A Survey of the Immunization Delivery System to Preschool Children in an Urban Canadian Community

by

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A study was carried out of the mixed public-private delivery system for preschool immunizations in the Simon Fraser Health Unit, an urban health unit area in the Lower Mainland of British Columbia.

The objectives of the study were to compare the effectiveness of physicians and public health nurses as providers of immunizations by specific measures of performance and to assess some of the determinants of parental preference for providers.

General data was gathered from a literature review on these issues of provider effectiveness and parental preferences. Specific data was gathered on these two providers' effectiveness in timing measles immunization and parental willingness to pay user fees using a sample survey of 600 randomly selected three year old children born in 1978 in the health unit area.

The literature reviewed and the results of the survey suggested that public health nurses provide equivalent or better services by specific measures of performance. In particular, the survey was able to show that public health nurses more closely adhered to provincial policies for the timing of measles immunizations. The survey also showed a mix of 55% private and 45% public delivery in the area studied. Prominent determinants of
parental preference for both providers were found to be convenience (38%), personal preferences other than convenience (34%), and physician's advice (25%). Respondents in the survey were split on their willingness to pay user fees for these preventive care services.

Finally based upon the findings of this study, a number of future studies were suggested. In particular, cost-minimization studies were recommended to assess the potential of various supply and demand side controls in making the current mixed delivery system of preschool immunization more efficient.
To my wife Cathryn, 
and sons Alexander and Andrew
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CHAPTER ONE

Introduction

Background

While Canadian health care services expanded gradually following World War Two, the pace of this expansion steadily increased in the fifties and sixties with the evolution of government funded health care. Legislation to provide hospital and medical services to all Canadians resulted in a steadily increasing percentage of total public revenues devoted to health care services.

By the late seventies, health care costs represented the single largest expenditure of public funds in B.C. on a percentage basis. For example, 33% of public revenues went towards health care in British Columbia in 1981 as compared to 11% in 1951 (B.C. Public Accounts).

With a faltering economy in the 1980's, public revenues have leveled off or decreased, public deficits have increased; and governments have placed a high priority on cost-containment, and efficiency. However, professional and public demand for health care services continues to expand.
Thus, Canadian health care faces an economic dilemma where the costs of maintaining and developing health care services conflict increasingly with the reality of declining government revenues to fund them.

This conflict has generated much debate in the political arena with the result that politicians, policymakers, professionals, and consumers frequently offer very different solutions to this dilemma. In general, the position of each of these groups is to blame the other and to preserve as much of the status quo as possible for itself. Despite the political rhetoric, the types of solutions proposed by various actors, with perhaps the exception of consumers, generally fall into two broad categories of cost control:

1. Supply side controls — limiting or making more efficient use of available manpower and resources; and

2. Demand side controls — controlling utilization of services by direct or indirect monetary or nonmonetary barriers.

On the supply side, there have been some attempts and considerable rhetoric about providing services more
efficiently by controlling or streamlining the use of available manpower. A example of this has been the suggestion to increase the use of public health nurses to provide services like immunizations that are currently provided by private physicians in many urban areas.

On the demand side, there has been a resurgence of the debate regarding the pros and cons of user fees to control or streamline consumer utilization of services and to generate revenues. For example, user fees have been tried in acute hospital and ambulatory care but have been rarely applied in preventive services like immunization (Beck and Horne 1980).

Immunization services provide a useful setting in which to consider some of the issues involved in the current political debate in health care.

Immunization services are highly valued in society (Gunn et al. 1979) and historically represent one of the most cost effective preventive programs funded (Willems 1981). However, in periods of economic restraint directly funded preventive programs like immunization are extremely vulnerable to budget controls as witnessed by recent provincial government reluctance to fund the new Hepatitis B vaccine since the immediate additional costs to government override consideration of its efficacy and long term cost.
benefit returns.

Finally, immunization programs represent a service that is readily measurable in terms of provider effectiveness by specific measures of performance; eg. clinically appropriate timing of vaccines, coverage rates, and adverse reaction reporting.

The efficacy of vaccines in use are generally well known, however there is much less known about the effectiveness of different providers or the effect the consumer has on choice of provider.

The timing of measles immunization as given by physicians and public health nurses is the specific effectiveness measure that is of interest in this study. In addition, some of the determinants of parental preference for a given provider are explored.

The Objective of the Study

The need or perceived need to control health care costs has so dominated the political debate in health care that it has overshadowed other important planning issues like effectiveness of providers and the determinants of consumer preferences which need to be analyzed in order to assess the value of supply and demand controls in a given delivery
system. The objective of this study is to examine the issues of provider effectiveness and parental preferences in a specific setting where both physicians and public health nurses provide immunizations to preschool children.

The information that is gathered on provider effectiveness and parental preference helps to provide some of the necessary background data required before future studies and planning options of supply and demand controls for this specific delivery system can be considered.

In many urban Canadian communities, parents have a choice between their family physician and a public health nurse when having their preschool children immunized. In the lower mainland of British Columbia, a natural study setting is provided since physicians and public health nurses provide these services to approximately equal numbers of preschool children. (Division of Epidemiology, B.C. Ministry of Health 1981)

However, before one can even begin to examine the potential cost savings of supply or demand control solutions to use manpower more efficiently in this mixed delivery system, some important questions need to be analyzed.

First of all, effective supply side controls assume
that public health nurses and physicians provide measurably equivalent service (Barer et al 1979).

Secondly, effective demand side controls assume parents’ willingness to accept changes in provider if a more efficient alternative exists, given the high value placed on freedom of choice in Canadian health care.

Information about these questions is gathered from a literature review and data gathered in a sample survey.

This information is then used to discuss the types of future studies needed to establish if various supply or demand controls in this delivery system would be cost effective or not.

The Study Design

The study was designed to review available literature and gather original data by means of a sample survey to provide information on provider effectiveness and the impact of parental preference in a mixed delivery system of preschool immunization. The questions asked were:

1. Do physicians and public health nurses provide equivalent immunization services when specific measures of performance are compared?

2. Why do parents have preference for a given provider?
3. How willing are parents to pay a user fee for preschool immunization and what impact would user fees have on parental choice of provider?

The sample survey was necessary since specific literature on these questions was limited and because the record-keeping system in most urban health units was not able to provide reliable data on preschool children’s immunization given by family physicians.

Therefore, a survey of 600 randomly selected children born in 1978 in an urban area with mixed delivery was undertaken.

The Survey Setting

The survey was carried out in the Simon Fraser Health Unit in the lower mainland of British Columbia. It is an area with four municipalities and an unorganized rural district. It is primarily a middle income area with a population of 140,000 people. Many of the residents commute to nearby Vancouver to work. Immunization services to preschool children in the Simon Fraser Health Unit are given by either physicians on a fee for service basis through the B.C. Medical Services Plan or by public health nurses. Parents currently receive these services for their children free of any direct user charge by either provider. A preliminary
study had shown that physicians and public health nurses provide immunizations to equal numbers of preschool children in this specific urban area (Everett 1981). This mixed delivery pattern is similar to that seen in many other urban areas of Canada although the percentage public-private mix varies. The delivery system shifts to a predominantly public delivery in rural British Columbia and most other rural areas of Canada. However, in the past few years has there been a trend in some rural B.C. areas towards physicians providing an increasing percentage of immunizations. By comparison across Canada, some notable exceptions to the British Columbia situation exist. Immunizations in Alberta and Saskatchewan are almost entirely provided by public health nurses in both urban and rural areas (White and Mathias 1982).

The Survey Questions

Do physicians and public health nurses provide equivalent immunization services when specific measures of performance are compared?

Information for question 1 provided data on the percentage mix of private and public delivery in this community and a comparison of the timing of measles immunization between providers in the survey response group.
While the focus is on measles immunization, mumps and rubella are often provided with measles in a combined vaccine (M.M.R) so that this data provides information on these two immunizing agents as well. The survey does not provide information on immunizations to the other four vaccine preventable diseases given to preschool children: ie. diphtheria, pertussis, tetanus and polio (DPTP).

The reason for the focus on measles immunization is threefold. Firstly, measles immunization was chosen because the timing of measles vaccine and coverage rates for measles are important given the current commitment in many jurisdictions to achieve the elimination of indigenous measles. To achieve this goal timely immunizations for measles with high coverage rates will be a major component of any successful program. Therefore, it is important to determine to what extent providers influence achievement of this goal. While most vaccine preventable diseases are well controlled, measles in 1981 was reported in Canada at rates ten times higher than in the United States (where the goal of eliminating indigenous measles was set for October 1982). Thus, it remains a preventable disease of some priority in public health today (Davies et al 1982).

Measles is a disease which can have serious sequelae, including mortality from viral encephalitis and rarely
subacute sclerosing panencephalitis. It may also produce significant morbidity from secondary pneumonia in high risk children. Measles as well as other viral agents have also been implicated as causative factors in diseases like juvenile diabetes and rheumatoid arthritis and other chronic illness (Davies et al. 1982). Since the introduction of measles vaccine in North America in 1963, the incidence of natural disease and many of these sequelae have decreased greatly (Krugman and Katz 1981). Studies of the cost benefit to society of preventing measles infection show it to be in the range of 1 to 10 (Albrittone 1978, Axnick 1969, Willems 1979).

