A COST EVALUATION OF THE FAMILY PRACTICE NURSE IN RURAL NEWFOUNDLAND

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A COST EVALUATION OF THE FAMILY PRACTICE NURSE IN RURAL NEWFOUNDLAND

by

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of the requirements for the degree of
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ABSTRACT

This research focuses its attention on the development of cost measurement tools which would empirically assess the costs associated with ten health service categories in order to measure the economic impact associated with the attachment of a family practice nurse in rural Newfoundland. An investigation of the utilization of these same health service categories by Family Practice Nurse Communities and a Control Community was also carried out during a period prior to the introduction of the FPN.

Data was obtained from hospital accounts of the Baie Verte Peninsula Community Health Centre, provincial government accounts, provincial medical care plan (MCP) payment schedules and other sources such as records from the School Medical Health Officer and the Director of Public Health Nursing for the province. Unit costs for ten health service categories were calculated from the Health Centre accounts where possible and were as follows: hospital out-patient visit ($7.67 per visit); hospital in-patient day ($69.50/day); home visits by a physician ($10.80/visit); well-baby visits ($1.45/visit); school examinations ($5.40/exam); immunizations ($1.08/immunization); out-patient laboratory units ($0.11/unit); out-patient X-Ray examination ($7.80/exam); prenatal visits ($7.67/visit); and home visits by a public health nurse ($14.16/visit).

The FPN Communities received a statistically significantly lower proportion of service than the Control Community for the following:

(1) hospital out-patient visits; (2) well-baby visits; (3) immunizations; (4) out-patient laboratory units; and (5) out-patient X-Ray examinations. The mean number of services of persons receiving one or more services were compared between communities with immunizations and out-patient laboratory units found to be statistically significantly lower in the FPN Communities.

ACKNOWLEDGEMENTS

I would sincerely like to thank Dr. Boyd Suttie, my thesis supervisor, for his initial direction in selecting a research area, and his continued support and guidance throughout the research project and during preparation of the manuscript. His broad knowledge of the concepts and implications inherent in the project and his unflagging interest have provided me with a very rich learning experience. Sincere thanks also is extended to Mr. Larry Chambers for his immeasurable help in all phases of the project but most particularly during the analysis of data and the numerous drafts prior to submission of the final manuscript. I would also like to thank Dr. John Ross. His vast knowledge of health care delivery in rural Newfoundland and his comments regarding the introduction of new health professionals were very helpful as the thesis neared completion.

I would like very much to thank Dr. Douglas Black, Medical Director and the staff at the Baie Verte Peninsula Community Health Centre for their help and co-operation since the inception of the project. Their interest and support greatly facilitated data collection.

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I. INTRODUCTION

A: Concept of the Family Practice Nurse

The concept of the nurse functioning in an expanded role is certainly not new to the Canadian health care system, and indeed, has been a reality in many rural areas of North America for some time. Historically, nurses have concerned themselves with the environmental, social and preventive aspects of care to individuals and families. However, during the last half century, the "medical model" has been adopted for the educational process of nursing and this has greatly influenced the settings and modes of practice for nurses. Nurses tended to be found working primarily in acute care facilities with their efforts focused mainly on a small percentage of the population experiencing acute episodes of stress and disease. The last decade has witnessed yet another shift in emphasis as nursing education and practice has attempted to grapple with such issues as the individual within the context of his family and his community; health promotion and maintenance throughout all stages of the life cycle; and care which is individualized whether it be in acute care facilities or community settings - urban or rural. These changes have been the result of several forces working within society, one of which has been the increasing education, interest and participation of consumers in health related issues and their attempt to cause health professionals to focus and redefine their concept of health. Consumers have also placed pressure on the system to redistribute health manpower and services to larger segments of the population be they urban

or rural, so that quality care would be accessible, convenient and continuous. Various government reports have urged the introduction of community health centres (Hastings)[1] and better utilization of health and medical manpower through teamwork and the use and training of new health professionals such as nurse practitioners (Boudreau).[2] The professions themselves have recognized a need to provide care which is more sensitive to the needs of the individual. Medicine has responded with the introduction of community medicine at the undergraduate level and family practice residency programs in post-graduate medical education. Nursing, too, has once again recognized the need to provide for the psycho-social well-being as well as the physical needs of people. In response to these and other changes and expectations within the fabric of society, educational programs to better prepare nurses to function in an expanded role have sprung up in great numbers across Canada and the United States. Until such time as the concepts inherent in expanded function for nursing in the community or within the framework of community health centres can be incorporated into baccalaureate nursing education, specialized family practice nurse and nurse practitioner programs will be necessary in order to provide for these needs amongst the population. These programs, and particularly the Family Practice Nurse Education Program at Memorial, basic objective is to prepare nurses to function in an expanded role giving primary health care services on a

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[1] Canada, Department of National Health and Welfare, Report of the Community Health Centre Project - the Community Health Centre in Canada, Ottawa, Queen's Printer, 1972.

[2] Canada, Department of National Health and Welfare, Report of the Committee on Nurse Practitioners, T. J. Boudreau, Chairman, April, 1972.

first contact and continuing basis to individuals and to families in urban and rural settings. The role of the family practice nurse in rural Newfoundland will be further defined and developed later in the paper.

B. Historical Background of Expanded Role Nurses in Newfoundland

Newfoundland presents a unique picture of nurses functioning in an expanded role historically and in the present day. Because of its geography and climatological conditions, many areas of the province (particularly portions of the South Coast, Northern areas and Labrador) are isolated for much of the year. Many of the communities are small and could not support the services of a physician. Consequently, organized district nursing was begun in 1920 by the Outport Nursing Committee.[3] Nurses who were recruited to these districts were usually midwives, and they functioned primarily in a curative role providing treatment to those who were ill. Increasing emphasis has been placed on preventive care over the years, and the public health program has evolved considerably, but in 1973 there still remained nine regional nurses in Newfoundland who were functioning in isolation in an expanded role for which they had no formal preparation.

C. The Rural Family Practice Nurse

The role of the family practice nurse in Newfoundland has evolved through the efforts of those involved with working parties and curriculum committees established at Memorial University, and reflects the thinking

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[3]Lady Harris, "Outport Nursing," The Newfoundland Quarterly, XXI (July, 1921).

of the Boudreau Committee on the Nurse Practitioner,[4] and others involved in similar efforts across Canada.[5] Rural family practice nurses differ from their urban counterparts not so much in their educational preparation and function within a health team providing primary care, but in the setting in which they practice. As previously stated, Newfoundland presents a unique challenge to those attempting to provide primary health care as outlined by Hastings.[6] Three of the four nurses who completed the Memorial University Family Practice Nurse Education Program in May, 1974, began practice in small cottage hospitals around the island - in Grand Bank, Placentia, and Botwood. The fourth nurse who had been sent to the program from Baie Verte returned to the area and was attached to the out-patient department of the Baie Verte Peninsula Community Health Centre. Additionally, she assumed responsibility for all of the first contact care for persons living in the communities of Fleur de Lys and Coachman's Cove - outport villages lying some twenty miles distant, over gravel roads, from Baie Verte (see Figure I).

Within a short time of her attachment to the Baie Verte area, a pattern of activity for the nurse had become established. Three-fifths (3/5's) of the nurse's time was spent in the two outport villages with her activities primarily focusing on the screening and treatment of

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[4]Report of the Committee on Nurse Practitioners, op. cit.

[5]W. O. Spitzer and D. J. Kergin, "Nurse Practitioners in Primary Care I, The McMaster University Educational Program," Can. Med. Assoc. Journal, Vol. 108 (April 21, 1973), pp. 991-995.

[6]Report of the Community Health Centre Project - the Community Health Centre in Canada, op. cit.

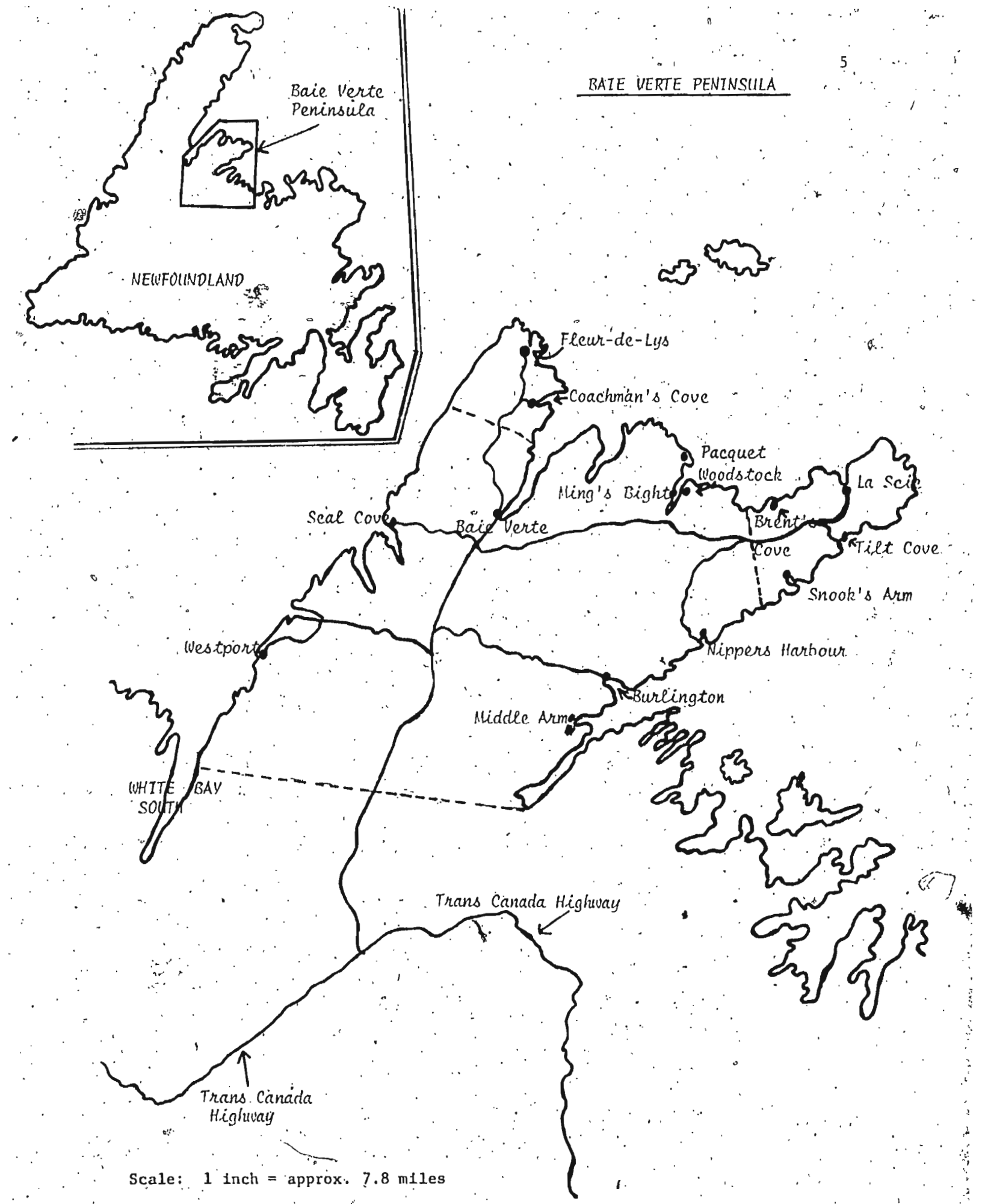
BAIE VERTE PENINSULA
Baie Verte Peninsula
NEWFOUNDLAND
Fleur-de-Lys
Coachman's Cove
Pacquet
Woodstock
Ming's Bight
La Scie
Seal Cove
Baie Verte
Brent's Cove
Tilt Cove
Snook's Arm
Westport
Nippers Harbour
Burlington
Middle Arm
WHITE BAY SOUTH
Trans Canada Highway
Trans Canada Highway
Scale: 1 inch = approx. 7.8 miles

Figure I

persons with minor complaints, the care of the chronically ill in their homes and a traditional public health nursing program. By October, 1974, the residents of Fleur de Lys had renovated a portion of an old school building, and provided the nurse with a medical clinic in which she would hold clinic sessions several times per week. Patients soon began coming to the nurse on an appointment basis. In addition to her solo work in Fleur de Lys and Coachman's Cove, the nurse also functioned as a member of the primary health care team in the out-patient department of the Baie Verte Peninsula Community Health Centre two sessions per week. She also took turns with the physician in taking calls one night per week, but she always had a physician to call on if need be. While she was not responsible for the care of patients once they were admitted, it was expected that she monitor her patients' progress to allow for continuity in follow-up care once they were discharged to their respective communities. For a more complete description of the roles and function of the family practice nurse, the reader should refer to Section IV, pp. 2 and 3 of NHG 601-20-6.

