

A MODEL OF INTERPERSONAL DYNAMICS
WITHIN THE COMMUNITY HEALTH TEAM

by

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ABSTRACT

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Submitted to the Alfred P. Sloan School of Management on May 11, 1973, in partial fulfillment of the requirements for the degree of Master of Science in Management.

A community health team is a group of people who provide both medical and social services to a community. The team is normally composed of people from many backgrounds: doctors, nurses, family health workers, and social workers. The goal of the team is to provide care to the entire family unit rather than simply individual patients.

The community health team's effectiveness is particularly sensitive to the relationships established by the team with the community; and equally important, the relationships between the members of the health team. Often these relationships are ignored, misunderstood, or ill-defined. This thesis provides a formal systematic framework to define, visualize, and study the operation of the health team. The model which is proposed includes four major types of influences: the relationship of individual classes of members of the health team, i.e. doctor, nurse, or family health worker, with the community; the relationship between the one class of members of the health team with members of other classes; the relationship of the health center as an entity with the community as an entity; the relationship of the provision of service with economic constraints. These four interrelationships are described in detail in the thesis.

A computer simulation model has been developed to test the logical consistency of the model and to demonstrate the dynamic nature of the interactions associated with health care. While the model still needs to be refined, the results are encouraging. A number of runs were made to determine if the model could demonstrate plausible behavior; the model appears capable of emulating patterns of operation of empirically observed community health centers.

The general framework which is described in this thesis appears to be a useful tool for developing a more precise set of definitions for the community health care problem, and can help provide better communication between the organizational psychologist, the medical personnel in the field, and the administrators responsible for the operating policy of community health centers. With refined definitions, the model should demonstrate the results of different policy decisions for a particular health center.

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CHAPTER I

INTRODUCTION

The concept of community health care has received much attention in the past few years. However, this attention has often been focused on a single aspect of the community health care problem.¹ Very little has been done to integrate these various aspects into a cohesive whole. Consequently, the results of empirical studies often appear contradictory. While the theories which are proposed are probably correct, they must be qualified by other conditions which are often outside the range of the particular study.

This thesis describes a model of a community health team which includes both the provision of health care and the behavioral aspects of internal team operation and the relationship of the members of the team and the community. The goal of this work was to integrate the relationships between the team members, the community as an aggregate body, and the community as individual patients. Further, the model also includes the interrelationships such as the operation of the team, the demand for service, financial pressure from the operation of the center, and the administrative control process.

The model was developed over a period of 5 months. The basic

¹One exception to the more restricted approaches to the health care problem is "System Simulation of Program-Patient Interaction: An Application of Systems Dynamics to 'Treatment Drop-Out' in a Community Mental Health Center", Deborah S. Kligler, Ph.D., et al, Proceedings of the Summer Simulation Conference, Boston, Mass., June, 1971. The paper includes aspects of assessment of need for treatment, resources available to the center, and perceptions of need for treatment by the patient.

information used to construct the model came from personal interviews with members of the staff of community health centers, and the staff of the Sloan School of Management, Massachusetts Institute of Technology. While the values of the model parameters have not been refined, the results of the model runs are encouraging. The model has demonstrated behavior which is at least plausible. Further, refinements of the model parameters should lead to a more realistic behavior.

A number of model runs were made which indicated that goal orientation of the entire health team is a critical factor in the relationship of the health team to the community. Individual changes such as increasing the nurse's responsibility were not particularly effective when the health team had only moderate goal orientation towards the community. An interesting result is that increasing the doctor's ability to communicate is one of the most effective single changes tried. The change not only increased the community acceptance of the health team but also increased the quality of medical care given to the community.

Why a Computer Model of a Health Team?

A computer model of a community health team and its relationship with the community appears to be the only way of handling the complex relations inherent in such a setting. The health center is in fact a very complex set of personal relationships as well as a vehicle for dispersing medical treatment. The members of the community interact as individuals with the individual doctors, nurses, and family health workers who provide the health services. The community acts as an aggregate through

the community boards and action groups. The aggregate community goals and desires are not necessarily the same as an individual's, and the community board and action groups influence the health center and the team through interaction with the health center administration. The administrator in his role as representative of the health center does not interact with the community in the same manner that an individual doctor and patient would. Further, internal to the health team there are interpersonal and professional relationships between doctor, nurse, family health worker, and administrator. The following illustration shows the interrelations between the individuals in this conception of the health team environment.

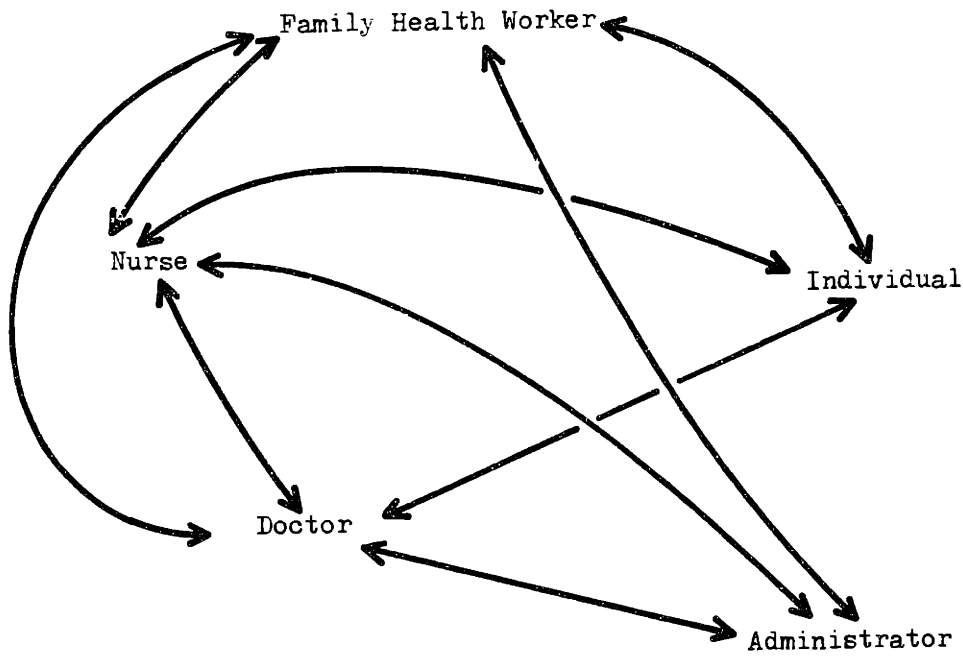
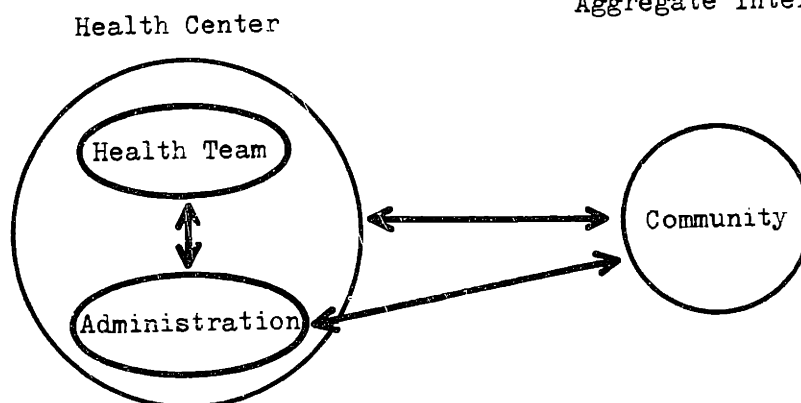


Figure 1 Individual Interrelationships

The aggregate interactions in the health team environment are displayed in the following illustration.

Figure 2

Aggregate Interrelationships



An accurate representation of the health team and its environment is the sum of these two sets of interrelations. A mental model which included the details of all the interrelationships would be unmanageable while a model which does not include all the relationships would be incomplete. The computer provides a mechanical means of keeping track of the relationships and permits the use of a much more complete model.

The use of a computer model allows this paper to explore the integration of reported studies on health teams. The previous work which is available in this field too often looks at only a narrow portion of the problem. Any extension of the concepts, the suggested approaches to delivering health care, or methods of developing better teams must be based on *ceteris paribus* assumptions. Unfortunately in practice, all things are rarely equal.

Often, two similar studies will show contradictory results. Why the results are different is often unclear. It is hoped that a more complex

and dynamic model which interrelates many of the individual studies will lead to an indication of why in one circumstance the results were effective and in another they were detrimental. It is then difficult to make comparisons between the different studies. Until now, no framework exists to integrate the results of the contradicting studies. This paper attempts to present a model framework in which this integration can be accomplished.

A simple illustration may help to highlight both the method of integration and the problems inherent in looking at only one aspect of a very complex environment. Let us look at two approaches of arriving at a more satisfied community. Both of these approaches will use what I define as a "simple linear solution". Let us use a diagrammatical presentation for expediency.

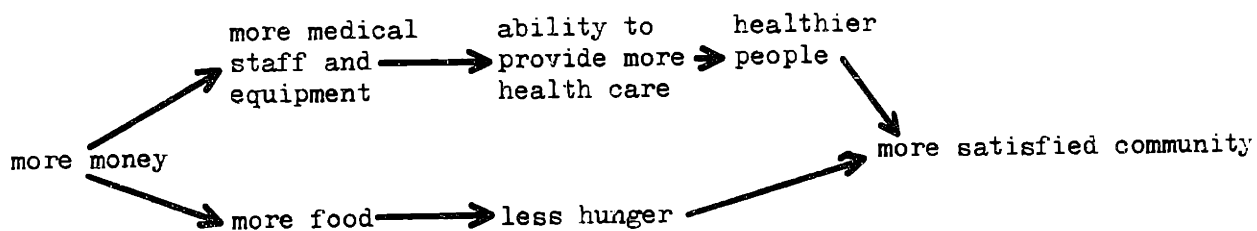
more money → more medical → ability to → healthier → a more satisfied
 staff and provide more people community
 equipment health care

Now let us look at a second method of arriving at a more satisfied community which may be especially pertinent to the ghetto community where poverty is prevalent.

more money → more food → less hunger → more satisfied community

While these examples are trivial, they have an essential ring of

truth and in effect have been proposed in a much more sophisticated manner by a number of people as the solution to provide a more satisfied community and to limit community unrest. This example is in many ways similar to the frequent one-to-one relationships found in the studies of complex problems. As an example, the introduction of family health workers as members of the health team have promoted the overall effectiveness of the community health team.² On the other hand, the introduction of family health workers in other community health centers has not always met with the community's acceptance.³ The resulting pressures and frustrations of both the family health workers and the other members of the health team have actually lowered the overall productiveness of the center. In many ways the suggestion to use the family health worker is parallel to the previous examples - add more family health workers and the dispensing of services should improve. One of the most important questions which must be answered is: why does this occur in one case and not in the other. If we return to the simple model and combine the two simple linear solutions:



²Ann Kieth, Assistant Medical Director - Brookside Park Family Life Health Center, private interview held at the Center, Jamaica Plain, Mass., January, 1973.

³Dr. Solomon Fleishman, (former Medical Director, Columbia Point Community Health Center, Dorchester, Mass.), private interview held at Harvard Community Health Plan, Boston, Mass., January, 1973.

The combination of the two solutions is possible since the inputs to the two solutions are identical and the goal is also identical. If we further recognize that the total supply of money is constrained, it becomes apparent that the problem is not only one of increase but also of allocation. The value of any increase in one leg of our new model depends on the balance of the previous state of allocation. The illustration also indicates one way to integrate the knowledge of practitioners in the field and the results of current studies. Rather than contradictory results, we have a compatible result which is now situationally dependent.

How Was the Model Developed?

The goal of the model is to integrate the current knowledge of community health teams. The information used in the development of this model was supplied by a number of different groups from various fields. The Organizational Studies Group of the Sloan School of Management has been working in the area of health team development, while the System Dynamics Group has been modeling various problem areas in health and health delivery systems. Both of these groups provided reports and useful insights into the interactions which occur in health teams and the problems occurring in community health centers. Members of functioning health teams were a major source of information. The Acknowledgement page lists the health centers in the city of Boston and the center staff members who provided the necessary information for the development of this model.

Since there were no previous formal models which related the interpersonal relationships with the working of a health center, I felt it was necessary to first develop a more generalized model, rather than model a specific health center. While a generalized model can't be immediately applied, it nevertheless avoids the possibility of ignoring factors which occur in different community health centers. By talking to members of different health centers it was possible to find alternative pressures and responses which might not be evident in one center alone.

The Current State of the Model

The model which this thesis presents is still in a crude form; however, it does provide a basic framework on which to develop a more accurate and useful model. This work then can be classified as a basically theoretical or more abstract effort which attempts to find a framework for attacking the problems associated with the relationships within a health team. The model runs that are included in this paper are for the purpose of demonstrating the type of output which will be available and the general characteristics of the model in its present form.

While a good deal of effort has been spent in making the internal relationship plausible, some relationships are still incomplete and will require further investigation by people who are intimately involved in the operation of the health team - the doctors, nurses, family health workers, and administrators. For this reason, only a limited effort was made to balance finely the parameters and values of the coefficients

of this model to produce totally realistic output. While an attempt was made to determine realistic values for the model, a great deal more effort will be required for the development of a model which truly reflects the operation of an individual health team.

The reasons behind the present state of the model are important and reflect the problems which will be encountered in any further work in the area. The first difficulty is the subjective nature of the problem. The model deals with interpersonal relations, with the perceptions of various team members, and with individual responses to perceptions and pressures. Series of situations and the resultant reactions have to be translated into general rules. Not only does the translation from situation to response have to be correct, but there is the everpresent danger that alternative pressures or reactions have been neglected. In interviewing, something may be missed in the formulation of the questions, in the responses given, or in the misinterpretation of the question or the responses. For the model to be useful it must not be so complex that it can't be understood. The development of descriptive rules is therefore more difficult. The model must be complex enough to be realistic, yet simple enough to be comprehensible.

Since the model is subjective it is prey to two other problems: faulty or nebulous definitions and self-deception. Having been involved in work on a theoretical model of human change and behavior originally developed by Professor D. Kolb^{4,5}, it became apparent that the more

⁴David A. Kolb, "A Cybernetic Model of Human Change and Growth", A Working Paper of the Sloan School of Management, Massachusetts Institute

people involved in the development of a subjective model, the more accurate and precise the definitions become. This is a result of the fact that each person has his own interpretation of the definitions in the model and these definitions have to be reconciled and refined as model development continues. Even with tighter definitions, the subjective nature of the problem allows one to become trapped by a conceptual argument which may not be correct. The only way to avoid this pitfall is to have a number of different people provide input for the model at different stages of model development. This prevents blindspots by challenges of conceptualization and highlighting of neglected areas. Changes in the model, which produce more plausible output without extensive justification for the change, defeat the purpose of the model. During the formulation of the model, the output provides the check on the consistency and logic of the model. The computer later acts as an impartial judge which indicates when inconsistency or logic errors exist.

of Technology, Cambridge, Mass., WP 526-71, 1971.

⁵The model used by Professor Kolb and the model developed in this thesis are the outgrowth of a general modeling approach developed by Professor Jay W. Forrester in Principles of Systems (Cambridge, Mass.: Wright - Allen Press, 1968). The programming was done in a simulation language, DYNAMO II; the description of the DYNAMO language is contained in the DYNAMO II User's Manual (Cambridge, Mass.: The M.I.T. Press, 1970).

CHAPTER II

CRITICAL ASSUMPTIONS AND DEFINITIONS WITHIN THE MODEL

In this chapter a number of assumptions and definitions which play an important role in the development of the model are discussed. First and basic to the model is the definition of goal orientation and the differences in goal orientation between various members of the health team. Second is the definition of a synergistic goal orientation or the team goal orientation. Third, I discuss how the limits and changes in goal orientation, recognition levels, and desires are quantified. These topics are recurrent in the model and basic to the development of the entire framework. But before going any further the social worker must be mentioned.

The Inclusion of the Social Worker in the Health Team Model

While the social worker is a key element in the operation of the community health team, it appears possible to include the social worker implicitly in the model rather than explicitly. This is possible since the social worker's duties and responsibilities have elements of the duties and responsibilities found in the other members of the health team. The work performed by the professional social worker ranges from diagnosis and treatment of problems, counseling, providing supporting information to the rest of the health team, and being aware of community problems. While social workers do not have the status of the doctor, they have unique talents and training which make them experts in their field. And at varying times the social worker's status in the health team due to

the nature of the duties carried out is like that of the nurse, or the doctor, or the family health worker. There are elements of each of the other three members of the health team within the social worker and the social worker should react to some pressures to which each of the other team members are responsive. Figure 1 shows the interrelation paths between the members of the health team when the social worker is included.

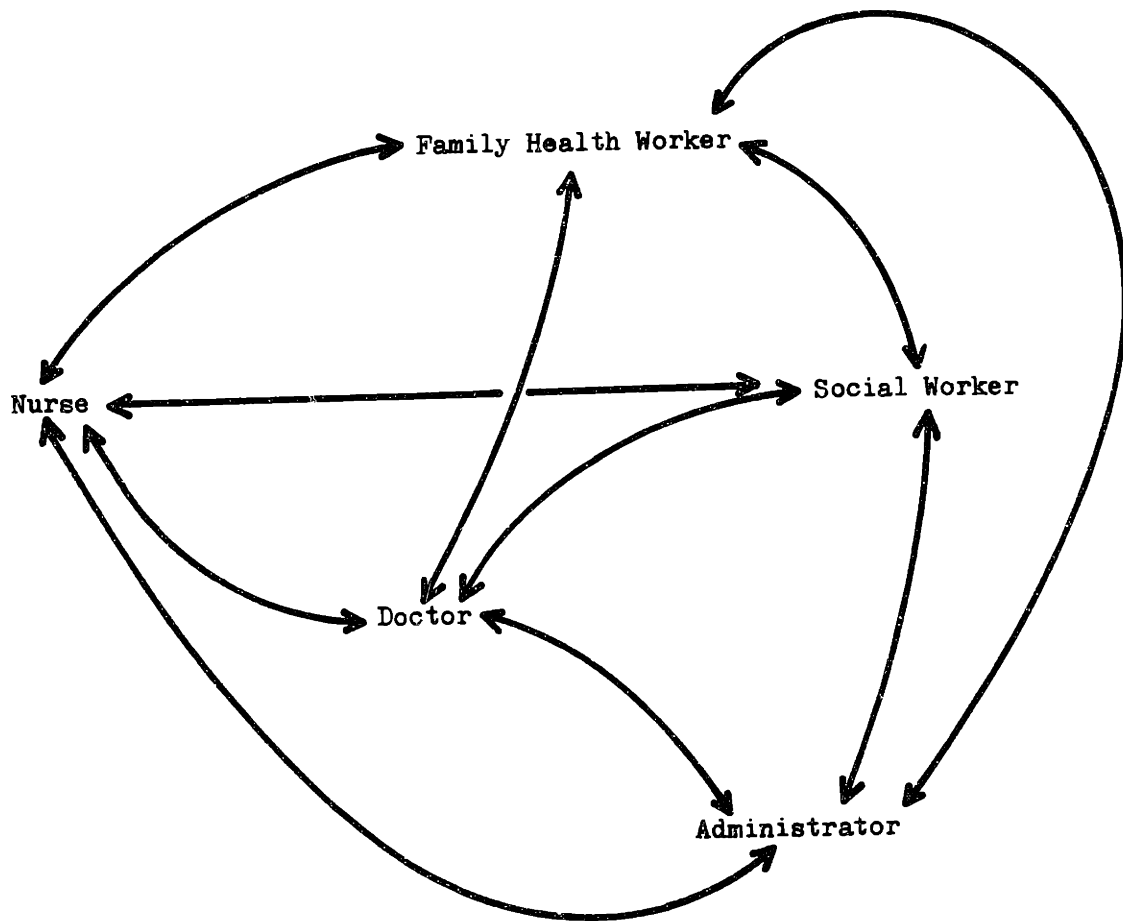
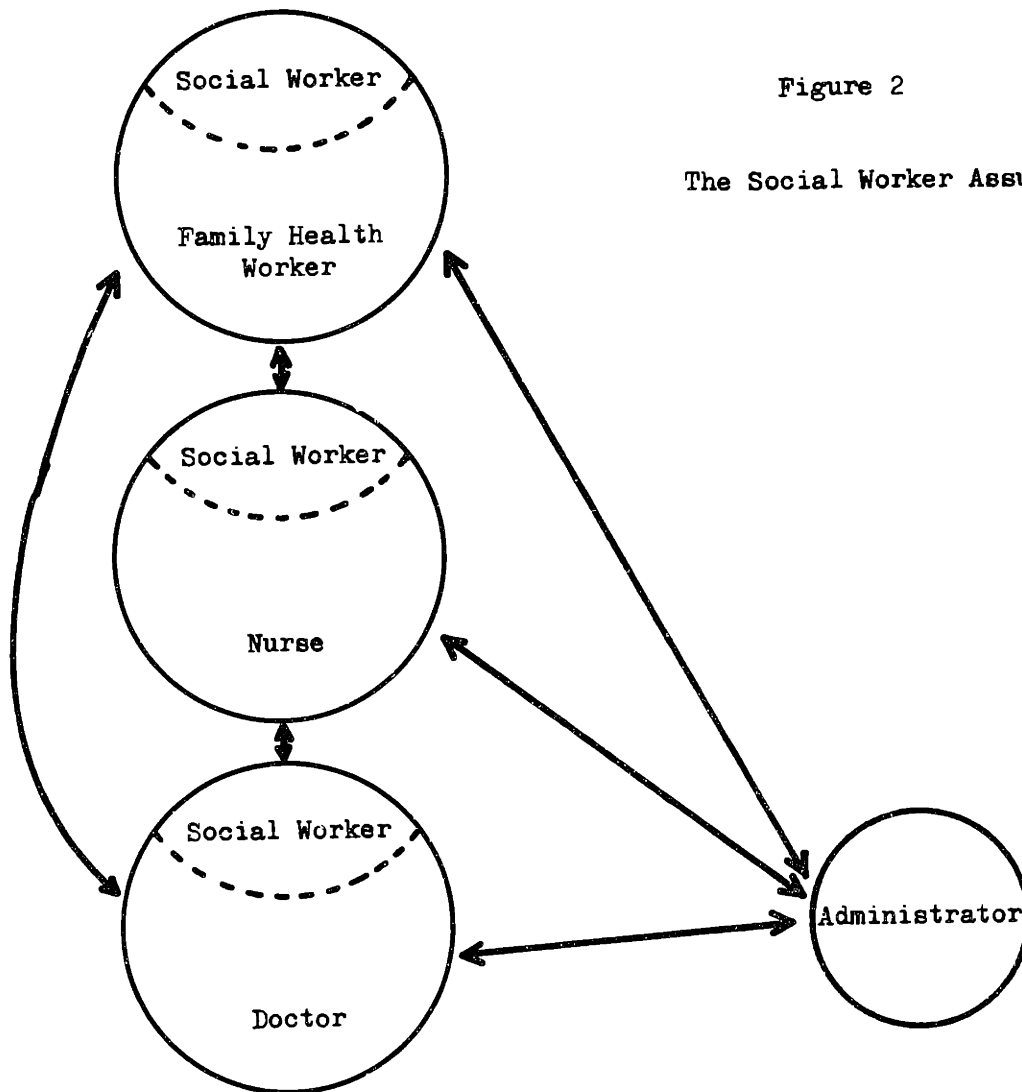


Figure 1

Interrelations in the Health Team

The following illustration shows the assumption made in this model.



The integration deletes the possibility of separate conflicts between the social worker and the rest of the health team in the model if the orientation of the goals of the social worker are very different from those of the rest of the team. If the goals are very different for the

social worker, the integration will not be justified and a separate segment will have to be included in the model.

Goal Orientation

Inherent within a model of interpersonal relationships is the question of goals. Within a model of this type there are goals for each of the groups - doctors, nurses, family health workers, and the goals of the community itself. Rather than modeling a myriad of goals (goal of self-improvement, a goal of being accepted by one's peers, etc.) for each of the above classes, the decision was made to develop an aggregate goal for each class. It was necessary then to develop a definition of goal orientation and also develop a scale which could be used to measure the degree to which a member of a class accepted the defined goal. Since some individually held goals are irrelevant only in that they detract from or lower the goal of health care, it seemed appropriate to define goal orientation only in terms of what affected health care. The existence of competing goals irrespective of their nature would only lower the aggregate goal orientation towards health care.

