|---|---|---|---|---|---|---|
| Underassessment | 2 | 6.1 | 3 | 12.5 | 5 | 8.8 |
| Same Assessment | 26 | 78.8 | 15 | 62.5 | 41 | 71.9 |
| Overassessment | 5 | 15.2 | 6 | 25.0 | 11 | 19.3 |

| | | | Test Statistic | $p <$ |
|---|---|---|---|---|
| K-W Ranking Overall | 28.64 | 29.50 | 0.0605 | .8100 |
| Chi-Square Approximation | | | 3.2102 | .4000 |

Note: Percentages are columnwise

## Predictive Effects of Demographic Variables on the Effectiveness Measures

The Multiple Regression procedure of Statgraphics was applied to the various effectiveness measures, in order to see whether any of the demographic characteristics had a predictive effect on those measures. As noted above, the two groups' demographic characteristics were basically the same except for the level of personal experience with suicide. Thus, these characteristics, except for personal experience with suicide, may behave like any other controlled variables in an experiment. In general, multiple regression for the raw data measures--instrument assessment, perceived assessment, and caseworker assessment--produced statistically significant models, while multiple regression for the dissonance measures did not. Also, multiple regression produced much more significant measures for the Sondra interviews.

Multiple Regression Model for Instrument Assessment

A multiple regression procedure was performed on the data for the instrument assessment, and is presented in Table 27. In general, the model coefficient represents how much the variable's value, multiplied by the coefficient, contributes to the value of the dependent variable. A negative coefficient indicates that an inverse relationship exists between the independent variable and the dependent variable. The larger the absolute value of the t-value of a variable, the more likely that variable will have a predictive effect. The significance level of a variable represents the probability that a more accurate multiple regression model would occur without that variable; as before, the smaller the *p*-value, the greater the likelihood that the variable has predictive value. In addition, the $R^2$ indicates the strength of the effect the entire model has on the dependent variable, and the F-statistic indicates how significant that model is; a large F-statistic, with its concomitant small *p* value indicates that the model is significant, otherwise, the model is not. Again, the target *p* value for determining significance will be .05 or less.

In the multiple regression model for the Sondra instrument assessments, the *p*-value of .0388 would indicate that the entire model is significant, but not very much so. It is clear that the only variable that has any predictive value here is education, with $p < .05$. Group membership is the next strongest factor, but is not significant. This was not unexpected, because the instrument assessment has the

Table 27.-Multiple Regression for Instrument Assessment - Sondra Interviews

| variable | coefficient | std. error | t-value | sig.level |
|---|---|---|---|---|
| Group Membership | 0.229609 | 0.159839 | 1.4365 | .1579 |
| Gender | -0.051519 | 0.148157 | -0.3477 | .7297 |
| Age | 0.002806 | 0.008321 | 0.3373 | .7375 |
| Education | -0.134376 | 0.057823 | -2.3239 | .0248 |
| Social Service Experience | -0.023640 | 0.018708 | -1.2636 | .2130 |
| Clinical Experience with Suicide | -0.040874 | 0.09184 | -0.4451 | .6585 |
| Personal Experience with Suicide | 0.075479 | 0.079894 | 0.9447 | .3500 |

| $R^2$ | F-Ratio (df = 7,44) | *p*-value |
|---|---|---|
| 0.157262 | 2.35957 | .0388 |

least caseworker-subject involvement; the subject collected the data, but the instrument assessment was the assessment that the instrument would have developed, as long as the instrument's rules were correctly applied to the inventory data. Thus, the main source of variation would have been how correctly the subject entered the data.

It is worth noting that when stepwise regression was used, education level and group membership were the only independent variables selected. When the model was reduced to these two factors only, group membership had a significant affect on the instrument assessment, with $p < .05$.

The model for the Nadine interviews' instrument assessments was not significant. Also, the subject's personal experience with suicide had no predictive value for instrument assessment in either model.

Multiple Regression Model for the Perceived Assessment

A multiple regression procedure was performed on the data for the perceived assessment, and is presented in Table 28. As is evident from this table, group membership was the only independent variable with predictive power, with a very large t-value and a very small significance level. This result was not unexpected, considering the fact that the differences in the perceived assessments, particularly for the Sondra interviews, were shown to be associated with group membership.

Table 28.-Multiple Regression for Perceived Assessment - Sondra Interviews

| variable | coefficient | std. error | t-value | sig.level |
|---|---|---|---|---|
| Group membership | 0.692727 | 0.179693 | 3.8551 | .0004 |
| Gender | -0.244791 | 0.166560 | -1.4697 | .1488 |
| Age | 0.001800 | 0.009355 | 0.1924 | .8483 |
| Education | -0.099933 | 0.065006 | -1.5373 | .1314 |
| Social Service Experience | -0.015991 | 0.021032 | -0.7603 | .4511 |
| Clinical Experience with Suicide | -0.118872 | 0.103248 | -1.1513 | .2558 |
| Personal Experience with Suicide | 0.025739 | 0.089818 | 0.2866 | .7758 |

| $R^2$ | F-Ratio (df = 7,44) | *p*-value |
|---|---|---|
| 0.343645 | 4.81456 | .0004 |

When all the independent variables were included in the regression model for the Nadine interviews' perceived assessments, the model was not statistically significant, even though it indicated significance for group membership's effect. Stepwise regression procedures were applied to the

model, and they selected group membership as the only significant variable in the model. With group membership as the only independent variable, the model was significant ($R^2$ = .1136, $F_{1,50}$ = 7.54, $p < .01$); as the only independent variable in the model, group membership was also significant, with $p < .01$.

As before, the subject's personal experience with suicide did not have any predictive value for perceived assessments in either client role.

## Multiple Regression Model for the Caseworker Assessment

A multiple regression procedure was performed on the data for the caseworker assessments; the model for the Sondra interviews is presented in Table 29. As before, only group membership showed predictive value.

In the Nadine interviews, although group membership was by far the only variable with any influence, the entire model was not significant.

## Multiple Regression Model for Perception Dissonance

As noted before, generally the multiple regression models for the dissonance measures were not significant. When the models were reduced to the significant variables only, there were two exceptions, both for the Sondra interviews.

### Regression Model for Perception Dissonance

For the Sondra interviews' perception dissonance, stepwise regression procedures rejected every variable except

Table 29.-Multiple Regression for Caseworker Assessment - Sondra Interviews

| variable | coefficient | std. error | t-value | sig.level |
|---|---|---|---|---|
| Group membership | 0.623350 | 0.161028 | 3.8711 | .0004 |
| Gender | 0.085131 | 0.149259 | 0.5704 | .5713 |
| Age | -0.007349 | 0.008383 | -0.8766 | .3855 |
| Education | -0.109691 | 0.058254 | -1.8830 | .0663 |
| Social Service Experience | -0.022958 | 0.018847 | -1.2181 | .2297 |
| Clinical Experience with Suicide | -0.034604 | 0.092523 | -0.3740 | .7102 |
| Personal Experience with Suicide | -0.037625 | 0.080488 | -0.4675 | .64250 |

| $R^2$ | F-Ratio (df = 7,44) | *p*-value |
|---|---|---|
| 0.293577 | 4.02781 | .0017 |

group membership, leaving a linear regression model. With group membership as the only independent variable, the model was significant ($R^2 = .1166$, $F_{1,50} = 7.73$, $p < .01$); as the only independent variable in the model, group membership was also significant, with $p < .01$.

Regression Model for Compliance Dissonance

Stepwise regression procedures found only the caseworker's gender as significant to compliance dissonance in the Sondra interviews. With gender as the only independent variable, the model was significant ($R^2 = .1043$, $F_{1,50} = 6.94$, $p < .05$); as the only independent variable in the model, group membership was also significant, with $p < .05$. But even though caseworker gender seems to have an influence on this measure, since there was no significant difference in the

gender composition of the two groups, the influence of gender should be similar to that of a controlled variables in an experiment.

Linear Regression Using Personal Experience with Suicide

The multiple regression models above consistently excluded the caseworkers' personal experience with suicide as a significant factor. Since the subject's personal experience with suicide was the only demographic variable which differed between the experimental groups, it was worthwhile to specifically examine whether this characteristic had any predictive value on the dependent variables. Statgraphics' linear regression procedure indicated that no relationship existed between the dependent variables and the caseworker's personal experience with suicide. This variable had little predictive value for the caseworker assessment, and so its unequal level in the two groups poses no problem. The only variable that both shows predictive effect and differs between the groups is group membership.

## Post-Interview Attitudinal Surveys

After completing both interviews, the caseworker-subjects were surveyed as to their attitudes towards whichever instrument they used in the screening process. The responses were based on 5-point Likert scales, and the averages and standard deviations of the subjects' responses are shown in Table 30.

On the whole, the subjects' responses were somewhat non-

Table 30.-Descriptive Statistics for Attitudinal Responses

| Variable | STUDY GROUP Mean | STUDY GROUP Std. Dev. | CONTROL GROUP Mean | CONTROL GROUP Std. Dev. | POOLED Mean | POOLED Std. Dev. |
|---|---|---|---|---|---|---|
| Satisfied | 3.73 | 0.9770 | 3.30 | 1.0632 | 3.55 | 1.0130 |
| Confident | 3.73 | 1.0085 | 3.58 | 1.1389 | 3.67 | 1.0650 |
| Trust | 3.55 | 0.9395 | 3.38 | 1.2091 | 3.46 | 1.0606 |
| Like | 3.82 | 1.0445 | 3.21 | 1.1025 | 3.56 | 1.0691 |
| Connected | 3.12 | 1.4309 | 3.17 | 1.3406 | 3.14 | 1.3938 |

Scale: 1 = Not At All; 2 = A Little; 3 = Some;
4 = A Lot; 5 = A Great Deal

committal across the board; the average response was a little higher than a 3. The subjects' in both groups scored the personal connection with the client the lowest of all the categories ($M_{study}$ = 3.12, $M_{control}$ = 3.17). Curiously, the control group rated how much they liked the instrument the second lowest ($M_{control}$ = 3.21), but the study group rated this category the highest ($M_{study}$ = 3.82).

The attitudinal responses for the two groups were compared to see whether there was any difference in attitude towards the instrument used. The null hypothesis (H0) was the same for each attitudinal variable, namely, that there would be no difference between the two groups. The alternative hypothesis was that two groups were different in terms of the respective variable. The size of the control group called for a non-parametric procedure, and the Mann-Whitney U test was used (Table 31). In every category except the personal connection with the client the study group's rankings were higher; nonetheless, there was no statistical difference

between the two groups, except for how much the subjects liked the instrument. In this case, the subjects in the study group reported that they liked Lifenet to a significantly greater degree, with $p < .05$.

Table 31.-Mann-Whitney U Tests on Attitudinal Responses

| Variable | Average Rankings: Study Group | Average Rankings: Control Group | Test Statistic | p-value | Decision |
|---|---|---|---|---|---|
| Satisfied | 30.91 | 25.04 | -1.3720 | .1701 | Not Reject H0 |
| Confident | 29.76 | 27.96 | -0.4105 | .6814 | Not Reject H0 |
| Trust | 29.80 | 27.90 | -0.4392 | .6605 | Not Reject H0 |
| Like | 32.77 | 23.81 | -2.0760 | .0379 | Reject H0 |
| Connected | 28.73 | 29.38 | 0.1404 | .8883 | Not Reject H0 |

## Summary of Findings

The purpose of this experiment was to determine whether caseworkers using Lifenet would perform differently than caseworkers using a manual procedure currently used in social service agencies. The comparisons were performed using non-parametric ranking procedures. The data were also placed in contingency tables, and the strength of association between dependent variables and group membership were tested by calculating chi-square approximations. In some cases, the data were regrouped into 2x2 contingency tables in order to use Fisher's Exact Test to measure association.

