CANADIAN THESES

THÈSES CANADIENNES

NOTICE

The quality of this microfiche is heavily dependent upon the quality of the original thesis submitted for microfilming. Every effort has been made to ensure the highest quality of reproduction possible.

If pages are missing, contact the university which granted the degree.

Some pages may have indistinct print especially if the original pages were typed with a poor typewriter ribbon or if the university sent us an inferior photocopy.

Previously copyrighted materials (journal articles, published tests, etc.) are not filmed.

Reproduction in full or in part of this film is governed by the Canadian Copyright Act, R.S.C. 1970, c. C-30.

AVIS

La qualité de cette microfiche dépend grandement de la qualité de la thèse soumise au microfilmage. Nous avons tout fait pour assurer une qualité supérieure de reproduction.

S'il manque des pages, veuillez communiquer avec l'université qui a conféré le grade.

La qualité d'impression de certaines pages peut laisser à désirer, surtout si les pages originales ont été dactylographiées à l'aide d'un ruban usé ou si l'université nous a fait parvenir une photocopie de qualité inférieure.

Les documents qui font déjà l'objet d'un droit d'auteur (articles de revue, examens publiés, etc.) ne sont pas microfilmés.

La reproduction, même partielle, de ce microfilm est soumise à la Loi canadienne sur le droit d'auteur, SRC 1970, c. C-30.

THIS DISSERTATION
HAS BEEN MICROFILMED
EXACTLY AS RECEIVED

LA THÈSE A ÉTÉ
MICROFILMÉE TELLE QUE
NOUS L'AVONS REÇUE

Dental Care Utilization in Canada:

An Analysis of the Canada Health Survey (1978-79).

A thesis
presented to the University of Ottawa
in partial fulfillment of the requirements
for the degree of Master in Health Administration
in the Faculty of Administration

by Andre Charette

May 1986.

ISBN 0-315-33274-3

UNIVERSITÉ D'OTTAWA
UNIVERSITY OF OTTAWA

AUTHOR'S DECLARATION

First draft. This is not to be used for citation unless authorized by Statistics Canada.

ABSTRACT

The determinants of dental care utilization in Canada were analyzed using Canada Health Survey (1978-79) data files. The conceptual framework for analysis relied upon a model of dental care utilization which recognizes the importance of need factors, along with predisposing and enabling variables.

The analysis of the data consisted of a descriptive and multivariate components. In the descriptive part of the analysis, the effect of each independent variable on utilization was examined. In addition, the effect of dental insurance status, parental influence, and correlations between utilization and participation in dental care plans were analyzed at a macro (province) level only, because of data limitations.

The multivariate analysis focused on the use or non-use of dental care services as a dependent variable, in relationship to several socio-demographic, economic and dental needs factors. An additional multivariate analysis estimated the probability of being affected by some type of dental morbidity, in relationship to the same explanatory factors. A special analysis examined the determinants of use or non-use on the dentate population only.

In total, the discriminant analysis of the use or non-use of dental care services indicated that more than 55% of the variation between a user and a non-user could be explained by dental needs, oral health status, preventive behaviour, age, education, dentist to population ratio, dental problems, sex, family income, family size, marital status and labour force status. Oral health status, age, education, dental problems and availability of dental manpower, were found to be the foremost predictors of dental care utilization, on both the total and the dentate population

Additional analyses confirmed that an individual's predisposition vis a vis preventive health in general, was a very strong predictor of dental care utilization. It was also found that a mother's predisposition to visit a dentist had a positive impact on her children's dental behaviour.

The results of the study confirmed the existence of provincial imbalances with respect to utilization rates, manpower distribution and participation in private and public dental care plans. The findings of the descriptive analysis of utilization and manpower distribution, and participation in dental insurance plans suggest that the degree of monetary contribution to a dental plan will likely have an impact on utilization (people being less likely to visit a dentist when the services are actually free). In addition, it was found that utilization was higher in provinces with higher manpower supply and with greater participation in private dental care plans.

The findings of the discriminant analysis of the presence or absence of dental problems indicate that Canadians in lower socio-economic groups (low income, low education, unemployed), exhibited a greater propensity of being affected by dental morbidity.

The analyses yielded a number of interesting policy issues, ranging from the identification of target groups, availability and accessibility of dental manpower, dental insurance, prevention and promotion strategies, to the issue of oral disease and the quality of life. Of interest to policy makers is the finding that Canadians in lower income groups exhibited a lower propensity to seek dental care treatment, despite their greater need for such services, and despite the existence of provincial denticare plans, coverage through the Canada Assistance Plan, or in some cases municipal dental care programs. It was found that the barriers to dental care in Canada are no doubt multi-faceted including price, availability and education.

ACKNOWLEDGEMENTS

First and foremost, I wish to thank Dr. Pran Manga, my thesis supervisor, who, in his capacity as a National Health Research Scholar, has provided state of the art research expertise, knowledge and guidance throughout the thesis. Many thanks are also owed to Mr. Doug Angus who reviewed and commented several drafts of this thesis, all of which was conducted with the professionalism and proficiency which has become his trademark. I am also endebted to Sharon Amer and Dr. Don Lewis, who have been particularly helpful and accessible, in helping me with the review of the literature, and in providing their advice as required. I also wish to acknowledge the contribution of Ed Praught for his expertise and considerable knowledge, with respect to the Canada Health Survey data. Special thanks are also owed to Statistics Canada, Owen Adams in particular, for giving me the opportunity to work on this project. I also wish to thank Dave Paton for his guidance and expertise regarding the methodological aspects of the Canada Health Survey. Finally, very special thanks are owed to Lise Lafleur and Denise Danis who assisted me with some computer and clerical work, and library search. All of you, your collaboration is greatly appreciated. Many thanks!

TABLE OF CONTENTS.

LIST OF TABLES

LIST OF FIGURES

Chapter 1

INTRODUCTION.

Interest in the utilization of dental care services is growing rapidly, mainly because of several changes in the Canadian dental sector. Proliferation of public and private dental insurance plans, growth in the number of dentists, expansion of the number and use of dental auxiliaries, major improvements in technology and productivity, shifts in the demographic and cultural characteristics of the population, upward trends in income and education, and greater efforts in promoting healthy lifestyles, are all examples of current factors, which, as they change, influence the volume and pattern of dental care utilization. In order to explain some of these utilization patterns, researchers must come to grips with these characteristics. Furthermore, it has been suggested that, since poor dental health is, in general, not life-threatening or debilitating, people may put little emphasis on good oral health, compared to good health in general (Evans and Williamson, 1978). Yet, in Canada, in 1978-79, dental problems accounted for nearly 4 million major activity loss days.[1] Only 50 percent of Canadians visited a dentist during the same time period. Given this situation, is it possible to identify and describe those who were users of dental care services in 1978-79? What factors explain the low or non-use of dental care services? Are any of these factors a legitimate concern for public policy?

For several decades now, researchers have examined factors which explain the utilization of dental services, and a corresponding body of literature and knowledege has developed. The purposes of studies in dental care have been as varied as the methods and studies themselves. Studies of dental care utilization patterns are important for several reasons.

---

[1] Source: Canada Health Survey, 1978-79.

First, the ever important question of manpower planning can only be answered properly with studies which evaluate the demand for dental care. Second, promotion and prevention campaigns can only be successfully launched if planners are able to identify the characteristics of the target groups (e.g., low and non-users). Third, utilization studies have also proven useful in the examination and analysis of trends over a long time period. Fourth, it is important to know what factors account for the variations in the usage of dental care services, across different population groups, of interest to policy makers.

The Present Study

Very few Canadian studies have examined, in depth, the numerous factors which exert a significant influence on the utilization of dental care services. Furthermore, few of these studies are national in scope. The comprehensive understanding of dental care utilization and its determinants at the national level still remains very problematic in Canada, largely because of a lack of prerequisite data.

Who are the users of dental care services? Who are the non-users? What are some of the barriers to dental care? How well does the present delivery system operate? How can we plan for future demand?... These important questions must be addressed by health planners and health administrators before planning for dental care delivery systems. Without answers to these questions, any planning, promotion or prevention exercise in dental care becomes less meaningful. This study of the determinants of dental care utilization in Canada is timely and relevant.

Generally, the purpose of this study is to examine plausible relationships that may exist between a number of factors and the utilization of dental care services in Canada. It draws upon the most recent nationwide health data (the Canada Health Survey) to analyze dental care utilization at the national level, using multivariate analysis techniques, and hence, represents a major effort to determine the factors associated with dental care utilization patterns in Canada, an area which is currently under-researched in this country. The findings of the present study should enable us to achieve the following specific objectives:

1. to verify the previously reported influence of selected variables on dental care utilization, and establish comparisons.
2. to determine the relative importance of these factors with respect to their effects on utilization, and how these factors explain variations in dental utilization.
3. to determine the demographic and socio-economic characteristics of users and non-users of dental care services.
4. to identify some of the major barriers to dental care.
5. to indirectly examine the present dental care delivery system, and how effectively it reaches the Canadian population.
6. to apply existing analytical and statistical tools in examining the utilization of dental services, an area of research which appears to be somewhat under-developed in this country.
7. to critically review and examine the dental care data derived from the Canada Health Survey, and recommend improvements for future surveys.

It is anticipated that this study will augment the current body of knowledge about the factors which influence dental care utilization in Canada, and hence contribute to future planning and evaluation of dental care delivery systems in Canada.

The report begins with a review of Canadian, and United States' literature on dental care utilization. Such a review is extremely important, as it represents the building block for the construction of a conceptual framework for analysis. Following the section on the conceptual framework, is a description of the methodology employed for this study, as well as a comprehensive description of all data sources and their limitations. The next chapters concentrate on the analysis of the data. In the first of these chapters, a descriptive analysis is used to explore the influences of individual variables on utilization. In the second, the analysis relies on the use of multivariate analysis techniques to examine and explain the relative importance (jointly and independently) of explanatory factors with respect to the utilization of dental care

services. Finally, the last chapter deals with the policy implications resulting from the major findings of the study, along with recommendations for the Canadian dental care sector in general.

Chapter 2

A REVIEW OF THE LITERATURE

Very few studies of dental care utilization have been conducted on a national scale, in Canada. In fact, most of the efforts to study the utilization of dental care services in Canada have been done at the provincial or regional level. Furthermore, there are even fewer studies which attempted to examine the determinants of utilization with multivariate analysis techniques.

The present review of the literature deals first with the Canadian studies. It begins by a close examination of the development of national statistics and trends in the utilization of dental care services across the country. The review of such trends will serve as the basis in comparing utilization rates derived from the Canada Health Survey (1978-79) with previous experience. Next, we will review provincial or regional studies which bear some resemblance to the methodology developed for the present study.

Turning to the international scene, we concentrate mainly on the examination of dental care studies from the United States. We will compare utilization trends from the United States with those observed in Canada for the same time period. Again, we will concentrate on some foreign studies which used a similar approach and methodology as the one developed for this research. The review of foreign literature on dental care utilization is of interest, in that it permits us to compare trends and determinants under different delivery systems.

The present exercise is by no means a comprehensive review of the literature on dental care utilization. The studies that were examined were carefully selected on the criteria of context (Canadian and U.S. experience) and methodology. The commentaries and lessons learned from past research on utilization will greatly benefit the present study. In fact, the

review of the literature represents the building blocks for the conceptual framework of this research. A thorough examination of past and present research efforts in dental care utilization had to be conducted in order to formulate hypotheses about utilization and its determinants in the Canadian context. Although many studies were reviewed, not all of the studies are described here.

2.1 The Canadian Experience: The National Scene.

2.1.1 The Canadian Sickness Survey: 1950-51

The Canadian Sickness Survey which was conducted in a twelve month period was the first nationwide effort to obtain an overall picture of the health problems of the Canadian population. The survey aimed at bringing together areas of research which were not normally covered by the traditional mortality, morbidity and hospital statistics. The survey included three fields of inquiry: ill health, health care use, and expenditures on health care. Data on dental care were obtained via the health care section of the questionnaire which was, by and large, the biggest component of the survey. A record was kept of dental care received by patients from qualified dentists. The volume of care was also measured in terms of the number of visits made to dentists' offices and clinics. Dental treatment received at hospital out-patient clinics was included, but any dental treatment received in school clinics was excluded (Canada, DHW, 1960, p. 76).

The sample design of the survey consisted of a multi-stage selection procedure, using uniform stratification and area sampling within each province. The overall sample size consisted of approximately 10,000 households which represented roughly 33,000 individuals. The sample excluded residents of institutions, military establishments, Indian reservations and remote areas.

The findings of the Canadian Sickness Survey indicated that only 15 percent of the

Canadian population visited a dentist at least once in 1950–51.[2] Of this group, women were higher utilizers (60 % of the group). By and large, the highest number of persons reporting dental care utilization was found in the 15–24 age group. Decreasingly smaller proportions of population reported visiting a dentist in subsequent age groups (Canada, 1960, p. 52). The distribution of people with dental care revealed that many more Canadians in the higher income groups received dental care treatment in 1950–51. This discrepancy was particularly marked in the case of children under 15 years of age. The findings also revealed that, on average, those who visited a dentist did so more than twice a year. Significant differences in utilization were also observed by region. The lowest utilization rates were reported in Quebec (8.3 %) and in the Atlantic provinces (9.1%), while the highest rates were observed in British Columbia (22.6 %). To sum up, the Canadian Sickness Survey data on dental care utilization suggest that income, age and sex were the major determinants of utilization in Canada in 1950–51.

2.1.2 Dental Care in 1967: A Supplement to the Labour Force Survey.

The Canadian labour force survey of February 1968 comprised added questions on dental care utilization. Such a request was prompted by the Department of National Health and Welfare in response to a growing demand for information about dental care in Canada.

The survey was conducted in 1968 and covered approximately 35,000 households chosen across Canada by area sampling methods. The dental questions also related to people under 14, an age group not normally included in the monthly labour force survey.

The results of the survey indicated that almost 42 percent of Canadians visited a dentist at least once in 1967. This proportion varied considerably by region, with 31 percent of Atlantic residents utilizing dental care services, while more than 48 percent of British Columbia's population were users in 1967.

---

[2] It is believed that this figure is actually underestimated, since school clinics treatments were excluded from the count. The underestimation, however, is not likely to be great.

Utilization rates also varied by age and sex, the 14-16 age group being the highest utilizers for both sexes. Females exhibited a greater propensity to visit a dentist in all age groups, except for the 35 and over. Significant differences in rural and urban utilization were also noticeable. In Canada as a whole, 44 percent of urban residents visited a dentist at least once, while only 34 percent of rural residents were users in 1967.

On average, each Canadian 14 years of age and older who visited a dentist in 1967, did so approximately 2.4 times. Labour force members showed a slightly higher utilization rate (42.1 %) than non-members (38.7%).

2.1.3 Nutrition Canada: The Dental Report, 1977

The Dental Report of 1977 stems from data collected in 1970-72 as part of the Nutrition Canada National Survey (Health and Welfare Canada, 1977). The survey was carried out primarly to assess the nutritional status of Canadians. However, it had severe limitations as an epidemiological survey, because of the undersampling for the younger age groups (Health and Welfare Canada, 1977, p. 6). Nevertheless, it represents a major national effort in collecting data on Canadian's oral health status and dental care utilization patterns.

Three separate sampling designs were developed for each group of population surveyed: non-instutionalized residents of the ten provinces, Indians and Eskimos. Of the total 15,920 sample size, 14,245 dental records were obtained. Three questions asked in relation to dental care utilization: a) How long since the last visit? b) How many visits in the last 12 months? c) What were the main reasons for the visits?

The findings reported in the "Dental treatment requirements" section of the survey indicated that, almost 50 percent of teenagers and young adults visited a dentist a least once within the last year (Health and Welfare Canada, 1977, p. 6). Provincial variations were also remarkable, British Columbians enjoying the highest utilization rates (62.4%), while Quebecers experienced the lowest rates (33.1%).

The results of the survey also illustrated differences in utilization due to differences in income, those in low income areas being less frequents users for all ages. Finally, for all age groups, females constantly exhibited a higher propensity to visit a dentist than their male counterparts.

2.2 Local and Regional Studies in Canada.

2.2.1 Determinants of Dental Care: The Lawton et al. study, 1973

Lawton, Williams, and Martiñello (1973), carried out a systematic analysis to determine who regularly visited dentists and for what purposes: preventive or therapeutic. The authors distributed 360 questionnaires to mothers in three zones of London, Ontario, and in three surrounding rural communities. The purpose of the survey was to collect information on demographic variables, patterns of dental care, complaints and views of dental care services in Ontario.

The authors concentrated their efforts on the analysis of background variables and patterns of dental care. The premise upon which Lawton et al., built their analysis was that " mothers are the primary dental agents of the family" (Lawton et al., 1973, p. 348).

The authors reported that children generally received more care than their mothers, but the mothers' orientation to oral health had a significant influence on children's dental health habits. Social class was found to be the single most important determinant of dental care utilization. Respondents from upper and middle social classes exhibited a greater propensity of following preferred treatment, while subjects of lower social class background were more likely to seek symptomatic care only (Lawton et al., 1973, p. 349). The authors also concluded that the time-distance factor in the areas selected for the study (London and adjacent communities) was apparently not a barrier to dental care.

2.2.2 Dental Health Status Survey of Manitoba Children: 1976.

Cageorge, Ryding and Leake (1980) took a survey of 1,192 Manitoba children to provide data on the disease level and treatment requirements of children aged five, nine, 13 and 17, to plan for and later evaluate a provincial children's dental health program (Cageorge et al., 1980, p. 108). One of the objectives of the survey was to measure dental service utilization by children in the sample.

The target population for the survey included all Manitoba children three to twelve years of age. All respondents were randomly selected by methods of multi-stage cluster sampling. The sample resulted in an over-representation of the rural component of the population. It was believed, however, that rural children were expected to have higher prevalence of caries (mainly because of the lack of fluoridated water supply), and that this increased sample size would contribute to reduce the variance of DMF indexes between rural and urban children, thus yielding more precise estimates of overall oral health status. This assumption seems acceptable on the grounds of clinical assessment of oral health, but the over-sampling of rural children might have caused some bias. However, the estimates are representative of the areas sampled and the findings are indicative of dental care utilization patterns in rural and urban Manitoba.

Cageorge et al. (1980) reported that, in all, 66 percent of the respondents visited a dentist at least once in 1976. No significant differences in utilization were found by age. The proportion of urban children visiting a dentist was significantly higher (75%) than rural children (61%). The authors also reported that the majority of dental visits by children were mainly for preventive reasons. The findings also linked dental care with oral health status, those who had not had dental care within the previous year had significantly higher restoration and extraction requirements (Cageorge et al., 1980, p.112). The study also highlighted the importance of parent's occupation and level of education as determinants of children dental care utilization (utilization being higher for children with a 'white collar' parent or a higher edu-

cated mother). Finally the report revealed urban-rural differences in disease levels to the detriment of the rural population. The authors attributed this difference by the exposure to fluoridated water by urban children.

2.2.3 The Utilization of Dental Care Services by Ontario Adults: 1979-80

Bullen (1982) examined a sample of 1,093 Ontario homes to inquire about the respondents' use of dental care services in 1979 and 1980. The author analyzed data from a Gallup poll household survey conducted in February 1981. The sampling method used was designed to produce a group of respondents who were representative of the Ontario population over seventeen years of age (Bullen, 1982, p. 6).

For purposes of analysis, the survey population was further classified in three groups: the entire population, those with complete dentures and those with teeth. This was done in order to fully analyze and explain differential utilization patterns between the dentate and denture groups. Bullen first analyzed the data by means of descriptive analysis (frequency distribution, crosstabulations) and multivariate analysis (one-way analysis of variance, multiple classification analysis and multiple regression analysis).

The results of the descriptive analysis suggest that the per capita mean number of visits made in Ontario in 1979 and 1980 varied with age (a decreasing rate with age); sex (females being higher users); geographic location (those in the Central Regional Planning Area being the heaviest users); residential setting (high rates being observed in urban areas); education (an increasing rate with education level); occupation (those employed in business and professions making the most visits); family size (increased utilization as size increases up to five members); marital status (the single and married being the heaviest users, compared to widowed and divorced) and income (the rates increasing as the level of family income increases). No association was found between language spoken and religion.

Bullen examined the characteristics of dental insurance with respect to a number of demographic and personal factors (Bullen, 1982, p.65). She found that dental insurance was

positively associated with income, marital status (single and married), occupation (skilled labourers), location and community size. Of importance to the analysis, Bullen also examined the respondents' perceptions of the effects of dental insurance. In general, it was found that respondents perceived that "insurance would have or has had only a limited effect on their use of dental services" (Bullen, 1982, p.68). The descriptive analysis showed that insured respondents used more dental services than uninsured. This effect was, however, smaller when users only were considered.

The respondents perceived dental needs were also investigated. Those respondents who felt they had good or excellent oral health made fewer visits than those who perceived they had fair or poor oral health. This illustrates the importance of the need factors in the utilization of dental care services.

The one-way analyses of variance of 1979 and 1980 utilization highlighted the statistically significant variables ($p < .01$), which were, in order of importance, oral health status, family income, age, education, occupation of the head of household, region, dental insurance status and sex.

Bullen (1982) then used a mutilple classification analysis technique to study individual and joint effects of predictor variables on the utilization of dental services, defined as the actual number of visits over the two year period (1979-80). Self-reported oral health status was found to be the most important predictor of dental care utilization for the entire Ontario adult population. A separate analysis was also completed with the dentate population only. This analysis demonstrated that family income was the most important predictor. With both samples, sex, education, insurance, dentist to population ratio, age, area, occupation and community size were also found to be determining factors of dental care utilization in Ontario. Bullen's study demonstrated that people's perception about the influence of health status on utilization was not consistent with their behaviour. While people thought that insurance would or has had a limited effect on utilization, the regression analysis demonstrated that insurance status was in fact a predictor of utilization.