Goal Orientation of the Doctor, Nurse, and Family Health Worker

The basic definition of goal orientation for these three classes is: the degree to which the person is willing to promote the health care of the community. However, we are still left with a definitional problem of what is health care. In this case the definition of "health care" is being used in probably its most liberal sense. Health care is defined

as the provision of services which promote the mental and physical well-being of the patient, family, and community which the health team serves, i.e. medical treatment for illness, preventative medicine, social work, and mental hygiene. The goal is to provide care not only as the individual's professional ethics dictate but also in consideration of the community's perceived needs.

Since the concept of goal orientation is subjective and difficult to quantify, a scale of zero to one was chosen. Zero signifies absolute lack of orientation towards health care while one is the ideal level of altruism. This is really no different than the commonly seen questionnaires which ask for choices between none-almost never-occasionally-fairly often-very frequently. The only difference is that rather than five choices, there is a continuous scale which runs from zero to one.

Goal Orientation of the Community

In the case of the community, goal orientation is defined as its level of acceptance of services which might lead to the increase in its well-being. As with the health team members, a number of competing goals are handled in the same manner. The scale is also zero to one. The zero level indicates that the community is not particularly interested in health care and definitely has no interest in the health team. When the level is one the community has interest in and accepts all methods which will contribute to their well-being.

Team Orientation

Team orientation is defined similarly to the class goal orientation such as the doctor's goal orientation. However, team orientation is or can be synergistic. Since it is a rather complex psychological phenomena and the actual effects of groups is open to debate, the value has been chosen as a simple average of the values of goal orientation of the doctor, nurse, and family health worker. Alternative team orientation functions which should be considered are a weighted average with the doctor's goal orientation given heavier weighting and more complex functions which might more closely relate to current group dynamics theories. This is one of the areas of the model construction which deserves more study and comment.

Limits and Changes in Goal Orientation, Levels of Recognition, and Desires

The phenomena of goal orientation, recognition of value and ability, as well as the level of desire have an element of commonality in the way these levels change as they approach their maximum or minimum levels. Each of these phenomena are influenced by a factor which I call commitment. To arrive at the maximum or "1" level requires "effort" by the individual. The same is true of the minimum or zero level. In the case of the "1" level, any competing goals will have to be lowered sufficiently that they will not detract. At the same time once an individual has reached a near absolute state in terms of goals or desires, he normally requires a great deal of effort or influence to increase or decrease his level. To illustrate better the implications and method by which

commitment affects these phenomena, consider goal orientation as a reservoir and a rate of flow into and out of the reservoir. The rate of flow corresponds to the rate of change in goal orientation. This rate is influenced by a number of factors. With commitment the rate depends not only on the other factors but also on the existing level of goal orientation. The effect of commitment is graphed in Figure 3.

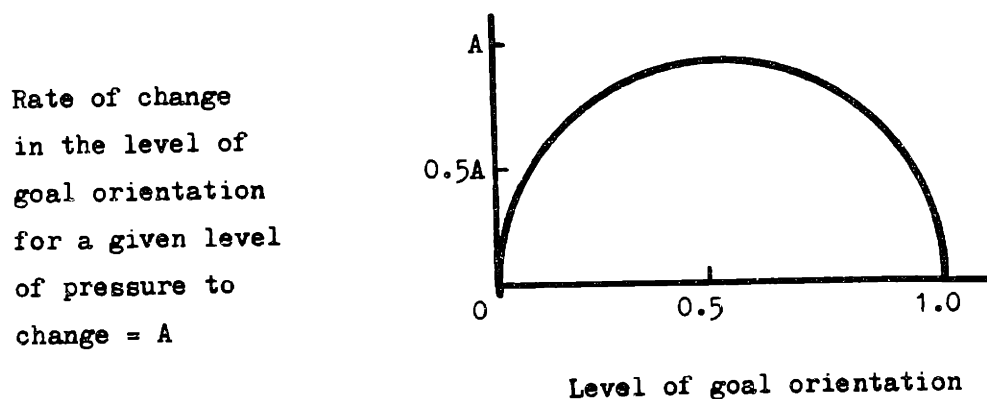


Figure 3 Effect of Commitment

What this implies is that as goal orientation reaches either limit ("0" or "1") a greater pressure to change will be required to have the same rate of change as when goal orientation is near the middle of the range, i.e. 0.5. The use of this construction seems reasonable since someone who is only partially committed would seem to be more flexible than someone who was wholly committed to a goal. This construction is used frequently throughout the model.

The Chapters Which Follow

The foregoing section has described the more common elements and some of the major assumptions in the model. The next chapters deal with a detailed description of the model segments and their interrelationships.

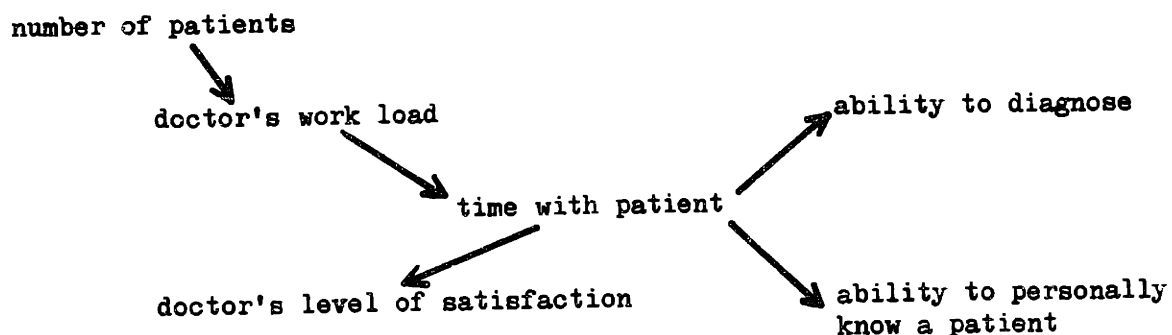
CHAPTER III

THE DOCTOR

In this section of the model I treat the interaction of the doctor with the community as well as bring in the effects of information flow from the nurse and the family health worker. The perceptions of the community and the doctor play an important role in the dynamics of this model segment. The psychological aspects of the act of being treated are often as important or sometimes more important than the actual physical portion of the treatment of the patient. In many cases the patient will not be able to perceive improvement until after a considerable delay. Under these circumstances the perception of treatment is solely dependent on the patient's expectation of benefit and his faith in the doctor. Only after a much longer period will he be able to physically recognize the effects of treatment. The doctor at the same time can measure his effectiveness in two ways. The first is the success rate of treatment and the second is his perception of the patient's satisfaction with the course of the treatment and its outcome.

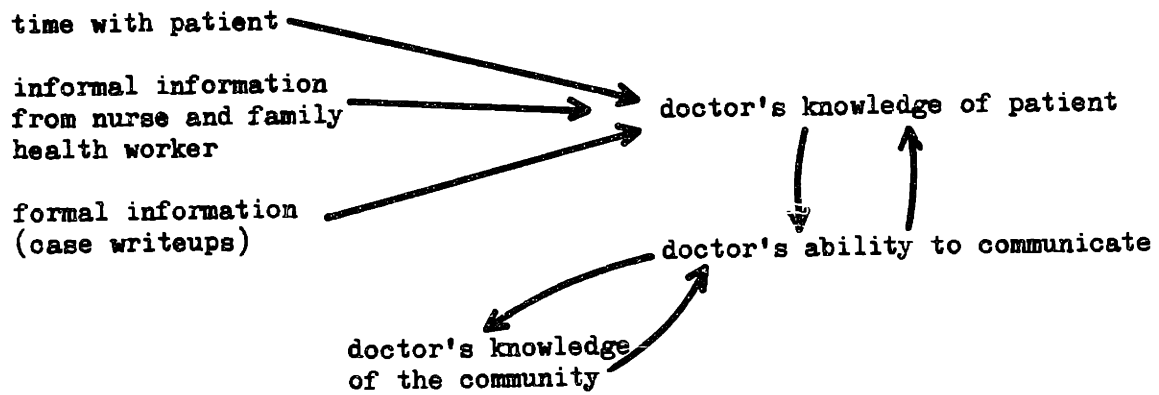
An important assumption in this section of the model is that the doctor comes to the center with a full complement of medical knowledge and skill. Further, during the time frame of the model the skill level of the doctor remains constant. Any improvement in performance comes through knowledge of the patient, both personal and case history, and knowledge of the community, i.e. what are common problems both in terms of disease and social factors?

The Effects of Work Load on the Doctor



One of the basic inputs to the doctor-community loop is the level of work load of the doctor. This effectively can be translated into a measure of the amount of time that a doctor can spend with a patient (TWPAT). The time with the patient affects a number of other variables within the doctor-treatment loop. As the doctor's work load begins to increase, given an increase in the number of patients and a fixed amount of time available to the doctor to perform his necessary functions, the amount of time with the individual patient must decrease. Once the amount of time with the patient has decreased to a certain point, the doctor's ability to know the patient as an individual begins to lessen. If the amount of time with the patient decreases even further, his ability to diagnose which is a function of the amount of time he can spend with a patient gathering useful medical information also decreases, and effectively lowers the level of medical treatment the doctor can perform. In addition, there is a certain amount of time spent with the patient which the doctor would consider ideal and any deviation from this ideal amount of time will affect his personal satisfaction.

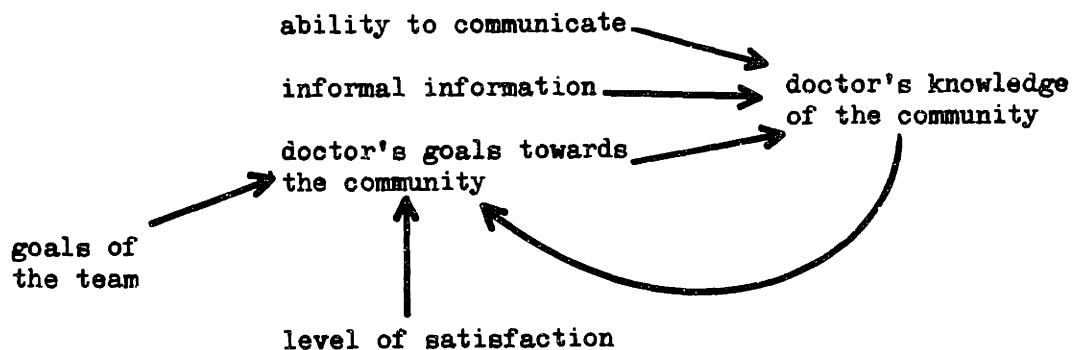
Factors Influencing Knowledge of the Patient



The doctor's knowledge of the patient (DKOP) is influenced by three initial factors. The first, as mentioned before, is the amount of time the doctor can spend with an individual patient. The other two are the informal information flows which are available through both the nurse and the family health worker and the formalized patient reporting system which the health team uses. The model separates the formal and informal information into two segments - (IINF) informal information and (FINF) the formal portion of the information that is characterized by the reporting system. The formal information system is characterized as a fixed level of information since most probably it will not change radically during the operation of the model and any changes over time can be accounted for exogenously. The formal information, however, is still insufficient to provide a total picture of the health or well-being of the patient. The amount of informal information which the doctor receives from the family health worker and the nurse is affected by a number of factors such as frustration felt by the individuals and their desire to communicate.

Even with a reasonable amount of time to spend with the patient, the doctor may find that communication is a problem. A middle class doctor beginning a practice in a ghetto community would find his initial ability to communicate quite low as opposed to a middle class doctor beginning a practice in a middle class neighborhood. The doctor's ability to communicate is basically a function of his knowledge of the community and his knowledge of the patient. If both of these factors are low, the ability to communicate should also be low. A low ability to communicate makes it more difficult to gain knowledge of the patient. If both the knowledge of the community and the patient are low, any increase in the ability to communicate would then have to come through the formal reporting system or more likely the informal information flow from the nurse and the family health worker.

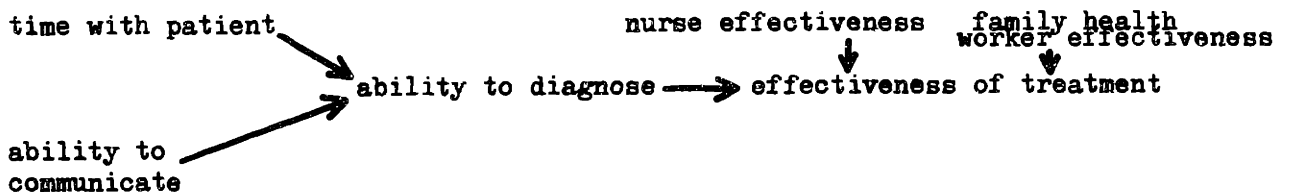
The Doctor's Knowledge of the Community



The doctor's knowledge of the community (DKOC) depends on his ability to communicate, the team information flow, and the doctor's level of goal orientation towards the community. If the doctor is highly oriented towards helping the community, his level of knowledge of the

community should increase more rapidly since he will make an effort to gain as much as possible from the informal information flow. As his knowledge of the community increases, his ability to communicate should increase allowing the doctor to learn directly from his patients. The loop I have described has a positive feedback nature, in that the initial level of the doctor's goals tend to drive his goal farther in the same direction. There are two factors outside this loop which tend to change the doctor's level of goal orientation. One is the average orientation of the goals in the team towards the community (TO) as was discussed earlier. The second which would tend to provide an influence for change of the doctor's goals is the satisfaction level which the doctor has in doing his work. If he tends to be satisfied, he will probably be interested in participating even more to increase his own satisfaction.

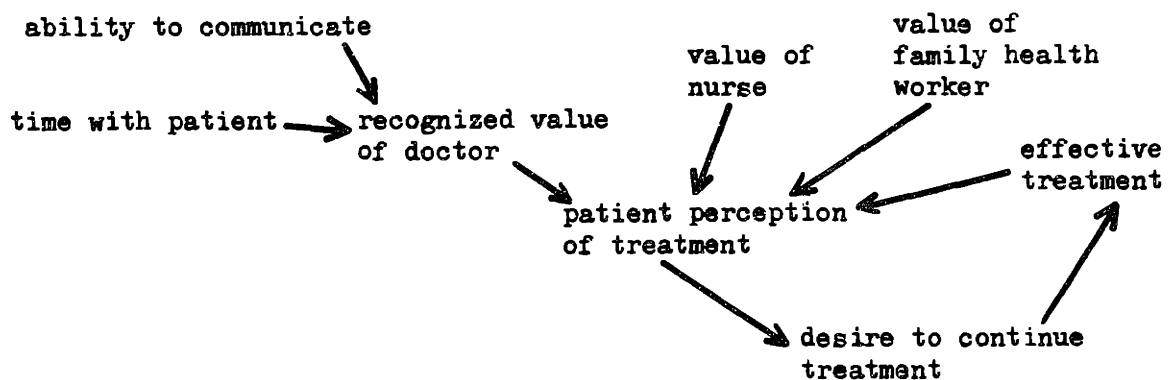
Diagnosis, Treatment, and the Patient



To a first order the medical aspects of the treatment depend on the time the doctor can spend with a patient; his ability to communicate with the patient leads to an increase in his ability to diagnose. While a doctor may be able to diagnose the bulk of the patient's problems with medical tests alone, this method will be time consuming. The ability to communicate seems to be a prerequisite for speeding up this process and

leads to a much better diagnostic ability. This diagnostic ability (DATD) will determine the effectiveness of a course of treatment. The better the diagnostic ability, the more effective the treatment. The nurse and the family health worker's efforts in health care also affect the outcome of the course of treatment. The family health worker and the nurse maintain an awareness of the patient's prognosis, try to maintain the patient's continuation of treatment, and handle social or family problems that might be associated with the treatment. If the level of these three factors (the DATD, the family health worker's effectiveness and the nurse's effectiveness) are high, the effective treatment should be operative at a high level. But, the patient may not be aware of the physical or medical changes which are occurring until some later time. The patient's misperception is due to a time delay between the beginning of the course of treatment and the changes in well-being which the patient can observe. This effect is portrayed in the model as the perception of treatment by the patient (POT). This perception is only of the medical aspects of treatment, the change of the physical course of the disease or the problem which the patient is facing. The doctor's personal relationship with the patient and the patient's expectations also affect the patient perception of treatment. This is developed through the value of the doctor (VD). The value of the doctor to the patient depends on the amount of time a doctor can spend with the patient, which shows concern, and the doctor's ability to communicate, which tends to alleviate fears. The patient requires time to develop a rapport and to evaluate the real value of the doctor. This is basically through a time delay since a

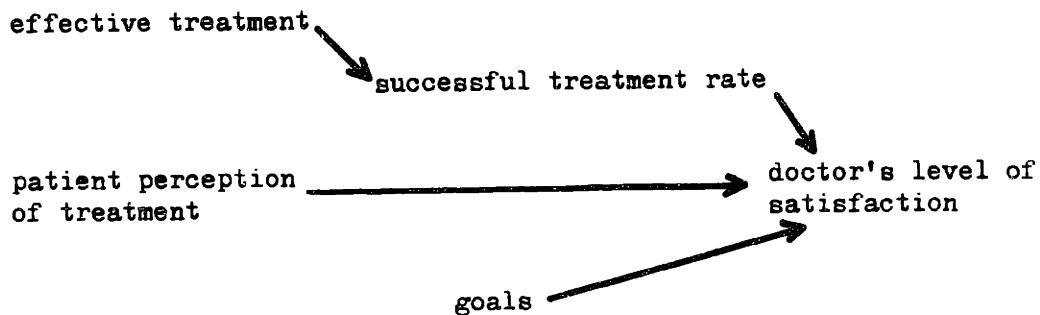
number of meetings with the doctor are required before the patient can estimate the value of the doctor. This then generates the recognized value of the doctor to the patient (RVD). Physical perception of the treatment and the recognized value of the doctor lead to what the patient actually perceives of the course of treatment (PPOT). This is also coupled with the recognized value of the family health worker and the value of the nurse.



Should the patient initially not have faith in the staff or in the benefits expected from treatment, his desire to continue treatment will be much lower. In this case it would lower the effect of the treatment that the health team is performing on him and after some delay once again lower the physical perception of treatment. The patient has made what amounts to a self-fulfilling prophecy: he didn't expect the treatment to do any good, didn't follow up the course of it and found out that especially after one visit he may have been no better off than he had been before he went to the health center! The treatment is only effective, even given top quality medical care, if the patient cooperates. If the effective treatment continues to be operative and the desire to continue

treatment is maintained, the successful treatment rate will be high unless there are any economic or social factors which might mitigate the quality of treatment.

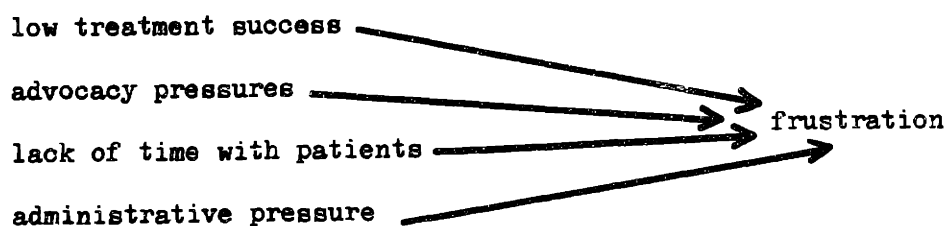
Factors Providing Satisfaction



The doctor can perceive the past treatment rate or the successful treatment rate (STR) over time through a delay in perception. This perception of the treatment rate will be used as one of the doctor's measures to evaluate himself. A second perception which affects the doctor is his perception of the patient's reaction to treatment (PPPOT). The doctor may or may not place great value on the patient's perception of treatment. If he is essentially looking at the practice of medicine as merely dispensing medical treatment and not considering the reaction of the patient, he will not weigh his perception of the patient's perception of treatment as highly as he would his perception of the successful treatment rate. The doctor gains satisfaction (DMSAT) through the perception of the patient's reaction to treatment, his perception of the successful treatment rate, and the amount of time he can spend with the patient. His perception of the reaction of the patient (PPOT) is

modified by the level of his goals towards the community. If they are high, he will place great value in the patient reaction to treatment. If his goals towards the community are low, he will place less value or emphasis on the patient reaction to treatment.

Frustration



Frustrations for the doctor can develop from a poor treatment rate, which indicates a lack of success in his medical techniques, and a poor patient perception of treatment, when his actual success of treatment rate is high if he is highly goal oriented towards the community. Frustrations also result from other interactions with the team. One is from high advocacy pressure which is discussed in the advocacy loop or the negative reaction of the staff (NRST). Frustrations can develop from too little time to spend with the patient, from pressures especially from the administration to control his method of treatment, and from the operation of his portion of the health team. Some of these pressures can occur when the health center is under strong financial pressure. The development of pressure due to administrative pressure is covered more fully in the financial-administrative section of this model.

CHAPTER IV

THE NURSE

The functions of a nurse in many community health teams have changed considerably over the formerly held conception of a nurse as merely an assistant to the doctor. The nurse-practitioner role is becoming increasingly more common. Rather than the nurse being simply an assistant, the practitioner role involves a greater degree of independent action and responsibility. The nurse over a period of time has taken over many of the more routine duties of the doctor. The medical treatments and medical tests which a nurse can perform are of course limited by the nurse's competence and by the legal and ethical boundaries, but over time these boundaries have changed. At one time the doctor made routine tests such as blood pressure: the testing of blood pressure was then delegated to the nurse, and now is frequently delegated to the medical aides. On the health team, the nurse performs many functions - schedules, assists, performs simple medical diagnosis or tests, counsels, and educates patients. The nurse can act to a degree both as a family health worker and a doctor. In the health team situation, she finds that there is a status pressure which tends to make additional medical duties appealing, yet a counter pressure due to the ethical and legal bounds often make independent action on her part result in a feeling of insecurity and frustration. Whether the independence is frustrating often depends on both the attitudes of the doctor and the community. Work by the Organizational Development Group at the Sloan School of Management has

indicated that in a health team setting, a nurse can feel that she is exceptionally suited to use her nurse's training in a family health worker mode of duties.¹ However, status pressures tend to force the nurse in the opposite direction. Further, the doctor tends to equate responsibility with additional independence or at least more duties in the medical area.² While in a sensitive health team the nurse can move towards the more interpersonal areas, this model endeavors to look at the more common reactions within the health team. It will therefore be assumed that the status pressure is the strongest and will normally cause the nurse to enlarge her duties and responsibilities in the medical area.

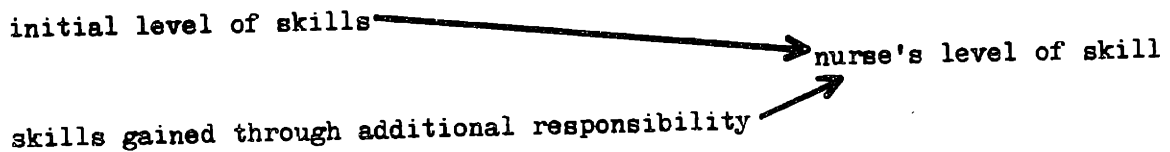
The nurse segment of this model looks at a number of features in the relationship between the nurse and her environment; the nurse's reaction to the community, the community's perception of her work and ability, the information flow between the family health worker and the nurse, and the doctor's perception of the nurse's ability. A distinction is also made in this model between the amount of effort devoted by the nurse to general health work and the level of medical treatment which she dispenses. While it is questionable whether these two facets of her work can really be separated, they are normally discussed in this manner by the majority of people involved in the health field³ and by the community health team staff which I interviewed.

¹Professor Irwin Rubin, Sloan School of Management, private conversation at Sloan School of Management, Cambridge, Mass., January, 1973.

²idem.

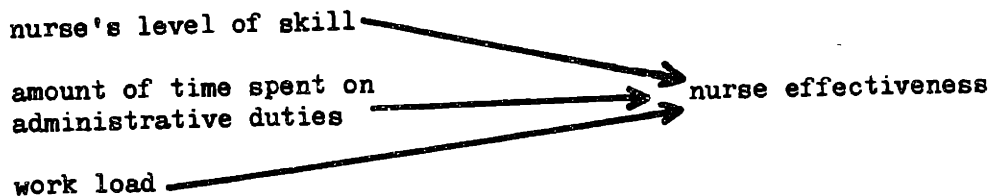
³idem.

Skill Level of the Nurse



An external input in this section of the model is the nurse's level of skill (NLS). The nurse's level of skill includes her formal capabilities in both medical and sociological areas as well as any external training. The actual level of skill of the nurse (NLSK) depends both on the formal inputs and the level of medical treatment which she performs during the course of her work. If she is given more responsibility, the level of her skills should increase over a period of time. If she is not given the opportunity to increase the level of medical treatment which she provides, her skill level should not increase beyond her formal skill level.