The demographic characteristics of the study and control groups were compared in order to assess whether any of these

characteristics would serve as confounding variables in the subjects' performance. These comparisons were made using the Mann-Whitney U procedure, which compares the median of the respective groups. There was no statistical difference between the two groups for any of the demographic characteristics except for the subjects' personal experience with suicide. Multiple regression models showed that this characteristic had no significant effect on the dependent variables measured later.

Measures of efficiency, such as the length of the inventory-taking, how long the assessment took, and the length of the total interview, were compared using the Kruskal-Wallis Analysis of Variance by Ranks. There was no significant difference in the length of the inventory-taking between the two groups. The study group had shorter assessment times and shorter total interview times.

Measures of effectiveness were compared separately for the Sondra (suicidal) and the Nadine (non-suicidal) roles. A summary of these comparisons is displayed in Table 32. For the Sondra interviews, the study group recorded more accurate instrument, perception, and caseworker assessments at statistically significant levels. The study group also showed smaller amounts of perception dissonance and compliance dissonance that were statistically significant. There was no difference in assessment dissonance between the two groups.

For the Nadine roles, the study group showed more accurate performance in the perceived assessments, and a smaller degree of perception dissonance. In all the other

measures, there was no overall difference between the groups. In general, the differences between the two groups were more pronounced with Sondra roles than with the Nadine roles.

With the compliance dissonance variable, the subjects in the control group showed a significant tendency to overassess, i.e., the caseworker assessment recorded greater risk than did the perceived assessment. This was true of this measure in both the Sondra and Nadine interviews.

Table 32.-Summary of Effectiveness Measures' Results

| Measure | Sondra Interviews p < | Sondra Interviews Decision | Nadine Interviews p < | Nadine Interviews Decision |
|---|---|---|---|---|
| Instrument Assessment[a] | .0500 | Reject H0 | .5000 | Not Reject H0 |
| Perceived Assessment[a] | .0005 | Reject H0 | .0500 | Reject H0 |
| Caseworker Assessment[a] | .0010 | Reject H0 | .2000 | Not Reject H0 |
| Perception Dissonance[b] | .0050 | Reject H0 | .0300 | Reject H0 |
| Compliance Dissonance[b] | .1000 | Not Reject H0 | .2000 | Not Reject H0 |
| - Overassessment[b] | .0500 | Reject H0 | .0512 | Not Reject H0 |
| Assessment Dissonance[b] | .2000 | Not Reject H0 | .9000 | Not Reject H0 |

[a] H1: Study Group was more accurate for this measure
[b] H1: Study Group exhibited less dissonance for this measure

The dependent variables were placed in a multiple regression model with the independent variable of group membership and the demographic characteristics. Generally, the only models with statistical significance were the assessment measures for the Sondra interviews. Multiple regression did not produce significant models for either the

assessment measures for the Nadine interviews or the dissonance measures. The caseworkers' personal experience with suicide, the only characteristic variable that was not the same for the two experimental groups, did not have a significant bearing on any of the measures.

The post-assessment survey of attitudinal questions showed that the two groups reported similar levels of satisfaction, confidence, trust, and connection with the client; in general, the ratings were non-committal. The study group reported a significantly greater liking for the assessment instrument. The level of connection with the client received the lowest rating in both groups.

# CHAPTER SIX

# DISCUSSION

This chapter presents an interpretation of the study's findings, which in general support the hypothesis that paraprofessional caseworkers will perform some clinical tasks more accurately using an expert system such as Lifenet. Additionally, this improved performance can have a positive impact on social service delivery, specifically in the clinical assessment and administrative functions. Included in this discussion are the implications these findings have for particular assessment and administrative functions, and alternative interpretations of the findings; these may provide a different perspective on Lifenet's impact. Afterwards, the chapter presents the more generalized implications these findings have for the social service agency, in terms of the administrative, clinical, and operational aspects of using expert systems, and in terms of potential structural change. Lastly, directions for future research are explored in relationship to the results presented here.

## The Administrative Efficiency Measures

### Interpretation of Findings

The data analyses of the various time measures indicate that the overall interview and assessment process takes less

time when using Lifenet. The actual interview, during which the caseworker takes the inventory, is not any shorter; the time savings occurs during the assessment. The structured interview requires the caseworker to perform several grading procedures before arriving at the final assessment, and the expert system eliminates virtually all the time needed for this processing. The time savings in the assessment portion of the interview are enough to make the entire interview time--inventory-taking plus assessment--shorter for the interviews conducted using Lifenet.

The similarity of inventory-taking times between the experimental groups indicates that, no matter what the recording technique, the length of the structured interview is not likely to differ. Nonetheless, many diagnostic tools have been restructured for computer use (Kutchins & Kirk, 1987), and structured interviews are designed partially for ease of later computer-based evaluation. This requires additional administrative resources for data entry. Thus, even with no change in the length of the inventory-taking, Lifenet's computerized data entry eliminates later data entry costs.

The shorter times for the group using Lifenet are not surprising, because time efficiency is one of the touted administrative benefits of computing. It is helpful to know precisely how the savings occur; for the inventory-taking, the savings is implicit in the elimination of later data entry, but the assessment process sees much more direct and explicit time saving.

## Implications of Administrative Measures

The results of the administrative measures findings have several implications. The most obvious is that less time-consuming interviews should free paraprofessional personnel for other service delivery tasks, allowing for more services to reach clients. The potential for bundling data collection into the interview and assessment process may also release administrative human resources from data entry tasks, although these savings will possibly be offset by the additional resource demands of computerization.

## Clinical Effectiveness Measures

Overall, the differences between the study group using Lifenet and the control group using the manual procedure were much stronger when assessing the Sondra (suicidal) role. The study group consistently showed a greater degree of accuracy in assessing Sondra to be in imminent danger; this was true of the instrument assessment, the perceived assessment, and the caseworker assessment. The Nadine interviews produced less extreme results; there was no difference between the groups in the instrument and caseworker assessments, although the study group was more accurate in rating the perceived assessments. It is important to note not only that the study group subjects produced more accurate assessments for the Sondra interviews, but also that they did not demonstrate any greater likelihood for false positive assessments, i.e., assessing imminent danger where there was only moderate risk, for the Nadine interviews.

Possible Causes of Difference in Assessments

There are several possible reasons for the disparity of performance between the two client roles. Simple miscoding of answers was not the reason, because then a difference between the groups' Nadine instrument assessments would also exist, and that was not the case. Most likely the control group caseworkers, if left on their own, avoided the uncomfortable and stigmatizing aspects of assessing a client as potentially suicidal. Possibly the caseworker minimized the client's responses during the inventory-taking, or skipped crucial portions of the interview; the study group's more accurate instrument assessments for the Sondra role would indicate caseworkers provided Lifenet with better data with which to process its rules. This might simply be because the caseworkers, just like the clients themselves in other studies (Lucas et al, 1977; Greist et al, 1977), recorded information on sensitive issues more readily to a computer.

The extreme difference in accuracy between the two groups' perceived assessments indicates that the control group processed the assessment rules for the manual screen quite inaccurately. And finally, the Lifenet group's more accurate caseworker assessments for the Sondra role, as opposed to the two groups' equally accurate caseworker assessments for the Nadine role, indicate that in making the final assessment, the caseworkers not guided by the expert system were less willing to consider the possibility of imminent danger.

Underassessment in Perception Dissonance

The various dissonance measures provide for more subtle interpretations of the subjects' performance. The perception dissonance measures were used to gauge the difference between the instrument and perceived assessments for each interview. The constant underassessment in perception dissonance by the control group caseworkers indicated that their less accurate perceived assessments were due not only to differences in the instrument assessments themselves, but also to problems in scoring the manual form. This may be because of difficulty in understanding the decision rules, computational inaccuracy, or in the case of depression scale, not reversing crucial items. This tendency was true for both the Sondra and the Nadine interviews.

Overassessment in Compliance Dissonance

With compliance dissonance, the control group demonstrated a greater tendency to overassess, i.e., the caseworkers in the control group gave caseworker assessments that indicated higher risk levels than their perceived assessments indicated. Although this trend was not conclusive for the Nadine interviews, it was consistent with the same trend in the Sondra interviews, which was statistically significant. This indicates that the control group caseworkers were less willing to follow the perceived assessment than their colleagues in the study group; possibly the difficulties in scoring the instrument, evidenced in the perception dissonance, led the control group to play it safe

with a caseworker assessment of higher risk.

Implications of Clinical Measures

Based on the findings for the clinical measures, there are several implications for using an expert system such as Lifenet in social service delivery. The most obvious clinical effect is that caseworkers will more accurately assess clients who are in imminent danger for attempting suicide. This should minimize the chances of at-risk clients not receiving needed treatment. Additionally, since the rate of false-positive assessments were no greater for the study group, the chances of stigmatization for those clients not in imminent danger are minimized. It also means that there will be no loss of human resources for purposes of unnecessary follow-up treatments. These last two points may not be significant, however, since there was no indication of a caseworker tendency to assess clients at a greater risk level than they were.

The study group's more accurate instrument assessments for the Sondra interviews suggest that, particularly in more critical cases, an expert system can provide improved record-keeping for clinical histories. Since previous studies have shown that computerized interviews often render more complete clinical histories (Greist et al, 1973b; Angle et al, 1978), this improved recordkeeping should enhance clinical treatment in other areas. Again, the improved accuracy of data recording which occurred in the Sondra interviews suggests that the caseworkers had a greater willingness to record

sensitive information on a computer than on a paper form.

## Attitudinal Measures

In the attitudinal surveys, caseworkers in the study group generally gave the same ratings to Lifenet as the control group subjects gave to the manual form, but the study group liked Lifenet to a greater degree than the control group liked the manual instrument. These findings suggest that there should be little resistance to implementing a system such as Lifenet in an agency, since the manual form is already in field use in several locales around the country. This interpretation is consistent with previous studies which show paraprofessional workers are less reluctant than professionals to use computerized tools for clinical tasks (Grann, 1982). Where paraprofessionals show resistance is in the collection of data which seems to have little clinical value to the caseworker (Carrilio et al, 1985); when information has a seemingly direct clinical purpose, caseworker acceptance improves (Alter, 1985). In this particular study, since the information was collected solely for Lifenet's assessment purposes, the caseworkers likely saw the clinical benefit in collecting the data.

Of course, this begs the issue as to whether caseworkers may prefer a non-structured interviewing approach to either the computerized or non-computerized structured interview. But the structured clinical interview is one of the reasons why paraprofessionals are able to engage in clinical tasks in the first place; the non-structured interview requires too

much training and is not consistently reliable even when conducted by professionals. Thus, this is something of a red herring.

## Alternative Interpretations

There are several alternative interpretations for some of the clinical effectiveness measures. Although they do not refute the basic conclusions presented in this study, they do provide other perspectives on understanding the subjects' performance in the study.