D. Educational Program for Family Practice Nurses in Newfoundland

Subsequent to the efforts of several working parties to delineate the role of a family practice nurse and to structure a curriculum designed to prepare nurses for an expanded role in either urban or rural settings, the first four students were admitted to the nine-month certificate course in September, 1973. These first four students (three diploma and one baccalaureate student) entered the two semester program on a pilot project basis. Following the completion of the curriculum which emphasized the acquisition of theoretical knowledge and the appli-

cation of that knowledge in clinical settings (see NHG 601-20-6, Section II - Educational Program, Attachment VIII, Education Curriculum 1974-75) the graduates returned to rural practice settings previously described. The evaluation of the educational program for this first group of students has been an on-going process following the general guidelines set out by Chambers et. al.[7] for the urban pilot study, namely, the learning development of the students, the educational program's relevance to the graduates' needs in delivering primary care, and the impact of the FPN graduate on the primary care provided in Newfoundland. As evaluation of the learning which took place and the effectiveness of the four family practice nurses continues, the main thrust of this research has centred around the one nurse who returned to the Baie Verte Peninsula and the impact she has had on the health care system. An outline of the ways in which the impact of the FPN could be measured and events leading up to the submission of a grant request to fund the project follows in the next section.

E. The Rural Pilot Project as a Part of the Family Practice Nurse Project (NHG 601-20-6)

In April, 1971, an advisory board consisting of members of the Faculty of Medicine and the School of Nursing at Memorial University was established to study the feasibility of beginning an educational program to prepare nurses for an expanded role. As previously noted, working parties were formed to define the expanded role of nursing in Newfoundland and build a curriculum. All of this activity eventually resulted in the

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[7] L. W. Chambers et. al., "Expanded Role Nurses: An Educational Program in Newfoundland and Labrador, Canadian Journal of Public Health, Vol. 65 (July/August, 1974), pp. 273-276.

submission of a grant in December, 1972 to National Health and Welfare. The primary objective of the project was ". . . to measure, on a before and after basis, the impact - on patient care and transfer of functions - of the introduction to each of ten urban general practices of a nurse who will have received preparation specific to a described expanded role."[8] In subsequent grant submissions in 1973 and 1974, evaluation of a Rural Pilot Project for family practice nurses was further delineated (see 601-20-6, Section IV).[9] The rural pilot project became a portion of the larger family practice nurse project which was funded by National Health and Welfare.

Baie Verte sent a nurse to the educational program, and it was decided that she and the area in which she returned to practice would be selected for assessment in determining the impact of a family practice nurse in a rural setting. In this portion of the project, patient outcomes as described by certain indicator conditions and a cost analysis were to be evaluated on a before and after basis. The main bulk of this research focuses on the development of methods to analyze empirically the costs associated with the attachment of a family practice nurse to the Baie Verte area. Concomitantly, function transfer and utilization of health services will also be examined to determine "who is doing what and to whom" within the practice on a before and after basis.

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[8]Canada, Department of National Health and Welfare, Memorial University of Newfoundland Family Practice Nurse, Grant No. 601-20-6, December 22, 1972, p. 1.

[9]Canada, Department of National Health and Welfare, Memorial University of Newfoundland Family Practice Nurse, Grant No. 601-20-6 (Section IV, The Rural Pilot Project).

II. METHODOLOGY

A. Research Design

The study periods and events occurring within the Rural Pilot Project are shown in Figure II, "Before/After Design and Schedule of Time and Events," on the following page. The Baseline Period extends from May 16, 1973 to May 15, 1974 and defines the period of time when counts of services for the Fleur de Lys/Coachman's Cove population (FPN Communities) and the sample Baie Verte population (Control Community) were to be extracted. Also during this time, the nine month Family Practice Nurse Educational Program began in September, 1973, enrolling the first four students. The study population of persons living in Fleur de Lys and Coachman's Cove was identified, and the sample Baie Verte population (Control Community) systematically allocated. In June, 1974 the Family Practice Nurse returned to the Baie Verte Peninsula and began practice in the study communities of Fleur de Lys and Coachman's Cove. During the summer of 1974 counts of services were extracted from each patient chart in the two populations and then coded and keypunched for computer summarization and analysis. Also during that summer the indicator condition study for the Baseline Period was conducted.

The Experimental Period began October 1, 1974 and ended September 30, 1975, with the same types of research activities occurring in terms of extraction of counts of services and the indicator condition study. A systematic review of patient charts for the two populations was conducted to extract data regarding services performed by the physician,

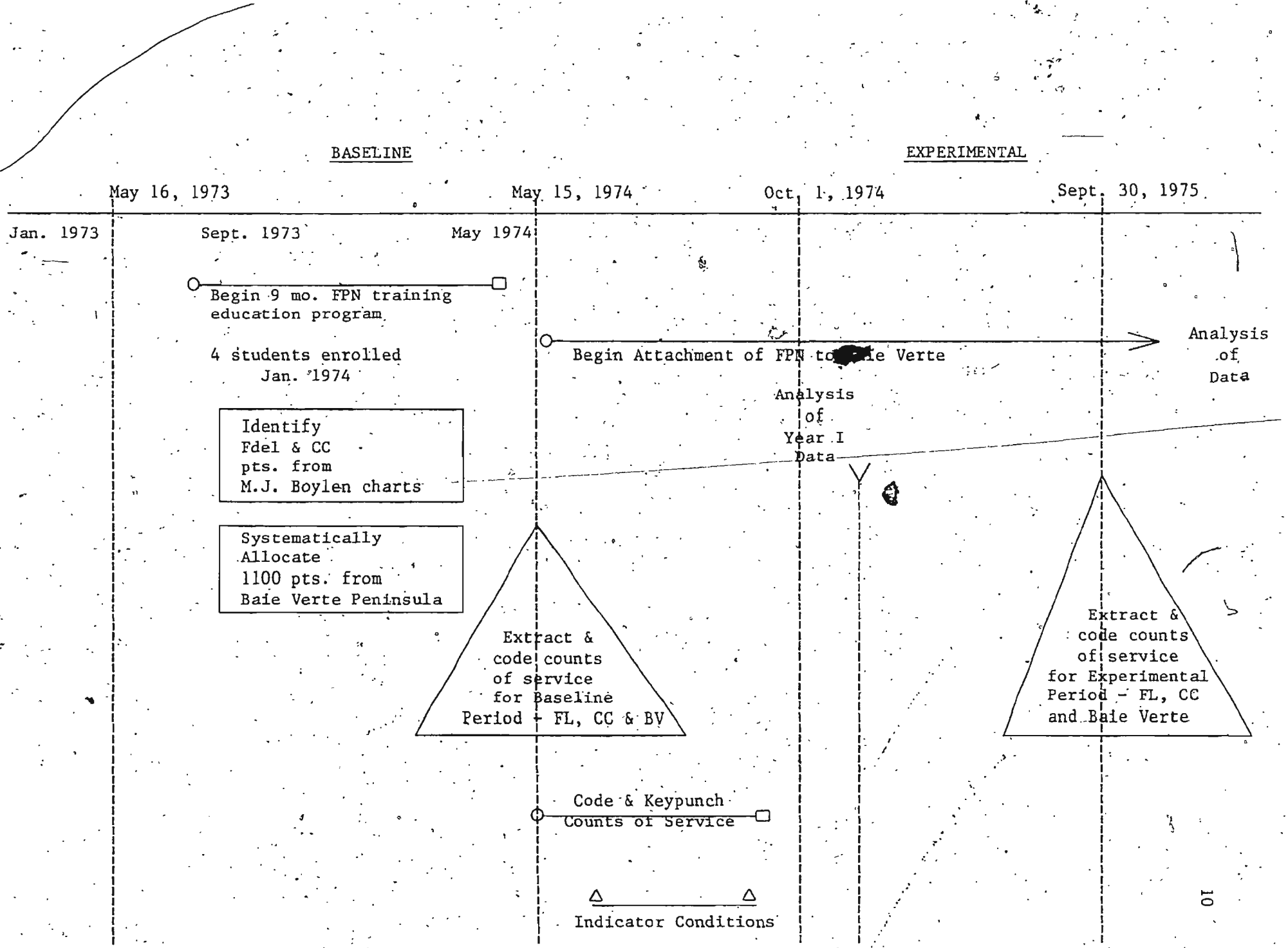

Figure II. Before/after design and schedule of time and events for the Rural Pilot Project (Baie Verte) of Memorial University family practice nurse study

public health nurse, and during this experimental period, the family practice nurse.

1. Populations studied

The two communities of Fleur de Lys and Coachman's Cove are located on the northern tip of the Baie Verte Peninsula. The family practice nurse began practice in these two communities in June, 1974. The 1971 census reported that 1120 persons lived in Fleur de Lys and Coachman's Cove, and 6875 persons lived on the remainder of the Peninsula (excluding Tilt Cove, Brent Cove, Snook's Arm and La Scie) at the time of enumeration. Persons living in the four communities of Tilt Cove, Brent Cove, Snook's Arm and La Scie were excluded from the sample of the Baie Verte population because they receive their primary care from a local general practitioner and did not normally attend the Baie Verte Peninsula Community Health Centre.

In early 1974, a medical records librarian reviewed all of the patient charts (approximately 15,000) at the Baie Verte Peninsula Community Health Centre (hospital in-patient and out-patient charts are filed together) and identified medical charts of 1153 persons living in Fleur de Lys and Coachman's Cove (the FPN Communities). The medical records librarian then systematically sampled (by choosing every seventh patient chart) 1100 persons who lived on the Baie Verte Peninsula excluding Fleur de Lys and Coachman's Cove. These 1100 persons comprised what would be termed, the Control Community. An additional 100 persons were selected in the same fashion to serve as substitutes for the sample Baie Verte population when persons in the Baie Verte study area moved away or died during the study periods. The population on the Peninsula was relatively

stable however and it was not found necessary to utilize any patients from this group. Infants born during the Baseline and Experimental Periods were not included in the sample Baie Verte population.

The "sample" of 1153 persons living in Fleur de Lys and Coachman's Cove and in the Baie Verte population of 1100 allows for statistical tests at the beta (β) level of probability to avoid the risk of missing statistically significant differences.[1] Possible differences between the 1971 census data and the 1974 chart review for Fleur de Lys and Coachman's Cove were examined using the Chi Square Goodness of Fit test.[2]

2. Data sources

a. Counts of service

In the summer of 1974 (just following the completion of the Baseline Period), a medical records librarian with the help of an assistant began extracting counts of service data for the FPN Communities and the Control Community. The type and number of each kind of health service received by persons in the two populations during the Baseline Period were recorded on an abstraction form. (See Appendix A for a copy of the code sheet containing patient identification and categories of health service.) The categories of health service are summarized below:

- Hospital Out-Patient Visit
- Hospital Admissions

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[1] Anita K. Bahn, Basic Medical Statistics, Greene and Stratton, New York, 1972.

[2] A. Bradford Hill, Principles of Medical Statistics, 9th Edition, Oxford Press, New York, 1971.

- Hospital Days (In-Patient)
- Home Visits by a Physician
- Well-Baby (Pre-School) Exam
- School Exam
- Immunization
- Out-Patient Laboratory Test
- Out-Patient X-Ray
- Prenatal Visit
- Home Visit by a Public Health Nurse

These services were chosen because they represented a comprehensive cross-sectional view of primary health care services. While hospital admissions and in-patient care is not normally considered in the realm of primary care, they were included as a measure of the frequency of admission and length of stay between the two populations.

Once data regarding health services for each resident in the two populations was extracted, it was coded and cards were keypunched to facilitate computer analysis of the counts of services. The information was later transferred and stored on magnetic tape. A Statistics Package for Social Sciences (SPSS) Sub-program Aggregate was developed to summarize and analyze the data.