Nurse Effectiveness

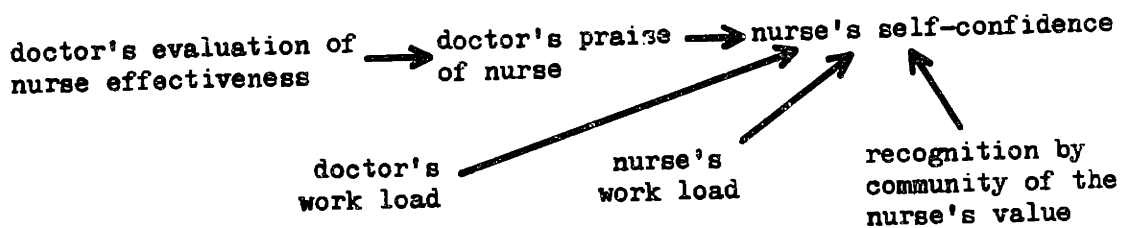


The nurse's effectiveness is a measure of how well the skills are used in dealing with individual patients. The effectiveness (NEFF) depends on a number of factors - the nurse's skill level, the percentage amount

of time which the nurse spends on administrative duties that can not be perceived by the community, and her work load. If her work load is high, she is able to spend less time with each patient and her effectiveness drops.

The doctor then evaluates the nurse's performance based on her effectiveness and the amount of work she performs. This evaluation is made through the model function (DMNF) that describes the doctor's measure of nurse effectiveness. This effectiveness leads to a level of praise by the doctor (DPON).

The Doctor's Role in Developing the Self-Confidence of the Nurse

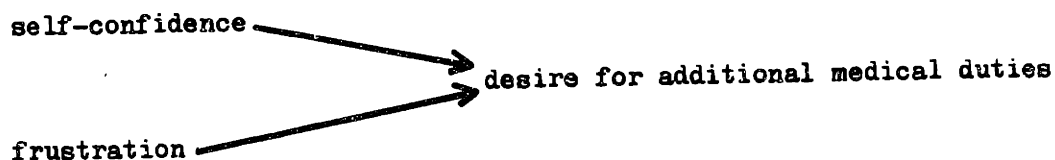


Many people within the medical profession argue that the nurse training programs often train the nurse against taking personal responsibility.⁴ The model includes this fact by requiring that any major change in the level of self-confidence must be initiated by the doctor. The self-confidence of the nurse (SCONF) therefore depends on a

⁴Rheba De Tornay, M.D. and Abraham B. Bergman, M.D., "Two Views on the Latest Health Manpower Issue", American Journal of Nursing, 71(May, '71), 974-977.

number of factors, including the doctor's praise of the nurse. The second factor is the level of work (NWORK) which the nurse has to perform. If her work load is high, her self-confidence in her abilities to perform additional medical work will probably be low. The doctor's level of work also influences her level of self-confidence. If the doctor's work load is high, he is unable to work with the nurse in order to build up her level of confidence. In addition, the nurse's perception of the community's reaction to her new medical duties also plays an important role in determining her level of self-confidence. If she is highly valued by the community, it is more likely that she will develop a feeling of general confidence. If she is not valued by the community, it will be more difficult to feel confident with the patients.

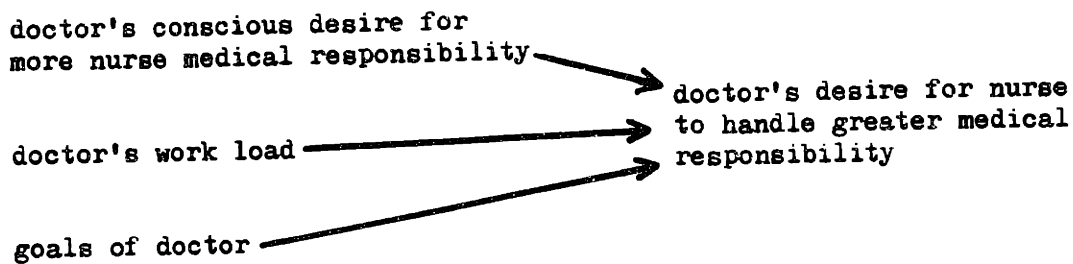
The Nurse's Desire to Increase Her Responsibility



Whether or not the nurse will desire to take on additional duties depends not only on her level of confidence, but also on what other pressures she faces in interacting with the health team. If her level of frustration is high, she will not be interested in attempting to take on additional medical duties, since any additional and more uncertain duties should increase the existing level of frustration. If her frustration

level is low and she has a high level of confidence, her desire to increase her duties and gain additional status should also be high.

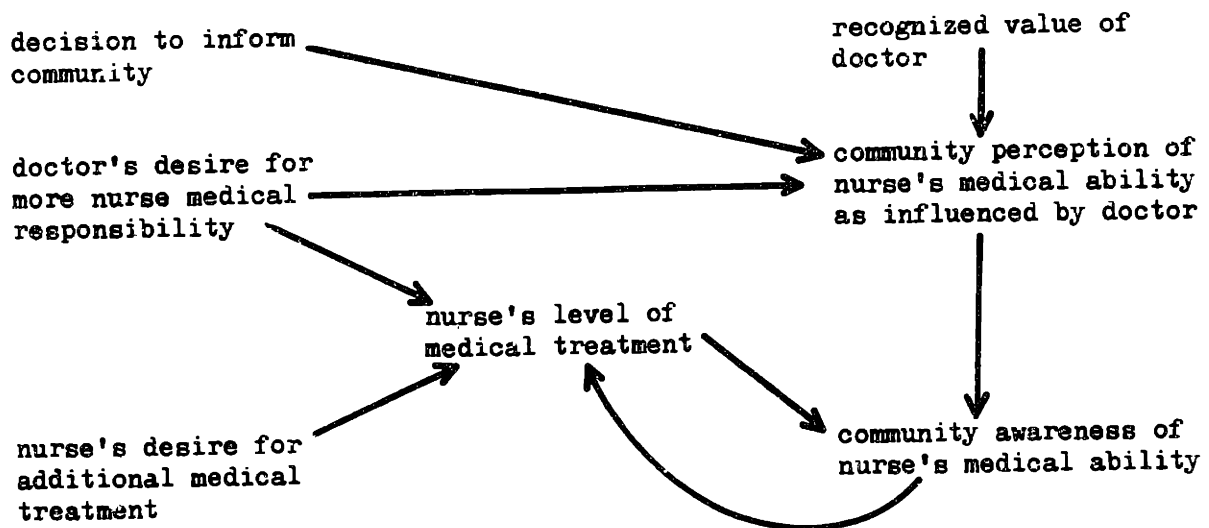
Doctor's Decision to Increase Nurse Responsibility



Within the health team, the doctor determines the limitations on the nurse's medical duties. We have to look to the doctor's desire for the nurse to increase her medical duties as well as her own self-confidence. The doctor's desire for the nurse to perform medical treatment (DDNMT) depends on his desire to increase the nurse's level of responsibility (DINR). This portion of desire to increase responsibility is predetermined external to the operation of the model. A second factor internal to the model also influences the doctor's desires. Independent of the doctor's conscious desire to increase the nurse's responsibility is the doctor's own work load which can create a pressure to delegate responsibility. If the doctor's work load is high and he is oriented towards the community, he will feel that it is necessary to delegate some of his work to the nurse to allow him more time with his patients. If his goals towards the community are considerably lower (even with an extremely high work load), he will tend to allocate less duties to the nurse. This may be

due to a desire to maintain his own status or excessive cautiousness on his part.

Development of Community Awareness

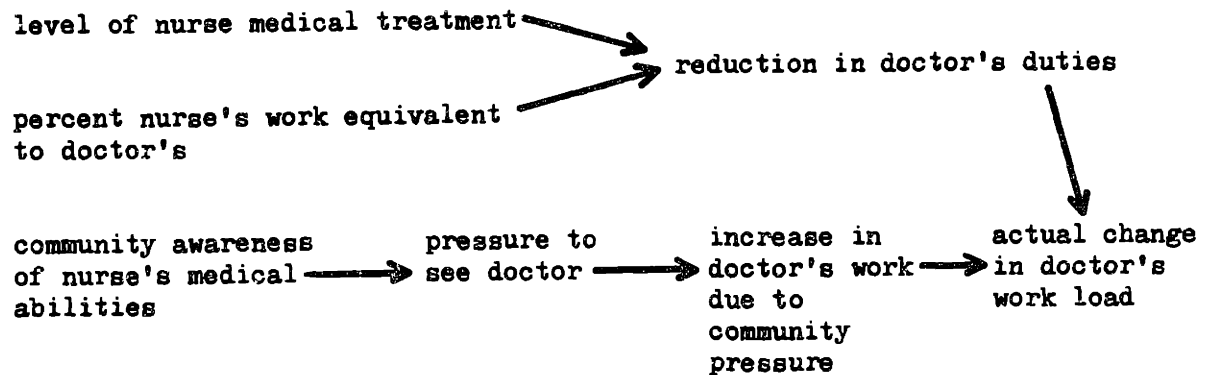


Should the doctor decide to increase the nurse's duties, he has the option of informing the community of his impression of the nurse's medical abilities, and his desire for her to take over certain duties. He may not do this for a number of reasons. Either he will consider that her ability should be self-evident to the community, or he may feel that it is not necessary. The model has been created so that the user can decide whether or not the doctor will prepare the community for an increase in the level of the nurse's medical work.

The level of praise of the nurse perceived by the community depends on how the community values the doctor. In other words, if the recognized value of the doctor is low, the community will tend to

disbelieve any praise from the doctor. They may feel that the doctor doesn't feel like doing the work and is attempting to ease his burden by delegating the work to the nurse. Alternatively, if the community values the doctor, they will more readily accept his decision. Through the doctor's praise of the nurse to the community and any preexisting medical treatment which the nurse gives to the community, the community develops an awareness of the nurse's medical abilities (CAMAN). This perception of the nurse's medical ability is also modified by the goals of the community towards a better health care (CPNMT). If the health care goals of the community are rather low, the community will be rather inflexible towards the method in which health services are provided, and they may not be interested in the nurse performing additional medical services for them. As community awareness of the nurse's medical abilities increase, it is likely that the nurse can more rapidly increase her level of medical treatment since she will have already gained acceptance from the community. Therefore, the change in the nurse's level of medical treatment depends both on her desire for increasing medical treatment (NDTMD), and the doctor's desire for her to increase medical treatment which are multiplied by the level of the community's awareness.

Reduction of the Doctor's Work Load



If the nurse's level of medical treatment increases, it is possible for her to take over some of the duties previously performed by the doctor and effectively reduce his work load. But, there are problems in the actual amount of reduction of the doctor's work load. As the rate of increase in the nurse's medical work rises, the nurse is able to reduce the level of the doctor's work load (RIDNM). It is assumed in the model that the reduction of the doctor's work load is a fraction of the additional medical work performed by the nurse. At the same time if the community is not aware of the medical abilities of the nurse there will be a pressure to see the doctor, irrespective of the level of work that the nurse is accomplishing. Depending on the level of the nurse's medical work load and the level of community awareness, the doctor may have to compensate for the work that the nurse has done by performing brief examinations to corroborate her statements and to basically satisfy the patient's expectations. It is likely, when the nurse increases the level of her medical treatment by a large amount, the community

awareness will lag behind. Under these circumstances it is very conceivable that the doctor will not decrease his work load. If the lag in community awareness is too long, the doctor will believe that the nurse is not effective. He will believe he should maintain his level of medical treatment and not delegate any further work or responsibility to the nurse.

CHAPTER V

THE FAMILY HEALTH WORKER

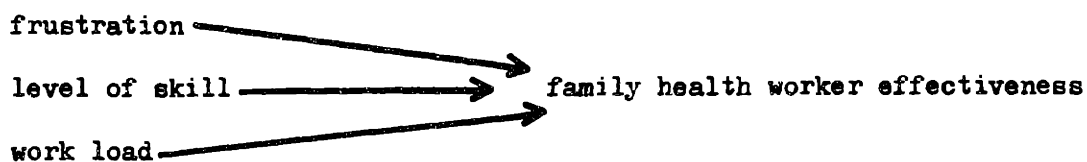
The family health worker is the primary interface between the community and the health team. It is her job to make certain that necessary information is transferred between both groups. In addition, she provides a physical link with the community since she is normally a member of the community which she serves.

The abilities of a family health worker come from two sources - one innate and one through formal training. The innate source is her knowledge of the community, its mores, goals, and problems. Since the family health worker is a member of the community, she can reduce the "strangeness" of the clinic for the patient. In order to facilitate her role on the health team she has had a brief training period of approximately six weeks where she has been given a basic understanding of the operation of a health team, and a brief survey of medical and social problems which she may encounter. Her function is to take the patient through the health center, stay aware of the progress of the patient, encourage others to use the services of the health center, and encourage patients to continue treatment. Her key functions are interpersonal in nature, and her performance is influenced strongly by her own personal goals and aspirations, part of which are reflected in her goals for the community. Her effectiveness is directly affected by the pressures and frustrations to which she is subjected. The effectiveness she has is further modified by the perceptions of her personal abilities and goals by the community, the individual patient, and the rest of the health team.

The family health worker evaluates herself by the reaction she perceives from the rest of the health team and the community. These perceptions and reactions play an important part in determining how much information can be transferred and setting the general tone of the relationship of the health center with the community. Ultimately, these reactions affect the quality and amount of care which can be delivered to the community. It is this type of relationship which this section of the model deals with. The remainder of this chapter will discuss the interactions which make up the family health worker portion of the model.

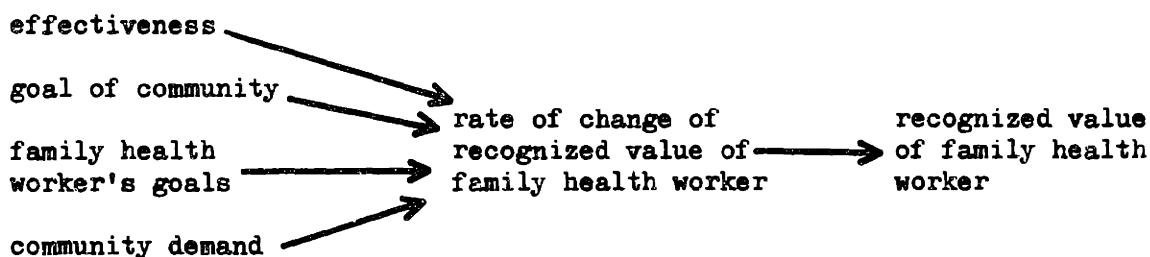
Since the actual training of the family health worker is episodic in nature (an initial training program with the occasional possibility of some short one day to one week courses), the level of skill is an external variable in the model which will be set at some level of skill at the beginning of the model runs. The second component which makes up the level of skill is the present state of the family health worker's knowledge of the community. Initially this would normally be at a very high level, since the family health worker does come directly from the community but this can change over a period of time due to a number of factors. These factors will be discussed later in this chapter.

Effectiveness of the Family Health Worker



The effectiveness of the family health worker can be modified by two factors. One factor is the level of frustration which the family health worker feels. As the frustration level of the family health worker mounts, one would expect that her effectiveness will be reduced. Also as the frustration for all family health workers increases, an increase in job turnover would be expected. A finite period of time will be required for the new family health worker to become integrated with the health team. Therefore, even when frustration leads to job turnover, the aggregate effect is still a reduction in effectiveness. The second modifier of effectiveness on a per patient basis is the work load of the family health worker. As the work load increases, the ability of the family health worker to deal with one specific family will have to decrease.

Community Recognition of the Family Health Worker



The value that the community senses in the family health worker depends not only on this measure of the family health worker effectiveness (FEFF) but on the goals of the community. If the community's goals are different from that of the family health worker's, both in terms of health

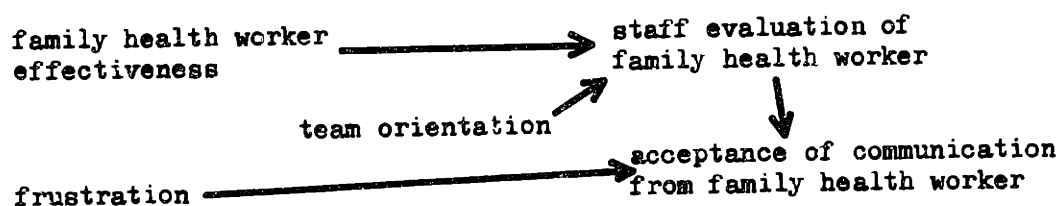
care and personal relationships, the family health worker's level of effectiveness is then modified by what the community perceives as effective. In many communities, health care is not the primary goal: the eradication of rats, the reduction of crime in the community, or economic improvement is the primary goal.¹ Under these circumstances, the family health worker is not effective unless she is able to help solve these problems. Alternatively, the family health worker's goal orientation could be low relative to the community's. The low goal orientation in this case might result in a patronizing attitude on her part. In either case, the effectiveness of the family health worker as perceived by the community would be lower than her true technical effectiveness.

The actual effectiveness of the family health worker then depends on the goals of the population, the worker's own goals, and her effectiveness in a technical sense. This perceived effectiveness is integrated over time and is a measure of the recognized value of the family health worker to the community (RVFW). One factor which can lower the recognized value of the family health worker is the level of militancy or level of community demand (CDMND). If the community demand remains high over a period of time, the community may feel that the family health worker is ineffective in helping them gain their demands. Even worse, the family health worker could be suspected of aligning herself

¹Richard Beckhard, "Organizational Issues in the Team Delivery of Comprehensive Health Care", Millbank Memorial Fund Quarterly, L(July, '72), 289.

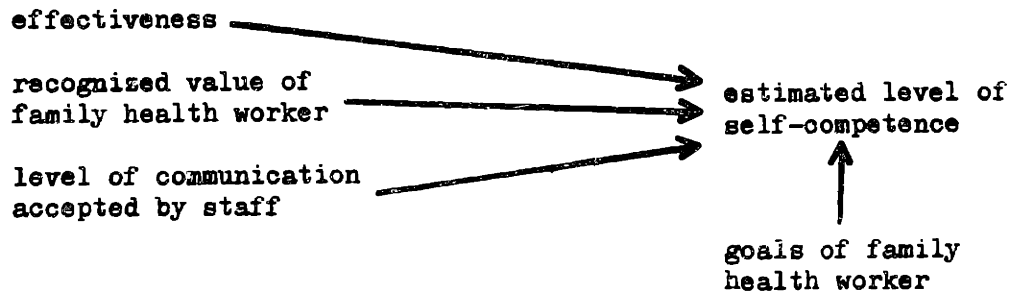
with the health care team rather than the community. Both results would cause the community to lower its estimation of the value of the family health worker.

Staff Evaluation of the Family Health Worker



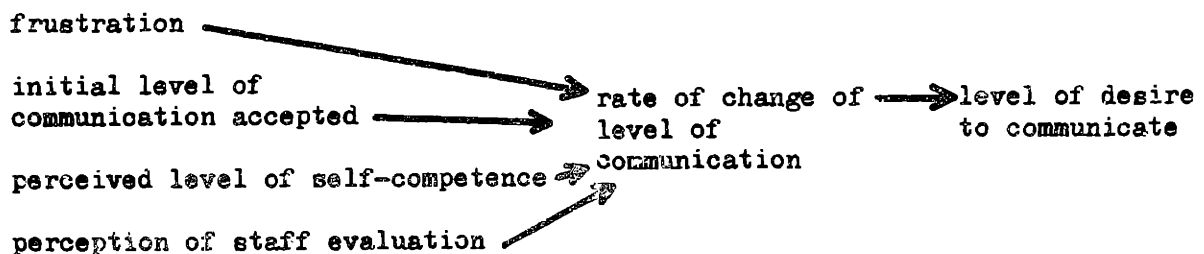
The other members of the health team also evaluate the effectiveness of the family health worker; but they evaluate her past performance from a different perspective than the community. The goal orientation of the health team as a whole weights the effectiveness of the family health worker. If the team orientation (TO) is low, i.e. the team is interested in the technical practice of medicine but not in the more interpersonal components, the staff's measure of the effectiveness of the family health worker (SLF) will be lower than another team which considers both the medical and personal aspects as important.

The staff's measure of the effectiveness of the family health worker determines how much communication will be accepted from the family health worker. The percentage of communicated information which is accepted (ACI) also depends on the general level of frustration of the entire staff including the family health worker. As frustration increases, one expects that the level of communication will decrease.

Self-evaluation

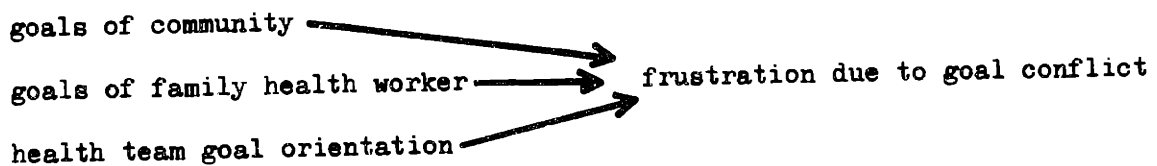
The family health worker also evaluates herself. She can perceive her total skill level, her past effectiveness, and recognizes what level of communication is being accepted by the staff as well as the response of the community. These perceptions determine her self-estimated level of competence (LSC).

This segment of the model contains three separate perceptions of the effectiveness of the family health worker - the community's (RVFW) or the recognized value of the family health worker, her own value or the perceived level of self-competence (PLSC), and the perceived level of competence of the family health worker as recognized by the medical staff (SPL).

The Desire to Communicate

The family health worker in order to perform her work must communicate with the medical team. Initially, the family health worker has some level of desire to communicate (DTCF). This desire to communicate is influenced by three factors - her own self-perception of her level of competence, the magnitude of her frustration, and the past level of communication accepted by the health team. If she feels competent, she will be more likely to communicate. If she feels less competent in her ability to explain a patient's problems she will limit her communication. Similarly, she senses what the evaluation of the health team is of her qualifications. If the evaluation is low, this will limit her attempts to communicate information. If the health team's evaluation of her work is high, she will tend to offer more information.

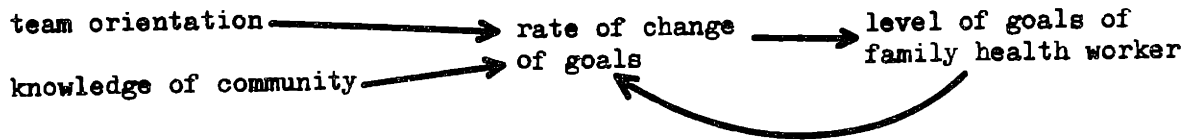
Goal Conflicts in the Family Health Worker



The family health worker is faced with a number of pressures resulting in frustration. Some of these pressures are generated in other sections of the model and will be discussed in the appropriate sections. Within this model segment, frustration is generated by the dual allegiance of the family health worker. The family health worker is in a rather unique position much like a factory foreman - neither manager nor worker. She is not a medical member of the health team, yet she is

no longer a member of the community since joining the health team. This leads to two separate pressures which can result in frustration. She must please two groups which may not have the same goals. The family health worker frustration function attempts to take this situation into account by looking at the difference between the goals of the family health worker and the goals of the community. As the difference between these goals increases, the frustration will increase. The family health worker is also affected by the goal difference between herself and those of the health team. It is conceivable that she can be too oriented towards the team from the viewpoint of the community, yet not oriented enough towards the team from the viewpoint of the doctors and nurses. If the difference between either of these increases, her frustrations will tend to increase. There is a case, however, where a difference in goals can exist but where frustration will not increase. The one case where a difference in goals will not have any effect is where the family health worker becomes totally aligned with the health team and the health team has a low goal orientation towards the community. This would tend to cause the family health worker's goal orientation to decrease. While a difference in goals would exist, the health worker would be less sensitive to the difference and would feel less frustration due to the difference. This reaction in the family health worker would be to the detriment of the team; however, since the team also has a low goal orientation, it would not perceive the difference.

