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The Impact of Formal Services to the Homebound Elderly on Informal Caregivers and the Level and Types of Services They Provide

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THE IMPACT OF FORMAL SERVICES TO THE HOMEBOUND ELDERLY ON INFORMAL CAREGIVERS AND THE LEVEL AND TYPES OF SERVICES THEY PROVIDE

by

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VITA

The author, Perry Edelman, is the son of Irving Edelman and Estelle (Wellen) Edelman. He was born March 8, 1952 in Brooklyn, New York.

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Mr. Edelman has been actively engaged in research in the area of aging. Through his work at Loyola University, he co-authored a number of technical reports and he published a chapter in Human Behavior in Fires entitled: "Application of 'A model of human behavior in a fire emergency' to the analysis of a nursing home fire." He has conducted research at the Chicago Office for Senior Citizens and Handicapped and at the Center for Health Services and Policy Research at Northwestern University. Mr. Edelman has presented findings from his studies at the Annual Meeting of the Gerontological Society of America and at the American Public Health Association Conference.

TABLE OF CONTENTS

Page

LIST OF TABLES

Table Page

Table Page

CONTENTS FOR APPENDICES

Introduction

Caring for the elderly in the United States is currently one of the most debated issues in both a political and personal sense. Politically, choices must be made regarding the best method of caring for an ever-expanding population of chronically ill elderly people. The "best" method includes not only consideration of the quality of care provided, but also includes the cost of such care and the needs of others who are vying for a share of the same limited resources. In a personal sense, caring for the elderly requires that choices be made by the family and friends of the infirm elderly. The decision to maintain the older person in the community -- either in his or her own home or the home of the caregiver -- requires sacrifices on the part of all involved. Currently, the family and friends of the homebound elderly provide the majority of assistance required to maintain older people in the community and out of nursing homes. These informal caregivers shoulder a heavy burden, a burden which typically becomes greater with time as the health of the older person deteriorates. Therefore, the "best" method of caring for the elderly also requires an assessment of what is best for informal caregivers.

Community care through the provision of a variety of services to the homebound elderly is a program at the center of this controversy regarding the care of the elderly. The impact of community care on informal caregivers has been used to argue for and against the expansion of community care services. Critics of the program argue

that community care replaces service (from informal caregivers) that incurs no direct public cost with service that does require public funding. Supporters argue that informal caregivers are doing all they can possibly do to assist the chronically ill elderly and that community care services often provide respite to informal caregivers that allows these individuals to maintain the elderly in the community and out of more expensive and less desirable nursing homes.

This study assessed the impact of community care service on informal cargivers and the service they provided to the homebound elderly by examining the relationship between the change in the level of formal service and change in the level of informal service. Both short term and long term assessments were made by studying changes over 9 months and 48 months. The impact of community care services on informal caregiving was evaluated in relation to other variables through the use of multivariate analysis.

Growth of the Elderly Population

In 1980 there were 25 million Americans over 65. The elderly have represented the fastest growing segment of the population in recent years, increasing twice as fast as the non-elderly population between 1960 and 1980 (Deming & Cutler, 1983).

In 1960 the elderly represented 9.3% of the total U.S. population. In 1980 they accounted for 11.2% of the population and by the year 2040 (just 54 years from now) it is estimated that they will compose 17.8% of the population (Liu, Manton & Alliston, 1983). This trend toward the "graying" of America is particularly striking in the

oldest age groups (75-84 and 85+), which have experienced even greater relative increases between 1960 and 1980, and will continue to outpace the "young old" in the future. Thus, not only is the elderly population getting larger in absolute numbers and larger as a proportion of the total population in the U.S., but the mean age of the elderly population is rising steadily as well.

Institutionalization

As a result of government policies, long term care of the frail elderly has often meant institutionalization, i.e., nursing home care under Medicaid funding for many older persons (Brownstein, Dillon & Hyman, 1983; Somers, 1982). The results of this system of care have been far from satisfactory. With limited in-home services available in the community, impaired elderly with few or depleted social and economic resources may have few options beyond residence in a nursing home. This can result in the premature institutionalization of chronically ill, older people. For example, social workers, physicians and nurses in one study estimated that between 16% and 30% of new Medicaid nursing home admissions in one month could have been avoided if in-home services had been available (Bell, 1973). Bradshaw, Brandenburg, Basham and Ferguson (1980) cite a report which indicated that 40% of institutionalized elderly do not need the type of services institutions provide.

Nursing home placement is generally considered undesirable by the elderly and their caregivers alike and is typically used as a last resort (Bell, 1973; Blenkner, 1965). Exposes in the media have

sensitized the general public to the depressing, degrading and sometimes dangerous conditions present in some nursing homes. In addition, the relative cost of nursing home care has increased dramatically in the United States. In 1950, the proportion of all costs related to direct patient care which was accounted for by nursing home care was 1.7%, in 1980 it was 9.4% and in 1990 it is projected to be 9.8%. This represents a 17% annual growth rate between 1950 and 1990, compared to an 11.7% rate for acute hospital care costs during the same time period (Freeland & Schendler, 1983). In dollar terms, nursing home care cost 0.2 billion dollars in 1950, 20.6 billion dollars in 1980 and is estimated to cost 67.1 billion dollars in 1990. The combination of increasingly more expensive care and a ballooning base of potential recipients is cause for great concern to policy makers in the United States.

Informal Care

The major alternative to nursing home care has been informal care provided by family and friends of the impaired elderly. The dominance of the informal care network has been well documented. Data obtained from the Home Care Supplement to the 1979 National Health Interview Survey indicated that nearly 90% of the elderly needing home care relied in some way on informal providers (Soldo, 1983). In addition, almost three fourths of these elderly were totally dependent on informal services. The extent of assistance provided by informal caregivers varies, but is substantial. Sangl (1983) notes an investigation of care given to the elderly by families before

institutionalization which found that the percentage of families providing regular help with different services was: shopping (72%), laundry, medical affairs and heavy cleaning (69%), cooking (58%), bathing (32%), dressing (21%) and using the toilet (12%). In terms of actual time involved in assisting the elderly, 20 to 30 hours per week were typically spent in providing affective and instrumental assistance. Another study cited by Sangl reported that 40% of children caring for an elderly parent in the same household spent the equivalent of a full-time job in their caregiving activities.

The effort expended by informal caregivers on behalf of the impaired elderly is not without consequences. The stress of this effort and competing responsibilities can become too much to bear and may lead to caregiver "burn out." An especially susceptible group of caregivers is what Brody (1981) calls "women in the middle," older women caring for an elderly parent as well as their own family. Although these individuals often experience financial hardship and decline in their own physical health from their caregiving activities, the most pervasive consequences are in the area of emotional strain (Brody, 1955; Cantor, 1983; Reece, Walz & Hageboeck, 1983). Not surprisingly, the amount of care provided and living with the dependent person are strongly related to strain and negative consequences of caregiving (Cantor, 1983; Reece, Walz & Hageboeck, 1983).

Formal In-Home Services

Provision of formal in-home services has been suggested as one solution to the problem. Formal services could provide overextended informal service providers with relief from some of their responsibilities, thereby reducing the caregivers' burden and also, possibly preventing the total collapse of the informal support system. The fear, however, is that formally provided in-home services (paid fully or in part by public funds) will replace or substitute for informally provided services which incur no direct cost to the general public. With an estimated 5.2 million people aged 65 and over living in the community and in need of long term care (Day, 1985), the potential cost of substituting formal services for informal services is great. Therefore, the impact of formal services upon the largest contributor of services to the elderly - family and friends - is of vital concern. Policy decisions regarding programs designed to meet the needs of the growing population of impaired elderly must be made with a clear understanding of the effect those decisions will have on informal caregivers.

Related Research

Evaluation of Unanticipated Consequences

The substitution of formal services for informal services can be described as an unanticipated consequence of the innovative service programs. Although few researchers have given it much emphasis, the need for vigilance regarding unanticipated program outcomes has been recognized for some time. Deutscher (1976) referred to a number of individuals who have demonstrated this awareness, including Merton as far back as 1957. More recently, Posavac and Carey (1985) have listed "learning about unintended effects" as one of six major reasons for conducting program evaluations. The same outcomes have been variously described as "external or third party effects," "secondary effects" and "side effects" (Cain & Hollister, 1972; Rossi & Freeman, 1982; Rutman, 1977). Rutman (1977) emphasized the use of formative evaluation -- which plays a major role in Scriven's goal-free evaluation (Scriven, 1967) -- as a means of identifying side effects of a program.

One goal of this study was to investigate a potential unanticipated consequence of a home care program, i.e., the replacement of services provided by family and friends with services provided by community care agencies (see "Method" section). This study evolved from a desire to learn more about the impact of home care on individuals other than the direct clientele, i.e., clients' families and friends ("third party effects"). Therefore, instead of analyzing data collected for the express purpose of assessing the

impact of home care on the family and friends of service recipients, this research capitalized on data collected for other purposes, but which, fortuitously, contained information relevant to the objectives of this study. In this sense, the researcher followed the advice of Talmage and Rasher (1980) who suggested conducting secondary analyses of available data to identify unanticipated outcomes.

Impact of Formal Services on Informal Care

Investigators disagree on what effect providing formal services to the elderly would have on pre-existant informal service provision. Few studies related to this question appear in the literature, and the interpretation of the research that does exist has been debated. Greene (1983) studied 140 impaired elderly clients of a comprehensive service program that had as its goal: "to provide in-home services to frail elderly individuals in order to delay or prevent institutionalization" (p. 612). He found evidence of a substitution effect - formal services replaced informal services - and he reported that unmet needs was a major variable in predicting both informal and formal support levels. In discussing the substitution effect, Greene suggested that the interpretation of this result as "good" or "bad" depended upon how one defined the proper role of formal services. If services were intended to compensate only those older individuals with an unmet need, substitution represented failure. However, if respite for informal caregivers was an appropriate outcome, then substitution may be considered successful. Greene also noted that specialization (i.e., shifting of effort from

one service to another by informal providers), not simple substitution, may have occurred. Unfortunately, an assessment of this process requires a measure of intensity of use of informal services over time, data which were not available to Greene.

Spivack and Capitman (1984) used a pretest-12 month posttest design to assess the impact of three community based long-term care programs on informal support. They found that targeting clients was important in determining outcomes. Supplementation, rather than substitution, was more likely for clients who were in imminent need of institutionalization.

Christianson and Stephens (1984) cited two studies in which substitution occurred, but they also note disagreement by some researchers as to the occurrence of substitution and its economic effect. For instance, one researcher claimed that by providing respite to informal caregivers, substitution of formal services for informal services would allow informal caregivers to continue providing care. This could prevent institutionalization of the elderly service recipient and thereby result in cost savings.

Relationship Between Formal and Informal Services

The complementary role played by formal and informal services has been stressed by some researchers (Carrilio & Eisenberg, 1983; Brownstein, Dillon & Hyman, 1983) who have concentrated on the importance of providing the right mix of formal and informal services. These researchers stress that formal services should supplement services provided by informal providers. Morris, Sherwood

and Morris (1984) found support for this position in their survey of 753 elderly community residents in Massachusetts who were identified as functionally vulnerable. These investigators concluded that formal services were required where the informal support system was weak, and even when the informal support system was strong, formal service appeared to make a difference as to whether overall needs were being met.

Some researchers (Litwak, 1966; Sussman, 1976) have emphasized the role of informal caregivers as buffers or links between the older person and community services. Sussman noted that informal caregivers act as a source of information regarding available resources and services, as well as mediators between the elderly and formal organizations. These same authors (Litwak, 1966; Sussman, 1977) have noted that there are certain functions and tasks which are performed better by formal agencies and other tasks which are performed better by informal caregivers. For instance, services requiring technical expertise, such as nursing care are more appropriately provided by trained professionals. On the other hand, as Carrilio and Eisenberg (1983) have suggested, informal caregivers are probably better able to meet the emotional needs of the frail elderly.

To summarize, this review of the literature indicates that a good deal of uncertainty exists in this area of research. Limitations of the data that were available to researchers is one cause of the confusion. Greene, for instance, was limited to data collected at one point in time and was not able to detect the occurrence of

specialization/reallocation. Spivack and Capitman's pre-post design did allow them to assess the incidence of specialization/reallocation as well as substitution and supplementation; however, their findings were based on changes in the number of areas of need which were unmet by informal caregivers. Their report did not provide an analysis for specific services, which would have been useful to service agencies, planners and decision-makers. The present study as described below addresses these limitations. The study assesses the incidence of specialization/reallocation and, in addition, examines the occurrence of substitution and supplementation for nine specific services.

Research Goals, Objectives and Hypotheses

Goals and Objectives

This study examined the relationship between formal and informal services provided to the chronically ill, homebound elderly. Specifically, it assessed the impact of formal services (i.e., those provided by private or public agencies) on the number and level of services provided by informal caregivers (family and friends). The services most often required to maintain the impaired elderly in a non-institutional setting (e.g., health care, personal care, household chores, transportation) were included in the analyses. The first goal of this research was to describe the number and types of services provided by service providers at baseline and posttest. The second goal was to evaluate the impact of community care service in terms of three processes; namely substitution, supplementation and specialization/reallocation. Substitution is the replacement of informal service provision by services from formal community care agencies. Substitution occurs when the level of formal service increases for a given service but the level of informal service provision decreases for the same service. Supplementation refers to the situation in which the level of informal service provision remains the same even though formal services are added. Specialization/reallocation is defined as a decrease in the level of informal service provision for one type of service, concommitant with an increase in the level of informal service provision for another service. This process assumes that informal caregivers specialize or reallocate

their efforts to a particular service or services. These processes are defined by asessing the source and amount of service at baseline and posttest, therefore they will be referred to as baseline-posttest service provider processes.

Substitution processes will be further differentiated into respite substitution and replacement substitution. This will be accomplished by defining respite substitution as substitution that occurs when the informal caregiver is likely to be in need of relief from their caregiving behavior. If respite is not likely to be required, substitution will be defined as replacement substitution. The distinction between respite and replacement substitution is important because, whereas respite substitution represents an intended, "third party effect" of the program, replacement substitution indicates a negative, unintended consequence of formal home services. The differentiation of these two types of substitution will help dispel some of the confusion concerning the meaning and impact of substitution of formal services for informal services.

The third goal of this research was to determine the impact of community care service on informal service provision in relation to other variables that might also influence informal caregiving. Finally, the influence of community care service upon specific aspects of the service recipient-informal service provider relationship was assessed.

The specific objectives of these analyses were:

(a) to describe the number and types of different services received at baseline, 9 month and 48 month posttest,

(b) to describe the bivariate frequency of service provider by type of service at baseline, 9 month and 48 month posttest,

(c) to describe the frequency of baseline-posttest service provider combinations at 9 month and 48 month posttest,

(d) to assess the occurrence of substitution, supplementation and specialization/reallocation at 9 month and 48 month posttest,

(e) to assess the relationship between the change in the number/level of service provided by home care agencies, in conjunction with other independent variables (e.g., demographics, health and functional status of service recipient), and number/level of services provided by informal caregivers at 9 month and 48 month posttest using multiple regression,

(f) to assess the relationship between formal service provision and (1) the number/level of visits and telephone calls received by the elderly service recipient from family and friends, and (2) the service recipient's self-reported satisfaction with the frequency of contact with his or her family.

Achieving these objectives will provide answers to the following questions:

(a) What services were provided?

(b) Who provided the services?

(c) What patterns of combinations of service providers occurred over time.

(d) Which service provider processes occurred?

(e) What is the impact of community care service on service provided by informal caregivers in relation to other potential determinants of informal care?

(f) What impact does formal service provision have on the service recipient-informal caregiver relationship?

Hypotheses

This study tested a number of hypotheses. Regarding predictions concerning which type of service provider (informal, formal or mixture of both) is most likely to provide specific types of services, the following hypotheses were investigated:

1. Services requiring special skills such as nursing care and physical therapy are more likely to be provided by only formal agencies at posttest. The proportion of clients receiving these services from only formal agencies will increase at posttest compared to baseline measurement.
2. Informal caregivers are better able to provide services such as housekeeper/homemaker, meal preparation, personal care and transportation than nursing care and physical therapy, and thus they are more likely to continue providing these services at posttest. However, since these services are targeted for provision by home care agencies, it is likely that these services will be provided by formal agencies as well.

Therefore, the proportion of clients receiving these services from both formal and informal providers or from formal providers alone will increase at posttest compared to baseline measurement.

3. The provision of information and referral, personal business/legal services and relocation services requires access to specific information about the service and a degree of personal involvement with the service recipient. Therefore, the proportion of clients receiving these services from both formal and informal providers or from formal providers alone will increase at posttest compared to baseline measurement.

Hypotheses 4 through 9 are relevant to baseline-posttest service provider processes. Hypothesis 4 refers to a "per person" assessment, i.e., assessing the pattern of results across services.

A "per person" assessment includes an evaluation of all services received by the client. Supplementation (as will be described in the "Method" section) includes cases in which a "new" service, i.e., a service which was not received at baseline, is provided at posttest by a formal service provider. Since all clients were obtained through one of two programs which provide community care to the elderly, it is likely that these clients had unmet needs at baseline. It is also likely that the community care programs attempted to meet those needs by providing the services that their clients lacked.

4. When assessed per person, supplementation will occur more frequently than substitution or specialization/reallocation at posttest.

Information was available for specific services, thus "per service" findings were assessed. The elderly repondent's need for service was one type of information available "per service."

However, due to ambiguity in the wording of the survey question, it is not possible to distinguish between the need for more service and the need for service which is currently being received. It is clear, however, that when the respondent indicated that there was no need for service, at minumum there was no need for additional service. A respondent who did not need additional service was unlikely to have received service from an agency in order to supplement the same service provided by family or friends. Rather, as stated in hypthesis 5, the formal service will substitute for informal care. Instead, the purpose of the service may have been to provide relief or respite to the informal caregiver as indicated by Hypothesis 6.