The results of the regression analysis indicated that self-reported oral health status accounted for the largest proportion of the variance in dental visits. The second most important predictor was family income. Sex, education and dental insurance status also contributed to explain the variance. It was found that age was not significant in explaining the variance in the number of dental care visits.

The lessons learned from Bullen's work can be examined under two aspects. The first one deals with the confirmation of hypotheses about dental care utilization and some of its predictors. In such, Bullen's findings corroborate some earlier Canadian and international findings. Oral health needs, family income, sex, marital status, occupation, dental insurance were all found to be predictors of utilization. The second aspect, which is of prime importance to our study, deals with the methodology and analysis techniques. Bullen's work is unique in Canada, in that it illustrates very well the importance of studying the joint effects of variables, as well as their independent effects on the utilization of dental services.

For example, Bullen highlighted the fact that occupation of the head of household had a fairly large individual effect, but rather insignificant effects when other variables such as income and education were included in the analysis. The same also holds true when age is used in conjunction with oral health status (perceived need).

The findings of Bullen's study thus illustrate some of the difficulties in formulating a model of dental care utilization from empirical data. In spite of the problems encountered, Bullen's analysis was very useful in demonstrating a number of important characteristics about dental care utilization by Ontario adults, and in illustrating the unique effect of each variable, something that until then, had not been well demonstrated or even attempted in the previous Canadian literature.

Summary

The review of Canadian literature on dental care utilization on the national scene, reveals that utilization rates rose from 15 percent in 1950–51, to almost forty percent in 1967. The most salient determinants of dental care utilization have not changed over the years. Indeed, the Canadian Sickness (1950–51), the Labour Force Survey (1968) and the Dental Report of the Nutrition Survey (1977) all reported that high income earners, young adults and children, higher educated individuals, female and urban residents were all greater utilizers of dental care services. Furthermore, over the years, remarkable regional variations in utilization rates were also observed, the highest always being reported in British Columbia, while Quebec and the Atlantic provinces witnessed the lowest rates. In brief, although a greater proportion of Canadians visited a dentist in the seventies, compared to the fifties, it appears that significant inequalities in utilization by socio-economic and demographic status still existed.

The review of the literature also highlights the weaknesses and limitations of Canadian data on dental care utilization. Only four major nationwide surveys were conducted from 1951 to 1979. Yet, the comparability of the estimates remains questionable from survey to survey, merely because different age groups and different segments of population were surveyed. Furthermore, these national surveys only represent a snapshot of dental care utilization at one given point in time. Therefore, it makes it very difficult to derive national trends on dental care utilization in Canada. With the exceptions of the Nutrition Survey (1972) and the Labour Force Survey (1968), the other national surveys focused on general health care statistics, leaving little to dental care components. The information available for analysis is thus limited to specific key variables (demographic and economic) at the macro level.

The review of Canadian literature also reveals that, over the years, the major efforts in studying dental care utilization at the national level primarily covered the most salient determinants of dental care utilization, namely education, income and age. No major efforts were made in looking at attitudes or beliefs in relation to dental care utilization. Furthermore, it

is surprising to observe that none of the major surveys addressed the important question of dental care insurance.

Finally, the Canadian literature on dental care also suffers from the lack of multivariate analyses of dental care utilization. Bullen (1982) stressed the importance of studying both the independent and joint effects of the predictors of utilization. In Canada, the most noticeable efforts to examine such effects with mutlivariate techniques were done for specific localities (Bullen, 1982; Lawton et al., 1973), and, at best, can only be extrapolated to the provincial level.

2.3 The U.S. Experience: National Level.

2.3.1 Data from the National Health Survey: 1978-79.

The U.S. Department of Health and Human Services prepared a report, in 1982, which examined dental visits volume and the interval since last visit, in the United States, for the 1978-79 period. The review of this report is interesting, in that it enables us to compare U.S. national findings with the 1978-79 Canadian nationwide findings, drawn from the Canada Health Survey.

The information presented in the report were derived from the 1978-79 National Health Interview Survey (NHIS). During this two year period, approximately 220,500 individuals were surveyed on the general status of their health. In addition to data pertaining to acute illness and injuries, disability days, activity limitation, chronic conditions and health care utilization, data on the volume and interval of dental visits and dental expenses were also collected.

The population covered by the sample for the NHIS represents the civilian noninstitutionalized population of the United States. The sampling methodology consisted of a multistage probability design that permitted a continuous sampling of the population. Such a sampling scheme bears a very close ressemblance with the Canada Health Survey, and as such

permits the comparison of data collected in a similar way at the same time period, in two different countries, a rather fortunate occurence.

The National Centre for Health Statistics (NCHS) report indicates that, on average, 50 percent of the U.S. population made at least one visit to a dentist during the year prior to the interview. Children in the 6-16 year age group showed the highest percentage of users (64.2%), while persons 65 years and older were least likely to have had a dental visit (32.5%). On average, females visited a dentist in a higher proportion than their male counterparts. Persons with annual family income of $ 25,000 or more reported the highest proportion with a dental visit (66.5%) (U.S., DHEW, 1982, p.7).

Persons with higher levels of education also reported the highest proportion with at least one dental visit in the past year. Employed individuals also demonstrated higher utilization rates. Utilization rates were also higher for people living in metropolitan areas. A greater proportion of white people (52.3%) indicated visiting a dentist when compared to non-whites (35.2%). Residents in the Northeast regions were higher utilizers as measured by age adjusted and unadjusted rates. Meanwhile, Americans living in the Southern regions were found to have lower utilization rates.

On average, 1.6 dental visits per person per year were reported. An average of 3.3 visits per person was reported for those individuals who visited a dentist at least once during the year. As it was the case with utilization rates, volume of dental care was found to be higher for females, white individuals, high income earners, higher educated Americans, residents of metropolitan areas, and persons living in the North East.

2.3.2 National Health Surveys prior to 1978.

Since the 1950's nationwide data on health care have been collected on a continuing basis in the United States. The purposes of these continuous health surveys have been to provide data on individual and family health care utilization and expenditures. Some data on dental care utilization and expenses have also been collected and dental reports have been published

on an ad hoc basis. The sampling design and methodology, consisted of a multistage sampling plan and was consistent for all surveys.

The findings of the surveys are comparable from year to year. The estimated proportion of U.S. population who visited a dentist in a given year rose from 34 percent in 1953, to 37 percent in 1958, to 42 percent in 1963, to finally reach 45 percent in 1969. Although these trends indicate a considerable increase in dental care utilization over the years, the same data confirm that the most salient determinants of dental care by U.S. citizens have not changed considerably, from 1954 to 1969. In fact, it was found that family income, education of the head of household, age, sex, race and place of residence were the most important predictors of dental care utilization in the United States, during the fifties, the sixties and the seventies.

2.3.3 The Newman and Anderson Study: 1972.

The National Opinion Research Center of the United States interviewed, in 1965, a national sample of 10,293 individuals to obtain data concerning their utilization of dental services for the calendar year of 1964. In an attempt to collect more information, Newman and Anderson (1972) made an effort to obtain additional data from the respondents' dentists. Such an effort is unique in that it represents the first major study that made use of a verification procedure for exact cost, service and visit data. Newman and Anderson's work represent not only an effort to provide information for comments and analysis, but also an effort to build an empirically valid framework for the interpretation of dental care utilization data.

Newman and Anderson's findings corroborate several other findings about dental care utilization in the United States: despite significant increases since 1930, the utilization of dental care services still remained relatively low. Their data also confirmed the expected relations between utilization and predisposing factors. Namely, the inverse "U-shaped" relationship with age was confirmed by Newman and Anderson's data. The two researchers also found that females were higher users and that white individuals visited a dentist more often. Enabling factors such as family income, occupation and education were also found to be positively related to utilization.

Newman and Anderson carried their analyses further and examined utilization by six major dental service categories. Age and race were found to be associated to all services, except dentures. Education, occupation and income were highly associated with the use of cleaning services, examination and x-rays, fillings and inlays. Newman and Anderson also confirmed that utilization was highly dependent upon the dental condition of the respondents. Turning to the analysis of continuity of utilization, Anderson reported that, as education, income, occupational status and ability to pay increase, so does utilization. Finally, with respect to the population who never made use of dental care services, Newman and Anderson found that this group mostly comprised non-whites, in the 2-13 age group.

2.4 The U.S. Experience: Isolated Efforts.

2.4.1 The Wan and Yates Study: 1975.

Wan and Yates (1975) analyzed data from a community health survey conducted by the New York-Pennsylvania Health Planning Council Inc., in 1972. The purpose of the study was to analyze the predictors of dental care utilization in five counties in New York and Pennsylvania.

The survey method consisted of a multi-stage sampling procedure aimed at collecting information on health status, health needs, and health care utilization. The final sample size comprised 2,168 households. The analytic technique used by Wan and Yates consisted of a two stage multivariate analysis which identifies the differential effects of various predictor variables on dental care utilization.

In the first stage of the analysis, the automatic interaction detector (AID) analysis was employed, to partition the total sample into clusters of households having homogeneous dental services utilization patterns. To supplement AID, a multiple classification analysis (MCA) was employed to provide information about the effects of each predictor, after adjustments for its intercorrelations with other predictors (Wan and Yates, 1975, p.148). The second stage

of the analysis relied upon multiple regression analysis to investigate the relative influence of several independent variables on dental services use, which was defined as the annual average number of dental visits per person.

The AID analysis indicated that income, dentist to population ratio and social class were all significant predictors (in that order) of dental care utilization. The MCA analysis identified higher dental utilization rates for urban residents, Jews, white people, high income earners and for those residing in areas with a high dentist to population ratio. The multiple regression analysis showed that the proportion of persons in each household responding to symptoms, by seeking dental care was, by far, the most significant predictor of dental services utilization (Wan and Yates, 1975, p.153). Such a finding thus illustrates the strong relationship between utilization and perceived need. Other influencial factors such as occupation score, availability of supply, income level, education and cost of the services, were also found to be significant predictors of dental care utilization.

2.4.2 The Leverett, Hooper and Russel Study: 1978.

Leverett et al. (1978), conducted in 1974 a study in which they analyzed family records and claims forms of a company-sponsored dental care plan to determine the effects of socio-demographic and economic variables on utilization of the plan and patterns of expenditures.

The company under investigation was the Sybron Corporation which was made up of 48 divisions located in 15 states and two Canadian provinces The company is involved primarily in the manufacture of medical and dental equipment, chemical research, scientific instruments and dental laboratories (Leverett et al., 1978, p. 1174). The dental plan was non contributory on the part of the employees and individual utilization of the plan closely approximated the average for the entire U.S. population for that year (1974).

A total of 1,896 individuals were randomly sampled among the employees who were eligible for the dental program. Treatment information along with demographic (age and sex) and socio-economic (employment status, income, years of employment) information were

collected and further collapsed into eight geographical regions of the United States and Canada. Where appropriate, chi-square, analysis of variance and multiple regression techniques were used to test the statistical significance of the data (Leverett et al., 1978, p. 1175).

The results of the study revealed that, although children were higher utilizers than adults (employees and their spouses), the differences were not statistically different. The same conclusion was also reached when comparing utilization rates between males and females. In proportion, females utilized more, but the difference was not statistically significant. However, male utilization was statistically different between age groups, with peaks at 9-17 and 46-65 years of age. Leverett et al., showed that family utilization was directly related to employment status (salaries vs hour) and income. In relation to family size, utilization rates presented the form of an inverted U, the rates peaking for a family of five, and then dropping significantly as family size increased. Although there were significant differences in family utilization from one division of the Corporation to another, the study indicated no significant differences in utilization from one geographical area to the other.

Multiple regressions were carried out to measure the impact of age, sex, family size, employment status, income, years of service, and division of Corporation on utilization and expenditures. The most important predictor of utilization proved to be employee's income, followed, in order, by employment status and employee's age. As an overall conclusion Leverett et al mentioned that: "the primary effect of third-party participation in the payment of dental care is to increase the amount previous users spend on dental care, rather than increase the proportion of the eligible population seeking care" (Leverett, et al., 1978, p. 1177). Such a conclusion suggests that dental care insurance may exert a more significant effect on the volume of dental care, as opposed to the use or non-use of dental services.

2.4.3 The Okada and Wan Study: 1979.

Okada and Wan (1979) examined utilization rates of dental care services among low income urban populations, prior to and following the introduction of Medicaid and Community Health Center (CHC) programs.

The data for the study were obtained via a baseline survey of five areas (Massachusetts, South Carolina, Georgia, Missouri and California). The survey technique consisted of household interviews. The households were selected using an area probability sampling method. Utilization was measured by the dental visit rates in a year per population, and by the percentage of population visiting a dentist at least once during a year.

Okada and Wan's findings indicate that, for the combined five areas, the dental visit rate rose 25 percent from 1969 to 1975. However, these rates were always below the national average for both time periods. With the exception of Roxbury (Massachusets area) the dental visit rate increased from 33 to 80 percent. The increase was much higher among the poor. Okada and Wan hypothesized that the effect of Medicaid and CHCs should have been largest for the poor, since these two programs were aimed at providing greater benefits to the poor (Okada and Wan, 1979, p. 1002).

Dental care utilization increased, on average, from 31 percent to 39 percent, for the five areas, from 1969 to 1975. This rate is however lower than the 1975 national average of 50 percent. The greatest increases in dental utilization were generally observed among the poor, blacks, children and elderly. Although the study design and survey data preclude drawing causal inferences, Okada and Wan suggest that Medicaid and CHC programs contributed to increase access and utilization of dental care for this segment of the population.

Okada and Wan also analyzed the joint effects of several explanatory variables on the probability of visiting a dentist in a year. To determine the relative influence of such explanatory variables, the two researchers performed a Multiple Classification Analysis (MCA) on their sample. The results of the MCA revealed that "usual source of dental care" was the

strongest predictor of the probability of seeing a dentist at least once during a year. In order of importance, age, race-income status, geographic area and Medicaid coverage, were also found to be significant factors in explaining the likelihood of visiting a dentist. Where utilization was measured by the number of dental visits, source of payment, source of dental care, geographic area, ranked accordingly in terms of explanatory power. Okada and Wan also found that the effects of age, race and income were negligible on the number of dental visits by the individuals selected in their sample.

2.4.4. The Kronenfeld Study: 1979.

Kronenfeld (1979) compared physician care with dental care, looking at regular source of care and analyzing data on dental care utilization. The key interest of Kronenfeld's study was to determine the relative importance of education and income as determinants of dental care and physician care utilization.

The data for Kronenfeld's study were derived from the 1974 Rhode Island Health Survey. This survey consisted of a simple random sampling of 1,329 individuals which were representative of the Rhodes Island population. The analysis of the data relied mainly on the gamma technique of measuring associations in contingency tables. The examination of a regular source of care was futher analyzed with Pearson correlation and discriminant analyses techniques. Of importance to Kronenfeld's study, is the fact that Rhode Island has a fairly generous Medicaid program which provides a variety of dental care benefits (Kronenfeld ,1979, p. 1003).

Kronenfeld's findings indicate that approximately. 54 percent of Rhode Island individuals visited a dentist at least once during a given year (1974). This utilization rate was considerably higher than the 45 percent rate observed for the entire country in 1971.

Kronenfeld also found that there was a strong positive relationship between income and education and seeing a dentist at least once in Rhode Island in 1974. The author pointed out that no such clear pattern was evident in the case of physician care. Actually, it was

observed that low income earners were most likely to have seen a physician at least once (Kronenfeld, 1979, p. 1004). A positive relationship was also found between income and education with the number of dental care visits per year. However, for those who actually visited a dentist, this relationship tends to disappear, thus suggesting that once low income and low education groups gain access to dental care, they will visit the dentists as frequently as other groups. Kronenfeld also observed a strong relationship between having a regular source of dental care and going to the dentist.

Compared to the proportion who had a regular source of medical care (91%), fewer reported having a regular source of dental care (73%). Income and education were found to be very important factors in determining whether someone had a regular source of dental care. As observed by Kronenfeld, as education and income increased, so did the percentage of people reporting having a regular source of dental care. In addition to income and education, sex, age and race were also significant predictors of regular source of dental care. Income was, by and large, the most important predictor of those five.

Finally, Kronenfeld conluded her study by noting that Medicare and Medicaid have lessened socio-economic barriers to physician care in Rhode Island, but that these differentials still existed to a high degree with dental care. Although the literature has emphasized that dental care is perceived as more elective and less serious than medical care, and that because of that, policicy makers should focus on education, promotion and prevention, Kronenfeld's findings suggest that income is still the most important factor, and that policy makers should rather consider an approach aimed at reducing the effective price to the consumer of dental care, through more private and public dental insurance (Kronenfeld, 1979, p. 1010).

2.4.5 The Teh-wei-Hu Study: 1981.

Teh-wei-Hu (1981) analyzed the demand for dental care services among different income classes, as well as the effect of dental insurance coverage on demand. The demand for dental care services was defined as the number of dental visits per year. Teh-wei-Hu used

estimates from the 1970 National Opinion Research Center (NORC) health survey data files. The total sample for this study consisted of 4,376 individuals. Among them, 599 had free dental care, 811 had dental insurance and the vast majority (9,976) had no dental care insurance. The study focused on the demand for dental services among low and other income level families, and on the effects of dental care insurance.

Teh-wei-Hu devised an equation in which the dependent variable, demand for dental care is assumed to be influenced by cost, income, insurance coverage, race, education, age, location and other exogenous factors such as water fluoridation and availability of dentists. Of particular importance to Teh-wei-Hu's study was the inclusion of the dental care insurance variable. The author points out that number of past studies did not include dental insurance as a separate variable, but rather included it as a proxy by changing the net price (cost) variable (Teh-wei-Hu, 1981, p.154). In Teh-wei-Hu's study, dental insurance was explicitely introduced and was divided into three groups: people with no dental insurance, people with some dental insurance, and people with free dental care. To fully analyze the demand for dental care between groups, the author also focused on separate analyses for the total sample, for below and above poverty groups (the cut-off point being $6,000), and for white and non-white individuals. Finally, in addition to the dental visit equation, supplemental equations were devised to estimate individuals' dental expenditures, and to estimate the probability of having dental insurance (Teh-wei-Hu, 1981, p. 155).

From a statistical perspective, the method of estimation varied with each equation. A Tobit model was used in estimating dental visits. The estimation of dental care expenditures was based on the classical least squares regression approach. Finally, the probability of having dental insurance was calculated using Probit analysis.

In terms of purely descriptive analysis, the 1970 NORC data indicate that the average dental fees were similar for both the above-poverty ($9.63) and below-poverty groups ($9.96). However, low income earners reported, on average, fewer visits (.5) than high

income earners (1.3 visits). Differences in average visits and average costs were also noticeable between the no dental insurance sample (.96 visits with an average cost of $18.25); the dental insurance sample (1.39 visits with an average cost of $18.25); and the free dental care sample (3.26 visits, with an average cost of $58). Teh-wei-Hu suggests that these differences imply that free dental care is available mainly to low income earners, which leads to much more utilization of dental care services, when compared to high income earners.

The NORC data also revealed a higher education level for individuals with dental care insurance. A higher percentage of individuals with free dental care (low income earners) was also found to be living in urban centers where the dentist to population is higher, and where dental prices are also higher.

The empirical results and estimations of the dental visits equation indicate that income is one of the most important predictors in terms of the demand for dental visits. It was found that income had a high and positive effect on the number of visits. Price also had a significant negative effect on the demand for the total sample and for low income earners , but no significant effect on dental visits for the above-poverty group (Teh-wei-Hu, 1981, p. 166).

Dental insurance was also found to be highly and positively related to the demand for dental care, as measured by the number of visits. Dental insurance had a much greater effect on low income earners than for the other group. In fact, the empirical findings indicated no significant differences in dental visits between insured and non-insured individuals in the above-poverty sample.

When analyzing socio-demographic variables, Teh-wei-Hu arrived at the conclusion that females (especially in the below-poverty sample), white individuals, higher educated persons, and children between 5 and 17, all had more dental visits, thus confirming their greater propensity to seek dental care.

In terms of accessibility, Teh-wei-Hu's findings revealed that the supply of dentist (population per dentist) was a significant factor in the demand for dental care services.

While no differences in urban and rural consumption of dental services were observed for the total sample, it was found that the above-poverty urban sample made greater use of such services compared to the below-poverty urban sample. Finally, it appeared that water fluoridation had no significant effect on the demand for dental care services (Teh-wei-Hu, 1981, p. 170).

The analyses of the sub-samples consisting of people with dental insurance; people with no dental insurance and those with free care, indicated that the determinants of utilization for those with no insurance were comparable to the total sample. These determinants were: females, white people, higher educated individuals, high income earners and children. Furthermore, Teh-wei-Hu found that price and population per dentist had negative effects on the number of dental visits.

Among individuals with dental insurance, whites, healthier, higher income and educated individuals visited dentists more frequently. Fluoridation appears to have a negative effect on the number of visits.

For individuals receiving free care only two variables significantly contributed to the model: those in fair health visited more, while children under age 5 visited less frequently. This suggests that when dental care is free, there are almost no differences among whites, nonwhites, males, females, children and adults in their utilization of dental care services (Teh-wei-Hu, 1981, p. 174).