Change in Goal Orientation

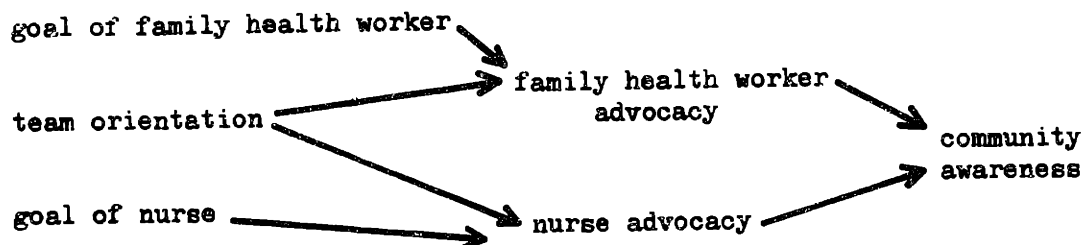


The previously mentioned pressures can work to modify the goals of the family health worker. The goals of the team as a whole can be described roughly as the average of the combined goals of the doctor, nurse, and the family health worker. This combined goal becomes the norm for the team. If the goals of the family health worker are very different from the norm, the family health worker will tend to change her goal orientation towards the norm to reduce dissonance. If the family health worker also retains a good knowledge of the community and its problems, this influence should tend to maintain or raise the level of her goals. These two forces compete with each other in the model.

CHAPTER VI

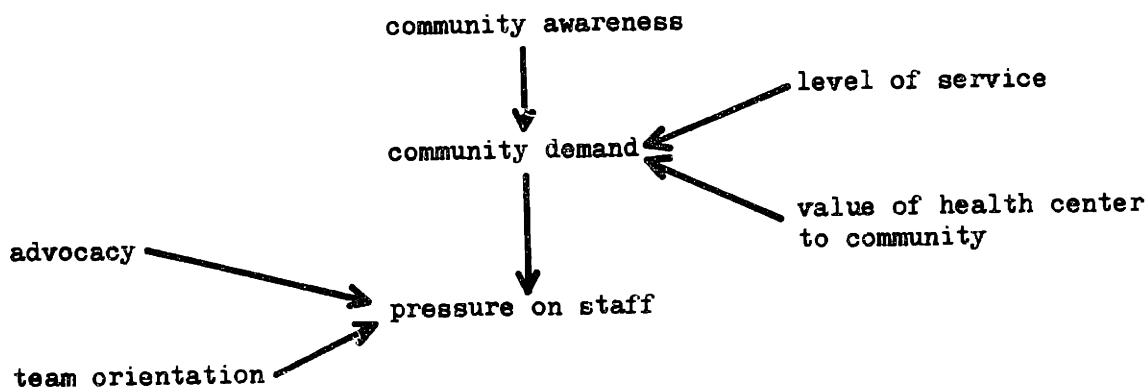
THE EFFECT OF ADVOCATES IN THE HEALTH TEAM

In this segment of the model we look at advocacy as a means of changing the level of service that the health team performs and at the same time the possibility that advocacy will lead to other reactions within the staff which will decrease the level of work performed. In the model the term advocacy is defined as the act of informing patients of health care which either is available or should be available and also placing pressure on the rest of the staff and the center administration to change the overall level of service or the direction of service of the health team. Further, this form of advocacy is that portion of the information or pressure which doesn't meet the norm of the health team as a whole. In other words, if the goal of the family health worker is oriented towards the community much more highly than the rest of the health team, her efforts to help the community will exceed those deemed proper by the rest of the health team and perceived as advocacy. This is also true of the nurse. The pressures from the advocacy of the nurse and the family health worker are summed and the resultant pressure determines the effort which is made to change the awareness of the community.



The community can be made aware both of the existing health services and other health services which could be provided. Over a period of time the level of advocacy increases the community awareness. As the community becomes aware of the possibilities of the potential existing in the health team or which could exist in the health team, community demand can develop.

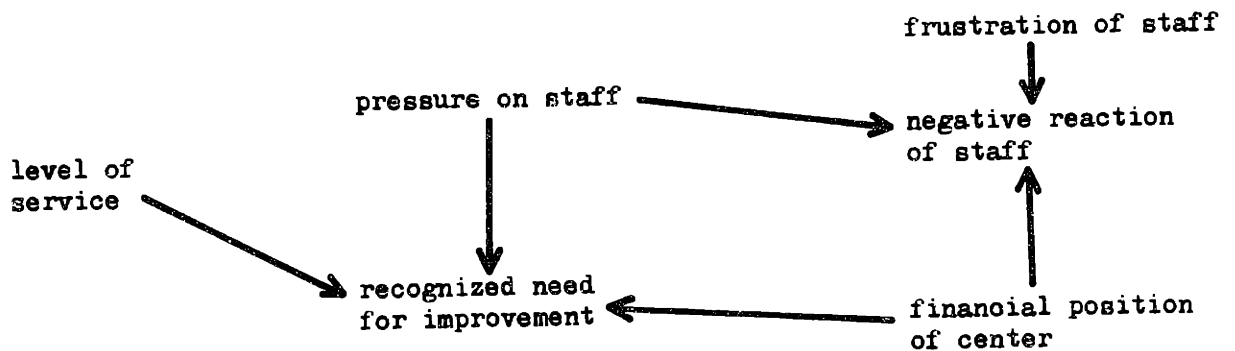
Community Demand and Pressure on the Staff



The strength of the community demand is dependent on the level of service. If the level of service is relatively high, close to the level of community awareness, then there would be little demand. If the awareness is high and the level of service is low, the response will be larger, i.e. the demand would be much greater. At the same time, a consideration has to be made for the community's general impression of the health center - their recognized value of the health center. If they value the center and if community relations are good, the militancy or pressure of community demand should lessen since there is more of an

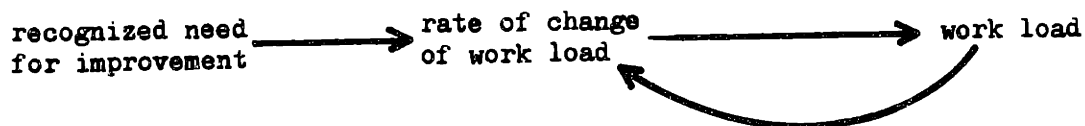
awareness of the staff's direct attempts to help the community get what service is possible. Thus community demand plus the advocacy directed towards the rest of the staff, notably the doctors and administrators, will lead to a pressure on the staff to change the service which the health center provides.

Recognition of the Need for Improvement



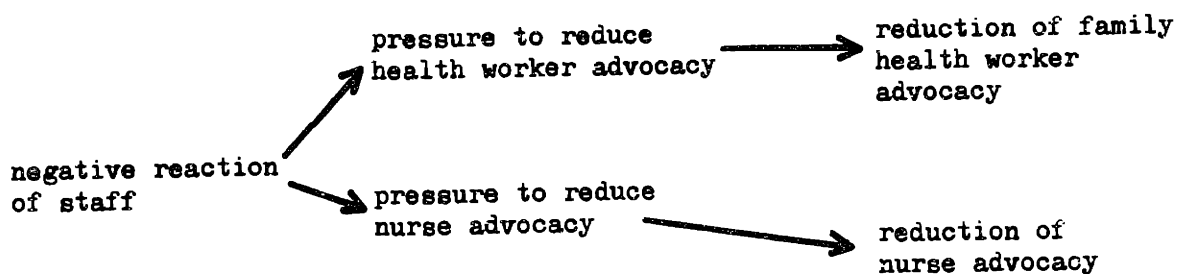
After some delay, the rest of the staff will sense that the pressure is recurrent and react to it. There are two possible reactions to this pressure. First, if the level of service is high in terms of an ideal goal there will be little desire to change the work load. If there is a negative financial pressure (FINPR), i.e. if funds are very limited, the staff will realize that any change in service has to result from a change in their own work loads. When there is a negative financial pressure and if the level of service is relatively low, the staff will attempt to increase their individual work loads. This need for improvement (NIMP) is recognized by the members of the staff, and they change their level of

work by an amount which depends on their existing work level.



If they are already at the limit of their capacity, the amount of change for any given acknowledged need will be less than if their work load is not as heavy. If the financial pressure is low, there will be little desire on their part to increase the work load since there are funds available which will allow this change in service to be accomplished through the addition of extra staff or equipment.

Negative Reaction of the Staff



If the level of work of each of the members of the health team is near maximum while the financial pressure is still negative, i.e. limited funds and the community demand continues, there will be continued pressure on the staff since the level of service cannot change under these conditions. Pressure on the staff under these conditions leads to a negative reaction of the staff. A means of relieving that pressure is

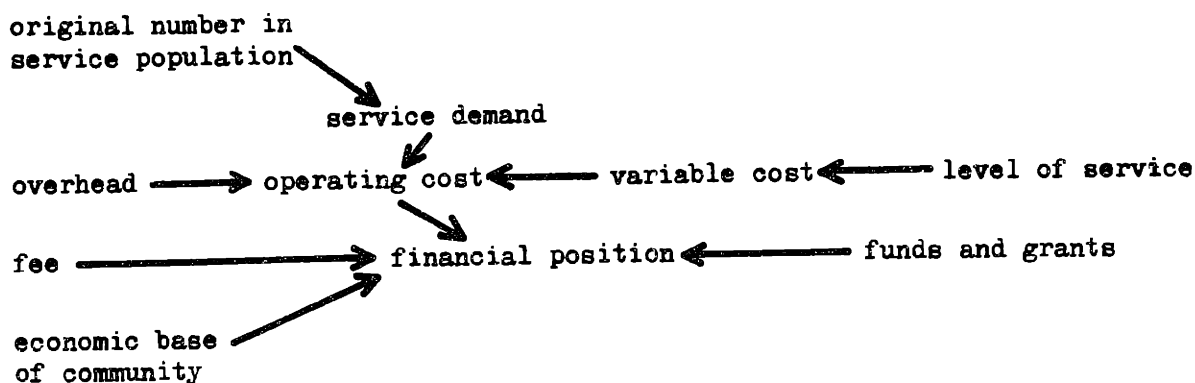
to put pressure back on the advocates to reduce the level of advocacy in the hope that the community awareness can be lowered.

CHAPTER VII

THE IMPACT OF FINANCES AND ADMINISTRATION OF THE HEALTH TEAM

This section of the model attempts to interface financial pressures and realities of the health center which influence the health team. It deals with the frustration developed both in the administrator and the rest of the team from financial problems that occur during the operation of the center. The structure of this segment of the model is the result of two basic forces. The first is the quasi-accounting type structure in the cost section that allows for some latitude in the center's financial operation which differ between centers. The second portion of this model segment separates the service output of the center into two components. The first component is the level of service without staff improvement. Any changes depend on the financial situation and other pressures. These changes, if the level of service increases can be ascribed to the addition of other personnel who provide a fixed amount of work output. As an approximation I am assuming that their level of work will not change during the course of this run, while the work done by the health team may. A change in service demand will raise or lower this level of service. An increase in population will lower the service. The inherent assumptions in this model segment are that an individual health team can change its work load and effectiveness and that any additional funds will just change the overall level of service without modifying the effectiveness of the specific health team.

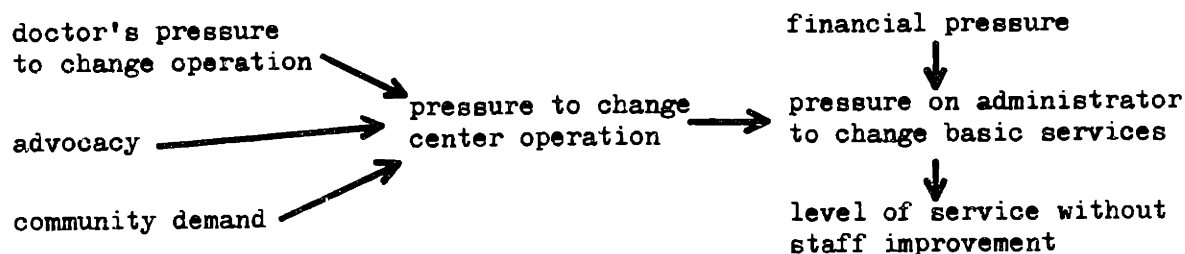
Determining the Financial Position of the Health Center



The model then begins with an exogenous variable, the number of people within the health team service population (NUMBR). The number of people generate the service demand which the center sees. The required expenditures which the health center is faced with depends on any overhead which the center requires to maintain its operational status. In some cases the overhead is only a small fractional portion of the total operating cost of the health center and can very well be ignored. However, for flexibility I have left the option of including overhead in the model. The rest of the operating cost is the service demand or the number of patients times a variable cost that depends on the level of service that the center is providing. If the center provides only a minimal level of service the variable cost per patient would naturally be much less than if the level of service is raised. This operational cost is then subtracted from any and all income which the center receives. This income can be in the form of funds and grants provided by the state, federal, or local government, and fees collected from third parties or

payments by private individuals. Since most centers attempt to provide service to all those who need it within the area covered by the center or catchment region, the total amount collected in fees depends on two basic factors. The first is the percentage of the population that is financially able to pay and the second is the regulations and rulings concerning the initial granting of funds. In the case of some of the funds, certain restrictions are placed on who may receive treatment as well as regulations concerning who may pay for treatment. In some cases the regulations have been such that even those who can pay are not charged due to the funding rules and requirements. The average percent of the population which is expected to pay is reflected in (EBOA) the economic base of the area; in this case it is that group of the population which cannot pay or which the funds regulations have restricted from paying. This limits the amount of fees that can be collected by any center and also determines the amount of funds necessary to support the center in addition to any fee collection. This difference over time determines the financial position of the center. Should the operating cost be such that the inflow of funds does not meet the operating costs, this financial position will go negative indicating that the center does not have sufficient money to meet costs.

Pressures to Change the Level of Service Provided

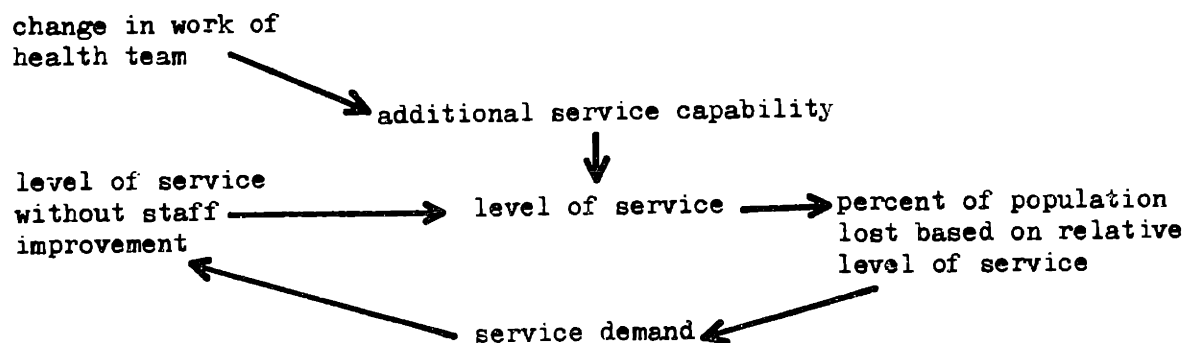


During the operation of the center there will be a number of forces which can cause a pressure to change the operation of the center (PTCOP). This pressure results from the doctor's pressure to change the operation of the center (DPTC), and advocacy pressure from the nurse and the family health worker (ADVF), and community demand (CDMND). As each of these three groups, after viewing the operation of the center and estimating the need for service, determines that the operation of the center is insufficient to meet these needs, its advocacy pressure to change the operation will increase. This pressure is perceived by the administrator after a period of time. The amount of time that it requires the administrator to perceive this pressure is a function of the frustration that the administrator is under. If the administrator is under very little pressure and has a low level of frustration, he will tend to be more aware of changes in the operation of the center and problems within the staff. As his frustration level rises, he may very well tend to increase the amount of time that it takes him to perceive any pressures from change in the system. In effect he is trying to delay perception of problems in order to decrease the frustration which he feels. This

delay then affects (DPTCA) the delayed pressure to change operations as perceived by the administrator. At the same time this effect also increases the delay with which the administrator can perceive any interpersonal problems within the rest of the staff of the health team. The administrator will normally perceive these problems as the frustrations of the members of the health team (FRUST) which is a composite of the doctor's, nurse's and family health worker's frustrations. The ability to change the level of service without any staff improvement results from the pressure to change the basic service. If the administrator's perception of the need for change is high and the financial pressure is positive, i.e. funds are available for change, he should be able to change the level of service to accommodate both the community and the rest of the health team. If the funds which have been given to him through the various grants are extremely restrictive, he may not be able to change even though these funds could supply a considerable portion of the money necessary to provide the change if the regulations were not so restrictive. If the financial pressure is large and negative, i.e. operating costs exceed the amount of income expected, the administrator will tend to reduce the level of service to maintain continuous operation. The amount of reduction will be tempered by any pressure he sees from the other members of the health team and the community. If the funding regulations are extremely restrictive, the administrator may not be able to lower the level of service without violating the funding requirements. In this case the financial pressure can worsen. The level of service can also change should the number within the population that the center

serves change. With fixed resources an increase in demand will result in a lower level of service per individual.

Level of Service Change Due to Change in Work of the Health Team



As described in the advocacy section of this model, the other members of the health team can also perceive the need for an increase in the level of service. If they are not overburdened with work at this point, they can endeavor to change the level of their work output, and effectively assign additional service capability to the center. This increases the level of service (LOS) and accounts for the staff improvement portion of the service output. The level of service that the center provides can also change the demand requested of the center. Since a certain portion of the population that the center serves does pay, this portion of the community should be able to obtain medical care elsewhere should they desire. Since the fees for service at health centers are normally competitive or less than conventional health care elsewhere, the prime determinant of choice of those who can pay but choose to

receive health care elsewhere then depends on the level of service. As the level of service decreases from an optimum level, a fraction of this population will seek their care elsewhere. As the service continues to decrease, a much sharper drop in the number who seek their health care at the center would be expected. A plateau of those coming to the center is probably reasonable, since a number of factors such as transportation problems can limit the total number who can seek service elsewhere. Those who do leave reduce the service demand but also reduce the income of the center.

CHAPTER VIII

MODEL RUNS AND CONCLUSIONS

This chapter discusses the model runs, provides comments on the results of the runs and their implications, and makes concluding remarks on the overall thesis and model. There are seven runs described which provide insight into the general nature of the model. The financial-administrative section of the model appears to dominate the service characteristics when the health team goals are moderate to high. The model is also very sensitive to the goal orientation of the entire team. For a health team with high goal orientation, significant improvement in the interpersonal relations can occur. Further, changes in goal orientation also affect the community recognition and community demand. For moderate levels these effects are much less evident.

The Base Model Run

A base model run is used to make comparisons against later changes in the model. The initial values and coefficients which are used in this run, as well as the complete computer model, are contained in Appendix A. The initial values which will be of particular interest in this chapter are:

Nurse	= 0.6	slightly higher than average
Doctor	= 0.2	very low
Family Health Worker	= 0.8	quite high
Community	= 0.4	slightly less than average for the general population (for a low income community this may be on the high side)

Initial Work Load

Doctor = 0.8

Nurse = 0.8

Family Health Worker = 0.7

All members of the health team have reasonably high work loads at the beginning of the model run. As the work load approaches "1", the endurance limit of the staff is almost reached and any further increase is difficult to motivate.

Skill Level

Nurse = 0.7 above average

Family Health Worker = 0.5 average

Doctor's Ability to Communicate = 0.3 moderately low (while the doctor's medical skill is considered high, the effectiveness is in part determined by his communication ability)

The level of skills relate only between other possible team members of the same class, i.e. the nurse's skills are relative to an ideal nurse's skills and do not offer any comparison between the doctor's skills and those of the nurse.

The model is run for a simulated period of 80 weeks or approximately one and one-half years. It is felt that the time period is compatible with the model construction since the model does not include the possibility that the health center will be able to significantly influence the morbidity of the community. During a period of one and one-half years migration in and out of the community as well as people

leaving or enrolling in the center should keep the morbidity rate constant from the health team's viewpoint.

A number of initial runs were made before the base run was selected. As mentioned in an earlier chapter, the model is still in a formative stage; however, some basic characteristics of the model can be demonstrated. It is also important to point out that the structure of the model affects the results as well as the values of the coefficients. Therefore, the changes in the dynamic behavior in the model can indicate trends even if the coefficients are not exact. It is these changes which will be discussed in this chapter. The plots of the values of selected variables for the base run are contained in Figures 1 - 9 found at the end of the next section.

Output of the Base Run

The financial segment of the model maintains a balance between the level of service and the service demand or the number of visits to the center (Figure 1). This is due to the financial constraints which limit the level of service and a counter pressure from the community, and the health team to provide the best service possible. The level of service increases by more than 25% at the end of 80 weeks. Part of the large change in the level of service is accounted for by a drop in the number of visits to the center (Figure 1). This drop is approximately 18% of the original level of service demand. In order to measure better the level of improvement or decline in the output of the center, two criteria have been developed. The first criterion, Service Level (MEASR), is the

product of the service demand times the level of service, which gives a material measure of staff output. The second measure is more closely related to the quality of health in the community health center patient population. This criterion is the Medical Level (MEDL) which the health center can provide and is the product of the effective treatment operative and the service demand. These two measures and the community demand, a measure of community pleasure or displeasure with the health center, provide a base to determine what possible changes can improve the operation of the health center.

In the base run the Service Level increases while the Medical Level decreases and community demand rises (Figure 2). This is partly a result of the recognized value of the family health worker dropping and going to zero in the 23rd week (Figure 3). The patient perception of treatment depends in part on the recognized value of the family health worker. The patients' lowered perception of treatment (Figure 4) reduces the patient desire to continue treatment. The reduced desire for treatment then lowers the effective treatment rate since the patient will not continue with the treatment. In addition, the reduced desire to continue treatment reduces the number of patient visits at the center (SDMND).