Health service utilization rates were calculated for twenty-two age-sex groupings in the Fleur de Lys/Coachman's Cove population and the sample Baie Verte population (Control Community). Expected numbers of services and age-sex standardized rates were calculated for the Fleur de Lys and Coachman's Cove population. A direct standardization method was utilized in which the Control Community was taken as the standard population. It was thus possible to test if there were any statistically significant differences in health service rates between the two separate populations.

b. Accounts available through the Baie Verte Community Health Centre

In addition to information abstracted retrospectively by the medical records librarian, the hospital administrator of the Baie Verte Peninsula Community Health Centre was helpful in providing cost data for the Baie Verte Peninsula Community Health Centre and the family practice nurse's clinic in Fleur de Lys. The total operating costs of the Health Centre as well as related costs such as operation of clinics in Westport and the public health nursing activities were obtained for the Baseline and Experimental Periods. In addition to this, the administrator supplied breakdowns of operating costs and numbers of services rendered within various departments of the hospital.

c. Provincial medical care plan (MCP) payment schedules

Where information about a particular health service was not available or difficult to access, alternate data sources were sought. The Medical Care Plan (MCP) Payment Schedule for Newfoundland and Labrador was utilized as a data source in attempting to arrive at an estimated cost for physician's making a home visit and for the administration of an immunization by a physician.

d. Provincial government accounts - budget allowances

Additionally, as another data source, information was also obtained from provincial government records for the estimation of costs for various health services based upon budget allotments to hospitals for a particular health service, e.g. out-patient laboratory tests.

e. Other sources

Finally, where information regarding the cost of certain services was either non-existent or not recorded as such, estimations were made by the investigator. This occurred in two categories of service, school examinations, and home visits made by a public health nurse. These estimations followed discussions with the School Medical Health Officer, and the Director and Associate Director of Public Health Nursing for the province of Newfoundland and Labrador. Letters were also sent to the public health nurse attached to the Baie Verte Peninsula Community Health Centre inquiring about the number and type of activities she was involved in; and the records of the division of public health nursing and the School Medical Health Officer were also closely examined.

B. Cost Measurement and Analysis

In attempting to do a cost analysis for the services rendered to residents in the two populations of the FPN Communities and the Control Community, it became evident that one was not merely looking at counts of service delivered to a person by a physician, public health nurse or family practice nurse - but more importantly at the economic impact of a family practice nurse on the area. In other words, what economic benefits or liabilities are associated with the attachment of an FPN in terms of alterations in length of stay in hospital, improved immunization status, or utilization of a community clinic as opposed to travelling many miles to the out-patient department of the Health Centre? The concept of "unit cost" per category of health service will be defined and described later, as will methods of calculating each unit cost per service. However, initially in this cost analysis, an estimation of

expenditures or operating costs associated with the health centre was done.

1. Costs outside the scope of this study

Any study is bound by several constraints such as the amount of time allocated for completion and the amount of resources at its disposal. The investigator realizes that not all avenues could possibly be thoroughly explored as regards cost associated with the delivery of health services and its relationship to the introduction to a new type of health professional; however this was primarily due to time and resource constraints. Certain social costs or costs borne by the public at large such as social services can be measured in relation to health care costs. Individual costs associated with health care are much more difficult to measure, however. Individual costs would include such things as time lost from work due to illness, travel expenses to and from a health care facility, baby-sitting costs, medication costs not covered by insurance. etc. The best method of determining these associated costs would be through individual interview or questionnaire on a before and after basis (prior to the introduction of the FPN, and following a period of her attachment) - both time consuming and costly ventures. Also outside the scope of this study were any longitudinal surveys regarding cost benefit in terms of the impact of preventive health care and health education activities which the FPN may have introduced.

2. Estimating expenditures

a. Total operating costs of the Baie Verte Peninsula Community Health Center - Baseline and Experimental Periods

Total operating costs were broken down into five major categories

such as medical and nursing services (including salary); community health services; emergency and out-patient care; administrative services and all other services associated with acute, in-patient care. These broad categories were further broken down and comparisons made between the Baseline and Experimental Periods. By studying each category separately, differences in the demand may be observed, e.g. was an increase in administrative costs due to inflation or because extra staff were added?

b. Cost of introducing an FPN to the study communities

Concomitantly, the cost of introducing a family practice nurse to Fleur de Lys and Coachman's Cove during the Experimental Period can also be observed. Such items as the salary of the nurse; medical supplies, medications and equipment; transportation, and operation of the clinic in Fleur de Lys were considered in the cost of maintaining a family practice nurse in the study communities.

3. Estimating costs of services

As has been mentioned previously in the research design, several data sources were needed in order to estimate the cost associated with a health service empirically. No single data source was able to provide information on all categories of health services; and in each case, estimates were made on the best available data.

a. Counts of services

The initial objective of the estimation of costs was to arrive at a "unit cost" per individual category of health service. By "unit cost" is meant a standard measurement in dollars systematically calculated and assigned to a particular category of service. This unit cost

was sometimes taken as a value previously established by another data source such as Medical Care Plan Payment Schedules. An alternate way to calculate unit cost would be to sum all of the variables contributing to that "cost" such as salary, rent, maintenance, depreciation, equipment and supplies, and divide by the total number of services provided. A simple model of this concept is given below:

$$\frac{\Sigma \text{ Variable Costs Contributing to a Health Service}}{\text{Number of Services Rendered}} = \text{Unit Cost of that Service X}$$

Categories of health services for utilization and cost analysis can be found in Appendix B and they were also summarized briefly in the Data Sources section under Counts of Services. Unit costs were calculated for each of the categories of service (Hospital Admissions and Hospital Days were considered together for costing purposes) by the several methods which follow.

b. Unit cost based on estimated costs of operating a service at the Baie Verte Peninsula Community Health Centre

As mentioned previously, the hospital administrator was very helpful to the investigator in establishing several unit costs of services being investigated. Unit costs for an out-patient visit and a prenatal visit were ascribed by summing all of the costs associated with operating the out-patient department in 1974 and dividing by the number of patients seen during that period. (Prenatal visits were included in this calculation in that this is an activity which takes place within the out-patient setting much as any other adult visit would.) In summing all costs associated with out-patients' operation, allowance was made for medical-surgical supplies, electricity, fuel, depreciation, phone, laundry, office supplies and housekeeping. These were calculated based

on the square footage the OPD occupied in relation to the remainder of the hospital. Employees who did not spend their entire time engaged in out-patient activity such as office personnel, administrative staff and physicians, were asked to estimate what percentage of their time was spent in this area over a two week period. (For a complete breakdown of costs and numbers of services rendered in out-patients in 1974, see page 62 in Appendix C.) Unit costs for an out-patient X-Ray examination and an out-patient laboratory test were also calculated in a similar fashion, utilizing real costs associated with the service in Baie Verte in 1974.

c. Unit cost based on Medical Care Plan (MCP) payment schedule

The unit cost of a physician making a home visit and an immunization were ascribed by utilizing the provincial medical care plan (MCP) payment schedule. Physicians employed at the Baie Verte Peninsula Community Health Centre are salaried so it was difficult to estimate the cost associated with a home visit in any other way. Similarly, immunization unit cost was ascribed through use of the schedule. It should be noted that classifying immunizations as injections and costing them in a like manner is not the optimal method of determining cost - but simply the only method available. The cost of an immunization is normally "buried" within the context of a well baby visit or within the School Health Program. The method for calculating the cost of an immunization can be found in Appendix D.

d. Unit cost based on provincial government budget allotments

Budgets are prepared and submitted each year to the provincial Department of Health by each hospital in order to secure operating funds

for the coming year. The Department of Health then allocates a total amount of money to each institution based on an anticipated number of services to be delivered. Each of these services have had a "unit cost" ascribed to them - and it was this unit cost which was utilized in four categories of health service: out-patient visit (which would encompass prenatal visit); out-patient X-Ray examination and out-patient laboratory test; and hospital day (which would include hospital admission). As will be noted, the first three of these have already been costed in an alternate way using operating costs of the service provided by the hospital administrator.

e. Unit cost based on other data sources

Two categories of health service, school exams and a home visit by a public health nurse were estimated empirically by the investigator utilizing a retrospective review of available records. School exams have been carried out by a team of physicians and public health nurses in the larger centres across the island since November, 1973. Physicians bill their services on a sessional basis, but public health nurses are retained on a monthly salary. After discussions with the School Medical Health Officer for the province and a review of all of the records from November, 1973 to June, 1975, calculations were made. While this may not be representative of the type of school exam performed on the Baie Verte Peninsula it was the best information available. For a precise description of how the calculations were made, please refer to Appendix E.

Similarly, a retrospective review of the activities of nurses employed by the Division of Public Health Nursing during the Baseline Period was also conducted. This involved a review of the monthly reports

for a one year period for a group of eighty-seven nurses. Records kept by the public health nurse employed by the Baie Verte Peninsula Community Health Centre were reviewed in a similar fashion for the same time period. Appendix F shows the precise method utilized in arriving at a unit cost. At the same time, the public health nurse employed on the Baie Verte Peninsula was also reviewed in terms of ascribing a unit cost for public health nursing visits and well baby visits which she was responsible for.

III. RESULTS

The analysis and results of this study were conducted in three phases, and are presented in that format for the purposes of summarization and/or their generalizability to other similar studies.

A. Populations Studied - Chi Square Goodness of Fit Test

A Chi Square Goodness of Fit Test (Test of Homogeneity) was conducted for the FPN Community and the Control Community to determine if the age distributions of the two populations differed significantly. As can be seen from Table I, there was no significant difference between the two populations being studied.

B. Counts of Service

1. Analysis of utilization rates between the two populations

The SPSS Subprogram Aggregate generated data regarding health service utilization rates for each community by age and sex. Table II shows the total number of health services and the number of persons having one or more services for each health service category. The data show that the FPN Communities had fewer out-patient visits (1908), fewer well-baby visits (171), fewer hospital days (838) and immunizations (188), and fewer out-patient laboratory units (642) and X-Ray examinations (262). Both communities had only one home visit by a physician during the Base-line Period, while the Control Community had slightly fewer hospital admissions (156), prenatal visits (111), and home visits by a public

Table I

Chi Square Goodness of Fit Test for Determination of Age Differences Between the FPN Community and the Control Community

Age Group	FPN Community	Control Community	Expected* Frequency	X^2
0-4	130	180	185.64	0-17
5-9	191	139	143.35	0.13
10-14	158	127	130.98	0.12
15-19	151	144	148.51	0.15
20-24	129	108	111.38	0.10
25-29	78	107	110.33	0.10
30-34	57	67	69.10	0.06
35-39	49	38	39.19	0.04
40-44	54	46	47.44	0.04
45-49	29	38	39.19	0.04
50-54	19	32	33.00	0.03
55-59	36	22	22.69	0.02
60-64	46	28	28.88	0.03
65-69	10	11	11.34	0.01
70-74	6	9	9.28	0.01
75+	10	22	22.69	0.02
Total	1153	1118		1.06 NS

X^2 NS $p < 0.01$ 14DF

*Based on the Age Distribution of the Control Community $\frac{1153}{1118} = 1.03$

NS = not statistically significant

DF = Degrees of freedom

Table II

A Comparison of Health Service Utilization by Service Category Between the Control Community and the FPN Communities During the Baseline Period

Health Service Category	Control Community n	Control Community Total Number of Services	Control Community Persons having 1 or more Services	FPN Communities n	FPN Communities Total Number of Services	FPN Communities Persons having 1 or more Services
Out-Patient Visit	1118	2270	676	1153	1908	629
In-Patient Admissions	1118	156	121	1153	158	125
Hospital Days	1118	903	121	1153	838	125
Home Visits by Physician	1118	1	1	1153	1	1
Well Baby Visits	319	269	103	321	171	81
School Exams	590	206	173	630	321	243
Immunizations	918	346	163	930	188	119
Out-Patient Lab Units	1118	1107	287	1153	642	260
Out-Patient X-Ray Exams	1118	297	204	1153	262	180
Prenatal Visits	257	111	25	222	112	25
Home Visits by PHN	1118	123	68	1153	148	82

n = total number of persons eligible to receive the health service

health nurse (123). Additionally, the Control Community had a relatively low number of school examinations (206) when compared to the FPN Communities.