The empirical results of the dental expenditures equation revealed that overall, family size had a negative effect on out-of-pocket spendings for dental care services. Males spent less than females. Urban individuals spent more than rural individuals. The average spendings of whites exceeded those of non-whites. Higher educated head of household had greater individual dental care expenditures, the difference being much higher among high income earners. Children (5-17 age group) had more dental spendings for the total sample and the above-poverty sample. Teh-wei-Hu explains this by assuming that more children in the

above-poverty sample, probably had more preventive dental work (Teh-wei-Hu, 1981, p. 180). Finally, income had a positive influence on dental care expenditures. For both the total sample and the above-poverty group, dental insurance had no significant effect on dental care expenditures. However, for low income earners, it was found that dental insurance increased out-of-pocket dental spendings.

As a concluding note, Teh-wei-Hu estimated that the probability of having dental insurance increased significantly for white individuals; for young (18-36) and middle-aged (36-45) people; for high income earners; for higher educated individuals; for urban poor who are more likely to use medical programs and for those in kindred occupations (Teh-wei-Hu, 1981, p.192).

Summary

The review of the U.S. literature reveals that utilization rates of dental care in the United States rose from 34 percent in the early fifties to more than 50 percent in the late seventies. Compared to the Canadian picture, the U.S. rates have always been higher. These rates were significantly higher in the U.S. in the early fifties and started to level off in the mid-seventies. In spite of these considerable increases, it is suggested that the rates are still very low, compared to the utilization of other health care services. Furthermore, as was also the case for Canada, it has been found that the most salient determinants of dental care utilization have not changed considerably over the years. Income, education, age, sex, location and race have been identified as the most important predictors of dental care utilization in the United States. Given the composition of the U.S. population, race or ethnicity has always received considerable attention in explaining utilization patterns. No such variable has been covered in the Canadian literature.

While the Canadian literature merely highlights the effects of dental variables at a more macro level (income, age, region), many researchers in the U.S. attempted to analyze the effects at a more micro level (above vs below poverty groups; insured vs non-insured indivi-

duals; Medicaid vs non-Medicaid recipients; etc.). Furthermore, many American studies also concentrated on dental insurance and its impact on utilization, along with the characteristics of the individuals with dental insurance. There are only a few studies which examine this issue on the Canadian scene (Bullen, 1982; Lewis, 1980).

Researchers in the U.S. also attempted to look beyond the traditional predisposing (age, education, sex) and enabling factors (income, and supply), by examining such variables as parental influence, dental habits, source of regular care, distance, travel time, price, etc., which are also believed to influence utilization patterns (Freeman and Lambert, 1965; U.S., DHEW, 1978).

The lessons drawn from the U.S. literature highlight the importance of studying dental care utilization with multivariate analysis techniques, in order to fully analyze the joint and independent effects of the predictors of dental care utilization. The U.S. literature is also enhanced by studies of dental insurance and price/demand elasticities in dental care. Therefore, dental care studies in the U.S. have expanded from the purely sociological studies to a more complete economic approach.

As was the case with the Canadian experience, perhaps the most severe defiency of U.S. literature on dental care, is the lack of research dealing with attitudes and beliefs toward dental care services, though more attention has been given to these factors in the United States. Likewise, very little attention has been paid to the relevant dimensions of time and how it impacts on utilization patterns.

Finally, the review of both Canadian and U.S. literatures suggests that the most salient determinants of dental care utilization have been identified. Nevertheless, researchers have not yet found uniform and comparable measures for explanatory variables (and to a certain extent even for dependent variables). The review of the literature suggests that more work is required in the development, standardization and empirical verification of dental variables. Based on the knowledge found in the literature, future research should examine other expla-

natory variables such as time, price and quality of care, attitudes of patients and providers, etc., all of which, until now, have been given little attention compared to variables which have been significant determinants for the past thirty years (age, education, income, etc.).

30

Chapter 3

CONCEPTUAL FRAMEWORK AND METHODOLOGY.

3.1 Conceptual Framework

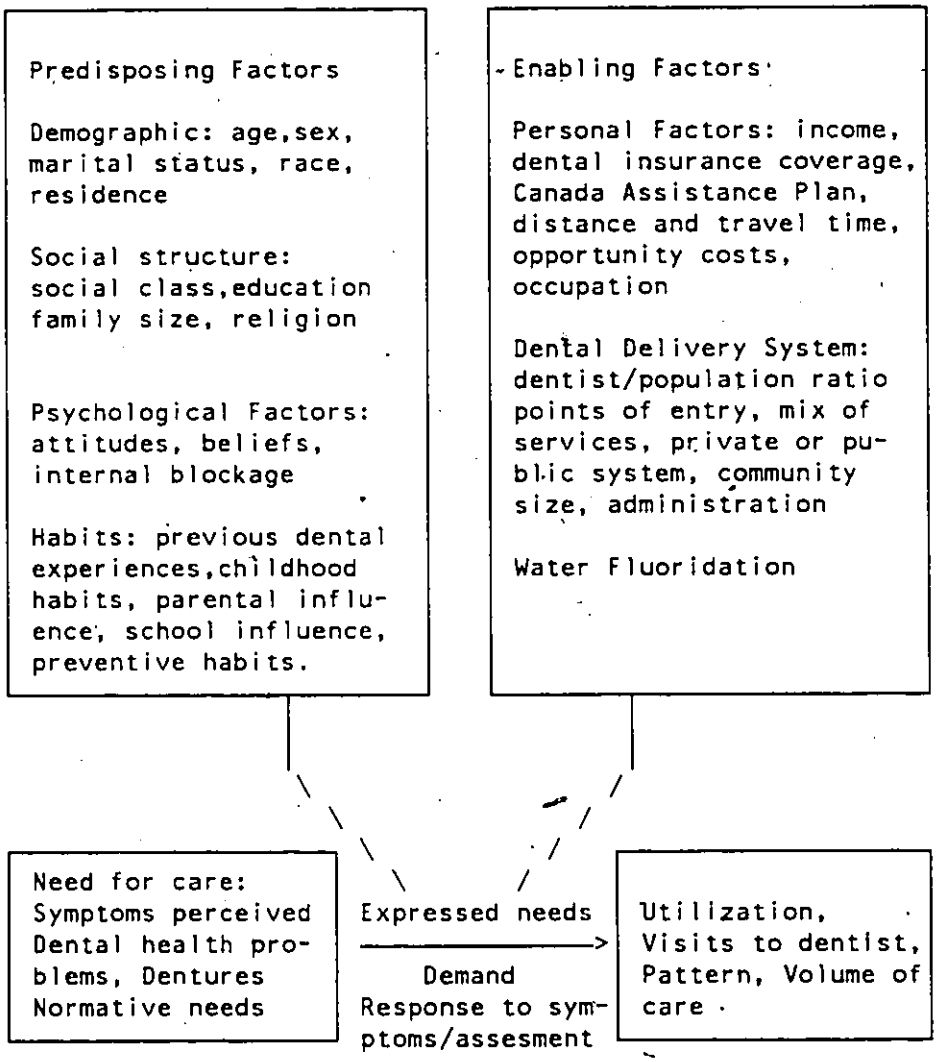
Studies in the health care field suggest that medical care is consumed to reduce or eliminate the differences between one individual's current and expected health status (Newhouse et al., 1974; Grossman, 1972; Evans, 1984). Accordingly, it is believed that one individual will consume dental care in order to reduce the gap between his/her perceived dental health status and his/her expected dental health status (Newman and Anderson, 1972; Lewis and Brown, 1973).

Ever since Rosenstock (1966) formulated the Health Belief Model to predict and explain the utilization of health care services, many researchers have suggested modifications to the model (Becker and Maiman, 1975; Anderson and Andersen, 1972). In the field of dentistry, Wan and Yates (1975) have suggested a model of dental care utilization which recognizes the importance of need factors, along with enabling and predisposing variables, in relationship to dental care utilization. According to Wan and Yates, "dental services may be thought of in terms of the following model: beginning with a need for care, a person's decision to use services may be conceptualized as being influenced by predisposing factors and enabling factors. This process takes place in the context of the social, cultural and economic values and traditions of the society" (Wan and Yates, 1975, p. 143) (figure 1). The need for care refers to the symptoms perceived by the individual (perceived need) or to the clinical assessmnet of an individual's dental condition (normative need) (Bradshaw, 1972). These needs are then translated into a demand for dental care which is translated into a visit to the dentist. Such a demand is, however, affected by predisposing factors (age, sex, race, residence, education,

social class, attitudes, beliefs, etc.) and by enabling factors (income, insurance, opportunity costs, distance, travel time, supply of dentists, accessibility, mix of services, equity, etc.).

Figure 1

The Schematic Model of Wan and Yates (adapted to the Canadian context).



The conceptual framework for this study was drawn from Wan and Yates' work. This approach was preferred to the Health Belief Model for several reasons. First, most variables in Wan and Yates' model are quantifiable and are available from the Canada Health Survey computer data files. This is not the case with questions on attitudes or beliefs, which can be highly subjective and not as easily quantifiable. Second, the value of studying attitudes for their ability to predict dental utilization is questionable in view of the fact that "there is a considerable discrepancy between what people say they should do about dental care, and what they actually do" (Wan and Yates, 1975; Bene et al., 1974). Third, it is believed that the studying of discriminating factors between users and non-users of dental care is better accomplished within the framework of health need, predisposing factors and enabling factors. Such an approach not only enables us to differentiate between users and non-users in terms of socio-economic and socio-demographic characteristics; it also enables us to examine discrepancies in terms of equity to dental care. Indeed, the major barriers to health care can be classified under three categories, namely need variables, predisposing variables and enabling factors.

Thus, by studying differences between users and non-users of dental care services in terms of equity to care, we are in a better position to comment on the major obstacles that the individual faces in seeking dental care services.

3.1.1 Dependent Variable

The very concept of utilization in dental care is problematic. A universal and operational definition of utilization is absent from the literature. The U.S. Department of Health Education and Welfare (DHEW) reviewed 44 articles in which dental care utilization was measured in 16 different ways (US, DHEW,1978). The most common measure of utilization in dentistry is the annual number of dental visits per person. From the point of view of economic theory, this measure is appropriate since it represents an approximation of a quantity demanded. However, the practical usefulness of such a measure is questionable. Indeed,

such a measure gives equal weight to all visits to a dental office without regard to the quality of care given, or the volume and mix of services. Furthermore, the average number of dental visits does not vary very much per user. Given the more predictable nature of dental care (Evans and Williamson, 1978) it has been found that the average user will not consume dental care services more than 2 or 3 times during a given year, leaving very little variability in the dependent variable.

The second most common measure of utilization in dental care is the percentage of a population visiting a dentist in a given period (usually a year). In its dictionary definition, the word utilize means "put to use". In this regard, utilize implies a dichotomy: use or non-use. The advantage of such a measure is that it enables us to maximize the statistical differences between users and non-users of dental care services. As mentioned earlier, one objective of this study is to analyze differences that exist between those individuals who visit a dentist and those who don't during a given time period. Therefore, such a measure of utilization is suitable for the purposes of this study. For statistical analysis it was decided to construct a "dummy" dependent variable. Scores of one were assigned to respondents indicating that they visited a dentist at least once over the past twelve months, while those who did not go to a dentist during the same time period were assigned a score of zero.[3]

3.1.2 Independent (Explanatory) Variables

3.1.2.1 Predisposing Factors

The propensity to use dental services varies from person to person and may be influenced by the demographic, social and psychological characteristics of the individual. A number of demographic variables have been found to influence dental services utilization. Age, education, sex, marital status, and family size have all been attributed a strong to weak influence

---

[3] The information on use and non-use of dental care services was derived from the IAQ component of the Canada Health Survey, Section I on Health Care Utilization, question 16a which asks the following:" During the past 12 months, how many times did _____ see or talk to a dentist ". Source: The Health of Canadians, 1981, p. 193.

on utilization.

Demographic Variables: Information on demographic variables was available from the Household Record Card (HRC) component of the Canada Health Survey and from the Interview Administered Questionnaire (IAQ) and Lifestyle and your Health Questionnaire (LHQ). All of these variables were transformed into (1,0) "dummy" variables. A dichotomous coding was selected mainly because of the necessity to dissect our study population into factors which best illustrate the dental needs of each specific group.

The review of the literature indicates that age is a very important explanatory variable in dental care utilization. The functional expression of the relationship is usually an inverted U (US,DHEW, 1978; Health and Welfare Canada, 1977; Canada, DBS, 1971). This relationship suggests that younger and older groups of the population utilize dental services less than the middle age groups. In Canada, in the mid-seventies, several provinces have made major developments in publicly funded children dental care plans. Furthermore, epidemiological studies reveal that oral health problems are more prevalent at an earlier age (Stamm et al., 1984; Health and Welfare Canada, 1978). Because of such trends, it can be hypothesized that the traditional inverted U-shaped relationship of utilization by age, now resembles more an inverted J-shaped curve; with highest utilization at an even younger age. The assumption can thus be made that the need for dental care is inversely proportional to age, when focusing on the total population. When focusing on the dentate group only, it is expected that this relationship will not be as pronounced between different age groups (Bullen, 1982).

Education has been found to be one of the most important determining factor of dental care utilization (U.S. DHEW, 1963; Lewis, 1980; Newman and Larsen, 1980). Most of the studies which have evaluated the relationship between education and dental care utilization report that utilization rates increase as the level of education increases. This hypothesis will be tested in our study. The education of the head of household will be used as a surrogate for children's education.

Early studies suggest that females tend to utilize slightly more dental care services than males (Nikias, 1971; Anderson and Andersen, 1967; Canada, DHW, 1960). Although the trends in utilization suggest that differences in utilization between male and female tend to disappear, we assume that women consume more dental care than men, because of their greater propensity to seek medical care in general (Lapierre, 1984; Broyles et al., 1983).

The review of the literature yields ambiguous results when analyzing dental care consumption by marital status (U.S. DHEW, 1978). This results mainly from definitional problems. It appears, however, that utilization is weakly related to marital status, single people being the greatest utilizers within that group (Avnet and Nikias, 1967). It is probable that higher per capita disposable income and a greater concern for personal appearance (aesthetics) by single individuals might lead them to visit a dentist more often. However, it could also be assumed that a greater concern to maintain "good family health" (education-prevention) among married people (especially with children) might incite this group to visit a dentist more often.

Family size represents an interest insofar as it reflects the mechanisms used to make intra-family allocations of budgeted money for dental care. However, the literature suggests that the overall relationship between family size and utilization is extremely weak (Borhani and Kaus, 1973; Newman and Anderson, 1972; Avnet and Nikias, 1967). Some researchers reported that households with fewer members made more frequent use of dental services compared to larger households (Hunt et al., 1980). On the Canadian scene, the labour force survey of February 1968 reported that the percentage of children visiting a dentist tended to decrease in households with more than four children (Canada, DBS, 1971). Consequently, we might assume that if a relationship exists between family size and utilization, it could be very weak, with lower utilization rates in larger families (4 children or more).

Parental Influence: According to the literature on dental care utilization, a child's visit to a dentist is likely to be more recent as the mother's preventive orientation increases (Free-

man and Lambert, 1965). In order to analyze the foregoing relationship, we derived a CHS family file based on census family identifier.[4] For purposes of analysis, two "dummy" variables were created: one for the mother of a family, and another for each child in that same family. In both cases (mother and child) a user of dental care services was assigned a score of one, while a non-user was given a value of zero. It is expected that a child's propensity to seek dental care will increase if this child's mother is a user of dental care services (visited a dentist at least once in 1978-79).

Preventive Medical Behavior: The review of the literature suggests that an individual with a strong positive predisposition towards preventive health in general, will likely exhibit a greater propensity to seek dental care (Suchman and Rothman, 1969).

In order to explore this relationship, a preventive medical behavior index was constructed. This index was determined by computing a score for each respondent's actions with respect to immunization, seatbelt use and level of activity. Because information on seatbelt use and level of physical activity was collected for those respondents 15 years of age and older, the analysis of dental care use by preventive behavior will be restricted to the sample comprised of individuals 15 years of age and older.

The variables pertaining to immunization and seatbelt use were assigned a score of one, when the respondent indicated a positive answer to these questions (i.e., if he or she had ever been immunized; or if he or she was a regular user of seatbelt, when riding or driving a motor vehicle). The variables pertaining to physical activity were assigned a score ranging from zero to six, depending upon the frequency, duration and average metabolic cost of each activity.[5]

---

[4] It is possible to link individuals in the Canada Health Survey by their census family codes. All individuals in the same census family were assigned the same code. The tracing of each member of a family was done by assuming that the oldest female in the group was the mother.

[5] Metabolic cost is measured in terms of multiples of the resting metabolism. It increases with the degree of physical exertion of each activity. Source: The Health of Canadians, Report of the Canada Health Survey, 1981, p. 74.

The preventive medical index was then constructed by computing the composite score for each respondent, in relationship to his/her immunization status, frequency of seatbelt usage, and level of physical activity. Consequently, the index can take scores ranging from zero, for those who exhibit no, or a very low preventive medical behavior; to nine, for those who are very active, well-protected (in terms of immunization), and who buckle their seatbelt always or most of the time.

Since dental visits could be viewed as comparable behaviors (U.S., DHEW, 1978; Stevens, 1985), it is expected that those Canadians who score high on such a preventive medical index, will be more likely to receive dental care at least once during the year.

3.1.2.2 Enabling Factors

Income: Data pertaining to respondent's income were obtained via the IAQ questionnaire. Given the highly sensitive nature of this information it is not surprising to observe a relatively high non-response rate (6%) for this question. The income variable was treated as a dummy variable and broken down into economic family income quintile. Because of the importance of the non-respondents, an additional dummy variable was also constructed for all those individuals who failed to report their income.

Economic family income quintile was preferred to raw income as the unit of analysis for several reasons. First, with quintile, it is possible to assign an income value to each individual in the survey. This is not possible with raw income data, since income was reported only for individuals 15 years of age and older. Second, given the difficulty in obtaining precise data on income, it is believed that the grouping of individuals in economic family income quintile eliminates some of the potential biases generated by raw estimates. Third, it is suggested that income quintile represents a much better socio-economic status indicator than raw income alone, since it also takes into consideration family size, yielding to some indication of how much 'per capita' income a family disposes of.

Income is the most frequently studied explanatory factor in dental care utilization. The literature reports a moderate to strong positive relationship between income and utilization rates (Teh-Wei Hu, 1981; Canada, DHW, 1960; Canada, DBS, 1967). Given that most Canadians have to disburse "out-of-pocket" money for dental care services, it seems reasonable to assume that the strong relationship between income and utilization will hold, and that persons in the higher income quintile will exhibit a greater propensity to seek care than those in the lower quintiles.

Occupation: Information on labour force status was collected in the demographic section of the IAQ component of the Canada Health Survey. The occupation variable was constructed in accordance with the categorization elaborated by the Labour Force Survey.[4] The occupation variable was treated as a dummy (1,0) variable comprised of four different groupings. Those who were not in the labour force were mainly housewives, children, students and retired individuals. The unemployed are defined as those who were out of work but looking for a job. The employed group was further broken down into blue collar and white collar workers.

The literature identifies the effects of occupation on dental care utilization as being moderate to strong (Newman and Anderson, 1972; Nikias, 1971; Avnet and Nikias, 1967). If we accept the assumption that one's occupational status might be employed as a surrogate for the opportunity costs incurred when visiting a dentist, it is probable that, ceteris paribus, these cost are higher for the employed than for those who are either unemployed, or not in the labour force. Within the employed group, it could be hypothesized that the blue collar workers might incur higher opportunity costs when visiting a dentist, as opposed to white collar workers. This could be explained by the fact that white collar workers usually work under more flexible schedules and may enjoy more employment benefits in terms of sick leave, compared to blue collar workers (and especially the self-employed). In addition,

---

[4] Source: Dominion Bureau of Statistics, Occupational Classification Manual, Census of Canada, 1971, Catalogue no.12-537E, March, 1971.

white collar workers have traditionally been associated to higher income groups, therefore giving them more purchasing power for dental services. It is thus expected that white collar workers will exhibit a greater propensity to seek dental care, because of more disposable income and because of lower opportunity costs.

From another perspective, if we consider that private dental plans in Canada represent a growing employee fringe benefit, it could be argued that, since the majority of private group dental plans ties eligibility to participation in the workforce (Stamm et al., 1984); those individuals who are currently employed (and therefore more likely to participate in such a plan) may be inclined to visit a dentist more often.

Industry Occupation Classification: The review of the literature also suggests that workers in certain job classification are more likely to receive automatic, fully or partially paid dental insurance. Given that group dental plans are a growing fringe benefit for union members and professional associations, it could well be assumed that members of highly unionized associations (manufacturing, construction, primary industry, etc.) may exhibit a greater demand for dental care services.

Social Assistance Source of Income: Data on CHS respondents' source of income was obtained via the IAQ component. Respondents were asked what were all their sources of income, an element of which was social assistance. Because of the highly sensitive nature of this information, we observed a relatively high number of non-respondents (more than 8%) for this field. Social assistance as a source of income was treated as a dummy variable with two categories: those who were recipients, and those who were not.

A word of caution should be mentioned about this variable. Because of definitional problems, sampling procedures and sensitivity of the data, the weighted estimates provided by the Canada Health Survey are not fully compatible with the estimates published by Health and Welfare Canada, in 1981. However, given the potential importance of the information on social assistance as it relates to health benefits, it was decided to use whatever information was available to analyze the effects of social assistance on dental care utilization.

Among other benefits, the Canada Assistance Plan includes payments to persons in need of certain health care services not covered under universal health care programs. Some provinces do extend these health care benefits to offer free basic dental care to persons eligible to receive social welfare benefits. Because of the removal of financial barriers to some dental care for certain social assistance recipients, it could be suggested that these individuals may exhibit a greater propensity to seek care. However, the review of the literature reports that utilization of dental care services is usually lower for those at the lowest income levels (Wilson and White, 1977). Furthermore, insurance data indicate that a large proportion of the population will not seek regular care even when services are free (Evans and Williamson, 1978). Consequently, in view of these contradictory findings, the objectives of this analysis will be to verify which hypothesis is demonstrated in the Canadian context.