FINANCIAL AND SERVICE VARIABLES

level of service = L in arbitrary units

cumulative deviation from budget = F in thousands of dollars

service demand = # number of visits

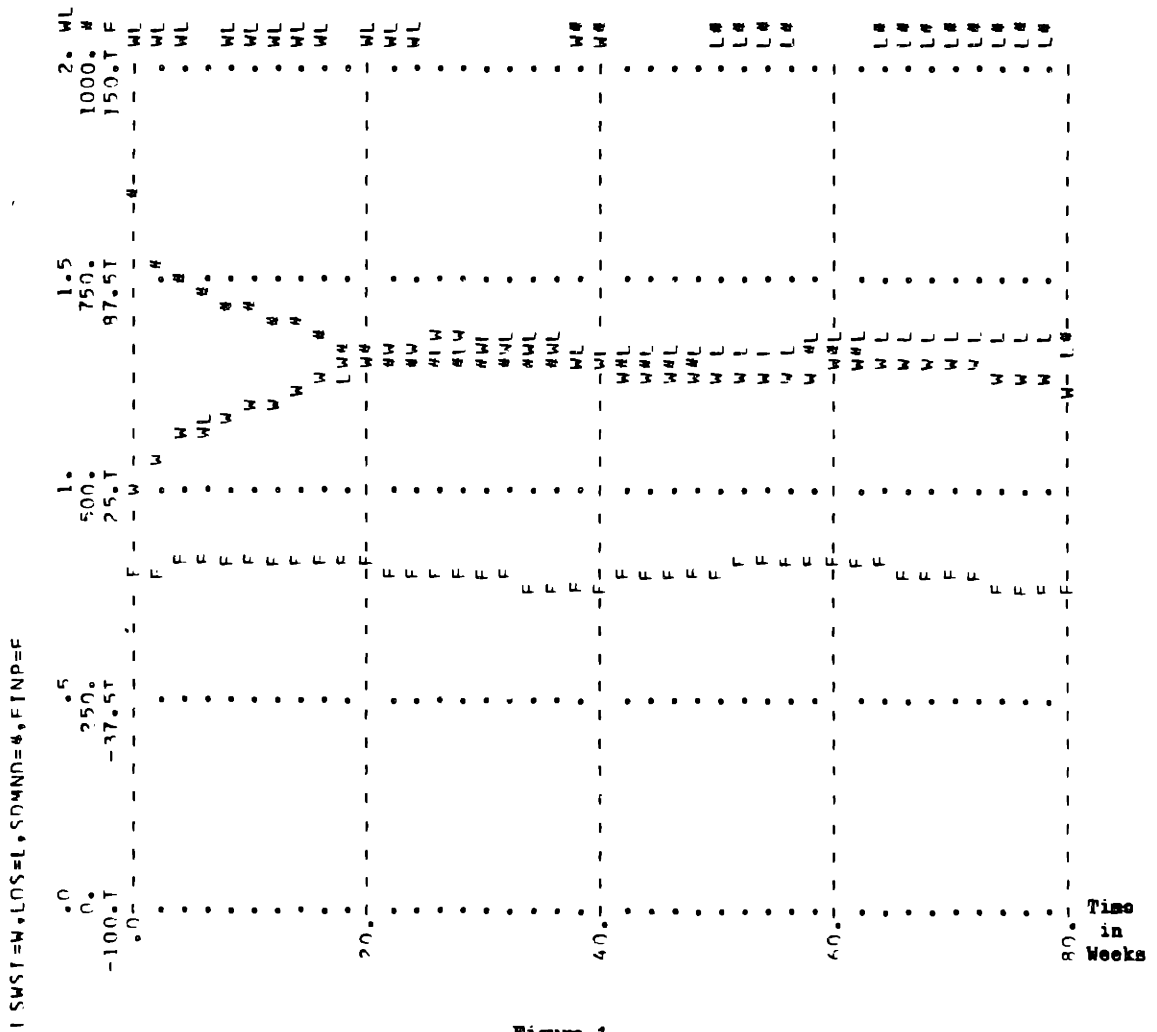


Figure 1

CRITERIA

Service Level = M in arbitrary units

Medical Level = * in arbitrary units

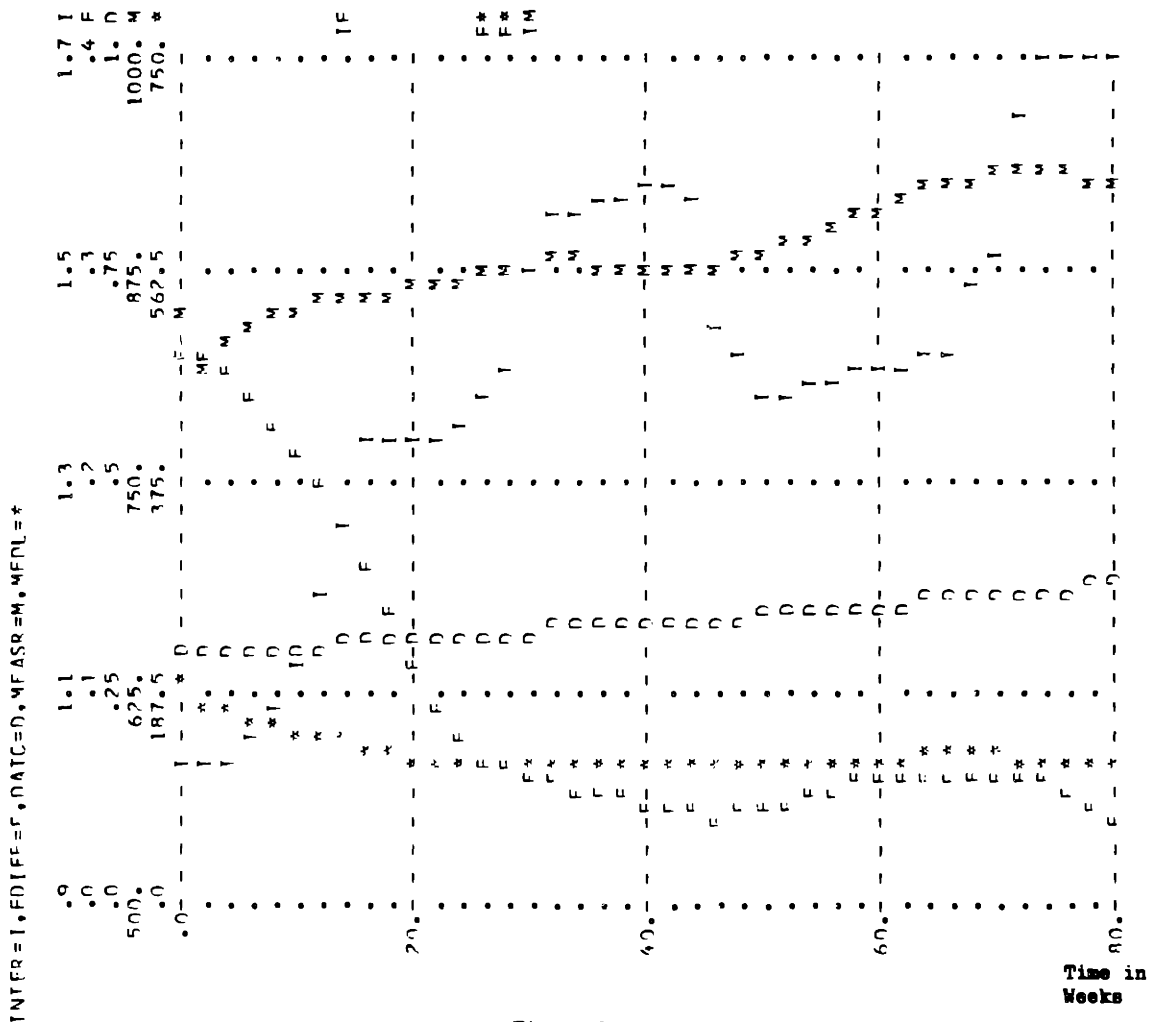


Figure 2

RECOGNIZED VALUE OF THE FAMILY HEALTH WORKER

Recognized value of family health worker = F in arbitrary units

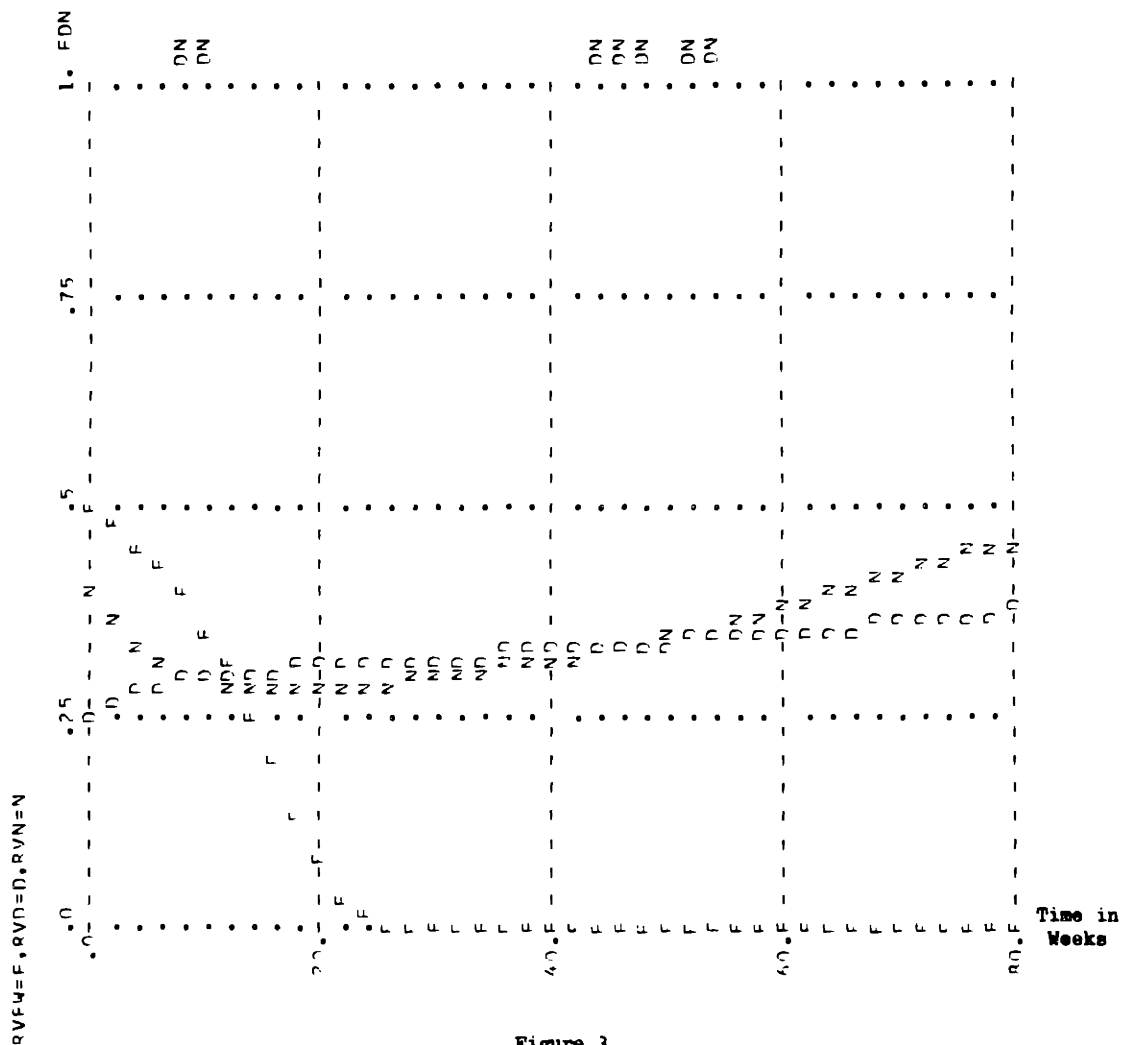


Figure 3

PATIENT PERCEPTION OF TREATMENT

patient perception of treatment - P in arbitrary units

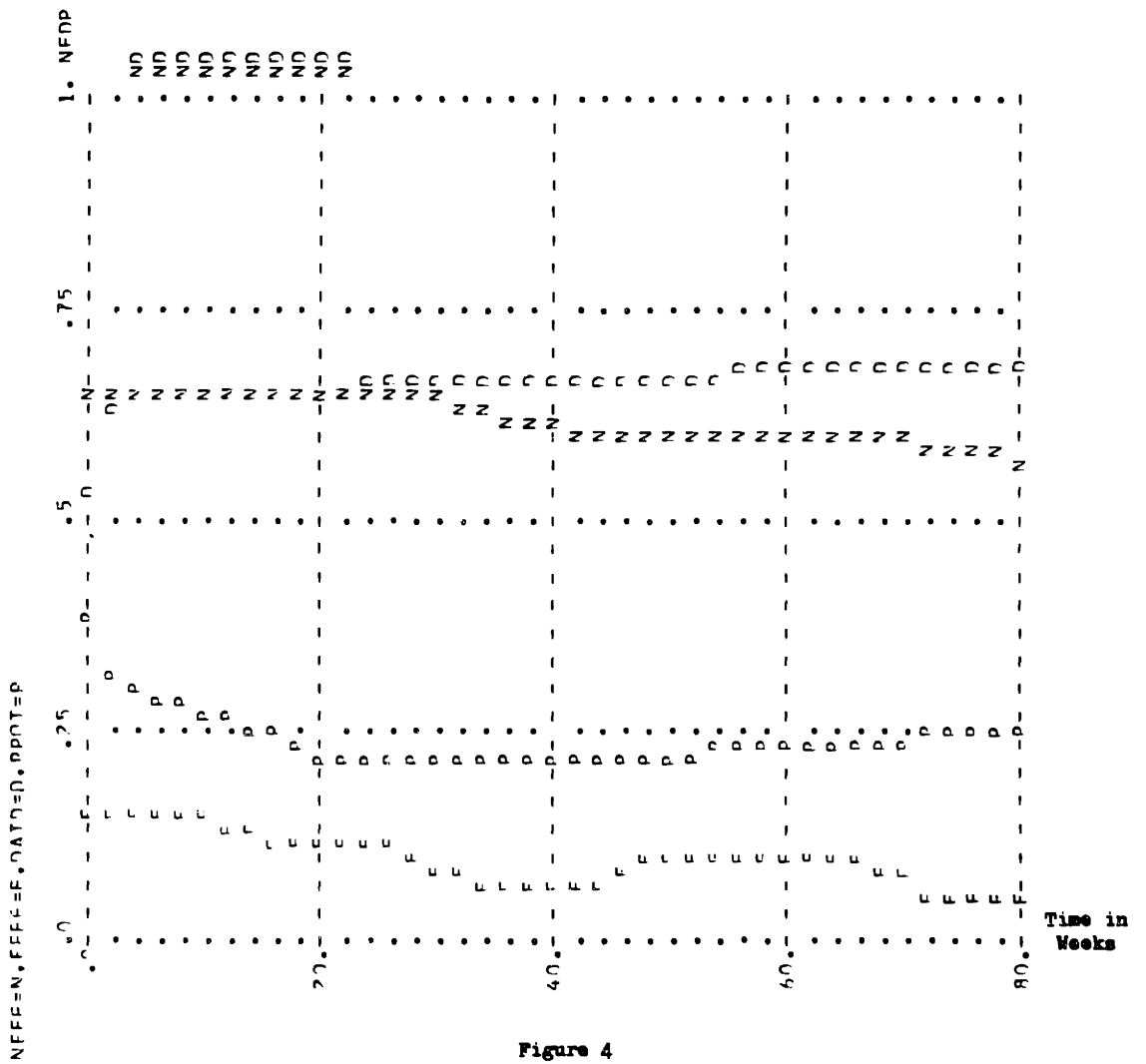


Figure 4

COMMUNITY DEMAND

Community demand = C in arbitrary units

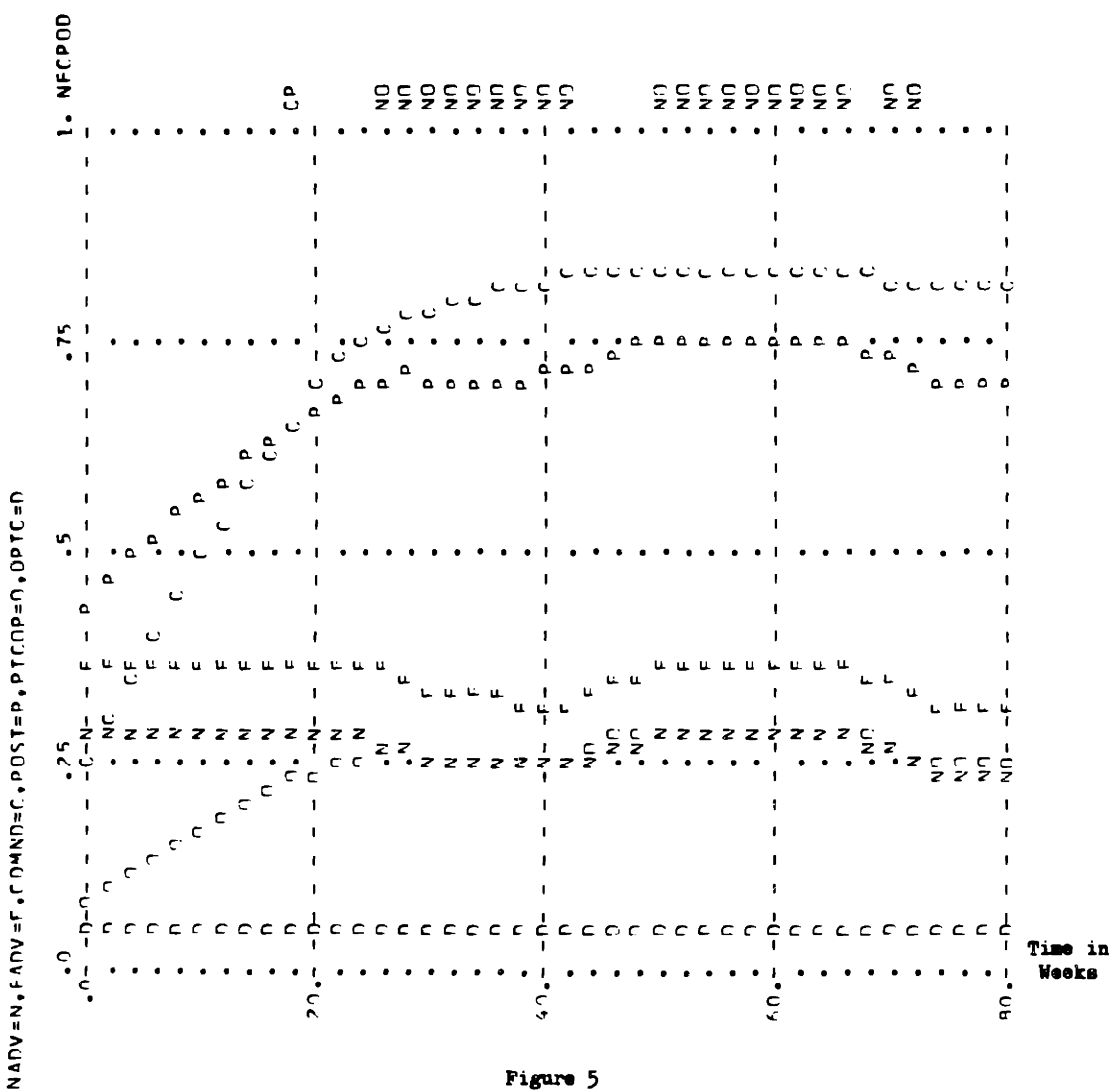


Figure 5

HEALTH TEAM GOAL ORIENTATION

Goal orientation of family health worker = F in arbitrary units

Goal orientation of doctor = D in arbitrary units

Goal orientation of nurse = N in arbitrary units

Goal orientation of population = P in arbitrary units

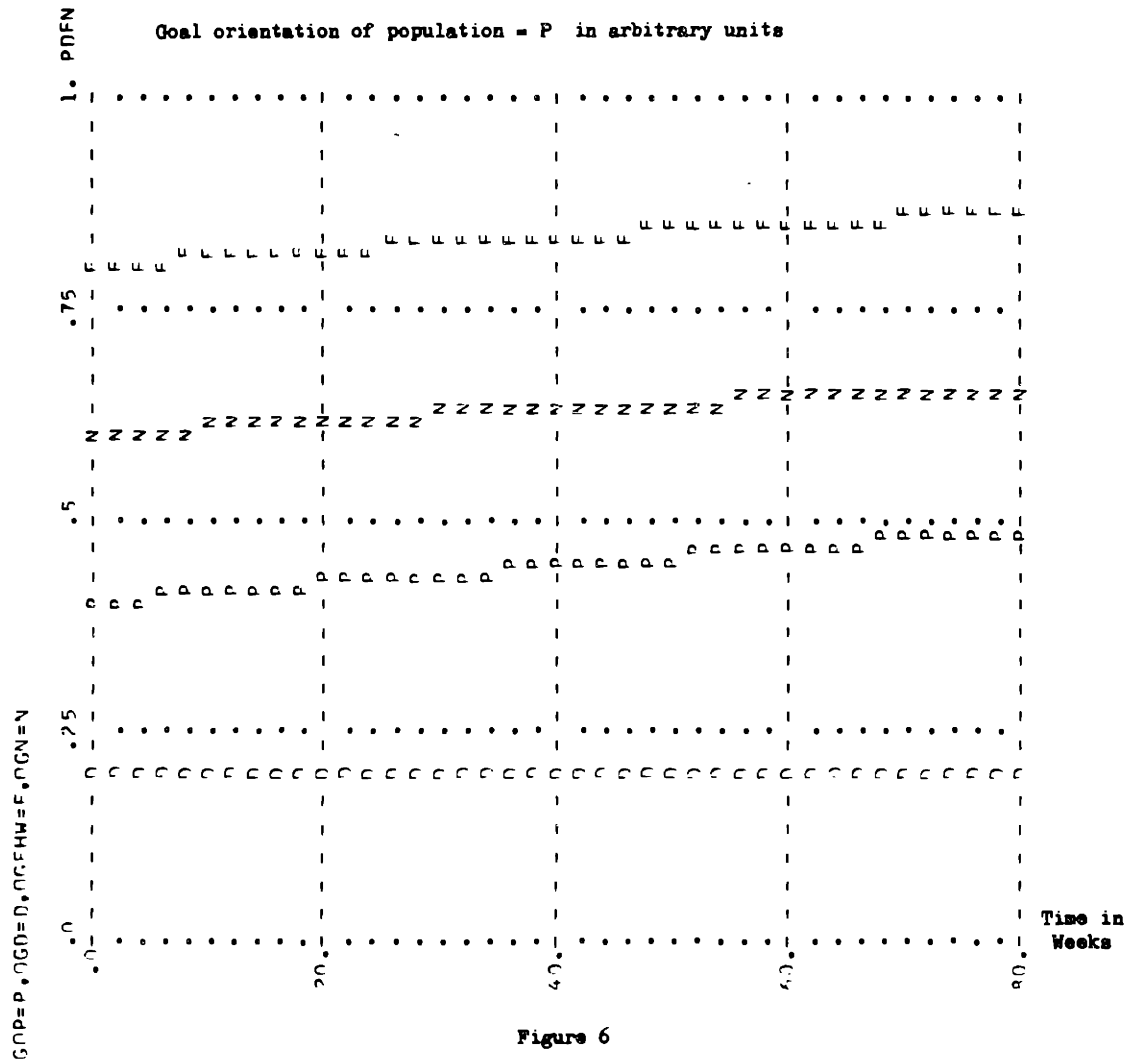


Figure 6

KNOWLEDGE LEVELS AND COMMUNICATION

Amount of FHW communication accepted by staff = A in arbitrary units

Family health worker's knowledge of community = F in arbitrary units

Nurse's knowledge of community = N in arbitrary units

Doctor's knowledge of community = D in arbitrary units

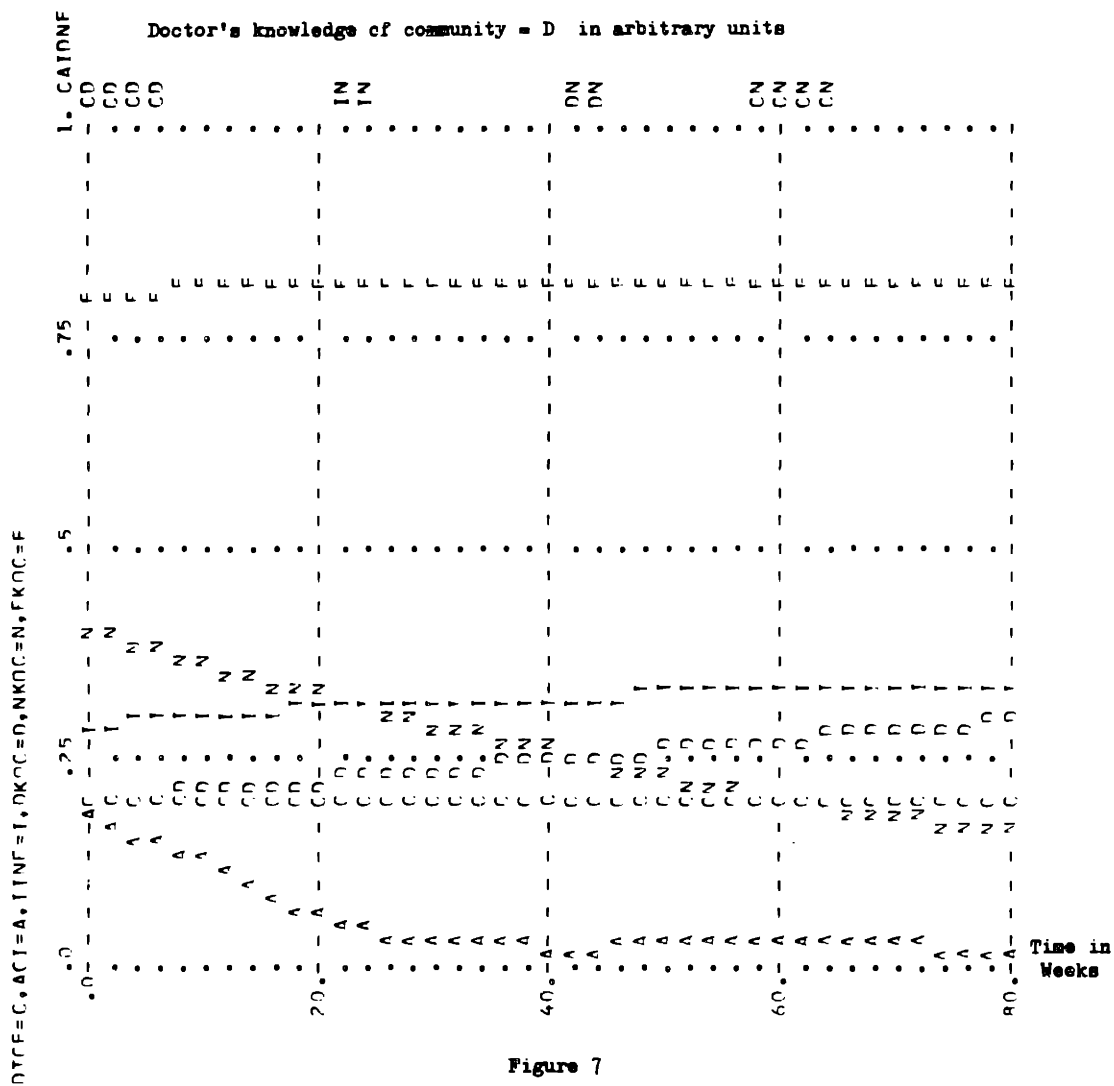


Figure 7

LEVEL OF FRUSTRATION

Frustration level of family health worker = F in arbitrary units

Frustration level of doctor = D in arbitrary units

Frustration level of nurse = N in arbitrary units

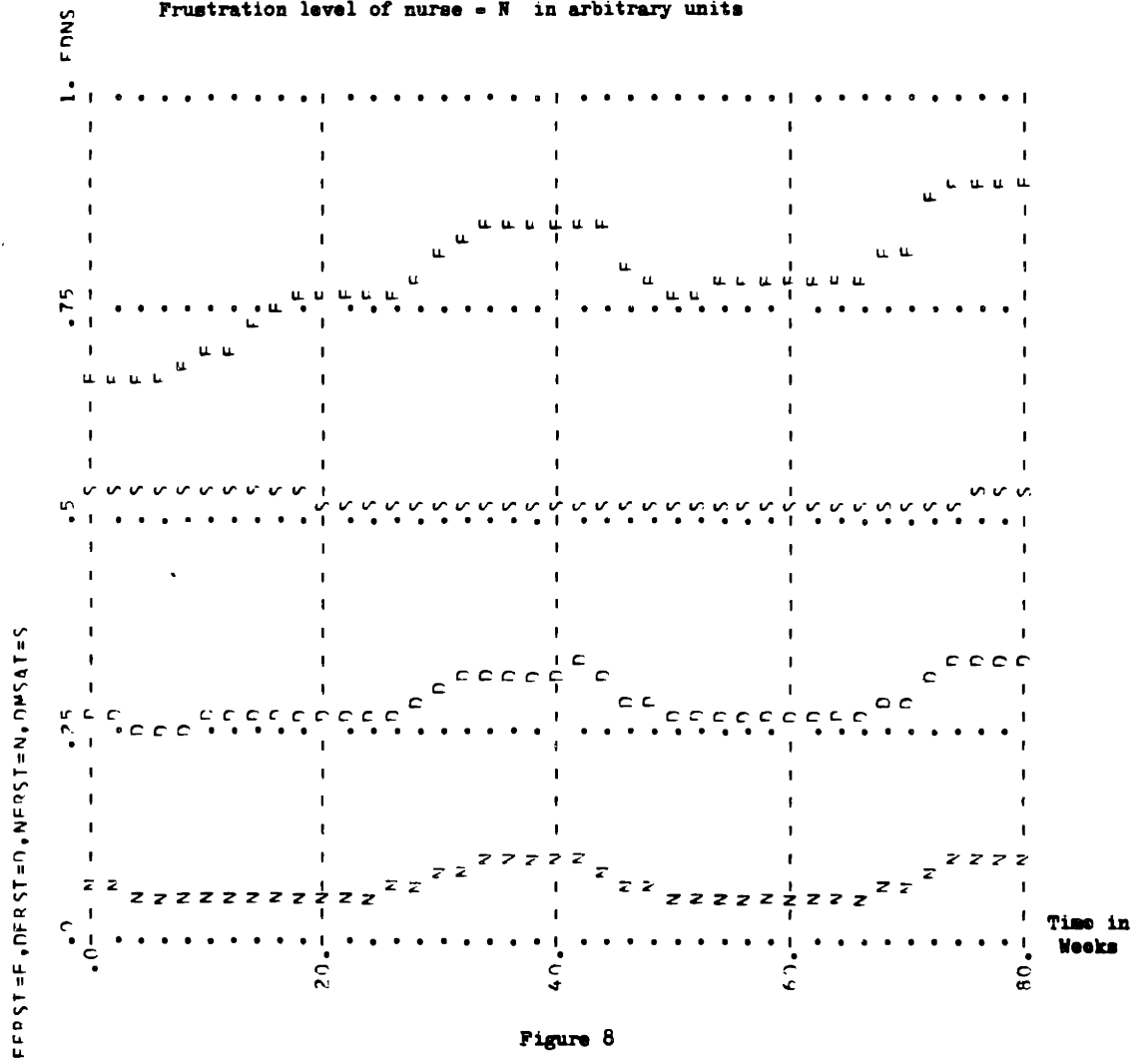
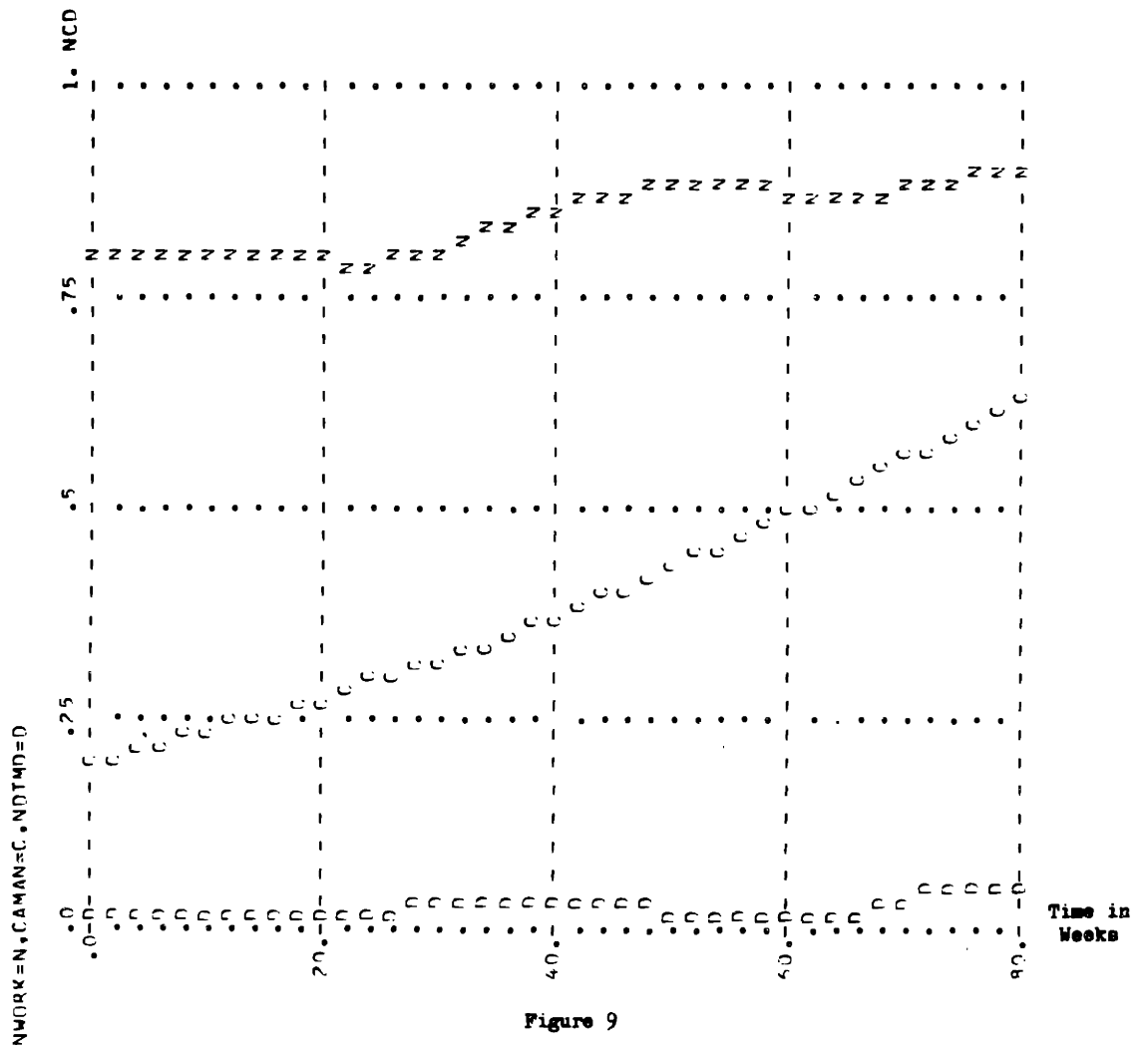


Figure 8

NURSE DESIRE FOR MEDICAL TREATMENT WORK

Level of nurse desire = D in arbitrary units



Further Experiments With The Model

RUN 2 - A Health Team With High Goal Orientation

The changed values are:	<u>Old</u>	<u>New</u>
Goal orientation of doctor	0.2	0.8
Goal orientation of nurse	0.6	0.8

This run is used to determine what improvement occurs if all goals of the members of the health team are higher than the base run. This change is expected to have considerable influence on the behavior of the model. The purpose of this run is two fold; to determine what happens as the result of a major initial condition change and to see if the selection of personnel using goal orientation would be important to the success of a health team. The policy of selection would be useful in the development of new health centers.

The results in comparison with the base run and by the 80th week are:

1. A decrease of 25% in the level of community demand and a similar reduction in the pressure to change the operation of the center.
2. The recognized value of the family health worker does not reach zero until the 57th week and the recognized value of the nurse improves by 50%.
3. The goals of the population rise by 20%.
4. The doctor's knowledge of the community increases by 50%.
5. The two criteria, Service Level and Medical Level remain

the same.

This run indicates that high goal orientation does improve community relations, but does not necessarily improve the quality of medical care to the community. Further, high team orientation is not sufficient to improve the value of the family health worker as recognized by the community, given the conditions described in the model. The limited change in service criteria is to a good degree controlled by the constraints of additional work load available and the amount of funds available to the health center. This run shows a dominance of the financial loop when community relations are moderate to good.

The results of the run from a purely medical point of view are only cosmetic. The next model run attempts to determine if there is an alternative way to produce this affect.

RUN 3 - Increased Doctor's Ability To Communicate Given The Original Goal Orientations

The changed value is:	<u>Old</u>	<u>New</u>
Doctor's ability to communicate	0.3	0.6

It might be possible to increase the ability to communicate by giving the doctors special training before they enter practice at a health center. The training might involve understanding street language and to develop in the doctor the ability to convert medical terminology into a more understandable form for the patients.

The results in comparison with the base run and by the 80th week are:

1. Community demand decreases by 12%.
2. The service demand increases slightly.

3. The recognized value of the doctor increases by 75%.
4. The medical level criterion improves slightly.
5. The doctor's knowledge of the community increases by 30%.
6. The doctor's goal orientation remains the same.

This run provides many of the improvements found in the high goal case (Run 2). The ability to communicate increases the patient's perception of treatment which in turn increases the desire to continue treatment. The continuation of treatment is responsible for a large percentage of the increase in the medical level criterion. The other contribution to the medical level criterion is the improved diagnostic ability of the doctor due to better communication with the patients.

RUN 4 - The Nurse and Family Health Worker Have High Goal Orientations

The changed value is:	<u>Old</u>	<u>New</u>
Nurse's goal orientation	0.6	0.8

This run investigates the possibility that an increase in the goal orientation of the nurse is sufficient to cause a significant improvement in the operation of the health team. Attitude awareness programs and other nurse training could be carried on in nurse practitioner programs before the nurse joins the health center. A greater change in goal orientation might be possible since nurses appear to be more flexible in terms of being more readily able to change their attitudes.

The results in comparison with the base run and by the 80th week are:

1. The community demand drops slightly.

2. The service demand and the level of service remain the same.
3. The recognized value of the nurse increases 20%.
4. The patient perception of treatment is the same.
5. Both the service level criterion and the medical level criterion remain the same.

The overall improvement resulting from the change in the nurse's goal orientation is not significant. The nurse has adjusted to the operation in the center and the pressures bring the responses back to a normal range. There is a threshold effect which requires an increase of the entire team goal orientation to shift in order to obtain significant improvement. While the model is basically described as the interrelation of responses and pressures, the structure of the model causes the output of the health team to be less correlated with the changes which occur with individual members.

RUN 5 - Increasing The Family Health Worker Skill Level In A Highly
Community Goal Oriented Health Team

The changed values are:	<u>Old</u>	<u>New</u>
Family health worker skill level	0.5	0.8
Goal orientation of nurse	0.6	0.8
Goal orientation of doctor	0.2	0.8

In all previous runs the recognized value of the family health worker declines to zero between the 23rd week and the 57th week. Since

many actual communities do not reject the family health worker, it is necessary to see whether the model has been constructed so that it is possible to increase the value of the family health worker.

The results by the 80th week are:

1. The recognized value of the family health worker rises to nearly 1 by the end of the period.
2. The amount of communication the rest of the health team accepts from the family health worker rises by a factor of 7 over the value found for accepted communication in Run 2 (the all high goal run).
3. The medical level criterion rise significantly (52% increase) over the final level of the all high goal run.
4. The patient perception of treatment rises 50% over the all high goal run.
5. The level of service criterion at the end is once again approximately the same as the base run.

This run demonstrates again the critical nature of the initial conditions in determining the operation of the model. The run also demonstrates that the recognized value of the family health worker is not always forced to a low value.

The marked improvement in the medical level criterion is due to a number of factors. Increased communication from the family health worker leads to better information on which to base help and treatment. The overall increases in the recognized value of the health team members

provides a higher perception of treatment as well as some actual quality improvement. The perception once again leads to a greater desire to continue treatment, thus improving its effectiveness.

RUN 6 - Increasing The Doctor's Desire For Greater Nurse Responsibility

The changed values are:	<u>Old</u>	<u>New</u>
Amplitude of desire (AMPL)	0.0	0.8
Time at which the decision is made (STTM)	-	10 weeks

The decision to increase the nurse's responsibility was made in the 10th week of the model run. The expected effect is that the nurse will increase the amount of medical treatment duties. However, the change in medical duties depends on the self-confidence of the nurse, her desire for additional duties, and the community acceptance of her modified role.

The results in comparison with the base run and by the 80th week are:

1. The community level of acceptance of nurse medical work is virtually the same.
2. The level of nurse medical treatment is virtually unchanged (slight increase).
3. No major differences were found between this run and the base run.

The major reason for little change in the level of nurse medical treatment is the relatively low level of the nurse's desire to take on additional medical duties and only a moderate acceptance by the