5. When assessed per service, and "no need for service" is reported at baseline, substitution is more likely to occur than supplementation.
6. When assessed per service, and "no need for service" is reported at baseline, the frequency of respite substitution will be higher than the frequency of replacement substitution.

I believe that the level of service being provided by many informal caregivers may be a physical and emotional burden to them, therefore, they are likely to be in need of respite. Thus, when substitution occurs, I hypothesize that it will more often take the form of respite substitution rather than replacement substitution. In addition, because: (a) the FHHEP provides a more coordinated system of services (than the comparison group), it is more likely to attempt to meet the needs of informal caregivers, and (b) the previous analysis of these data indicated that the FHHEP clients are older and more impaired on activities of daily living, this hypothesis (Hypothesis 7) will be more clearly demonstrated with the FHHEP clients than with the comparison group of clients.

7. When per service substitution occurs, it will more often be respite substitution than replacement substitution. In addition, this will be more clearly demonstrated in the Five Hospital Homebound Elderly Program (FHHEP) group of clients than in the comparison group of clients.

Providing services for an impaired elderly person is likely to be a substantial burden for informal caregivers; therefore, they may be experiencing difficulty in maintaining their current level of service provision and they may require respite services. Merely reallocating or shifting their efforts to a different type of service may not meet the needs of either the caregiver or the elderly recipient. In addition, because FHHEP clients were older and more impaired at

baseline, Hypothesis 8 should be more clearly demonstrated in the FHHEP group.

8. The relative and absolute frequencies of specialization/-reallocation processes will be low at the 9 month and 48 month posttests. This will be more clearly demonstrated in the FHHEP group of clients than in the comparison group of clients.

Hypothesis 9 reflects the likelihood that during 48 months of caring for a frail elderly person, the older person will become more impaired and dependent and informal caregivers are likely to be in greater need of relief from their caregiving activities. Similarly, the number of services provided by formal providers should increase over time relative to the number of services provided by informal caregivers. Hypothesis 10 reflects this expectation.

9. When assessed per service, substitution is more likely to occur and supplementation and specialization/reallocation are less likely to occur at the 48 month posttest as compared to the 9 month posttest.

10. The number of services received from formal providers will increase over time (9 and 48 months after baseline) relative to the number of services provided by informal caregivers.

Method

Sample

Two groups of clients were included in this study: 157 individuals who were admitted as clients to the Five Hospital Homebound Elderly Program (FHHEP) and 156 individuals admitted to a geographically contiguous home delivered meals program offered by the local branch of the Area Office on Aging (comparison group). FHHEP provides a variety of services to chronically ill, homebound elderly in Chicago, Illinois with the goal of maintaining clients at the highest possible level of functioning in their homes for as long as possible. Although all respondents were new clients to their respective service programs, many respondents were receiving formal services at baseline from other providers. Throughout this study, respondents could have obtained service from any available agency; however, for each group of clients the majority of the formal services received were obtained from one of the study agencies or any agency that the client was referred to by the study agency.

The posttest sample sizes were substantially reduced by attrition, largely due to mortality and change in residence to nursing homes. At the nine month posttest, data were obtained from 117 FHHEP clients and 108 comparison group clients who were still living in the community; at 48 months, data were obtained from 38 FHHEP clients and 38 comparison group clients.

Source of Data

The data for the proposed study were obtained from a database

constructed by a team of researchers led by Dr. Susan Hughes from the Center for Health Services and Policy Research at Northwestern University. These data were collected to evaluate FHHEP. Homebound individuals who were at least 60 years of age and were accepted to either FHHEP or the comparison group home-delivered meals program between June, 1977 and December, 1979 were eligible to be included in the study. The research design of the evaluation was quasi-experimental with repeated measures. Major outcomes of interest included functional status, nursing home use, hospital use, cost and mortality. A more detailed description of the FHHEP and the evaluation project is available elsewhere (Hughes, Cordray & Spiker, 1984).

Design

Longitudinal data were collected at baseline (usually within a month after clients were accepted to the service programs) and 9 and 48 months after baseline data were collected. As noted above, the 48 month posttest sample size was considerably less than the 9 month sample size. Therefore, the design of this study is best described as two baseline-posttest assessments; one assessment being short term in nature (9 months) and the other being long term (48 months).

Although an evaluation of the effectiveness of FHHEP was not the focus of this study, analyses were conducted separately for each group of clients. This method was chosen because of known differences between the client groups. In terms of programs, FHHEP offered a more comprehensive system of home care. Although comparison group clients

were able to access compensatory services similar to services received by FHHEP clients, in general, FHHEP clients received different types of services. In addition, as intended, FHHEP clients received a higher volume of service. In terms of differences between client characteristics (as reported by Hughes, Cordray & Spiker, 1984), substantial and statistically significant differences were observed at baseline. Therefore, if the two groups were combined, conclusions regarding the impact of formal services were likely to reflect differences between the two groups of clients, and differences between the service programs in addition to any differences due to changes in the number or level of services provided by the agencies over time. Thus, initial, descriptive analyses were conducted separately for FHHEP and comparison group clients. The multivariate analyses were conducted with the groups combined using the group variable as a dichotomous, dummy variable to assess the impact of differences between the two groups of clients.

Instruments

Information related to demographics, social resources, physical health, mental health, ability to perform activities of daily living, source of service and need for services was obtained from the Older American Resources and Services Multidimensional Functional Assessment Questionnaire (MFAQ). The service utilization section of the MFAQ provides extensive information regarding utilization of services. In addition to whether or not the client is currently receiving any of 19 services, the MFAQ provides information regarding: whether or not

clients received service in the previous six months, the source of service (family or friends, a hired individual/person from an agency or both of these types of individuals), the frequency of service and the client's self-reported need for the service. Although the MFAQ provides information relevant to 19 services, only those services which were most often provided as in-home services to the elderly are included in this study: transportation, personal care, nursing care, physical therapy, housekeeper/homemaker services, relocation services, meal preparation, personal business/legal assistance and information and referral services.

Definition of Variables

Baseline-Posttest Service Provider Processes

Information regarding level of service is available on the MFAQ for transportation, personal care, nursing care, physical therapy and housekeeper/homemaker services. An index of total level of service was computed using these five variables as well as the remaining variables which were coded dichotomously (see Appendix A). Processes were defined "per service" and "per person." The per service assessment of processes described the impact of formal service provision on informal service provision for each service independent of changes which occurred for other services. This somewhat restricted approach was undertaken in order to determine whether or not there was a relationship between specific services and processes. This information could be useful to policy makers and home

care agencies in determining strategies for maximizing their resources.

Per service. Operationally, different service provider processes were defined by different baseline-posttest service provider combinations and changes in the total amount or level of service received. Per service supplementation occured when: (a) a formal agency provided service at the time of the posttest (in addition to any service it may have provided at baseline) which had been provided (at least in part) by an informal caregiver at baseline, and (b) the informal caregiver did not reduce his or her level of service provision. When a formal caregiver provided additional service at posttest which had been provided by an informal caregiver at baseline and the level of service provided by the informal caregiver decreased at posttest, substitution occurred.

Per person. The disadvantage of assessing the relationship between formal and informal caregivers service-by-service is that this method may not provide a complete picture of this relationship as it exists. If, as the literature review suggests, different service providers are better able or more willing to provide different services, the impact of formal service provision might be to allow the informal caregivers to reduce their level of effort in one service and increase their level of effort in another service. Only an evaluation of changes in source of service for all services will allow the identification of these types of processes. Therefore, "per person" processes were also defined.

Specialization/reallocation could not be defined per service but was defined per person. This process occured when substitution was found for one service and an increase in informal service provision was found for a different service. This process suggests that the informal caregivers specialize in terms of the service they provide or reallocate their effort towards providing a particular service.

Supplementation and substitution were redefined at the per person level. Supplementation at this level included those instances of supplementation previously defined at the per service level. In addition, supplementation was expanded to include cases in which: (a) at least one service was provided at baseline and posttest by an informal caregiver, and (b) at least one service which was not received by the client at baseline was provided at posttest by a formal service provider. Therefore, cases in which the formal service provider supplied "new" service which supplemented the efforts of the informal caregiver were included as supplementation. By including "new" formal services only (and not increases in level of service provided at baseline), the definition was somewhat conservative in defining supplementation. However, this definition assured that the formal service agency was making a clear contribution and effort on behalf of the client and not merely an incremental change in prior behavior.

Substitution per person was operationalized by finding substitution per service for at least one service. However, because specialization/reallocation also included the identification of

substitution for one service, per service substitution associated with specialization/reallocation was not included as substitution per person. If substitution was found for more than one service and specialization/reallocation was also found for the same client, then substitution as well as specialization/reallocation was computed on a per person basis for that client.

Respite and replacement substitution. Substitution processes were further differentiated into respite substitution and replacement substitution. This was accomplished by defining substitution processes which occurred when the informal caregiver was likely to be in need of relief as "respite substitution," and by defining substitution processes which occurred when the informal caregiver was not likely to be in need of relief as "replacement substitution" (i.e., formal services merely replaced informal services and did not provide respite to the informal caregiver). The conditions under which informal caregivers are likely to require respite have been noted in the literature (Brody, 1985; Cantor, 1983; Reece, Waltz & Hageboeck, 1983). These studies indicated that informal caregivers experience higher levels of physical and emotional strain when they: (a) lived with the frail, older person or (b) provided high levels of service. The rendering of personal care services has been shown to be especially stressful. With respect to the first part of this operational definition, the relationship (i.e., spouse, child, other relative, friend, etc.) of the person who provided most of the assistance was determined from the MFAQ survey. In addition, the

identity of the person living with the respondent was known. From this information it was determined whether the informal caregiver lived with the respondent. In terms of the second part of the definition of respite substitution, the following combinations of service were used to determine a high level of service provision. Starred responses represent the highest level of service provision on a three point scale.

Conditions Defining High Levels of Service

Hrs per week of personal care service provided		Hrs per week of household service provided		Number of round trips per week (transportation) for shopping, doctors, etc
More than 10.5*	+	4 or more		
3.5 or more	+	9 or more*	+	4 or more*
3.5 or more	+	4 or more	+	4 or more + 1 or more other services

These conditions were based on at least 15 hours of service per week and: (a) the highest level of service provision for service that has been described as most stressful to informal caregivers - personal care services; or (b) provision of multiple services including personal care services.

Plan of Analysis

The analyses were conducted in four stages as indicated in Table 1. The first stage was descriptive and consisted of assessing information regarding the type(s) of service received by clients, the

Table 1

Overview of Analyses Conducted

Stage 1: Descriptive Analyses

a. Service received (type and quantity)

b. Source of service (provider)

c. Baseline-posttest service provider combinations

Stage 2: Analysis of Baseline-Posttest Service Provider Processes

a. Frequency of substitution, supplementation, specialization/re-allocation

b. Frequency of respite substitution and replacement substitution

Stage 3: Multivariate Analyses

Two sets of multiple regression analyses using: (a) number of services received and (b) level of services received from informal caregivers at posttest

Stage 4: Analysis of Other Areas of Impact of Formal Services

Correlation of change in the number/level of services provided formally with (a) change in the number of visits/phone calls received by the client and (b) the clients' satisfaction with frequency of contact with family and friends.

quantity of service received and the source(s) of those services at baseline, 9 month posttest and 48 month posttest (including baseline-posttest service provider combinations). An analysis of the baseline-posttest service provider processes constituted the second stage. In this stage, the patterns of service provision at baseline and posttest were classified as indicating substitution, supplementation and specialization/reallocation processes on a "per service" or "per person" basis. Substitution was differentiated further into respite substitution and replacement substitution. The relative frequency of these processes were examined.

In the third stage of analysis, multivariate techniques were used to examine the impact of formal service provision in conjunction with other independent variables on informal service provision. Regression analyses were conducted to determine the relationship between the change in the number and level of formal services (in conjunction with other independent variables) and the change in the number and level of services provided by informal providers at posttest. Independent variables included demographic variables, the number and level of informal services at baseline, whether or not the informal caregiver was under stress at baseline, the baseline-posttest change in the number and level of services provided by formal providers, change in mental and physical health and client group. Some of these variables are indices representing a composite of a number of variables (see Appendix C). This procedure helped preserve degrees of freedom and maximized the power of the analyses. The analysis proceeded in a

hierarchical fashion with different sets of variables entered at each step (Cohen & Cohen, 1983). The ordering of independent variable sets was based on: causal priority, the proper representation of interaction terms (i.e., the main effects must be partialled from the product of the main effects in order to properly assess the interaction of two variables) and the importance of the variable set to the analysis (Cohen & Cohen, 1983). The square of the partial correlation was evaluated at each step and indicated the amount of variance in the dependent variable accounted for uniquely by the variable set when all other sets which proceeded it are partialled out.

Demographic variables were entered first, followed by the baseline number/level of informal services. The ability of informal caregivers to increase the amount of service they provide or, conversely, their likelihood of reducing service provision, was expected to be related to their need for respite; therefore, this baseline measure was entered next. Need for respite was operationally defined by whether or not informal caregivers were experiencing stress as determined by: (a) the number, level and types of services they were providing and (b) whether or not they lived with the homebound older person. Following caregiver stress, the interaction of caregiver stress and baseline number/level of informal services was assessed.

The baseline-posttest change in health and change in number/level of formal services could have been mutually influencing, thus they

were entered together as a set after demographics and baseline variables. The interaction of change in number/level of formal services and baseline number/level of informal services was assessed next in the regression. Finally, variance in the dependent variable which could be accounted for by the client group, beyond that accounted for by the other independent variables was assessed.

In the final stage of analysis, the focus was on other areas of impact of formal services, such as the number of visits and phone calls received by the client. The possibility existed that the provision of services from agencies might reduce the amount of contact that informal caregivers would have with the elderly service recipient. This could occur with or without a concomittant decrease in informal service provision. The care recipient's satisfaction with the frequency of contact with his or her family or friends was also assessed.

Power analyses (Cohen & Cohen, 1983) were conducted for the 9 month data, using $N = 225$ and $p < .05$. The power of the analysis to reject the null hypothesis that the squared partial correlation squared is zero for the tenth variable tested of ten variables, is approximately .74 when $R^2 = .30$ and partial $r^2 = .05$; the power is approximately .86 when $R^2 = .40$ and partial $r^2 = .05$. The study, therefore, had sufficient power given the expected parameters.

Results

Characteristics of the Samples at Baseline

Previous work by the author which indicated that FHHEP and comparison group clients differed on certain characteristics, served in part as the basis for analyzing the two groups separately in this study. Table 2, which describes self-reported data for all respondents at baseline, indicates that the two groups of clients did indeed differ in certain respects. FHHEP clients were significantly older (80.8 vs. 77.8) and were less well educated (only 41% of FHHEP clients had more than 8 years of education compared to 57% of OSCH clients); however, they had better social resources. Only 56% lived alone, whereas 76% of comparison group clients lived alone. In addition, 31% of FHHEP clients indicated that help was available indefinitely if they were to get sick, while only 17% of comparison group clients reported that help was available indefinitely. Although each group had the same median income, FHHEP clients more frequently reported that their assets were sufficient to meet emergencies (64% vs. 49%). In terms of physical and mental health the groups were similar; however, FHHEP clients were significantly more impaired regarding physical activities of daily living (e.g., dressing, eating, bathing) and instrumental activities of daily living (e.g. using the telephone, shopping, cooking). No significant differences were found in terms of race, sex, or marital status.

In general, differences and similarities at baseline between FHHEP clients and comparison group clients were the same in the 9 and

Table 2

Characteristics of All Respondents at Baseline

	FHHEP (n=157)	Comparison Group (n=156)	df	X^2 or t^a
Sex				
Female	76%	76%	1	0.00
Male	24%	24%		
Race				
White	97%	97%	1	0.00
Other	3%	3%		
Age				
Mean age (SD)	80.8 (7.3)	77.8 (8.2)	311	3.36**
Education				
8 yrs or less	59%	43%	2	8.49*
9 - 12 yrs	25%	36%		
Post high school	16%	21%		
Marital status				
Single	19%	17%	3	3.86
Married	20%	17%		
Widowed	56%	55%		
Divorced, separated	5%	11%		
Duration of help if sick				
Indefinitely	31%	17%	3	12.06**
Short time	12%	25%		
Occasionally	39%	41%		
Not at all	18%	18%		
Household composition				
Lives alone	56%	76%	1	13.41**
Lives with someone	44%	24%	1	
Annual income				
Median income	$3,500	$3,000	--	--
Assets sufficient for emergencies				
Yes	64%	49%	1	6.10*
No	36%	51%		

Table 2 (continued)

Characteristics of All Respondents at Baseline

	FHHEP (n=157)	Comparison Group (n=156)	df	X^2 or t[a]
Diseases reported				
Mean number (SD)	3.1 (1.7)	3.3 (2.0)	285	0.75
Subject's mental health rating				
Excellent	12%	17%	3	1.92
Good	48%	43%		
Fair	27%	25%		
Poor	13%	15%		
Degree health interferes				
Not at all	11%	11%	2	1.80
A little	21%	28%		
A great deal	68%	61%		
PADL[b]				
Mean ADL (SD)	9.2 (2.8)	10.2 (1.7)	260	3.99**
IADL[c]				
Mean IADL (SD)	7.0 (3.4)	8.5 (2.7)	295	4.37**

Note. Total percentage may not be equal to 100% due to rounding errors.

[a]All tests were two-tailed.

[b]PADL (Physical Activities of Daily Living) is the sum of 6 items. Scales scores could range from 0 to 12, with higher scores indicating better functioning.

[c]IADL (Instrumental Activities of Daily Living) is the sum of 7 items. Scale scores could range from 0 to 14, with higher scores indicating better functioning.

*$p < .05$. **$p < .01$.