Secondly, the issue of measles immunization timing was studied because of the ongoing debate that began in the mid-1970's over measles vaccine efficacy.

While there was agreement that the measles vaccine currently used appeared to be efficacious if it is given after 12 months of age and it was properly handled and stored, a debate began in the mid-1970's over whether the appropriate age to immunize for measles was at 12 months or 15 months. Studies in the United States in the mid-1970s suggested poor protection in those immunized between 12-14 months of age (Krugman et al. 1977). As a result, American policy shifted to immunization at 15 months old or later. The
Canadian Pediatric Society and the National Advisory Committee on Immunization reviewed this literature and determined that there was insufficient evidence to change the policy of 12 months or later (C.D.W.R. vol.3-39 1977). The B.C. Ministry of Health endorsed this National Advisory Committee policy. The survey attempts to determine conformance to the provincial policy by both providers.

Finally, in terms of gathering valid information on provider effectiveness, Measles(M) or MMR is a single injection which is easier for parents to recall or confirm on records whereas DPTP which involves completion of a series of doses (4 over 18 months) is more likely to be confused by parents in recalling records (Comstock 1973).

The determinants of parental preference were assessed by asking the following questions:

Why do parents have preference for a given provider? and

How willing are parents to pay a user fee for preschool immunization and what impact might user fees have on parental choice of provider?

Data on parental preference and willingness to pay user fees provide information on the possible impact of demand side controls in a mixed immunization delivery system; e.g. would differential fees charged directly by
physicians or through government policy by health units change parental preference from one provider to another?

While professional self-interest in proposed changes to the delivery system are not specifically examined in the study, some comments on this aspect of the delivery system are brought into the discussion later in this thesis.

Data from these two questions also help in addressing some of the broader planning issues arising in the study. Delivery system changes arising from "objective" planning often fail to thrive if the human element of health care is ignored as pointed out by D. O. Anderson in Epidemiology in Health Care Planning:

... The purposes of a planning system are shaped by the environment within which it functions. The objective realities faced by the society and its prevailing social and political values jointly determine the nature and scope of the problem to which planning is addressed, which actors participate, the degree to which planning is integrated across sectors, and the powers that planners are given to exercise (Knox 1979).

The Format of the Thesis

In chapter two, the literature is reviewed in a number of areas relevant to the study; namely, the issue of efficacy and timing of measles immunization, evaluation of physicians and public health nurses as providers of immunization services, consumer preferences, and socio-
economic factors in the utilization of preventive services, the advantages and limitations of the survey method in planning, and current issues in immunization planning.

Chapter three will describe the specific methods used in this study including the choice of sampling frame, sample selection, questionnaire design, pre-testing of the questionnaire, steps used in carrying out the survey and proposed data analysis. In Chapter four, the results of the survey are presented and briefly discussed. In Chapter five, the findings of the survey will be discussed in the context of the questions set out in the introductory chapter. Finally, in Chapter six, the specific and general information gathered in the study is discussed in terms of future studies required to determine if various supply and demand controls in this delivery system would be cost effective.
CHAPTER TWO

Literature Review

In addressing the questions posed in this study, the literature was reviewed in a number of areas. The first section deals with published data regarding the timing of measles immunization in young children since it is used as a specific measure of provider performance. In fact, the timing of measles immunization was much debated through the later part of the seventies when most of the children in this survey received measles vaccine. The second section presents available data from the literature that compares physicians and public health nurses as providers of immunization in terms of other specific measures of performance.

In order to provide background on parents' choices of providers and willingness to change provider, the third section reviews some of the published data on socio-economic factors, including user fees, that effect utilization of preventive services like immunization. The fourth section
will discuss the advantages and limitations of the method used in this study. Finally, some of the current issues in immunization program planning are reviewed.

The Timing of Measles Immunization

The initial controlled field trials of the further attenuated measles vaccine used today (Krugman et al 1965) showed the vaccine to be efficacious (95% seroconversion). However by the mid-1970’s concern was raised about the vaccine’s efficacy because of the increasing observations of vaccine failure in previously immunized children during measles outbreaks (Yaeger et al 1977, Shasby 1977, Albrect et al 1977, Krugman et al 1977). These studies all provided data supporting the hypothesis that the increased vaccine failure noticed in various outbreaks was due to the timing of immunization and not due to waning antibody with time. Yaeger et al (1977) carried out the largest study in which 465 children were serologically tested by Hemaglutination inhibition (H.I.) tests for measles antibodies. They were able to show a statistically significant difference in HI titers in infants immunized at 15 months and older as opposed to those immunized at less than 14 months. Vaccine failure occurred in 15% of those
children less than 14 months and only in 5% who were 15 months and older. Other serological and epidemiological studies were supported by the observation that maternal antibodies in infants persisting up until 14 months of age were capable of blocking the immune response to measles immunization (Krugman 1977, Albrect 1977, Shasby 1977, Srassberg 1978, Judelsohn 1978). After reviewing these findings, the American Pediatric Society and the American Committee on Immunization Practice (ACIP) recommended in May 1977 that measles immunization be withheld until 15 months or later to improve vaccine efficacy.

However, a large serologic study by Wilkins and Wehrle (1978) using paired sera for H.I.s on 851 children showed no significant difference in sero-conversion between those immunized at 15 months and older and those between 12-14 months of age. Epidemiologic studies of vaccine efficacy also supported Wilkins and Wehrle's observations (Marks et al 1978, McIntyre et al 1978). As a result of these findings, Wilkins and Wehrle made a strong counter recommendation that measles immunization be reinstated to the 12-14 month time period not only on the basis of their serological observations but also using the rationale that the 15 month or later policy for measles immunization
unnecessarily put an extra 125,000 children between 12 to 15 months at risk of natural infection while outbreaks of measles infection continued to occur in the United States.

Marks et al (1982) provide a very useful critique of methods used by the various studies carried out in the late seventies on the timing of measles. They point out that a number of important differences in methodologies and small differences in vaccine efficacy in these various studies made reliable comparisons difficult. While large studies like Wilkins and Wehrle (1978) used the more specific benchmark of seroconversion to assess vaccine efficacy, most of the other serology studies showing a difference between 12 and 15 months used a less specific benchmark; ie. seropositivity (eg.Yeager et al 1977). This is based upon the fact that seroconversion by paired sera (Wilkins and Wehrle 1978) is a far more specific measure of vaccine effectiveness in comparison to single serum analysis or test for seropositivity (Yaeger et al 1977) which can represent either exposure to vaccine or natural infection.

The analysis by Marks et al lends greater support to the type of serology study on timing carried out by Wilkins and Wehrle (1978) as compared to those showing differences between 12 and 15 months old (Yaeger et al 1977).
They also reviewed seven of the epidemiological studies for and against the 12 month approach to measles immunization and compared the methods used in each. They concluded that while three of the epidemiological studies showed statistically significant improvement in vaccine efficacy in the child 15 months or older, four of the studies did not. Further, both the studies favoring the 12 month approach and 15 month approach also differed in other important ways including: intensity of effort to seek out unreported cases; case definitions; how vaccines were handled or stored by individuals or groups studied; the precision of defining age at immunization (varied from ± two weeks to ± four weeks); and differences in historical bias. Neither the 12 month or 15 month studies were superior in design by these features. Their overall position from a review of the epidemiological studies was that it was impossible to draw useful conclusions from them because they were not comparable in study design. Early in this debate in the United States, the Canadian National Advisory on Immunization stated that:

... in view of the contradictory evidence available that there be no change in the recommendation of 12 months or later for measles immunization in Canada and that while outbreaks of measles continue to occur a delay to 15 months put young children at risk of disease who often have higher rates of complications with natural infection. Since
general medical assessments at 12 months of age are currently routine a disruption of this pattern would lead to lowering of immunization rates in the population (C.D.W.R. vol.3-39 1977).

Recent data shows that in the U.S. very few children in the second year of life in fact had natural measles following the change to 15 months (M.M.W.R. vol.31, May 7, 1982). However, the marked decreased incidence of measles overall in the population during this time period could explain the low incidence of measles in children under two (Hinman 1979).

While this review does not resolve the issue of measles immunization timing, the overall conclusion that can be drawn from the literature is that a policy of measles immunization at 12 months or as soon as possible thereafter is as effective as the 15 month or older approach.

It is interesting to note that the U.S. recommendation of 15 months and older is increasingly contradicted in policy statements:

... that persons can be considered immune who have been vaccinated on or after their first birthday (M.M.W.R. vol.31, May 7 1982).

This type of statement suggests that a softening of the policy to immunize after 15 months has occurred since the 1970’s. Despite the 12 versus 15 month debate in the 1970’s, there has always been consensus, with the
exception of measles outbreaks, that measles immunization should not be given before 12 months of age because of the significantly decreased vaccine efficacy in children less a year old (Krugman 1976, Hinman 1979).

Since this study measures physicians' and public health nurses' effectiveness in timing measles immunization, they are compared using the standard of 12 months or later which was the recommendation in place in British Columbia during the period when most of these children were immunized.

Therefore, based upon this literature review, the most significant differences in effectiveness between providers would be demonstrated in the number of children receiving measles vaccine at less than 12 months (except in outbreaks).