community during the 80 week period.

**RUN 7 - Informing The Patients As Well As Increasing The Doctor's Desire
For Nurse Medical Responsibilities**

The changed values are:	<u>Old</u>	<u>New</u>
Level of desire	0.0	0.8
Time at which decision is made (STTM)	-	10 weeks
Decision to promote nurse to community (SWT1 = 0, zero implies yes)	1	0

In the previous run (Run 6) the doctor encouraged the nurse to assume greater medical responsibilities, but he made no effort to prepare the community for the nurse's changing role. In this run the doctor praises the nurse's medical ability to the patients of the health center. The goal of the doctor's effort is to make the nurse's role change as easy as possible by preparing community acceptance.

The results by the 80th week are:

1. An increase of 40% over Run 6 in the level of community awareness of the nurse's medical ability.
2. Community demand begins to fall below the values in Run 6 after the 60th week. By the end of the run there is a 6% decrease in the level of community demand over that in Run 6.
3. The level of nurse medical treatment increases significantly over that of Run 6.

4. The recognized value of the nurse increases by 33% over both the base run and Run 6.
5. The medical level criterion and the service level criterion are essentially the same as the base run.

Comments on the Model Runs and Results

Once again it is important to stress the limited validity of the present values and coefficients used in this model. Much work still needs to be done; however, the general nature of the changes which occur in the model are representative of the trends which this model predicts. To use this model to determine concepts of policy alternatives will depend greatly on the initial conditions of the health center. This is demonstrated by the difference in results between the original goal case and the all high goal case. Since there are many functions in the model which have a "critical" nature, i.e. the value of the output changes much more rapidly as the input to this function passes through a certain range of values, the structure of these functions must be better defined. The reader will also notice that many of the runs involve initial value changes in the model. The reasoning behind the decision to change the model values in this manner is twofold; first, it is a policy consideration and secondly, these changes provide some bounds on the operational limits of the model without having to consider realistic times for change (further work is necessary to better define these times). The policy consideration is based on the normally high work load of the

health team. Many training sessions and other on-the-job training methods are at best difficult or impossible to implement due to the limited time the health team can or wishes to spend on training.¹ Therefore, one policy approach would be to attempt training and attitude awareness sessions before the staff joins the health center team; this is the approach chosen for many of the model runs.

The general trends in the model runs indicate, over the very long term, that the positive loops within the model may dominate behavior and attitudes. The simulated run time should be increased; however, the assumption of a constant morbidity rate as seen by the health team must be more rigorously justified to allow for longer run lengths. In addition, health centers are often located in communities which are in a state of economic transition. The present model does not account for community attitude or goal orientation change which results from the changing economic and social characteristics of the community.

Future runs of the model should include changes which can occur within a practicing health center. The model with minor modifications should easily lend itself to intervention approaches as practiced by behavioral psychologists. This may be accomplished by providing functions which allow for increases in communication between team members and also lower the negative pressures which result from differences in goal orientation between team members.

¹Dr. Solomon J. Fleishman, (former Medical Director of Columbia Point Health Center, Dorchester, Mass.), private interview held at the Harvard Community Health Plan, Boston, Mass., January, 1973.

Final Comments

The results of the model are encouraging. The general characteristics of the model appear to relate to empirical observations of health centers. The model is capable of demonstrating significant improvement in performance for a given policy under one set of circumstances and little or no improvement if the initial conditions are different. This model can be used to simulate different results from empirical studies of the behavior of two different health centers given the same policy at both centers. Further, the model formulation has provided the author with a cohesive conceptualization of the interrelationships which abound in a community health team and their relationships with the center administration and the community. In addition, the model provides the ability to manipulate both structures and values to determine possible outcomes of policy decisions. It is hoped that the dynamic model structure can provide a similar benefit to others who are interested in this area of health care. Should further work be carried on in the development of this model, the model development team should be composed of people from a number of diverse fields. The team might ideally be composed of a systems dynamics practitioner, members of community health teams, a representative of the community which the health team serves, and a behavioral psychologist to promote the operation of the team and provide the theoretical background of interpersonal interactions.

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APPENDIX A

ADVOCACY SEGMENT

$NADV.K = (1 - TO.K) * (1 - PUNA.K) * CGN.K$ 59, A
 NADV - NURSE ADVOCACY
 TO - TEAM GOAL ORIENTATION
 PUNA - PRESSURE ON NURSE ADVOCATE
 CGN - ORIENTATION OF GOALS OF NURSE

$FADV.K = (1 - TO.K) * (1 - PUFA.K) * UGFHW.K$ 60, A
 FADV - FHW ADVOCACY
 TO - TEAM GOAL ORIENTATION
 PUFA - PERCENT PRESSURE ON FHW
 UGFHW - GOAL ORIENTATION OF FHW

$ADVS.K = NADV.K + FADV.K$ 61, A
 ADVS - ADVOCACY SUPPORT
 NADV - NURSE ADVOCACY
 FADV - FHW ADVOCACY

$CAWAR.K = CAWAR.J * (DI) (ADVS.J - CAWAR.J / LRAWR) (1 - CAWAR.J) / TAD$ 62, L
 TAD=10 62.1, C
 LRAWR=5.2 62.2, C
 CAWAR - COMMUNITY AWARENESS OF RIGHTS
 ADVS - ADVOCACY SUPPORT
 LRAWR - LOSS RATE PERIOD RELATIVE TO TAD
 TAD - TIME DELAY ASSOC. WITH GAINING AWARENESS

$CDMND.K = CAWAR.K * TABHL(CDM, (LUS.K * RUBC.K), 0, 1, 0.2)$ 63, A
 $CDM = 1 / 1.8 / .6 / .4 / 0$ 63.1, T
 CDMND - COMMUNITY DEMAND
 CAWAR - COMMUNITY AWARENESS OF RIGHTS
 CDM - COMMUNITY DEMAND VS PERCEIVED LEVEL OF SERVICE
 LOS - LEVEL OF SERVICE
 RUBC - RECOGNIZED USEFULNESS BY COMMUNITY

$POST.K = TC.K * CDMND.K + (1 - TO.K) * ADVS.K$ 64, A
 POST - PRESSURE ON STAFF (MEDICAL AND ADMIN.)
 TO - TEAM GOAL ORIENTATION
 CDMND - COMMUNITY DEMAND
 ADVS - ADVOCACY SUPPORT

$PPOST.K = SMOOTH(POST.K, PPST)$ 65, A
 PPST=3 65.1, C
 PGFA=0 65.2, N
 PCNA=0 65.3, C
 PPOST - PERCEIVED PRESSURE ON STAFF
 POST - PRESSURE ON STAFF (MEDICAL AND ADMIN.)
 PPST - DELAY IN PERCEPTION OF PRESSURE
 PUFA - PERCENT PRESSURE ON FHW
 PCNA - PRESSURE ON NURSE ADVOCATE

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$FCNA.K = PPN * NRST.K$ 75, A
 PUNA - PRESSURE ON NURSE ADVOCATE
 PPN - PERCENT PRESSURE ON NURSE
 NRST - NEGATIVE REACTION OF STAFF

$PCFA.K = PPF * NRST.K$ 76, A
 PUFA - PERCENT PRESSURE ON FHW
 PPF - PERCENT PRESSURE ON FHW
 NRST - NEGATIVE REACTION OF STAFF

$FDAN.K = (PCNA.K * (1 - PUNA.K) * 4 + OGN.K / LUS.K) / 2$ 77, A
 FDAN - FRUSTRATION DUE TO PRESSURE ON NURSE
 PCNA - PRESSURE ON NURSE ADVOCATE
 OGN - ORIENTATION OF GOALS OF NURSE
 LUS - LEVEL OF SERVICE

$FDAF.K = (PCFA.K * (1 - PUFA.K) * 4 + OGFHW.K / LUS.K) / 2$ 78, A
 PFN=0.5 78.1, C
 PPF=0.5 78.2, C
 FUTOU=J.333 78.3, C
 ACJ20=1 78.4, C
 FDTOF=0.333 78.5, C
 CWRX=.3 78.6, C
 CWRAR=CWRX 78.7, N
 FDTCN=J.333 78.8, C
 FDAF - FRUSTRATION DUE TO PRESSURE ON FHW
 PUFA - PERCENT PRESSURE ON FHW
 OGFHW - GOAL ORIENTATION OF FHW
 LOS - LEVEL OF SERVICE
 PPN - PERCENT PRESSURE ON NURSE
 PPF - PERCENT PRESSURE ON FHW
 FDTOF - FRACTION OF ADDITIONAL DUTIES TAKEN ON BY DOCTOR
 CWRX - INITIAL VALUE OF COMMUNITY AWARENESS
 CWRAR - COMMUNITY AWARENESS OF RIGHTS
 FDTCN - FRACTION OF ADDITIONAL DUTIES TAKEN ON BY NURSE

DOCTOR - COMMUNITY SEGMENT

$A = CATD * NEFF + FEFF$ 79.6, N
 $B = RVD + 0.5 * RVN + 0.5 * RVFW$ 79.7, N
 $ECT = A * (0.8 + 0.2 * ((D/2) + A * ADJ6 * J.9) / 2) * ADJ6$ 79.8, N
 DATD - DOCTOR'S ABILITY TO DIAGNOSE
 NEFF - NURSE EFFECTIVENESS
 FEFF - FHW EFFECTIVENESS
 RVD - RECOGNIZED VALUE OF DOCTOR
 RVN - RECOGNIZED VALUE OF NURSE
 RVFW - RECOGNIZED VALUE OF FHW
 ECT - EFFECTIVE OPERATION OF COURSE OF TREATMENT
 ADJ6 - NORMALIZING FACTOR

$TWPAT.K = TABHL(TWP, EWURK.K, 0, 2, 0.4)$ 80, A
 TWPAT - TIME WITH PATIENT
 TWP - NORMAL VALUE OF DOCTOR'S WORKLOAD
 EWURK - PERCENTAGE EXTRA WORK

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$E_{WCRK.K} = \frac{NUMNO * LSWSI * K * (DWCRK.K + NMT.K)}{(SUMNO.K * NLSWS * N(WOR))}$ 81, A
 $TWP = 0.325 / 0.006 / 1 / 1 / 1$ 81.1, T
 $NDWOR = DWOR + NMI$ 81.2, N
 $NUMNO = SUMNO$ 81.3, N
 $NLSWS = LSWSI$ 81.4, N

EWCRK - PERCENTAGE EXTRA WORK
 NUMNO - NORMAL VALUE OF SERVICE DEMAND
 LSWSI - LEVEL OF SERVICE WITHOUT STAFF IMPROVEMENT
 DWCRK - LEVEL OF WORK PERFORMED BY DOCTOR
 NMT - LEVEL OF NURSE MEDICAL TREATMENT
 SUMNO - SERVICE DEMAND
 NLSWS - INITIAL VALUE OF SERVICE WITHOUT STAFF IMPROVEMENT
 TWP - NORMAL VALUE OF DOCTOR'S WORKLOAD