As discussed above, the control group's level of overassessment in the compliance dissonance measure may indicate less trust or faith in the manual instrument, in spite of the non-committal response in the attitudinal question on trusting the instrument. Just as possible is the interpretation that caseworkers may have a more naive trust in computers, or a greater tendency to abdicate responsibility in the face of computer output. Anecdotal reports of mistaken identity in criminal cases (Richards, 1989) and consumer fraud based on erroneous credit reports (Kling, 1980) illustrate this misplaced reliance on computer output. Perrolle (1991) argues that naive users are likely to attribute greater validity to computer-based data; this may be due to the compelling nature of technology of computers combined with a commendable purpose (Shattuck, 1984)--in this case, prevention of adolescent suicide. Either way, paraprofessional caseworkers generally may follow computer recommendations more blindly. This is certainly possible for the caseworkers in the

study group, and further investigation of this problem is suggested.

The lack of difference in the assessment dissonance measures may indicate that, based upon the information collected during the interview, caseworkers may have a good heuristic sense of what the client's condition is. The difficulty may lie in inadequate interviewing techniques. If paraprofessional caseworkers can learn to cover all the necessary questions in non-computerized interviews, it is possible that they may arrive at fairly accurate clinical assessments in the end. As always, one problem is where the agency will find the time and resources to train the caseworkers in better interviewing techniques. The lack of these resources is one reason for increased interest in computerized clinical tools in the first place. Also, there is adequate documentation that computerized assessment tools produce more accurate assessments than professional clinicians; there is no reason to believe that this would not be true for even the well-trained paraprofessional.

## Broader Implications for Social Service Delivery

The findings indicate that, besides their impact on the specific function areas, the use of expert systems has implications for the entire social service agency. Since the interview process is shortened with the use of Lifenet, and the paraprofessionals showed little indication of resistance to its use, it would be feasible to implement several such computerized tools in the organization. An extension of this

is the development of Lifenet's inventory-taking facility into a more comprehensive interviewing tool, in order that the caseworker may gather a more detailed and robust client profile. Not all of this information may be relevant to Lifenet's decision making process, but could be appropriate to other areas of service delivery, including expert systems assessing other clinical issues. This may contribute to improved recordkeeping of clinical histories and match clients to services more accurately. More precise targeting of services to needs can minimize unnecessary service provision and maximize the effectiveness of the services that are provided. On the administrative side, use of clinical records may supply data to improve the agency's accountability reports to funding sources and strategic decision-making concerning the targeting of service populations. Again, as long as the data collection seems clinically driven, as opposed to administratively driven, caseworker resistance may not occur. A side benefit that may occur is the reduction of client impatience with being asked similar questions repeatedly on different interviews.

Due to the shorter length of the interview process, agencies should accrue some economic benefit from the increased number of interviews that caseworkers can conduct. Agencies may not enjoy much additional direct savings by having technology replace costly human experts, simply because many agencies have already minimized the number of professional staff and replaced them with paraprofessionals. The benefits will accrue in greatly improving the decision-

making of paraprofessionals at very little additional cost. Computer hardware costs a fraction of the salary of even the lowest paid paraprofessional. Much of the knowledge acquisition and codification for clinical expert systems has already been done for the sake of developing manual structured interviews. Moreover, the findings of this study strongly suggest that an expert system could improve paraprofessionals' clinical performance with no more training than a manual procedure would require. Thus, agencies should be able to provide superior services at a minimal additional cost.

Additionally, agencies may be able to improve the training that paraprofessionals receive. Training conducted by a professional trainer is an expense that the social service agency is unable to afford on a regular basis. In agencies where coverage is thin and caseloads are heavy, it is difficult to send more than just a few workers to any one training session. The training that paraprofessionals receive is infrequent, and typically part of a research project such as this. This study has indicated that the use of an expert system can produce better clinical performance with the same amount of training. Furthermore, an expert system with a well-developed explanation facility can also provide a means of continual reinforcement of training (Clancy, 1983); paraprofessionals can use an expert system independently to develop and hone their skills further. A suite of expert systems could provide an agency with the means of both training new personnel and continually upgrading the skills of veteran paraprofessionals in various service tasks. With

traditional training, the agency incurs new costs for every session; using expert systems as training adjuncts, the agency can provide additional training to its paraprofessionals while minimizing the need, and thus the costs, of organized training sessions. Furthermore, in the latter training mode, the costs of the expert systems are spread out over both assessment interviews and individual practice sessions, reducing the systems' per-session cost.

These benefits may not directly refute the objections of Weizenbaum, Dreyfus, and others which were discussed earlier in Chapters Two and Three. But again, the issue should be framed not so much as one of replacing expert professional human clinicians with computerized expert systems, but as one of expert systems augmenting the decision-making of non-expert paraprofessionals. Fiscal constraints have already forced many social service agencies to minimize the presence of mental health and social service professionals in the agency; instead, less costly paraprofessionals with less training and skill provide many of the services that professionals once did. The existence of expert systems had little to do with this development. The moral and philosophical objections to clinical expert systems do not offer adequate alternatives in this context of service delivery, whereas an expert system can provide improved clinical performance to caseworkers with little training.

The overall clinical accuracy, administrative efficiency, and operational feasibility makes implementation of such a system in the social service setting possible. Since

paraprofessionals are already performing clinical tasks, albeit to mixed reviews, providing them with tools for making more accurate assessment should improve their clinical performance. Although improving clinical judgement in one task should be beneficial enough, another possibility is that social service management will extend the use of expert systems to assist paraprofessionals in performing a wider variety of assessment tasks; the work of mental health professionals will be focussed on specialized follow-up treatment, and away from routine assessment.

The literature review presented an analysis of structural interests in the health care professions (Alford, 1975), particularly the struggle between the dominant interests of the medical profession and the challenging interests of the bureaucratic rationalizers; a similar situation exists in the social service agency. It is likely that the increased use of expert systems will decrease the presence of mental health professionals in the agency--they will be reserved for specialized treatment--and increase the reliance upon paraprofessionals for routine clinical tasks. The de-emphasis of the mental health professional as an integral part of the agency will lead to the ascendance of the challenging interests--the professional agency manager. Although the paraprofessional's clinical decision-making status may be elevated, it will not equal the power of the professional manager. And with training for social work students moving towards social welfare and administration issues, and away from private therapeutic practice methods, the new social

worker will have less of a vested interest in maintaining the traditional position of clinical professionals in the social service agency. Thus, the introduction of systems such as Lifenet likely will contribute to a shift of power towards the challenging interests of professional social service managers.

## Areas for Future Research

The findings raise questions in several basic areas where future research would be helpful--a closer examination of Lifenet's use itself, the extension of the Lifenet model to other clinical areas, and further application of the different measures of the system's impact.

### Research in the basic Lifenet model

One topic for future research suggested earlier is the examination of whether caseworkers simply believe computer output more than a manual rule-processing approach. The results of such a study could have serious ethical and legal ramifications for the developers of clinical expert systems.

Another question is whether the basic inventory-taking be done with direct client-to-computer interaction. Will the removal of the caseworker from the entire interviewing process make a difference in the caseworker's assessment, or is this just a logical step in the eventual automation of clinical tasks? Previous research indicates that direct client-computer interaction is effective and accurate, but these studies either suffered from badly controlled experimental methods, or did not investigate critical applications such as

risk assessment in youth.

## Applying the Lifenet Model to Other Problem Areas

The application of the Lifenet model to other problem areas warrants further investigation; of particular interest are areas where the timing of the assessment is so critical. Possible systems include those for assessing the risk of physical abuse or sexual abuse of children. These may be targeted at either the potential victim or the perpetrator of the abuse.

Also of interest, as discussed above, should be the feasibility of developing a large inventory-taking facility with specialized modules for different assessments or recommendations. Many social ills, such as self-harm, sexual and physical abuse, and contagion of the HIV virus share similar risk factors such as substance abuse, depression, and low impulse control. Information on these risk factors can be applied repeatedly by systems assessing different problem areas.

## Further Application of the Effectiveness Measures

The measures in this study were helpful for laying a groundwork for examining the efficiency and effectiveness of expert systems such as Lifenet. Still, this study relied on a clinically controlled experiment as its basis, and empirical research in an actual implementation would be helpful. Some of the study's measures should be applied to an agency environment into which Lifenet is introduced, using pre- and

post-Lifenet comparisons. Besides those aimed specifically at Lifenet's performance, other gauges of operational impact should be measured:

- the number of both line and administrative personnel;
- the labor hours providing self-harm assessment services;
- the number of crisis situations engendered by threats or incidents of self-harm;
- the number of times and the labor hours lost when caseworkers had to bring a client to a clinic or hospital for intensive treatment.

While still based within a limited application, such a case history should provide a more robust appraisal of Lifenet's impact on service delivery.

## Conclusion

This study presents several measures by which to gauge the effectiveness of caseworkers using Lifenet for assessing adolescents in imminent danger of self-harm. The data collected employing these measures support the hypothesis that paraprofessional caseworkers using an expert system are much more accurate in identifying adolescents who are at risk for self-harm than those caseworkers using a manual procedure. The study also demonstrates that the caseworkers using the expert system perform the interview and assessment process much more quickly than do those using the manual procedure.

These results, combined with already existing tendencies in social service organizations, will have the following impacts on the social service agency:

- Paraprofessional personnel, with the aid of computerized assessment and diagnostic tools, will increasingly perform clinical tasks.
- The presence of mental health professionals as integral personnel within the agency will decrease, and instead these professionals will be consulted as specialized outside resources.
- Power in the social service agency will shift to the professional manager, since the mental health professional will no longer be an integral presence in the agency.

This study should provide developers and users of clinical expert systems with a greater awareness of the consequences of using such systems and minimize the unanticipated nature of these consequences. Nonetheless, further empirical study of Lifenet's implementation in an agency environment will be helpful for additional understanding of the expert system's impact.