48 month samples (Tables 3 and 4) as they had been in the sample consisting of all clients. However, except for age, none of the statistically significant differences which were found in the full sample reached statistical significance in the 48 month sample. To some extent, this is attributable to smaller sample sizes. The finding of higher PADL scores for the 48 month sample does suggest that elderly clients who survived and were non-institutionalized after 48 months were more likely to have been at higher levels of PADL functioning at baseline.

Ignoring comparisons between groups and assessing only the differences between samples, there were no substantial differences in age, education, availability of help if sick, adequacy of assets in an emergency and number of diseases reported. Differences regarding other characteristics were found. Although a small number of non-white respondents were found in the full sample and the 9 month sample, all of the respondents in the 48 month sample were white. As might be expected due to mortality, a greater percentage of the 48 month sample was female. The 48 month sample consisted of individuals who were advantaged in terms of certain indicators of social and economic support. They more often lived with someone, were more likely to be married and had a higher median income. FHHEP clients from the 48 month sample, more often than FHHEP clients from other samples, indicated that their health never interfered with their activities.

Table 3

Characteristics of 9 Month Sample at Baseline

	FHHEP (n=117)	Comparison Group (n=108)	df	X^2 or t[a]
Sex				
Female	80%	74%	1	0.65
Male	21%	26%		
Race				
White	96%	97%	1	0.06
Other	4%	3%		
Age				
Mean age (SD)	80.7 (7.6)	77.6 (7.8)	223	3.03**
Education				
8 yrs or less	60%	39%	2	10.51*
9 - 12 yrs	24%	40%		
Post high school	16%	21%		
Marital status				
Single	16%	15%	3	2.98
Married	21%	20%		
Widowed	58%	55%		
Divorced, separated	4%	10%		
Duration of help if sick				
Indefinitely	34%	19%	3	8.85**
Short time	14%	26%		
Occasionally	37%	36%		
Not at all	15%	19%		
Household composition				
Lives alone	55%	74%	1	8.33**
Lives with someone	45%	26%	1	
Annual income				
Median income	$3,500	$3,500	--	--
Assets sufficient for emergencies				
Yes	64%	53%	1	2.03
No	36%	47%		

Table 3 (continued)

Characteristics of 9 Month Sample at Baseline

	FHHEP (n=117)	Comparison Group (n=108)	df	X^2 or t[a]
Diseases reported				
Mean number (SD)	3.1 (1.6)	3.3 (2.1)	190	0.85
Subject's mental health rating				
Excellent	11%	17%	3	1.95
Good	51%	45%		
Fair	25%	26%		
Poor	14%	12%		
Degree health interferes				
Not at all	12%	12%	2	1.27
A little	21%	28%		
A great deal	67%	61%		
PADL[b]				
Mean ADL (SD)	9.1 (2.9)	10.2 (1.7)	193	3.66**
IADL[c]				
Mean IADL (SD)	7.0 (3.5)	8.8 (2.5)	211	4.39**

Note. Total percentage may not be equal to 100% due to rounding errors.

[a]All tests were two-tailed.

[b]PADL (Physical Activities of Daily Living) is the sum of 6 items. Scales scores could range from 0 to 12, with higher scores indicating better functioning.

[c]IADL (Instrumental Activities of Daily Living) is the sum of 7 items. Scale scores could range from 0 to 14, with higher scores indicating better functioning.

*$p < .05$. ** $p < .01$.

Table 4

Characteristics of 48 Month Sample at Baseline

	FHHEP (n=38)	Comparison Group (n=38)	df	X^2 or t[a]
Sex				
Female	87%	79%	1	0.37
Male	13%	21%		
Race				
White	100%	100%	--	--
Other	0%	0%		
Age				
Mean age (SD)	80.8 (6.3)	75.4 (7.1)	74	3.51**
Education				
8 yrs or less	61%	37%	2	4.28
9 - 12 yrs	24%	37%		
Post high school	16%	26%		
Marital status				
Single	8%	11%	3	3.08
Married	26%	34%		
Widowed	61%	42%		
Divorced, separated	5%	13%		
Duration of help if sick				
Indefinitely	31%	15%	3	4.19
Short time	22%	21%		
Occasionally	36%	38%		
Not at all	11%	27%		
Household composition				
Lives alone	53%	63%	1	0.49
Lives with someone	47%	37%	1	
Annual income				
Median income	$4,500	$4,500	--	--
Assets sufficient for emergencies				
Yes	61%	44%	1	1.28*
No	39%	50%		

Table 4 (continued)

Characteristics of 48 Month Sample at Baseline

	FHHEP (n=38)	Comparison Group (n=38)	df	X^2 or t[a]
Diseases reported				
Mean number (SD)	3.2 (1.5)	3.7 (2.1)	67	1.32
Subject's mental health rating				
Excellent	6%	12%	3	3.89
Good	56%	35%		
Fair	29%	32%		
Poor	9%	21%		
Degree health interferes				
Not at all	20%	9%	2	2.15
A little	20%	29%		
A great deal	60%	63%		
PADL[b]				
Mean ADL (SD)	9.8 (2.3)	10.4 (1.6)	65	1.26
IADL[c]				
Mean IADL (SD)	7.6 (2.8)	8.9 (3.5)	74	1.80

Note. Total percentage may not be equal to 100% due to rounding errors.

[a]All tests were two-tailed.

[b]PADL (Physical Activities of Daily Living) is the sum of 6 items. Scales scores could range from 0 to 12, with higher scores indicating better functioning.

[c]IADL (Instrumental Activities of Daily Living) is the sum of 7 items. Scale scores could range from 0 to 14, with higher scores indicating better functioning.

*$p < .05$. **$p < .01$.

Nine Month Sample

Quantity of Service Received

The homebound elderly have been described as requiring a number of home care services. The "Results" section reports the number of services received by the elderly participants of this study and the source of those services by client group.

Baseline. On the average, clients in each group received over 4 services at baseline (Table 5). The source of services differed only slightly between groups. Over half of the services received by FHHEP clients were provided by informal caregivers, over one third were provided by formal agencies and only 8% were provided by both informal and formal service providers together. Comparison group clients received just under half of their services from informal caregivers; 44% of their services were provided by formal agencies and 10% of their services were provided by both informal and formal providers.

In order to test for differences between formal and informal providers without dropping cases from the analysis, services provided by formal and informal caregivers together were divided evenly between the providers. A t-test indicated no difference in the mean number of services supplied by each type of provider in the comparison group, but significant difference was found in the FHHEP group, $t(116) = 2.00$, $p < .05$, indicating a greater volume of service was provided by informal caregivers at baseline.

Nine month posttest. FHHEP clients received 21% more services at posttest than at baseline, resulting in a mean of 5.3 services per

Table 5

Number and Percent of Services Received at Baseline and 9 Months

	FHHEP (n=117)				Comparison Group (n=108)			
	Baseline		9 Months		Baseline		9 Months	
Service	n	%	n	%	n	%	n	%
Informal	266	52	233	38	213	46	188	38
Formal	201	39	321	52	201	44	251	51
Both Informal and Formal	43	8	62	10	45	10	56	11
Total	510	99	616	100	459	100	495	100
Overall Mean (SD)	4.4	(2.1)	5.3	(1.7)	4.3	(1.8)	4.6	(1.8)

Note. Total percentage may not be equal to 100% due to rounding errors.

person. As expected, the proportion of services provided by formal agencies increased (from 39% to 52%) and the proportion of services provided by informal caregivers decreased (from 52% to 38%). Only 10% of the posttest services were provided by both formal and informal providers. T-test results demonstrated that more services were received from formal agencies than informal caregivers at the 9 month posttest, $t(116) = 2.68$, $p < .01$. Paired t-tests of the number of services provided at baseline and posttest to FHHEP clients indicated no difference in the mean number of services provided by informal caregivers but a significant increase in number of services provided by formal agencies was found, $t(116) = 6.43$, $p < .001$.

Comparison group clients also received more services at the time of the posttest; however, the increase over baseline (8%) was considerably smaller than the increase for FHHEP clients. The distribution by source of services for comparison group clients was nearly identical to that found for FHHEP clients. Over half of the services (51%) were provided by formal agencies at posttest; 38% of the services were provided by informal caregivers and only 11% of the services were provided by both formal and informal providers at posttest. Significantly more formal than informal services were received, $t(107) = 2.43$, $p < .02$. As was found in the FHHEP group, there was no significant difference in mean number of services provided by informal caregivers from baseline to posttest, but the mean number of services provided by formal agencies increased significantly at posttest, $t(107) = 3.42$, $p < .001$.

Distribution of Number of Services Received from Each Source

The distribution of the number of services received per person analysed by source also illustrates the shift from reliance on informal caregivers at baseline to reliance on formal service providers at the 9 month posttest. Forty-four percent of FHHEP clients received 3 or more services from informal caregivers at baseline and 28% received 4 or more services (Table 6). At posttest, those figures dropped to 35% and 20%. The opposite pattern was found for service provided by the home care agency. At baseline, only 29% of the clients received 3 or more services and only 14% received 4 or more services from the home care agency. At the posttest, however, over half of the clients (52%) received 3 or more services from the agency and 30% received 4 or more services. Although not as dramatic, a similar pattern of service provision was observed for the comparison group (Table 7).

Specific Services Received by Clients

Baseline. Table 8 demonstrates that the services received most frequently at baseline by FHHEP clients were information and referral (75%) and housekeeper/homemaker services (72%). Between 43% and 63% of FHHEP clients received assistance with meal preparation, assistance with personal business/legal matters, personal care services, transportation and nursing care. Physical therapy and relocation services (assistance in finding a place to live) were received by only 21% and 7% of FHHEP clients, respectively.

Table 6

Distribution of Number of Services Received at Baseline and 9 Months by Source for FHHEP Clients

	BASELINE (n=117)						9 MONTHS (n=117)					
Number of	Informal		Formal		Both		Informal		Formal		Both	
Services Received	n	%	n	%	n	%	n	%	n	%	n	%
0	28	24	35	30	86	74	27	23	8	7	79	68
1	24	21	23	20	22	19	29	25	23	20	22	19
2	14	12	25	21	7	6	20	17	25	21	9	8
3	19	16	18	15	1	1	17	15	26	22	6	5
4	14	12	9	8	1	1	12	10	16	14	1	1
5	10	9	4	3	0	0	7	6	11	9	0	0
6	6	5	3	3	0	0	5	4	5	4	0	0
7	1	1	0	0	0	0	0	0	3	3	0	0
8	1	1	0	0	0	0	0	0	0	0	0	0
	117	101	117	100	117	101	117	100	117	100	117	101

Note. Total percentage may not be equal to 100% due to rounding errors.

Table 7

Distribution of Number of Services Received at Baseline and 9 Months by Source for Comparison Group Clients

Number of Services Received	BASELINE (n=108) Informal n	Informal %	Formal n	Formal %	Both n	Both %	9 MONTHS (n=108) Informal n	Informal %	Formal n	Formal %	Both n	Both %
0	21	19	29	21	71	66	23	21	13	12	64	59
1	28	26	25	23	29	27	33	31	24	22	37	34
2	22	20	27	25	8	7	19	18	26	24	5	5
3	20	19	17	16	0	0	21	19	20	19	0	0
4	8	7	10	9	0	0	6	6	13	12	1	1
5	6	6	5	5	0	0	6	6	9	8	1	1
6	2	2	1	1	0	0	0	0	3	3	0	0
7	1	1	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0
	108	100	108	100	108	100	108	101	108	100	108	100

Note. Total percentage may not be equal to 100% due to rounding errors.

Table 8

Number and Percent of Clients that Received Each Service at Baseline and 9 Months

	FHHEP (n=117)				Comparison Group (n=108)			
	Baseline		9 Months		Baseline		9 Months	
Service	n	%	n	%	n	%	n	%
Transportation	52	44	51	44	67	62	76	70
Personal Care	62	53	74	63	50	46	44	41
Nursing Care	50	43	105	90	40	37	46	43
Physical Therapy	25	21	23	20	32	30	18	17
House/Homemaker	84	72	104	89	84	78	88	82
Relocation	8	7	13	11	9	8	13	12
Meal Preparation	74	63	78	67	46	43	97	90
Business/Legal	68	58	77	66	53	49	55	51
Information & Referral	87	75	91	81	78	72	58	54

Comparison group clients were similar to FHHEP clients in terms of the relative frequency each service was received. Housekeeper/homemaker services and information and referral (I&R) were received by 78% and 72% of the clients, respectively. As was the case with FHHEP clients, the least frequently used services were physical therapy and relocation. All other services were received by 30% to 62% of comparison group clients.

Nine month posttest. In the FHHEP group, the ordering of services in terms of the frequency they were received remained fairly stable after 9 months. The only difference was that nursing care was received by 90% of the clients, making it the most frequently used service. This is a reasonable finding in light of the fact that all FHHEP clients should have been assessed by a nurse. Although the actual number of clients that received each service increased for most services, the increase was greatest for nursing care, housekeeper/homemaking services and personal care. The McNemar test of difference in changes of proportions for dichotomous variables (Siegal, 1956), the appropriate non-parametric test for paired variables in a pretest-posttest design, supported these findings. Using a two-tailed test, significant changes in the proportion of clients who received service were found for: nursing care, X^2 (1, N = 117) = 47.80, $p < .001$; housekeeper/homemaker, binominal test, N = 117, $p < .001$; personal care, X^2 (1, N = 117) = 3.56, $p < .06$. (The binominal distribution was used because the number of observed differences was 25 or less.)

At the 9 month postttest, meal preparation was the service most frequently received by comparison group clients. The increase over baseline was significant, X^2 (1, N = 108) = 5.28, $p < .03$. This finding was expected, since the comparison group clients were obtained from clients of a home-delivered meals program. Except for I&R, the ordering of the remaining services in terms of the frequency they were received remained the same as at baseline. The proportion of comparison group clients who received services at 9 months dropped for two services: I&R (decreased by 18%) and physical therapy (dropped by 13%). These decreases were significant for both services: I&R, X^2 (1, N = 107) = 7.22, $p < .008$; physical therapy, X^2 (1, N = 108) = 5.28, $p < .03$. The number of clients who received other services increased or remained the same.

Source of Service

Baseline. Informal caregivers were the primary source of service for 5 of the 9 services received by FHHEP clients at baseline (Table 9). These five services included transportation, housekeeper/homemaker services, relocation, meal preparation and personal business/legal assistance. Nursing care and physical therapy were the only services in which formal agencies served as the primary source of service. For personal care services and I&R, a single, dominant source of service was not found.

As was true for FHHEP clients, informal caregivers were the primary source of transportation, meal preparation and personal business/legal services and formal caregivers were the primary source

Table 9

Number and Percent of Each Service Provided by Source at Baseline for the 9 Month Posttest Sample

	FHHEP (n=117)						Comparison Group (n=108)					
	Informal		Formal		Both		Informal		Formal		Both	
Service	n	%	n	%	n	%	n	%	n	%	n	%
Transportation	43	83	6	12	3	6	53	79	7	10	7	10
Personal Care	27	44	24	39	11	18	22	44	26	52	2	4
Nursing Care	5	10	40	80	5	10	2	5	36	90	2	5
Physical Therapy	3	12	21	84	1	4	1	3	30	94	1	3
House/Homemaker	44	52	32	38	8	10	28	33	43	51	13	16
Relocation	6	75	1	13	1	13	3	33	6	67	0	0
Meal Preparation	44	60	25	34	5	7	23	50	13	28	10	22
Business/Legal	56	82	11	16	1	2	47	89	5	9	1	2
Information & Referral	38	44	41	47	8	9	34	44	35	45	9	12

Note. Total percentage per service for each group may not be equal to 100% due to rounding errors.

of nursing care and physical therapy for comparison group clients. However, whereas FHHEP received relocation assistance primarily from informal caregivers, comparison group clients received these services primarily from formal agencies. In addition, personal care services were somewhat more likely to be provided by formal providers. Single dominant source of service was not found for I&R in the comparison group.

Nine month posttest. FHHEP clients relied heavily on formal providers at 9 months (Table 10). Formal providers were the primary source of service at 9 months for four services which had been either provided primarily by informal caregivers at baseline or were not provided primarily by any one source at baseline: personal care, relocation assistance, housekeeper/homemaker services and I&R. Although small n's reduced the power, non-parametric tests were conducted for each service and indicated a significant change for I&R; two-tailed, binomial test, $n = 52$, $p < .02$.

The primary source of each service for comparison group clients changed for three services. Informal caregivers became the primary source of relocation and I&R at 9 months. Meal preparation was provided primarily by formal agencies at posttest. None of these changes were statistically significant at the .05 level. For both groups of clients, FHHEP and comparison group, the results for relocation assistance are difficult to interpret due to the small number of clients that received this service.

Table 10

Number and Percent of Each Service Provided by Source at the 9 Month Posttest

	FHHEP (n=117)						Comparison Group (n=108)					
	Informal		Formal		Both		Informal		Formal		Both	
Service	n	%	n	%	n	%	n	%	n	%	n	%
Transportation	45	88	6	12	0	0	55	72	12	16	9	12
Personal Care	23	31	36	49	15	20	19	43	21	48	4	9
Nursing Care	0	0	93	89	12	11	3	7	41	89	2	4
Physical Therapy	1	4	21	91	1	4	0	0	18	100	0	0
House/Homemaker	34	33	54	52	16	15	19	22	55	63	14	16
Relocation	3	23	9	69	1	8	11	85	2	15	0	0
Meal Preparation	41	53	31	40	6	8	6	6	70	72	21	22
Business/Legal	61	79	16	21	0	0	43	78	9	16	3	6
Information & Referral	25	28	55	60	11	12	32	55	23	40	3	5

Note. Total percentage per service for each group may not be equal to 100% due to rounding errors.

Baseline-9 Month Posttest Service Provider Combinations

The baseline-posttest, results which have been described to this point have consisted of grouped data, i.e., specific changes over time for individuals were not presented. In this section data are presented which illustrate baseline-posttest changes actually experienced by individuals.