$DKOP.K = \frac{ADJ4 * (ADJ3 * TWPAT.K * (DATC.K + 0.75) + FINF.K + IINF.K)}{1}$ 82, A
 DKOP - DOCTOR'S KNOWLEDGE OF PATIENT
 ADJ4 - NORMALIZING FACTOR
 ADJ3 - NORMALIZING FACTOR
 TWPAT - TIME WITH PATIENT
 DATC - DOCTOR'S ABILITY TO COMMUNICATE WITH PATIENTS
 FINF - FORMAL INFORMATION FLOW
 IINF - INFORMAL INFORMATION FLOW

$DATC.K = \frac{ADJ5 * TWPAT.K * (1 + DATC.K)}{1}$ 83, A
 DATC - DOCTOR'S ABILITY TO DIAGNOSE
 ADJ5 - NORMALIZING FACTOR
 TWPAT - TIME WITH PATIENT
 DATC - DOCTOR'S ABILITY TO COMMUNICATE WITH PATIENTS

$DATC.K = \frac{DATC.J + (DT)(RDATC.JK)(DATC.J)}{TTCCD}$ 84, L
 DATC - DOCTOR'S ABILITY TO COMMUNICATE WITH PATIENTS
 RDATC - RATE OF CHANGE OF DOCTOR'S ABILITY TO COMMUNICATE
 TTCCD - TIME TO CHANGE DOCTOR'S KNOWLEDGE OF COMMUNITY

$RDATC.KL = \frac{(1 - DATC.K)(DKOCL.K * DKOP.K - TABLE(RDT, TWPAT.K, 0, 1, 0.2))}{1}$ 85, R
 $RDT = 1 / .8 / .6 / .4 / .2 / 0$ 85.1, T
 $TTCCD = 26$ 85.2, C
 RDATC - RATE OF CHANGE OF DOCTOR'S ABILITY TO COMMUNICATE
 DATC - DOCTOR'S ABILITY TO COMMUNICATE WITH PATIENTS
 DKOCL - DOCTOR'S KNOWLEDGE OF COMMUNITY
 DKOP - DOCTOR'S KNOWLEDGE OF PATIENT
 RDT - RATE VS TIME WITH PATIENT
 TWPAT - TIME WITH PATIENT
 TTCCD - TIME TO CHANGE DOCTOR'S KNOWLEDGE OF COMMUNITY

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CGD.K=UGD.J+(LT)(DMSAT.J-DFRST.J)(TU.J)(DKOC.J)(1- 93, L
 OGD.J)(CGD.J)/TTCG
 TTCG=52 93.2, C
 OGD - ORIENTATION OF DOCTOR TO COMMUNITY
 DMSAT - DOCTOR SATISFACTION
 DFRST - DOCTOR'S FRUSTRATION
 TU - TEAM GOAL ORIENTATION
 DKOC - DOCTOR'S KNOWLEDGE OF COMMUNITY
 TTCG - TIME TO CHANGE DOCTOR'S GOALS

VD.K=DATC.K*THPAT.K/ETWP 94, A
 VD - VALUE OF DOCTOR
 DATC - DOCTOR'S ABILITY TO COMMUNICATE WITH
 PATIENTS
 THPAT - TIME WITH PATIENT
 ETWP - EXPECTED TIME WITH PATIENT

RVD.K=SMOOTH(VD.K,DRD) 95, A
 RVD - RECOGNIZED VALUE OF DOCTOR
 VD - VALUE OF DOCTOR
 DRD - DELAY IN WEEKS OF RECOGNITION OF DOCTOR

DTCT.K=TABLE(TCT,PPOT.K,0,1,0.2) 96, A
 TCT=.25/.40/.55/.70/.85/1 96.1, T
 DTCT - DESIRE TO CONTINUE TREATMENT
 TCT - DESIRE TO CONTINUE VS PATIENTS' PERCEPTION
 PPOT - PATIENT'S PERCEPTION OF TREATMENT

STR.K=TABHL(EO,EOT.K,0,1,0.1) 97, A
 EO=0.4/0.4/0.4/0.4/0.4/0.4/0.55/0.7/0.85/0.95/1 97.1, T
 STR - SUCCESSFUL TREATMENT RATE
 EO - SUCCESSFUL TREATMENT RATE VS EOT
 EOT - EFFECTIVE OPERATION OF COURSE OF TREATMENT

SFPC.K=TABHL(PT,TWPAT.K,0,1,0.2) 98, A
 PT=0/0/.33/.66/.99/1.0 98.1, T
 SFPC - SATISFACTION FROM PATIENT COMMUNICATION
 PT - PATIENT COMMUNICATION VS TIME WITH PATIENT
 TWPAT - TIME WITH PATIENT

PSTR.K=SMOOTH(STR.K,PTDEL) 99, A
 PSTR - PERCEIVED SUCCESSFUL TREATMENT RATE
 STR - SUCCESSFUL TREATMENT RATE

FDPTR.K=TABLE(PST,PSTR.K,0,1,0.1) 100, A
 PST=1/1/1/1/1/1/0.9/0.5/0.25/0.1/0 100.1, T
 FDPTR - FRUSTRATION DUE TO POOR TREATMENT RATE
 PSTR - PERCEIVED SUCCESSFUL TREATMENT RATE

DMSAT.K=(SFPC.K+UGD.K*PPOT.K)/2 101, A
 DMSAT - DOCTOR SATISFACTION
 SFPC - SATISFACTION FROM PATIENT COMMUNICATION
 CGD - ORIENTATION OF DOCTOR TO COMMUNITY
 PPOT - PERCEIVED PATIENTS' PERCEPTION OF TREATMENT

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SCOMP.K=TABHL(DM,DMSAT.K,0,1,0.1) 102, A
 SCOMP - DOCTOR SATISFACTION COMPENSATION FUNCTION
 DM - SATISFACTION COMPENSATION VS SATISFACTION
 DMSAT - DOCTOR SATISFACTION

DFRST.K=SCOMP.K*(NRST.K+DFDAC.K+FDPTR.K)/3 103, A
 DM=1/1/1/1/0.9/0.8/0.7/0.6/0.5/0.4/0.3 103.1, T
 DFRST - DOCTOR'S FRUSTRATION
 SCOMP - DOCTOR SATISFACTION COMPENSATION FUNCTION
 NRST - NEGATIVE REACTION OF STAFF
 DFDAC - DOCTOR FRUSTRATION DUE TO ADMIN. CONTROL
 FDPTR - FRUSTRATION DUE TO POOR TREATMENT RATE
 DM - SATISFACTION COMPENSATION VS SATISFACTION

PPPOT.K=SMOOTH(PPUT.K,DPDEL) 104, A
 PPPOT - PERCEIVED PATIENTS PERCEPTION OF TREATMENT
 PPOT - PATIENT'S PERCEPTION OF TREATMENT
 DPDEL - DELAY TIME FOR PERCEPTION OF PATIENTS
 ATTITUDE TO TREATMENT

FINF.K=FIN 105, A
 FINF - FORMAL INFORMATION FLOW

IINF.K=(DTCN.K+DTCF.K)/2 106, A
 DWORK=DWRKX+(1-CAMAN)*PNEDW*NMT 106.1, N
 DWRKX=0.8 106.2, C
 DRD=3 106.3, C
 DELSE=5 106.4, C
 DATC=DATCX 106.5, N
 DATCX=0.3 106.6, C
 DKCC=DKCCX 106.7, N
 DKCCX=.2 106.8, C
 PTDEL=2 106.9, C
 IINF - INFORMAL INFORMATION FLOW
 DTCN - NURSE'S DESIRE TO COMMUNICATE
 DTCF - DESIRE TO COMMUNICATE BY FHW
 DWORK - LEVEL OF WORK PERFORMED BY DOCTOR
 DWRKX - INITIAL VALUE OF DOCTOR'S WORKLOAD
 CAMAN - COMMUNITY AWARENESS OF MEDICAL ABILITY OF
 NURSE
 PNEDW - PERCENT NURSE WORK EQUIVALENT TO DOCTOR'S
 NMT - LEVEL OF NURSE MEDICAL TREATMENT
 DRD - DELAY IN WEEKS OF RECOGNITION OF DOCTOR
 DELSE - DELAY IN STAFF ESTIMATION
 DATC - DOCTOR'S ABILITY TO COMMUNICATE WITH
 PATIENTS
 DATCX - INITIAL VALUE OF DOCTOR'S ABILITY TO
 COMMUNICATE
 DKCC - DOCTOR'S KNOWLEDGE OF COMMUNITY
 DKCCX - INITIAL VALUE OF DOCTOR'S KNOWLEDGE OF
 COMMUNITY

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$FFRST.K = TABHL(FRT, INTER.K, 0, 2, 0.2)$ 121, A
 $FRT = J/.2/.4/.5/.58/.66/.71/.78/.86/.94/1$ 121.1, T
 FFRST - FHW FRUSTRATION
 INTER - INTERMEDIATE VARIABLE

$OGFHW.K = OGFHW.J * (DT) * (RCOGF.JK) * CGFHW.J$ 122, L
 OGFHW - GOAL ORIENTATION OF FHW
 RCOGF - RATE OF CHANGE OF GOAL ORIENTATION

$RCOGF.KL = (FKUC.K + (TU.K - OGFHW.K) * (1 - RVFW.K)) * (TO.K) * (1 - CGFHW.K) / AUJZ1$ 123, R
 RCOGF - RATE OF CHANGE OF GOAL ORIENTATION
 FKUC - FHW KNOWLEDGE OF COMMUNITY
 TU - TEAM GOAL ORIENTATION
 OGFHW - GOAL ORIENTATION OF FHW
 RVFW - RECOGNIZED VALUE OF FHW

$RFKCC.KL = (RIT.K - KLIT) * (1 - FKUC.K) * (FKUC.K) / TTCKF$ 124, R
 RFKOC - RATE OF CHANGE OF FHW KNOWLEDGE OF COMMUNITY
 RIT - RATE OF INFORMATION TRANSFER
 FKUC - FHW KNOWLEDGE OF COMMUNITY
 TTCKF - TIME TO CHANGE KNOWLEDGE OF COMMUNITY

$FKCC.K = FKCC.J * (DT) * (RFKOC.JK)$ 125, L
 $TTCKF = 52$ 125.1, C
 FKOC - FHW KNOWLEDGE OF COMMUNITY
 RFKOC - RATE OF CHANGE OF FHW KNOWLEDGE OF COMMUNITY
 TTCKF - TIME TO CHANGE KNOWLEDGE OF COMMUNITY

$RVFW.K = RVFW.J * (DT) * (FCIR.JK) * (1 - RVFW.J) * RVFW.J$ 126, L
 RVFW - RECOGNIZED VALUE OF FHW
 FCIR - RATE OF CHANGE OF RECOGNIZED VALUE

$RIT.K = (RVFW.K * 2.0 + RUBC.K) / 3$ 127, A
 RIT - RATE OF INFORMATION TRANSFER
 RVFW - RECOGNIZED VALUE OF FHW
 RUBC - RECOGNIZED USEFULNESS BY COMMUNITY

$FDIFF.K = MAX(PLSC.K - SPL.K, SPL.K - PLSC.K)$ 128, A
 FDIFF - DIFFERENCE BETWEEN PERCEPTIONS
 PLSC - PERCEIVED LEVEL OF SELF-COMPETENCE BY FHW

$FCIR.KL = GOP.K * FFEF.K * OGFHW.K - TABLE(FCI, CMDND.K, 0, 1, 0.2)$ 129, R
 $FCI = .1/.1/.1/.2/.6/1$ 129.1, T
 FCIR - RATE OF CHANGE OF RECOGNIZED VALUE
 GOP - GOALS OF POPULATION
 FFEF - FHW EFFECTIVENESS
 OGFHW - GOAL ORIENTATION OF FHW
 FCI - RATE OF CHANGE VS COMMUNITY DEMAND
 CMDND - COMMUNITY DEMAND

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CTCF.K=DTCF.J+(DT)(PLSC.J)(LCA.J)(1-FFRST.J)(1- 130, L
 DTCF.J)*DTCF.J
 DTCF - DESIRE TO COMMUNICATE BY FHW
 PLSC - PERCEIVED LEVEL OF SELF-COMPETENCE BY FHW
 LCA - LEVEL OF COMMUNICATION ACCEPTED
 FFRST - FHW FRUSTRATION

SPL.K=SMOOTH(SLF.K,DELSP) 131, A
 ADJ21=52 131.1, C
 ACJ7=1 131.2, C
 DELC=8 131.3, C
 ACJS6=1.0 131.4, C
 DSCF=8 131.5, C
 DELSP=4 131.6, C
 CTCF=0.2 131.7, N
 FKOC=FKOCX 131.8, N
 FKOCX=.8 131.9, C
 SLF - STAFF ESTIMATION OF PERFORMANCE OF FHW
 DELSP - DELAY IN PERCEPTION
 ADJ7 - NORMALIZING FACTOR
 DELC - DELAY IN LEVEL COMMUNICATED(PERCEIVED)
 ADJS6 - NORMALIZING FACTOR
 DTCF - DESIRE TO COMMUNICATE BY FHW
 FKOC - FHW KNOWLEDGE OF COMMUNITY
 FKOCX - INITIAL VALUE OF FHW KNOWLEDGE OF COMMUNITY

RVFW=0.5 132, N
 ADACI=1 132.1, C
 OGFHW=OGFMX 132.2, N
 OGFHX=0.8 132.3, C
 LS=0.5 132.4, C
 GOP=GOPX 132.5, N
 GOPX=0.4 132.6, C
 FWRK=FWRKX 132.7, N
 FWRKX=0.7 132.8, C
 FDIFF=0 132.9, N
 RVFW - RECOGNIZED VALUE OF FHW
 ADACI - ADJUSTMENT FACTOR ACI
 OGFHW - GOAL ORIENTATION OF FHW
 OGFMX - INITIAL VALUE OF FHW GOAL ORIENTATION
 GOP - GOALS OF POPULATION
 GOPX - INITIAL VALUE OF GOAL ORIENTATION OF
 COMMUNITY
 FWRK - LEVEL OF WORK PERFORMED BY FHW
 FWRKX - INITIAL VALUE OF FHW WORK LOAD
 FDIFF - DIFFERENCE BETWEEN PERCEPTIONS

FINANCIAL - ADMINISTRATIVE

SEGMENT

FINR.K=FINP.K/OPCST.K 134, A
 FINR - FINANCIAL RATIO
 FINP - FINANCIAL POSITION
 OPCST - OPERATING COST OF CENTER

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$LFINA.K = (1.0 - EBUA) * PLOST.K$ 151, A
 LFINA - NUMBER LOST OF FINANCIALLY ABLE
 EBUA - ECONOMIC BASE OF AREA (THOSE WHO CANNOT PAY)
 PLOST - PERCENT OF FINANCIALLY ABLE WHO HAVE BEEN LOST

$PTCCP.K = (EPTC.K + ADVS.K) (COMMND.K) / 2$ 152, A
 PTCCP - PRESSURE TO CHANGE OPERATION
 EPTC - DOCTORS PRESSURE TO CHANGE
 ADVS - ADVOCACY SUPPORT
 COMMND - COMMUNITY DEMAND

$OPTCA.K = SMOOTH(PTCCP.K, PDEL.K)$ 153, A
 OPTCA - DELAYED PRESSURE TO CHANGE ADMIN
 PTCCP - PRESSURE TO CHANGE OPERATION
 PDEL - PERCEPTION DELAY

$DPTC.K = (NRST.K + 1) * OGD.K / (2 * (1 + LCS.K))$ 154, A
 DPTC - DOCTORS PRESSURE TO CHANGE
 NRST - NEGATIVE REACTION OF STAFF
 OGD - ORIENTATION OF DOCTOR TO COMMUNITY
 LCS - LEVEL OF SERVICE

$PDEL.K = NPC * (1 + AFRST.K)$ 155, A
 PDEL - PERCEPTION DELAY
 NPC - NORMAL PERCEPTION DELAY
 AFRST - ADMIN. FRUSTRATION LEVEL

$PFRST.K = SMOOTH(FRST.K, ADMAN.K)$ 156, A
 PFRST - PERCEIVED STAFF FRUSTRATION BY ADMIN.
 FRST - AVERAGE FRUSTRATION LEVEL OF STAFF
 ADMAN - ADMIN. AWARENESS DELAY

$AFRST.K = AFRST.J + DT * RAFR.K / JK$ 157, L
 AFRST - ADMIN. FRUSTRATION LEVEL
 RAFR - RATE OF CHANGE OF ADMIN. FRUSTRATION

$ADMAN.K = NAW + AFRST.K$ 158, A
 ADMAN - ADMIN. AWARENESS DELAY
 NAW - NORMAL AWARENESS
 AFRST - ADMIN. FRUSTRATION LEVEL

$LSWSI.K = LSWSI.J + (DT) * ((PTCBS.J / ROI) - CSDMD.J)$ 159, L
 LSWSI - LEVEL OF SERVICE WITHOUT STAFF IMPROVEMENT
 PTCBS - PRESSURE TO CHANGE BASIC LEVEL OF SERVICES
 ROI - RATE OF INCREASE
 CSDMD - CHANGE IN SERVICE DEMAND (PERCENT)

$ASC.K = ASC.J + (DT) * (CWORK.K / JK)$ 160, L
 ASC = 0 160.1, A
 ASC - ADDITIONAL SERVICE CAPACITY
 CWORK - RATE OF CHANGE OF TEAM WORK LOAD

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$CWGRK.KL = (DCIw.JK + FCIw.JK + NCIw.JK) / 3$ 161, R
 CWGRK - RATE OF CHANGE OF TEAM WORK LOAD
 DCIw - RATE OF CHANGE IN WORK OF DOCTOR
 FCIw - RATE OF CHANGE OF WORK BY FHW
 NCIw - RATE OF CHANGE IN WORK OF NURSE

$VACST.K = CPLSP * LSWSI.K$ 162, A
 VACST - VARIABLE COST/PATIENT
 CPLSP - COST PER LEVEL OF SERVICE PER PERSON
 LSWSI - LEVEL OF SERVICE WITHOUT STAFF IMPROVEMENT

$LOS.K = LSWSI.K + NSERV * INTSL * ASC.K / (LSWSI.K * SDMNC.K)$ 163, A
 LOS - LEVEL OF SERVICE
 LSWSI - LEVEL OF SERVICE WITHOUT STAFF IMPROVEMENT
 NSERV - NUMBER SERVED PER GIVEN SERVICE LEVEL
 INTSL - INITIAL SERVICE LEVEL
 ASC - ADDITIONAL SERVICE CAPACITY
 SDMNC - SERVICE DEMAND

$RUBC.K = (RVD.K + RVN.K + RVFw.K) / 3.0$ 164, A
 RUBC - RECOGNIZED USEFULNESS BY COMMUNITY
 RVD - RECOGNIZED VALUE OF DOCTOR
 RVN - RECOGNIZED VALUE OF NURSE
 RVFw - RECOGNIZED VALUE OF FHW

$PTCBS.K = ACPRB.K * (CLIP(DPTCA.K, 0, FINPR.K, 0) * CLIP(0, (1 - DPTCA.K), FINPR.K, 0) + 1) * 0.5 * FINR.K * CLIP(1, VAL.K, FINR.K, 0) * CLIP(VAL2.K, 1, FINR.K, 0)$ 165, A
 PTCBS - PRESSURE TO CHANGE BASIC LEVEL OF SERVICES
 ACPRB - DELAYED PRESSURE TO CHANGE ADMIN
 DPTCA - DELAYED PRESSURE TO CHANGE ADMIN
 FINR - FINANCIAL RATIO

$VAL.K = TABFL(LIM, LOS.K, 0, 1, 0.2)$ 166, A
 $LIM = 0/0/0.3/0.9/0.95/1$ 166.1, T
 LOS - LEVEL OF SERVICE

$VAL2.K = TABHL(LIM2, LOS.K, 0, 2, 0.2)$ 167, A
 $LIM2 = 1/1/1/1/1/1/0.95/0.99/0.5/0.3/0$ 167.1, T
 LOS - LEVEL OF SERVICE

$RAFR.KL = (DPTCA.K + PFRST.K - EXLC.K) * TABLE(NPR, FINPR.K, -1, 1, 0.2) * PCIF * (1 - AFRST.K) / (AFRST.K)$ 168, K
 $PCIF = J.05$ 168.2, C
 RAFR - RATE OF CHANGE OF ADMIN. FRUSTRATION
 DPTCA - DELAYED PRESSURE TO CHANGE ADMIN
 PFRST - PERCEIVED STAFF FRUSTRATION BY ADMIN.
 EXLC - EXPECTED LEVEL OF COMMUNITY DEMAND
 AFRST - ADMIN. FRUSTRATION LEVEL

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EXLC.K=SMOOTH((DPTCA.K+PFKST.K-NORMC),SMD)+NORMC 169, A
 SMD=52 169.1, C
 NORMC=DPTCA+PFKST 169.2, N
 NPK=.3/.34/.38/.42/.46/.5/.57/.9/1/1/1 169.3, T
 FF=C/0/0/0.2/0.5/1.0 169.4, T

EXLC - EXPECTED LEVEL OF COMMUNITY DEMAND
 DPTCA - DELAYED PRESSURE TO CHANGE ADMIN
 PFKST - PERCEIVED STAFF FRUSTRATION BY ADMIN.
 NORMC - INITIAL VALUE OF EXPECTED FRUSTRATION

FFDAC.K=TABLE(FF,AFKST.K,0,1,0.2) 170, A
 FFDAC - FFW FRUSTRATION DUE TO ADMINISTRATIVE
 CONTROL
 AFRST - ADMIN. FRUSTRATION LEVEL

NFDAC.K=TABLE(DF,AFKST.K,0,1,0.2) 171, A
 DF=J/0/0.2/J.4/0.8/1.0 171.1, T
 NFDAC - NURSE FRUSTRATION DUE TO ADMIN. CONTROL
 AFRST - ADMIN. FRUSTRATION LEVEL

DFDAC.K=TABLE(DF,AFKST.K,0,1,0.2) 172, A
 NAW=4 172.1, C
 AFRST=0.2 172.2, N
 LSWSI=1 172.3, N
 DFDAC - DOCTOR FRUSTRATION DUE TO ADMIN. CONTROL
 AFRST - ADMIN. FRUSTRATION LEVEL
 NAW - NORMAL AWARENESS
 LSWSI - LEVEL OF SERVICE WITHOUT STAFF IMPROVEMENT

NURSE SEGMENT

NSDT.K=NDTMD.K*(NMT.K-CAMAN.K) 174, A
 NSDT - SATISFYING RESPONSE
 NDTMD - NURSE'S DESIRE TO TAKE OVER DUTIES
 NMT - LEVEL OF NURSE MEDICAL TREATMENT
 CAMAN - COMMUNITY AWARENESS OF MEDICAL ABILITY OF
 NURSE

NSDTP.K=SMOOTH(NSDT.K,NSDEL) 175, A
 NSDEL=10 175.1, C
 NSAT=(RVN*OGN+1.0)/2 175.2, N
 NSDTP - NURSE SATISFACTION DUE TO PERCEPTION OF
 COMMUNITY RESPONSE
 NSDT - SATISFYING RESPONSE
 NSDEL - DELAY IN PERCEIVING RESPONSE
 NSAT - NURSE SATISFACTION
 RVN - RECOGNIZED VALUE OF NURSE
 OGN - ORIENTATION OF GOALS OF NURSE

NS.K=TABLE(N,NSDTP.K,-1,+1,0.2) 176, A
 N=1/1/1/1/1/1/1/1/0.75/0.5/0.25/0 176.1, T
 NS - ACTUAL SATISFACTION DUE TO COMMUNITY
 NSDTP - NURSE SATISFACTION DUE TO PERCEPTION OF
 COMMUNITY RESPONSE

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$NEFF.K = NLSK.K * TABHL(TNW, NWORK.K, J, 1.2, 0.1) * \quad 185, A$
 $TABLE(NFF, NFRST.K, 0, 1, 0.2)$
 $NFF = 1/1/.85/.70/.55/.40 \quad 185.2, T$
 $TNW = 1/1/1/1/1/1/1/1/0.95/0.90/0.80/0.50/0.40/0.35 \quad 185.3, T$
 NEFF - NURSE EFFECTIVENESS
 NLSK - NURSE'S LEVEL OF SKILLS
 TNW - NURSE EFFECTIVENESS VS WORK LOAD
 NWORK - LEVEL OF WORK PERFORMED BY NURSE
 NFF - NURSE EFFECTIVENESS VS FRUSTRATION
 NFRST - NURSE FRUSTRATION