## APPENDIX A - MANUAL ASSESSMENT FORM

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# Evaluation of Suicide Risk Among Adolescents

**Screener:** Mark the teen's response on the lines on the left. On any answer: Not applicable – 8; Cannot remember – 9

_____ **1.** A. How often in the last week have you been angry?
**(If not at all, skip to question 2)**
1 Not at all
2 Occasionally, 1 to 2 times
3 Sometimes, 3 to 4 times
4 Frequently, 5 or more times

_____ B. When people get angry sometimes they are just a little annoyed or irritated, and other times they are furious. In the last week, what was the *most* angry that you felt?

no anger 1 2 3 4 5 6 7 most angry possible

_____ **2.** A. How often in the last week have you felt sad, depressed, or down in the dumps?
**(If not at all, skip to question 3)**
1 Not at all
2 Occasionally, 1 or 2 times
3 Sometimes, 3 or 4 times
4 Frequently, 5 or more times in past week

_____ B. What was the most depressed you felt in the last week?

not depressed at all 1 2 3 4 5 6 7 most depressed possible

_____ **3.** A. Have you thought about hurting yourself or killing yourself in the last week?
**(If not at all, skip to question 4)**
0 No, not at all
1 Thought about it once
2 Thought about it two (2) or three (3) times
3 Thought about it every day
4 Thought about it so much that I could not think of anything else

_____ B. In the last week, have you made any plans to hurt or kill yourself?
0 No, not at all
1 Made plans, but did not actually try to hurt or kill myself
2 Actually tried to hurt or kill myself

_____ C. Do you want to die now?
0 No, not at all
1 Maybe
2 Yes

_____ **4.** A. Have you ever seriously thought about killing yourself? By seriously, I mean every day for a week, or more. **(If not, skip to question 4C)**
0 No, not at all
1 Yes
If yes, enter the number of times _____

_____ **4.** B. If yes, when was the last time you thought about hurting yourself?

1 Less than a week ago
2 1 week – 1 month
3 1 – 6 months
4 6 months – 1 year
5 1 – 3 years
6 more than 3 years ago

_____ C. Have you ever hurt yourself or tried to kill yourself? **(If not at all, skip to question 5)**

0 No, not all all
1 Yes
If yes, enter the number of times _____

_____ D. When was the last time you tried to hurt yourself?

1 Less than a week ago
2 1 week – 1 month ago
3 1 – 6 months ago
4 6 months – 1 year ago
5 1 – 3 years ago
6 more than 3 years ago

_____ E. How did you try to kill yourself the last time you tried?

1 Taking pills, drinking chemicals
2 Cutting wrists
3 Hanging
4 Carbon monoxide
5 Jumping
6 Gun
7 Other: _____

_____ F. Have you ever been hospitalized for trying to kill yourself?

0 No, not at all
1 Yes
If yes, enter the number of times _____

_____ G. Did you use drugs or alcohol within 2 days of trying to kill yourself?

0 No, not at all
1 Yes
If yes, enter the number of times _____

_____ H. Have you ever received counseling or therapy for trying to kill yourself?

0 No, not at all
1 Yes
If yes, enter the number of times _____

_____ I. How long did you receive services?

Enter length of treatment in months _____

_____ J. Did any of these things happen to you during the three days before you tried to kill yourself?

☐ argument
☐ told "I wish you were dead"
☐ trouble at home
☐ humiliation
☐ trouble at school
☐ trouble with police
☐ assaulted
☐ disappointed
☐ pregnancy
☐ sexual abuse
☐ other: _____

_____ K. Thinking of your most serious attempt, the attempt when you came the closest to dying, were you alone at the moment you tried to kill yourself; that is, were you alone when you (refer to method(s) above).

0 Alone _____
1 Not alone _____

_____ **5.** A. Have any of your parents, brothers, sisters, grandparents, aunts, or uncles, relatives or close friends killed themselves or tried to kill themselves?
**(If no, skip to question 6)**

0 Yes
1 No

_____ **5.**

B. How many members of your family have attempted suicide?
Enter the number of family members _____

_____ C. When was the most recent suicide attempt by a family member?
1 during the last 3 months
2 from 3 months to a year ago
3 from 1 to 2 years ago
4 more than 2 years ago

_____ D. How many have died by suicide?
Enter the number _____
Relationship to teen _____

_____ E. Have many of your close friends attempted suicide?
(If none, skip to question 6)
Enter the number _____

_____ F. When was the most recent suicide attempt by a person your own age?
1 during the last 3 months
2 from 3 months to a year ago
3 from 1 to 2 years ago
4 more than 2 years ago

_____ G. How many of your friends, other than relatives, have died by suicide?
Enter the number _____

**6.** Answer how often you have experienced each of the following during the last week.

| | | | 3<br>5-7<br>days | 2<br>3-4<br>days | 1<br>1-2<br>days | 0<br>Less than<br>1 day |
|---|---|---|---|---|---|---|
| _____ | A. | How often in the last week have you been bothered by things that do not usually bother you? | 3 | 2 | 1 | 0 |
| _____ | B. | How often have you felt lonely? | 3 | 2 | 1 | 0 |
| _____ | C. | How often have you felt fearful? | 3 | 2 | 1 | 0 |
| _____ | D. | How often have you felt hopeful about the future? | 3 | 2 | 1 | 0 |
| _____ | E. | How often has your sleep been restless in the last week? | 3 | 2 | 1 | 0 |
| _____ | F. | Because of your mood, how often have your eating habits changed during the past week? | 3 | 2 | 1 | 0 |
| _____ | G. | How often have you had trouble speaking your mind to others? | 3 | 2 | 1 | 0 |
| _____ | H. | How often have you enjoyed yourself in the last week? | 3 | 2 | 1 | 0 |
| _____ | I. | How often have you felt your life was a failure? | 3 | 2 | 1 | 0 |
| _____ | J. | How often have you felt you could not "get going"? | 3 | 2 | 1 | 0 |
| _____ | K. | How often have you been happy? | 3 | 2 | 1 | 0 |
| _____ | L. | How much weight have you gained or lost in the last week?<br>Lbs gained _____ lost _____ | | | | |

**7.** Enter the number of times each of the following has ever happened to you.

| | | | | |
|---|---|---|---|---|
| _____ | A. | been arrested | _____ | times |
| _____ | B. | run away | _____ | times |
| _____ | C. | used a weapon in a fight | _____ | times |
| _____ | D. | been kicked out of school | _____ | times |

**Circle how often in the LAST TWO MONTHS you have:**

| | | | Times per week | | | |
|---|---|---|---|---|---|---|
| | | | 5 or more | 3 to 4 | 1 to 2 | Not at all Less than once |
| _____ | E. | missed school | 3 | 2 | 1 | 0 |
| _____ | F. | destroyed property | 3 | 2 | 1 | 0 |
| _____ | G. | joined with members of a gang to cause trouble | 3 | 2 | 1 | 0 |
| _____ | H. | teased or fought with younger children | 3 | 2 | 1 | 0 |
| _____ | I. | got into a physical fight with others | 3 | 2 | 1 | 0 |
| _____ | J. | drank alcohol | 3 | 2 | 1 | 0 |
| _____ | K. | used drugs | 3 | 2 | 1 | 0 |
| _____ | L. | got in trouble at home (if you are a runaway, before you left home) | 3 | 2 | 1 | 0 |
| _____ | M. | lied | 3 | 2 | 1 | 0 |
| _____ | N. | stole | 3 | 2 | 1 | 0 |
| _____ | O. | set fires | 3 | 2 | 1 | 0 |

## SUICIDE RISK SUMMARY SCORING

**POTENTIAL IMMINENT DANGER** is based on meeting either of criteria 1 or 2:

| | | |
|---|---|---|
| 1. | Current ideation or | Question 3.A. with a 3 or 4 |
| | Plan to attempt suicide | Question 3.B. with a 1 or 2 |
| 2. | The youth reports 5 or more of the following risk factors: | |
| | A previous suicide attempt | Question 4.C. |
| | More than one suicide attempt | Question 4.C. |
| | A past suicide attempt using a method other than ingesting drugs | Question 4.E. |
| | Suicidal behavior by family | Question 5.A. |
| | Suicidal behavior by a friend | Question 5.E. |
| | Depression | Question 6, answering a 2 or 3 on at least 6 items (including weight gain/loss of 5 lbs.) |
| | Behavior problems | Question 7, answering positive on A to D or a 2 or 3 on E-O for a total of 6 items |
| | Frequent use of drugs and alcohol | Question 7.J. or 7.K., answering a 2 or 3 |
| | Being a boy and scoring depressed | |

# APPENDIX B - DESIGN OF THE LIFENET PROTOTYPE

From the system design and programming viewpoint, the Lifenet prototype was a hybrid of artificial intelligence programming techniques, with the following features:

- It was a Rule-Based System - the final decisions as to the assessment of the client's risk for self-harm were simply a collection of rules weighing various indices to make a recommendation.
- It was written in PROLOG - PROLOG, as its name suggests, was designed for PROgramming LOGic, using the declarative approach to knowledge representation. But for the purposes of implementing the Lifenet prototype, PROLOG was attractive more for its pattern-matching abilities and built-in back-tracking features, which required minimal construction of the inference engine needed in the system.
- It used Object-Oriented Techniques - The data structures used in the database carried the information the system needed to know in order to conduct the interview procedurally - a minimum of procedural information had to be built into the system in order to conduct the interview.

## Implementation of the Lifenet Prototype

The Lifenet prototype's knowledge base contained two types of rules:

- Rules which contained knowledge about the problem domain. These rules developed a running risk assessment of the teenager, and helped the program provide its running

judgement to the interviewer.

. Rules which were basically 'control rules', i.e. rules which governed the problem-solving strategy as opposed to containing knowledge about the problem domain. These were used to minimize the somewhat 'rambling' aspect of some rule-based systems which fire rules in a somewhat random order, frustrating users because the questioning strategy is not at all apparent nor intuitive (Pedersen, 1989). Also, some of these rules would alter the direction of the interview based upon the cumulative responses to the prior questions; for example, if the client was male, there was a rule to make sure he was not asked whether he was pregnant!

The basic program architecture consisted of a data base of specific factors which was filled in through a prompted interactive questionaire. The purpose of this questionaire was to develop an attitudinal, behavioral and background profile of the interviewed teenager. The Lifenet prototype then helped the interviewer make a risk assessment of the teenager's potential for suicide.

How the Prototype Worked

The questions fell under one of eight different categorical types discussed in Chapter Three. These were:

. IDEATION

. MOOD

. GENDER

. DEPRESSION

. FAMILY

. PEERS

. REBEL

. SELF-HARM

The individual questions and their responses were collected in a data type that was indexed by a pair of identifiers, one for the categorical type (called Section) and the second for the specific within-group question (called Key). This primary data base type was a PROLOG functor with the following construction:

**ans( Section , Key , Prompt , Responses_key, Response ).**

An example of this structure is:

**ans(thought_self_harm, contemplate,**

**"\n Have you ever seriously thought about hurting yourself?", yesno, 0).**

As mentioned above, one of the aspects of the Lifenet prototype was that it utilized Object-oriented programming to process questions. Each **ans** functor contained within itself the information needed for the system to know when and how to process each question. Also, each **ans** functor contained its own prompts (the PROMPT atom), and its own response validator (Responses_key), which both displayed valid responses for a question and then checked for a valid response.

The Section was also used for context-limiting, in order to separate the 'ans' elements into groups and to reduce the number of conflicts among rules (McDermott, 1981).

There was also the following Prolog functor to aid in

displaying possible responses and verifying valid answers :

**prompt(Responses_key, List_of_Responses)**

such as :

**prompt(yesno, " \n\t\tYES\n\t\tNO\n\t\tRESPONSE : ").**

The use of these structures is explained below.

The reason for this double indexing, SECTION and KEY, was that it followed the thought pattern of the original questionaire. Also, there were similar questions across groups, so this design allowed greater freedom and therefore a greater affinity in the selection of KEY values. The double indexing also allowed for quick access to **ans** elements (Sciore & Warren, 1988).

The following description gives an overview of the program's flow of control. The master or top level predicate was RUN. This predicate in turn ran through the eight question groups in a prescribed sequence which could be altered based upon cumulative responses. For each question group the following transpired:

- a list of all KEYs in that SECTION was assembled.
- a predicate called GET_DATA recursively searched the list of KEYs, found the **ans** structure for each SECTION/KEY combination, and displayed the PROMPT on the screen.
- the RESPONSE_KEY for that ANS was used to find the appropriate PROMPT record so that the LIST_OF_RESPONSES was also displayed.
- the user's entry was validated, and the original **ans** record was RETRACTed (RETRACT is the PROLOG reserved word for removing a fact from the knowledge base) and the new one,

with the user's response, was ASSERTed (ASSERT is PROLOG for adding a new fact into the knowledge base) into the knowledge base.