Table III shows the unadjusted and age sex adjusted average number of health services per person in the FPN Communities as compared with the Control Community. The adjusted percentage difference is also shown in that table, and in all but two health service categories the FPN Communities had a lower average number of services. The two exceptions were school exams in which the Control Community averaged 1:2 exams per person and the FPN Communities averaged 1.3 exams per person for a percent difference of +8%. The Control Community averaged 3.8 out-patient laboratory units per person, compared to the age sex adjusted of 5.0 units per person in the FPN Communities for a percent difference of +32%.

a. Difference in proportions test

In addition to looking at the average number of health services per person and percentage differences between the two populations, health service utilization rates were also calculated. The data for each community was dichotomized as follows: (1) persons who received no services were grouped together, and (2) persons who received one or more services. The relative frequency of services in each community was tested statistically with the Difference in Proportions test which assumes that the proportions of people receiving at least one service are the same for each community. Results of this analysis shown in Table IV revealed that the probability of obtaining a particular type of health service did not differ significantly between the FPN and Control Communities except in the following six (6) categories: (1) Out-patient visits (54% FPN - 61%

Table III

Average Number of Health Services of Persons Having One or More Health Service by Community in the Baseline Period

Category of Health Service	Control Community: Persons having 1 or more Services	Control Community: Average Number of Health Services per Person a	FPN Community: Persons having 1 or more Services	FPN Community: Unadjusted Average No. of Health Services per Person	FPN Community: Age-Sex Adjusted Average No. of Health Services per Person b	% Difference (Adjusted) $\frac{b-a}{a} \times 100$
Out-Patient Visits	676	3.4	629	3.0	3.0	-12
In-Patient Admissions	121	1.3	125	1.3	1.3	0
In-Patient Days	121	7.5	125	6.7	6.0	-20
Home Visits by a Physician	1	-	1	-	-	
Well-Baby Visits	103	2.6	81	2.2	2.3	-12
School Exams	173	1.2	243	1.3	1.3	+ 8
Immunizations	163	2.1	119	1.6	2.0	- 5
Out-Patient Lab Tests	287	3.8	260	2.5	5.0	+32
Out-Patient X-Rays	205	1.6	180	1.5	1.5	- 6
Prenatal Visits	25	5.0	25	4.5	4.3	-14
Home Visits by PHN	68	1.8	82	1.8	1.4	-29

Table IV

Differences in Proportion of Health Service Utilization - FDN Communities and the Control Community in the Baseline Period

Comparison of Health Service Utilization Between the Family Practice Nurse Communities and the Control Community for the Baseline Period

Service Category	Fleur de Lys (FPN Community) n	Fleur de Lys (FPN Community) Percent having 1 or more Services	Baie Verte (Control Community) n	Baie Verte (Control Community) Percent having 1 or more Services	Z Value +
Out-Patient Visits	1153	54%	1118	61%	*
In-Patient Admissions	1153	11%	1118	11%	NS
Hospital Days	1153	11%	1118	11%	NS
Home Visits by MD	1153	09%	1118	09%	NS
Well-Baby Visits	321	25%	319	32%	*
School Exams	630	39%	590	29%	*
Immunizations	759	15%	698	23%	*
Out-Patient Lab Tests	1153	23%	1118	26%	*
Out-Patient X-Rays	1153	16%	1118	18%	*
Prenatal Visits	241	10%	251	10%	NS
Home Visits by PHN	1153	7%	1118	8%	NS

NS = not statistically significant

* < .05

+ Z Value calculated through Hypothesis Testing: The difference between two population proportions where Z is significant at the 0.05 level with values > 1.645.

Control); (2) Well-baby visits (25% FPN - 32% Control); (3) School Exams (39% FPN - 29% Control); (4) Immunizations (15% FPN - 23% Control); (5) Out-patient laboratory tests (23% FPN - 26% Control); and (6) Out-patient X-Ray examinations (16% FPN - 18% Control). As can be seen in the table, the FPN Communities received a significantly lower proportion for all services except School Examinations.

b. Difference in means test

For service categories where the FPN Communities were shown to have a significantly lower proportion of services rendered, the mean number of services of persons having one or more services in each community were compared. A Difference in Means test was calculated for these service categories and on the hospital days category. Table V shows only immunizations and out-patient laboratory units to be significantly lower in the FPN Communities when the mean number of services was used as a basis of comparison. The mean number of immunizations in the Control Community was 2.1 as compared with the unadjusted mean of 1.6 in the FPN Communities. Similarly, the mean of 3.8 out-patient laboratory units in the Control Community is higher than the unadjusted mean of 2.5 for the FPN Communities. Table V also gives an unadjusted and adjusted rate of service (adjusted for age and sex). When the adjusted mean number of services were compared, out-patient laboratory units were significantly higher in the FPN Communities.

A Difference in Means test was not carried out on all health service categories. This decision was made because it was thought that proportion of services delivered to the two communities during the Base-line Period was the central issue. Proportion of service would give some

Table V

Frequency of Health Service Utilization of Persons Having One or More Health Services by Community in the Baseline Period

Service Category	Control Community: Average Number of Health Services per Person	FPN Community: Unadjusted Average No. of Health Services per Person a	FPN Community: Age-Sex Adjusted Average No. of Health Services per Person b	Z Value+: a	Z Value+: b
Out-Patient Visits	3.4	3.0	3.0	NS	NS
In-Patient Days	7.5	6.7	6.0	NS	NS
Well-Baby Visits	2.6	2.2	2.3	NS	NS
School Exams	1.2	1.3	1.3	NS	NS
Immunizations	2.1	1.6	2.0	*	NS
Out-Patient Laboratory Tests	3.8	2.5	5.0	*	*
Out-Patient X-Ray Exams	1.6	1.5	1.5	NS	NS

NS = Not statistically significant

* = Two tailed test $p < 0.05$

\+ = Z value calculated through Difference in Means test (two tailed test where Z is significant at the 0.05 level with values ≥ 2.33).

indication of the accessibility to health care services; and this was an important area to establish prior to the attachment of the FPN to her study communities. Having established significantly lower proportion of service in certain areas, then measurements of frequency of service once access into the health care system was obtained could be done. The health service category of Hospital Days was included in the analysis of mean number of services because it is one of the most costly components of health care; therefore, it was important to establish if any significant difference existed.

C. Cost Analaysis

1. Estimating expenditures

a. Total operating expenses of the Baie Verte Peninsula Health Centre

A review of the accounts available through the Baie Verte Health Centre showed that the total operating costs for the Centre were $830,861 for the Baseline Period. Of this total, 77% ($643,559) was allocated for salaries with a further breakdown of physician's salaries - $133,437, nurse's salaries - $194,131, and salaries of other personnel - $315,991. As shown in Table VI, the Baseline is compared with the Experimental Period where the total operating costs reached $1,041,420. During the Experimental Period, the salary portion was reduced from 77% to 73% of the total, or $764,336. The physician's salaries were $145,750, nurse's salaries rose to $234,338, and the salaries of other personnel were $384,248. The costs associated with the FPN Clinic ($17,227) which included salary, supplies and overhead were included in the total operating costs for the Experimental Period.

Table VI

Baie Verte Peninsula Community Health Centre
Total Operating Costs

Baseline Period (July 1, 1973 - June 30, 1974)			Experimental Period (October 1, 1974 - September 30, 1975)		
	Salaries Only	Salaries & Supplies		Salaries Only	Salaries & Supplies
Quarter ending 9.30.73	$130,948	$158,553	Quarter ending 12.21.74	$169,650	$233,910
Quarter ending 12.31.73	$177,486	$224,487	Quarter ending 3.31.75	$168,091	$234,927
Quarter ending 3.31.74	$144,744	$196,428	Quarter ending 6.30.75	$177,699	$257,760
Quarter ending 6.30.74	$190,381	$251,393	Quarter ending 9.30.75	$248,896	$314,823
Total	$643,559*	$830,861	Total	$764,336**	$1,041,420

* = 77% of the total operating cost in the Baseline Period

** = 73% of the total operating cost in the Experimental Period

b. Costs of introducing the FPN to the Study Communities

The cost analysis of the family practice nurse and the operation of her clinic was conducted in two parts: (1) the start-up costs associated with her clinic; and (2) operating costs generated by the nurse and her clinic which may be expected to continue from year to year. The village council of Fleur de Lys (location of the FPN Clinic) contributed $7,000 to the start-up expenditures necessary for the clinic. In addition, council donated a section of the old school house and then utilized their contribution in making renovations such that a 5-room clinic (2 examining rooms, a washroom, kitchenette, and waiting room) was opened on October 1, 1974. Over and above these expenditures, the Baie Verte Health Centre provided the Clinic with medical and surgical supplies and equipment which cost $2,193. Total start-up costs then can be estimated at $9,193.

The operating costs for the FPN and her clinic in Fleur de Lys came to $15,034 for the Experimental Period. Of this amount, $11,683 was allocated for salary, and the remainder was expended on drugs, transportation, electricity for the clinic, and janitorial maintenance. Table VII shows the start-up and operating costs for the FPN Clinic during the Experimental Period.

2. Estimating unit costs

Unit costs for each of the ten (10) health service categories were calculated from various information sources and included: out-patient visits ($7.67 or $4.40/visit); hospital in-patient day ($69.50/day); home visits by a physician ($10.80/visit); well-baby visits ($1.45/visit); school examinations ($5.40/exam); immunizations ($1.08/immunization);

Table VII

Family Practice Nurse Clinic Start-Up and Operating Costs in the Experimental Period

START-UP COSTS			
Renovations to Old School House (estimated)	$7,000		
Medical/Surgical Supplies and Minor Equipment	2,193		
TOTAL START-UP COSTS			$ 9,193
OPERATING COSTS			
Salary			
FPN Salary		$11,683	
Overhead			
Drugs/therapeutics, office supplies	257		
Automobile expense (Payments, gasoline, maintenance)	1,530		
Telephone	96		
Electricity	816		
Janitorial	652		
Total		3,351	
TOTAL OPERATING COSTS			$15,034

out-patient laboratory units ($0.11 or $0.10/unit); out-patient X-Ray examinations ($7.80 or $5.80/exam); prenatal visits ($7.67 or $4.40/visit) and home visits by a public health nurse ($13.16 or $10.58/visit). Costs recorded here are considered the most reliable. Table VIII shows the unit costs for each health service category and the data source utilized in calculation. Some health service categories have more than one unit cost estimate such as out-patient visits. This occurred when several data sources provided costing information, e.g. the Baie Verte Peninsula Health Centre estimated an out-patient visit to cost $7.60, whereas the cost inputed utilizing Provincial Government Accounts was only $4.40 during the Baseline Period. Where possible the Health Centre accounts were used in calculating total cost for a particular health service. A detailed description of the methods utilized in determining unit cost for the various health service categories can be found in the Appendix.

3. Cost associated with delivering health care services to the study communities based on utilization rates and unit costs

By combining data generated by the SPSS computer program for utilization rates and the unit cost analysis per health service category, it was possible to estimate the total cost of delivering a particular health service to both FPN Communities and the Control Community. Table IX shows the total operating costs of each health service based on utilization rates for the two study communities. Using out-patient visits as an example, the cost of all out-patient visits made by the 1153 residents of the FPN Communities was $14,634.36 as compared with $17,410.90 for the 1118 residents in the Control Community. Data analysis was not

Table VIII

Unit Cost Analysis
Calculation of Unit Costs and Sources of Information

"Costed" Service Category	Baie Verte Peninsula Community Health Centre Accounts (Cost/Service) 1974	MCP Payment Schedule (Cost/ Service) 1974	Provincial Government Accounts (Cost/ Service) 1974	Other Sources (Cost/ Service) 1974
Out-Patient Visit	$7.67/visit		$4.40/visit	
Hospital Admission (Hospital Days)			$69.50/day	
Home Visit by M.D.		$10.80/visit		
Well-Baby Visit	$1.45/visit			
School Exam				$5.40/Exam*
Immunization		$1.08/service		
Out-Patient Lab Test	$0.11/unit		$0.10/unit	
Out-Patient X-Ray	$7.80/exam		$5.80/exam	
Prenatal Visit	$7.67/visit		$4.40/visit	
Home Visit by PHN	$13.16/visit			$10.58/visit+

*Information gained through School Medical Health Officer for the Province and a review of school health records.