Accessibility/Availability of Services: Because of the data limitations of the CHS, desired measures of access to dental care such as presence or absence of provider, travel time, location of dentist, etc., were not available. Consequently, we had to rely on two crude indicators of availability of dental care services. The first one is the conventional dentist to population ratio. This ratio was computed for each of the communities included in the CHS sample. The dentist to population ratio is based on the population estimates and the workplace of dentists, derived from the 1981 Census, that is, it was established from non CHS data sources.

The other indicator which attempts to measure accessibility is community size. This indicator was treated as a dummy variable broken down into four classes: rural areas, small cities, large cities and metropolitan areas. Selection of this indicator is based on the assumption that access to care improves as the size of the community increases.

The review of the literature suggests that utilization rates are higher where there are more dentists per capita (U.S., DHEW, 1978; Wan and Yates, 1975). Furthermore, other studies have also concluded that utilization also increases with the concentration of the popu-

lation (U.S., DHEW, 1978; Quebec, 1975). This can be explained by the fact that the regional distribution of dentists has traditionaly been heavily concentrated in urban areas. Therefore a greater availability of supply in larger communities implies greater accessibility (and choice) for the consumer of dental care services. We can thus assume that higher utilization rates would be expected in communities with high dentist to population ratios and in large urban centers.

Dental Insurance: Unfortunately, the Canada Health Survey did not provide information on the respondents' dental insurance status. Therefore, to study the effects of dental insurance on utilization, we were forced to rely on proxy indicators. One of these indicators is an estimate of a province' s population who is eligible for coverage under either a publicly funded or a private dental plan. For the most part, such an index attempts to measure the proportion of a population which does not have to absorb the full cost of dental care services at the time it seeks professional help for oral health problems. Given the relative importance of provincial public dental care plans in Canada, and given the importance of the extended health benefits to those Canadians assisted by the Canada Assistance Plan, an attempt was also made to identify those respondents who were likely to be eligible for public dental care insurance.

Since the cost of dental care services is one of the major barriers to care, it is hypothesized that the introduction of dental insurance plans would remove these barriers and would result in an increase in utilization (Feldstein, 1973; Manning and Phelps, 1977). The review of the literature makes it difficult to draw any definite conclusions about the effect of insurance on utilization. Although the provision of dental care insurance does not seem to create a "stampede" to the dental offices (Evans and Williamson, 1978); it still appears that the recent current rapid growth of third-party prepaid dental plans might have a significant impact on overall utilization levels. Furthermore, the review of the literature suggests that the degree of contribution to the premium by the beneficiary is directly related to his/her

utilization level (Avnet and Nikias, 1967). If such is the case in the Canadian context, it could be hypothesized that individuals who participate in a private plan with some kind of contribution (co-payment, premium), may be more likely to visit a dentist, than those who are covered by a publicly funded dental care plan, in which there is no premium or co-payment.

Water Fluoridation: Data on water fluoridation were obtained from the Health Protection Branch of Health and Welfare Canada. These data provide a complete list of all communities in the country which have either naturally occuring or controlled fluoridation. For purposes of analysis, the variable was treated as a (1,0) "dummy" variable, where communities with fluoridated water were assigned a score of one, while others were given a value of zero.

A large body of research demonstrates that the impact of water fluoridation has been to reduce significantly the incidence of dental caries in children (Health and Welfare Canada, 1980; CDA, 1981). The review of the literature suggests that the utilization levels of dental services are found to be lower in communities with fluoridated water (Douglas et al., 1971, Maurizi, 1975; Upton and Silverman, 1972). There is no doubt that fluoridation contributes to improve overall oral health status, and that, by extrapolating, might have an impact on the utilization of dental services.

3.1.2.3 Need Factors

Dental Needs: The Canada Health Survey was not designed to collect information on oral health status or dental needs of Canadians. Therefore, in order to estimate individuals' dental needs we had to construct another proxy variable. In the IAQ component of the CHS, respondents were asked whether they suffered any discomfort or difficulty with their teeth, gums dentures or plates. In addition, the information pertaining to health problems was regrouped in 22 classes, one of which related to dental morbidity. With the information contained in these two fields (difficulty with teeth; dental problems), a dummy variable was created for analysis. Those respondents who experienced any dental trouble were assigned a

score of one, while those who did not experience any dental problem were given a score of zero.

Despite the fact that dental need has received relatively little attention as an explanatory factor of dental care utilization (U.S., DHEW, 1978), it is obviously one of the foremost determining factor of utilization. It is assumed that the presence of dental symptoms will make a person more likely to visit a dentist (Newman and Anderson, 1972; Bullen, 1982).

Population with dentures: Data on Canadians who wear dentures were collected through the IAQ component of the CHS, in the section dealing with dental health, hearing and vision (appendix B, question 34). For purposes of descriptive analysis, the variable pertaining to denture-wearing was divided into four classes: those with no dentures (the dentate population); those with full lower plates only; those with full upper plates only; and those with both upper and lower plates (full complete denture).

For purposes of multivariate analysis, the "denture" variable will first be examined as an independent (1,0) dummy variable. In addition, this indicator will be used to divide the population into two groups for analysis: the total population (full sample including the dentate and the denture-wearing groups); and the dentate population (those with no dental prosthesis).

Bullen (1982) found that the presence or absence of dentures was an important predictor of the number of dental visits (those with dentures being less likely to have had a dental visit). As such, the denture variable represents an indicator of one's oral health status, and can be classified as a "need factor". The rationale goes on that those individuals who wear a full denture (upper and lower plates) have very little need to visit a dentist. Therefore, it is expected that Canadians with both upper and lower plates will exhibit a lower propensity to seek dental care services.

3.2 Methodology

From an analytical perspective, this study first concentrates on the analysis of contingency tables. This approach will draw together information on dental care utilization by selected factors which are believed to have an influence on utilization patterns. This preliminary descriptive analysis will enable us to derive plausible relationships between utilization of dental care services and some of its determinants. Such relationships will then be verified statistically.

For this purpose, measures of association such as chi-square, correlation coefficients, t-statistics and others will be considered. To pursue the statistical analysis further, a discriminant analysis technique was selected. This approach was selected for several reasons. First, one objective of such a technique is to develop several linear combination of variables that are believed to maximize the statistical differences between users and non-users of dental care services. Second, the weighted regression coefficients may be used to assess the direction of relation between the dependent variable (use or non-use of dental services) and a set of explanatory variables. The regression coefficients may also be used to assess the significance of the relationship and the relative importance of each predictor (or group of predictors) to the discriminant function. Third, the complex sample design of the Canada Health Survey requires the use of multivariate techniques that accomodate differential probabilities of inclusion in the sample. For that reason, standard computer packages such as S.A.S., S.P.S.S., B.M.D.P.[7] can only be used to estimate the weighted regression coefficients. Any test of significance (F-test or T-test) is meaningless with these packages for CHS data, because the algorithm of these packages do not take into account the design effect of the Canada Health Survey.

---

[7] S.A.S.: Statistical Analysis System S.P.S.S.: Statistical Package for the Social Sciences; B.M.D.P.: Biomedical Computer Programs.

The Institutional and Agriculture Survey Methods Division of Statistics Canada developed an in-house software program capable of accounting for the complex sample design in the derivation of the F and T-tests of statistical significance.[1] This program enables us to rely on estimation techniques such as multiple regression analysis, discriminant analysis and logistic regression.

Many of the variables selected for this sudy were assigned a nominal scale of measurement. Since the numbers assigned to categories of a nominal scale are not assumed to have an order and unit of measurement we had to create a set of "dummy" variables in order to treat each category of a nominal variable as a separate variable. Consequently, all observations were assigned an arbitrary score of zero or one, depending upon their presence or absence in each category of the "dummy" variable. By assigning metric values of 1 or 0 to our variables, were are then able to treat them as interval level variables suited for regression analysis. This technique of regression analysis with "dummy" variables is widely known and commonly used in social reasearch (Younger, 1979).

Of importance in the interpretation of the results, is the method of treating non-responses to specific questions of the survey. For this matter, the rate of non-response of the Canada Health Survey varies with the interview component. As a general guideline, for this study, if a response was unknown, a value of zero was assigned to the corresponding explanatory variable. This alternative was selected over the deletion of the entire observation because we wished to maintain a larger sample size, and also because we felt that it was important to keep some information on other explanatory variables that would have been deleted otherwise. However, when the rate of non-response appeared to be significantly high (more than 5%), the unknown group was categorized as a "dummy" variable and entered as such in the regression equation. Finally, non respondents for the dependent

[1] This computer program consists of a combination of several S.A.S. procedures, SUPERCARP (Consistent Asymptotic Regression Program, developped at Iowa State University) procedures, S.A.S. and PL/1 computer languages. This software consists of a set of multivariate programs that permit a weighting of observation in accordance with the reciprocal of the sample inclusion probabilities.

variable (use or non-use of dental services) were simply deleted from the data file, as it was impossible to impute for them. Although the influence of this approach is not known with certainty, it is suggested that the net effects are negligible, and that the reduction in the sample size (178 cases out of 31,668 were deleted) does not impeed upon the number of degrees of freedom for statistical analysis.

Chapter 4

DATA SOURCES AND LIMITATIONS.

4.1 Canada Health Survey (C.H.S.)

For the most part, data for this study were derived on an individual basis from the Canada Health Survey. This survey, conducted from March 1978 to March 1979, was designed to gather information on the socio-demographic and economic characteristics, health risks, health status, and health problems and their consequences of the Canadian population. It was anticipated that the findings of the survey would also be useful in the areas of health care planning, health promotion and disease prevention. The richness of the information derived from the C.H.S. enables researchers to examine such things as the determinants of the use of health care services, to conduct epidemiological studies and helps planners to identify groups at risk or affected by ill health. The experience of doing the survey is also useful to local agencies which may wish to undertake their own health surveys.

4.1.1 Survey Methods.

With the exception of individuals residing in the Yukon, Northwest territories, Indian Reserves and remote areas, the C.H.S. covered all of the non-institutionalized Canadian population. In total these exclusions represent approximately 3% of the total Canadian population.

The broad scope of information collected via the C.H.S. required the use of a wide range of survey methods and data collection instruments and measurements. In general, the survey was comprised of essentially two components: the interview and the physical measures questionnaire.

The Interview component was made up of three questionnaires. The first of these consisted of the Household Record Card (HRC), which was designed to collect information concerning the dwelling unit (the basic sampling unit of the survey), as well as the information concerning the individuals residing there.

The second form of the Interview component was named the Interview Administered Questionnaire (IAQ). The information collected via this method often required probing by a trained interviewer and was provided by the respondents themselves or by an informed household member (proxy). The IAQ component contained questions pertaining to short term disability, health care utilization, accidents, drug use, activity limitation, dental, hearing and vision problems, chronic health problems, and some demographic information such as income, marital status, employment status, language and geographic location. Health problems identified by selected health behaviours or consequences were probed in a separate section. The Interview Administered Questionnaire was completed in 10,571 dwellings, resulting in a total sample size of 31,668 persons and a response rate of 86%.

The third part of the Interview component consisted of a self administered questionnaire known as the Lifestyle and your Health Questionnaire (LHQ). Since the data to be collected via the LHQ questionnaire were considered sensitive, it was left with the individual to be answered, without the presence of an interviewer. This component was designed to collect information concerning Canadians' emotional and physical health, family's medical history, physical and alcohol consumption experience, transportation and seatbelt usage, along with certain demographic characteristics. The population eligible to complete this questionnaire consisted of those individuals, 15 years of age and older, who were originally selected for the IAQ component. This selection resulted in a total sample of 23,791 persons, and was completed by 87% of this group.

The second component of the Canada Health Survey, called the Physical Measures Questionnaire (PMQ), was divided in two parts. The first part included physical measure-

ments of the respondents' height, weight, blood pressure, skinfold, and cardiorespiratory fitness. The second part consisted of the collection of blood samples in order to determine the immune status as well as biochemical and trace metal levels.

Because of the special training required for measurements, costs of the instruments, transportation costs for the blood sample, laboratory procedures, etc., the PMQ component was, by far, the most expensive component of the C.H.S. For these reasons, the sample for the PMQ was approximately one third of the IAQ sample, that is 8,486 persons. The response rate here was 72%.

4.1.2 Sample Design.

Since the Canada Health Survey was intended to be a continuous monthly survey with an annual cycle, the sample design was developped on that basis. The Interview component (I-type) was provided to all sampled households, while the Physical Measures component (P-type) was given to a further subsample of dwellings. The sampling methods consisted of a multi stage sampling design utilizing systematic sampling techniques, probability proportional to size and simple random sampling.

The required annual sample size for the I-type component was to be 12,000 households, resulting in a total of approximately 40,000 respondents. As planned, this sample was to be drawn from 100 geographical clusters in monthly samples of 10 households per clusters. The 100 clusters were allocated to the provinces in proportion to the square root of the 1971 Census provincial estimates. Because of their size, Quebec and Ontario were further divided into three sub-regions, defined in terms of contiguous health regions. For these two provinces, cluster allocation was distributed in accordance with the square root of each subregion's population.

Within each province (and subregion for Quebec and Ontario), three major strata, which represented major cities, other urban areas and rural areas, were formed. The first stratum comprised 11 major cities, the population of which were large enough to allow the allocation

of at least two clusters per stratum. The second stratum consisted of cities classified as Canadian Labour Force Survey self-representing units. Cities were selected on the basis of probability proportional to size (PPS) systematic sample for each province (or sub-region). Each selected city was allocated one cluster.

All other areas not in stratum 1 or 2 were allocated to stratum 3. The selection of a rural stratum was made on the basis of a simple systematic sampling of 1971 Census Area Aggregates (AA) (the equivalent of a census tract: 4,000 to 7,000 persons).

The further stages of selecting households were identical for strata 1 and 2. Within these strata, cities were divided into an area and apartment frames. In the area frame, a systematic sample of clusters was taken at one stage, while a simple systematic sample of households was taken at another stage. In the apartment frame, a PPS systematic sample of apartments and buildings was first taken, followed by a simple systematic sample of apartments.

In the rural stratum, each selected Census Area Aggregate (AA) was further split into three Enumeration Areas (EA), with one of these three being selected at random. The last stage of sampling consisted of the simple systematic sampling of households within a cluster, each of which represented a twelfth of the EA's selected at the second stage of sampling.

Because of the high costs related to the P component of the survey (Physical measures and blood tests), it was decided to include only 50 clusters to the provinces and major strata. The allocation was done analogously to the allocation of the 100 clusters, as described above. Since it was not possible to account for a minimum of two clusters for the P-component, the estimation of sampling error required the collapsing of strata.

4.1.3 Data limitations

Because the probability of being selected was different for each household, weights were assigned to each household, in order to provide estimates at the provincial and national levels. The same weight was assigned to all respondents within the same household. These weights which are the reciprocal of the probability of selection were further adjusted within a

Province–Age–Sex group, based on population projections. However, since the weighted data of the Canada Health Survey are only scientific estimates of some population's parameter, the chance always exists that these estimates might not have the desired degree of accuracy.

The degree of precision of the estimates are determined by sampling and non-sampling errors. Sampling errors occur because not every unit in the population was selected, hence leading to a degree of uncertainty in the population estimates. The magnitude of this error can be calculated from the sample. In a study conducted by Praught in 1981, it was shown that there was a strong correlation between high sampling error and and small sample size (Praught, 1981). Consequently, data with relatively small sample sizes have to be treated cautiously and sometimes cannot be broken below a certain cell level (e.g., national aggregates).

While every effort has been made to minimize non-sampling errors, these will almost always be present due to deficiencies in coverage, measurement, non-response, processsing and estimation. Non-response errors are easier to identify, and it was decided to adjust for them whenever possible. Adjustments were made for non-response at the dwelling level for those who provided answers only on the Household Record Card; and for those who responded to the IAQ component but did not provide response to the LHQ, PMQ or Blood component of the survey. No adjustments or imputations were made for partial non-response within a form (e.g. one section of a questionnaire), or for non-response at a variable level.

4.1.4 Data on dental care

Information pertaining to dental care was derived from three parts of the Interview Administered Questionnaire (IAQ) of the Canada Health Survey. In the first part, which dealt with health care utilization, respondents were probed on their contacts with several health professionals (one of which was a dentist) during the last two weeks. For those indicating a contact, further information was asked about which health professional was visited most recently.

where the visit took place and the reason for the visit. Of primary importance to this study is the information derived from the "health care utilization in past twelve months" section.[9] This section provided data on the number of times each individual saw or talked to a dentist during one full year.

The IAQ component also provided data on family's dental health, hearing and vision status. This section contained information on orthodontics and on the difficulty or discomfort respondents experienced with their teeth, gums, dentures or plates.

Finally, throughout the entire IAQ questionnaire, Canadians were probed on specific health problems and some of their consequences (disability days, drug use, etc.). One of these health problems specifically related to dental trouble as manifested by the respondents.

4.1.5 Some specific problems and limitations.

While the Canada Health Survey was designed and successfully implemented to fill gaps between existing and desirable information for health planning and research at a broad level, there are serious limitations with respect to the dental care section.

Unlike the situation vis-a-vis hospital and physician services in Canada, many individuals are still bearing the direct financial responsability for diseases of the teeth. It is important to obtain data not only on dental care utilization, but also on the characteristics of existing dental care insurance plans (private or public), in order to understand more completly the impact of insurance coverage on utilization patterns. Unfortunately, since the Canada Health Survey does not provide such information, we had to derive crude measures (age group, percentage distribution, etc.) as surrogates for those with dental care insurance.[10]

---

[9] For the details consult the CHS questionnaire attached to appendix 2.

[10] The consequences of this omission are even heavier in this study of the determinants of dental care utilization. Based on the experience of universal health insurance in Canada, it is felt that dental care insurance coverage might have a determining impact on the use or non-use of dental services. (Manga, 1978; Broyles et al., 1983).

Due to the complexity of the sample design and because of the way in which data were processed for computer-readable files, the linkage of individuals into family records represents a very complex and to a certain extent, biased procedure. This difficulty seriously hampers any attempt to analyze CHS data at the family level. The extent of this problem is even more significant when one considers that health, in general, is not only an individual matter, but also an increasing family concern.

In the elaboration and design stage of the Canada Health Survey, it was proposed that some measure of dental health status be included with the Physical Health Section of the survey. However, because of cost and time restrictions, it was decided that, since the measurement of dental health requires a well trained observer (even for a simple DMF index), the proposal for a dental health status indicator would be excluded from the survey.[11] Consequently, no physical measure of Canadians' dental health status (other than the self-reported dental health problem) was available via the CHS.

Finally, data on items such as the public's awareness concerning publicly funded dental care programs, costs of private insurance, family expenditures on dental care, oral health education, prevention and practices, all of which could be determinants of dental health status and dental care utilization patterns, were not collected by the Canada Health Survey. We realize that such items fall beyond the general scope of a national health survey, and would probably be best suited for a national dental survey.

4.2 Other Sources of Data

4.2.1 Data on Publicly Funded Dental Care Programs

Information pertaining to the number of people eligible for coverage, type of service, provider and setting, number of services and expenditures for each different provincial dental programs, was derived from Stamm's comprehensive report on dental care programs in Canada

[11] Canada Health Survey Exclusions, Working Paper Series, 1976, #76-1, p. 23.

(Stamm et al., 1984).

The data for the Stamm report were obtained from interviews with all provincial senior dental consultants.[11] Furthermore, valuable information in the form of statistical summaries, periodic reports, special studies, annual statistical and financial reports were obtained via the provinces' administrative data files.

For the most part, data furnished by publicly funded dental care treatment programs were quite accurate (Stamm et al., 1984, p. 7). However the same high quality data were not available for some prevention oriented programs because such data are not always accumulated in a routine manner. Other limitations include difficulties in obtaining longitudinal data because of the level of aggregation of the data.

4.2.2 Data on Private Group Dental Plans

The Stamm report on dental care programs in Canada also contains useful information pertaining to private dental plans. Since one of the requirements of our study was to obtain estimates of the proportion of the population enrolled in private dental plans in each province, further information such as enrolment, benefits, dental services, administration and costs was also derived from Stamm's work.

Data on private sector group dental plans were derived from the National Dental Insurance Survey conducted in 1982. For this survey, carriers were identified as the sampling unit rather than plan sponsors, because it was expected that carriers represented the best source of information on coverage, utilization, benefits and expenditures for the plans they offer (Stamm et al., 1984, p. 213). Three types of carriers were identified as organizations offering group dental coverage: Insurance companies, Cooperatives and Blue Cross plans, and others. Fifty six carriers were selected for sampling, 48 of which responded to the survey.

---

[11] The Survey was conducted in 1981, and since most of the data were already in summarized form, they did not require much further editing or reduction.

In general, the quality of the data available varied widely among the carriers. At the extreme, informed estimates were preferred to no data at all, thus requiring cautious interpretation of the data. However, for the purposes of our study, crude estimates on the number of Canadians enrolled in private dental plans were deemed sufficient for analysis, and in any case was the best that could be done under the circumstances.

4.2.3 Data on Dental Manpower

Provincial estimates on the number of practising dentists were obtained from the Health Manpower Inventory of 1983 (Health and Welfare Canada, 1984). More detailed information for the community level were obtained from the 1981 Census data files. These estimates were preferred to the 1971 estimates because 1981 represents a closer time period for purposes of comparisons with CHS data (1978-79). Population estimates and counts of dentists by place of work were produced at the Census Subdivision level. This can be problematic, especially at the rural level, since some of the smaller communities selected for the Canada Health Survey only represent an area of a Census Subdivision. In such cases, the Census Subdivision in which this community is located was used as a a proxy to estimate the population and count of dentists.