The above description is for a modularly designed program. As experience evolves additional question groups could be easily added without disrupting the previous groups. Also, intragroup questions may be added with ease. The only restriction is the obvious one that within each SECTION unique KEY values for every question be selected. The controlling predicate for a SECTION would automatically pick out any **ans** element in that section.

The window displays were designed within a modular framework also so that any textual changes may be accomplished with a minimum of concern for the details of formatting.

## Presenting Advice

During each section, the client's various responses were collected. At the end of each section, the assessment rules, which were basically a system of thresholds and weights applied to client's responses, provided the basis for the recommended assessment. This knowledge was embodied in a set of predicates similarly named such as EVALUATE_REBEL.

The assessment for a particular section was displayed at the bottom of the monitor, in a window using a different background color than the rest of the display, so that the user's attention was drawn to the assessment. The assessment for each section typically fell into four categories -

. very high positive risk factor

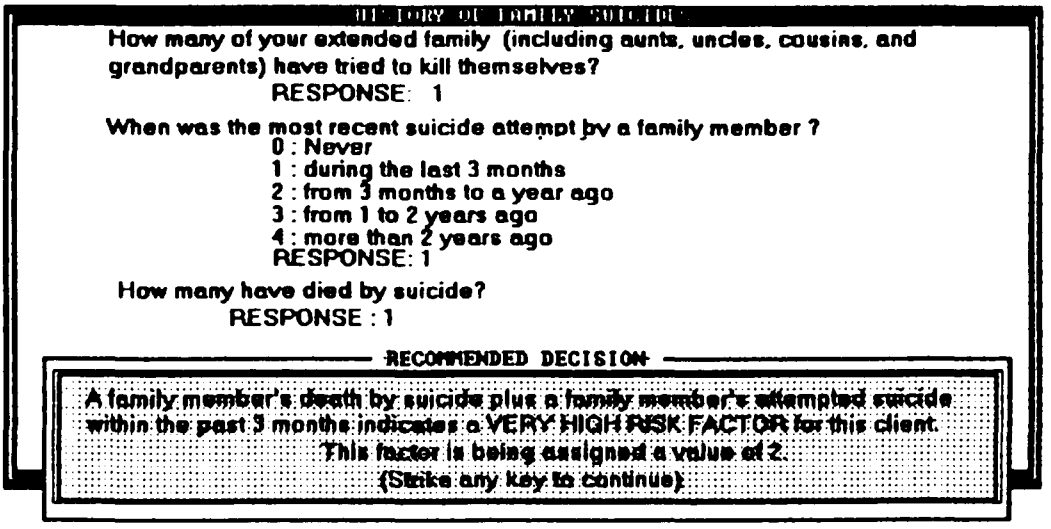
. positive risk factor

. moderate risk factor

. negligible risk factor

There was also a brief explanation of how the Lifenet prototype reached its conclusion for that section (Figure 4).

Figure 4.-The Lifenet Prototype's Onscreen Analysis & Recommendation During A Session.




The final risk assessment was presented as a set of indices, derived from the individual sections. Each factor which resulted in an risk assessment that was more than negligible was displayed on the monitor, and a TOTAL RISK INDEX was computed. A recommendation was then displayed on the monitor, which was one of the following actions:

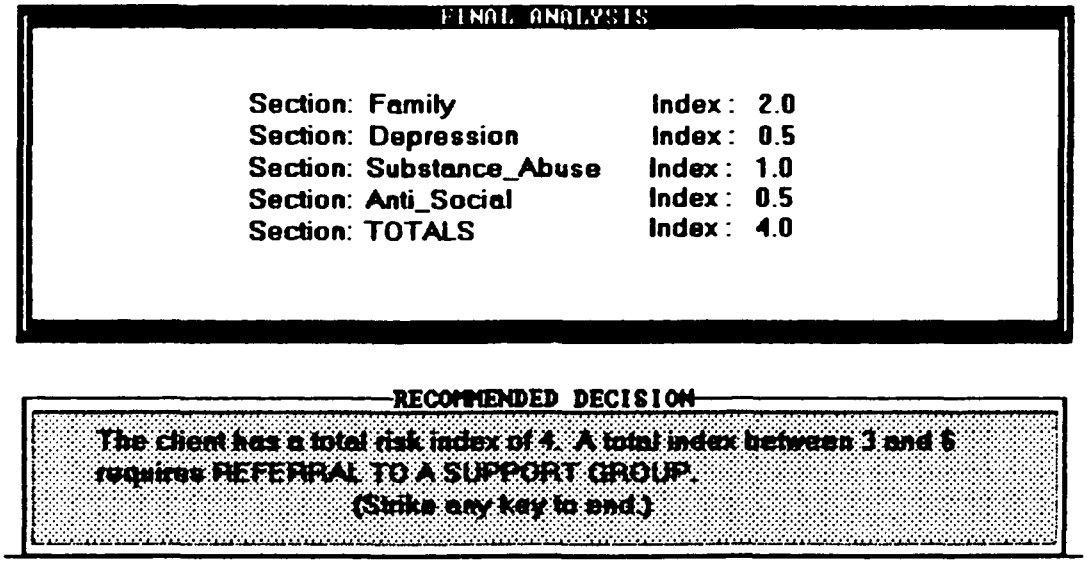
. refer the client to immediate intensive counseling

. refer the client to a counseling group

. do not take any extraordinary actions

Some factors, such as a youth's strong ideation of suicide, weighed so heavily that, no matter what the results were in any other factors, the client was still considered to be at very high-risk. However, even moderate responses in many areas might still produce a positive risk factor, with some intervention recommended (see Figure 5).

Figure 5.-Sample of the Lifenet Prototype's Final Analysis & Recommendation




The Lifenet prototype altered the questions it asks depending upon the responses an interviewee gives. For example, in the IDEATION section, if the teenager says they have not had any history of self-harm, it would be useless to then ask by what method the client had attempted to kill him/herself previously - instead, the rest of that section is

skipped and the system goes on to investigate whether there are more subtle indications of danger in other sections.