+Information gained through the Director of Public Health Nursing, Department of Health for the Province and a review of public health nursing records.

Table IX

Estimated Costs* of Providing Health Care Services in the FPN Communities and Control Community - Baseline Period

Category of Health Service	FPN Community	Control Community
Out-Patient Visits	$14,634.36	$17,410.90
Hospital Days	$58,241.00	$62,758.50
Home Visit by Physician	$ 10.80	$ 10.80
Well-Baby Visit	$ 247.95	$ 390.05
School Exams	$ 1,773.40	$ 1,112.40
Immunizations	$ 203.04	$ 373.68
Out-Patient Laboratory Tests	$ 77.04	$ 132.84
Out-Patient X-Ray Exams	$ 2,043.60	$ 2,316.60
Prenatal Visits	$ 858.74	$ 851.37
Home Visits by Public Health Nurse	$ 1,949.68	$ 1,618.68

*Total Estimated Cost = Total Services x Estimated Unit Cost
(Baie Verte Peninsula Health Centre estimates used when available)

completed for the Experimental Period utilization rates at the time of this writing, however comparisons of the total cost for each health service category will be made for the FPN and Control Communities on a before and after basis following introduction of the Family Practice Nurse.

IV. DISCUSSION

A. Introduction

The proliferation of family practice nurse or nurse practitioner programs in North America since 1970 has led some centres to begin a systematic evaluation of the need for such a health professional and the effectiveness and/or impact of the professional on the practice area once introduced.[1,2,3,4,5] Historically, Newfoundland has had expanded role nurses in its rural areas for many years. As awareness of these programs across Canada and in the United States increased, the advisory board from the Faculty of Medicine and School of Nursing at Memorial University of Newfoundland embarked upon an assessment of the potential

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[1] N. C. Chenoy, W. O. Spitzer, and G. D. Anderson, "Nurse Practitioners in Primary Care II. Prior Attitudes of a Rural Population," Canadian Medical Association Journal, Vol. 108 (April 21, 1973), pp. 998-1003.

[2] Robert L. Greenberg, et. al., "Primary Child Health Care by Family Nurse Practitioners," Pediatrics, Vol. 53, No. 6 (June, 1974), pp. 900-906.

[3] Charles E. Lewis, et. al., "Activities, Events and Outcomes in Ambulatory Patient Care," New England Journal of Medicine, Vol. 280, No. 12 (March 20, 1969), pp. 645-649.

[4] W. O. Spitzer, "The Burlington Randomized Trial of the Nurse Practitioner," New England Journal of Medicine, Vol. 290, No. 5 (January 31, 1974), pp. 251-256.

[5] A. Yankauer, et. al., "Pediatric Practice in the United States with Special Attention to Utilization of Allied Health Worker Services," Pediatrics, Vol. 45, No. 3 (March, 1970), Part II, pp. 521-551.

need for such a health professional, the educational program to be adopted and the measurement tools needed for evaluation in 1971. The aim of evaluation was to measure on a large scale the impact of the FPN in both urban and rural Newfoundland settings and to replicate and corroborate the findings established in similar studies. Newfoundland has had the cottage hospital system since 1933 in which health care costs were largely covered through government funding, and Canada now verges on its third decade with health care funded largely out of the public sector. Because government is so heavily involved and committed to the provision of health care, it is important and timely to consider and re-examine alternative modes of health care delivery. Concern rests not only with ever increasing costs associated with the health dollar, but also with the distribution and utilization of health manpower to their optimum effectiveness and satisfaction, and with the patient and families satisfaction and outcome following health intervention. With these issues in mind, the Family Practice Nurse Project at Memorial University of Newfoundland was undertaken. The Rural Pilot Project was seen as an essential component of the larger research project because it focused on an area in which expanded role nurses had traditionally functioned in Newfoundland, and perhaps more importantly, the evaluation outcomes could be a valuable determinant in shaping policy and health program development for the province.

B. Populations Studied - Introduction of Possible Bias

The filing system at the Baie Verte Peninsula Community Health Centre was structured in such a way as to identify individual persons by their medical chart. The medical charts of 1153 persons living in the

FPN Communities were identified, which is representative of the total population insofar as the 1971 Census enumerated 1120 persons in the FPN Communities and the Health Centre is the only source of care available to the residents. Persons were systematically selected for the Control Community from the remainder of the Baie Verte Peninsula excluding the FPN Communities and Brent's Cove, Tilt Cove, Snook's Arm and LaScie. Selection of the Control Community was to have been done randomly; however due to misinterpretation of instructions, selection was completed choosing every seventh patient chart from the remainder eligible on the Peninsula.

Differences in utilization of health services could be attributed to age and sex differences in the FPN and Control Communities thus distorting observed differences in access to and availability of health services and possible differences in orientation to health services and health care workers. When the Chi Square Test of Homogeneity was performed, no statistically significant difference attributable to age was found between the FPN and the Control Community.

C. Limitations of the Study

1. Data sources

Several data sources ((1) accounts of the Baie Verte Community Health Centre; (2) provincial government accounts - budget allowances; (3) provincial medical care plan (MCP) payment schedule; (4) school medical health records; and (5) public health nursing records) were utilized in attempting to arrive at a comprehensive, accurate method of estimating expenditure and unit cost per category of health service. All persons who were approached regarding information were very co-

operative; however, empirically estimating expenditures and unit costs is a difficult task. When doing a retrospective study the time lag is an important factor in: (1) retrieving information of certain activities performed; (2) recalling numbers of persons seen during a clinic session; and (3) remembering the average amount of time associated with performing a particular task. Selected employees of the Baie Verte Health Centre were asked to keep a record of the amount of time each of them spent which was directly involved with the out-patient department each day for a two week period. This time was later converted to yearly estimates by the hospital administrator to establish a baseline of activity for personnel during the Baseline Period. This method of investigation is limited due to: (1) the individual interpretation of each person surveyed regarding his/her time spent in out-patients; (2) the variation in reporting of amount of time spent in out-patients; and (3) the possibility that two weeks may not be a representative portion of the total year's activities. Keeping these limitations in mind, there remained no alternative data sources which could provide information relevant to the problem, thereby leaving the investigator with a best estimate and not an actual mean cost per health service category.

Similarly, for assigning unit costs for school exams and home visits made by public health nurses, a retrospective record review was conducted. Decisions were made and unit costs were assigned empirically based on the best available information. However, bias could have been introduced due to: (1) variation in reporting of certain activities of the nurse and the physician; (2) variation in the length of certain activities over time such as Well-Baby Clinics; and (3) errors in interpretation of the findings by the investigator. Data collection was complete

to the extent that all available record data for school exams from November, 1973 to June, 1975, and all monthly reports of public health nurses in the province for a one year period corresponding to the Base-line Period were reviewed.

2. Estimating expenditures

Unlike Sparer and Anderson's[6] study of the costs of specific services at neighbourhood health centres, the data utilized in this study was not generaged from a cost accounting system designed specifically for the purpose of analyzing complete costs associated with a particular health service category. Indeed, in attempting to estimate expenditures in the out-patient area of the Health Centre, the hospital administrator made numerous estimations regarding personnel, supplies, maintenance, laundry services and telephone calls where costs could be dichotomized into out-patient and in-patient services. As previously stated, selected personnel were asked to estimate their time spent in out-patients over a two week time frame; however the remainder of the estimations were extrapolated from the percentage of space (square footage) the out-patient department occupied in relation to the remainder of the Health Centre. Square footage was utilized as a basis of estimation because it seemed to be the best measure for such items as fuel and electricity and building depreciation. These estimations obviously were a possible source of bias in the overall costing analysis.

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[6] Gerald Sparer and Arne Anderson, "Cost of Services at Neighborhood Health Centres," New England Journal of Medicine, Vol. 286, No. 23 (June 8, 1972), pp. 1241-1245.

D. Deferment of the Experimental Period

The Experimental Period was deferred for a period of four months during the summer and early fall of 1974 following the attachment of the FPN to the study communities. This necessarily has delayed data gathering and planned analyses between the Baseline and Experimental Periods. However, as in Greenberg, et. al.'s[7] study involving family nurse practitioners, a period of adjustment was considered to be of importance as a buffer between initial attachment and the beginning of evaluation. During this period of time, the physicians at the Baie Verte Community Health Centre could act as preceptors in the continued learning of the FPN, and the FPN could increase and sharpen some of her skills gained during the formal education period. This four month time period also allowed for renovations to be completed on the FPN clinic in Fleur de Lys, so that the nurse could begin practice on a regularly scheduled appointment basis.

E. Other Family Practice Nurse Studies

This research took place within the framework of on-going evaluation (at Memorial University and at other health care institutions and universities) of a new type of health worker and this person's potential impact on health care delivery systems in North America and the United Kingdom. Other related research activity occurring within the field has many implications for influencing changing patterns of health care delivery, utilization of health care manpower and further analyses of cost effectiveness and cost benefits. Notably, in evaluation of educa-

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[7] Greenberg, op. cit.

tional programs for FPN's, Dobmeyer, et. al.[8] thoroughly and concisely surveyed existing physician assistant's training programs in the United States; Taller[9] has described the training program for nurses at Kaiser-Permanente in California; Andrews, et. al.[10] have elaborated on the educational program for pediatric nurse practitioners in the eastern United States and Chambers, et. al.[11] have reported the role and function of FPN's graduating from the Memorial University Family Practice Nurse educational program which produced the practitioner being evaluated in this study. Lewis,[12] Greenberg[13] and Spitzer[14] have addressed themselves to the issue of health outcome and clinical management of patients seen by the FPN. Reid[15] and Merenstein[16] have utilized work sampling tech-

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[8] M. A. Dobmeyer, et. al., "A Report of a 1972 Survey of Physician's Assistant Training Programs," Medical Care, Vol. XIII, No. 4 (April, 1975), pp. 294-307.

[9] Stephen L. Taller, "The Training and Utilization of Nurse Practitioners in Adult Health Appraisal," Medical Care, Vol. XII, No. 1 (January, 1974), pp. 40-48.

[10] Priscilla Andrews, A. Yankauer and J. P. Connelly, "Changing the Pattern of Ambulatory Pediatric Caretaking: An Action Oriented Training Program for Nurses," American Journal of Public Health, Vol. 60, No. 5 (May, 1970), pp. 870-879.

[11] Chambers, op. cit.

[12] Lewis, op. cit.

[13] Greenberg, op. cit.

[14] Spitzer, op. cit.

[15] Richard A. Reid, "A Work Sampling Study of Midlevel Health Professionals in a Rural Medical Clinic," Medical Care, Vol. XIII, No. 3 (March, 1975), pp. 241-249.

[16] Joel H. Merenstein, "The Use of Nurse Practitioners in a General Practice," Medical Care, Vol. XII, No. 5 (May, 1974), pp. 445-452.

niques to determine the types of activities FPN's assume both in rural clinic areas and general practice. Chenoy[17] and MacKay[18] examined the acceptance of this new type of health worker by the population they served; with MacKay additionally investigating morbidity rates of patients cared for by the physician or nurse practitioner. And finally, Yankauer[19] has considered the utilization and professional satisfaction of expanded role nurses.

Cognizance of the contributions of these and other researchers has aided in synthesizing much of the decision making and methodology of this study. Many of the issues raised by the above noted investigators will be undertaken in the evaluation of other portions of the Family Practice Nurse Project in Newfoundland. However, this study has focused primarily on the development of measurement tools to evaluate the economic impact of the FPN, and a health service utilization analysis.

F. Other FPN Studies which Investigate Cost

To date, there has been a paucity of research devoted to measuring the costs associated with the delivery of health care. Researchers are beginning to develop measurement tools which will attempt to measure actual mean costs of services, but many analyses (including this one) are based on empirical estimations. Even fewer studies have addressed themselves to the longitudinal aspects of cost benefit following health

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[17] Chenoy, op. cit.

[18] Ruth MacKay, D. S. Alexander and L. J. Kingsbury, "The Nurse as the Pediatrician's Associate," Canadian Nurse, August, 1972, pp. 32-37.