Table 11 describes patterns of service provision for FHHEP clients. The frequency of baseline-posttest service provider combinations by service is shown. Since 15 possible combinations are included (no service at baseline-no service at posttest was omitted), it is not surprising that most cells of the table indicate a low frequency and percentage. The most frequently occurring combination was "I-I," informal caregiver at baseline and informal caregiver at posttest. Summing across all services, this combination was found 165 times. The combinations of no service-formal and formal-formal also occurred frequently: 149 and 134 times, respectively. Together, these three service provider combinations accounted for 63% of all combinations in the FHHEP group. Other combinations which accounted for at least 5% of the total were formal-no service, no service-informal, and informal-no service. The informal-informal combination accounted for roughly half of all of the transportation and personal business/legal assistance and no service-formal accounted for 53% of the nursing care received.

Table 12 describes service provider combinations which occurred in the comparison group. Relatively few combinations (two or three)

Table 11

Number and Percent of FHHEP Clients Receiving Services from Various Combinations of Service Providers at Baseline and 9 Months

S E R V I C E

(N=117)

Source		TRAN		PERS		NURS		PT		HOUS		RELO		MEAL		BUS		I&R		TOTAL	
Base	Post	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
I	0	8	13	6	7	0	0	1	3	3	3	5	26	4	5	11	12	4	4	42	6
F	0	3	5	2	2	3	3	14	37	2	2	0	0	2	2	6	6	11	10	43	6
B	0	2	3	3	4	0	0	0	0	0	0	1	5	0	0	0	0	3	3	9	1
0	I	10	16	7	8	0	0	0	0	3	3	3	16	2	2	16	17	7	7	48	7
I	I	33	52	11	13	0	0	1	3	27	25	0	0	36	43	43	46	14	13	165	23
F	I	1	2	3	4	0	0	0	0	3	3	0	0	2	2	1	1	3	3	13	2
B	I	1	2	2	2	0	0	0	0	1	1	0	0	1	1	1	1	1	1	7	1
0	F	3	5	15	18	57	53	12	32	22	20	8	42	6	7	10	11	16	15	149	21
I	F	2	3	4	5	1	1	1	3	4	4	0	0	3	4	2	2	14	13	31	4
F	F	1	2	15	18	33	31	7	24	22	5	1	5	21	25	4	4	21	19	134	19
B	F	0	0	2	2	2	2	1	4	4	0	0	0	1	1	0	0	3	3	13	2
0	B	0	0	1	2	1	1	1	0	0	0	0	0	2	2	0	0	2	2	7	1
I	B	0	0	6	7	4	4	0	10	9	5	1	5	1	1	0	0	6	6	28	4
F	B	0	0	4	5	4	4	0	3	3	0	0	0	0	0	0	0	2	2	13	2
B	B	0	0	4	5	3	3	0	3	3	0	0	3	3	4	0	0	1	1	14	2
Total		64	103	85	102	108	102	38	102	19	99	109	102	84	99	94	101	108	102	716	101

Note. TRAN = tranportation, PERS = personal care, NURS = nursing care, PT = physical therapy, HOUS = housekeeper/homemaker, RELO = relocation, MEAL = meal preparation, BUS = personal business/legal, I&R = information & referral, I = informal caregiver, F = formal service provider, 0 = no service.

Total percentages may not be equal to 100% due to rounding errors.

Table 12

Number and Percent of Comparison Group Clients Receiving Services from Various Combinations of Service Providers at Baseline and 9 Months

S E R V I C E

(N=108)

Source		TRAN		PERS		NURS		PT		HOUS		RELO		MEAL		BUS		I&R		TOTAL	
Base	Post	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
I	0	10	11	7	12	1	1	0	0	6	6	2	11	5	5	13	18	12	13	56	9
F	0	3	3	7	12	14	18	22	54	2	2	3	17	1	1	3	4	20	22	75	12
B	0	1	1	1	2	2	3	1	2	2	2	0	0	1	1	1	1	3	3	12	2
0	I	16	18	6	10	2	3	0	0	3	3	8	44	3	3	16	22	4	4	56	9
I	I	35	39	11	19	0	0	0	0	12	12	1	6	2	2	27	38	19	20	107	17
F	I	0	0	2	3	1	1	0	0	1	1	2	11	1	1	0	0	4	4	11	2
B	I	4	4	0	0	0	0	0	0	3	3	0	0	0	0	0	0	5	5	12	2
0	F	6	7	2	3	19	35	9	22	10	10	1	6	47	45	3	4	8	9	105	17
I	F	3	3	2	3	1	3	1	2	4	4	0	0	6	6	5	7	3	3	25	4
F	F	3	3	16	27	21	34	8	20	36	37	0	0	11	11	1	1	11	12	108	17
B	F	0	0	1	2	0	1	0	0	5	5	0	0	6	6	0	0	1	1	13	2
0	B	1	1	1	2	2	3	0	0	1	1	0	0	8	8	0	0	3	3	16	3
I	B	5	6	2	3	0	0	0	0	6	6	0	0	10	10	2	3	0	0	25	4
F	B	1	1	1	2	0	0	0	0	4	4	0	0	0	0	1	1	0	0	7	1
B	B	2	2	0	0	0	0	0	0	3	3	0	0	3	3	0	0	0	0	8	1
Total		90	100	59	100	63	99	44	100	18	101	104	102	44	100	72	99	93	99	636	102

Note. TRAN = tranportation, PERS = personal care, NURS = nursing care, PT = physical therapy, HOUS = housekeeper/homemaker, RELO = relocation, MEAL = meal preparation, BUS = personal business/legal, I&R = information & referral, I = informal caregiver, F = formal service provider, 0 = no service.

Total percentages may not to equal be 100% due to rounding errors.

accounted for at least half of each service. However, unlike the findings for FHHEP clients, service provision was not dominated by three specific types of service provider combinations. In the comparison group, six service provider combinations: formal-formal, informal-informal, no service-formal, formal-no service, informal-no service and no service-informal - were responsible for most (81%) of the service combinations observed. A major difference between the two groups of clients was that two combinations, informal-no service and formal-no service accounted for 21% of the service received by comparison group clients but only 12% of the service received by FHHEP clients.

The high frequency of occurrence of the informal-informal combination in each group demonstrates the continued involvement of informal caregivers after 9 months. In addition, the fact that the no service-formal combination was found more often than informal-formal and both-formal combined indicates that services provided by formal agencies after baseline measurement did not in general, duplicate services that had been provided by informal caregivers at baseline.

As expected, the majority of the "new" services (service initiated after baseline measurement) were provided by formal caregivers. The proportion of all new service ("0-I" + "0-F" + "0-B") that was provided by formal caregivers alone ("0-F") was 73% and 59% for FHHEP clients and comparison group clients, respectively.

Baseline-9 Month Posttest Change in Level of Services Provided by Informal Caregivers

Some information regarding change in the level of service provided by informal caregivers can be obtained from Tables 11 and 12. For example, the combination no service-informal indicates an increase in the level of informal service provision at posttest. Informal-formal indicates a decrease in the level of informal service provision at posttest. However, service provider combinations do not provide all of the information which is available in the database to determine change in the level of service provided by informal caregivers. For 5 of the 9 services, the actual level of service provided (on a 3 or 4 point scale) is also available. This information along with knowledge of service provider combinations identifies additional instances of change in the level of service provided by informal caregivers. For instance, the service provider combination informal-both, along with a decrease in the overall level of service would be defined as a decrease in informal service provision. (Since formal service was added at posttest, the decrease in overall level of service is attributed to a decrease in level of service provided by informal caregivers.)

Table 13 indicates for each service the number of times that the level of service provided informally increased or decreased. In the FHHEP group, more increases than decreases in the level of service provision were found for transportation, relocation and personal business/legal assistance. More decreases than increases were found

Table 13

Baseline-9 Month Posttest Change in Level of Services Provided by Informal Caregivers

	FHHEP (n=117)				Comparison Group (n=108)			
	Increased		Decreased		Increased		Decreased	
Service	n	%	n	%	n	%	n	%
Transportation	12	67	6	33	20	69	9	31
Personal Care	21	50	21	50	12	67	6	33
Nursing Care	5	38	8	62	5	63	3	38
Physical Therapy	1	33	2	67	0	0	2	100
House/Homemaker	13	34	25	66	14	38	23	62
Relocation	3	75	1	25	10	100	0	0
Meal Preparation	6	46	7	54	12	43	16	57
Business/Legal	17	89	2	11	17	74	6	26
Information & Referral	14	40	21	60	11	61	7	39
Total	92		93		101		72	
	(50%)		(50%)		(58%)		(42%)	

Note. Total percentage per service for each group may not be equal to 100% due to rounding errors.

for nursing care, physical therapy, housekeeper/homemaker services, meal preparation and I&R. The number of increases and decreases was the same for personal care and meal preparation. Overall, the number of increases were equal to the number of decreases for FHHEP clients. In the comparison group, more increases in the level of service provided by informal caregivers were found for all services except physical therapy and meal preparation.

Baseline-9 Month Service Provider Processes

Baseline-posttest service provider processes were operationalized in this study to provide a direct measure of the impact of formal service provision on caregiving. Three processes were defined: substitution, supplementation and specialization/reallocation. Of the three, the substitution process is of particular interest to policy makers due to controversy regarding the impact of substituting services provided by agencies (and which are supported by public funds) for services provided by family and friends.

Per service. The findings of the assessment of substitution and supplementation conducted by service appear in Table 14. Few instances of supplementation occurred per service in either group. Substitution occurred most often for housekeeper/homemaker, I&R and personal care services in the FHHEP group, and for housekeeper/-homemaker, transportation, meal preparation and personal business/legal services in the comparison group. In both groups, substitution was found least often for relocation and physical therapy.

Table 14

Frequency of Baseline-9 Month Posttest Service Provider Processes Per Service

	FHHEP (n=117)		Comparison Group (n=108)	
	Subst	Suppl	Subst	Suppl
Service	n	n	n	n
Transportation	2	0	6	0
Personal Care	10	0	4	1
Nursing Care	4	3	1	0
Physical Therapy	1	0	1	0
House/Homemaker	15	1	12	0
Relocation	0	NA[a]	0	NA
Meal Preparation	3	NA	6	NA
Business/Legal	2	NA	5	NA
Information & Referral	14	NA	3	NA
Total	51	4	38	1

Note. Subst = substitiution, Suppl = supplmentation.

[a]NA = information not available.

Per person. Table 15 indicates the frequency of processes when the analysis is not restricted to "per service" definitions of processes. These broader definitions allow the inclusion of specialization/reallocation in the analysis. In addition, instances in which a respondent received service from an informal caregiver at baseline and received a "new" service (service which the respondent had not received at baseline) from a formal caregiver at posttest can be included as supplementation. The percentages are based on the number of clients in each group, 117 and 108 for the FHHEP and comparison group respectively. The results for each group were similar. Supplementation was found most frequently, occurring for over one third of the respondents. Substitution was found for one fourth and specialization/reallocation was found for 15% of the respondents in each group. More than one type of process could occur on a per person basis.

Due to the large number of cases in which no processes were identified, the sign test, which ignores zero differences, was determined to be most appropriate for comparing the frequencies of processes. Since the frequency of supplementation was expected to be larger than the frequency of substitution which was, in turn, expected to be larger than the frequency of specialization/reallocation, one-tailed tests were conducted. The results were the same in both groups of clients, supporting the a priori expectations. The supplementation-substitution comparisons were significant at $p < .05$ and the

Table 15

Frequency of Baseline-9 Month Posttest Service Provider Processes Per Person

Group	Processes						Types of Substitution[a]			
	Subst		Suppl		Special		Respite Substitution		Replacement Substitution	
	n	%[b]	n	%[b]	n	%[b]	n	%[c]	n	%[c]
FHHEP (n=117)	30	26	42	36	17	15	12	44	15	56
Comparison (n=108)	27	25	40	37	16	15	9	33	18	67

Note. Subst = substitution; Suppl = supplementation; Special = specialization/reallocation.

[a]The sum of respite and replacement substitution cases do not equal the total number of substitution cases in the FHHEP group due to missing data.

[b]Percentage is based on all respondents: FHHEP = 117, OSCH = 108. More than one process could have occurred for each respondent. The number of different people included in these data is FHHEP = 69, Comparison = 64.

[c]Percentage is based on number of respondents for whom substitution was found.

remaining comparisons of supplementation and substitution with specialization/reallocation were significant at $p < .01$.

Substitution was differentiated further into respite and replacement substitution. Table 15 indicates that respite substitution occurred less frequently than replacement substitution especially in the comparison group. These findings were unexpected; however, they were not statistically significant using two-tailed binomial tests or chi-square one-sample tests.

Table 16 describes the frequency of respite and replacement substitution by service. As demonstrated per person, the frequency of the two types of substitution processes was roughly the same for the FHHEP group, but respite substitution occurred less frequently than replacement substitution on a per service basis for the comparison group. The relative frequencies for respite vs. replacement substitution were 48% vs. 52% and 42% vs. 58% for FHHEP and comparison group, respectively. Although the number of cases by service is small, the data displayed in Table 16 reveal a few interesting findings. First, for the comparison group clients, the difference in frequency between respite and replacement substitution is attributable in large part to one service - housekeeper/homemaker services. Second, for FHHEP clients, respite substitution actually occurred more frequently than replacement substitution for personal care and nursing care. The relative frequency of replacement substition was greater for transportation, housekeeper/homemaker services, meal preparation and personal business/legal services.

Table 16

Frequency of Respite Substitution and Replacement Substitution Per Service in the 9 Month Sample

	FHHEP (n=117)		Comparison Group (n=108)	
	Resp Subst	Repl Subst	Resp Subst	Repl Subst
Service	n	n	n	n
Transportation	0	2	3	3
Personal Care	7	3	2	2
Nursing Care	4	0	1	0
Physical Therapy	1	0	0	1
House/Homemaker	5	9	4	8
Relocation	0	0	0	0
Meal Preparation	0	3	3	3
Business/Legal	0	2	2	3
Information & Referral	6	6	1	2
Total	23 (48%)	25 (52%)	16 (42%)	22 (58%)

Note. Resp Subst = respite substitution, Repl Subst = replacement substitution.

Relationship Between "No Need for Service" and Processes

Hypothesis 5 predicted that when a client reports "no need for service" at baseline, substitution is more likely to occur than supplementation. The results for each group supported this hypothesis. There were a total of 15 processes found (7 for FHHEP and 8 for comparison group) for which the clients stated they did not need the service, and substitution occurred in all 15 instances.

Hypothesis 6 predicted that respite substitution was more likely to occur than replacement substitution when "no need for service" was reported. The findings did not support this hypothesis. Of the 15 instances of substitution, 12 (80%) were classified as replacement substitution.

Multivariate Analysis of Informal Services Received at the 9 Month Posttest

Multiple regression analysis was conducted in order to assess the impact of formal service provision and other independent variables on informal service provision. As described in the "Method" section, the analysis strategy was to enter and interpret sets of variables hierarchically based on their causal priority, the proper assessment of an interaction and the importance of the set to the analysis. The following sets of variables were entered into the regressions: demographics; baseline number/level of informal services; informal caregiver's stress at baseline (dichotomous); interaction of caregiver's stress and baseline number/level of informal services; baseline-posttest change in self-perceived physical health, baseline-

posttest change in ability to perform activities of daily living, baseline-posttest change in number/level of formal services; interaction of change in number/level of formal services and baseline number/level of informal services; interaction of caregiver stress and change in number/level formal services; client group (dichotomous). In order to maintain as much power as possible at each stage of the analysis, when multiple variables were available as candidates for a set, the intercorrelation of these variables was assesed to select variables for use in the regression analysis. Six demographic variables were available: sex, race, education, marital status, age and annual income. Sex which was significantly correlated with marital status and annual income which was significantly correlated with education and marital status were dropped from this set (Table 17). In order to determine the loss of explanatory power attributable to dropping these variables, the dependent variables were regressed on sex and annual income after partialling out the effect of the selected demographic variables. Only 0.3% of the variance in number of informal service at posttest ($\underline{p} < .71$) was explained by the dropped variables, as indicated by the change in the squared correlation coefficient ($\underline{R}^2$). The result was similar using level of informal services as the dependent variable; change in $\underline{R}^2 = .011$, $\underline{p} < .26$.

Measures of change in health status from baseline to posttest were computed from indexes of health status at baseline and posttest. A total of 22 indexes (11 baseline and 11 posttest) were computed and the reliability of each index was estimated using

Table 17

Correlation Matrices for Demographic Variables and Change of Health Measures in the 9 Month Sample

DEMOGRAPHIC VARIABLES

(N=225[a])

	Sex	Race	Age	Education	Married
Race	.066				
Age	.032	.132*			
Education	-.066	.065	-.127		
Married	-.237**	.099	-.187**	.177	
Annual Income	-.176*	.045	-.120	.142*	.514**

CHANGE OF HEALTH MEASURES

(N=225[a])

	Sick	Hosp	NH	ADL	Diseases	Med	PH	MH	SPMSQ
Hosp	.320**								
NH	.168*	.094							
ADL	-.226**	-.281**	-.114						
Dis	.129	.047	.039	-.184*					
Med	-.023	.040	-.055	-.016	.163*				
PH	-.120	-.035	.144	.127	-.107	.050			
MH	.003	-.014	.036	.115	-.203**	-.099	.270**		
SPMSQ	-.055	-.075	.014	.080	.050	-.112	.050	.068	
Psych	.045	.018	-.039	-.110	.248**	.095	-.150	-.256**	-.078

Note. Sick=Number of days ill in past 6 months, Hosp=number of hospital days in past 6 months, NH=number of nursing home days in past 6 months, ADL=ability to perform activities of daily living, Dis=number of diseases which interfere a great deal with normal activities, PH=self-perceived physical health, MH=self-perceived mental health, SPMSQ=measures of organic brain deficit (Pfeifer, 1975), Psych=symptoms of psychological disturbance.