Physicians and Public Health Nurses as Providers of Immunization

There is no specific data in the published literature that compares the effectiveness of physicians and public health nurses providing measles immunization at an appropriate time. However, there is some more general data
available which compares provinces in terms of coverage rates, morbidity and mortality of infectious diseases, adverse reaction reports, and other effectiveness measures like completion rates.

Unfortunately, most public health data is based upon children's immune status at school entry. However, this population data is an indirect measure since some provinces have a mixed delivery system (e.g., British Columbia and Ontario) and others are almost totally public (e.g., Alberta and Saskatchewan). Although the data is crude, the public delivery provinces like Alberta and Saskatchewan show better measures of performance for adverse reaction reporting while data on the other comparative measures do not so clearly favour one or the other delivery system (see Appendix I).

The annual two year old immunization studies that the Centers for Disease Control (C.D.C.) in the U.S.A. carry out do not provide comparison between public and private delivery. This is also true of data from the United Kingdom and Europe.

McDaniel et al (1975) provides one of the few published studies in which physicians and public health nurses are compared as providers of immunization. They conducted an audit of 813 two year old children’s records
in physician's offices and health departments in rural and urban Idaho. They were able to show that completion rates of a DPTP series was 44% in the health departments and slightly lower in the physicians office 38%. A significant finding in their study was that many patients who started out using a physician and who then went to public health subsequently for economic reasons had completion rates as low as 8%. McDaniels et al do not elaborate further on these low rates but the findings raise questions about socio-economic factors effecting immunization outcomes or poor communication between providers. What other published data there is refers more to comparisons of nurse practitioners and physicians and to comparisons of well-baby care but not specifically immunization services (Sackett 1980, Charney 1971, Ford et al 1966).

Socio-Economic Factors Affecting the Utilization of Preventive Services

This section reviews data in the literature on how socio-economic factors (income, education, and user fees) affect the utilization of health care services; specifically, preventive services like immunization. While some of the literature is rather general, it provides an
overview that is useful in the analysis of the survey data on parental choice and willingness to pay user fees. Immunization services to children are generally highly valued by parents and most parents do get their children immunized even without compulsion (Gunn et al 1977) although some parents object to immunization on religious, philosophical or medical grounds. In the past, the empirical and theoretical literature has consistently shown that an individual's level of education and income effect the use of health care services. The 1981 document THE HEALTH OF CANADIANS which studied morbidity in Canada shows that people with higher incomes are more likely to consult a health professional in the absence of disease for services like annual checkups and immunization (Canada Health Survey 1981).

However, the mechanisms of how these socio-economic factors work in determining patient behaviour are not well understood. Rundell and Wheeler (1979) studied 781 Michigan residents using path analysis to test three possible explanations of the effect of a patient's income on use of preventive care services:

1. the direct effect of income;
2. the indirect effect of income through health beliefs (perceived susceptibility to illness, and perception of the efficacy of the preventive measure); and
3. the indirect effects of income through system
barriers (mobility, transportation, proximity to ambulatory care).

Their data suggest that the direct effect of income on patients' use of preventive care is small in comparison to the indirect affects of health beliefs and system barriers that act as stronger barriers to using preventive health care services. In their analysis, incomes ranged from $1000 to $35,000 with a mean of $12,000. Marks et al (1979) studied a sample of two year olds using discriminate analysis to identify the most significant socio-economic factors that effected the completion of a basic DPTP series. They found that children of parents with less than grade 12 education or more than three siblings had a fourfold increase in failure to complete a series. They further concluded that as immunization rates increase in the community those who remain unimmunized become an increasingly hardcore group who are difficult to reach or motivate.

The concept of user fees in health care provide further insight into the socio-economic factors that effect use of care and patient behavior. In the normal marketplace, surcharges tend to reduce demand of a product or service and to increase demand for cheaper alternatives. While a strong argument can be made to the effect that health care does not
follow the rules of the laissez-faire marketplace, nonetheless user fees imposed on services do have an impact on demand and this varies according to differences in socio-economic status (Beck and Horne 1980, Stoddard and Woodward 1980).

A useful overview of demand side interventions in health care is provided by Barer et al (1979). Various forms of patient participation in paying for services are first categorized as provider determined (e.g., professional surcharges) and nonprovider determined (e.g., government fee policies). The surcharges are either uniform (e.g., income tax based or a per-service charge), or they are differential (e.g., risk insurance or extra-billing).

There is considerable pressure today from the providers of health care and government to impose "demand controls" in a climate of so-called economic restraint. While there is little data to demonstrate the impact of user fees on preventive services like immunization, some data exists on nonacute ambulatory care. Perhaps one of the better studies on ambulatory care was done by Beck and Horne (1980) in which they analyzed data on the Saskatchewan copayment experiment in health in the 1960s. They looked at hospital and ambulatory care service utilization before, during and after small user fees were added to these services. Their
data showed that after the introduction of Medicare the poor (defined as those spending 70% of income on food, clothing and shelter) increased the use of services over which patients had more discretionary control. For example, nonacute ambulatory care use increased in comparison to acute hospital care. Following the introduction of copayments, the same group decreased the use of ambulatory services much more than for acute hospital care. The poor decreased the use of ambulatory services 18% compared to 6% in the higher income groups.

Beck and Horne (1980) also observed that the overall decline of ambulatory care use by the poor was matched by an increase of ambulatory care use (e.g. annual checkups) by higher income groups which they felt represented supplier induced demand by physicians to compensate for decreased use by lower income groups of ambulatory care. Their data suggest that the overall impact of user fees was to redistribute health care to the higher income groups.

Stoddard and Woodward (1980) in a submission to the Hall report on Medicare (1980) showed data on the effects of physician extrabilling in Ontario in terms of income groups. They studied 2,827 patients in areas of Ontario where as many as 25% percent of physicians were extrabilling. They found, using Horne and Beck's definition
of poor, that 30% of the low income group reported delays in seeking care or inattention to health complaints compared to 16% in higher income groups. They did not specifically analyze the impact of extrabilling on the use of preventive services. Moreover, preventive services like immunization services appear to differ in a number of ways even from nonacute ambulatory care. Parents make decision for their children based on concerns for theoretical risks that the immunization will prevent and the seeking of care is decided upon in the absence of presenting complaints. Nonetheless, preventive services like immunization do have some parallels to ambulatory care services and one might anticipate similar effects of user fees as shown for ambulatory care.

The Advantages and Limitations of a Sample Survey

The sample survey is one of a number ways in which information can be gathered about a population in order to make useful observations and inferences on the entire population. Obviously, the survey is only useful if the methods used to conduct the survey are consistent with methods known to produce valid and reliable data. Survey
methods using questionnaires are prone to a number of biases that can defeat this purpose, among them are: sampling error; self-reporting bias; and non-response bias. The ideal sample will most closely resemble the target population being studied.

The survey method used in this study is based upon methods established by C.D.C. for its immunization surveys of two year olds which include:

1. Defining a specific birth period.
2. Selecting children randomly from the target population or birth cohort.
3. Vigorously seeking out all study subjects by repeated mail and phone call followups to achieve as high a response rate as possible.

If method 2 and 3 are carried out, the survey has the greatest chance of being generalizable to the target population.

The survey method must also consider problems with validity of the data. There can be problems with historical data like parents' recall of records of immunization. Some of these issues have been looked at with reference to immunization. Studies by Comstock (1973) and Levine (1969) show that studies of immunizations using
29

records have most of the problems that any retrospective study has with historical bias. Comstock provides some useful comments regarding questionnaire studies of childhood immunization. In most studies of immunization, the medical or health unit record is used as the source to check validity of parental recall on survey questionnaires. However, he suggests that this method of record confirmation has a built-in bias to correcting parent's understatement of their child's immunization status in comparison to correcting for overstatements since in most studies parental reporting of immunization in the absence of medical records are usually accepted as valid.

Current issues in Planning Immunization Services

Immunization programs have established a solid tradition of showing high cost-benefit returns in preventing infectious diseases. It is estimated that savings to the Canadian taxpayer have been 200 million per year since 1955 for polio and 10 million a year for measles since these vaccines became available (Willems et al 1982). Immunization programs have been based upon a tradition of program evaluation with well identified monitoring
measures for vaccines and technical processes including adverse reaction reporting systems, analysis of vaccine efficacy, coverage rates, completion rates, timing and handling and storage of vaccines and active infectious disease surveillance systems. These technical evaluations of immunization services are far more developed than similar evaluations in ambulatory care or in other preventive services.

However, the major emphasis to date in immunization program analysis has tended to relate more to technique than to an analysis of structural issues in the delivery system: eg. the effect of different providers on immunization program goals; the effect of poor coordination of provision in the community etc. Ahumada et al (1967) sums this up well:

...advances in the delivery system have lagged far behind the development and technique of vaccines. In our technological society we are good at problems of technique, but if we are to make progress we must devote more attention to problems of priority.

This study examines some of these structural issues by attempting to measure provider effectiveness and consumer preferences in a mixed delivery system of preschool immunizations. The information gathered is used to consider structural changes in terms of available manpower in
this mixed delivery system that would achieve immunization program goals more efficiently.
CHAPTER THREE

Methods

This chapter describes the survey methodology used to sample a population of three year old children in the Simon Fraser Health Unit to gather data on the study questions. This includes a brief description of the survey setting, the providers of immunization in the area and how the target population was established.