LIFENET PROTOTYPE SOURCE CODE LISTING

```
/****** LIFENET  : A SUICIDE SCREEN EXPERT SYSTEM  ******/
 code = 2048
domains
  questionlist = symbol*
  numlist = integer*
  realist = real*

database
  risk_values(symbol,real)
  ans(symbol,symbol,symbol,symbol,integer)
  prompt(symbol, symbol)

predicates
  /*   MAIN  DRIVER   PREDICATES */
  run.
  final_analysis.
  display_factors(questionlist).
  display_recommendation(real).          print_index(symbol).
  display_ideation.

  /*  SUBSECTION PREDICATES   */
  process_ideation.                    ideation_risk.
  moderate_ideation.
  family_and_peers.                    process_family.
  evaluate_family_risk.                evaluate_peer_risk.
  process_peers.
  continue_family_and_peers.
  process_depression.
  depression_risk(integer, integer).
  do_male.
  evaluate_gender.
  process_rebel.
  anti_social_risk(integer,integer).
  drug_and_alcohol.
  process_self_harm.                   self_harm_risk.
  continue_self_harm.                  method_of_attempt.

  /*  UTILITY   PREDICATES  */
  sumlist(numlist, integer).     count_3s(numlist, integer).
  rsumlist(realist, real).
  write_prompt(symbol,symbol).           get_data(symbol).
  do_prompts(questionlist, symbol).
  recalc_positives(questionlist).
  get_response(symbol,integer).
  convert_ans(char,integer).
  action_window.
  continue_prompt(symbol,real).
  recalc_weight.                         null_window.
  initialize.
  clear_val(questionlist).
  error_window.
```

```
  include "question"

goal initialize, process_ideation,!, do_male, !,
family_and_peers,!,
          process_depression, !, process_rebel, !,
          process_self_harm, !, final_analysis,!,
removewindow.
clauses
```

```
/******************  FINAL ANALYSIS **********************/
  final_analysis :- null_window,
     makewindow(1,7,112,"FINAL ANALYSIS",0,5,15,70),
     findall(Vals,risk_values(_,Vals), Value_list),
     rsumlist(Value_list, Risk_index),
     assertz(risk_values("TOTALS",Risk_index)),
     findall(Category, risk_values(Category,_), Catalog),
     display_factors(Catalog),
     display_ideation,
     display_recommendation(Risk_index).

display_factors([]).
display_factors([Head|Tail]) :- print_index(Head),
          display_factors(Tail).

print_index("TOTALS") :- risk_values("TOTALS", 0.0),!,
   writef("\n Section : %-20    Index : %5.1f","TOTALS",
       0.0).
print_index(Category) :- risk_values(Category,0).

print_index(Category) :- risk_values(Category,
   Index),!,Index > 0.0,
   writef("\nSection : %-20    Index : %5.1f",Category,
       Index).

display_ideation :- risk_values(ideation, Val), Val >= 4,
     action_window,
     write("                ****  SPECIAL  NOTE  ****"),
     write("\n Since the client has given strong indications
                of self-ideation"),
     write("\n of suicide, an IMMINENT DANGER ASSESSMENT
                should be made no "),
     write("\n matter what the other factors are !!!"),
     write("\n                    (Strike any key to
                continue)"),
     readchar(_), clearwindow.

display_ideation.

display_recommendation(Index) :- Index >= 6, action_window,
  write("\n The client has a total risk index of ", Index,
   ". A total which is 6 or"),
  write("\n greater  requires an IMMINENT DANGER
ASSESSMENT."),
  write("\n\n\t\t (Strike any key to end.)"),
  readchar(_), clearwindow.

display_recommendation(Index) :- Index >= 3, Index < 6,
action_window,
     write("\n The client has a total risk index of ",
        Index, ". A total index between"),
     write("\n 3 and 6 requires REFERRAL TO A SUPPORT
        GROUP."),
     write("\n\n\t\t (Strike any key to end.)"),
     readchar(_), clearwindow.
```

```
display_recommendation(Index) :- Index < 3, action_window,
     write("\n The client has a total risk index of ",
        Index, ". A total which is"),
     write("\n less than 3 indicates NO RISK IS PRESENT."),
     write("\n\n\t\t (Strike any key to end.)"),
     readchar(_), clearwindow.


/************** CLIENT IDEATION OF  SUICIDE **************/
process_ideation :-
  makewindow(1,7,112,"CLIENT'S IDEATION OF
      SUICIDE",0,0,25,80),
  get_data(ideation),
  ideation_risk.

ideation_risk :- ans(ideation,thought,_,_,Think), Think >=2,
  ans(ideation,plans,_,_,Plan), Plan >= 1,
  ans(ideation,desire,_,_,Desire), Desire >= 1,
  action_window,
  write(" Since the client has thought several times in the
      past week\n"),
  write(" about suicide, has started making plans, and may
      still desire\n"),
  write(" to die, the client should be given an IMMINENT
      DANGER ASSESSMENT\n."),
  continue_prompt(ideation,4).

ideation_risk :-  moderate_ideation, action_window,
  write(" Since the client has either thought several times
      in the past week\n"),
  write(" about suicide, has started making plans, or may
      still desire\n"),
  write(" to die, the client should be REFERRED TO A SUPPORT
      GROUP.\n"),
  continue_prompt(ideation,2).

ideation_risk :- ans(ideation,thought,_,_,0),
  ans(ideation,plans,_,_,0),
  ans(ideation,desire,_,_,0), action_window,
  write(" Since the client has no explicit ideation of
      suicide,\n"),
  write(" it will be necessary to decide if other RISK
      FACTORS suggest\n"),
  write(" the need for an IMMINENT DANGER ASSESSMENT.\n"),
  continue_prompt(ideation,0).

moderate_ideation :- ans(ideation,thought,_,_,Think), Think
      >=2.
moderate_ideation :- ans(ideation,plans,_,_,Plan), Plan >=
      2.
moderate_ideation :- ans(ideation,desire,_,_,Desire), Desire
      >= 1.
```

```
/************  IS THE CLIENT A MALE ? **********************/
do_male :- null_window,
   makewindow(1,7,112,"GENDER OF CLIENT",5,10,10,60),
   get_data(gender), evaluate_gender.

do_male.

evaluate_gender :- ans(gender, male,_,_, 2), action_window,
   write(" Since males statistically have higher suicide
      rates,\n"),
   write(" the client's gender is considered a POSITIVE RISK
      FACTOR.\n"),
   continue_prompt(gender, 1).

evaluate_gender :-  ans(gender, male,_,_, 1), action_window,
   write(" Since females statistically have lower suicide
     rates,\n"),
   write(" the client's gender is not considered a risk
      factor.\n"),
   continue_prompt(gender, 0).


/*************** FAMILY AND PEER BACKGROUND **************/

family_and_peers :-
  makewindow(1,7,112,"HISTORY OF FAMILY SUICIDES",
      0,0,25,80),
  get_data(family_peer),   continue_family_and_peers.

continue_family_and_peers :-
   ans(family_peer,attempts,_,_,0),
   action_window,
   write(" Since client indicates no attempted or
      successful\n"),
   write(" suicides among family or peers, this is NOT a
      RISK\n"),
   write(" FACTOR, and this section will be skipped."),
   write("\n\n\t\t (Strike any key to continue)"),
   readchar(_), clearwindow.

continue_family_and_peers :- ans(family_peer,
   attempts,_,_,1),
   process_family,!,process_peers.


/*************** HISTORY OF PEER SUICIDES ******************/
process_peers :- makewindow(1,7,112,"HISTORY OF PEER
      SUICIDES", 0,0,25,80),
  get_data(peers), evaluate_peer_risk.

process_peers.
```

```
evaluate_peer_risk :- ans(peers,close_friends,_,_,Num),
      Num > 0,
  ans(peers, when,_,_, 1),
  ans(peers, actual,_,_,0 ), action_window,
  write(" The recency of a close friend's attempted suicide
      indicates\n"),
  write(" a VERY HIGH POSITIVE RISK FACTOR for this
      client.\n"),
  continue_prompt(peers, 2).

evaluate_peer_risk :- ans(peers,attempts,_,_,Num),  Num > 0,
  ans(peers, when,_,_, 1),
  ans(peers, close_friends,_,_,0),
  ans(peers, actual,_,_,0 ),  action_window,
  write(" The recency of a peer's attempted suicide
      indicates\n"),
  write(" a HIGH POSITIVE RISK FACTOR for this client.\n"),
  continue_prompt(peers, 1.5).

evaluate_peer_risk :- ans(peers,when,_,_,WHEN),   WHEN < 3,
  ans(peers, actual,_,_,Died),   Died > 0, action_window,
  write(" A close friend's death by suicide, along with a
      peer's attempt\n"),
  write(" within the past  year indicates a HIGH POSITIVE
      RISK FACTOR\n"),
  write(" for this client.\n"),  continue_prompt(peers,
      1.5).

evaluate_peer_risk :- ans(peers,attempts,_,_,Num),  Num > 0,
  ans(peers, when,_,_,2),
  ans(peers, actual,_,_,0 ), action_window,
  write(" A peer's attempted suicide within the past
    year\n"),
  write(" indicates a POSITIVE RISK FACTOR for this
    client.\n"),
  continue_prompt(peers, 1).

evaluate_peer_risk :- ans(peers,attempts,_,_,Num),  Num > 0,
  ans(peers,close_friends,_,_,Friend), Friend >0,
  ans(peers, when,_,_,3),
  ans(peers, actual,_,_,0 ), action_window,
  write(" A close friend's attempted suicide within the last
    2 years\n"),
  write(" indicates a POSITIVE RISK FACTOR for this
    client.\n"),
  continue_prompt(peers, 1).

evaluate_peer_risk :- ans(peers,when,_,_,WHEN),   WHEN < 4,
   WHEN > 0,
   ans(peers, actual,_,_,Died),   Died > 0, action_window,
   write(" A peer's suicide attempt within the past 2 years,
    along\n"),
  write(" with a close friend's death by suicide, indicates
    a \n"),
  write(" POSITIVE RISK FACTOR for this client.\n"),
```

```
  continue_prompt(peers, 1).

evaluate_peer_risk :- ans(peers,when,_,_,4),
  ans(peers, actual,_,_,Died),   Died > 0, action_window,
  write(" A close friend's suicide, along with an attempt
    over 2 years\n"),
  write(" ago, indicates a  MODERATE RISK FACTOR for this
    client.\n"),
  continue_prompt(peers, 0.5).

evaluate_peer_risk :- action_window,
  write(" THERE IS LITTLE RISK FROM PEER HISTORY.\n\n"),
  continue_prompt(peers, 0).

/**************  HISTORY OF FAMILY SUICIDES  *************/

process_family :-
  makewindow(1,7,112,"HISTORY OF FAMILY SUICIDES",
    0,0,25,80),
  get_data(family), evaluate_family_risk.

process_family.

evaluate_family_risk :- ans(family,attempts,_,_,Num),
  Num > 0,
  ans(family, when,_,_, 1),
  ans(family, actual,_,_,0 ), action_window,
  write(" The recency of a family member's attempted
    suicide\n"),
  write(" indicates a VERY HIGH POSITIVE RISK FACTOR for
    this client.\n"),
  continue_prompt(family, 2).

evaluate_family_risk :- ans(family,actual,_,_,Num),
  Num > 0,
  ans(family, when,_,_, 1),  action_window,
  write(" A family member's death by suicide plus a family
    member's \n"),
  write(" attempted suicide within the past 3 months
    indicates a \n"),
  write(" VERY HIGH POSITIVE RISK FACTOR for this
    client.\n"),
  continue_prompt(family, 2).

evaluate_family_risk :- ans(family,attempts,_,_,Num),
  Num > 0,
  ans(family, actual,_,_,Actual ), Actual > 0,
  ans(family, when,_,_,2),  action_window,
  write(" A family member's death by suicide plus a family
    member's \n"),
  write(" attempted suicide within the past year indicates a
    \n"),
  write(" HIGH POSITIVE RISK FACTOR for this client.\n"),
  continue_prompt(family, 1.5).
```

```
evaluate_family_risk :- ans(family,attempts,_,_,Num),
  Num > 0,
  ans(family, when,_,_,2),
  ans(family, actual,_,_,0 ), action_window,
  write(" A family member's attempted suicide within the
    past year\n"),
  write(" indicates a POSITIVE RISK FACTOR for this
    client.\n"),
  continue_prompt(family, 1).


evaluate_family_risk :- ans(family,when,_,_,4),
  ans(family, actual,_,_,Died),   Died > 0, action_window,
  write(" A family member's suicide, along with an attempt
    over 2 years    ago,\n"),
  write(" indicates a  POSITIVE RISK FACTOR for this
    client.\n"),
  continue_prompt(family, 1).


evaluate_family_risk :- ans(family,when,_,_,WHEN),
  WHEN < 4,  WHEN > 0,
  ans(family, actual,_,_,Died),   Died > 0, action_window,
  write(" A family member's suicide attempt within the past
    2 years alone\n"),
  write(" with a family death by suicide, indicates a
    POSITIVE RISK FACTOR\n"),
  write(" for this client.\n"),
  continue_prompt(family, 1).


evaluate_family_risk :- ans(family,when,_,_,WHEN),
  WHEN < 3,   WHEN > 0,
  ans(family, actual,_,_,Died),   Died > 0, action_window,
  write(" A family member's suicide within the past  year
    indicates\n"),
  write(" a  HIGH POSITIVE RISK FACTOR for this client.\n"),
  continue_prompt(family, 1.5).

evaluate_family_risk :- action_window,
  write(" THERE IS LITTLE RISK FROM FAMILY HISTORY.\n\n"),
  continue_prompt(family, 0).


/************* MEASURING DEPRESSION LEVEL ****************/
process_depression :-   makewindow(1,7,7,"SYMPTOMS OF
    DEPRESSION LEVEL",0,0,25,80),
  get_data(depression),
  recalc_positives([hopeful,enjoyed,happy]),
  recalc_weight,!,
  findall(Ans, ans(depression,_,_,_,Ans), Anslist),
  sumlist(Anslist,Sum), count_3s(Anslist,Count),
  depression_risk(Sum, Count).

process_depression.
```

```
depression_risk(Sum,_) :- Sum > 30,  action_window,
  write(" Client indicates a VERY HIGH-LEVEL of depression
    with a\n"),
  write(" total index of ",Sum,". This is a VERY HIGH
    POSITIVE\n"),
  write(" RISK factor for Imminent Danger Assessment.\n"),
  continue_prompt(depression, 2),!.

depression_risk(_, Count) :- Count > 7,  action_window,
  write(" Client indicates a high-level of depression
     with ",Count,"\n"),
  write(" responses of 3 on negative questions or 0 for
    positive ones.\n"),
  write(" This is a VERY HIGH POSITIVE RISK factor.\n"),
  continue_prompt(depression, 2),!.


depression_risk(Sum,_) :- Sum >= 20,  action_window,
  write(" Client indicates a high-level of depression with a
    total\n"),
  write(" index of ",Sum,". This should be considered as a
    POSITIVE\n"),
  write(" RISK factor for Imminent Danger Assessment.\n"),
  continue_prompt(depression, 1),!.

depression_risk(_, Count) :- Count > 5,  action_window,
  write(" Client indicates a high-level of depression
    with ",Count,"\n"),
  write(" responses of 3 on negative questions or 0 for
    positive\n"),
  write(" ones. This should be considered as a POSITIVE RISK
    factor.\n"),
  continue_prompt(depression, 1),!.

depression_risk(Sum, _) :- Sum >= 12,  action_window,
  write(" Client indicates a moderate level of depression
    with a total\n"),
  write(" index of ",Sum,". It may not be a risk
    factor.\n"),
  continue_prompt(depression, 0.5),!.

depression_risk(_,Count) :- Count >= 3,  action_window,
  write(" Client indicates a moderate level of depression
    with " , Count,"\n"),
  write(" responses of 3 on negative questions or 0 for
    positive\n"),
  write(" ones. This may not be a risk factor.\n"),
  continue_prompt(depression, 0.5),!.

depression_risk(Sum, _) :- Sum < 12,  action_window,
  write(" Client indicates a low-level of depression with a
    total\n"),
  write(" index of ",Sum,". It is NOT likely to be a risk
    factor.\n"),
  continue_prompt(depression, 0), !.
```

```
/***************** ANTI-SOCIAL BEHAVIOR ******************/
process_rebel :-   makewindow(1,7,112,"HISTORY OF
    ANTI-SOCIAL BEHAVIOR",0,0,25,80),
  get_data(rebel),
  findall(Ans, ans(rebel,_,_,_,Ans), Anslist),
  drug_and_alcohol,
  sumlist(Anslist,Sum), count_3s(Anslist,Count),
  anti_social_risk(Sum, Count).

process_rebel.

drug_and_alcohol :- ans(rebel,alcohol,_,_,Drink),
  Drink >= 2,
  ans(rebel,drugs,_,_,Drugs), Drugs >= 2, action_window,
  write (" The client's use of drugs AND alcohol several
    times a week\n"),
  write (" indicates a HIGH POSITIVE RISK FACTOR.\n"),
  continue_prompt(substance_abuse, 2).

drug_and_alcohol :- ans(rebel,alcohol,_,_,Drink),
  Drink >= 2,
  action_window,
  write (" The client's use of alcohol several times a
    week\n"),
  write (" indicates a POSITIVE RISK FACTOR.\n"),
  continue_prompt(substance_abuse, 1).

drug_and_alcohol :- ans(rebel,drugs,_,_,Drugs), Drugs >= 2,
  action_window,
  write (" The client's use of drugs several times a
    week\n"),
  write (" indicates a POSITIVE RISK FACTOR.\n"),
  continue_prompt(substance_abuse, 1).

drug_and_alcohol.

anti_social_risk(Sum,_) :- Sum > 30,  action_window,
  write(" Client indicates a VERY HIGH-LEVEL of anti_social
    behavior\n"),
  write(" with a total index of ",Sum,". This is a VERY HIGH
    POSITIVE\n"),
  write(" RISK factor for Imminent Danger Assessment.\n"),
  continue_prompt(anti_social, 2).

anti_social_risk(_, Count) :- Count > 7,  action_window,
  write(" Client indicates a high-level of anti_social
    behavior with ", Count,"\n"),
  write(" responses of 3 on negative questions or 0 for
    positive ones.\n"),
  write(" This is a VERY HIGH POSITIVE RISK factor.\n"),
  continue_prompt(anti_social, 2).
```

```
anti_social_risk(Sum,_) :- Sum >= 20,  action_window,
  write(" Client indicates a high-level of anti_social
    behavior with a\n"),
  write(" total index of ",Sum,". This should be considered
    as a \n"),
  write(" POSITIVE RISK factor for Imminent Danger
    Assessment.\n"),
  continue_prompt(anti_social, 1).

anti_social_risk(_, Count) :- Count > 5,  action_window,
  write(" Client indicates a high-level of anti_social
    behavior with ", Count,"\n"),
  write(" responses of 3 on negative questions or 0 for
    positive\n"),
  write(" ones. This should be considered as a POSITIVE RISK
    factor.\n"),
  continue_prompt(anti_social, 1).

anti_social_risk(Sum, _) :- Sum >= 12,  action_window,
  write(" Client indicates a moderate level of anti_social
    behavior with\n"),
  write(" a total index of ",Sum,". It may Not be a risk
    factor.\n"),
  continue_prompt(anti_social, 0.5).

anti_social_risk(_,Count) :- Count >= 3,  action_window,
  write(" Client indicates a moderate level of anti_social
    behavior with ", Count,"\n"),
  write(" responses of 3 on negative questions or 0 for
    positive\n"),
  write(" ones. This may not be a risk factor.\n"),
  continue_prompt(anti_social, 0.5).

anti_social_risk(Sum, _) :- Sum < 12,  action_window,
  write(" Client indicates a low-level of anti_social
    behavior with a total\n"),
  write(" index of ",Sum,". It is NOT likely to be a risk
    factor.\n"),
  continue_prompt(anti_social, 0).

/**************** HISTORY OF SELF-HARM ********************/
process_self_harm :- makewindow(1,7,112,"HISTORY OF
    SELF-HARM",0,0,25,80),
  get_data(history_self_harm), continue_self_harm.

process_self_harm.

continue_self_harm :- ans(history_self_harm,actual,_,_,0),
  action_window,
  write(" Since client indicates no previous suicide
    attempts this\n"),
  write(" is NOT a RISK FACTOR, and this section will be
    skipped.\n"),
  write("\n\n\t\t (Strike any key to continue)"),
  readchar(_), clearwindow.
```

```
continue_self_harm :- ans(history_self_harm,actual,_,_,1),
  clearwindow,
  get_data(self_harm),
  self_harm_risk, method_of_attempt.

continue_self_harm.

self_harm_risk :- ans(self_harm,count,_,_,Times),
  Times >= 2,
  action_window,
  write(" The fact that the client has made more than one
    previous\n"),
  write(" suicide attempt indicates a POSITIVE RISK FACTOR
    for this\n"),
  write(" client.\n"), continue_prompt(self_harm, 1).


self_harm_risk :- ans(self_harm,count,_,_,1), action_window,
  write(" The fact that the client has made only one
    previous\n"),
  write(" suicide attempt indicates a MODERATE RISK FACTOR
    for this\n"),
  write(" client.\n"), continue_prompt(self_harm, 0.5).

self_harm_risk :- ans(self_harm,count,_,_,0), action_window,
  write(" The fact that the client has made no previous\n"),
  write(" suicide attempts indicates this is NOT a RISK
    FACTOR \n"),
  write(" for this client.\n"),
  continue_prompt(self_harm, 0).

method_of_attempt :- ans(self_harm,method,_,_,Method),
  Method >= 2,
  action_window,
  write (" The use of method other than ingestion in the
    client's\n"),
  write (" previous attempt(s) suggests the seriousness of
    that\n"),
  write (" attempt and indicates a POSITIVE RISK
    FACTOR.\n"),
  continue_prompt(method, 1).

method_of_attempt.

/******************* INITIALIZATION ************************/
initialize :-  findall(Sect, risk_values(Sect,_),
  Sect_list), clear_val(Sect_list).

clear_val([]).
clear_val([Sect|Sect_list]) :- retract(risk_values(Sect,_)),
  clear_val(Sect_list).
```

```
/******************* UTILITY FUNCTIONS **********************/
sumlist([],0).
sumlist([Head|Tails], Sum) :- sumlist(Tails, Next_sum),
          Sum = Head + Next_sum.

rsumlist([],0).
rsumlist([Head|Tails], Sum) :- rsumlist(Tails, Next_sum),
           Sum = Head + Next_sum.

/* This counts the number of times '3' was an answer in the
    DEPRESSION and in the ANTI-SOCIAL sections */
count_3s([],0).
count_3s([Head|Tails], Count) :- count_3s(Tails, Next_sum),
  Temp = Head div 3, Count = Temp + Next_sum.

/* This reverses answers on the positive attitude questions
    in DEPRESSION so that they can be matched with the
    negative questions */
recalc_positives([]).
recalc_positives([Head|Tails]) :-
  ans(depression,Head,_,_,Ans), New_ans = 3 - Ans,
  retract(ans(depression,Head,P,R,_)),
  assertz(ans(depression,Head,P,R,New_ans)),
  recalc_positives(Tails).

recalc_weight :- ans(depression, weight,_,_,Weight),
  New_weight = abs(Weight) / 3,
  retract(ans(depression, weight,P,R,_)),!,
  assertz(ans(depression, weight,P,R,New_weight)).

get_data(Section) :- findall(Question,
  ans(Section,Question,_,_,_), Qlist),
  do_prompts(Qlist, Section).

do_prompts([], _).
do_prompts([Head|Tail], Part) :- write_prompt(Part,Head),
  do_prompts(Tail, Part).

write_prompt(Sect,Key) :-
  ans(Sect,Key,Prompt,Key_response,_),
  prompt(Key_response, Response_values),
  write(Prompt,Response_values),
  get_response(Key_response, ANS),
  retract(ans(Sect,Key,Prompt,Key_response,_)),!,
  assertz(ans(Sect,Key,Prompt,Key_response,ANS)).

write_prompt(Sect,Key) :- error_window, beep,
  write("\n You entered an invalid response for this
    question."),
  write("\n Please try again."),
  write("\n\n           (Strike any key to continue)."),
  readchar(_), removewindow, clearwindow,
  write_prompt(Sect,Key).
```

```
get_response(yesno,Ans) :- readln(Ans_string),
  frontchar(Ans_string, Ans_ch, _),
  convert_ans(Ans_ch, Ans).

get_response(often_week, Ans) :- readint(Ans),
  Ans >= 0,  Ans <= 3.

get_response(times_week, Ans) :- readint(Ans),
  Ans >= 0,  Ans <= 3.

get_response(when_years, Ans) :- readint(Ans),
  Ans >= 0,  Ans <= 4.

get_response(blank, Ans) :- readint(Ans).

convert_ans('Y',1).
convert_ans('y',1).
convert_ans('N',0).
convert_ans('n',0).

action_window :- makewindow(1,112,7, "RECOMMENDED
    DECISION",17,5,8,70).

error_window :-  makewindow(1,112,7, "ERROR
    DETECTED",17,5,8,70),beep.

continue_prompt(Sect,Risk) :-
   assertz( risk_values(Sect,Risk)),
   write("\tThis factor is being assigned a value
     of ",Risk,".\n"),
   write("\n\t\t (Strike any key to continue)"),
   readchar(_), clearwindow.

  null_window :- makewindow(1,0,0,"",0,0,25,80).

/*  run :- initialize, process_ideation,!, do_male, !,
    family_and_peers, !, process_depression, !,
    process_rebel, !, process_self_harm, !, final_analysis.
*/
run.
```