4.2.4 Data on Water Fluoridation

Data on water fluoridation were obtained from a report published in 1978 by Health and Welfare Canada, entitled :"Fluoridation in Canada as of December 31, 1976 " (Health and Welfare Canada, 1977). The report was prepared by staff of the Bureau of Chemical Hazards (Health and Welfare) from data collected and provided by the Canadian Dental Association. This publication provides information on municipal and other water systems and the population actually supplied by each system. The information provided in the report gives a comprehensive list of municipalities with naturally occurring fluoride or with adjusted fluoridation at or near the level recommended for ensuring good dental health. This infor-

mation was matched to the list of municipalities selected for sampling in the Canada Health Survey. Although these data were produced for the 1976 period, it is felt that they were a reasonable reflection of the 1978-79 period (year of the CHS), given that the percentage of population consuming fluoridated water in Canada has not changed from 1976 to 1980. In fact, the comparability of the 1976 estimates with the 1978-79 period is only problematic for the provinces of Quebec and Saskatchewan. Indeed, from 1977 to 1980, Quebec was the only province observing a rise in the number of communities with controlled fluoridated water; while Saskatchewan incurred a decrease in the number of communities with controlled fluoridation. (Canadian Dental Association, 1980).

Chapter 5

DESCRIPTIVE ANALYSIS OF DENTAL CARE UTILIZATION

5.1 Introduction

The present chapter represents a quantitative description of dental care utilization by selected variables. As described in the conceptual framework, utilization will be measured in terms of users and non-users.

Text and analyses are derived from the tables displayed at the end of this chapter. These tables, obtained through Canada Health Survey data files, illustrate percentage utilization rates by selected variables. As indicated in the section dealing with the conceptual framework, percentage utilization rates of dental care services will be analyzed by predisposing, enabling and need factors.

5.2 Utilization by province.

The data provided by the Canada Health Survey indicate that 50.1% of Canadians visited a dentist at least once in 1978-79. Highest utilization rates were observed in Ontario (56%) and British Columbia (55%); while only 30 percent of respondents in Newfoundland utilized dental services (figure 2). On average, the residents of British Columbia were the greatest users with 1.4 visits per capita. At the other extreme, people in Newfoundland averaged less than one (.6) visit to the dentist. The average number of visits reported in all other provinces did not fluctuate significantly around the Canadian average of 1.1 dental visits.

Those Canadians who were users of dental care services in 1978-79, made, on average, two annual visits to their dentist (the actual average being 2.2). In all provinces the mean number of visits per user was very close to the national average of 2.2. The nature of these

findings suggest that, once an individual accesses the dental care system, the volume of care that this individual will consume will likely be the same as other Canadians who use dental care services, regardless of the different provincial delivery mechanisms.

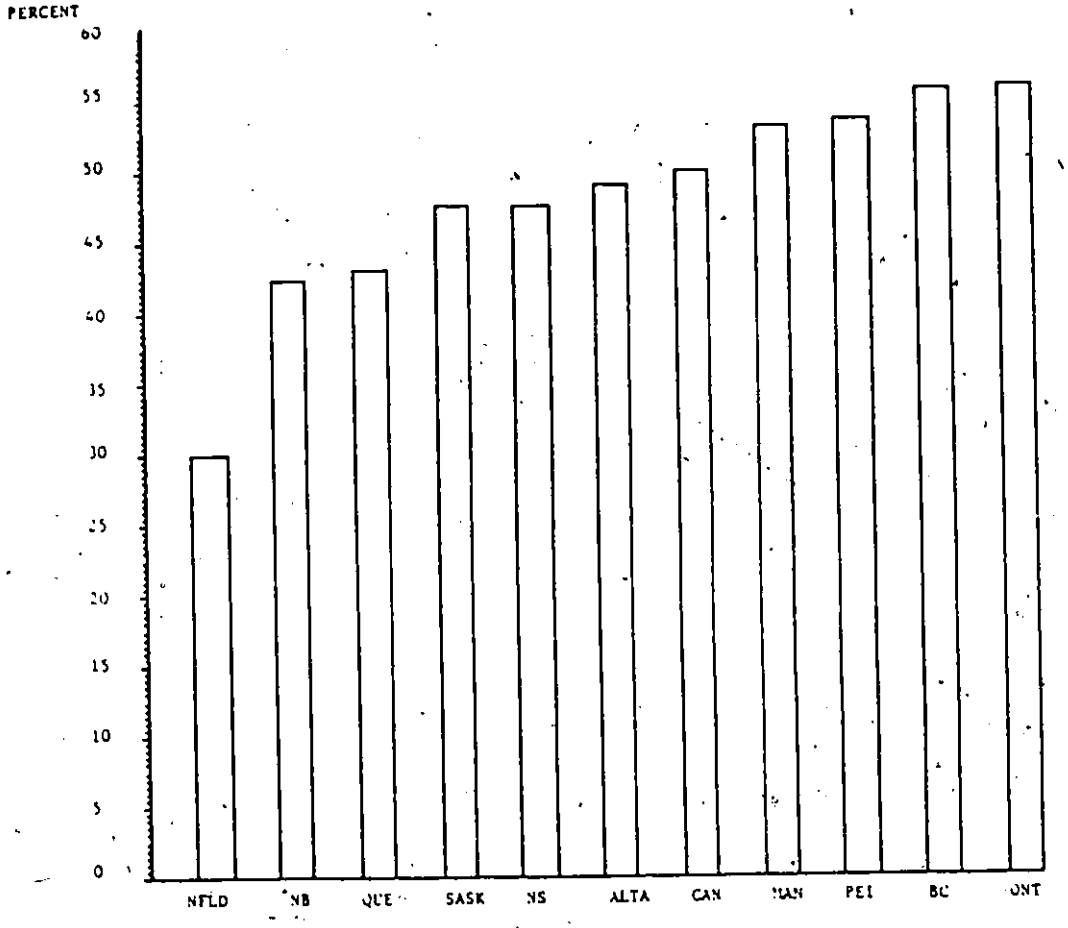


Figure 2 Percentage of the Population Making at Least One Dental Visit, Canada and the Provinces, 1978–79.

5.3 Predisposing Factors

5.3.1 Utilization by age

The analysis of dental care utilization by age group reveals one major trend: a significantly greater proportion of Canadians in the lower age groups (5-9; 10-14) visited a dentist at least once, in 1978-79, compared to those in the older age groups (15 and over). As previous research has shown, the utilization rates of dental care services in Canada tend to decline, as age increases.

Figure 3 shows that the relationship between utilization and age takes the form of an inverted J. Such a relationship is different from the traditional inverted "U-shaped" curve, reported elsewhere in the literature, especially in the United States. In part, this can be explained by the existence of provincial dental care programs aimed at children in Canada.[13]

Higher utilization rates for children reflects their greater need for dental care, particularly since dental caries and tooth decay are highly prevalent among children. This is also true of young adults relative to the older age groups (Lewis, 1973; Health and Welfare Canada, 1978).

The analysis of dental care utilization by age group at the provincial level reveals some interesting findings. The trends observed at the national level (i.e. utilization decreases as age increases), are also applicable to most provinces; with few exceptions (table 15). In Ontario and British Columbia, a greater proportion of people in the 25-39 and 40-54 age groups were users, compared to young adults (20-24). What is particular about Ontario and British Columbia, is that in 1978-79, these two provinces had the highest enrolment rates in private group dental plans (table 8). Since these private group dental plans are mainly employment based, and that the 25-54 age group represents the majority of the labour force in these two

---

[13] At the time of the Canada Health Survey (1978-79), seven Canadian provinces actually provided some type of publicly funded and operated dental care plans for children. These provinces were: Newfoundland, Prince Edward Island, Nova Scotia, New Brunswick, Quebec, Manitoba and Saskatchewan. See Appendix 1.

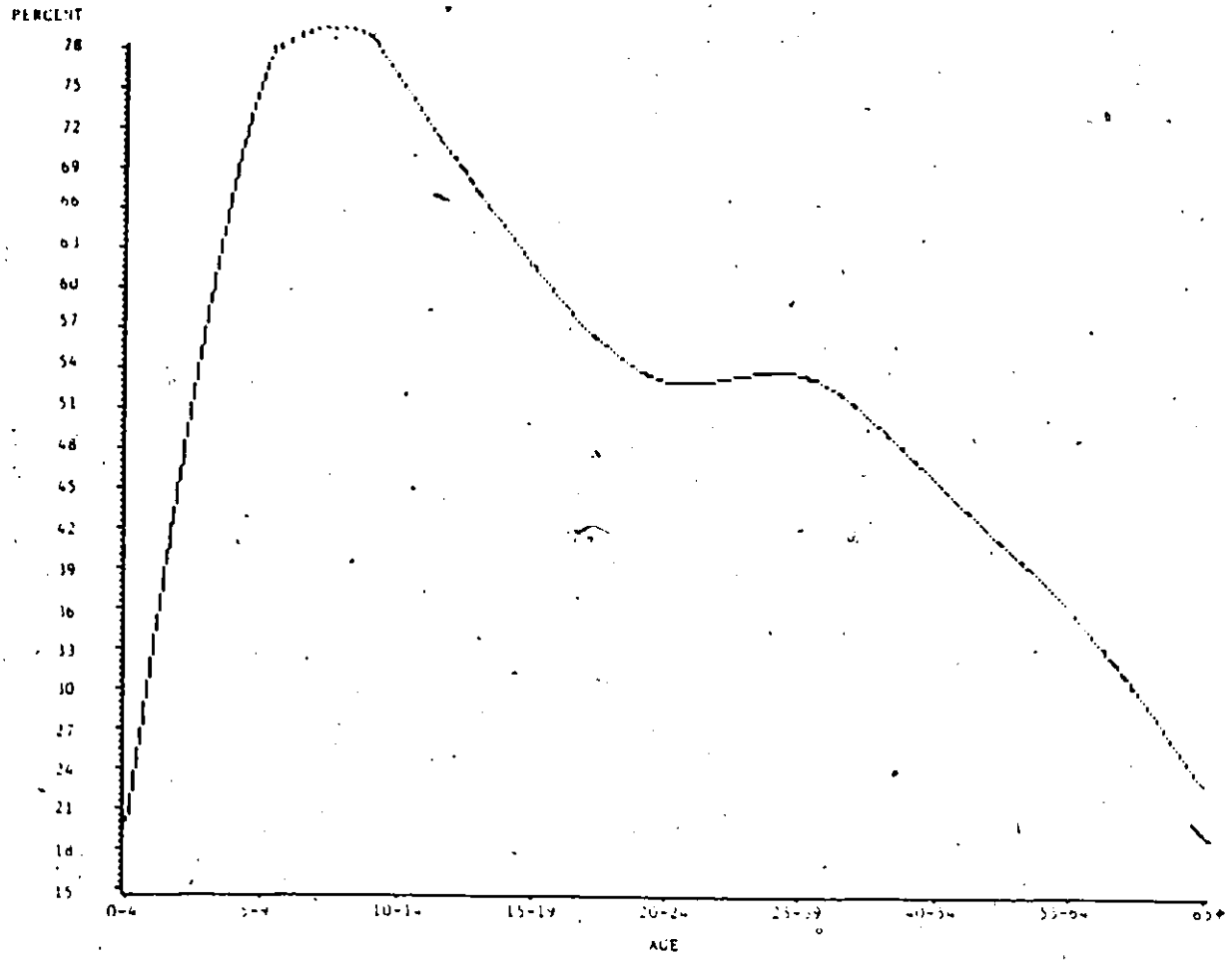


Figure 3

Percentage of the Population Making at Least One Dental Visit, by Age Group, Canada, 1978-79.

provinces[14] it is quite likely that a greater proportion of those individuals may have dental insurance coverage, and therefore exhibit a greater propensity to seek dental care.

In those provinces with universal age-specific public dental plans, children in the specific age group eligible for coverage, constantly showed higher utilization rates, compared to all other age groups (table 1).

[14] In 1979, approximately 63 % of British Columbia and Ontario's labour force was in the 25-54 age group. Source: Statistics Canada, The Labour Force, 1979, catalogue 71-001.

Table 1

Percentage of Children Making at Least One Dental Visit, in Those Provinces with a Children Dental care Plan, by Selected Ages, 1978-79.

Province	Age group eligible for coverage	use %	Other age groups	use %
Manitoba	5-9	75%	0-4; 10 +	51%
Newfoundland	0-12	32%	13-65 +	29%
Nova Scotia	0-12	56%	13-65 +	45%
Prince Edward Island	3-13	84%	0-2; 14 +	46%
Quebec	0-13	56%	14 +	39%
Saskatchewan	3-13	84%	0-2; 14 +	39%

In 1978-79, Prince Edward Island and Saskatchewan were the only two provinces which provided free dental care to their children in school-based clinics. The utilization rates displayed in table 1, were considerably higher for eligible children in Saskatchewan and Prince Edward Island, compared to eligible children in other provincial plans. These data confirm the net advantage of a school-based public dental care program over a private-based insurance-type public program, in attaining higher utilization rates.

An interesting observation concerning utilization by age, is in the province of Alberta. Unlike other provinces, Alberta provides an age-specific dental plan aimed only at the elderly (65 years of age and older), and their dependents. Yet, only 26 percent of Albertans in that age group visited a dentist in 1978-79. Compared to other provinces, Alberta ranked third in terms of utilization rates for this age group, after Ontario (31%) and Manitoba (28%) (Table 15).

To explain the relatively low utilization rates by the elderly in Alberta, Stamm (1984) suggests that the present generation of elderly may place lower values on oral health, and may represent a large proportion of endentulous persons. Consequently, people in that age group might expect and use less of the dental care system. It may also be assumed that,

since Alberta's dental services are provided in private setting, accessibility and transportation may constitute serious barriers to seeking dental care.

5.3.2 Utilization by sex

Generally, the findings of the Canada Health Survey reveal that more women (52%) visited a dentist than men (48%). Only in the provinces of Prince Edward Island and Nova Scotia were men greater users of dental services (figure 4). Again, the highest consumption rates were observed in British Columbia and Ontario where approximately 58 percent of the female population and 54 percent of men visited a dentist. The lowest utilization rates for both sexes were observed in Newfoundland, where only 28.5 percent of men and 32 percent of women were users.

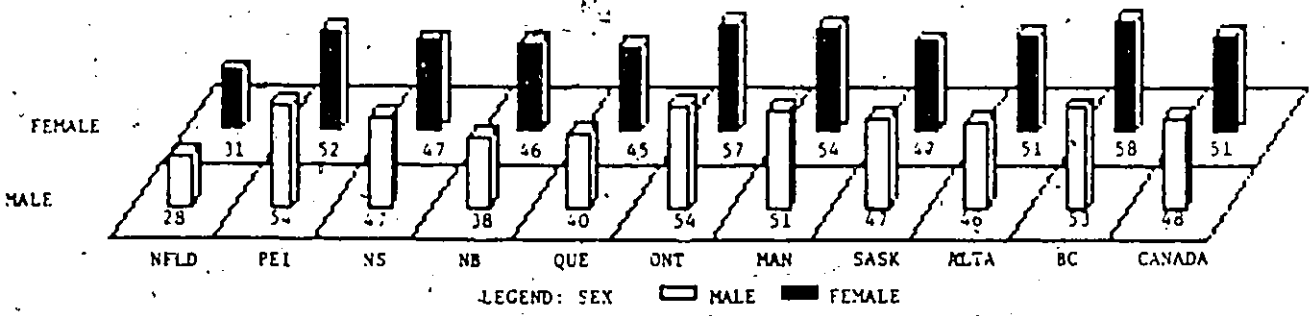


Figure 4

Percentage of the Population Making at Least One Dental Visit, by Sex, Canada and the Provinces, 1978-79.

5.3.3 Utilization by Education

The findings of the Canada Health Survey confirm the direct association between education and dental care utilization. Indeed, figure 5 illustrates the increasing utilization rates, as the level of education increases. Less than 46 percent of Canadians with some secondary education or less visited a dentist at least once in 1978-79. Meanwhile 72 percent of Canadians with a graduate degree were users of dental care services during the same period (Table 17).

With few exceptions (New Brunswick and Saskatchewan), these trends were highly consistent in all provinces. The lowest rates were observed for less educated people in Newfoundland (26%); while British Columbians with higher levels of education exhibited the highest propensity to seek dental care (81%).

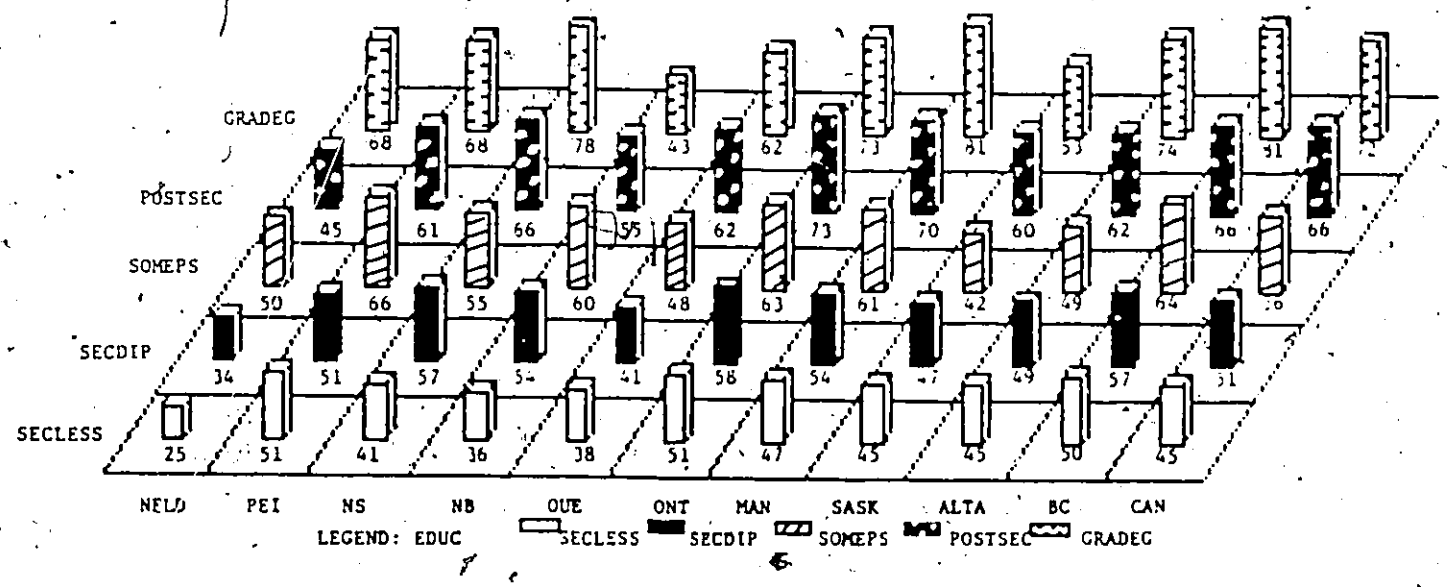


Figure 5

Percentage of the Population Making at Least One Dental Visit, by Education, Canada and the Provinces, 1978-79.

Given that there is usually a strong correlation between education and income, it could be argued that those individuals with more education are likely to be high income earners. The rationale continues that these people probably have more purchasing power, and, hence, will be in a better position to afford the costs of dental treatment. Furthermore, it seems reasonable to assume that better educated people might be better informed and more aware of the consequences of poor oral health, and therefore of the ways and means of preventing it.

5.3.4 Utilization by Marital Status

The utilization rates of dental care services by marital status present a highly consistent trend at both the national and provincial levels. Single individuals reported the highest consumption rates (58% were users at the national level). Married persons, 45 percent of whom visited a dentist at least once, ranked second in terms of percentage utilization. Finally, only 35 percent of widowed, divorced or separated Canadians were users of dental care services in Canada, in 1978-79. (figure 6).

It could be argued that the higher utilization rates by single people might be a reflection of the fact that, by definition, children are also included in that group. As was observed previously, Canadian children tend to be higher consumers of dental care services. Therefore it is possible that their inclusion in the "single" group may inflate the utilization rates for that specific group.

In order to verify this assumption, it was decided to examine dental care utilization patterns of single individuals fifteen years of age and older, and to compare these patterns for the sample of single individuals. The results of this analysis are presented in table 2.

The analysis of dental care utilization by single individuals fifteen years of age and older reveals that, single Canadians are still the highest consumers, when compared to married and separated/divorced or widowed individuals. In fact, the findings reported in table 3 suggest that, utilization by children significantly inflates the rates for single people, only in provinces

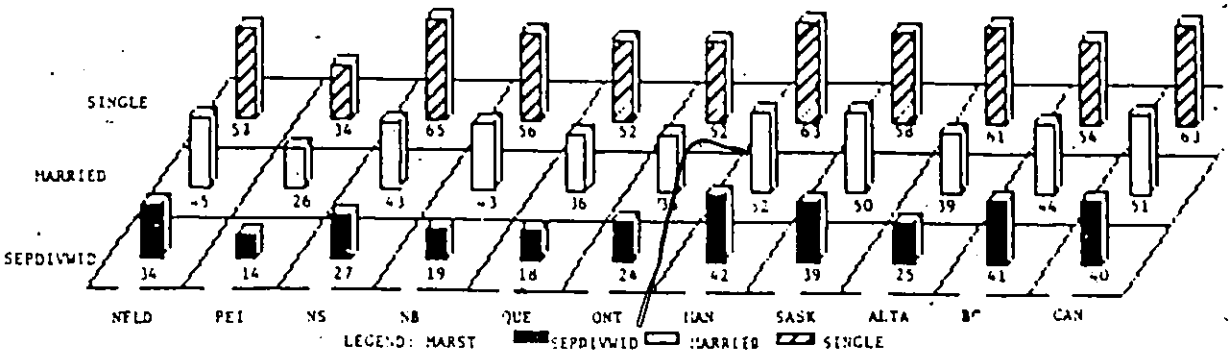


Figure 6

Percentage of the Population Making at Least One Dental Visit, by Marital Status, Canada and the Provinces, 1978-79.