Finally, the sampling method used and the process used to conduct the survey are presented including the questionnaire design, pretesting of the questionnaire, follow-up methods, and proposed methods of analysis.

The Community

The Simon Fraser Health Unit (S.F.H.U.), an urban community in the lower mainland of British Columbia, has a population of 141,000 (1981 Canadian Census) and is primarily a residential middle income community. The area studied includes: three cities, New Westminster, Port
Coquitlam, and Port Moody; the District of Coquitlam; the village of Belcarra; and electoral area B (an unorganized rural district).

The Providers of Immunization

Previous study (B.C. Ministry of Health 1981) has shown that physicians and public health nurses provide immunization services to approximately equal numbers of preschool children in this health unit area. Almost all health nurses in the health unit, except senior supervisory staff, give immunizations to preschool children. However, not all physicians that practice in the area give immunization. Therefore, the comparisons are restricted to those family physicians and a few pediatricians that do give immunizations. An estimate based on health unit records of vaccine released to physicians with office addresses in the health unit shows that approximately 75% of the family physicians in this area immunize children in their practice.

In addition, some providers of immunizations to S.F.H.U. children practice outside the boundaries of the health unit.
The Target Population

The objective of the survey was to provide data comparing measles immunizations given by physicians and public health nurses to preschool children in the S.F.H.U. area.

Therefore, a cohort of three year olds born in 1978 and still resident in the health unit at the time of the survey was selected as the target population of children.

The Sampling Method

There were a number of alternative sources of data available for determining a sampling frame for this study.

One source was the Physician’s Notice of Live Birth (P.N.O.B.) which is available to identify birth cohorts in the health unit. It was not used because the PNOB data include a large number of preschool children who move out of the health unit area.

The second source that was considered was the Federal Family Allowance system for the health unit area. It provides a very up to date registry of names and addresses by birth cohorts. However, a sample from the Federal Family Allowance system was also ruled out because data by
individual name and address is not available for use in research for reasons of confidentiality. In addition, it includes many recent entries to the study area who were immunized in other communities.

The source that was finally chosen was the three year old Dental Birthday Card Registry (Registry). The Dental division in the health unit uses this Registry to update the addresses of three year olds born in the health unit (from original PNOBs) so that they can make contact by mail regarding preventive dentistry. Addresses on the cohort of children born in 1978 were updated in 1981 by checking the most recent telephone directory. If the family surname under the father’s or mother’s first name was not listed in the directory, the child was deleted from the Registry. If the surname under father’s or mother’s first name was found, appropriate revisions were made to the Registry. Therefore, three year olds born in 1978 that are excluded using this source were:

1. children born in 1978 who moved from the health unit; i.e. the PNOB record would have been transferred to another health unit. No records are kept of where these families move.

2. a few families who have resided in the area
continuously but are not listed in the current telephone directory; eg. no phone, unlisted number, or very recent move.

3. a small number of children born in the health unit and still resident in the area but for whom no PNOB was ever received (or misplaced) by the health unit.

4. children whose parents have changed surname in the interim and for whom the health unit was not made aware.

Thus, the sampling frame includes:

1. children indigenous to the Simon Fraser Health Unit area and;

2. a few children who enter the registry but whose PNOB was transferred into the S.F.H.U. from another jurisdiction on moving to the area (7 respondents in survey sample).

From the PNOB total of 1697 children born in 1978 in the Simon Fraser Health Unit, the Registry listed 1054 children (final update December 1981). While the Registry as a sampling frame may differ somewhat from the target population, the difference is small. Moreover, the Registry was the most readily available up to date source of an indigenous population of preschool children.
The Sample Size

The criteria used to establish the sample size were determined by following the methods used by the C.D.C. for carrying out mailed surveys of immunization status of two year old children. In their protocol, the sample size is set at 600 individuals. They established this sample size so that limited resources could be concentrated on the task of recovering high quality data on a large enough sample in a reasonable time to yield results that can be generalized to the target population with an acceptable degree of statistical confidence. (C.D.C. protocol) The C.D.C. protocol uses the sample size of 600 for much larger birth cohorts than the 1054 sampling frame in this survey. They provide a statistical adjustment for this situation as described in the following:
...In certain situations the required sample size can be adjusted downward. This situation results when the total number of annual births within a strata is small relative to required sample of births. As a general rule if the ratio (percent) of the sample size to the total number of births is 10% or greater then the adjustment should be made. This adjustment is made using the following formula:  

\[
\frac{n}{1 + \frac{N}{n}}
\]

(C.D.C. Guidelines for Assessing Immunization Levels)

\[n = 600\]
\[N = 1014\] (1054 less 40 children used from the Registry in pretesting the survey questionnaire.)

Using this formula, the adjusted sample size needed for this survey was 378 children. Based on response rates anticipated by first mailing (50%) and followup (20-30% more), 600 children were selected from the 1014 on the Registry using a computer generated random allocation program. This sample of 600 children represented almost 60% of those children on the Registry.

The Questionnaire Design

The questionnaire was designed to elicit information on
the following:

- date of birth,
- date of measles immunization,
- public or private provider,
- reason for provider preference,
- willingness to pay user fees,
- number of children in family,
- number of parents in household,
- sibling order,
- education of head of household and,
- annual family income.

The exact date of birth (DOB) of the child was validated against the original PNDB. Information on record of receipt of M (measles vaccine alone) or MMR (mumps, measles, rubella) and the exact date the immunization was given were confirmed by parents checking their own or the provider's record. Using this information, time intervals between birth and age when measles vaccine was administered could be calculated. It was important to separate out M and MMR since MMR was not available free of charge when these children were immunized. Parents who chose that their child get the combined vaccine may have paid as much as $15.00 at a pharmacy.
The parents were asked to state who provided the vaccine. This was followed by asking parents to give a subjective reason for their choice of provider. Parents were then asked if in the future they would be willing to pay a user fee to either a physician or the public health department for immunization services. To explore further the issue of user fees, parents were given a qualitative scale (definitely no, probably no, probably yes, definitely yes) to respond to as well. Specific dollar amounts were also assigned to the user fee question ($5, $10 and $15) to attempt to quantify willingness to pay a user fee. If parents said "no" to user fees, they were given an opportunity to state "why not". This helped to assess if parents' negative attitudes to user fees were other than monetary.

Sociodemographic information was also elicited to explore the possible influences (if any) of socioeconomic factors (level of education, income, and family size). These data were used also to assess if the respondent group was comparable to census data for this area. (1976, 1981 Canadian Census) The means and medians on income and education for the area surveyed, taken from July 1981 data of the B.C. Ministry of Industry and Small Business Development, were used to help set appropriate
intervals for income and education on the questionnaire.

The Survey

Pretesting of the questionnaire was carried out in November 1981. A random sample of 40 parents was mailed a letter and questionnaire. Following a single mailing 20 (50%) were returned over a one month period. Based on this pretesting, modifications were made on a final draft of the questionnaire.

On January 1st. 1982, 600 questionnaires were mailed out with identifier codes for each child. Each envelope contained a copy of the questionnaire, a letter to the parents and a stamped business reply envelope (see Appendix III). After three weeks, nonresponders were phoned and asked if they had received the questionnaire. If they were contacted by phone, they were asked to mail in the questionnaire or provide the information over the phone. For those remaining not contacted by phone, a second questionnaire was mailed out. The cutoff date of the survey was set at February 24, 1982.

The data from the survey were coded and key punched at the Computer Science Division of the University of British Columbia. Using the Statistical Program for the Social
Sciences SPSS (Chigago 1980), the data were collated into frequency tabulations for all of the individual variables ascertained in the survey. A number of cross-tabulations between these variables were also carried out along with appropriate statistical tests of significance.
Results

In this chapter, the analysis of survey data is presented in the following order: survey response and sociodemographic data; measles immunization data; and finally provider preference and user fee data.

Survey Response and Sociodemographic Data

This section summarizes the survey response and the sociodemographic data on the survey respondents and provides comparisons with available census data.

By the cutoff date, February 24th, 1982, 382 completed questionnaires had been returned achieving the required sample size of 378. The final outcome of the entire 600 questionnaires originally mailed out is shown in Table I.
TABLE I

OUTCOME OF THE 600 SURVEY QUESTIONNAIRES SENT TO PARENTS OF THREE YEAR OLDS BORN IN 1978 IN THE S.F.H.U.

<table>
<thead>
<tr>
<th></th>
<th>No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Completed responses by cutoff date of Feb. 24th, 1982.</td>
<td>382</td>
<td>64</td>
</tr>
<tr>
<td>Non responses by cutoff date of Feb. 24th 1982.</td>
<td>171</td>
<td>28</td>
</tr>
<tr>
<td>Returned Undeliverable</td>
<td>47</td>
<td>8</td>
</tr>
<tr>
<td>Total</td>
<td>600</td>
<td>100</td>
</tr>
</tbody>
</table>

Of the 382 responses, 83% were obtained with the first mailing and the remaining 17% were obtained by followup including phone calls and second mailings. The 47 questionnaires returned undeliverable included families that had recently left the area for whom the post office had no forwarding address.