[19] Yankauer, op. cit.

care intervention. Steele, et. al.'s[20] study of costs of services in primary care settings established objectives similar to those of the Family Practice Nurse Project at Memorial in terms of: (1) evaluating the process of providing primary care; (2) comparing the quality of care in two practice settings; and (3) estimating and comparing costs of services rendered. However, their methodology in terms of data collection was notably different in that they conducted a pilot study of presenting symptom/sign complexes in two separate two week study periods; and they were not evaluating the economic impact of the FPN, but observed differences between hospital emergency departments and family physician's offices.

Because the Baie Verte study focused its attention on the Baseline Period of the Project, it was important to establish unit costs of health service categories or dollar equivalents which could be utilized as a basis of comparison over time in assessing the economic impact of the FPN. The term "unit cost" should not be confused with Robertson's designation in which "unit (average) costs of health services are computed by relating the costs to the quantity of services generated."[21] For the purposes of this study, unit cost was defined as the sum of all costs contributing to a health service category divided by the number of services rendered; in other words, it is similar in concept to the term

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[20] Robert Steele, et. al., "Cost of Primary Health Services in the Emergency Department and the Family Physician's Office," Canadian Medical Association Journal, Vol. 112 (May 3, 1975), pp. 1096, 1097, 1098 and 1113.

[21] Robert L. Robertson, et. al., "Costs and Financing Policies at a Neighborhood Health Centre," Inquiry, Vol. X (September, 1973), p. 37.

dollar weight or dollar equivalent described in the Burlington Trial.[22]

Data analyses for the Experimental Period was not completed at the time of this submission; therefore comparisons made between this and other studies must be confined to methodology, specifically in cost measurement and analysis. Nelson, et. al.'s[23] work concerning the financial impact of employing a MEDEX stated that one could not attribute dollar values to costs and benefits associated with employing a physician's assistant. One could agree that it is difficult to incorporate all of the intangibles into an attempt to capture all benefits and expenditures in a cost analysis. However, by empirically determining unit costs for each health service category, a measurement tool has been designed for this study which can assess and measure financial impact. As was noted in the Burlington Trial,[24] the measurement tool of unit cost cannot claim to measure absolute costs or actual mean expenditures per category of health service because of the difficulties regarding estimation. Unit costs or dollar equivalents can provide a basis of comparing cost changes between the FPN Communities and the Control Community prior to the introduction of the FPN; between the Baseline and Experimental Period over time; and as an indicator of the magnitude of costs involved.

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[22]Economic Findings of Burlington Trial - Abstracted from: Effect of Nurse Practitioners on the Use of Health Services, Paper presented at the American Public Health Association, San Francisco, November, 1973.

[23]Eugene C. Nelson, et. al., "Financial Impact of Physician's Assistants on Medical Practice," New England Journal of Medicine, September 11, 1975, pp. 527-530.

[24]Economic Findings of Burlington Trial, op. cit.

G. The Cost Issues Particularly Associated with This Study

The issue of cost is one which is necessarily intertwined with the broad concepts of effectiveness of care, the quality and process of health care, the availability of and access to health care services, patient satisfaction and health outcome and professional satisfaction of those providing the care. Morbidity and mortality rates within a population can be reduced if health promotion activities and specific preventive measures are instituted during the period of primary prevention, and early diagnosis and prompt treatment are carried out in secondary prevention In order to be effective the screening program must reach its target population, specific protective measures must be available to all requiring them, and patients must comply to the treatment program. For any given individual then, health care may be ineffective due to some problem within the delivery system; and it then becomes very difficult to apply any measurement criteria for evaluating health outcome or cost benefit.

The quality of care and process of care are being measured separately in this study utilizing indicator conditions. However, cost is also at issue in this area as well in terms of measuring the impact of new type of health professional on a community. The FPN may have more time to do follow-up on her patients after initial treatment which could alter patient compliance to a treatment regimen. There is also the visible presence of the FPN in the community where before there had been no health worker on a regular basis, and the patient's perception of the FPN and the establishment of a clinic within the community may in turn alter his compliance to treatment. The issue of compliance and its

relationship to cost effectiveness and cost benefit is also difficult to measure quantitatively.

The issue of availability of health care services and accessibility to care figures very large in this study due to geographical isolation of the FPN Communities and harsh weather conditions for a majority of the year which further impede travel. The majority of primary care services had simply not been available to residents of the FPN Communities except for those services performed by the public health nurse when she visited the communities prior to introduction of the FPN. In attempting to assess the impact of the FPN on the health care system of the Baie Verte Peninsula, it was important to ascertain if the FPN Communities differed significantly from the Control Communities in their utilization of health care services prior to the FPN attachment. The difference in proportions analysis was performed as a means of discovering any discrepancies in terms of access and utilization of services provided in Baie Verte for the two populations. As was noted in the Results section, there were significantly fewer out-patient visits, well-baby visits, immunizations, out-patient laboratory tests and out-patient X-Ray examinations in the FPN Communities prior to the nurse's attachment. Long distances travelled to a primary care centre may act as a physical deterrent to care and thereby decrease health care costs; however, are costs really reduced if the immunization status of a community is lowered resulting in an increased incidence of rubella and a subsequent increase in infants born with rubella syndrome? Because of the many variables involved and the length of time needed for evaluation of these questions, this issue was beyond the scope of the present study.

This study generated no quantitative data which can substantiate

an increase in patient or family satisfaction following the introduction of the FPN. However, discussions have been held with the FPN and the Medical Director of the Baie Verte Peninsula Community Health Centre at several points during the FPN's attachment. They both have felt that the FPN is accepted by colleagues, allied health professionals and the community. The investigator met with the Deputy Mayor of Fleur de Lys in August, 1975, and he reaffirmed the support the FPN continues to receive from the community and the unmeasured benefits to the community associated with her attachment (such as the formation of a TOPS Group, long-term follow-up for the elderly in their home, counselling and liaison with the judiciary and law enforcement officials regarding legal issues surrounding health and social problems). It is difficult to measure the cost benefits associated with providing a health professional to a community who not only delivered preventive services but also provides on-going care and a measure of security to persons isolated from the traditional health services.

This study also did not address itself to assessing health professional satisfaction in a formal way. Numerous discussions have been held with the FPN, however, and she reports a good working relationship between herself and the medical staff has developed in which she functions as a colleague and a co-practitioner. Similarly she has been accepted by the nursing staff at the hospital and among nurses and other health professionals in the community. The communities of Fleur de Lys and Coachman's Cove have overwhelmingly accepted her as their provider of primary care services, and will often request to see the FPN when they attend clinic at the Baie Verte Community Health Centre. They also look with pride on the establishment of a clinic in their own community, and

hope the FPN will continue to serve the health and social needs of their village.

H. Planned Analyses

Data collection for the Experimental Period was completed by mid-January, 1976. At the time of this submission it was being keypunched and stored on magnetic tape in preparation for analysis and summarization by the SPSS Subprogram Aggregate. Whereas this study focused its attention primarily on the development of cost measurement tools and analyses of data between the two populations in the Baseline Period, future analyses will concentrate on comparisons between the Baseline and Experimental Periods (period of attachment of the FPN).

Appendices G and H show the code sheet and procedure for abstraction of data during the Experimental Period. It differs from the code sheet utilized in the Baseline Period only insofar as data was additionally abstracted for the performance in various health service categories by the FPN.

Anticipated analyses include:

- crude rates of service for the Experimental Period and their difference from rates calculated during the Baseline.
- age-sex adjusted rates of service for the Experimental Period.
- a difference in proportions test for utilization of services comparing the Baseline and Experimental Periods.
- a difference in means test for frequency of service comparing the Baseline and Experimental Periods.
- development of unit costs for those categories of health service provided by the FPN alone, and when the FPN and physician have jointly delivered the service.

These analyses should be completed during the summer of 1976 by the investigator.

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APPENDIX A

Codes of Identification and Service for
Baie Verte and Fleur de Lys
Baseline Period

Variable	Columns	Name	Range
1	16-20	Patient's Hospital Chart Number	0-99999
2	21	Sex of Patient	Male = 1 Female = 2
3	22-23	Age of Patient	0-99
4	24	Patient's Community Location	Fleur de Lys - Coachman's Cove = 1 "Baie Verte" = 2
5	25-27	Number of Hospital Out-Patient Visits in Baseline Period	0-999 Unknown = 999
6	28-29	Number of Hospital Admissions in Baseline Period	0-99 Unknown = 99
7	30-32	Number of Hospital Days in Baseline Period	0-999 Unknown = 999
8	33-34	Number of Home Visits in Baseline Period - Physician	0-99 Unknown = 99
10	37-38	Number of Well-Baby (preschool) Visits in Baseline Period	0-99 Unknown = 99
11	39-40	Number of School Exams in Baseline Period (Public Health)	0-99 Unknown = 99
12	41-42	Number of Immunizations in Baseline Period	0-99 Unknown = 99
13	43-44	Number of Out-Patient Laboratory Tests (by individual test) in Baseline Period	0-99 Unknown = 99
14	45-46	Number of Out-Patient X-Rays in Baseline Period	0-99 Unknown = 99
15	47-48	Number of Prenatal Visits in Baseline Period	0-99 Unknown = 99
16	49-50	Number of Home Visits in Baseline Period - Public Health Nurse	0-99 Unknown = 99

N.B. Variable #9 - Number of Telephone Calls in Baseline Period excluded from the study.

APPENDIX B

Categories of Health Service for Utilization and Cost Analysis for Baie Verte and Fleur de Lys Baseline Period

Variable	Name
5	Number of Hospital Out-Patient Visits in Baseline Period
6	Number of Hospital Admissions in Baseline Period
7	Number of Hospital Days in Baseline Period
8	Number of Home Visits in Baseline Period - Physician
10	Number of Well-Baby (preschool) Visits in Baseline Period
11	Number of School Exams in Baseline Period (Public Health)
12	Number of Immunizations in Baseline Period
13	Number of Out-Patient Laboratory Tests (by individual test) in Baseline Period
14	Number of Out-Patient X-Rays in Baseline Period
15	Number of Prenatal Visits in Baseline Period
16	Number of Home Visits in Baseline Period - Public Health Nurse

APPENDIX C

Baie Verte Peninsula Community Health Centre
Unit Cost Analysis

Summary Sheet to Determine Cost of
Out-Patient Visits - 1974

Doctors Salaries (Exhibit 1)	$ 88,805
Emergency Unit and Other Salaries (Exhibit 2)	48,620
Laboratory Salaries and Supplies (Exhibit 3)	19,325
Utilities and Other Supply Expense (Exhibit 4)	13,096
Pharmacist (Exhibit 5)	500
X-Ray Salaries and Supplies (Exhibit 6)	24,595
	$194,941

Number of Out-Patient Visits to Out-Patient Department and Emergency - 19,697

$\frac{\$194,941}{19,697}$ = $9.90 per visit including Lab and X-Ray Expenses

$\frac{\$151,021}{19,697}$ = $7.67 per visit Not including Lab and X-Ray Expenses

Exhibit 1

Doctors Salaries 1974

Dr. A - $40,500 ÷ 1950 = $20.77 hourly rate

Dr. B - 21,000 ÷ 1950 = $10.77 hourly rate

Dr. C - 23,000 ÷ 1950 = $11.79 hourly rate

Dr. D - 25,000 ÷ 1950 = $12.82 hourly rate

Dr. E - 27,000 ÷ 1950 = $13.85 hourly rate

Two week sampling doctors' hours with out-patients

Dr. A - 37 hours x 26 = 962 hours per year x $20.77 = $19,980

Dr. B - 57 hours x 26 = 1482 hours per year x $10.77 = 15,960

Dr. C - 52 hours x 26 = 1352 hours per year x $11.79 = 15,940

Dr. D - 60 hours x 26 = 1560 hours per year x $12.82 = 20,000

Dr. E - 47 hours x 26 = 1222 hours per year x $13.85 = 16,925

$88,805

Exhibit 2

Emergency Unit Salaries 1974	$38,794
Other Salaries	
Payroll Clerk, 676 hours @ $3.52/hour	2,380
Medical Records Technician, 312 hours @ $3.20/hour	998
Storekeeper, 260 hours @ $3.02/hour	785
Housekeepers, 1820 hours @ $2.29/hour	4,168
	$47,125
Unemployment Insurance Expense	619
Canada Pension Plan Expense	613
Workman's Compensation Expense	263
	$48,620

Exhibit 3

Laboratory Salaries 1974	$24,156	
U.I.C. Expense	328	
C.P.P. Expense	348	
W.C. Expense	135	
		$24,967
Laboratory Supplies		7,475
		$32,442

$\frac{162366 \text{ Units O.P.}}{272571 \text{ Total Units}} = 59.5\%$

59.5% of $32,442 = $19,325 Out-Patient Department Expense

$\frac{\$32,442 \text{ Total Lab Expense}}{272,571 \text{ Total Units}} = .119¢ \text{ per unit}$

Exhibit 4

Hospital Square Footage = 32,336 square feet

Out-Patient Department = 2,322 square feet

Out-Patient Department = 7.18% of area

Expense to run Out-Patient Department

Medical/Surgical Drug Supplies	$ 3,600
Electricity 7.18% x $13,717	985
Fuel 7.18% x $21,122	1,517
Depreciation 7.18% x $23,298	1,673
Phone* 40% of $8,261	3,304
Laundry 480 lbs. per month x 12 = 5760 lbs. @ $0.13	749
Office Supplies* - Printing, Postage 10% of $7,684	768
Housekeeping Supplies 7.18% of $6,957	500
	$13,096

*Percentages estimated.