Table 2

Percentage of Single Individuals who Visited a Dentist at Least Once During the Year, for two Samples, Canada and the Provinces, 1978-79.

Province	Single: Total Sample N= 23,023,000	Single: Age > 14 N= 17,492,000
Newfoundland	34.5 %	34.9 %
Prince Edward Island	65.2 %	57.5 %
Nova Scotia	56.5 %	56.6 %
New Brunswick	52.7 %	57.5 %
Quebec	52.7 %	47.7 %
Ontario	63.1 %	65.4 %
Manitoba	58.2 %	58.1 %
Saskatchewan	61.3 %	53.6 %
Alberta	54.6 %	57.3 %
British Columbia	63.8 %	61.7 %
Canada	57.8 %	57.0 %

which offer a publicly funded children dental care plan in school-based clinics (Prince Edward Island and Saskatchewan). Otherwise, children' s utilization does not appear to have an influence on overall higher use by single Canadians. These findings are consistent with research reported in the literature (Evans and Williamson, 1978).

5.3.5 Utilization by Family Size

Figure 7 illustrates that the utilization of dental care services by family size present the form of an inverted U. Actually, the curve is not a perfect inverted U, because of an upward trend for families of eight. This disruption in the decline is mainly caused by higher sampling variability observed in larger families. Thus, the estimates for family size 7 or more could be unreliable, because of sampling error.

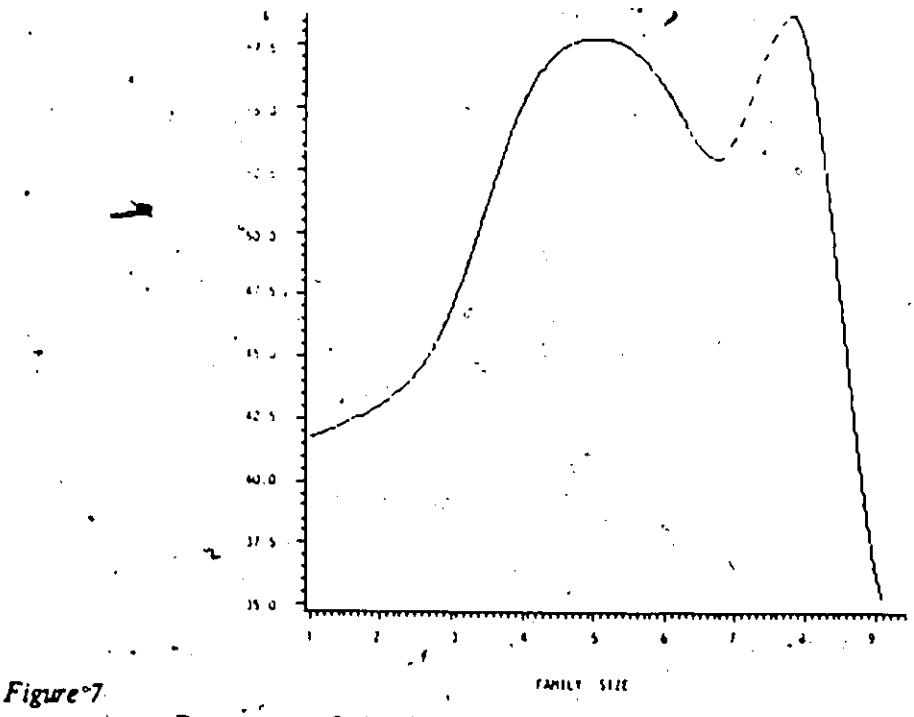


Figure 7 Percentage of the Population Making at Least One Dental Visit, by Family Size, Canada, 1978-79.

The rates slowly increase up to five members in a family, and then progressively decline. These findings are comparable to the ones previously reported by Health and Welfare (1971), Leverett et al. (1977) and Bullen (1982), in which the relationship between utilization and family size presented the inverted U shape, with peaking rates for families of four and five.

5.3.6 Parental influence and children's utilization

Data reported in table 3 suggest that, in Canada as a whole, a greater proportion of children (70 %) belonging to mothers who visited a dentist at least once, were also users of dental care services. In contrast, only 49 percent of children who belonged to non-user mothers made at least one dental visit during the year. These statistics suggest that the mothers' dental habits may exert an influence on their children' s oral health behaviour. There are of course other plausible explanations as well. Children with mothers who have poor oral health may themselves have poorer oral health, and hence exhibit a greater need for care. These children may visit a dentist, while their mothers remain non-users.

Table 3

Percentage of Children and Mothers who Visited a Dentist at Least Once During the Year, Canada, 1978-79.

Children	Mother	
	Non-Users	Users
Non-Users		
No.	1,741,754	1,006,778
percent	51.17%	29.54%
Users		
No.	1,661,526	2,401,242
percent	48.83%	70.46%
Total		
No.	3,403,280	3,408,018
percent	100.00%	100.00%

The idea embodied in table 3 may be influenced by the existence of provincial children dental plans. It is quite likely that denticare plans might increase the utilization for children, irrespective of their mother's dental health habits, especially for those plans which provide dental care in school-based clinics. This can be explored by examining children and mothers' dental care utilization at the provincial level.

Table 4 reveals that, in those provinces with universal children dental care plans, the percentage of "child-user and mother user" is lower than the percentage of "child-user and mother non-user" with the exceptions of Nova Scotia and Saskatchewan. This situation is however reversed in those provinces with non-universal children dental care plans, where the proportion of "child and mother user" is constantly greater than the proportion of "child user and mother non-user". Furthermore, in those provinces with no such plans (Alberta, Ontario and British Columbia), there were, on average, twice as many children who visited the dentists, when the mothers also received dental care.

It appears that parental influence has a major impact on their children's dental health practices (as measured by their use or non-use of dental services). This effect is significantly more pronounced in provinces with no or limited children dental care plans (Ontario, B.C., Alberta, New Brunswick and Manitoba). In provinces with such plans, it seems that parental influence is moderately to largely attenuated by the school or dental plan's influence on dental behaviour.

Table 4

Percentage of Children and Mothers who Visited a Dentist at Least Once During the Year, by Type of Children Dental Plan, by Province, 1978-79.

Province and type of Plan	Percentage of child user and mother non-users	Percentage of child user and mother user
Universal plan		
Quebec	54%	46%
Newfoundland	60%	40%
Nova Scotia	44%	56%
Prince Edward Island	54%	46%
Saskatchewan	49%	51%
Non-Universal Plan		
New Brunswick	42%	58%
Manitoba	34%	66%
No Children Plan		
Alberta	38%	62%
British Columbia	33%	67%
Ontario	33%	67%

5.3.7 Utilization and Preventive Health Behaviour

As was described in the conceptual framework (chapter 2), the preventive index was constructed to estimate the relative predisposition of an individual towards preventive health in general. The higher the score, the greater the likelihood that a respondent may be positively involved in preventive health habits. The findings of the Canada Health Survey indicate clearly that an individual with positive health behaviours will also be more likely to visit a dentist. In fact, the numbers reported in table 5 suggest that those Canadians with no or a very low predisposition towards preventive health (a score of zero) will be least likely to visit a dentist (76% of this group were non-users). At the other end of the scale, Canadians with a very strong predisposition towards healthy life styles, will exhibit a much greater propensity to seek dental care services (70% of this group were users).

Table 5

The Use or Non-Use of Dental Care Services by Preventive Health Score, Canada, 1978-79.

Preventive Index Score	Non-user (0 visit)	User (1 + visit)	Total
	in thousands		
0			
no.	646	202	848
%	76%	24%	100%
1			
no.	2,960	1,995	4,995
%	60%	40%	100%
2			
no.	1,529	1,235	2,764
%	55%	45%	100%
3			
no.	1,174	1,151	2.325
%	50%	50%	100%
4			
no.	478	594	1,072
%	45%	55%	100%
5			
no.	770	828	1,598
%	48%	52%	100%
6			
no.	483	642	1,125
%	43%	57%	100%
7			
no.	669	863	1,532
%	44%	56%	100%
8			
no.	410	665	1,075
%	38%	62%	100%
9			
no.	28	65	93
%	30%	70%	100%

5.4 Enabling Factors

5.4.1 Utilization by Income

The findings of the Canada Health Survey confirm the strong and positive association between dental care utilization and income in Canada. The data displayed in table 19 indicate that 39 percent of Canadians in the lowest economic income quintile visited a dentist at least once in 1978-79. Meanwhile, more than 60 percent of Canadians in the highest income quintile were users of dental care services during the same period. This trend was consistent throughout most provinces (figure 8).[1]

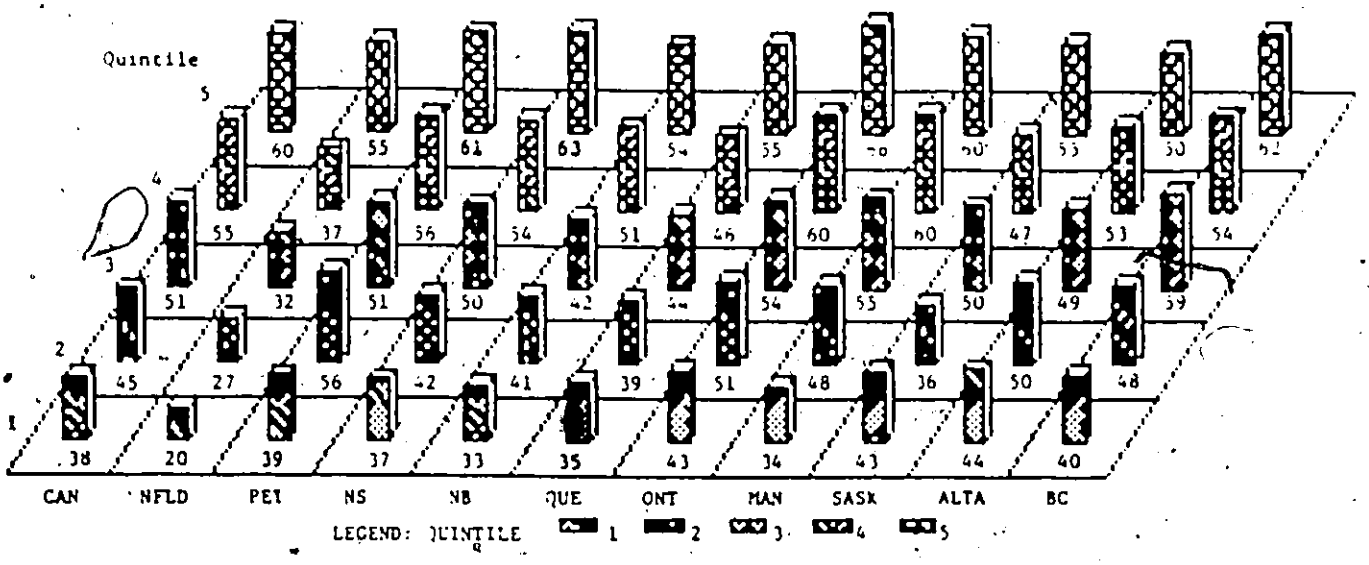


Figure 8

Percentage of the Population Making at Least One Dental Visit, by Economic Family Income Quintile, Canada and the Provinces, 1978-79.

The analysis of dental care utilization by income at the provincial level reveals interesting findings, and also raises several questions about the various delivery mechanisms. In all provinces, high income earners (people in the fifth quintile), exhibited higher utilization rates than the overall Canadian rate of 50.1 percent. The smallest discrepancies between low income earners and high income earners were observed in Alberta; while the highest inequalities in utilization between the lowest and highest income quintiles were found in Newfoundland. (Table 19).

Interestingly, Saskatchewan was the only province where people in the lowest income quintile were not the lowest users of dental care services. Rather, the lowest rates were observed for individuals in the second quintile. Unlike most other provinces, Saskatchewan does not show a constant increase in utilization, as income increases. The association is somewhat marked by significant fluctuations from one quintile to the other.

[1] The income quintiles were derived from the national average income. Therefore, the cut-off points between quintiles at the national level are not an exact reflection of what they would be for each province, taken individually. Consequently, grouping individuals at the provincial level by quintiles which were derived on a nationwide basis, may create some under or over sampling in the provincial distributions. In fact, the estimates from the CHS reveal that a higher proportion of people living in the eastern provinces were found in the three lowest quintiles, compared to a higher proportion of westerners in the highest quintiles (the quintiles being derived from the national average, refer to table 22). These provincial imbalances in the distribution of individuals by income quintile may account for some fluctuations of dental utilization by income at the provincial level.

5.4.2 Utilization by Activity Status

The analysis of dental care utilization by activity status reveals that employed Canadians were higher users of dental care services (51%), compared to unemployed Canadians (48%), and to those not in the labour force (41%). As illustrated in figure 9, this trend was more or less consistent throughout most provinces. The highest rates were observed for employed people in British Columbia and Ontario, where 58 percent of employed people visited a dentist at least once in 1978–79. Since these two provinces have the highest enrolments in employment based private group dental plans in Canada (Stamm et al., 1984), this observation is not surprising.

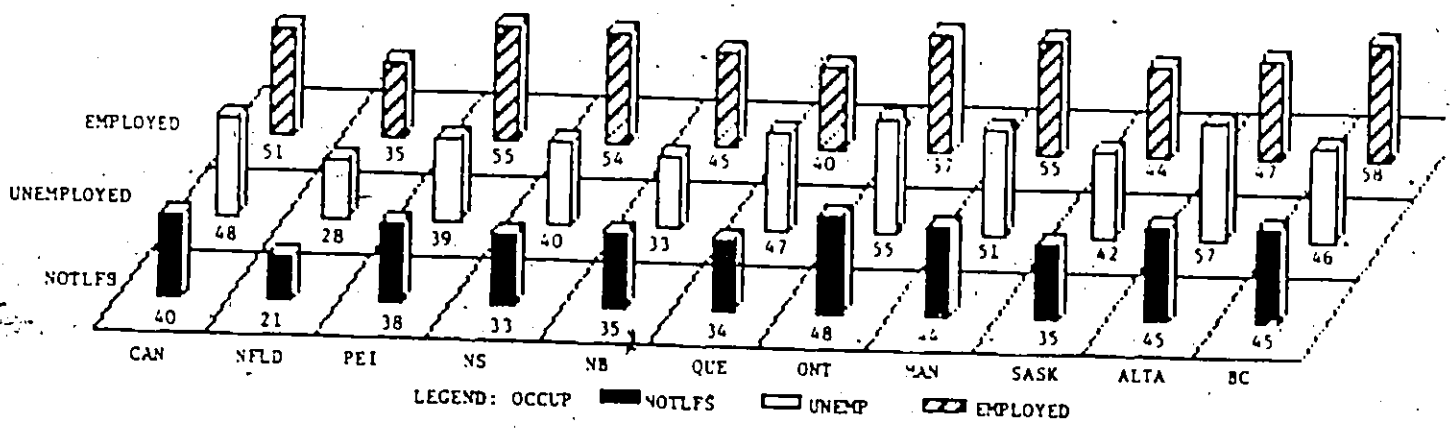


Figure 9

Percentage of the Population Making at Least One Dental Visit, by Activity Status, Canada and the Provinces, 1978–79.

There are two major exceptions to the above mentioned trends, which are worthy of further discussion. In Quebec and Alberta, people in the unemployed category exhibited a greater propensity to seek dental care, compared to those in the other labour force categories. The higher utilization rates by unemployed Quebecers and Albertans (47 and 57 %) could be explained by these two provinces' mechanisms of providing dental care under the federal-provincial Canada Assistance Plan.

By definition [13], most individuals reporting social assistance as their main source of income were also reported as unemployed in the Canada Health Survey. Along with Saskatchewan, Quebec and Alberta offer, under the Canada Assistance Plan (CAP), a wide range of basic dental services to eligible social assistance beneficiaries (Stamm et al., 1984). Since more dental services are being offered and made available to social assistance recipients in Quebec and Alberta, a greater demand may be expressed by these individuals, thus explaining their relatively higher utilization rates.

Data in table 6 suggest that differences in utilization between employed and unemployed individuals are greater in those provinces which provide free dental services to social assistance recipients only on an individual "as needed" basis. The difference in utilization between the employed and the unemployed is smaller (and in some provinces greater in favour of the unemployed) in those provinces which offer a more comprehensive and formal dental care coverage to those in financial needs.

Such differences are very difficult to explain within the limitations of CHS data. It may be that additional dental care benefits via CAP may alleviate financial barriers in certain provinces (insofar as unemployment is used as a surrogate to social assistance recipient). Yet, this remains a working hypothesis and requires more reliable data to test it. The best one can do with CHS data is to describe the situation as presented in tabe 6.

---

[13] Refer to the section on the conceptual framework to see how the labour force status variable was constructed.

Table 6

Percentage of the Population Making at Least One Dental Visit, for Employed and Unemployed Canadians, by Type of Coverage Under C.A.P., by Province, 1978-79.

Provinces with formal dental care under CAP	Activity Status Employed	Unemployed	% /\
Alberta	48 %	57 %	- 9
Quebec	41 %	47 %	- 6
Saskatchewan	45 %	43 %	2
Ontario	58 %	55 %	3
Manitoba	56 %	51 %	5
New Brunswick*	46 %	34 %	12
British Columbia**	58 %	46 %	12
Provinces with no formal dental care under C.A.P.	**Employed**	**Unemployed**	**% /**
Newfoundland***	35 %	28 %	7
Nova Scotia	54 %	40 %	14
Prince Edward Island	55 %	39 %	16

* New Brunswick imposes restrictions upon dental services covered for C.A.P. beneficiaries, 18 years of age and older.

** British Columbia offered, in 1978-79, only certain support dental services to residents in need, via the Ministry of Human Resources.

*** The already low utilization rates in Newfoundland can explain the relatively small difference between employed and unemployed.

5.4.3 Utilization by occupational class

Analysis of utilization patterns by occupational class suggests that a much larger proportion of white collar workers visited a dentist (57%) than did their blue collar counterparts (41%). Figure 10 illustrates that these trends were consistent in all provinces. Again, highest utilization rates were found among white collar workers in British Columbia and Ontario (63%); while blue collar workers in Newfoundland (25%) and Quebec (29%) were the lowest users.

These findings suggest that the opportunity costs of visiting a dentist may be higher for blue collar workers, who are more likely to be wage earners or self-employed. These costs

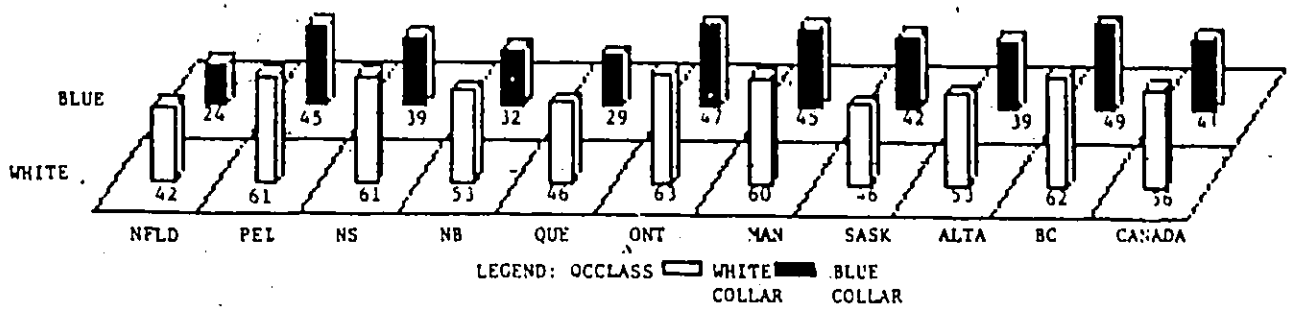


Figure 10

Percentage of the Population Making at Least One Dental Visit, by Occupational Class, Canada and the Provinces, 1978-79.

of foregone income may act as a deterrent in seeking dental care. Such costs may also be lower for white collar workers who, on the whole, have traditionally enjoyed greater flexibility in terms of work schedule and sick leave benefits.

5.4.4 Utilization and Community size

Figure 11 shows that the rates of dental care services increase with community size, thus suggesting differential levels of accessibility to dental care depending upon the size of the community.

In Canada as a whole, data indicate that people living in rural areas were the lowest users of dental care, (nearly 42 percent). Residents of small cities (1,000 - 99,999 population) were the next highest users (45 percent). Utilization rates then climbed to 53 percent for residents living in major cities, and reached a high of 55 percent for those residing in metropolitan areas.