The 171 nonrespondents were further analyzed as a special subset in an attempt to see if they differed significantly from the respondents. This was accomplished by a followup of a random sample of this group (49) using available public health records and where possible physician's records. In most cases, the source document was the health unit PNOB or family file folder. Record of
immunization for measles and provider were ascertained. Although socio-economic data were not available on the nonrespondents, they did not differ greatly from the response group in terms of measles immunization data or choice of provider.

Recent data from the Federal Family Allowance system show that there were 1787 three year olds born in 1978 with postal codes in the Simon Fraser Health Unit area as of January 1982. While the majority of the children on the Federal system are from the target population, the difference between the Registry and the Federal system data principally reflects the entry into the area of preschool children after birth.

The original PNOBs for the 1978 cohort to the area was 1697. The difference between the PNOBs and the Registry principally reflects the degree of movement out of the area following birth.

Sociodemographic data from the respondents in the survey were used to compare to census data for the municipalities surveyed in order to clarify how representative the respondents were of the target population.

Most families that responded to the survey had two children. (Table II)
### TABLE II

**TOTAL NUMBER OF CHILDREN IN FAMILIES WHO RESPONDED TO THE SURVEY.**  
(S.F.H.U. 1982)

<table>
<thead>
<tr>
<th>No.</th>
<th>%</th>
<th>% 1976 Census</th>
<th>% 1981 Census</th>
</tr>
</thead>
<tbody>
<tr>
<td>One child</td>
<td>53</td>
<td>14</td>
<td>30</td>
</tr>
<tr>
<td>Two children</td>
<td>220</td>
<td>58</td>
<td>41</td>
</tr>
<tr>
<td>Three children</td>
<td>79</td>
<td>21</td>
<td>26</td>
</tr>
<tr>
<td>Four children</td>
<td>11</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Four+ children</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>No response</td>
<td>17</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>382</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

While the respondents showed a higher percentage of families with two children and a lower percentage of single child families in comparison to census data, the differences were consistent with the pattern expected from a sample of families with three year olds from the target population living in the area and for secular changes generally.

Data on the birth order of children in the sample show that first borns were most common in the sample. This pattern in Table II and Table III fits with a response group that predominantly consists of many young families with a child younger than the three year old surveyed.
TABLE III

BIRTH ORDER OF 3 YEAR OLDS IN FAMILIES WHO
RESPONDED TO THE SURVEY
(S.F.H.U. 1982)

<table>
<thead>
<tr>
<th>Birth Order</th>
<th>no</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Child</td>
<td>186</td>
<td>49</td>
</tr>
<tr>
<td>Second Child</td>
<td>149</td>
<td>39</td>
</tr>
<tr>
<td>Third Child</td>
<td>40</td>
<td>10</td>
</tr>
<tr>
<td>Fourth or Later</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>382</td>
<td>100</td>
</tr>
</tbody>
</table>

In the study 4% of respondents were single parents and 96% were two parent families. Census data for 1976 and 1981 shows that the percentage of single parent families was 10% and 12% respectively. This raises the possibility of a sampling bias in the survey results. Some records of a number of single mothers may have been lost by the telephone updating system used by the Registry if mothers had reverted to maiden names.

The majority of heads of household have completed high school or some form of postsecondary education (Table IV).
**TABLE IV**

LEVEL OF EDUCATION OF HEAD OF HOUSEHOLD
IN RESPONDENTS TO SURVEY
(S.F.H.U. 1982)

<table>
<thead>
<tr>
<th>Years attained at school</th>
<th>No.</th>
<th>% 1976 Census</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-8 years</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>9-12 years</td>
<td>137</td>
<td>36</td>
</tr>
<tr>
<td>13-15 years</td>
<td>143</td>
<td>37</td>
</tr>
<tr>
<td>&gt;16 years</td>
<td>83</td>
<td>22</td>
</tr>
<tr>
<td>No response</td>
<td>13</td>
<td>3</td>
</tr>
<tr>
<td>Totals</td>
<td>382</td>
<td>100%</td>
</tr>
</tbody>
</table>

The survey respondents parallel 1976 census data for this area with some differences; namely, the respondents have a smaller percentage of individuals with 1-8 years of education and a greater percentage of individuals with greater than 16 years education. Thus, there is a bias towards respondents with higher education. 1981 Census data is not available on education at this reporting.

Data on Annual family income show that the majority of respondents had incomes in the $20,000-40,000 range (Table V).
TABLE V

ANNUAL FAMILY INCOME (BEFORE TAXES)
OF RESPONDENTS TO SURVEY
(S.F.H.U. 1982)

<table>
<thead>
<tr>
<th>Income Range</th>
<th>No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; $10,000</td>
<td>13</td>
<td>3</td>
</tr>
<tr>
<td>$10,001 to $20,000</td>
<td>33</td>
<td>9</td>
</tr>
<tr>
<td>$20,001 to 30,000</td>
<td>152</td>
<td>40</td>
</tr>
<tr>
<td>$30,001 to 40,000</td>
<td>95</td>
<td>25</td>
</tr>
<tr>
<td>&gt; $40,000</td>
<td>50</td>
<td>13</td>
</tr>
<tr>
<td>No Response</td>
<td>39</td>
<td>10</td>
</tr>
<tr>
<td>Total</td>
<td>382</td>
<td>100</td>
</tr>
</tbody>
</table>

The 1971 census data on income for this area are given as individual incomes not family income which makes comparisons difficult. The 1981 census does present income as annual family income (before taxes) but it is not available at this time. Inquiries were made of planning authorities in the municipalities studied but no useful comparative figures are readily available. Data on income would appear to be closely guarded information as was adamently pointed out by many of the 39 nonresponses to this specific question.

However, the sociodemographic data obtained from respondents indicates that they are primarily a population
of middle and upper income families.

Measles Immunization Data

The Provider Mix

For the 382 respondents, 55.5% were immunized by physicians and 45.5% were immunized by public health nurses. This finding is comparable to previous data on the percentage of private-public delivery mix in this health unit (Everett 1981) and fits with data collected by the Division of Epidemiology, B.C. Ministry of Health in 1981 which reported estimates made by Medical Health Officers in five lower mainland urban health units suggesting that 40-60% of preschool immunizations were given by physicians.

The 382 respondents to the survey included immunization by 91 different physicians and 42 different public health nurses. The majority of preschool children received MMR (90%) as opposed to M (10%) from both physicians and public health nurses. This predominance of MMR is significant since parents during this time period paid $10-$15.00 for MMR; government supplied only M free of charge. Parents who paid for MMR vaccine at a private pharmacy would take the vaccine to either their physician or
a public health clinic for administration. Table VI shows the tabulation of providers and type of measles vaccine used.

### TABLE VI

**TYPE OF MEASLES VACCINE GIVEN TO THREE YEAR OLDS BORN IN 1978 BY PROVIDER**

(S.F.H.U. 1982)

<table>
<thead>
<tr>
<th></th>
<th>Physicians</th>
<th>Public Health Nurses</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
</tr>
<tr>
<td>MMR</td>
<td>188</td>
<td>50</td>
<td>148</td>
</tr>
<tr>
<td>M</td>
<td>20</td>
<td>5.5</td>
<td>15</td>
</tr>
<tr>
<td>Total</td>
<td>208</td>
<td>55.5</td>
<td>163</td>
</tr>
</tbody>
</table>

**Coverage**

For the 382 respondents to the survey, 371 or 97% of respondents received measles immunization (M.M.R. or M). This 97% is higher than coverage rates reported in 1981 using data from school enrolment at the end of first grade (92.5% S.F.H.U. Annual report 1981). This finding could represent a survey sample which overstates the true coverage rate in preschool children (e.g. sampling frame or response biases).
It could also reflect a cohort effect since there has been increased attention given to measles immunization over the past few years.

There were 11 children who did not receive vaccine. The reasons given included: one who had prior infection; six (1.5%) for medical reasons (this is consistent with the literature, Hinman 1979); three children whose immunization status was unknown and who were assumed to be unimmunized; and finally, one child who was the ninth sibling in the family about whom the mother candidly reported: "Didn't seem to find time to get around to it".

Geographic Distribution

A significant number of children received vaccine outside the health unit area, even though they were born and still resided in the health unit. This was particularly true for those who went to physicians. In most cases, the child was immunized in a physician's office in one of the adjacent urban areas (5 to 30 Km. from their homes). However, some children were also immunized outside the health unit by public health nurses. (Table VII).
TABLE VII

GEOGRAPHIC LOCATION OF PHYSICIANS AND PUBLIC HEALTH NURSES WHO PROVIDED MEASLES IMMUNIZATION TO THREE YEAR OLDS LIVING IN THE S.F.H.U. (SURVEY 1982)

<table>
<thead>
<tr>
<th>Percentage of Physicians offices</th>
<th>Percentage of Public health clinics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Within SFHU</td>
<td>52%</td>
</tr>
<tr>
<td></td>
<td>83%</td>
</tr>
<tr>
<td>Outside SFHU but</td>
<td></td>
</tr>
<tr>
<td>in adjacent Lower Mainland health units</td>
<td>47%</td>
</tr>
<tr>
<td></td>
<td>14%</td>
</tr>
<tr>
<td>Outside Lower Mainland</td>
<td>1%</td>
</tr>
<tr>
<td></td>
<td>3%</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>100%</td>
</tr>
</tbody>
</table>

The greatest number of children immunized by physicians in adjacent lower mainland health units went to the city of Vancouver. Those immunized by public health nurses outside the S.F.H.U. were equally distributed among the adjacent health units.