[a]The actual number of cases used in each correlation may differ due to missing data.

*$p < .05$, two-tailed.

**$p < .01$, two-tailed.

Cronbach's alpha. The baseline and posttest social isolation indexes were dropped because of poor reliability; Cronbach's alpha was .41 for the baseline measure and .45 for the posttest measure.

The remaining 20 indexes were used to compute 10 change in health measures. The correlation matrix of these measures was assessed in order to reduce the number of variables which would be used in the regression analysis (Table 17). Intercorrelations were found for two general types of measures, those that assessed physical health and those that assessed mental or emotional health. From the physical health domain, the 13 item activities of daily living (ADL) measure was chosen for inclusion in the analysis. ADL was correlated with the number of days ill, the number of hospital days and the number of diseases which interfered a great deal with normal activities. From the mental health domain, the 3 item measure of self-perceived physical health was chosen for use in the regression analysis. The correlation of this measure with self-perceived mental health was significant. Self-perceived physical health was also chosen because it had somewhat less missing data than other measures in the mental health domain. The eight change in health measures which were not used in the analysis were assessed for their ability to explain variance in the dependent variables. The change in $\underline{R}^2$ due to these eight measures after the two selected measures were partialled was .039 ($\underline{p} < .36$) using number of informal services as the dependent variable and .036 ($\underline{p} < .42$) when level of informal services was used as the dependent variable. A description of the independent variables

used in the regression analysis can be found in Appendix C. In addition, descriptive statistics for the independent and dependent variables are displayed in Table 18.

Number of informal services as the dependent variable. Results previously described, demonstrated a significant baseline-posttest increase in number of formal services received by clients. The descriptive analyses also indicated that a certain amount of substitution of formal for informal services did occur. Therefore, the change in number of formal services could be related to the number of informal services received at posttest.

Prior to interpretting the results of the regresion analysis, an evaluation of a plot of standardized residuals against standardized predicted values indicated unequal variance of the residuals. A normal probability plot also suggested a non-normal distribution of residuals. A log transformation of the dependent variable was made. Since zero was a possible value for the number of informal services at posttest, one unit was added for each case to accomodate the log transformation. Assessment of residuals using the transformed variable indicated improved variance and normality of the residuals.

The regression of this tranformed variable on the demographic set of variables indicated that the demographic variables did not account for a significant amount of variance (as measured by the change in R^2) in the number of informal services at posttest (Table 19). T-tests of the regression coefficients of each of the four demographic variables indicated that only the coefficient of marital status was

Table 18

Descriptive Statistics for Variables Used in the 9 Month Regression Analysis[a]

Dependent Variables	Range	$\bar{x}$	(SD)	Median
Number of informal services at posttest	0 - 6.5	2.1	(1.8)	2.0
Level of informal services at posttest	0 - 12.5	3.0	(3.0)	2.0
Independent Variables				
Age	60-100	79.2	(7.8)	--
Race	0/1	0.80[b]	--	--
Education	1 - 8	3.1	(1.7)	2.5
Marital status	0/1	0.21[b]	--	--
Number of informal services at baseline	0 - 8	2.3	(1.9)	2.0
Level of informal services at baseline	0 - 14	2.9	(3.1)	2.0
Informal caregiver stress	0 - 1	0.24[b]	--	--
Change in ADL	-12 - 10	0.3	(3.4)	0
Change in self-peceived health status	-6 - 6	0.2	(2.2)	0
Change in number of formal services received	-5 - 5.5	0.8	(1.7)	1.0
Change in level of formal services received	-9 - 9	1.1	(2.9)	1.0
Client group	0/1	0.52[b]	--	--

[a] $N=225$.

[b] Means of dichotomous variables equal the percentage of "1" responses when multiplied by 100.

Table 19

Hierarchical Regression of Number of Informal Services at the 9 Month Posttest[a]

Analysis Step	Independent Variable/Set	Change in R^2 Due to Set	F	t of Variables
1	Demographic	.03	1.79	
	Marital Status			2.18*
	Race			1.16
	Education			0.56
	Age			1.63
2.	Number Baseline Informal Services (Number I)	.43	176.94***	
3.	Caregiver Stress (Stress)	.00	0.58	
4.	Stress X Number I	.01	1.97	
5.	Baseline-Posttest Change	.03	4.40**	
	Change in Number of Formal Services (Number F)			2.91**
	Change in Self-Perceived Health			0.65
	Change in Activities of Daily Living			2.70**
6.	Number F X Number I	.00	0.02	
7.	Number F X Stress	.00	0.98	
8.	Client Group	.00	0.95	

[a]N=225.

*p < .05. **p < .01. ***p < .0001.

statistically different from zero. By contrast, the number of services provided by informal caregivers at baseline accounted for 43% of the number of informal services provided at the 9 month posttest (partial $r = .67$, $p < .001$). The third variable set, caregiver stress, which was by definition highly correlated with the number of informal services at baseline ($r = .51$, $p < .001$) accounted for an insignificant amount of variance in the number of informal services at posttest. When the order of entry of these two related, independent variables was reversed, stress accounted for 12% and number of informal services at baseline accounted for 32% of the variance in the dependent variable. The partial correlation of stress was only .04 compared to .57 for number of baseline informal services when both variables plus demograhics are in the regression. Therefore, caregiver stress is related to the number of informal services at posttest, but only to the extent that the variable measures the number of informal services at baseline. The interaction of caregiver stress and the number of baseline informal services was assessed after partialling the main effects of these two variables. This interaction term did not significantly increase the R^2 of the regression equation.

The increase in R^2 due to the set of baseline-posttest change variables was significant. The regression coefficients of the change in the number of formal services and the change in the ability to perform activities of daily living (ADL) were significant at $p < .01$. The signs of these coefficients indicate that an increase in the number of services provided by formal caregivers and improvement in

the client's ADL are significantly, linearly related to a decrease in the number of informal services at posttest. The absolute values of the partial correlation of each of these two variables without the other variable in the equation were roughly equivalent; for change in ADL, $r = .14$, for change in number of formal services, $r = .16$.

None of the three remaining independent variable sets--the interaction of change in number of formal services with number of baseline informal services, the interaction of change in number of formal services with caregiver stress and the client group--significantly increased the R^2.

The final step of the hierarchical analysis is a regression equation with all variable sets included simultaneously. The regression coefficient of each variable in the last equation represents the relationship between the independent and dependent variable with all other independent variables partialled out or controlled. The results of the final regression equation provided support for findings from the prior steps of the hierarchical analysis. The regression coefficient of the number of informal services at baseline remained significant at $p < .001$. The coefficients of change in ADL and change in number of formal services were also significant, at $p < .01$ and $p < .05$, respectively. The total R^2 with all independent variables in the equation was .51.

Level of informal services as the dependent variable. Level of service represents a somewhat more specific measure than number of

services. This variable better reflects changes in service provision and as such, somewhat different findings might result from its use.

T-tests comparing baseline to posttest means of level of informal and formal services were conducted in the FHHEP and comparison groups. The findings for both groups of clients were the same; no differences for informal services and significant increases for formal services. The mean level of formal services in FHHEP increased from 2.9 to 4.4, $t(104) = 5.10$, $p < .001$, and the mean level in the comparison group increased from 3.1 to 3.7, $t(103) = 2.34$, $p < .02$. These results were similar to those previously described for baseline-posttest comparisons of number of services. Assessment of the residuals from the initial regression of level of informal services, indicated a need to transform this dependent variable. A log transformaiton was conducted, resulting in more appropriate residuals.

As indicated in Table 20, the first step of the hierarchical regression showed that demographics accounted for a significant amount of variance in the level of informal services at posttest (5%). The coefficient of marital status was both significant and positive indicating that married clients received more services from an informal caregiver at posttest than unmarried clients. A higher baseline level of informal services and a caregiver who is under stress were both associated with a higher level of informal service at posttest. The level of informal services at baseline accounted for 36% ($p < .001$) and caregiver stress accounted for 1% ($p < .05$) of the

Table 20

Hierarchical Regression of Level of Informal Services at the 9 Month Posttest[a]

Analysis Step	Independent Variable/Set	Change in R^2 Due to Set	F	t of Variables
1	Demographic	.05	2.97*	
	Marital Status			3.32**
	Race			1.04
	Education			0.81
	Age			0.99
2.	Level of Baseline Informal Services (Level I)	.36	132.67***	
3.	Caregiver Stress (Stress)	.01	4.57*	
4.	Stress X Level I	.00	1.88	
5.	Baseline-Posttest Change	.01	1.34	
	Change in Level of Formal Services (Level F)			0.083
	Change Self-Perceived Health			0.28
	Change Activities of Daily Living			1.95
6.	Level F X Level I	.01	2.59	
7.	Level F X Stress	.01	4.03*	
8.	Client Group	.00	0.81	

[a] $N=225$.

* $p < .05$. ** $p < .01$. *** $p < .0001$.

variance in the level of informal services at posttest. When the order in which these variables entered the regression was reversed (thus partialling caregiver stress from level of baseline informal services), the square of the partial correlation was .18 ($p < .001$) for caregiver stress and .19 ($p < .001$) for level of baseline informal services. These results suggested a significant (and expected) correlation between these variables.

Neither the interaction of caregiver stress with level of baseline informal services nor the set of change variables significantly increased the R^2 of the regression. However, a significant interaction was found between stress and change in the level of formal services. Additional analyses were conducted to determine the nature of this interaction. The cases were dichotomized at the median/mean of the change in level of formal services (median and mean = 1). The correlation between caregiver stress and the level of informal services at posttest was .52 for cases in which the change in the level of formal service was zero or less and the correlation was .46 when the change was one or greater. Thus, based on assessment of zero-order correlations, an increase in the level of formal services decreased the relationship between caregiver stress at baseline and level of informal services at posttest. However, the decrease was small.

The results of the final step of the hierarchical analysis, in which all independent variables were analyzed simultaneously, supported the findings from the prior steps of the analysis.

Coefficients of those variables which were statistically significant in the hierarchical analysis -- baseline level of informal service, caregiver stress and the interaction of caregiver stress and change in level of formal services -- were also significant in the final regression equation. The $\underline{R}^2$ of the final equation was .46.

The finding that high caregiver stress at baseline was related to high levels of informal service at the 9 month posttest (when demographic variables and baseline level of informal service are partialled out) was surprising since stress was expected to reduce the informal caregiver's ability to provide additional services. The capacity and/or willingness of informal caregivers to provide service may have been underestimated. The relationship of the informal caregiver to the care recipient might provide an indication of the caregiver's willingness to provide high levels of service. Therefore, bivariate analysis of caregiver stress and type of informal caregiver was conducted. The data indicated that 76% of the 54 informal caregivers under stress were either a spouse or child of the care recipient; 24% were a friend or more distant relative. Only 27% of the 102 caregivers not under stress were a spouse or child; 73% were either a friend or more distant relative, with most (44%) being a friend. The fact that three-fourths of the caregiver's under stress were either a spouse or child of the care recipient, suggests that this group of caregivers might have been strongly motivated to provide a high level of service.

Other Areas of Impact of Formal Service

Provision of formal services had the potential of reducing contact between the informal caregiver and the elderly care recipient. This could occur with or without a concomitant decrease in service provision by informal caregivers. The following two survey questions provided information relevant to this issue:

About how many times did you talk to someone -- friends, relatives, or others--on the telephone in the past week (either you called them or they called you)?

0 = Not at all

1 = Once

2 = 2 - 6 times

3 = Once a day or more

How many times during the past week did you spend some time with someone who does not live with you, that is you went to see them or they came to visit you, or you went out to do things together?

0 = Not at all

1 = Once

2 = 2 - 6 times

3 = Once a day or more

Additionally the following question tapped the respondents' satisfaction with the frequency of contact they had with family and friends.

Do you see your relatives and friends as often as you want to or are you somewhat unhappy about how little you see them?

1 = As often as wants to

2 = Somewhat unhappy about how little

For each group of clients, correlational analyses of baseline-posttest change in the number and level of formal services with the change in each of these three variables were conducted. None of the two-tailed tests of correlations were significant. The potential impact of formal services on the informal caregiver-care recipient relationship was further explored. Prior to the implementation of formal services through the community care programs in the study, no correlation between number or level of formal services and any of the three variables of interest was expected. At posttest, an impact of formal services would be indicated by a correlation between formal services and: (a) contact between informal caregivers and the elderly recipient or (b) satisfaction of the elderly person with the frequency of contact with family and friends. Analyses showed that there was no correlation between formal services and any of the three variables at baseline or posttest in the comparison group. In the FHHEP group, a significant ($p < .03$) but low (.15) positive correlation was found at posttest between number of formal services and dissatisfaction with the frequency of contact with family and friends. However, none of the other baseline or posttest correlations were significant. In general, the data did not demonstrate an impact of formal services on the amount of contact between informal caregivers and care recipients

or on care recipients' satisfaction with the frequency of contact with family and friends.

Forty-eight Month Sample

Quantity of Service Received

Baseline. On the average, clients in the 48 month sample received over 4 services at baseline (Table 21). Informal caregivers provided the majority of the services received by FHHEP clients and formal agencies provided the majority of the services received by comparison group clients. The difference in the mean number of services provided by each type of service provider was not statistically significant in either group of clients.

Forty-eight month posttest. Table 21 indicates that FHHEP clients received a larger portion of services from formal agencies than informal caregivers at the 48 month posttest, but there was no significant difference in the mean number of services provided. Comparison group clients received the same proportion of services from each type of provider at the 48 month posttest. It is also interesting to note that the proportion of services that were provided by both formal and informal caregivers together, doubled from baseline to posttest in each group.

Differences in the mean number of services provided at baseline and posttest by each type of service provider were assessed using paired t-tests. The analyses indicated no statistically significant baseline-posttest differences in the number of services provided by informal caregivers in either group. However, the number of services

Table 21

Number and Percent of Services Received at Baseline and 48 Months

	FHHEP (n=38)				Comparison Group (n=38)			
	Baseline		48 Months		Baseline		48 Months	
Service	n	%	n	%	n	%	n	%
Informal	90	57	68	38	69	42	51	44
Formal	56	35	82	46	84	51	49	43
Both Informal and Formal	13	8	30	17	11	6	15	13
Total	159	100	180	101	164	99	115	100
Overall Mean (SD)	4.2	(2.1)	4.7	(2.0)	4.3	(2.0)	3.1	(2.1)

Note. Total percentage may not be equal to 100% due to rounding errors.

provided by formal providers was higher at the 48 month posttest in the FHHEP group, $t(37) = 2.76$, $p < .01$; and lower at posttest in the comparison group, $t(36) = 2.54$, $p < .02$.

Distribution of Number of Services Received from Each Source

The baseline-posttest pattern of service provision indicated reliance on formal community care services in the FHHEP group at the 48 month posttest. The proportion of FHHEP clients receiving three or more services dropped from 42% at baseline to 29% at the 48 month posttest (Table 22). The pattern was reversed for services provided by formal agencies; 24% of the FHHEP group received three or more services at baseline and 45% received three or more services at posttest. Comparison group clients demonstrated a very different pattern of service use. At the 48 month posttest the quantity of service received from both types of service providers was markedly reduced. This is best demonstrated in Table 23 by the baseline-posttest change in proportion of clients who received zero services. The proportion of clients receiving zero services increased by 18% for informal caregivers and by 24% for formal service providers. Only 11% and 6% of comparison group clients received three or more services at posttest from informal and formal service providers, respectively.

Specific Services Received by Clients

Baseline. The services most frequently received at baseline in each group were I&R and housekeeper/homemaker services (Table 24).

Table 22

Distribution of Number of Services Received at Baseline and 48 Months by Source for FHHEP Clients

	BASELINE (n=38)						48 MONTHS (n=38)					
Number of	Informal		Formal		Both		Informal		Formal		Both	
Services Received	n	%	n	%	n	%	n	%	n	%	n	%
0	9	24	6	16	27	71	16	42	15	40	28	74
1	11	29	7	18	11	29	6	16	6	16	6	16
2	6	16	8	21	0	0	10	26	11	29	3	8
3	8	21	10	26	0	0	2	5	4	11	1	3
4	1	3	4	11	0	0	1	3	1	3	0	0
5	1	3	3	8	0	0	3	8	1	3	0	0
6	1	3	0	0	0	0	0	0	0	0	0	0
7	1	3	0	0	0	0	0	0	0	0	0	0
	38	102	38	100	38	100	38	100	38	102	38	101

Note. Total percentage may not be equal to 100% due to rounding errors.

Table 23

Distribution of Number of Services Received at Baseline and 48 Months by Source for Comparison Group Clients

Number of Services Received	BASELINE (n=38) Informal n	%	Formal n	%	Both n	%	48 MONTHS (n=38) Informal n	%	Formal n	%	Both n	%
0	8	21	15	40	29	76	11	29	9	24	24	63
1	8	21	9	24	7	18	7	18	10	26	6	16
2	6	16	5	13	1	3	9	24	2	5	4	11
3	5	13	3	8	0	0	5	13	7	18	1	3
4	3	8	3	8	4	3	3	8	6	16	2	5
5	5	13	2	5	0	0	2	5	3	8	1	3
6	3	8	1	3	0	0	1	3	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	1	3	0	0
	38	100	38	101	38	100	38	100	38	100	38	101

Note. Total percentage may not be equal to 100% due to rounding errors.