LIFENET PROTOTYPE - INITIAL PROLOG DATABASE

```
clauses

ans(gender,male, "\n Is the client male or female ?\n\t\t1:
    FEMALE\n\t\t2:   MALE\n\t\tRESPONSE : ",blank,0).

ans(depression, bothered, "\n How often in the last week
   have you been  bothered by things which\n do not usually
   bother you ?",often_week, 0).
ans(depression, lonely, "\n How often in the last week have
    you felt more lonely than usual ?",often_week,0).
ans(depression, fearful, "\n How often in the last week have
    you felt more fearful than usual ?",often_week, 0).
ans(depression, hopeful, "\n How often in the last week have
    you felt more hopeful than usual ?",often_week, 0).
ans(depression, restless, "\n How often in the last week
    have you been more restless in sleeping \n than usual
    ?",often_week, 0).
ans(depression, appetite, "\n How often in the last week has
    your appetite been poorer or greater \n than usual?",
    often_week, 0).
ans(depression, concentration, "\n How often in the last
    week have you had trouble keeping your mind\n on what
    you are doing ?",often_week, 0).
ans(depression, enjoyed, "\n How often in the last week have
    you enjoyed yourself ?",often_week, 0).
ans(depression, failure, "\n How often in the last week have
    you felt your life has been a failure ?",often_week, 0).
ans(depression, drive, "\n How often in the last week have
    you felt that you could not \'get going\' ?",often_week,
    0).
ans(depression, happy, "\n How often in the last week have
    you felt happy?",often_week, 0).
ans(depression, weight, "\n How much weight have you gained
    or lost in the last week ?  \n\tRESPONSE (enter + or -
    pounds) :",blank, 0).

 ans(family_peer,attempts, "\n Have any of your parents,
   brothers, sisters, grandparents, aunts,\n uncles,
   relatives or close friends killed themselves or tried
   to\n kill themselves ?",yesno, 0).
ans(family,attempts,"\n How many of your extended family
   (including aunts, uncles,\n cousins, and grandparents)
    have tried to kill themselves ? \n\t\tRESPONSE :
   ",blank,0).
ans(family,when,"\n When was the most recent suicide attempt
   by a family member ?",when_years,0).
ans(family,actual,"\n How many have died by suicide ?
   \n\t\tRESPONSE :  ",blank,0).

ans(peers,attempts,"\n How many of your peers have tried to
   kill themselves   ? \n\t\tRESPONSE : ",blank,0).
ans(peers,close_friends,"\n How many of these were close
   friends of yours ?   \n\t\tRESPONSE : ",blank,0).
```

```
ans(peers,when,"\n When was the most recent suicide attempt
   by a peer?",when_years,0).
ans(peers,actual,"\n How many close friends have died by
   suicide ?   \n\t\tRESPONSE : ",blank,0).

ans(ideation,thought,"\n Have you thought about hurting
   yourself or killing\n yourself in the past week?\n\t\t0:
   No, not at all\n\t\t1: Once\n\t\t2: Two or three
   times\n\t\t3: every day\n\t\t4: Could not think of
   anything else\n\t\tRESPONSE : ",blank,0).
ans(ideation,plans,"\n In the last week have you made any
   plans to hurt or kill yourself?\n\t\t0: Not at
   all\n\t\t1: Started making plans\n\t\t2:
   Finished plans\n\t\t3: Tried to hurt or kill
   myself\n\t\tRESPONSE: ",blank,0).
ans(ideation,desire,"\n Do you want to die now?\n\t\t0: No,
   not at all\n\t\t1: Maybe\n\t\t2: Yes\n\t\tRESPONSE:
",blank,0).

ans(thought_self_harm,contemplate,"\n Have you ever
   seriously thought about   hurting yourself?",yesno,0).
ans(thought_self_harm,when,"\n When was the last time you
   thought about hurting yourself?\n\t1: Less than a week
   ago\n\t2: 1 week - 1 month\n\t3: 1 - 6 months\n\t4: 6
   months to a year\n\t5: 1 - 3 years\n\t6: More that 3
   years ago\n\tRESPONSE: ",blank,0).

ans(unclass,pregnancy,"\n During these 3 days were you
   pregnant?",yesno,0).

ans(mood,angry,"\n How often in the last week have you been
  angry?",times_week,0).
ans(mood,anger_intensity,"\n In the last week what was the
   most anger that  you felt\n (on a scale of
   1-7)?\n\tRESPONSE: ",blank,1).
ans(mood,sadness,"\n How often in the last week have you
   felt sad or depressed?",times_week,0).
ans(mood,sadness_intensity,"\n What was the most depressed
   you felt in the last week\n (on a scale of 1 - 7)?
   \n\tRESPONSE:",blank,1).

ans(history_self_harm,actual,"\n Have you ever deliberately
   hurt or attempted to kill yourself?",yesno,0).
ans(self_harm,count,"\n How many times have  you tried to
   hurt yourself?\n\tRESPONSE: ",blank,0).
ans(self_harm,method,"\n How did you try to kill yourself
   the last time you tried?\n\t1: taking pills or
   chemicals\n\t2: hanging\n\t3: gun\n\t4:jumping\n\t5:
   cutting wrists\n\t6: other reckless behavior\n\tRESPONSE:
   ",blank,0).
ans(self_harm,argument,"\n Did you have an argument within
   the 3 days of your attempt to\n kill yourself?",yesno,0).
ans(self_harm,wish,"\n Did someone tell you within this same
   3 days that  they wished that\n you were dead?",yesno,0).
```

```
ans(self_harm,home,"\n Within these same 3 days did you
   suffer a personal humiliation?",yesno,0).
ans(self_harm,school,"\n Within these same 3 days did you
   have trouble at school?",yesno,0).
ans(self_harm,police,"\n Within these same 3 days did you
   have trouble with the police?",yesno,0).
ans(self_harm,assaulted,"\n Within these 3 days were you
  assaulted?",yesno,0).
ans(self_harm,disappointed,"\n Within these same 3 days did
   you suffer a disappointment?",yesno,0).
ans(self_harm,sexual_abuse,"\n Within these 3 days were you
   sexually abused?",yesno,0).
ans(self_harm,hospitalized,"\n Have you ever been
   hospitalized for trying to kill yourself?",yesno,0).
ans(self_harm,substance_use,"\n Did you use drugs or alcohol
   within 2 days of trying to kill yourself?",yesno,0).
ans(self_harm,counseling,"\n Have you *EVER* received
   counseling or therapy for trying to kill yourself?",
   yesno,0).
ans(self_harm,alone,"\n Thinking of your most serious
   attempt, the one for which you came\n the closest to
   dying, were you alone at the moment?",yesno,0).

ans(rebel,arrested,"\n How often have you been
   arrested?\n\tRESPONSE: ",blank,0).
ans(rebel,dropped,"\n How often have you dropped out of
  school?\n\tRESPONSE: ",blank,0).
ans(rebel,kicked,"\n How often have you been kicked out of
  school?\n\tRESPONSE: ",blank,0).
ans(rebel,missed,"\n How many days a week in the last two
   months have you missed school?",times_week,0).
ans(rebel,gang,"\n How many days a week in the last two
   months have you joined\n gang members to cause
   trouble?",times_week,0).
ans(rebel,alcohol,"\n How many days a week in the last two
   months have you consumed alcohol?",times_week,0).
ans(rebel,drugs,"\n How many days a week in the last two
   months have you used drugs?",times_week,0).
ans(rebel,home,"\n How many days a week in the last two
   months or 2 months prior to\n running away have you been
   in trouble at home?",times_week,0).
ans(rebel,lied,"\nHow many days a week in the last 2 months
   have you lied?",times_week,0).
ans(rebel,stole,"\n How many days a week in the last 2
   months have you stolen anything?",times_week,0).
ans(rebel,fires,"\n How many days a week in the last 2
   months have you set fires?",times_week,0).
ans(rebel,social,"\n How many days a week in the last 2
   months have you engaged in a\n social
   violation?",times_week,0).
```

```
prompt(often_week,"\n\t0: none, less than a day\n\t1: 1 to 2
   days per week\n\t2: 3 to 4 days per week\n\t3: 5 to 7
   days \n\tRESPONSE: ").
prompt(blank,"").
prompt(yesno,"\n\t\tYES\n\t\tNO\n\t\tRESPONSE :  ").
prompt(when_years,"\n\t\t0: NEVER\n\t\t1: during the last 3
   months\n\t\t2: from 3 months to a year ago\n\t\t3: from 1
   to 2 years ago\n\t\t4: more than 2 years ago
   \n\tRESPONSE: ").
prompt(times_week,"\n\t0: not once\n\t1: 1 - 2 times\n\t2: 3
   - 4 times\n\t3: 5 - 7 times\n\tRESPONSE: ").
```