The total number of children immunized outside the Lower Mainland of British Columbia was only seven: two by physicians out of province and five by public health nurses (three out of province and two in Victoria.) These seven were included in the analysis on timing of measles but did not truly fit the criteria for the target population. These
seven showed time intervals of approximately 16 months for physicians and approximately 15 months for public health nurses. The small number involved would not significantly effect comparisons of providers in the target population. Parents used providers in adjacent areas for a number of reasons, including proximity to daycare, proximity to parents' workplace, prior loyalties to a specific provider, etc.

Timing of Measles Immunization

The timing of measles immunization was compared between providers by analysing differences in time intervals between birth and date of immunization. Figure I shows the frequency distribution of measles immunization by age in months for 382 children in the response group.
FIGURE 1
THE TIMING OF MEASLES IMMUNIZATION BY PHYSICIANS & PUBLIC HEALTH NURSES
FOR A SAMPLE OF THE 1978 BIRTH COHORT IN THE SIMON FRASER HEALTH UNIT

PUBLIC HEALTH NURSES

PHYSICIANS

n = 382
In order to examine provider compliance with the provincial policy of 12 months, Chi-Square analysis was carried out on specified time intervals. The time intervals chosen were: less than 12 months (actually less than 11.4 months); 12-13 months (11.5-13.4 months); and greater than 13 months (13.5). The ranges used above recognize the practical necessity of providing some latitude in timing an event like immunization. While it is important to try to demonstrate differences between providers, especially for under 12 months, it is equally important to identify 12 months as a practical cutoff point. However, a lower point was set at 11.5 months to provide some reasonable leeway. The interval 11.5 to 13.4 was defined as the "most appropriate" time interval based upon the provincial recommendation of immunization of 12 months or as soon as possible thereafter. Chi-square analysis of the data (Table VIII) shows a significant difference between public health nurses and physicians although two out of six cells had expected frequencies less than 5.0.
A COMPARISON OF TIMING OF MEASLES IMMUNIZATION BETWEEN PROVIDERS USING CHI-SQUARE ANALYSIS.  
(S.F.H.U. SURVEY 1982)

<table>
<thead>
<tr>
<th></th>
<th>&lt;11.5 mon.</th>
<th>11.5-13.5 mon.</th>
<th>&gt;13.5 mon.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. immun.by</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physicians</td>
<td>3</td>
<td>39</td>
<td>149</td>
</tr>
<tr>
<td>%</td>
<td>2%</td>
<td>20%</td>
<td>78%</td>
</tr>
<tr>
<td>Public Health</td>
<td>3</td>
<td>48</td>
<td>88</td>
</tr>
<tr>
<td>Nurses</td>
<td>2%</td>
<td>36%</td>
<td>62%</td>
</tr>
<tr>
<td>Total</td>
<td>6</td>
<td>87</td>
<td>237</td>
</tr>
<tr>
<td>%</td>
<td>2%</td>
<td>26%</td>
<td>72%</td>
</tr>
</tbody>
</table>

Chi-square 8.65 with two degrees of freedom p<0.05

Given the small numbers in two of the cells, the data were analyzed using a fourfold table in which physicians and public health nurses were compared by the criteria of "Appropriate" (11.5-13.4 months) versus "Inappropriate" (all children less than 11.4 months combined with those children immunized after 13.5 months). A statistically significant difference at the 5% level was shown using Chi-Square analysis.
TABLE IX

COMPARISON OF PUBLIC HEALTH NURSES AND PHYSICIANS TIMING OF MEASLES IMMUNIZATION BY APPROPRIATE VERSUS INAPPROPRIATE CATEGORIES (S.F.H.U.SURVEY 1982)

<table>
<thead>
<tr>
<th></th>
<th>APPROPRIATE</th>
<th>NOT APPROPRIATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public Health</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nurses</td>
<td>48</td>
<td>91</td>
</tr>
<tr>
<td>%</td>
<td>36%</td>
<td>64%</td>
</tr>
<tr>
<td>Physicians</td>
<td>39</td>
<td>152</td>
</tr>
<tr>
<td>%</td>
<td>20%</td>
<td>80%</td>
</tr>
<tr>
<td>Totals</td>
<td>87</td>
<td>243</td>
</tr>
<tr>
<td>%</td>
<td>26%</td>
<td>74</td>
</tr>
<tr>
<td></td>
<td>139</td>
<td>191</td>
</tr>
<tr>
<td></td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Chi-square analysis =7.4 with 1 degree of freedom, p<0.05.

A Median Test, useful for analysis of skewed data, was also carried out to compare the timing of immunization. This test establishes a median for all the data and then examines the distribution for the independent variables (ie. providers) for statistically significant differences above and below the established median point (Table X). This analysis showed a statistically significant difference at a 5% level between providers. Physicians by this analysis were later overall in immunizing preschool children in comparison to public health nurses.
One of the most important observations from this analysis is that in comparison to the provincial recommendation of 12 months or as soon as possible thereafter, very few children (6) received vaccine from any provider before 12 months. Those that did may well have been immunized for an appropriate clinical reason (eg. there was an outbreak of measles in the lower mainland in 1979 when these children were about one year old). More importantly, this data does not show any difference between providers at less than 12 months. Both providers give measles vaccine well after the first year of life. However, when immunization is defined as "Appropriate" or if median
ages are examined, significant differences do emerge between providers. The difference demonstrated between physicians and public health nurses by this analysis may not have clinical significance in view of the literature reviewed. For example, Hinman (1979) has shown that as the incidence of natural measles in the 1970’s decreased there was no significant risk of measles infection in children in the second year of life. Therefore, if one compares these providers in terms of their effectiveness in protecting these children from natural disease, they may be equally effective. Nonetheless, the program significance of the findings is that public health nurses comply more completely with the provincial policy of 12 months or as soon as possible thereafter in comparison to physicians.

For the children who were immunized very late (i.e., after 26 months), 15 children were identified and were looked at more closely to try to determine why they received vaccine so much later than most of the respondent group. This group of 15 children was not significantly different from the other respondents in terms of family size, birth order, income or education. Specific reasons why this group was immunized later could not be ascertained from the questionnaire data.

The important differences noted in the subsample of 49
nonrespondents was that they were later on average in getting immunized (18.5 months) and represented a slightly higher percentage of provision by physicians than in the response group (65% vs 55%).

The data on family size, birth order, family income and education were cross-tabulated against the timing of measles immunization data. Chi-square analysis of these cross-tabulations showed that there was no significant association found for these variables (although many variables frequently had expected cell numbers less than five).

Finally, 60 questionnaires were randomly picked to carry out a validity check of parental reporting by comparing parents report against the providers record. There were 20 physicians and 40 public health nurses records checked in this manner and they showed parents reported accurately by this comparison (Table XI). This analysis is consistent with studies in the literature reviewed (Comstock et al 1973, and Levine et al 1979).
TABLE XI

AGREEMENT OF PARENT'S RECORD WITH PROVIDER'S RECORD
(S.F.H.U. SURVEY 1982)

<table>
<thead>
<tr>
<th></th>
<th>Physicians</th>
<th></th>
<th>Public Health Nurses</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>No record found.</td>
<td>6</td>
<td>30</td>
<td>6</td>
<td>15</td>
</tr>
<tr>
<td>Different date of immunization</td>
<td>1</td>
<td>5</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Exactly same date</td>
<td>11</td>
<td>55</td>
<td>28</td>
<td>70</td>
</tr>
<tr>
<td>*Minor difference</td>
<td>2</td>
<td>10</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>Totals</td>
<td>20</td>
<td>100</td>
<td>40</td>
<td>100</td>
</tr>
</tbody>
</table>

* minor differences included different day in month for D.O.B. and day for immunization.

Preference and User Fee data

Parents reported convenience as the most common reason for their choice of provider (Table XII). This was more frequently reported in reference to public health nurses than for physicians. Personal preferences other than convenience were the most commonly reported reason for the use of physicians (46%) as opposed to public health nurses (19%). The advice of physicians was also an
important determinant of provider choice particularly in directing parents to public health (30% versus 20%). Very few parents stated they were unaware of public health services; these individuals went to physicians.