Table 24

Number and Percent of Clients that Received Each Service at Baseline and 48 Months

	FHHEP (n=38)				Comparison Group (n=38)			
	Baseline		9 Months		Baseline		9 Months	
Service	n	%	n	%	n	%	n	%
Transportation	17	45	22	67	25	66	19	53
Personal Care	20	53	25	68	12	32	11	30
Nursing Care	14	37	22	61	18	47	2	5
Physical Therapy	4	11	6	17	17	45	3	8
House/Homemaker	28	74	31	86	26	68	24	65
Relocation	2	5	3	8	6	16	4	11
Meal Preparation	23	61	24	67	15	40	23	62
Business/Legal	23	61	21	60	17	45	15	42
Information & Referral	28	74	26	72	28	74	14	38

[a] $N = 76$.

$^{*}p < .10$. $^{**}p < .05$. $^{***}p < .001$.

Over half of the FHHEP clients also received meal preparation, personal business/legal assistance and personal care, while 45% or more of the comparison group clients received transportation, nursing care, physical therapy and personal business/legal assistance.

Forty-eight month posttest. At the 48 month posttest, proportionately more FHHEP clients used transportation, personal care, nursing care, physical therapy, housekeeper/homemaker services and relocation assistance. These increases in service use ranged from 3% for relocation assistance to 24% for nursing care. Comparison group clients, on the other hand, reduced their use of services for all services except meal preparation. Reductions in service use were as high as 36%, 37% and 42% for I&R, physical therapy and nursing care, respectively. Non-parametric McNemar tests indicated that only the decreased use of nursing care, physical therapy and I&R in the comparison group was statistically significant, $p < .01$ for two-tailed tests.

Source of Service

Baseline. In the FHHEP group, informal caregivers were the primary source of service at baseline for seven of the nine services studied. Table 25 shows that formal service providers were the primary source of only nursing care and physical therapy. A substantial proportion of clients (20%) reported receiving personal care from both types of service providers.

In the comparison group, informal caregivers were the primary source of service for only three services: transportation, meal

Table 25

Number and Percent of Each Service Provided by Source at Baseline for the 48 Month Posttest Sample

	FHHEP (n=38)						Comparison Group (n=38)					
	Informal		Formal		Both		Informal		Formal		Both	
Service	n	%	n	%	n	%	n	%	n	%	n	%
Transportation	16	94	1	6	0	0	19	76	5	20	1	4
Personal Care	9	45	7	35	4	20	5	42	7	58	0	0
Nursing Care	3	21	11	79	0	0	0	0	18	100	0	0
Physical Therapy	0	0	4	100	0	0	2	12	15	88	0	0
House/Homemaker	15	54	11	39	2	7	6	23	13	50	7	27
Relocation	2	100	0	0	0	0	1	17	5	83	0	0
Meal Preparation	13	57	7	30	3	13	9	60	6	40	0	0
Business/Legal	18	78	3	13	2	9	16	94	1	6	0	0
Information & Referral	14	50	12	43	2	7	11	39	14	50	3	11

Note. Total percentage per service for each group may not be equal to 100% due to rounding errors.

preparation and personal business/legal assistance. Formal service providers were the primary source (received by 50% or more of the clients) for the remaining six services. In addition, 27% of the comparison group clients reported receiving housekeeper/homemaker services from both formal and informal service providers.

Forty-eight month posttest. At the 48 month posttest, informal caregivers were found to be the primary source of only two services in the FHHEP group, transportation and personal business/legal assistance, whereas formal service providers were the primary source of physical therapy, relocation assistance, nursing care, I&R and personal care (Table 26). No primary source of housekeeper/homemaker services or meal preparation was found and one third of the FHHEP clients reported receiving personal care from both service providers. None of the baseline-posttest non-parametric tests of change in source of service were significant in the FHHEP group.

In the comparison group, informal caregivers continued to be the primary source of transportation and personal business/legal assistance. In addition, although the number of clients was small, informal caregivers assisted with relocation more often than formal service providers. Formal service agencies were the primary source of service for five services: nursing care, physical therapy, housekeeper/homemaker service, meal preparation and I&R. There was no primary source of service for personal care, and one fifth of the comparison group clients received transportation and housekeeper/

Table 26

Number and Percent of Each Service Provided by Source at the 48 Month Posttest

	FHHEP (n=38)						Comparison Group (n=38)					
	Informal		Formal		Both		Informal		Formal		Both	
Service	n	%	n	%	n	%	n	%	n	%	n	%
Transportation	17	77	3	14	2	9	11	58	4	21	4	21
Personal Care	6	24	11	44	8	32	5	46	5	46	1	9
Nursing Care	1	5	17	77	4	18	0	0	2	100	0	0
Physical Therapy	0	0	6	100	0	0	0	0	3	100	0	0
House/Homemaker	13	42	13	42	5	16	8	33	11	46	5	21
Relocation	0	0	3	100	0	0	3	75	1	25	0	0
Meal Preparation	10	42	10	42	4	17	6	26	13	57	4	17
Business/Legal	15	71	4	19	2	10	12	80	3	20	0	0
Information & Referral	6	23	15	58	5	19	6	43	7	50	1	7

Note. Total percentage per service for each group may not be equal to 100% due to rounding errors.

homemaker services from both service providers jointly. No statistically significant changes in source of service were found.

Baseline-48 Month Posttest Service Provider Combinations

The frequencies of specific baseline-48 month posttest service provider combinations in the FHHEP group are displayed in Table 27. The informal-informal and no-service-formal combinations were found most frequently. Although the n's were small, the data for specific services provided additional information. For instance, informal caregivers consistently served as the major source of transportation service; half of the transportation service combinations were informal-informal and another 21% were no service-informal. In addition, informal caregivers maintained their caregiving efforts over time in terms of housekeeper/homemaker services and personal business/legal services. The formal-formal combination was the combination most often found for I&R services. About one fifth of the nursing care, housekeeper/homemaker and meal preparation combinations were also formal-formal. While few new informal services appear in Table 27 ("0-I"), new formal services ("0-F") were found frequently for relocation assistance and physical therapy (the n's were small for both services), as well as nursing care and personal care. The both-both combination was found most frequently for personal care and meal preparation assistance.

Table 28 demonstrates that the most frequent service provision combination in the comparison group was formal-no service (25%) followed by informal-no service (15%). The informal-informal and no

Table 27

Number and Percent of FHHEP Clients Receiving Services from Various Combinations of Service Providers at Baseline and 48 Months

S E R V I C E

(N=38)

Source		TRAN		PERS		NURS		PT		HOUS		RELO		MEAL		BUS		I&R		TOTAL	
Base	Post	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
I	0	2	81	2	7	2	7	0	0	2	6	2	40	2	7	5	17	3	9	20	9
F	0	0	0	3	10	3	11	3	33	1	3	0	0	2	7	2	7	2	6	16	7
B	0	0	0	1	3	0	0	0	0	0	0	0	0	0	0	1	3	1	3	3	1
0	I	5	21	3	10	1	4	0	0	3	9	0	0	1	4	3	10	1	3	17	8
I	I	12	50	3	10	0	0	0	0	9	27	0	0	9	32	11	38	3	9	47	21
F	I	0	0	0	0	0	0	0	0	1	3	0	0	0	0	0	0	2	6	3	1
B	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	0	0	1	1
0	F	2	8	6	19	12	44	5	56	4	12	3	60	4	14	3	10	2	6	41	19
I	F	0	0	2	7	0	0	0	0	1	3	0	0	1	4	1	3	5	16	10	5
F	F	1	4	3	10	5	19	1	11	6	18	0	0	5	18	0	0	8	25	29	13
B	F	0	0	0	0	0	0	0	0	2	6	0	0	0	0	0	0	0	0	2	1
0	B	0	0	2	7	0	0	0	0	0	0	0	0	0	0	0	0	2	6	4	2
I	B	2	8	2	7	1	4	0	0	3	9	0	0	1	4	1	3	2	6	12	5
F	B	0	0	1	3	3	11	0	0	2	6	0	0	0	0	1	3	0	0	7	3
B	B	0	0	3	10	0	0	0	0	0	0	0	0	3	11	0	0	1	3	7	3
Total		24	99	31	103	27	100	9	100	34	102	5	100	28	101	29	97	32	98	219	99

Note. TRAN = tranportation, PERS = personal care, NURS = nursing care, PT = physical therapy, HOUS = housekeeper/homemaker, RELO = relocation, MEAL = meal preparation, BUS = personal business/legal, I&R = information & referral, I = informal caregiver, F = formal service provider, 0 = no service.

Total percentages may not be equal to 100% due to rounding errors.

Table 28

Number and Percent of Comparison Group Clients Receiving Services from Various Combinations of Service Providers at Baseline and 48 Months

S E R V I C E

(N=38)

Source		TRAN		PERS		NURS		PT		HOUS		RELO		MEAL		BUS		I&R		TOTAL	
Base	Post	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
I	0	8	29	2	12	0	0	2	13	0	0	1	10	3	11	7	32	7	23	30	15
F	0	1	4	4	24	15	88	10	67	4	13	5	50	2	7	0	0	8	27	49	25
B	0	0	0	0	0	0	0	0	0	4	13	0	0	0	0	0	0	1	3	5	3
0	I	1	4	3	18	0	0	0	0	2	6	3	30	2	7	5	23	1	3	17	9
I	I	8	29	2	12	0	0	0	0	2	6	0	0	3	11	6	27	3	10	24	12
F	I	1	4	0	0	0	0	0	0	3	9	0	0	1	4	1	5	2	7	8	4
B	I	1	4	0	0	0	0	0	0	1	3	0	0	0	0	0	0	0	0	2	1
0	F	2	7	2	12	0	0	0	0	5	16	1	10	10	36	1	5	2	7	23	12
I	F	1	4	0	0	0	0	0	0	2	6	0	0	1	4	2	9	0	0	6	3
F	F	1	4	3	18	2	12	3	20	3	9	0	0	2	7	0	0	4	13	18	9
B	F	0	0	0	0	0	0	0	0	1	3	0	0	0	0	0	0	1	3	2	1
0	B	1	4	1	6	0	0	0	0	0	0	0	0	2	7	0	0	0	0	4	2
I	B	1	4	0	0	0	0	0	0	1	3	0	0	1	4	0	0	1	3	4	2
F	B	2	7	0	0	0	0	0	0	3	9	0	0	1	4	0	0	0	0	6	3
B	B	0	0	0	0	0	0	0	0	1	3	0	0	0	0	0	0	0	0	1	1
Total		28	104	17	102	17	100	15	100	32	99	10	100	28	102	22	101	30	99	199	102

Note. TRAN = tranportation, PERS = personal care, NURS = nursing care, PT = physical therapy, HOUS = housekeeper/homemaker, RELO = relocation, MEAL = meal preparation, BUS = personal business/legal, I&R = information & referral, I = informal caregiver, F = formal service provider, 0 = no service.

Total percentages may not to equal be 100% due to rounding errors.

service-informal ("new" formal services) combinations also were found relatively often. As had been true for FHHEP clients, informal caregivers continued to provide transportation service to comparison group clients at the 48 month posttest. In addition, about one fourth of the service provider combinations found for personal business/legal assistance were informal-informal. Compared to other service provider combinations, the formal-formal combination was found relatively frequently for physical therapy, personal care and nursing care, although the small number of cases associated with these combinations should be noted. New formal services ("O-F") accounted for a large proportion of meal preparation and housekeeper/homemaker services. The overall reduction in services received by comparison group clients at the 48 month posttest is demonstrated by the frequency of occurrence of informal-no service and formal-no service.

Baseline-48 Month Posttest Change in Level of Services Provided by Informal Caregivers

Using information relevant to level of service provision at baseline and posttest, and service provider combinations, the number of increases and decreases in the level of informal caregiving was determined for each service (Table 29). Small n's per service limited the usefulness of these data; however, summing over services provided more reasonable n's. In the FHHEP group, no difference between increases and decreases was found. By contrast, in the comparison group, the level of informal caregiving increased more often than it decreased. This pattern was found for all but one of the eight

Table 29

Baseline-48 Month Posttest Change in Level of Services Provided by Informal Caregivers

	FHHEP (n=38)				Comparison Group (n=38)			
	Increased		Decreased		Increased		Decreased	
Service	n	%	n	%	n	%	n	%
Transportation	6	86	1	14	9	82	2	18
Personal Care	7	50	7	50	2	100	0	0
Nursing Care	1	50	1	50	2	100	0	0
Physical Therapy	0	0	0	0	0	0	0	0
House/Homemaker	5	50	5	50	5	33	10	67
Relocation	0	0	0	0	3	100	0	0
Meal Preparation	2	33	4	67	3	75	1	25
Business/Legal	4	67	2	33	8	80	2	20
Information & Referral	3	30	7	70	2	50	2	50
Total	28		27		34		17	
	(51%)		(49%)		(67%)		(33%)	

Note. Total percentage per service for each group may not be equal to 100% due to rounding errors.

services for which a change in level of informal service provision was found.

Baseline-48 Month Service Provider Processes

Per service. Table 30 shows that few per service processes were found in either group. Of the total 28 processes, 22 or 79% were substitution and 6 or 21% were supplementation. Only 3 processes were found when the client reported "no need for service", therefore any assessment of those data was omitted.

Per person. Table 31 demonstrates that per person supplementation occurred twice as frequently as substitution or specialization/reallocation. The n's in the FHHEP group were somewhat larger than the n's in the comparison group, and two-tailed binomial tests indicated significant differences between the relative frequency of supplementation and substitution ($p < .04$) and supplementation and specialization/reallocation ($p < .04$). A total of 10 instances of substitution were found, and 9 out of 10 were replacement substitution.

Multivariate Analysis of Informal Services Received at the 48 Month Posttest

The smaller sample sizes in the 48 month analyses were expected to considerably reduce the power of the regression analyses. In order to conserve degrees of freedom in the denominator of the F test and maintain as much power as possible for testing the most important variables, the number of variables tested was reduced. The

Table 30

Frequency of Baseline-48 Month Posttest Service Provider Processes Per Service

	FHHEP (n=38)		Comparison Group (n=38)	
	Subst	Suppl	Subst	Suppl
Service	n	n	n	n
Transportation	1	0	1	0
Personal Care	2	3	0	0
Nursing Care	1	0	0	0
Physical Therapy	0	0	0	0
House/Homemaker	4	1	3	2
Relocation	0	NA[a]	0	NA
Meal Preparation	1	NA	1	NA
Business/Legal	1	NA	2	NA
Information & Referral	5	NA	0	NA
Total	15	4	7	2

Note. Subst = substitiution, Suppl = supplmentation.

[a]NA = information not available.

Table 31

Frequency of Baseline-48 Month Posttest Service Provider Processes

Per Person

Group	Processes						Types of Substitution[a]			
	Subst		Suppl		Special		Respite Substitution		Replacement Substitution	
	n	%[a]	n	%[a]	n	%[a]	n	%[b]	n	%[b]
FHHEP (n=38)	7	18	15	40	7	18	0	0	7	100
Comparison (n=38)	3	8	7	18	3	8	1	33	2	67

Note. Subst = substitution; Suppl = supplementation; Special = specialization/reallocation.

[a]Percentage is based on all respondents: FHHEP = 38, Comparison Group = 38. More than one process could have occurred for each respondent. The number of different people included in these data is FHHEP = 69, OSCH = 64.

[b]Percentage is based on number of respondents for whom substitution was found.

correlation matrices of demographic variables and change in health measures for the 48 month data were assessed. One demographic variable, marital status, which was significantly correlated with sex (two-tailed $r = -.25$, $p < .03$) was selected for inclusion in the regression analyses. The baseline-posttest change in ADL which was correlated with self-perceived mental health ($p < .01$), number of diseases which interfered a great deal with normal activities ($p < .01$), self-perceived physical health ($p < .03$) and number of hospital days in the past 6 months ($p < .04$) was also selected for inclusion in the analyses. Other independent variables included baseline number/level of informal services, caregiver stress, change in the number/level of formal services and the interaction of stress with the number/level of formal services. The number and level of informal services at posttest was regressed on these independent variables hierarchically. Table 32 displays descriptive statistics for the variables used in the regression analysis.

Even though the number of independent variables was reduced, the power of the analysis was still low. Using an alpha of .05 and an estimated R^2 of .40, the power for detecting a squared partial correlation of .04 for the fifth variable of five variables tested was calculated to be only about .30. The squared partial correlation would have to be at least .12 in order for the the analysis to have power of .80. Therefore, the alpha level of the statistical tests was raised in order to further increase the power of the analyses. If alpha of .10 were used, the analysis would have power of .80 to detect

Table 32

Descriptive Statistics for Variables Used in the 48 Month Regression Analysis[a]

Dependent Variables	Range	$\bar{x}$	(SD)	Median
Number of informal services at posttest	0 - 6	1.9	(1.7)	2.0
Level of informal services at posttest	0 - 11	2.7	(3.2)	1.3
Independent Variables				
Marital status	0/1	0.29[b]	--	--
Number of informal services at baseline	0 - 7	2.3	(1.9)	2.0
Level of informal services at baseline	0 - 12	2.6	(2.7)	2.0
Informal caregiver stress	0/1	0.21[b]	--	--
Change in ADL	-11 - 10	0.4	(3.6)	0
Change in number of formal services received	-5 - 5	0.0	(2.1)	0
Change in level of formal services received	-7 - 11	0.6	(3.7)	0.5
Client group	0/1	0.52	--	--

[a] $N = 76$.

[b] Means of dichotomous variables equal the percentage of "1" responses when multiplied by 100.

a squared partial correlation of .095, and the analysis would have power of .70 to detect a squared partial correlation of .075. Therefore, for the 48 month analysis, findings which are significant at $p < .10$ will be noted and discussed. Any conclusions based on findings that are significant at $p < .10$ will be made with the realization that they are more likely to be chance findings, than if $p < .05$ had been used.