Exhibit 5

Pharmacist $2,000 per annum

Pharmacist estimates 25% of his time is chargeable to Out-Patient Department.

25% x $2,000 = $500

Cost of drugs included in Exhibit 4.

Exhibit 6

X-Ray Salaries 1974	$11,564	
Unemployment Insurance Expense	152	
Canada Pension Plan Expense	150	
Workman's Compensation Expense	64	
	$11,930	
Radiologist Salary 1974	10,432	
		$22,362
X-Ray Supplies		8,003
		$30,365

To establish % chargeable to out-patients I used 3 criteria.

1. Total Patients Seen

In-Patient	Out-Patients	Total	
672	2913	3585	$\frac{2913}{3585}$ = 81%

2. Total Examinations

In-Patient	Out-Patients	Total	
741	3151	3892	$\frac{3151}{3892}$ = 81%

3. Total Films

In-Patient	Out-Patients	Total	
1817	7772	9589	$\frac{7772}{9589}$ = 81%

81% of $30,365 = $24,595. Out-Patient Department Expense

$30,365 X-Ray Expense / 3,892 Total Examinations = $7.80 per exam

Exhibit 7

Salary Breakdown
Baseline Year - July 1, 1973 - June 30, 1974

	Quarter Ending 9/30/73	Quarter Ending 12/31-73	Quarter Ending 3/31-74	Quarter Ending 6/30/74	Total
Nursing Administration	1,961	3,655	2,699	3,056	11,371
Nursing Unit	34,920	55,535	39,508	52,797	182,760
Emergency Unit	6,948	10,695	8,657	11,720	38,020
C.S.R.	5,482	7,013	7,835	8,566	28,896
Laboratory	5,153	6,648	5,102	7,697	24,600
Pharmacy	300	300	500	500	1,600
Radiology	2,459	2,501	2,071	2,853	9,884
Radiologist	-	-	1,632	3,209	4,841
Dietary	7,258	12,095	7,823	11,966	39,142
Laundry	2,791	4,357	2,883	4,170	14,201
HouseKeeping	6,117	9,350	6,424	9,811	31,702
Administration	10,991	16,552	10,402	14,332	52,277
Plant Operation	8,634	11,504	8,599	11,699	40,436
Medical Salary	34,042	28,812	33,812	36,771	133,437
Public Health Baie Verte	2,896	6,993	5,887	8,407	24,183
LaScie Clinic	996	1,476	910	1,236	4,618
Nurse Practitioner Program	-	-	-	1,591	1,591
TOTAL	130,948	177,486	144,744	190,381	643,559

Exhibit 8

Breakdown of Public Health Salaries and Supplies
Baseline Year - July 1, 1973 - June 30, 1974

	Quarter Ending 9/30/73	Quarter Ending 12/31/73	Quarter Ending 3/31-74	Quarter Ending 6/30/74	Total
Baie Verte					
Salaries	2,896	6,993	5,887	8,407	24,183
Transportation	48	209	786	334	1,377
Supplies	Cr.(18)	201	191	Cr.(69)	305
Clinic Rentals	58	123	100	185	466
Office Rental	550	450	450	450	1,900
Telephone	-	39	-	57	96
TOTAL	3,534	8,015	7,414	9,364	28,327
LaScie					
Salaries	996	1,476	910	1,236	4,618
Westport					
Clinic Rent	60	60	40	50	210
Supplies - Drugs	622	-	-	128	750
	682	60	40	178	960
Sale of Drugs	Cr.(260)	Cr.(191)	Cr.(202)	Cr.(200)	Cr.(853)
	422	Cr.(131)	Cr.(162)	Cr.(22)	107

Exhibit 9

Salary Breakdown
Experimental Year - October 1, 1974 - September 30, 1975

	Quarter Ending 12/31/74	Quarter Ending 3/31/75	Quarter Ending 6/30/75	July-Aug. 1975	Sept. 1975	Total
Nursing Administration	2,754	2,902	3,178	300	462	9,596
Nursing Unit	49,477	50,001	53,937	51,490	19,837	224,742
Emergency Unit	9,496	9,116	10,308	10,408	3,921	43,249
C.S.R.	7,548	7,146	6,825	7,421	3,059	31,999
Laboratory	5,611	3,732	4,086	4,075	2,057	19,561
Pharmacy	500	500	500	333	167	2,000
Radiology	3,504	3,640	4,112	3,624	1,560	16,440
Radiologist	2,884	2,537	3,190	3,178	1,197	12,986
Physiotherapist	-	-	-	-	1,000	1,000
Dietary	11,040	10,626	12,004	16,108	5,622	55,400
Laundry	3,510	3,827	3,655	5,510	1,879	18,381
Administration	11,520	11,785	12,099	11,142	3,896	50,442
Plant Operation	9,741	10,170	10,246	12,788	4,702	47,646
Medical Salaries	32,688	33,844	33,969	30,759	14,490	145,750
Public Health Baie Verte	7,418	6,602	7,527	5,611	1,993	29,151
LaScie Clinic	1,011	1,073	1,072	1,390	493	5,039
Nurse Practitioner Program	2,696	2,996	2,995	1,997	999	11,683
Housekeeping	8,252	7,594	7,997	11,611	3,817	39,271
TOTAL	169,650	168,091	177,699	177,745	71,151	764,336

APPENDIX D

A Costing Method for Immunizations

The difficulties surrounding the estimation of a cost or "dollar weight" for an immunization have been previously alluded to in the methodology section of the thesis. What will follow is a more detailed outline of how the dollar equivalent of $1.08 per immunization service was calculated. The Provincial Immunization Schedule for Infants and Preschool Children states that immunizations shall be administered to children at five separate times prior to school entry. They are as follows:

1. a) Diphtheria, Pertussis and Tetanus (DPT)
   b) Oral Polio Vaccine (OPV)
   — at age 3 months
2. a) DPT
   b) OPV
   — at age 4 months
3. a) DPT
   b) OPV
   — at age 5 months
4. Measles, Mumps, Rubella (MMR) at age 12 months
5. a) DPT
   b) OPV
   — at age 15 months

Assuming that the majority of children would receive these five injections prior to school entry, and following the provincial payment schedule of $1.80 for the first intradermal, intramuscular or subcutaneaus injection and $0.90 for each additional injection, the calculation would be as follows:

$$\frac{\$1.80 + (\$0.90 \times 4)}{5 \text{ (total number of injections)}}$$

$$= \$1.08/\text{immunization}$$

APPENDIX E

A Costing Method for School Exams

School Exams performed by a physician with a public health nurse taking the health history are a relatively new type of service within the province. Since the fall of 1973, the School Medical Health Office has retained physicians on a sessional basis (with charges being made to the provincial Medical Care Plan) to perform them on children prior to school entry in the larger centres across the province. A retrospective review of the nineteen physicians thus far involved in the program was made, beginning November, 1973, to June, 1975.

In reviewing the records it was discovered that several different rates were paid per session depending on whether the physician was a General Practitioner or a Specialist, or whether the session was a half day or a full day. The results of this review are summarized in the table below.

Results of School Exams Performed Sessionally
by Physicians
November, 1973 to June, 1975

	Session @ $54	Session @ $60	Session @ $67.50	Session @ $75	Session @ $90	Session @ $150
Type of Session	½ day	½ day	½ day	½ day	full day	full day
Number of Sessions Held	104	5	9	6	3	2
Number of Exams Performed	1311	54	126	85	138	58
Rate of Exams per Session	12.61	10.8	14	14.7	46	29
Cost of Exams per Session	$4.28	$5.56	$4.82	$5.29	$1.96	$5.17

When the results of these various costs per exam are averaged over the sessions, a physician cost of $4.25/School Exam is reached.

$$\frac{(4.28 \times 1311) + (5.56 \times 54) + (4.82 \times 126) + (5.29 \times 85) + (1.96 \times 138) + (5.17 \times 58)}{1311 + 54 + 126 + 85 + 138 + 58}$$

$$= \frac{7538.63}{1772} = \$4.25/\text{School Exam (Physician Cost)}$$

However, to this figure must be added the cost associated with a public health nurse taking a health history during each examination. The hourly wage for a Public Health Nurse I in 1973 was determined previously in the costing methodology for PHN home visits at $4.25/hour. Dr. Clare Neville-Smith, School Medical Health Officer for the province has stated that each health history requires approximately fifteen minutes of the nurse's time; so the cost associated with this activity would then be about $1.15. Viewed from the point of having two health professionals involved in this service, the total cost of this service is then $4.25 + $1.15 = $5.40/Examination.

APPENDIX F

A Costing Method for a Public Health Nursing Visit

This costing method represents an estimated or imputed cost of a visit based on a retrospective review of the activities of public health nurses in the last two quarters of 1973 and the first two quarters of 1974 in the province of Newfoundland and Labrador. A total of 87 nurses from the Department of Health were evaluated (21 nurses from the St. John's office, 14 nurses from smaller centres such as Clarenville, Corner Brook, Gander, Grand Falls, and Stephenville, and 52 nurses who could be classified as working in rural areas). There were approximately thirteen other nurses working in primarily rural areas who were not included in the study for several reasons:

1) They worked less than eight months during the study period, and therefore there was insufficient data to report.
2) The nurse worked a full year, but only on a part-time basis.
3) The nurse's activities were such that very little home visiting was done within the scope of her practice because:
   a) The area was particularly isolated and normally without the services of a physician which led to the nurse offering a regional "medical" clinic in which the patients came to her for care and treatment.
   b) The nurse's program was mainly curative in nature with few preventive health measures such as school health, prenatal classes or health teaching in the home or office.

There were notable constraints involved in attempting to estimate the amount of time spent in home visiting and therefore, the cost of a visit. The most difficult problem would appear to lie with the reporting practices of the individual nurse. Monthly report forms are provided by

the Department of Health where the nurse is to record her activities of the month previous. However, there are not categories available for all possible activities of the nurse, there is not always sufficient time to report all activities, and reporting of the same activity by two different nurses can be recorded in two different ways due to subjective recording practices and subtle differences in her initial in-service education. There is also the problem of relevance of a monthly report to a nurse, and to what extent he/she sees it as an important activity and therefore an activity worthy of accurate reporting.

A further constraint was the "estimation" by the investigator of time spent on a particular activity, and therefore the cost of that activity when viewed within the total context of the public health nursing program. Nurses do record the amount of time spent in the school health program each month, but they do not report the number of hours spent in home visiting, well-baby clinics, prenatal classes and clinics and in travelling. In some instances, nurses do not report their office hours per month, despite the fact that space is provided for recording this activity. Nurses, however, do report the number of clinics or classes which are held each month; and from discussions with the Department of Health, Public Health Nursing Administrators, it was possible to ascribe approximate times to these activities. Approximately two hours are spent by the nurse for a well-baby or prenatal clinic or prenatal class session. While most nurses in the urban (St. John's) area did not report office hours, it was learned that these nurses spend at least one hour per day, plus one whole afternoon per week in this activity - in other words, an estimated 30 hours per month.