$RKCC.K = NKCC.J + (DT)(KNKC.JK)(1 - NKCC.J) \quad 186, L$
 NKCC - NURSE'S LEVEL OF KNOW. OF COMMUNITY
 KNKC - RATE OF CHANGE OF NURSE'S KNOWLEDGE OF COMMUNITY

$RNKCC.KL = (SLF.K * UGNI.K * FKCC.K * DTCF.K + RVN.K * RCTN - \quad 187, R$
 $NKCC.K) / TTKN$
 $TTKN = 52 \quad 187.1, C$
 RNKCC - RATE OF CHANGE OF NURSE'S KNOWLEDGE OF COMMUNITY
 SLF - STAFF ESTIMATION OF PERFORMANCE OF FHW
 UGNI - ORIENTATION OF GOALS OF NURSE
 FKCC - FHW KNOWLEDGE OF COMMUNITY
 DTCF - DESIRE TO COMMUNICATE BY FHW
 RVN - RECOGNIZED VALUE OF NURSE
 RCTN - RATE OF COMMUNICATION/WEEK TO NURSE
 NKCC - NURSE'S LEVEL OF KNOW. OF COMMUNITY
 TTKN - TIME TO CHANGE NURSE'S KNOWLEDGE OF COMMUNITY

$DMNEF.K = NEFF.K * NWORK.K \quad 188, A$
 DMNEF - DOCTOR'S MEASURE OF NURSE EFFECTIVENESS
 NEFF - NURSE EFFECTIVENESS
 NWORK - LEVEL OF WORK PERFORMED BY NURSE

$DPCN.K = SMOOTH(DMNEF.K, DNEFF) \quad 189, A$
 DPCN - DOCTOR'S PERCEPTION OF NURSE (PRAISE DELIVERED)
 DMNEF - DOCTOR'S MEASURE OF NURSE EFFECTIVENESS
 DNEFF - DELAY IN PERCEIVING VALUE

$PRVN.K = SMOOTH(RVN.K, DNR) \quad 190, A$
 PRVN - PERCEIVED RECOGNIZED VALUE OF NURSE
 RVN - RECOGNIZED VALUE OF NURSE
 DNR - DELAY IN PERCEPTION OF RECOGNIZED VALUE

$CPOP.K = DPNTC.K * RVD.K * 0.2 \quad 191, A$
 CPOP - COMMUNITY PERCEPTION OF PRAISE
 DPNTC - DOCTOR'S PRAISE OF NURSE TO COMMUNITY
 RVD - RECOGNIZED VALUE OF DOCTOR

$DINR.K = STEP(AMPL, STTM) \quad 192, A$
 DINR - DESIRE TO INCREASE NURSE RESPONSIBILITY
 AMPL - STRENGTH OF DESIRE TO INCREASE RESPONSIBILITY
 STTM - TIME AT WHICH INCREASE BEGINS

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$CPNMT.K = GCP.K * DPNMT.K$ 193, A
 CPNMT - COMMUNITY PERCEPTION OF NURSE MEDICAL TREATMENT
 GCP - GOALS OF POPULATION
 DPNMT - DELAYED PERCEPTION OF NURSE LEVEL OF MEDICAL TREATMENT

$CPNMT.K = SMOOTH(NMT.K, DPMT)$ 194, A
 DPNMT - DELAYED PERCEPTION OF NURSE LEVEL OF MEDICAL TREATMENT
 NMT - LEVEL OF NURSE MEDICAL TREATMENT

$CGNI.K = OGN.K$ 195, A
 CGNI - ORIENTATION OF GOALS OF NURSE
 OGN - ORIENTATION OF GOALS OF NURSE

$CGN.K = OGN.J + (DT)(KOGN.JK)$ 196, L
 OGN - ORIENTATION OF GOALS OF NURSE
 KOGN - RATE OF CHANGE OF NURSE GOAL ORIENTATION

$RCGN.KL = (NKOC.K)(1 - OGN.K)(TU.K)(CGN.K) / ADJ3J$ 197, R
 RCGN - RATE OF CHANGE OF NURSE GOAL ORIENTATION
 NKOC - NURSE'S LEVEL OF KNOW. OF COMMUNITY
 CGN - ORIENTATION OF GOALS OF NURSE
 TU - TEAM GOAL ORIENTATION
 ADJ3J - TIME REQUIRED TO CHANGE GOALS

$CRVN.KL = (CGN.K * NEFF.K * GCP.K + CAMAN.K * GCP.K - RVN.K) / 2$ 198, R
 CRVN - RATE OF CHANGE OF RECOGNIZED VALUE OF NURSE
 OGN - ORIENTATION OF GOALS OF NURSE
 NEFF - NURSE EFFECTIVENESS
 GCP - GOALS OF POPULATION
 CAMAN - COMMUNITY AWARENESS OF MEDICAL ABILITY OF NURSE
 RVN - RECOGNIZED VALUE OF NURSE

$RVN.K = RVN.J + (DT)(CRVN.K)(1 - RVN.J) * RVN.J$ 199, L
 RVN - RECOGNIZED VALUE OF NURSE
 CRVN - RATE OF CHANGE OF RECOGNIZED VALUE OF NURSE

$SCCNF.K = SCCNF.J + (DT)(KSCNF.JK)(1 - SCCNF.J)$ 200, L
 SCCNF - LEVEL OF NURSE'S SELF CONFIDENCE
 KSCNF - RATE OF CHANGE OF SELF-CONFIDENCE

$RSCNF.KL = (1 - NWCKK.K)(DPQN.K + (1 - DWURK.K) + PRVN.K) / (3 * TTGSC)$ 201, R
 TTGSC = 13 201.1, C
 KSCNF - RATE OF CHANGE OF SELF-CONFIDENCE
 NWURK - LEVEL OF WORK PERFORMED BY NURSE
 DPQN - DOCTOR'S PERCEPTION OF NURSE (PRAISE DELIVERED)
 DWURK - LEVEL OF WORK PERFORMED BY DOCTOR
 PRVN - PERCEIVED RECOGNIZED VALUE OF NURSE
 TTGSC - TIME TO CHANGE SELF-CONFIDENCE (WEEKS)

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DTCN.K=(SCCNF.K+DPCN.K-NFRST.K)/2	207, A
PNEDW=0.75	207.1, C
ADJ30=52	207.2, C
ROCTN=0.1	207.3, C
CLSMT=0.2	207.4, C
SCCNF=0.3	207.5, N
NMT=0.1	207.6, N
CNEFF=4	207.7, C
DNR=6	207.8, C
NLS=0.7	207.9, C
DTCN	- NURSE'S DESIRE TO COMMUNICATE
SCCNF	- LEVEL OF NURSE'S SELF CONFIDENCE
DPCN	- DOCTOR'S PERCEPTION OF NURSE (PRAISE DELIVERED)
NFRST	- NURSE FRUSTRATION
PNEDW	- PERCENT NURSE WORK EQUIVALENT TO DOCTOR'S
ADJ30	- TIME REQUIRED TO CHANGE GOALS
ROCTN	- RATE OF COMMUNICATION/WEEK TO NURSE
CLSMT	- CHANGE IN LEVEL OF SKILL/AMOUNT OF MEDICAL TREATMENT WORK
NMT	- LEVEL OF NURSE MEDICAL TREATMENT
CNEFF	- DELAY IN PERCEIVING VALUE
DNR	- DELAY IN PERCEPTION OF RECOGNIZED VALUE
NLS	- NURSE'S SKILL LEVEL
AMPL=0	208, C
STTM=80	208.1, C
CFMT=8	208.2, C
NWCRK=NWRKX	208.3, N
NWRKX=0.8	208.4, C
DPDEL=4	208.5, C
CGN=CGNX	208.6, N
GGNX=.6	208.7, C
RVN=0.4	208.8, N
NKOC=NKOCX	208.9, N
AMPL	- STRENGTH OF DESIRE TO INCREASE RESPONSIBILITY
STTM	- TIME AT WHICH INCREASE BEGINS
NWCRK	- LEVEL OF WORK PERFORMED BY NURSE
NWRKX	- INITIAL VALUE OF NURSE'S WORKLOAD
DPDEL	- DELAY TIME FOR PERCEPTION OF PATIENTS ATTITUDE TO TREATMENT
CGN	- ORIENTATION OF GOALS OF NURSE
CGNX	- INITIAL VALUE OF NURSE'S GOAL ORIENTATION
RVN	- RECOGNIZED VALUE OF NURSE
NKOC	- NURSE'S LEVEL OF KNOW. OF COMMUNITY
NKOCX	- INITIAL VALUE OF NURSE'S KNOWLEDGE OF COMMUNITY

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NKOCX=.4 209.0
 CAMAN=CMNX 209.1, N
 SWTI=0 209.2, C
 CMNX=.2 209.3, C
 ADJSC=1 209.4, C
 PTSD=0.3 209.5, C
 PCPT=0.2 209.6, C
 NPD=4 209.7, C
 KLT=0.05 209.8, C

NKOCX - INITIAL VALUE OF NURSE'S KNOWLEDGE OF
 COMMUNITY
 CAMAN - COMMUNITY AWARENESS OF MEDICAL ABILITY OF
 NURSE
 CMNX - INITIAL VALUE OF COMMUNITY AWARENESS OF
 NURSE MED. DUTIES
 SWTI - C IF DOCTOR DECIDES TO INFORM COMMUNITY
 ADJSC - NORMALIZING FACTOR
 PTSD - FRACTION OF TIME SPENT BY DOCTOR DEVELOPING
 NURSE CONFIDENCE
 PCPT - PERCENT CHANGE IN PATIENT TREATMENT/WEEK
 NPD - NORMAL PERCEPTION DELAY

MEASR.K=LCS.K*SDMND.K 210. A

MEASR - LEVEL OF SERVICE CRITERION
 LCS - LEVEL OF SERVICE
 SDMND - SERVICE DEMAND

MECL.K=EOT.K*SDMND.K 211. A

MECL - MEDICAL TREATMENT CRITERION
 EOT - EFFECTIVE OPERATION OF COURSE OF TREATMENT
 SDMND - SERVICE DEMAND

NAME	NO	TYPE	DEFINITION	WHERE USED
A	79-6	N		EUT,N,79-8
AC1	131	A	ACCEPTANCE OF COMMUNICATED INFORMATION	LCA,A,112
ACAC1	132-1	C	ADJUSTMENT FACTOR AC1	ACT,A,111
ADCS1			ADDITIONAL ADMINISTRATIVE COSTS DUE TO FUNDING	
ADJSC	209-4	C	NORMALIZING FACTOR	LSU,A,110
ADJSF	131-4	C	ADJUSTMENT FACTOR OF STAFF ESTIMATION	SLE,A,109
ADJS6	38-4	C	NORMALIZING FACTOR	NMP,A,67
ADJ20	121-1	C		KCOF,R,123
ADJ21	121-1	C		KCOF,R,123
ADJ3C	127-2	C	TIME REQUIRED TO CHANGE GOALS	KOGR,R,197
ADJ4	107-6	C	NORMALIZING FACTOR	UKUP,A,82
ADJ5	107-5	C	NORMALIZING FACTOR	UKUP,A,82
ADJ6	107-8	C	NORMALIZING FACTOR	UATU,A,83
ADJ7	131-2	C	NORMALIZING FACTOR	EUT,N,79-8/EUT,A,86
ADMAM	158	A	ADMIN. AWARENESS DELAY	ATEA,A,114
ADP	145-1	C		PRST,A,156
ADPRB	145	A	LEVEL OF ADMIN. PROBLEMS	ADPRB,A,145
ADVS	61	A	ADVOCACY SUPPORT	PTCS,A,165
AFKST	157	L	ADMIN. FRUSTRATION LEVEL	CAMAK,L,62/PUST,A,64/PTCOP,A,152
APPL	174-2	N	STRENGTH OF DESIRE TO INCREASE RESPONSIBILITY	PULL,A,155/AUMAM,A,158/NAFR,R,168/FFJAC,A,170/NFJAC,A,171
ASC	160	L	ADDITIONAL SERVICE CAPACITY	DFJAC,A,172
ATE	160-1	N		DINK,A,192
B	114	A	ABILITY TO EDUCATE	LSU,A,163
BEGIN	79-7	N		GDP,L,118
CAMAN	51-2	C	THE TIME THE EMP. IS FIRST PRESENTED TO COMMUNITY AWARENESS OF MEDICAL ABILITY OF NURSE	EUT,N,79-8
CAMAK	209-1	N		PINF,A,91
CDM	62	L	COMMUNITY AWARENESS OF RIGHTS	DUNK,N,106-1/NSDT,A,174/CRVN,R,198/INWL,K,205/DUNK,A,206
COMNO	63-1	T	COMMUNITY DEMAND VS PERCEIVED LEVEL OF SERVICE	CUMNU,A,63
CEFF	65	A	COMMUNITY DEMAND	CUMNU,A,63
CESMT	207-4	C	CHANGE IN LEVEL OF SKILL/AMOUNT OF MEDICAL TREATMENT WORK	PUST,A,64/FLIN,K,129/PTCOP,A,152
CMAX	209-3	C	INITIAL VALUE OF COMMUNITY AWARENESS OF NURSE MED. DUTIES	UJTAP,A,163
CPISP	137-1	C	COST PER LEVEL OF SERVICE PER PERSON	CAMAN,N,209-1
CPMT	193	A	COMMUNITY PERCEPTION OF NURSE MEDICAL TREATMENT	VALST,A,162
CPGP	191	A	COMMUNITY PERCEPTION OF PRAISE	CAMAN,L,203
CRVN	158	K	RATE OF CHANGE OF RECOGNIZED VALUE OF NURSE	KVN,L,199
CSOMO	144	A	CHANGE IN SERVICE DEMAND(PERCENT)	LSNSI,L,159
CHCRK	161	K	RATE OF CHANGE OF TEAM WORK LOAD	ASU,L,160
CHRX	78-6	L	INITIAL VALUE OF COMMUNITY AWARENESS	CAMAK,N,78-7
CATC	64	L	DOCTOR'S ABILITY TO COMMUNICATE WITH PATIENTS	DRUP,A,82/DATU,A,83/NDATC,K,85/ROKUL,K,90/YD,A,94
CATCX	106-6	C	INITIAL VALUE OF DOCTOR'S ABILITY TO COMMUNICATE	UATC,N,106-5
CATU	63	A	DOCTOR'S ABILITY TO DIAGNOSE	A,N,79-6/EUT,A,86
DCIM	72	K	RATE OF CHANGE IN WORK OF DOCTOR	UMUNK,L,73/CHDK,K,161

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LSK	115	M	INITIAL LEVEL OF THE SKILLS	AL,A,114/FEFF,A,117
LSR1	159	L	LEVEL OF SERVICE WITHOUT STAFF IMPROVEMENT	EMUKK,A,81/MS,MS,M,81-4/INTSL,N,136-2/LUS,2,100-1/VALST,8,102/ELC,8,163
MEASH	172-3	N	LEVEL OF SERVICE CRITERION	MS,A,176
PEDL	211	A	A MEDICAL TREATMENT CRITERION	AUS,8,61
A	176-1	I	A NURSE ADJUDICALLY	AUM,8,176
NADV	59	A	NURSE ADJUDICALLY	MS,MS,8,177
NAM	172-1	C	NORMAL AWARENESS	MS,MS,8,177
NC	173-1	I	COMPLETION VS LEVEL OF SATISFACTION	MS,MS,8,177
NCFM	68	R	RATE OF CHANGE IN WORK OF NURSE	SUM,MS,8,177/SUM,MS,139-2
NCFW	130	A	CONTACTS PER WEEK PER PERSON INCREASE IN FUNDING	MS,MS,8,177
NCPVN	130-7	A	CONTACTS PER YEAR PER PERSON	MS,MS,8,177
NCPND	81-3	A	NORMAL VALUE OF SERVICE DEMAND	MS,MS,8,177
NDTRD	212	A	A NURSE'S DESIRE TO TAKE OVER LOCITY	MS,MS,8,177
NURCH	61-2	N	NURSE EFFECTIVENESS	MS,MS,8,177
NEFF	185	A	NURSE EFFECTIVENESS	MS,MS,8,177
NF	180-1	I	FRUSTRATION VS INTERMEDIATE VARIABLE	MS,MS,8,177
NFCAC	171	A	NURSE FRUSTRATION DUE TO ADMIN. CONTROL	MS,MS,8,177
NFF	185-2	I	NURSE EFFECTIVENESS VS FRUSTRATION	MS,MS,8,177
NFSI	189	A	NURSE FRUSTRATION	MS,MS,8,177
NIR	27-2	I	NEED FOR IMPROVEMENT VS LEVEL OF SERVICE	MS,MS,8,177
NIRP	67	A	NEED FOR IMPROVEMENT	MS,MS,8,177
NINT	179	A	INTERMEDIATE VARIABLE	MS,MS,8,177
NKCC	186	L	NURSE'S LEVEL OF KNOW. OF COMMUNITY	MS,MS,8,177
NKCCX	208-9	N	INITIAL VALUE OF NURSE'S KNOWLEDGE OF COMMUNITY	MS,MS,8,177
NLS	267-9	L	NURSE'S SKILL LEVEL	MS,MS,8,177
NLSK	184	A	NURSE'S LEVEL OF SKILLS	MS,MS,8,177
NLSNS	61-4	N	INITIAL VALUE OF SERVICE WITHOUT STAFF IMPROVEMENT	MS,MS,8,177
NMT	2-4	L	LEVEL OF NURSE MEDICAL TREATMENT	MS,MS,8,177
NMRMC	169-2	N	INITIAL VALUE OF EXPECTED FRUSTRATION	MS,MS,8,177
APD	209-7	L	NORMAL PERCEPTION DELAY	MS,MS,8,177
NPR	169-3	I	NORMAL PERCEPTION DELAY	MS,MS,8,177
NRST	66	A	NEGATIVE REACTION OF STAFF	MS,MS,8,177
NS	176	A	ACTUAL SATISFACTION DUE TO COMMUNITY	MS,MS,8,177
NSAT	175-2	N	NURSE SATISFACTION	MS,MS,8,177
NSCGM	177	A	NURSE SATISFACTION COMPENSATION FUNCTION	MS,MS,8,177
ASDEL	175-1	L	DELAY IN PERCEIVING RESPONSE	MS,MS,8,177
ASDT	174	A	SATISFYING RESPONSE	MS,MS,8,177
NSDTP	175	A	NURSE SATISFACTION DUE TO PERCEPTION OF COMMUNITY RESPONSE	MS,MS,8,177
NSERY	136-6	L	NUMBER SERVED PER GIVEN SERVICE LEVEL	MS,MS,8,177
NUR	17	L	PERSONS	MS,MS,8,177
NURBR	178	A	NUMBER OF PEOPLE IN SERVICE AREA	MS,MS,8,177
NWURK	69	L	LEVEL OF WORK PERFORMED BY NURSE	MS,MS,8,177
NWURK	208-3	N	LEVEL OF WORK PERFORMED BY NURSE	MS,MS,8,177
NWURK	208-4	C	INITIAL VALUE OF NURSE'S WORKLOAD	MS,MS,8,177
OGD	53	L	ORIENTATION OF DOCTOR TO COMMUNITY	MS,MS,8,177
OGD	107	N	ORIENTATION OF DOCTOR TO COMMUNITY	MS,MS,8,177
OGD1	107-1	L	INITIAL VALUE OF DOCTOR'S GOAL ORIENTATION	MS,MS,8,177
OGD1	88	A	ORIENTATION OF GOALS OF DOCTOR	MS,MS,8,177
OGFHM	122	L	GOAL ORIENTATION OF FHM	MS,MS,8,177
OGFHM	132-2	N	GOAL ORIENTATION OF FHM	MS,MS,8,177

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OGFH	132.3	C	INITIAL	VALU	OF	PHM	OGAL	ORIENTATI	106FH,N,132.2
UGN	150	L	ORIENTATI	ON	OF	GOALS	OF	NURSE	NAUV,A,59/FUAN,A,77/10,A,115/NSAT,N,175.2/NSAT,A,178/OGMI,A,195/ROGN,K,197/CRVN,N,198
CGM	208.6	N	INITIAL	VALU	OF	NURSE'S	OGAL	ORIENTATI	UGN,N,208.6
CGM1	155	A	ORIENTATI	ON	OF	GOALS	OF	NURSE	GNKUL,M,187
CJAP	183	A	SKILL	INCR	DUE	TO	MEDICAL	TREATM	WOKR
DPST	135	A	OPERATI	NG	COST	OF	CENTER		MLSKA,A,184
CVRF	136.4	C	OVERHEA	D	COSTS	OF	CENTER		FINKA,A,139/FINP,L,140
PAN			PERCEIV	E	ABILITIES	OF	NURSE		UPCST,A,135
PCIF	140.2	C	PERCENT	CHANG	E	IN	PATIENT	TREATM	WEEK
PCPT	204.6	C	PERCENT	CHANG	E	IN	PATIENT	TREATM	WEEK
PDEL	155	A	PERCEPTI	ON	DELA	Y	FRUSTRATI	ON	BY
PPRST	120	A	PERCEIVED	STAFF	FRUSTRATI	ON	BY	ADMIN.	
PINF	51	A	PROVIDE	D	INFORMATI	ON			
PL	148.1	T							
PLUS	147	A	PERCENT	OF	FINANCIAL	LY	ABLE	WFO	HAVE
FLOST	148	A	PERCENT	OF	FINANCIAL	LY	ABLE	WFO	HAVE
PLSC	110	A	PERCEIVED	LEVEL	OF	SELF-COMPET	ENCE	BY	PHM
FNEDM	207.1	C	PERCENT	NURSE	WOKR	EQUIVALE	NT	TO	DUCTOR'S
PUFA	76	A	PERCENT	NURSE	WOKR	EQUIVALE	NT	TO	DUCTOR'S
FCNA	75	A	PERCENT	NURSE	WOKR	EQUIVALE	NT	TO	DUCTOR'S
FEST	64	A	PERCENT	NURSE	WOKR	EQUIVALE	NT	TO	DUCTOR'S
PPF	78.2	C	PERCENT	NURSE	WOKR	EQUIVALE	NT	TO	DUCTOR'S
FPN	76.1	C	PERCENT	NURSE	WOKR	EQUIVALE	NT	TO	DUCTOR'S
FPST	67	A	PERCEIVED	PERCEP	TION	OF	TREATM		
PPUT	65	A	PATIENT'S	PERCEP	TION	OF	TREATM		
PFECT	104	A	PERCEIVED	PATIENT'S	PERCEP	TION	OF	TREATM	
PPST	65.1	C	DELA	Y	IN	PERCEP	TION	OF	PRESSURE
FRVN	150	A	PERCEIVED	ACCURATE	VALU	E	OF	NURSE	
PST	100.1	T							
PSTR	55	A	PERCEIVED	SUCCESS	FUL	TREATM	RATE		
PT	58.1	T	PATIENT	COMMUNICATI	ON	VS	TIME	WITH	PATIENT
PIAN			PERCENT	TIME	IN	ADMINISTRATI	ON		
PICUS	165	A	PERCENT	TIME	IN	ADMINISTRATI	ON		
PICEP	152	A	PERCENT	TIME	IN	ADMINISTRATI	ON		
PIDEL	100.9	C							
PISD	209.25	C	FRACTION	OF	TIME	SPENT	BY	DOCTOR	DEVELOPING
QUANT	51.1	C	AMOUNT	OF	INFORMATI	ON	PROVIDE	EXTERNAL	TO
RFR	169	K	RATE	OF	CHANG	E	OF	ADMIN.	FRUSTRATI
RCCGF	123	K	RATE	OF	CHANG	E	OF	GOAL	ORIENTATI
RCATC	25	K	RATE	OF	CHANG	E	OF	DOCTOR'S	ABILITY
RKUG	50	K	RATE	OF	CHANG	E	OF	DOCTOR'S	KNOWLEDGE
NDT	25.1	T	RATE	VS	TIME	WITH	PATIENT		
REKOL	124	K	RATE	OF	CHANG	E	OF	PHM	KNOWLEDGE
RII	127	A	RATE	OF	INFORMATI	ON	TRANSFER		
RAKUL	127	K	RATE	OF	CHANG	E	OF	NURSE'S	KNOWLEDGE
PUCTA	207.3	C	RATE	OF	COMMUNICATI	ON	WEEK	TO	NURSE
RCGN	157	K	RATE	OF	CHANG	E	OF	NURSE	OGAL
FCL	136.7	C	RATE	OF	INCR	EASE			
RSCVT	201	K	RATE	OF	CHANG	E	OF	SELF-COMPET	ENCE