Number of informal services as the dependent variable. Analysis of residuals indicated that a log transformation of the dependent variable improved the normality and variance of residuals; therefore, the transformed dependent variable was used in the regression analyses. The demographic variable, marital status, was entered first in the hierarchical analysis and did not contribute significantly to the R^2 (Table 33). The number of baseline-informal services accounted for 23% of the variance in the dependent variable ($p < .0001$). Caregiver stress significantly contributed to the regression when entered next. When the order of entry of these two variables was reversed, caregiver stress significantly contributed to R^2 ($R^2 = .09$, $p < .008$) and the change in R^2 attributable to baseline number of informal services dropped from .23 to .15. The final regression equation, which partials each of these two variables (as well as marital status) from the other, indicated that only the regression coefficient of number of baseline informal services was significant. Therefore, caregiver stress, which was in part operationally defined by the number of informal services at baseline did not explain

Table 33

Hierarchical Regression of Number of Informal Services at the 48 Month Posttest[a]

Analysis Step	Independent Variable/Set	Change in R^2 Due to Set	F	t of Variables
1.	Marital Status	.04	0.08	
2.	Number Baseline Informal Services (Number I)	.23	23.44**	
3.	Caregiver Stress (Stress)	.01	0.90	
4.	Baseline-Posttest Change	.01	0.26	
	Change in Number of Formal Services (Number F)			0.47
	Change in Activities of Daily Living			0.99
5.	Number F X Stress	.03	2.83*	

[a] $N = 76$.

* $p < .10$. ** $p < .0001$.

variance in the dependent variable beyond that accounted for by the baseline number of formal services.

The baseline-posttest change variables--change in number of formal services and change in ADL - did not significantly increase the $\underline{R}^2$; however, the interaction of caregiver stress and change in number of formal services increased the $\underline{R}^2$ by .03 ($\underline{p} < .10$). The results of the hierarchial analysis were confirmed by the results from the final regression equation in which all five independent variables were assessed simultaneously. The $\underline{R}^2$ of the final equation was .32.

The significant interaction term was evaluated further. Caregiver stress and change in number of formal services were each correlated with the number of formal services at posttest while controlling for the other independent variable. No significant relationship was found between change in formal services and the dependent variable controlling for the presence or absence of caregiver stress. On the other hand, caregiver stress was significantly correlated with the dependent variable ($\underline{r} = .48$, $\underline{p} < .02$), but only when the change in the number of formal services was greater than or equal to one. Therefore, caregiver stress at baseline was associated with a high level of informal services at posttest, but only when the number of formal services increased from baseline to posttest. It is important to remember that the interaction term was significant at $\underline{p} < .10$, thus the finding was more likely to be due to chance than if it had been significant at $\underline{p} < .05$.

Level of informal services as the dependent variable. Initial analyses indicated improved residuals when the dependent variable was transformed with the log funciton; therefore, the transformed dependent variable was used in the regression analysis. Table 34 demonstrates that results using this variable were similar to the results discussed in the previous section. Level of baseline informal services was significantly linearly related to the level of informal services at posttest. Caregiver stress, entered as the third variable, was not a significant predictor but entered as the second variable after marital status accounted for 13% of the variance in the dependent variable ($p < .001$). The fact that caregiver stress is not significantly related to the dependent variable after variance accounted for by the baseline level of informal services is removed, suggests that the correlation between stress and the level of informal services at baseline ($r = 59$, $p < .001$) accounts for the relationship between stress and the dependent variable. The baseline posttest change variable set was not a significant contributor to the regression (although change in level of formal services by itself was significant at $p < .01$). The interaction of caregiver stress and change in level of formal services was significant at $p < .05$. Further analysis indicated that a caregiver who was stressed at baseline was correlated with high levels of informal services at posttest ($r = .55$, $p < .003$), but only when the level of formal services increased from baseline to posttest. The final step of the hierarchical regression, which included all independent variables,

Table 34

Hierarchical Regression of Level of Informal Services at the 48 Month Posttest[a]

Analysis Step	Independent	Change in R^2 Due to Set	F	t of Variables
1.	Marital Status	.01	0.72	
2.	Level of Baseline Informal Services (Level I)	.18	15.89***	
3.	Caregiver Stress (Stress)	.02	.18	
4.	Baseline-Posttest Change	.04	1.64	
	Change in Level of Formal Services (Level F)			1.81*
	Change Activities of Daily Living			0.25*
5.	Level F X Stress	.04	4.07**	

[a] $N = 76$.

*$p < .10$. **$p < .05$. ***$p < .001$.

supported the findings from the prior steps; only baseline level of informal services and the interaction of stress and change in level of formal services was significant. The R^2 of the final equation was .28.

Other Areas of Impact of Formal Service

Correlation analyses were conducted between number/level of formal services and change in: (a) client telephone contacts with family and friends, (b) in-person contacts with family and friends, and (c) satisfaction with frequency of in-person contact with family and friends for each group of clients. The correlation between change in the number of formal services and change in the frequency of telephone contact with family and friends was significant in the FHHEP group (two-tailed $r = .37$, $p < .04$), indicating that an increased number of formal services is correlated with decreased telephone contacts. No other correlations in either group were significant.

To further explore these data, baseline correlations were also conducted separately from posttest correlations. A finding of no correlation at baseline and a significant correlation at posttest, would suggest a potential impact of formal services on these other measures. In the FHHEP group, only the correlation between number of formal services and in-person contacts with family and friends followed this pattern. The data indicated that there was no significant correlation between these variables at baseline. At posttest, however, a high number of formal services was significantly

correlated with a low frequency of in-person contacts with family and friends ($r = -.36$, $p < .04$).

In the comparison group, the correlation between level of formal services and the client's satisfaction with the frequency of contact with family and friends was signficant at posttest and not at baseline. A significant negative correlation at posttest ($r = -.41$, $p < .03$) indicated that high levels of formal service were correlated with increased satisfaction with contact at the 48 month posttest. Thus, this finding suggests that formal service had a positive effect on the informal caregiver-care receiver relationship.

Discussion

Baseline data from this study confirmed what has been reported elsewhere, that informal caregivers supply the bulk of the service that is provided to the homebound elderly. This finding was most clearly demonstrated in the FHHEP group whose clients were older, more impaired and had better informal resources. Over half of the services received by FHHEP clients at baseline in both the 9 month and 48 month samples were provided by informal caregivers. The finding that the homebound elderly required assistance in multiple areas also agreed with other studies. On the average, FHHEP and comparison group clients in each sample received over four services at baseline. As expected, after enrolling in one of the two community care programs, the average number of services received by clients in the 9 month sample increased. In the 48 month sample, the number of services received by clients increased from a mean of 4.2 to 4.7 in the FHHEP group, but decreased from 4.3 to 3.1 in the comparison group. The decrease in the comparison group is attributable to a significant decrease in the number of services provided by formal agencies. Differences between the two community care programs might explain this finding. FHHEP services were more comprehensive and the program may have given greater attention, including follow-up, to its clients. Comparison group clients or their informal caregivers probably had to take greater initiative in obtaining needed services. After 48 months, comparison group clients and their informal caregivers may have become less able or less willing to try to obtain services.

Analysis of source of service at baseline and 9 months in both groups demonstrated a clear shift from dependence on informal caregivers to dependence on formal service providers for the majority of home care services. However, this finding should not be interpreted as a lessening of effort by informal caregivers. In fact, when baseline-9 month service provider combinations were assessed, it was found that the informal-informal combination was the most frequently observed combination in each group of clients. Informal-informal was also the most frequent combination found in the FHHEP group at 48 months and it was the second most frequent combination in the comparison group. Therefore, the involvement of informal caregivers was maintained over the 9 and 48 month time period.

Services provided by formal agencies after baseline measurement were in general, new services, not services that were provided by informal caregivers at baseline. This conclusion was supported by the finding that the second most frequently observed combination in each group at 9 months was no service-formal. This combination occurred more than twice as frequently than the combined frequency of informal-formal and both-formal, in which formal agencies supplied the same services provided by informal caregivers. At 48 months, clients received new formal services three times as often as they received formal services which had been previously provided by informal caregivers; 19% vs. 6% for FHHEP clients and 12% vs. 4% for comparison group clients.

Support for Study Hypotheses

Hypothesis 1

In terms of specific services, the data supported a number of research hypotheses. It was expected that services requiring special skills such as nursing care and physical therapy would be more likely to be provided by formal agencies. Depending upon the sample and client group, between 77% and 100% of the nursing care received at either baseline or posttest was provided by formal service providers. The finding for physical therapy was similar; formal caregivers provided between 88% and 100% of the physical therapy received by either group at baseline or posttest. This pattern of findings, that services requiring technical expertise are more likely to be provided by formal agencies, supports theories proposed by Litwak (1966) and Sussman (1977).

Hypotheses 2 and 3

The second hypothesis stated that the proportion of clients receiving homemaker-housekeeper services, meal preparation, personal care and transportation from both formal and informal providers together or by formal providers alone would increase at posttest compared to baseline measurement. This hypothesis was based on two assumptions: (a) informal caregivers were better able to provide these services than other home care services, and (b) these same services are often targeted for provision by home care agencies. For somewhat different reasons, the third hypothesis made the same prediction for I&R, personal business/legal assistance and relocation

services. The reasons for this prediction with regard to these services were: (a) informal caregivers have a degree of personal involvement with the frail elderly that is useful in successfully providing these services, and (b) formal service providers have access to specific information which is needed to provide these services. The data supported the predicted posttest outcomes in the FHHEP group for most services. The proportion of service provided to FHHEP clients by formal agencies or by both formal and informal providers together increased at 9 and 48 months for all services, except transportation in the 9 month sample. The number of clients that received relocation service at posttest was too small (n = 13 and n = 3, respectively) to use in this analysis.

For comparison group clients, the hypothesized increase in proportion of services provided by formal or formal and informal providers together was supported for all services except I&R and personal care in the 9 month sample, and personal care and homemaker/housekeeper services in the 48 month sample. As was true for FHHEP clients, the number of comparison group clients that received relocation at posttest was too small for reliable analysis.

The findings which supported the two hypotheses depended in large part on increased service provision from formal agencies. Only a relatively small proportion of the services received at the time of the posttest were provided by both formal and informal providers together. There are several possible explanations for this finding. First, it is possible that respondents tended to choose either formal

or informal caregivers, not both, when asked about the source of the services they received. This could be due to: (a) the predominance of one service provider over another, (b) ignorance on the part of the respondent as to the involvement of one of the two types of providers or (c) lack of acknowledgment of the informal caregiver's efforts (i.e., taking those efforts for granted).

Another interpretation of the low frequency of service provision by formal and informal caregivers together is that cooperative ventures may be, by their nature, difficult to undertake. It may also be true that formal agencies do not desire such joint ventures. Perhaps administrators of community care agencies believe it is more productive to allow their professional staff to assume full responsibility for service provision.

One final, potential explanation for the low frequency of joint formal-informal service provider arrangements is that informal caregivers in this study were not able or were not willing to provide the service that community care agencies provided. Although this study demonstrated that substitution of formal services for informal services did not occur with great frequency, the finding that most of the new service was provided by formal agencies could represent lost opportunities for cooperative service provision due to the informal caregivers' inability or unwillingness to provide additional services.

Hypothesis 4

Six hypotheses were directly relevant to baseline-posttest service provider processes. Hypothesis 4 stated that "per person" supplementation would occur more frequently than either substitution or specialization/reallocation. This hypothesis was based on the assumption that the community care agencies would respond to the unmet needs of their clients by providing services that their clients needed. Service provision of this nature, when given to an individual who is already receiving other services from an informal caregiver, was described in the "Method" section as service which supplements the service provided by informal caregivers. The hypothesis was supported by data which indicated that supplementation occurred more frequently than substitution and specialization/reallocation in each group of clients for both samples. The difference in relative frequency of occurrence of different processes proved to be statistically significant for all clients except the 48 month comparison group.

Hypotheses 5 and 6

The fifth hypothesis predicted that when "no need for service" was reported at baseline, substitution would be more likely to occur than supplementation on a "per service" basis. The per service definition of supplementation did not include "new" services provided by community care agencies. The definition only included services which agencies provided at posttest which were also provided by informal caregivers at both baseline and posttest; therefore, it represented a more restricted definition of supplementation.

Assessing these data by service was impractical since only 15 "per service" processes were found when there was "no need for service." (Only three processes occurred in the 48 month sample, so these data were not analyzed.) However, when the results of all services for both client groups were combined in the 9 month sample, all 15 processes were found to be substitution. These results supported the hypothesis. Additional findings, however, did not support the premise upon which the hypothesis was based.

The author had assumed that when service was provided to an individual who stated that he or she did not need the service, the service may have been intended to provide respite to the informal caregiver. Therefore, substitution was more likely to occur than supplementation. This assumption was also the basis for Hypothesis 6 which predicted a greater frequency of respite substitution than replacement substitution when "no need for service" was reported. The data did not support this assumption. Twelve of the 15 instances of substitution (80%) were classified as replacement substitution and only 20% were classified as respite substitution. One possible explanation for these findings is that respite substitution was poorly measured. The operational definition of respite substitution relied on the assumption that a specific set of conditions indicated that the informal caregiver was likely to require respite. It is possible that the definition of "high levels of service" was too restrictive. Perhaps the level of service was set too high and informal caregivers who were truly in need of respite did not meet the definition of "in

need of respite" which was chosen in this study. Alternatively, the status of the informal caregiver with regard to need for respite could have changed over time. New family members or friends could have been recruited, reducing the primary informal caregiver's need for respite substitution. In addition, for some clients, the indvidual identified as the primary informal caregiver changed between baseline and posttest measurement. Twenty seven percent of the FHHEP clients and 33% of the comparison group clients identified a different primary informal caregiver at the 48 month posttest. The new primary caregiver could have had less need for respite than the original primary caregiver.

In light of the fact that relatively little respite service had been provided to caregivers, the question remains: why was substitution found so frequently compared to supplementation when the client reported no need for service? Certainly, this finding is related to the low frequency of "per service" supplementation in general. The definition of supplementation required service to be provided jointly by formal and informal caregivers at posttest. As previously discussed, joint service provision was rare in the full sample so it should not be too surprising that in a more restricted sample supplementation was not found.

Hypothesis 7

Hypothesis 7 makes the same prediction as hypothesis 6, but on a more general level; when substitution occurs it will more likely be respite substitution than replacement substitution. The data, either per person or per service, do not support the hypothesis; about 60% of the instances of substitution in the 9 month sample were replacement substitution, and 9 of 10 instances of per person substitution in the 48 month sample were replacement substitution. Although the n's were too small for reliable analysis, the data displayed by service in the 9 month sample were enlightening. The results for FHHEP differed depending upon the service. Replacement substitution occurred more frequently than respite substitution for transportation, homemaker/housekeeper services, meal preparation and personal business/legal assistance, but respite substitution occurred more frequently for personal care and nursing services. It is interesting to note that respite substitution occurred for services which could be expected to be the most stressful for the informal caregivers (personal care) or which might indicate a more impaired care recipient (nursing services).

In the comparison group, no services were found in which the frequency of respite substitution was greater than the frequency of replacement substitution. However, the greater frequency of replacement substitution compared to respite substitution was due almost entirely to one service - housekeeper/homemaker services.

The seventh hypothesis also indicated that the predicted greater frequency of respite substitution would be more clearly demonstrated in the FHHEP group. The finding for personal care and nursing services in the FHHEP group lends some support for this aspect of the hypothesis.

These data provide some evidence for the conclusion that in some cases replacement substitution was an unanticipated negative outcome of community care service. However, a poor measure of respite substitution confounds these findings. The possible failure to accurately identify all instances of respite substitution has been discussed. One of the problems associated with a secondary analysis such as this one is the investigator's dependence upon available data. Future studies which make use of better operational definitions of respite substitution will provide more conclusive findings with regard to the processes of respite and replacement substitution.

Hypothesis 8

Hypothesis 8 was substantiated by the 9 month data. Specialization/reallocation was found less often than either supplementation or substitution. However, the predicted differential impact of client group was not found. In the 48 month sample, specialization/reallocation occurred less frequently than supplementation but as frequently as substitution.

Hypothesis 9

The ninth hypothesis stated that due to increased impairment of the older person and decreased capacity of the informal caregiver to provide assistance over time, the relative frequency of substitution would be greater in the 48 month sample than in the 9 month sample. Similarly, the relative frequency of supplementation and specialization/reallocation would be less in the 48 month sample compared to the 9 month sample. The data did not support this hypothesis. In the FHHEP group, the relative frequency of substitution was smaller in the 48 month sample and the relative frequency of the remaining two processes was somewhat larger. In the comparison group, the relative frequency of all three processes was smaller in the 48 month sample.

There are two potential explanations for the failure of the data from the FHHEP group to support Hypothesis 9. First, since the 48 month clients were a sub-sample of the 9 month clients, the overall characteristics of the two samples in terms of clients and informal caregivers were different. Although the needs of clients in both samples could be expected to increase over time, it is possible that factors associated with the clients ability to live in the community 48 months after baseline also precluded the need for substitution of informal services by formal services. For instance, clients with strong informal support networks might be better able to live in the community 48 months after posttest, and for the same reason, they may

be less likely to require formal services which substitute for informal services.

The second possible reason that Hypothesis 9 was not supported by the data from the FHHEP group has been previously discussed. The definition of "need for respite" may not have defined all cases in which respite was truly needed, or, alternatively, new informal caregivers may have been recruited, thus avoiding the need for respite substitution.

The failure of the data from the comparison group to support Hypothesis 9 is related to the significant decrease in number of formal services provided at the 48 month posttest. The definition of each service provider process requires that formal service be provided after baseline measurement. If no formal services were provided, there can be no impact of formal service and service provider processes cannot be defined.

Hypothesis 10

The last hypothesis in this study predicted an increase in the proportion of services provided by formal service providers at each posttest compared to the proportion of services provided by informal caregivers. This hypothesis was supported by the results of baseline-posttest t-test comparisons at 9 months. At 48 months, the proportion of services supplied by formal providers was greater than the proportion supplied by informal caregivers in the FHHEP group, but the results were not statistically significant. No differences were found for the comparison group at 48 months.