Besides estimating the amount of time spent by the PHN in a given

activity, it was also necessary to estimate the total number of hours it was possible for a PHN to work in a given month and year. These nurses are expected to work 37.5 hours per week on a 52 week basis (1950 hours/year); however, during those 52 weeks there are basic allowances for three weeks of holiday (15 days), 14 statuatory holidays and 6 possible days to be taken as sick leave – a total of 35 days or 7 weeks out of 52. A total of 1688 hours thus remain the maximum number of working hours for a PHN on a twelve month contract. This, of course, cannot account for those nurses who may work more than 37.5 hours per week.

Once a total potential number of working hours has been calculated, then hours spent in various activities can be subtracted from this total. For instance, if a nurse worked 1688 hours per year and 416.5 hours were spent on the school health program, 171 hours were spent in the office and 100 hours were spent on prenatal clinics, then of the time remaining it could be estimated that 1,001.5 hours were spent in relation to home visiting. Based on the number of home visits made, the amount of time per home visit could be established. Travel expenses were also figured into the cost – but again only on an estimated basis. If 59% of the nurse's time was spent home visiting, then 59% of her travel expenses were arbitrarily assigned to that activity.

An hourly wage was arrived at by dividing the total potential working hours into the annual salary of a Public Health Nurse I in 1973. To arrive at a cost per home visit then, the hourly wage was multiplied times the hours spent per home visit plus the travel cost per visit. Each individual nurse's cost for home visiting and travel were then averaged together to arrive at an overall dollar weight per home visit provincially. An example of this procedure follows:

Step #1 Determine if the nurse worked a 12 month contract. Total potential working hours were established for 12 month, 11 month, 10 month, 9 month and 8 month periods.

Step #2

Total number of potential working hours/year	1688
Minus hours in school	- 510
Minus hours in the office	- 315
Minus hours in prenatal classes	- 14
Equals estimated hours home visiting	= 849

Step #3 $\frac{\text{Hours spent home visiting}}{\text{Total number of home visits/year}} \quad \frac{849}{1463} = .58$ hour/home visit

Step #4 Hourly wage equal to $\frac{\text{annual salary}}{\text{total potential working hours}}$

or $\frac{\$7,728}{1688}$

= $4.58/hour

Step #5 Hourly wage times the hours spent per home visit

$4.58 x .58 = $2.66/home visit

Step #6 Percentage of time spent home visiting

$\frac{\text{Total hours spent home visiting}}{\text{Total potential working hours}}$

$\frac{849}{1688} = .50$ 50% time spent home visiting

Step #7 Yearly travel expenses divided by 50%

$\frac{\$332.61}{2} = \$166.30$

Step #8 50% of travel expenses divided by # of home visits

$\frac{\$166.30}{1463}$ = 11¢ travel expenses/home visit

Step #9 Cost of a home visit based on hours spent per home visit plus travel expenses per home visit.

Sum of Step #5 and Step #8

$2.66 + $0.11 = $2.77/home visit

The above has been an example of how to calculate the cost of an individual nurse delivering a single home visit. However, it is not representative of the amount of time and therefore of the cost associated with providing the service of a home visit across the province. For a more representative estimate, 87 nurses from across the province were reviewed in much the same manner as described above. The results of this review are outlined below. As well as giving a total provincial average of the cost of a home visit, the figures are broken down into urban, semi-urban, and rural to demonstrate any regional differences.

St. John's (Urban)

- 21 nurses surveyed
- Total average number of hours/home visit
  (from Step #3 of the above procedure)
  $\frac{22.21 \text{ hours/home visit}}{21 \text{ nurses}}$ = 1.06 hours/home visit average
- Total average travel expenses/home visit
  (from Steps #6, 7, and 8 of above procedure)
  $\frac{6.28 \text{ travel expense/home visit}}{21 \text{ nurses}}$ = $0.30 travel expense/home visit
- 1.06 x $4.58 = $4.85 + $0.30 = $5.15 home visit

Semi-Urban

- 14 nurses surveyed
  Clarenville
  Corner Brook
  Gander
  Grand Falls
  Stephenville

- Total average number of hours/home visit

$\frac{46.37}{14}$ hours/home visit nurses = 3.31 hours/home visit average

- Total average travel expenses/home visit

$\frac{20.88}{14}$ travel expense/home visit nurses = $1.49 travel expense/home visit

- 3.31 x $4.58 = $15.16 + $1.49 = $16.65/home visit

Rural

- 52 nurses surveyed

N.B. One of these nurses was removed from the survey because of the inordinate amount of time spent home visiting (30.71 hours/home visit), and one nurse does not report any travel expenses for the year.

- Total average number of hours/home visit

$\frac{114.77}{51}$ = 2.20 hours/home visit

- Total average travel expenses/home visit

$\frac{43.73}{50}$ travel expenses/home visit nurses = $0.87 travel expense/home visit

- 2.20 x $4.58 = $10.08 + 0.87 = $10.95/home visit

Total Provincial Average - Hours per Home Visit

(Without 1 rural nurse at 30.71 hours/home visit)

Urban Semi-Urban Rural

$$\frac{21 \times 1.06(22.21) + 14 \times 3.31\ (46.37) + 51 \times 2.20(114.77)}{21 + 14 + 51\ \ (86)}$$

$$= \frac{185.35}{86}$$

= 2.13 hours/home visit

Total Provincial Average - Travel Expenses per Home Visit

(Without 2 rural nurses) -

Urban	Semi-Urban	Rural

$$\frac{21 \times 0.30(6.28) + 14 \times 1.49(20.88) + 50 \times 0.87(43.73)}{21 + 14 + 50 \quad (85)}$$

$$= \frac{70.89}{85}$$

= $0.83 travel expense/home visit

Annual Salary PHN I May 1, 1973 $7,728.00

hourly wage $4.58/hour

2.13 hour/home visit x $4.58 = $9.75 nurse time

$9.75 + $0.83 = $10.58 Average Cost Provincially for a Public Health Nursing Visit

APPENDIX G

Baie Verte Codes
(Experimental Period)

List for Abstraction After October 1, 1975

Variable	Columns	Name	Range
17	1-5	Patient's Hospital Chart Number	0-99999
18	6	Sex of Patient	Male = 1 Female = 2
19	7-8	Age of Patient	0-99
20	9	Patient's Community Location	Fleur de Lys/ Coachman's Cove = 1 Baie Verte = 2
21	10-12	Number of Hospital Out-Patient Visits Experimental Period - Physician Only	0-998 Unknown = 999
22	13-15	Number of Hospital Out-Patient Visits Experimental Period - FPN Only	0-998 Unknown = 999
23	16-18	Number of Hospital Out-Patient Visits Experimental Period - Physician & FPN together	0-998 Unknown = 999
24	19-21	Number of Visits to Fleur de Lys Clinic - FPN Only	0-998 Unknown = 999
25	22-23	Number of Out-Patient Laboratory Tests (by individual test) in Experimental Period	0-98 Unknown = 99
26	24-25	Number of Hospital Admissions in Experimental Period	0-98 Unknown = 99
27	26-28	Number of Hospital Days in Experimental Period	0-998 Unknown = 999
28	29-30	Number of Well-Baby (preschool) Visits in Experimental Period in FL-CC - seen by FPN Only	0-98 Unknown = 99

Variable	Columns	Name	Range
29	31-32	Number of Well-Baby (preschool) Visits in Experimental Period in BV - seen by PHN Only	0-98 Unknown = 99
30	33-34	Number of School Exams in Experimental Period (Public Health) - seen by FPN Only	0-98 Unknown = 99
31	35-36	Number of School Exams in Experimental Period (Public Health) - seen by PHN Only	0-98 Unknown = 99
32	37-38	Number of Immunizations in Experimental Year	0-98 Unknown = 99
33	39-40	Number of Prenatal Visits in Experimental Period - Physician Only	0-98 Unknown = 99
34	41-42	Number of Prenatal Visits in Experimental Period - FPN Only	0-98 Unknown = 99
35	43-44	Number of Prenatal Visits in Experimental Period - Physician & FPN together	0-98 Unknown = 99
36	45-46	Number of Home Visits in Experimental Period by Physician	0-98 Unknown = 99
37	47-48	Number of Home Visits in Experimental Period by FPN	0-98 Unknown = 99
38	49-50	Number of Home Visits in Experimental Period by PHN	0-98 Unknown = 99
39	51-52	Number of Out-Patient X-Ray Examinations in Experimental Period	0-98 Unknown = 99

APPENDIX H

Baie Verte Codes
(Experimental Period)

Procedures for Abstraction of Data

Variable	Name	Procedure
21	Number of Hospital Out-Patient Visits Experimental Period - Physician Only	Review the total number of out-patient visits made by each patient during the experimental period which were seen only by the physician. Do not include any seen by the FPN or the FPN and physician together.
22	Number of Hospital Out-Patient Visits Experimental Period - FPN Only	Review the total number of out-patient visits made by each patient during experimental period which were seen only by the FPN. Do not include any seen by the physician or the FPN and physician together.
23	Number of Hospital Out-Patient Visits Experimental Period - Physician & FPN together	Review the total number of out-patient visits made by each patient during experimental period which were seen jointly by the physician and FPN on the same day. Both signatures for the physician and FPN should be on the chart to consider it a joint consultation.
24	Number of Visits to Fleur de Lys Clinic - FPN Only	Review the total number of visits made by each patient during the experimental period to the Fleur de Lys Clinic. Do not include any visits to the FPN at the out-patient department in Baie Verte.
25	Number of Out-Patient Lab Tests (by individual test) in Experimental Year	Review the total number of out-patient lab tests done during experimental period for each patient. Count each individual test and not each series of tests. Include only those tests done for out-patients.
26	Number of Hospital Admissions in Experimental Period	Review the total number of hospital admissions during experimental period for each patient. Count each separate admission and not each hospital day.

Variable	Name	Procedure
27	Number of Hospital Days in Experimental Period	Review the total number of hospital days during experimental period for each patient. Include each admission day as a hospital day. If the discharge day is not included in the billing - do not include it in the survey.
28	Number of Well-Baby (preschool) Visits in Experimental Period in FL-CC - FPN Only	Review the total number of well-baby (preschool) visits during the experimental period for each patient attending clinic in Fleur de Lys. These patients should have been seen by the FPN only - and a separate record is kept by the FPN. Check the FPN's basket in medical records - they should be filed each month.
29	Number of Well-Baby (preschool) Visits in Experimental Period in BV - PHN Only	Review the total number of well-baby (preschool) visits during the experimental period for each patient attending in Baie Verte. These patients should have been seen by the PHN only - consult PHN records for data.
30	Number of School Exams (Public Health) in Experimental Period - seen by FPN Only	Review the total number of school exams received during experimental period for each patient - and performed by the FPN alone.
31	Number of School Exams (Public Health) in Experimental Period - seen by PHN only	Review the total number of school exams received during experimental period for each patient - and performed by the PHN alone.
32	Number of Immunizations in Experimental Year	Review the total number of immunizations received by each patient in the experimental period. Count each individual immunization, do not count a series of immunizations as being one.
33	Number of Prenatal Visits in Experimental Period - Physicians Only	Review the total number of prenatal visits during experimental period for each patient. Count only those visits made to a physician.

Variable	Name	Procedure
34	Number of Prenatal Visits in Experimental Period - FPN Only	Review the total number of prenatal visits during experimental period for each patient. Count only those visits made to the FPN exclusively.
35	Number of Prenatal Visits in Experimental Period - Physician & FPN together	Review the total number of prenatal visits during experimental period for each patient. Count only those visits in which the patient was seen by both the physician and FPN on the same day. Both signatures should appear on the charts in order to count as a joint visit.
36	Number of Home Visits in Experimental Period by Physician	Review the total number of home visits made during experimental period to each patient by a physician.
37	Number of Home Visits in Experimental Period by FPN	Review the total number of home visits made during experimental period to each patient by a FPN. Do not include those made by PHN.
38	Number of Home Visits in Experimental Period by PHN	Review the total number of home visits made during experimental period to each patient by a PHN. Do not include any visits made by a FPN.
39	Number of Out-Patient X-Ray Examinations in Experimental Year.	Review the total number of out-patient X-Ray examinations during the experimental period for each patient. Do not count by the number of films of views - but by the number of examinations ordered and performed. Do not include any in-patient X-Ray examinations.