TABLE XII

REASONS GIVEN FOR PARENT'S CHOICE OF PROVIDER
(S.F.H.U. SURVEY 1982)

<table>
<thead>
<tr>
<th></th>
<th>Physicians</th>
<th>Public Health Nurses</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. %</td>
<td>No. %</td>
<td>No. %</td>
</tr>
<tr>
<td>Convenience</td>
<td>64 30</td>
<td>81 49</td>
<td>145 38</td>
</tr>
<tr>
<td>Physicians Advice</td>
<td>43 20</td>
<td>51 30</td>
<td>94 25</td>
</tr>
<tr>
<td>Personal Preference other than</td>
<td>98 46</td>
<td>34 19</td>
<td>132 34</td>
</tr>
<tr>
<td>convenience</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unaware of P.H.N.</td>
<td>6 4</td>
<td>0 0</td>
<td>6 2</td>
</tr>
<tr>
<td>No Response</td>
<td>2 1</td>
<td>3 2</td>
<td>5 1</td>
</tr>
<tr>
<td>Total</td>
<td>213 100</td>
<td>169 100</td>
<td>382 100</td>
</tr>
</tbody>
</table>

Parents were very similar in their willingness to pay user fees to public health nurses or physicians. although there were more nonresponses to this question for those whose children were immunized by public health nurses. For
each provider there was an approximately even split between those willing to pay a fee and those who would not (Table XIII). The data suggest that there is a tendency towards not wanting to pay a user fee. This trend is further suggested by the fact that only 14% of respondents were definitely in favour of user fees in comparison to the definitely "No"s (30%).

### TABLE XIII

PARENT'S WILLINGNESS TO PAY A USER FEE  
(S.F.H.U. SURVEY 1982)

<table>
<thead>
<tr>
<th></th>
<th>Physicians</th>
<th>Public Health Nurses</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. %</td>
<td>No. %</td>
<td>No. %</td>
</tr>
<tr>
<td>Definitely yes</td>
<td>56 (15%)</td>
<td>49 (13%)</td>
<td>105 (14%)</td>
</tr>
<tr>
<td>Probably yes</td>
<td>106 (28%)</td>
<td>117 (31%)</td>
<td>223 (30%)</td>
</tr>
<tr>
<td>Probably no</td>
<td>81 (21%)</td>
<td>66 (17%)</td>
<td>147 (19%)</td>
</tr>
<tr>
<td>Definitely no</td>
<td>121 (32%)</td>
<td>102 (28%)</td>
<td>224 (30%)</td>
</tr>
<tr>
<td>No response</td>
<td>18 (4%)</td>
<td>48 (11%)</td>
<td>66 (7%)</td>
</tr>
<tr>
<td>Total</td>
<td>382 (100%)</td>
<td>382 (100%)</td>
<td>764 (100%)</td>
</tr>
</tbody>
</table>

For parents who expressed a willingness to pay a user fee, only one third responded to the question
specifying a dollar amount they would be willing to pay. The largest group (n = 125 parents) were willing to pay $5.00, 30 parents were willing to pay $10.00 and 5 parents were willing to pay $15.00. Two hundred and thirty parents did not answer the question thereby limiting analysis. The 49% who responded "no" to the question on user fees were given an opportunity to express why they would not pay a user fee by answering a question "Why Not?". These responses were categorized into groups as shown in Table XIV. As can be seen in the table, not all reasons were purely monetary (eg. external effects reflected parent's concern that fees would cause increased disease in families that could not afford a user fee). Many respondents simply stated; "Government should pay." A small number who recalled paying for the MMR vaccine at a pharmacy stated; "no, I paid for the vaccine ". It is interesting so few made this point considering about 90% in fact paid for MMR. Some individuals felt a physician was unnecessary for this service. Some would pay "only if forced to" which suggested they would get future children immunized, but would be quite unhappy about paying for it.
### Table XIV

**Why Parents Would Not Pay User Fees to Providers**

*(S.F.H.U. Survey 1982)*

<table>
<thead>
<tr>
<th></th>
<th>Physician</th>
<th></th>
<th>Public Health Nurse</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>Only if I had to</td>
<td>14</td>
<td>4</td>
<td>13</td>
<td>4</td>
</tr>
<tr>
<td>External factors</td>
<td>28</td>
<td>7</td>
<td>57</td>
<td>15</td>
</tr>
<tr>
<td>Government should pay</td>
<td>110</td>
<td>29</td>
<td>64</td>
<td>17</td>
</tr>
<tr>
<td>No, physician not</td>
<td>17</td>
<td>5</td>
<td>15</td>
<td>4%</td>
</tr>
<tr>
<td>necessary</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No, I paid for vaccine</td>
<td>5</td>
<td>1</td>
<td>2</td>
<td>0.5</td>
</tr>
<tr>
<td>No response</td>
<td>208</td>
<td>55</td>
<td>231</td>
<td>59.5</td>
</tr>
<tr>
<td>Total</td>
<td>382</td>
<td>100</td>
<td>382</td>
<td>100</td>
</tr>
</tbody>
</table>

*Among parents whose children were immunized by public health nurses, some stated that if a fee was imposed they would prefer using a physician.*

In addition, the data on parental preference of provider and willingness to pay a user fee were cross-tabulated against size of family, family income, and education. This was then statistically analyzed using Chi-square tests. For the variables of family size, family
income and education, there was no significant difference in parent's preference or willingness to pay user fees at the 5% level of significance. However, many variables contained small expected cell numbers.

A cross tabulation was also carried out between parents' willingness to pay a user fee and parents' payment for MMR vaccine. No significant association at the 5% level of significance was found although one might have anticipated that those who had paid for M.M.R. might have been more willing to pay a user fee to a provider.
CHAPTER FIVE

Discussion

In this chapter, the results of the survey are discussed in the context of the questions posed in the introductory chapter and the literature reviewed. These questions were:

1. Do physicians and public health nurses provide equivalent immunization services when specific measures of performance are compared?

2. Why do parents have preference for a given provider?

3. How willing are parents to pay a user fee for preschool immunization and what impact would user fees have on parent’s choice of provider?

Physicians and Public Health Nurses as Providers of Immunizations

The data from the survey shows that with respect to the timing of measles immunization public health nurses conformed more closely to the provincial recommendation of 12 months or as soon as possible thereafter. The difference
between providers in the timing of measles immunization was shown to occur after 12 months of age. No difference between providers was shown before 12 months when vaccine efficacy is greatly decreased. Based upon the literature reviewed, the delay by both providers past 12 months shown in this study does not appear to place these children at risk of wild measles infection in view of the low incidence of natural disease in the preschool age group and maintainance of reasonably high coverage rates in the population (Hinman 1979).

Therefore, if one compares these two providers' effectiveness by the clinical criteria of protecting children from natural measles infection, the data in the survey and literature would also support the hypothesis that the two providers offer an equivalent service.

However, if the program goal in the community is to eliminate indigenous measles, the policy implications arising from this data are that; physicians particularly, but also public health nurses to some extent, in this mixed delivery area need to comply more effectively with the 12 month policy to keep the number of susceptible children to a minimum. The other important component of an elimination program is achieving and maintaining high coverage rates in the community. Heathcote (1983) using a mathematical model
suggests that a coverage rate of 98.4% is needed for a policy of immunization at 12 months (assuming a vaccine efficacy of 95%).

In a mixed delivery system of preschool immunizations, it is difficult to ascertain the coverage rates in the population since data on vaccines given by physicians are not known. One method that has been implemented in the S.F.H.U. to achieve better preschool data for measles coverage and to monitor provider effectiveness is a Measles Vaccine Monitoring System. Since physicians receive these vaccines from the health unit, this System collects data on children immunized by physicians in exchange for further supplies of vaccine. The added benefit of this system is that children who have not received measles vaccine can be more efficiently traced (Appendix III).

Comparisons of provider effectiveness reviewed in the literature show that physicians and public health nurses in other jurisdictions have shown similar completion and coverage rates in preschool children for DPTP (McDaniel et al. 1975). Other data also support the observation that public health nurses provide equivalent or better services by specific measures of performance when compared to physicians. For example, data at the provincial level suggest that in completely public delivery systems that
vaccine wastage is less, and adverse reaction reporting is more complete (White and Mathias 1982). While not exhaustive, the weight of evidence supports the hypothesis that public health nurses provide equivalent and possibly better immunization services.

Parental Preference and User Fees

Why do parents have preference for a given provider?

How willing are parents to pay a user fee for preschool immunization and what impact might user fees have on parental choice of provider?

The answers to these questions are not clearcut. In this urban community, parents continue to have a choice of provider. In this study setting, parents appear to choose either provider approximately equally. (Physicians 55% and Public Health Nurses 45%). The respondents, primarily middle and upper income families, did not differ significantly on socio-economic factors between provider groups, and their loyalty to a given provider was difficult to ascertain from the analysis of the survey data. If one considers the breakdown of factors such as convenience, doctor's advice, and personal preferences other than convenience, the most potent factor affecting choice of the physician was personal preference (46%) as opposed to public
health nurses (19%). This difference might possibly reflect a perception of differences between the two providers since most respondents claimed to be aware of public health as an alternative. Further support for the preference for physicians was suggested by the fact that many parents travelled outside the S.F.H.U. area to go to a physician. Convenience was the dominant factor affecting choice of the public health nurse (38%) compared with 30% in the physician group. The advice of the physician to use him or her (20%) or to use a public health nurse (30%) shows the strength of that advice to be another key determinant of parental choice. Since medical schools and family practice training programs have placed increased emphasis on preventive care in family practice in recent years, one anticipates that "physician advice" from younger graduates will tend to direct immunization increasingly towards private delivery.