Multivariate Findings

Through multivariate analysis, the impact of formal services and other independent variables upon informal caregiving was assessed. Two measures were used to operationalize informal caregiving: the number of informal services provided and the level of informal services provided at posttest. There were advantages and disadvantages to each measure. Level of services was scaled in smaller increments and the potential range of values was greater, therefore, it allowed the measurement of smaller changes. Number of services, on the other hand, was a more direct measure. It was a simple count of the number of services received; whereas, level of services was a computed variable. As such, number of services is more closely related to actual behavior, i.e., number of services measures the actual change in real service as opposed to a computed change which is a step removed from service provision as it actually occurs.

Multivariate regression analysis was conducted hierarchically with demographic and baseline variables entered first, followed by interaction terms, baseline-posttest change variables and the client group dichotomy. Analyses using either number or level of informal services at posttest as the dependent variable clearly supported one major finding: the best predictor of informal service provision at the 9 or 48 month posttest is informal service provision at baseline. When entered after demographic variables, depending on whether level or number of informal services is used, baseline informal service provision accounts for 36% and 43% of the variance in

the dependent variable in the 9 month sample and 18% and 23% of the variance in the dependent variable in the 48 month sample. These findings in the multivariate analysis correspond to results from the descriptive analyses, that there was little overall change in the quantity of service provided by informal caregivers after 9 months.

Less striking results were found for the influence of the baseline-posttest change in number of formal services on informal caregiving at the 9 month posttest. This independent variable had a low, but significant partial correlation of -.20 with number of informal services at posttest. The fact that change in formal service provision proved to be significant when number of services and not level of services was used could be related to the previously described correspondence of the "number of services" measure to "real world" behavior.

Caregiver stress proved to be linearly related to the level of informal services at the 9 month posttest. The fact that caregiver stress was highly correlated with level of informal service at baseline does not explain these findings, because baseline level of informal services was partialled out of the regression. This finding indicates that caregiver stress is more than just a proxy for level of informal care at baseline. Knowledge that the caregiver is stressed predicts the caregiver's posttest behavior beyond that which is predicted by knowing the level of services provided by informal caregivers at baseline. The expectation in this regard had been that an informal caregiver who was stressed at baseline might have a

limited capacity to meet increased needs of care recipients. However, the results showed just the opposite. When the informal caregiver was stressed at baseline, higher levels of informal service were received at posttest.

One possible explanation is that the informal caregivers in this study had a greater capacity or willingness to care for the elderly service recipient than was expected a priori. The relationship of the caregiver to the care recipient could provide an indication of the caregiver's potential motivation to provide high levels of service. For instance, a child or spouse is likely, due to feelings of love or filial responsibility, to feel more compelled than a friend or more distant relative to assist the homebound person to the greatest extent possible. In fact, bivariate analysis of caregiver stress by type of informal caregiver, indicated that 75% of the informal caregivers who were under stress were either a spouse or child of the care recipient. Only 26% of the informal caregivers who were not under stress were a spouse or child; most (44%) were friends of the care recipient.

Another explanation exists for the unexpected finding that higher levels of informal service at posttest were associated with a stressed informal caregiver at the posttest. As stated above, a caregiver who was stressed at baseline was not expected to be capable of providing additional services at posttest. However, the finding in this study concerned the <u>overall</u> level of informal service at posttest, not the level of informal service provided by the primary informal caregiver

alone. Therefore, it is possible that an increase in the level of informal service at posttest is due to an increase in service provision by informal caregivers other than the person who was the primary informal caregiver at baseline. The clearest example of this type of finding is when the individual identified as the primary caregiver at posttest is different than the person identified at basline. In the 9 month sample, 24% of the comparison group clients and 20% of the FHHEP clients identified a different primary informal caregiver at posttest than had been identified at baseline. Therefore, increased informal services at posttest in these cases would not be attributable to increased service provision by the baseline primary caregiver.

As a final note of caution concerning the finding that higher levels of informal service were associated with informal caregivers who were stressed at baseline, it must be remembered that the correlation of caregiver stress with level of informal services at posttest (with demographics and level of informal services at baseline partialled out) was low (r = .14) and accounted for only 1% of the variance in the dependent variable. In addition, the relationship was not found when number of informal services was used as the dependent variable.

Caregiver stress as an independent variable was not significantly related to number or level of informal services at the 48 month posttest. However, the interaction of stress and change in number and level of formal services was significant. A positive correlation

between caregiver stress and the dependent variable was only significant when there was an increase in formal services. Although the use of an alpha level of .10 makes these results less reliable statistically, the 48 month results follow the pattern of the 9 month findings, and at minimum, findings from the 48 month analysis do not directly contradict findings from the 9 month analyses.

A final point to mention regarding the multivariate analyses concerns the overall success of the independent variables in explaining variance in the dependent variable. The independent variables in the 9 month analyses accounted for a substantial amount of variance; 51% and 46% using number and level of informal services at posttest as dependent variables. The results were less satisfactory for the 48 month sample; 32% and 28% of the variance in the number and level of informal services at the 48 month posttest was explained. The reduced sample size and reduced number of independent variables included in the 48 month regression analyses may provide a partial explanation for these findings. In addition, since a longer period of time elapsed between baseline and posttest in the 48 month analysis than in the 9 month analysis the explanatory power of baseline variables was probably reduced. Although two baseline-posttest change variables were in the analysis, potentially important data were not available. For instance, no information was available related to informal caregivers which might indicate a change in their capacity to provide assistance. Information concerning baseline informal caregivers as well as new informal caregivers who may have

been recruited since baseline would be useful. In addition, Greene (1983) found that the clients' unmet needs were significant predictions of both informal and formal levels of support.

Finally, because of the time interval involved, the ability to predict 48 month outcomes from baseline data and variables which measure change from baseline to the 48 month posttest may be limited. Data collected at additional points in time (perhaps at yearly intervals) would facilitate more accurate, predictive analyses.

Impact of Formal Services on the Service Recipient-Informal Caregiver Relationship

The focus of this study was on the impact of formal service provision on informal caregiving in terms of amount (number and level) and type of service provided. Community care service could have other, less direct (and less easily measured) effects of a psychological or emotional nature. For instance, increased contacts with formal service providers could have a positive effect on the care recipient's sense of well-being if these contacts are valued by the care recipient as a source of stimulation or socialization. In addition, the availability of needed services could increase the frail, older person's sense of security. On the other hand, increased community care service could be detrimental if the older person is fearful of the service provider or if the service focuses the older person's attention on his or her diminished capacity.

Community care can also influence the quality of the care recipient-informal caregiver relationship. The 9 month regression

analysis indicated that an increase in the number of formal services is related to a lower number of informal services at posttest. This effect of decreasing the number of caregiver-care recipient contacts could be detrimental to the older person's sense of well being vis-a-vis the reduced involvement of the informal caregiver. Alternatively, relieving the informal caregiver from direct service provision could provide an opportunity for the caregiver to concentrate on the psychological or emotional health of the older person.

Improvement in the care recipient's emotional health would not necessarily have to result from a conscious effort on the part of the informal caregiver. Rather, respite provided to a stressed informal caregiver could improve the caregiver's well-being which might then allow the caregiver to interact with the care recipient in a more relaxed and positive manner.

Only limited data were available to evaluate these potential "side effects" of community care. The correlations between change in formal services and (a) the number of visits and telephone calls received by the elderly service recipient from family and friends, and (b) the service recipient's satisfaction with the frequency of contact with their family and friends were assessed for this purpose. Nine month analyses did not reveal any impact of formal services. Forty-eight month analyses in the FHHEP group suggested that an increase in formal services was correlated with less telephone and in-person contact between the informal caregiver and the care recipient. In the comparison group, high levels of formal service at posttest appeared

to be correlated with increased client satisfaction with the frequency of contact with family and friends. Although these findings must be considered suggestive at best, given the limited nature of the data, the fact that any association at all was found between formal service provision and the caregiver-care recipient relationship may indicate a line of research which is worthy of pursuing.

Service-Specific Findings

Information regarding the relationship between community care service and service provided by informal caregivers, in terms of specific services, could be useful to policy makers and administrators of community care agencies. Although service-specific findings relevant to service provider processes have been presented in this study, these findings were based on a small number of cases per service. Data relevant to primary source of service were based on the entire sample and also provide useful service-specific information. For instance, in the FHHEP group, the primary source of personal care and I&R changed from informal caregiver at baseline to formal service provider at posttest in both the 9 and 48 month samples. In the comparison group, meal preparation followed this same pattern. However, this finding is not very enlightening since comparison group clients came to the agency specifically seeking assistance with meal preparation. Community care agencies may wish to examine those cases in which the agency tended to replace the family and friends as the primary source of service. Examination of these cases would give agency administrators the opportunity to re-evaluate the

appropriateness of the service provided. The agency might conclude from such an examination, that better targeting of services to clients is needed. Alternatively, agency administrators might discover that reduction of caregiver stress is a factor in many of these cases.

Assessment of these cases could also result in opportunities for cost savings. For instance, data from this study indicated that at the 9 and 48 month posttest substantial proportions of the FHHEP clients (between 12% and 32% depending upon the sample and service) received I&R and personal care from both formal and informal service providers together at posttest. The possibility of additional joint formal-informal service provider relationships could be investigated.

Findings concerning areas in which informal caregivers increased the level of service they provided at posttest also provides useful information. For instance, FHHEP informal caregivers provided higher levels of transportation and personal business/legal assistance at the 9 and 48 month posttest than they had at baseline. Community care agencies might consider these services as strengths of informal caregivers that can be built upon in terms of the overall system of services provided to the frail elderly.

Limitations of Secondary Analyses and Suggestions for the Design of Future Research

Some of this study's limitations related to its design as a secondary analysis have been noted; however, in terms of future research a few points are worth reiterating. First, in order to

define the service provider processes with the data available in this study, specific patterns of responses had to be obtained. The type of data required by the operational definitions and the lack of information concerning level of service received for certain services, reduced the number of instances in which processes were defined, thus limiting the power of the analyses. Remedies for this problem include: (a) increasing the sample size and obtaining required data for all services assessed or (b) using different operational definitions of the processes. The last alternative could include the following elements: surveying all informal caregivers about the amount of service (in hours or instances of service) provided at different points in time, requesting all informal caregivers or the care recipients to record the amount of informal service provided, requesting care recipients to record the amount of services received from community agencies and making use of agency records to obtain the amount of formal services received.

A second major problem in this study was the need to define caregiver stress indirectly, based on level and type of service provided and whether or not the caregiver lived with the care recipient. Since the caregiver stress variable discriminates between respite and replacement substitution, an accurate definition of this variable is required. More direct measures of caregiver strain (Robinson, 1983), caregiver burden (Zarit, Reever & Bach-Peterson, 1980), and the impact of burden on the caregiver (Poulshock & Deimling, 1984) are available. In addition, information available

from community care agencies can be used to define respite and replacement substitution. Agency records or interviews with agency staff could be used to determine whether or not relief for the informal caregiver was a purpose of service provision.

The importance of appropriately defining variables was demonstrated by the assessment of service provider processes. Using "per person" definitions, supplementation was found significantly more often than substitution. However, the use of "per service" definitions, which eliminated the inclusion of specialization/reallocation processes and excluded "new" formal services from the definition of supplementation, indicated a greater frequency of substitution than supplementation. The consequences of using different operational definitions of variables must be clearly understood by investigators.

The low frequency of joint formal-informal service provision is worthy of further analysis. The joining of the expertise and knowledge of community care agencies with the concern and personal involvement of informal caregivers should result in a superior system of providing services such as information and referral, personal business/legal services and relocation services. Joint service ventures could also have beneficial secondary effects. Informal caregivers could receive support in their efforts from the formal service providers, while formal service providers might find increased satisfaction in their work due to appreciation expressed by informal

caregivers. The viability, advantages and disadvantages of cooperative service provision should be explored.

Future studies in this area, unburdened by the limitations of a secondary analysis, should obtain data which more clearly and accurately describe the relationship between community care and informal caregiving. In addition, the more powerful research design of such a study could incorporate additional client-specific information which would help providers target services to the most appropriate individuals. Policy makers and service providers should find information concerning the targeting of services useful in terms of improving the cost effectiveness of community care for the elderly.

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APPENDIX A

Computation of Total Level of Service

Level of service received was reported by clients for five services: transportation, personal care, nursing care, physical therapy and housekeeper/homemaker services. If the client indicated that the service was received from either an informal caregiver or a community care agency, but not both, the level of service provided for that service was the client's actual response (see column A below). If the client indicated that service was received from both an informal caregiver and a formal agency, the level of service was split between the informal and formal provider (see column B). A level that indicated one half of the amount of service received by the client was assigned to each service provider. This was not accomplished by merely dividing the value of the client's response by two, but rather I took into consideration the value of all available responses for that service. This method usually resulted in a level value halfway between the reported value and the next lowest value. For example, if a client reported that he or she received 1/2 - 1 1/2 hours of personal care per day (value = 2) from both informal and formal providers, the level of service assigned to each provider was 1.5. The method for assigning scores was deemed adequate in light of the relatively small number of cases in which service was provided by both providers.

Information regarding level of service was not available for four services: relocation, meal preparation, personal business/legal assistance and I&R. Level of services was coded dichotomously for

these services, i.e., if the service was provided, level = 1 and if the service was not provided, level = 0.

The sum of the level of service for each provider from all 9 services was computed as the total level of service provided by each provider.

	A	B
	If provider is either informal or formal, level for that provider is:	If provider is both informal and formal, level for each provider is:
Transportation		
Did not receive	0	0
Less than one per week	1	0.5
One to three per week	2	1.5
4 or more	3	2.5
Personal Care		
Did not receive	0	0
Less than 1/2 hour per day	1	0.5
1/2 to 1 1/2 hours per day	2	0.5
More than 1 1/2 hours per day	3	2.5
Nursing Care		
Did not receive	0	0
Not every day	1	0.5
Less than 1/2 hours per day	2	1.5
1/2 to 1 hour per day	3	2.5
More than 1 hour per day	4	3.5
Physical Therapy		
Did not receive	0	0
Less than once per week	1	0.5
Once per week	2	1.0
2 or more times per week	3	2.5

	A	B
	If provider is either informal or formal, level for that provider is:	If provider is both informal and formal, level for each provider is:
House/Homemaker		
Did not receive	0	0
Less than 4 hours a week	1	0.5
4-8 hours a week (a half-day to a day)	2	1
9 or more hours a week (more than one day a week)	3	2
Meal Preparation		
Did not receive	0	0
Received	1	1
Relocation Assistance		
Did not receive	0	0
Received	1	1
Personal Business/Legal Assistance		
Did not receive	0	0
Received	1	1
I&R		
Did not receive	0	0
Received	1	1

APPENDIX B

Operational Definitions of Processes

The table below indicates all of the possible circumstances which define the "per service" processes. Service providers are labeled as follows: I = informal caregiver, F = formal service provider and B = both informal caregiver and formal service provider. The baseline provider abbreviation appears first, followed by the posttest provider abbreviation. For example, "I-B" means an informal caregiver at baseline and both informal and formal providers at posttest.

Supplementation

a) I-B and level of service increased

OR

b) B-B and level of service increases (increase in level of formal service is assumed)

Substitution

a) I-F

OR

b) B-F and level of service increased or stayed the same

OR

c) I-B and level of service decreased or stayed the same (decrease in level of informal services is assumed)

Specialization/Reallocation

For at least one type of service:

a) I-F

OR

b) B-F and level of service increased or stayed the same

OR

c) I-B and level of service remained the same or decreased

(decrease in level of informal service was assumed)

AND

For at least one service (different from the one above):

d) I-I and level of service increased

OR

e) B-I and level of service remained the same or increased

(increase in level of informal service was assumed)

OR

f) No service-I OR g) No service-B OR h) F-I OR i) F-B

APPENDIX C

Description of Sets of Independent Variables Used in the Regression Analyses

A. Demographics
   1. Age: years

   2. Race: 0 = other, 1 = white

   3. Marital status: 0 = not married, 1 = married

   4. Education:
      1 = 0 to 4 years
      2 = 5 to 8 years
      3 = some high school
      4 = completed high school
      5 = post high school, business or trade school
      6 = 1 to 3 years of college
      7 = 4 years college completed
      8 = post college

B. Number of services provided by informal caregivers at baseline. Possible range of scores = 0 to 9.

C. Is informal caregiver in need of respite? 0 = no, 1 = yes

D. Indexes Derived from Multidimensional Functional Assessment Questionnaire Used to Compute Change Scores (Posttest - Baseline)

   1. Ability to perform activities of daily living. The sum of 13 items measuring the respondent's self-reported ability to: feed (eat), dress, groom, walk, get in and out of bed, bathe, use the telephone, travel distances, shop for groceries or clothes, prepare meals, do housework, take medicine and handle money.

      0 = completely unable
      1 = can do with some help
      2 = can do without help

      Possible range index scores = 0 to 26.
      Possible range of change scores = -26 to 26.

      Cronbach's alpha
      Baseline = .88
      9 months = .92

2. Self-perceived physical health status.
   The sum of three items:
   a) How would you rate your overall health at the present time?
      0 = poor
      1 = fair
      2 = good
      3 = excellent
   b) Is your health better, about the same or worse than it was five years ago?
      0 = worse
      2 = about the same
      3 = better
   c) How much do your health troubles stand in the way of your doing the things you want to do?
      0 = a great deal
      2 = a little (some)
      3 = not at all

   Cronbach's alpha
   Baseline = .67
   9 months = .66
   Possible range of index scores = 0 to -9.0
   Possible range of change scores = 9 to 9.

3. Number of services provided by community care agencies.
   Possible range of scores = 0 to 9.
   Possible range of change scores -9 to 9.

E. Client group: 0 = comparison group, 1 = FHHEP

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The dissertation is therefore accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy.

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