## APPENDIX C - INFORMED CONSENT

Purpose of Study: I have been asked to be part of a training to help case workers learn how to interview youth who might be at risk for committing suicide. Part of this training will be a study which will help researchers understand how to improve the training.

Study Procedure: I will be asked to partake in a four-hour training on issues around teenage suicide, plus conduct interviews with two youths. The interviews will take about an hour, after which I will answer a brief survey on my attitudes about the training.

Risk and Benefits: The youth whom I will interview are volunteers who also know that this is a training exercise. If needed, they will be given counseling by one of the research team. The activities that I participate in during this study will provide me with skills and knowledge which will help me interview possibly suicidal teenagers.

Anonymity and Confidentiality: I understand that my name will not be required on any of the research materials. I will be assigned an identification number at random, which I will use on all research materials. The research records will be kept in locked files. I understand that the interviews I conduct with clients may be audio-taped. These tapes will only be listened to by the research team, and no one will be permitted to have access to them. These tapes will not have any information that will identify me on them. I understand that all information that I share during these activities will be kept confidential.

Research Standards and Rights of Participants: I have been told that I may choose to participate or I may refuse. I will not be penalized in any way if I choose to refuse. I may withdraw at any time.

If I have questions about my rights as a subject, I may call:

- Bill Ferns - Principal Researcher 212 725-3168
  Dept. of Statistics and Computer Information Systems
  Baruch College, City University of New York

- The Office of Sponsored Research 212 642-2059
  The Graduate School and University Center
  City University of New York

I have received a copy of this consent form.

Signed _____

Date _____

## APPENDIX D - TRAINING INFORMATION

Instructions: Inside the envelope you have been given, you will find this form, an INFORMED CONSENT form, and an Identification number. The identification number will be the only way we will identify your responses. We do not know who has which numbers, nor will we make any attempt to find out.

First, carefully read and fill out the INFORMED CONSENT form. DO NOT write your identification number on this form. We will collect these first.

Next, please fill out the rest of this form. Write only your identification number on this form--do not write your name on this form.

**Identification Number:** _____

1. **Gender (circle one):** Female Male

2. **Age:** _____

3. **Highest Level of Education (check one):**
   _____ Some High School
   _____ High School Diploma or GED
   _____ Some College
   _____ Bachelor's Degree
   - if checked, what was your major _____
   _____ Some Graduate School
   _____ Graduate Degree
   - if checked, what was your major _____

4. **How many years have you worked in social service?** _____

Please answer the following questions by circling an answer on a scale from 1 to 4.

| | None | A Little | Some | A Great Deal |
|---|---|---|---|---|
| 5. How much experience do you have with computers? | 1 | 2 | 3 | 4 |
| 6. How much clinical experience do you have with suicide? | 1 | 2 | 3 | 4 |
| 7. How much personal experience do you have with suicide? | 1 | 2 | 3 | 4 |

Thank You

## APPENDIX E - ASSESSMENT FORM

Please make sure you write your identification number: ____

What is the client's first name? _____

After interviewing the client, which action did the screening procedure recommend?

____ No Action
____ Referral to a support group
____ Administer the Imminent Danger Assessment or invoke agency suicide intervention procedures

After interviewing the client, which action would **YOU** recommend?

____ No Action
____ Referral to a support group
____ Administer the Imminent Danger Assessment or invoke agency suicide intervention procedures

How would you describe the client's problems if you were discussing the client with a doctor or a social worker?

_____

_____

_____

_____

_____

_____

Please add any further comments you wish below.

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## APPENDIX F - FOLLOW-UP SURVEY

Please make sure you write your identification number: _____

Please answer the following questions on a scale of 1 - 5

| | Not at All | A Little | Some | A Lot | A Great Deal |
|---|---|---|---|---|---|
| 1. How satisfied with the screening procedure you used? | 1 | 2 | 3 | 4 | 5 |
| 2. How self-confident were you in using the screening procedure? | 1 | 2 | 3 | 4 | 5 |
| 3. How much did you trust the screening procedure? | 1 | 2 | 3 | 4 | 5 |
| 4. How much did you like the screening procedure? | 1 | 2 | 3 | 4 | 5 |
| 5. How connected did you feel to the clients using the screening procedure? | 1 | 2 | 3 | 4 | 5 |

Please add any comments you wish below. Remember, your answers will remain confidential. Thank you.

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