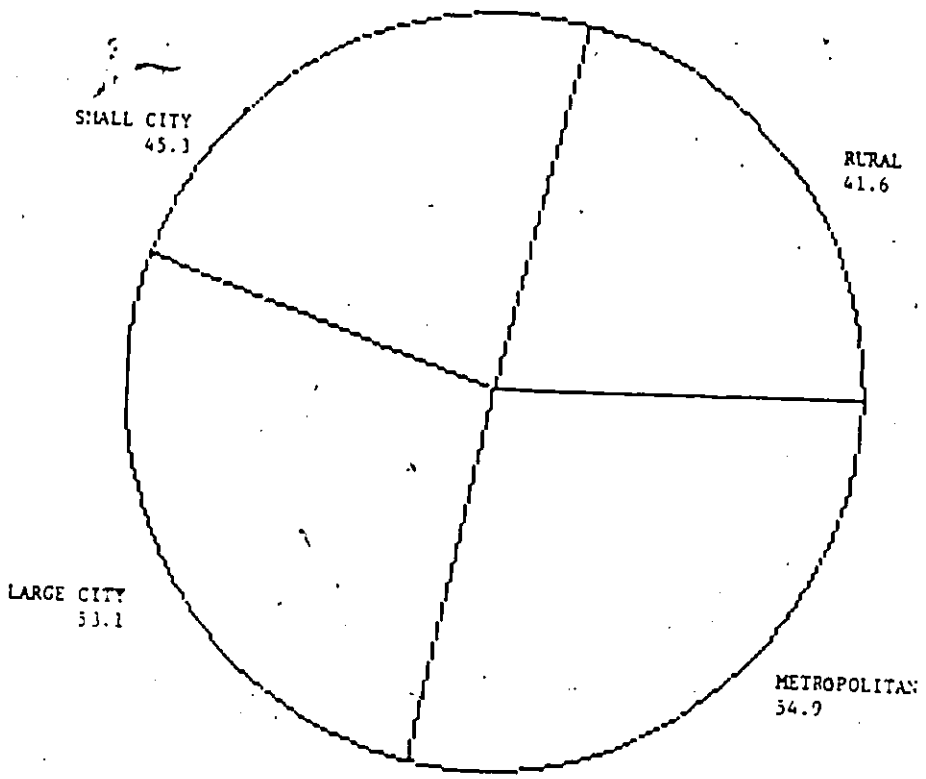


Figure 11

Percentage of the Population Making at Least One Dental Visit, by Community Size, Canada, 1978–79.

5.4.5 Utilization and manpower supply

From a geographic perspective, evidence suggests that the propensity to seek dental care appears to be strongly related to the availability of dental manpower as measured by the dentist to population ratio (per 100,000 population). In fact, as can be seen in figure 12, provinces with high dentist to population ratios also ranked higher in terms of overall utilization rates (Ontario, British Columbia, Manitoba, Alberta).

Statistical analysis also supports the contention that there is a direct positive relationship between high provincial dentist to population ratios and high utilization rates. This assumption is evidenced by the high positive correlation coefficient obtained between utilization and

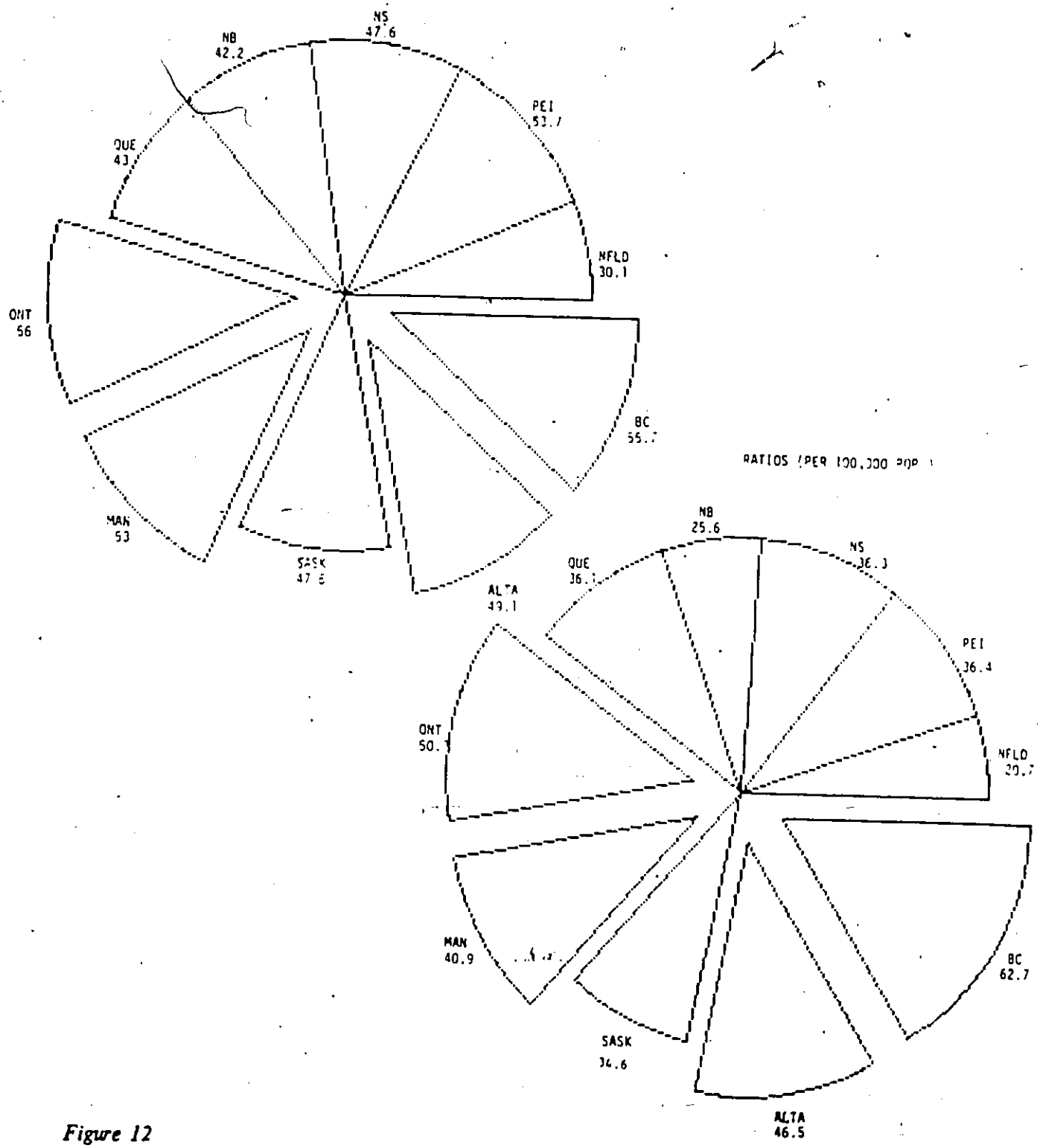


Figure 12

Percentage Utilization Rates of Dental Services, Compared to Dentist to Population Ratios, by Province, 1978–79.

dentist to population ratios for the ten provinces (r = .81, significant at the .01 level; table 7).

Table 7

Correlation Coefficients Between Provincial Utilization Rates of Dental Care Services and Provincial Dentist to Population Ratios, 1978-79.

	Dentist to population ratio
Utilization rate	r = .8081 P < .0047

Finally, as observed in figure 12, the distribution of dentists is heavily concentrated in the most industrialized and prosperous provinces (i.e. British Columbia, Ontario, Alberta). Traditionally, the locational preferences of dentists, like those of other professionals have lead them into the more densely-populated urban and industrialized areas. One of the reason for such a choice is quite obvious: for a professional, more people usually means a greater potential for business, and therefore a better opportunity to maximize earnings. In addition, there are other important reasons which are not related to economics: many professionals want the facilities (e.g., schools, universities, housing, cultural activities), which large urban areas offer.

5.4.6 Utilization and participation in dental care plans

Enrolment rates

Before examining the utilization of dental care services by participation in dental care plans, it seems appropriate to analyze the proportion of each province's population enrolled in such plans. As can be seen in table 8, British Columbia and Quebec were, in 1978-79, the two provinces with the highest enrolment rates in dental care plans (private and public plans combined). Meanwhile, Manitoba and New Brunswick ranked as the two provinces with the lowest rates.

Table 8

Estimated Proportion of the Population Enrolled in Private and Public Dental Care Plans, by Province, 1978-79.

ALL PLANS		PRIVATE PLANS		PUBLIC PLANS	
Province	Enrolment rate	Province	Enrolment rate	Province	Enrolment rate
B.C.	51.6 %	B.C.	45.3 %	Quebec	29.7 %
Quebec	36.1	Ontario	29.9	Newfoundland	27.1
Ontario	34.6	Alberta	17.1	P.E.I.	19.9
Alberta	30.7	Manitoba	10.0	Nova Scotia	19.4
Newfoundland	28.1	Quebec	8.2	Saskatchewan	18.7
Saskatchewan	24.3	Saskatchewan	5.6	New Brunswick	14.2
Nova Scotia	21.7	New Brunswick	3.2	Alberta	13.6
P.E.I.	21.1	Nova Scotia	2.9	Manitoba	7.0
New Brunswick	17.4	P.E.I.	1.6	B.C.	6.3
Manitoba	16.9	Newfoundland	1.4	Ontario	4.7

Source: Dental Health of Canadians - A Perspective, CDA, 1980.
Stamm et al. ,1984.

When estimating the proportion of each province's population enrolled in either a public or private plan, one very interesting trend seems to develop: those provinces with high enrol-

ment rates in private plans will likely have low enrolment rates in public plans, and vice versa.

For example, British Columbia (45%) and Ontario (30%) were, in 1978-79, the two provinces with the highest proportion of their population enrolled in private dental plans. However, the same two provinces ranked last (Ontario 5%) and second to last (British Columbia 6%), in terms of participation in publicly funded plans. The converse also holds true, when it comes to public plans. Newfoundland (27%) and Prince Edward Island (20%), were among the provinces with the highest enrolment rates in publicly funded dental care plans, while they respectively showed the lowest percentages of participation in private plans.

Such a phenomenom can be explained, in part, by the development of dental care insurance in this country. In the last decade, dental insurance plans have gained considerable popularity as a form of fringe benefit in union-employer contract negotiations. Such a trend was particularly noticeable in the more industrialized provinces (Ontario, British Columbia, Alberta), mainly because these provinces possess large industrial bases which are particularly well suited for the implementation of group dental insurance plans. Therefore, it is assumed that these provinces have, undoubtedly, benefited from the rapid proliferation of private dental plans, to attain part of their dental objectives (Stamm et al., 1984). This rapid growth in enrolment coupled with major improvements in the dental health status of children in British Columbia and Ontario[16] have, unavoidably, reduced the necessity and socio-political pressure for universal age-targeted publicly funded dental plans in those provinces (Duffy, 1985).

From the discussion of dental manpower supply, it was reported that a higher concentration of dentists could be found in the more industrialized provinces. If one relates these findings to those displayed in table 8 (i.e. high enrolment in private plans in the more industrialized provinces), one may assume a relationship between high manpower supply and high participation in private dental care plans in the provinces. This association is corrobo-

---

[16] Such improvements were largely attributed to the increased use of fluorides in all Canadian provinces.

rated by the very strong correlation coefficient observed between provincial dentist to population ratios and a province's percentage enrolment in private dental care plan (r= .91, significant at the .01 level, table 9). Conversly, the magnitude of the correlation coefficient between dentist to population and enrolment in public plans in a given province, shows a moderate inverse relationship between the two variables (r= -0.69, significant at the .02 level). Such a relationship suggests that a lower concentration of dentists is expected in those provinces with high percentages of their population enrolled in public dental plans.

Table 9

Correlation Coefficients Between Provincial Dentist to Population Ratios and Provincial Enrolment in Private and Public Dental Plans, 1978-79.

	Enrolment in private plans	Enrolment in public plans
Dentist to population ratio	r = 0.91 p < 0.01	r = -0.69 p < 0.02

The nature of these findings raises this very fundamental question: Why would dentists prefer to locate in those provinces with higher enrolment rates in private dental care plans? In answering this question House (1970) suggests that in a private practice system, dentists, like other professionals, tend to locate where there is a market. Obviously, provinces with higher enrolment in dental plans represent greater potentiality in terms of a "dental market". But, why private plans, as opposed to public plans? It is believed that consumers in employer-employee groups are "over-insuring" themselves for smaller more predictable dental bills. Therefore, such plans are aimed at rather specific and routine needs (Stamm et al.,1984). Furthermore, private plans are normally not subjected to the same government

regulations (eligibility, coverage, type and range of services, frequency of use, methods of paying the provider, etc.) as some of the publicly funded and operated plans. Harris (1977), also argues that heavy enrolment in a private dental plan in a given area may (and, in all probability, will) attract dentists to set up a practice to accomodate the employees covered by the plan. Obviously, the greater flexibility of private dental plans represents a very attractive opportunity to a dentist in setting and establishing a viable practice.

Utilization

The findings reported in table 10 indicate a moderate positive correlation between a province's percentage of its population enrolled in a private dental plan, and overall utilization in that same province ($r = 0.58$, significant at the .10 level). The nature of this correlation suggests that higher utilization rates are normally observed in those provinces with higher enrolment in private dental care plans.

Meanwhile, the correlation analysis between provincial utilization and percentage enrolment in a public plan reveals a strong negative asociation between the two variables ($r = -0.74$, significant at the .01 level). These findings suggest that lower utilization rates are expected in those provinces with higher participation in publicly funded dental care plans.

Table 10

Correlation Coefficients Between Provincial Utilization Rates and Provincial Enrolment in Private and Public Plans, 1978-79.

	Enrolment rate in private plans	Enrolment rate in public plans
Utilization rate	r = 0.58483 P < 0.07	r = -0.74175 P < 0.01

From a statistical perspective, an inverse relationship between between enrolment rates in private and public plans has been demonstrated (table 8). Therefore, if higher utilization rates were observed in provinces with high participation in private plans, one might expect lower utilization rates in those provinces with high enrolment in public plans (because of the inverse relationship between the two types of plans).

From a behavioral and economic perspective, there is also a reasonable explanation for the observed association displayed in table 10. Although the discussion around dental care insurance and utilization of dental care services is still ambiguous, it seems quite clear, however, from the review of the literature, that the degree of voluntary coverage is associated to the utilization level (Nikias, 1969; Teh-wei-Hu, 1981; Bullen, 1982). It could be argued that individuals who belong to a private insurance plan, somehow incur a direct or indirect cost (premium, union dues, deductible, etc.) and opportunity costs (rate of foregone income, trade off between other fringe benefits, etc.), at the time they enrol in such a plan. Their participation thus can be regarded as an investment. These individuals may or may not need to purchase dental services, but, by enrolling in a given plan, they have reduced the risk of heavy outlays at various points in time. Therefore, Canadians who "invest" in private dental care plans, may be more motivated to visit a dentist (for curative or preventive reasons), in order to obtain some kind of "return on their investment".

The provider of dental care services also plays an important role in determining the type and level of care (dentist induced demand). The association between high dentist to population ratios and high enrolment in private plans was already observed (table 9) and discussed. A greater concentration of manpower supply normally implies greater availability and also greater utilization. Some studies also suggest that there is a tendency for dentists to over-service patients in the presence of insurance, particularly private plans, resulting in increased utilization (Evans and Williamson, 1978, p. 221; Greene, 1984, p. 81).

Meanwhile, public insurance data tell a different story. In fact, these data indicate that a large proportion of the population will not seek care, when the services are actually free (Evans and Williamson, 1978, p. 124). This is especially true of dental care, since, unlike poor or deteriorating physical condition, poor oral health is not, in general, life-threatening or particularly debilitating. Consequently, people may not place as much emphasis on dental care to begin with. The findings reported in table 10 tend to corroborate the results of most early research on publicly funded dental care insurance and utilization. Our findings agree with the statement that the provision of free dental care does not create a "stampede" to the dentist's office (Avnet and Nikias, 1967).

5.4.7 Utilization and Water Fluoridation

Based on the numbers reported in table 11, it is not possible to assert wheter the fluoridation of water has a significant impact on dental care utilization. It appears that a slightly higher segment of the population with water fluoridation made at least one dental visit during the year. On the one hand, if water fluoridation were to produce the alleged negative effect on demand (Grembowski, 1984), one would expect to observe a lower proportion of users in those communities who do have fluoridated water. On the other hand, it might be argued that individuals living in areas with fluoridated water may be more predisposed to visit a dentist for preventive reasons, and may therefore exhibit a dental behavior such as the one presented in table 11. Unfortunately, such an assertion can not be verified empirically with Canada Health Survey data, and therefore leaves the question unanswered. The effects of water fluoridation will be assessed in a multivariate model, holding other factors constant.

Table 11

The Use or Non-Use of Dental Care Services, by Water Fluoridation Status, Canada, 1978-79.

Water Fluoridation	User (1+Visit)	Non-User (0 Visit)	Total
	in thousands		
Yes			
no.	5,473	4,861	10,334
%	53%	47%	100%
No			
no.	5,951	6,596	12,547
%	47%	53%	100%

5.5 Need Factors

5.5.1 Utilization and Presence or Absence of Dental Symptoms

As was already described in the section dealing with the conceptual framework, the presence or absence of dental symptoms could, at best, be estimated through a proxy which identified the prevalence of dental problems in the Canadian population.

The findings reported in table 12 suggest that 54 percent of Canadians with one or more dental problems visited a dentist at least once. In contrast, 46 percent of the population with dental problems failed to consult a dentist for their problem. Heavy economic outlays (it costs too much) was the reason cited most often for those who did not seek dental treatment, when facing a dental problem (Health and Welfare Canada and Statistics Canada, 1981, p. 175).

There appears to be considerable regional variations in the percentage of users with dental problems, versus the percentage of non-users with dental problems. Indeed, the figures displayed in table 12 suggest that, in the Atlantic provinces, in general, more than 50 percent of those with at least one dental symptom did not consult a dentist. On the other hand,

with the exception of Saskatchewan, in all other provinces, more than half of those with dental problems did in fact seek dental treatment. These findings might be indicative of certain unmet dental needs (insofar as dental problem is used as a surrogate to dental need), in eastern Canada, more specifically in New Brunswick and Newfoundland.

Table 12

The Use or Non-Use of Dental Care Services, by Presence or Absence of Dental Problems, Canada and the Provinces, 1978-79.

Province	Non-user (0 Visit)		User (1+ Visit)		Total	
	no.	%	no.	%	no.	%
NFLD						
No problem	376,725	70	157,383	30	534,108	100
1+ problem	18,133	59	12,751	41	30,884	100
PEI						
No problem	50,507	46	59,197	54	109,704	100
1+ problem	4,521	51	4,274	49	8,795	100
NS						
No problem	390,814	52	353,701	48	744,516	100
1+ problem	34 978	51	33,385	49	68,362	100
NB						
No problem	362,292	57	269,491	43	631,783	100
1+ problem	27,222	61	17,588	39	44,810	100
QUE						
No problem	3,310,990	58	2,399,020	42	5,710,010	100
1+ problem	210,933	45	254,984	55	465,917	100
ONT						
No problem	3,411,122	44	4,305,071	56	7,716,193	100
1+ problem	240,126	42	334,517	58	574,643	100
MAN						
No problem	434,897	48	471,228	52	906,125	100
1+ problem	28,541	35	51,375	65	51,375	100
SASK						
No problem	426,698	52	392,928	48	819,625	100
1+ problem	41,175	56	31,717	44	72,893	100
ALTA						
No problem	902,581	51	852,104	49	1,754,685	100
1+ problem	64,881	44	82,978	56	147,860	100
BC						
No problem	1,007,761	44	1,265,077	56	2,272,838	100
1+ problem	85,624	44	110,822	56	196,446	100
CAN						
No problem	10,674,387	50	10,525,200	50	21,199,587	100
1+ problem	756,144	44	934,391	56	1,690,535	100

5.5.2 Profile of the Population with Dentures

The findings of the Canada Health Survey indicate that 13 percent of the population wore a full denture (both upper and lower plates), in 1978-79 (table 13). The majority of the denture-wearing Canadians (78%) belonged to the 45 and over age group.

While more than 3 million Canadians reported wearing a full denture, there were approximately 2 million Canadians who indicated that they had upper plates only. A relatively smaller segment of the population (69,000 Canadians) reported wearing full lower plates only. When focusing on each specific age group, it can be noticed that the proportion of dentate Canadians decreases considerably with advancing age. Indeed, the findings presented in table 13 (column percentages) indicate that 98 percent of Canadians aged from 0 to 25 had no dental prosthesis whatsoever. This percentage dropped respectively to 76% and 53% for Canadians aged 25 to 44 and 45 to 64. The most significant proportion of individuals wearing a full denture (both complete lower and upper plates) was observed among those 65 years of age and older. More than half (53%) of Canadians in this age group (65+) indicated that they had both upper and lower plates.

Table 13

Population by Type of Denture, by Age, Canada, 1978-79.

Denture Type	Age Group (estimate in thousand) Total	0-24	25-44	45-64	65+
Total					
n	22,825	10,052	6,399	4,372	2,002
row %	100%	44%	28%	19%	9%
col %	100%	100%	100%	100%	100%
No Denture					
n	17,689	9,854	4,868	2,335	632
row %	100%	56%	27%	13%	4%
col %	78%	98%	76%	53%	31%
Upper Plates					
n	1,993	154	851	698	290
row %	100%	8%	43%	35%	14%
col %	9%	2%	14%	16%	15%
Lower Plates					
n	69	1	22	32	14
row %	100%	-	32%	42%	20%
col %	-	-	-	1%	1%
Both					
n	3,074	43	658	1,307	1,066
row %	100%	1%	21%	43%	35%
col %	13%	-	10%	30%	53%

5.5.3 Population with Dentures, the Dentate and Utilization

Earlier in this chapter, it was observed that the utilization of dental care services decreases considerably, as age increases (section 5.3.1). It was suggested that higher utilization rates for children reflected their greater need for dental care, particularly because dental caries and tooth decay are highly prevalent among children. It was also noted that these trends were observed on the full sample, and thus included both the dentate and the denture-wearing populations.

As can be seen from table 14, the differences in utilization between age groups are considerably attenuated when we compare the dentate population to the total population. In fact, while only 23 percent of all Canadians, 65 years of age and older, had visited a dentist only once in 1978-79; this proportion climbs to 39 percent when the denture-wearing population is removed from this group (table 14). The same trend can also be observed, to a lower degree, with the 25 to 44 and 45 to 64 age groups.