The user fee data was used to attempt to quantitate parental preference. The user fee data ironically helped more in determining non monetary factors in parental choice. While half the parents using either physicians or public health nurses would be willing to pay a user fee in the future, half were unwilling. It was the breakdown of "why no to user fees" (Table XIV) that
provided new insight. In response to this question, 5% felt physicians were unnecessary for this service if a fee were charged. 4% felt they would turn towards using a physician if a fee were charged. This information suggests that little movement from one provider to another would occur if uniform user fees were imposed. However, there are limits to the interpretation of this user fee data. Firstly, the construction of the question was open ended making it difficult to categorize parental responses to the question. Secondly, it is difficult to translate parents' "real" behaviour from a questionnaire survey response. Wicker et al (1969) have compared stated behaviour by individuals in surveys against their real behaviour later and have shown that individuals will often differ between the two.

The literature showed that for ambulatory care services user fees for elective services like annual checkups are associated with a decline in demand affecting those with lower incomes to a greater extent (Beck and Horne 1980, Stoddard and Woodward 1980). It is possible that a similar effect would occur with a preventive service like immunization. Thus, the imposition of user fees might reduce the possibility of achieving program goals such as high coverage and high completion rates especially in the families with lower education and income. However,
immunization services do appear to differ significantly from ambulatory care services by the fact that parents make choices for their child and the decision is made in the absence of illness or concerns for immediate risk. The fact that 90% of respondents paid ~$15.00 for MMR when a free M vaccine was available provides a useful direct measure of parents' willingness to pay for a "preventive product". However, M.M.R. was perceived by parents as "better" and may in fact be better since it contains three vaccines in one injection thereby decreasing the number of injections the child needed. While actual payment for MMR vaccine was not associated with willingness to pay user fees; it provides an indication, at least in a middle income group, that there is a willingness to pay for a "preventive product" which is perceived as better.

It is difficult to make further generalizations on the observed fact of parents' willingness to pay for a "better preventive product". For example, parents' willingness to pay a "user fee" to a provider for preventive services may
be perceived by parents quite differently than paying for a "better preventive product". The high percentage of respondents who were not willing to pay a user fee would tend to support a perceived difference, given that 90% of these parents paid for M.M.R.
Conclusions

In summary, this study provided some answers to the questions posed on the effectiveness of physicians and public health nurses in providing preschool immunizations and on determinants of parental choice of provider.

The literature specifically comparing these two providers of immunization suggests that public health nurses provide an equivalent or better service if specific measures are examined; eg. completion rates, coverage rates, and adverse reaction reporting (McDaniels et al 1974, White and Mathias 1982).

The survey findings suggest that public health nurses provide measles immunization to preschool children more effectively than physicians using the provincial policy of measles immunization at 12 months or as soon as possible thereafter as the criterion of judgement. However, a review of the literature would suggest that either provider appears to be equally effective in terms of protecting preschool children from measles infection (Hinman 1979).

From the perspective of eliminating indigenous
measles in B.C, the findings of this study suggest that both providers, but particularly physicians, should be more vigilant in conforming to the provincial policy of 12 months or as soon as possible thereafter. This is particularly important if the literature is valid which suggests that as few as 26 (.026%) susceptibles in a population of 100,000 will maintain an endemic level of wild measles virus (Wehrle and Wilkens 1981). The respondents in the survey showed a high percentage (97%) with vaccine coverage by both providers, although it was pointed out that this sample may had higher coverage rates than would be true for the indigenous preschool population. A 97% coverage rate represents 3000 susceptibles in a population of 100,000. Heathcote (1983) has also suggested that a coverage rate of 98.4% is needed if a 12 month or later measles immunization policy is used. Based on these observations, this mixed urban delivery system of preschool immunizations faces a considerable challenge in reaching the high coverage rates estimated to be required for measles elimination.

It was suggested that an active surveillance system of all measles vaccines used in this mixed delivery setting would be helpful in providing more accurate estimates of community coverage rates and in specifying
targets with which to plan for the elimination of indigenous measles (see Appendix III).

The comparisons of provider effectiveness in this survey did not consider other important aspects of preschool immunization services: e.g., DPT timing, and completion rates; nor did it attempt to compare other well baby services that both providers usually give at the time of immunization. These aspects of care merit further study and health units with mixed delivery provide a natural setting to carry out such analysis since the relative costs and benefits of these "other" services may well have implications for supply side controls.

The literature on parental preferences and willingness to pay user fees suggest that if user fees are imposed on ambulatory services individuals with lower incomes decrease their use of services more than those with higher incomes (Stoddard and Woodward 1980, Beck and Horne 1980). If ambulatory and preventive services are similar, then the impact of user fees on immunization services would likely be decreased coverage and completion rates for vaccines. The survey findings on parents' willingness to pay user fees were not clearcut. The respondents, in a middle to upper income sample, were evenly split on this issue. More specific research is required to assess the impact of user fees and
socioeconomic status on the use of preventive services.

The introductory chapter began with a discussion of the current dilemma of maintaining health care services in the face of declining public revenues. Government policymakers and politicians have placed a high priority on cost-containment and greater efficiency in the delivery of health care services.

The controls proposed generally fall into two categories:

supply controls; ie., more efficient use of available manpower and

demand controls; ie., monetary or nonmonetary barriers to decrease or streamline use of services.

This study provides some of the background data on effectiveness and parental behaviour that are needed in order to consider possible changes in the current mixed delivery system of preschool immunizations.

Before supply or demand controls are implemented in an effort to make this particular delivery system more efficient, costing out of various options needs to be undertaken.

Based upon this study, the physicians and public health nurses appear to provide equivalent services. Therefore, the studies that need to be carried out are those
of cost-minimization analysis of various supply and demand control options for this delivery system.

With limited resources for research, a priority should be given to cost-minimization analysis of the supply side controls; e.g., changing to an all public or all private delivery system. Cost minimization studies of demand side options like the imposition of various forms of user fees would also need to be carried out.

However, demand side controls need to be examined specifically in terms of their adverse effects on immunization goals and in terms of their effect on different socioeconomic groups in the community.
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APPENDICES
IMMUNIZATION SURVEY OF CHILDREN BORN IN 1978

PLEASE COMPLETE THE FOLLOWING QUESTIONS AND RETURN IN THE ENCLOSED BUSINESS ENVELOPE WITHIN 3 DAYS.

ALL INFORMATION WILL REMAIN CONFIDENTIAL. PLEASE CIRCLE OR MARK IN YOUR ANSWERS.

1. THE BIRTH DATE OF YOUR CHILD BORN IN 1978?
   DAY ______ MONTH ______ YEAR ______

2. HAS THIS SAME CHILD RECEIVED AN IMMUNIZATION SHOT FOR EITHER:
      If yes, when was it given? (Please check your records or providers to obtain exact date).
   DAY ______ MONTH ______ YEAR ______

   OR

      If yes, when was it given? (Please check your records or providers to obtain exact date).
   DAY ______ MONTH ______ YEAR ______

3. IF YOUR CHILD DID NOT RECEIVE,
   A Red Measles OR R.M.R. SHOT, IT WAS BECAUSE:
   1. Child already had Red Measles infection.
   2. Child's medical condition.
   3. Other (please comment)

4. WHO GAVE THE IMMUNIZATION? 1. Doctor's Office - Name __________________________
   2. Public Health Office - Name of Municipality __________________________

5. PLEASE INDICATE ONE MAJOR REASON FOR YOUR CHOICE OF DOCTOR'S OFFICE OR PUBLIC HEALTH SERVICES.
   1. Convenience 2. Doctor's advice 3. Personal preference 4. Didn't have a doctor
   5. Unaware of Public Health Services 6. Other (please comment)

6. WHETHER YOU WENT TO A DOCTOR OR PUBLIC HEALTH FOR IMMUNIZATION, WOULD YOU BE WILLING IN THE FUTURE:
   A. TO PAY A "FEE" TO THE DOCTOR ADDITIONAL TO THE MEDICAL PLAN COVERAGE FOR THESE VISITS.
      1. definitely yes 2. probably yes 3. probably no 4. definitely no
      If yes, how much per visit? 1. $5.00 2. $10.00 3. $15.00
      If no, why not? (please comment)

   B. TO PAY A "FEE" TO PUBLIC HEALTH SERVICES FOR IMMUNIZATIONS
      1. definitely yes 2. probably yes 3. probably no 4. definitely no
      If yes, how much per visit? 1. $5.00 2. $10.00 3. $15.00
      If no, why not? (please comment)

7. A FEW QUESTIONS ABOUT YOUR FAMILY FOLLOW:

   A. HOW MANY YEARS OF SCHOOL HAS THE HEAD OF HOUSEHOLD COMPLETED?
      1. 1-8 yrs. 2. 9-12 yrs. 3. 13-15 yrs. 4. more than 16 yrs.

   B. AN ESTIMATE OF LAST YEARS TOTAL FAMILY INCOME? (before taxes)
      1. up to $10,000 2. $10,001-20,000 3. $20,001-30,000 4. $30,001-40,000 5. greater than $40,000

   OTHER COMMENTS:

THANK YOU FOR YOUR CO-OPERATION IN THIS SURVEY. PLEASE RETURN IN ENCLOSED ENVELOPE AS SOON AS POSSIBLE.

ALL INFORMATION WILL REMAIN IN CONFIDENCE AND IS USED ONLY FOR PROGRAM ANALYSIS.

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