Table 14

The Use or Non-Use of Dental Care Services, on the Total, the Dentate, and the Denture-Wearing Population, Canada, 1978-79.

	Age Group				
Population	Total	0-24	25-44	45-64	65+
Total					
User	50%	58%	53%	40%	23%
Non-User	50%	42%	47%	60%	77%
Total	100%	100%	100%	100%	100%
Dentate					
User	51%	58%	58%	54%	39%
Non-User	49%	42%	42%	46%	61%
Total	100%	100%	100%	100%	100%
Dentures					
User	9%	21% *	10%	9%	8%
Non-User	91%	79% *	90%	91%	92%
Total	100%	100%	100%	100%	100%

* The sample size for these cells is low. Therefore their reliability is questionable.

The finding reported in the paragraph above is extremely important, as it suggests that, by removing from the study group those individuals who wear dentures, we are essentially removing a sub-population who has very little (but not zero) need for dental care services.

Therefore, although the utilization rate still decreases with advancing age in the dentate group, the gap in utilization between the young and the elderly is significantly narrower, when compared to the total population. Such findings may suggest that the very low utilization rates displayed by the elderly (on the full sample), may very well be attributable to lower dental needs, as witnessed by the larger number of senior citizens who actually wear a full denture.

The effect of the denture-wearing population on dental care utilization will be explored in the next chapter, by comparing the total population (the dentate plus the denture-wearing groups) with the dentate population, in a multivariate model.

Finally, it should be noted from table 14, that, on average for all age groups, approximately 90 percent of those wearing a full lower and upper denture did not seek dental care treatment in 1978-79, confirming their very little need for such services.

Table 15

Percentage of the Population who Visited a Dentist at Least Once During the Year, Canada and the Provinces, 1978–79.

Province	User (1 + visit)	Non-User (no visit)	Unknown	Total
		in thousands		
Newfoundland				
no.	170	395	2	567
%	30.1%	69.9%	-	100.0%
Prince Edward Island				
no.	63	55	1	120
%	53.6%	46.4%	-	100.0%
Nova Scotia				
no.	387	426	5	820
%	47.6%	52.4%	-	100.0%
New Brunswick				
no.	287	390	6	684
%	42.4%	57.6%	-	100.0%
Quebec				
no.	2,655	3,523	27	6,198
%	43.0%	57.0%	-	100.0%
Ontario				
no.	4,641	3,652	43	8,336
%	56.0%	44.0%	-	100.0%
Manitoba				
no.	523	463	3	989
%	53.0%	47.0%	-	100.0%
Saskatchewan				
no.	425	468	19	912
%	47.6%	52.4%	-	100.0%
Alberta				
no.	935	968	15	1,918
%	49.1%	50.9%	-	100.0%
British Columbia				
no.	1,376	1,093	8	2,479
%	55.7%	44.3%	-	100.0%
Total Canada				
no.	11,462	11,433	100	23,023
%	50.1%	49.9%	-	100.0%

Table 16

Average Number of Visits to a Dentist in the Last 12 Months, Canada and the Provinces, 1978-79.

Province	Average number of visits	
	Users only	Total population
Newfoundland	1.9	0.6
Prince Edward Island	2.2	1.2
Nova Scotia	2.2	1.1
New Brunswick	2.1	0.9
Quebec	2.0	0.9
Ontario	2.2	1.2
Manitoba	2.4	1.3
Saskatchewan	2.0	1.0
Alberta	2.0	1.0
British Columbia	2.5	1.4
Canada	2.2	1.1

Table 17

Percentage of the Population who Visited a Dentist at Least Once in the Last 12 Months, by Age, Canada and the Provinces, 1978-79.

	Age Group								
	0-4	5-9	10-14	15-19	20-24	25-39	40-54	55-64	65 +
Province	Percentage								
Nfld	9.8	44.4	45.3	37.8	36.2	36.3	21.0	10.9	5.6
PEI	31.7	89.4	89.3	72.3	57.8	51.5	39.3	38.2	19.4
NS	28.2	73.6	64.1	63.9	53.3	53.4	39.3	35.3	13.5
NB	19.9	58.6	65.8	67.6	56.0	44.4	28.0	24.8	11.6
Que	21.6	75.5	71.4	51.8	53.1	43.4	34.4	23.5	14.7
Ont	17.6	79.8	81.0	69.6	55.2	62.1	52.3	44.3	30.5
Man	17.1	74.5	80.6	65.2	52.8	60.3	49.4	44.4	27.7
Sask	19.8	94.2	84.3	61.9	50.1	48.8	38.4	29.8	16.3
Alta	14.7	71.0	70.8	63.1	52.4	49.7	49.4	32.7	26.3
BC	29.8	79.2	83.1	61.5	50.7	60.0	60.2	47.7	23.6
Canada	20.0	76.1	75.6	61.7	53.1	53.6	45.7	36.2	22.9

Table 18

Percentage of the Population who Visited a Dentist at Least Once in the Last 12 Months, by Sex, Canada and the Provinces, 1978-79.

Province	Male	Female	Both Sexes
Newfoundland	28.5%	31.7%	30.1%
Prince Edward Island	54.6	52.5	53.6
Nova Scotia	47.7	47.5	47.6
New Brunswick	38.8	46.0	42.4
Quebec	40.6	45.2	43.0
Ontario	54.3	57.6	56.0
Manitoba	51.5	54.4	53.0
Saskatchewan	47.2	47.9	47.6
Alberta	46.6	51.7	49.1
British Columbia	53.5	58.0	55.7
Total Canada	48.1	51.9	50.1

Table 19

Percentage of the Population who Visited a Dentist at Least Once in the Last 12 Months, by Education, Canada and the Provinces, 1978-79.

Province	Some Secondary or less	Secondary Diploma	Some Post Secondary	Post-Secondary Certificate or Diploma	Graduate Degree
Nfld	25.7%	34.4%	50.0%	45.9%	68.1%
PEI	51.0	51.3	66.7	61.7	68.5
NS	41.9	57.7	55.5	66.9	78.8
NB	36.4	54.5	60.6	55.9	43.1
Que	38.4	41.6	48.0	62.4	62.5
Ont	51.2	58.5	63.7	73.9	73.9
Man	47.3	54.7	61.2	70.4	81.1
Sask	45.6	47.1	42.7	60.9	53.9
Alta	45.4	49.7	49.9	62.2	74.3
BC	50.8	57.4	64.2	66.0	81.4
Canada	45.4	51.5	56.3	66.8	72.0

Table 20

Percentage of the Population who Visited a Dentist at Least Once in the Last 12 Months, by Marital Status, Canada and the Provinces, 1978-79.

Province	Married	Widowed/Separated or Divorced	Single	Single/Age Greater than 14
Newfoundland	26.5%	14.0%	34.5%	34.9%
Prince Edward Island	43.4	27.2	65.2	57.5
Nova Scotia	43.8	19.1	56.5	56.6
New Brunswick	36.1	18.6	52.7	57.5
Quebec	36.7	24.1	52.7	47.8
Ontario	52.1	42.7	63.1	65.4
Manitoba	50.3	39.7	58.2	58.1
Saskatchewan	39.0	25.8	61.3	53.6
Alberta	44.8	41.5	54.6	57.3
British Columbia	51.9	40.2	63.8	61.7
Total Canada	45.4	34.8	57.8	57.0

Table 21

Percentage of the Population who Visited a Dentist at Least Once in the Last 12 Months, by Economic Family Income Quintile, Canada and the Provinces, 1978-79.

Province	Quintile1	Quintile2	Quintile3	Quintile4	Quintile5
Nfld	20.2%	27.4%	32.4%	37.0%	55.4%
PEI	39.6	56.9	51.6	56.8	61.8
NS	37.8	42.6	50.3	54.5	63.5
NB	33.9	41.7	42.9	51.0	54.9
Que	35.7	39.5	44.9	46.0	55.1
Ont	43.7	51.0	54.8	60.8	66.9
Man	34.8	48.5	55.8	60.4	60.8
Sask	43.5	36.1	50.9	47.5	55.1
Alta	44.3	50.0	49.5	53.9	50.2
BC	40.9	48.2	59.8	58.7	62.1
Canada	38.8	45.1	51.1	55.1	60.5

Table 22

Percentage of the Population who Visited a Dentist at Least Once in the Last 12 Months, by Activity Status, Canada and the Provinces, 1978-79.

	Activity Status		
	Employed	Unemployed	Not in LFS
Newfoundland	35.4%	28.4%	21.1%
Prince Edward Island	55.2	39.3	38.7
Nova Scotia	54.4	40.5	33.1
New Brunswick	45.9	35.0	33.9
Quebec	47.4	40.9	34.1
Ontario	57.5	55.3	48.1
Manitoba	55.6	51.4	44.6
Saskatchewan	44.9	42.9	35.0
Alberta	57.3	47.9	45.9
British Columbia	58.0	46.3	45.3
Canada	51.3	48.2	40.9

Table 23

Percentage of the Population who Visited a Dentist at Least Once in the Last 12 Months, by Occupational Status, Canada and the Provinces, 1978-79.

	Occupational Status	
	White Collar Worker	Blue Collar Worker
Newfoundland	42.7%	24.5%
Prince Edward Island	61.9	45.6
Nova Scotia	61.3	39.1
New Brunswick	53.2	32.9
Quebec	46.9	29.2
Ontario	63.1	47.1
Manitoba	60.0	45.6
Saskatchewan	46.4	42.6
Alberta	53.3	39.6
British Columbia	62.7	49.6
Canada	56.9	41.1

Table 24

Percentage Distribution of Respondents by Economic Family Income Quintile, Canada and the Provinces, 1978-1979.

Province	Quintile1	Quintile2	Quintile3	Quintile4	Quintile5
Canada	20.0%	20.0%	20.0%	20.0%	20.0%
Nfld	33.8	27.4	17.3	12.5	9.0
PEI	20.6	23.4	17.1	20.1	18.8
NS	26.6	25.7	20.3	14.2	13.2
NB	29.5	21.8	20.7	15.8	12.2
Que	24.4	21.9	21.5	17.3	14.9
Ont	19.2	18.1	20.2	21.6	20.9
Man	15.6	18.0	22.1	20.3	24.0
Sask	16.2	19.3	17.4	20.9	26.2
Alta	11.0	20.1	14.8	23.8	30.3
BC	13.7	18.5	19.6	22.8	25.4

Chapter 6

RESULTS OF THE DISCRIMINANT ANALYSIS.

6.1 Introduction

The findings in the previous chapter are quite interesting. Most of the observed trends (utilization and age, income, education, etc.) are consistent with the expectations expressed earlier in the review of the literature. Although the analysis of cross-tabulations has enabled us to investigate relationships between utilization and a host of factors, the methods of descriptive analysis are however limited.

The above analysis did not attempt to study the effects of all the variables, taken into account simultaneously. Nor did the analysis address the issue of how and how much one particular variable may explain the observed distributions.

To further the analysis of dental care utilization, additional efforts must be made to isolate the effects of the independent variables on the use or non-use of dental care services. The problem is then one of statistical control or standardization. It is possible, through multivariate techniques, to explore utilization behaviour with regards to the relative importance of various determinants. Multivariate techniques will also enable us to analyze the relative magnitude and direction of those determinants, and, if any, the extent of interaction effects between certain explanatory factors (Manga, 1978, p. 87).

The purpose of this chapter is to investigate and explain further some of the incidence results reported in the previous chapter. A second objective is to analyze the extent to which the predisposing, enabling and need factors explain the use and non-use of dental care services in Canada.

6.2 The model and methodology

As already described in the conceptual framework, the selected approach consists of a multivariate model, and relies on the techniques of discriminant analysis for estimation. It was decided to estimate, at first, only a few parameters (as suggested by the review of the literature), and to gradually add new variables into the model. This "step-wise" approach enables us to examine the contribution of a new set of variables in explaining the variations between users and non users. The final analysis will focus exclusively on those factors which are believed to be of particular interest in the explanation of differential levels of utilization. It is imperative to include all variables, in order to estimate their respective effects in isolation. While these variables are important in their own right, failure to take them into account would result in a mispecification of the regression model, resulting in biased or misleading results (Manga, 1978, p. 87).

The final model is represented by the following mathematical expression, which depicts the probability of being a user of dental care services, depending upon a set of predisposing, enabling and need factors, as already described in the section dealing with the conceptual framework. The variables of this model, along with their measurement level, mean, and standard deviation are described in table 23.

DENTUSE = f (QUINT1, QUINT2, QUINT3, QUINT4, QUINTUNK,
SECLESS, SECDIP, PSECDIP, SEXF, SEPDIVW,
MARRIED, AGE014, AGE1524, AGE2544, AGE4564,
UNEMP, WHITEC, BLUECOL, RATIO, DENTALPB,
FLUOR, FAM1, FAM2, FAM3, FAM4, DENTURE)

Table 25

The Mean, Standard Deviation and Level of Measurement of Dependent and Explanatory Variables.

Variable	Name	Measurement	Mean	Std Dev.
Dependent Variable:				
Utilization	DENTUSE	Dummy	0.5006	0.500
Use		1		
Non-use		0		
Independent Variables:				
Predisposing Factors				
Demographic:				
Age		Dummy		
00-14	AGE014	(1,0,0,0)	0.2403	0.427
15-24	AGE1524	(0,1,0,0)	0.1966	0.397
25-44	AGE2544	(0,0,1,0)	0.2814	0.450
45-64	AGE4564	(0,0,0,1)	0.1935	0.395
65 +	AGE65	(0,0,0,0)	0.0880	0.283
Sex		Dummy		
Female	SEXF	1	0.5045	0.500
Male		0		
Marital Status		Dummy		
Single	SINGLE	(1,0)	0.4348	0.496
Married	MARRIED	(0,1)	0.4862	0.500
Separated/Divorced or Widowed	SEPDIVW	(0,0)	0.0755	0.264
Education		Dummy		
Secondary or less	SECLESS	(1,0,0)	0.6406	0.480
Secondary Diploma	SECDIP	(0,1,0)	0.1574	0.364
Post Sec. Diploma	PSECDIP	(0,0,1)	0.1737	0.379
Graduate Degree	GRADEG	(0,0,0)	0.0215	0.145
Family size		Dummy		
1 member	FAM1	(1,0,0,0)	0.1168	0.311
2 members	FAM2	(0,1,0,0)	0.2073	0.406
3 members	FAM3	(0,0,1,0)	0.1666	0.367
4 members	FAM4	(0,0,0,1)	0.2523	0.434
5+ members	FAM5P	(0,0,0,0)	0.2570	0.440
Preventive Behaviour *	PREVENT	Continuous (0-9)	2.7059	2.325

Enabling Factors				
Income		Dummy		
Quintile 1	QUINT1	(1,0,0,0,0)	0.1882	0.391
Quintile 2	QUINT2	(0,1,0,0,0)	0.1885	0.391
Quintile 3	QUINT3	(0,0,1,0,0)	0.1884	0.391
Quintile 4	QUINT4	(0,0,0,1,0)	0.1886	0.391
Quintile 5	QUINT5	(0,0,0,0,0)	0.1885	0.391
Quintile Unknown	QUINTUNK	(0,0,0,0,1)	0.0574	0.233
Social Assistance				
Source of Income		Dummy		
Yes	SOCASS	1	0.0168	0.129
No		0	0.9015	1.278
Labour Force Status		Dummy		
Unemployed	UNEMP	(1,0,0)	0.0506	0.219
Employed/White Col.	WHITEC	(0,1,0)	0.2759	0.447
Employed/Blue Col.	BLUECOL	(0,0,1)	0.1478	0.355
Not in Labour Force	NOTLFST	(0,0,0)	0.5207	0.516
Industry Occupation *		Dummy		
Manufacturing/ Construction	MANCONS	(1,0,0)	0.1561	0.363
Sales/Finance	SALEFIN	(0,1,0)	0.1312	0.338
Transportation/ Communication	TRANCOM	(0,0,1)	0.3927	0.488
Agriculture	AGRIC	(0,0,0)	0.0373	0.190
Accessibility				
Dentist/Pop. Ratio (per 100,000 pop.)	DENTPOPR	Continuous (0-62.7)	44.4753	10.154
Community Size		Dummy		
Rural < 1,000	RURAL	(0,0,0)	0.1680	0.374
Small City 10,000-99,999	SMALLCT	(0,0,1)	0.2143	0.410
Major City 100,000-999,999	MAJORCT	(0,1,0)	0.2920	0.455
Metropolitan area > 1,000,000	METROPOL	(1,0,0)	0.3244	0.468
Water Fluoridation	FLUOR	Dummy		
Yes		1	0.5480	0.498
No		0		

Need Factors:				
Dental Symptoms	DENTALPB	Dummy		
1+ Problems		1	0.068	0.261
No Problem		0		
Oral Health Status	DENTURE	Dummy		
Full Dentures		1	0.145	0.341
All Other (dentate)		0		

* These Variables were analyzed for those individuals 15 years of age and older only. (Refer to section on conceptual framework).

6.3 The form of the regressions: methods and statistics.

As was already discussed in the conceptual framework chapter, the majority of the independent variables in the model were coded as dummy (1,0) variables. Not only does this approach enable us to treat nominal variables as categorical variables, but it offers several other advantages as well. When continuous variables are used in regression analysis, the coefficient shows the effect on the average of one unit change in that given variable, all of this under the assumption of a linear relationship. Dummy variables allow for non-linearities in the relationship, and therefore, the coefficients will reflect any curvilinearity in the relationship (Goldberger, 1964). This becomes very important when there is no theoretical reason for assuming a linear trend in our data.

Given that our primary interest is in the differential utilization in terms of age, income, education, needs, etc., regression analysis with dummy variables becomes very instrumental in testing relationships between several sub-groups of a particular variable (age for example), in relation with the suppressed category for that variable. Therefore, the supressed category will form the basis for comparison between sub-groups of an independent variable. A further advantage of dummy coding, is that it permits a more flexible handling of missing (unk-

nown) information, for example, by treating all non-respondents as one particular sub-group of a variable. Finally, regression analysis with dummy variables allows greater flexibility in analyzing interactions between variables.

The statistical significance of the entire regression model is judged by the F-statistic for the total regression, while that for a group of coefficients, i.e., the variable as a whole, is measured by the partial F-statistic on the sub-groups which comprise the variable of interest. The relative importance of each variable will be measured by the sign and the value of its corresponding estimated regression coefficient, while the statistical significance of each variable will be judged by a two-tailed t-test (T-ratio).

The utility of the regression model will be measured by the coefficient of determination "R2", which indicates the percentage of variation explained in the dependent variable by the selected independent variables. The "R2" can also be used as a proxy to measure the goodness of fit of the chosen regression model. However, in the case of discriminant analysis, a better approximation of the goodness of fit can be obtained from the table of expected versus observed results, in conjunction with their probability distribution.

6.4 Interpretation of the results

Considerable attention has been given to income and education in relation to the utilization of dental care sevices (Lewis, 1978; Teh-wei-Hu, 1981; Kronenfeld, 1979; Evans and Williamson, 1978). Therefore, it is important to consider, at first, these two factors in isolation, in order to estimate their relative contribution in the discrimination between users and non-users of dental services.

The first regression model will focus only on income and education as explanatory factors. The results of this first analysis which are reported in table 26, suggest that the combination of income and education contribute to explain almost 52 percent of the variation in the dependent variable (use or non-use).

Table 26

The Use or Non-Use of Dental Care Services by the Relative Significance of Factors with Estimated Regression Coefficient. (Equation 1).

Factor	F-Ratio on Group	Variable	Estimated Coefficient	T-Statistic	
Education	37.50 (p < 0.01)	SECLESS	-0.184	-5.75	a
		SECDIP	-0.150	-4.62	a
		PSECDIP	-0.044	-1.22	
Family Income	14.75 (p < 0.01)	QUINT1	-0.170	-8.22	a
		QUINT2	-0.113	-6.10	a
		QUINT3	-0.059	-3.37	a
		QUINT4	-0.030	-2.57	a
		QUINTUNK	-0.091	-3.71	a
		Intercept	0.726	24.05	a

n = 31,490
R2 = 0.5176 a: p < 0.01 b: p < 0.05 c: p < 0.10

Both variables, taken as a whole, are statistically different from zero, implying that users and non-users of dental care services can be identified in terms of income and education differentials.

With the exception of PSECDIP, every regression coefficient is statistically significant from zero within the 99 percent confidence interval, suggesting that both income and education have a significant influence on the dependent variable. Furthermore, the signs and relative values of the coefficients, in conjunction with the suppressed categories (QUINT5 and GRADEG), indicate clearly that the propensity to seek dental care increases significantly, along with the individual's levels of income and education.

Additional steps in the discriminant analysis consisted of gradually adding more explanatory variables to the model, to finally arrive at equation 10. The results of each equation are

presented at the end of this chapter. The overall analysis will focus only on the final equation, because this equation is a more global one which incorporates the factors of interest which are available in our data files.

The results of the final discriminant analysis are presented in table 27 where the relative significance of a group of explanatory factors (measured by the partial F-ratios on groups) is ranked ordinally.

Focusing first on the explanatory power of the model as a whole, it can be seen that approximately 56 percent of the variance in the dependent variable (use or non-use) is explained by age, income, marital status, sex, occupation, availability and accessibility of dentists, dental needs, family size and education (R2 =.556 table 27). The relative value of the R2 measure is unusually high for cross-sectional data. In fact the coefficient of determination obtained in this study is one of the highest reported in the literature. In part, two major reasons can account for this relatively high R2. First, unlike physician and hospital use, dental care utilization is notably more predictable (Evans, 1984, p. 24). Physical and mental needs are more complex, mainly because of the multi-faceted aspects of human biology, whereas dental needs are restricted to one very specific part of the human body: the mouth. It is a much larger and more difficult challenge to derive a need variable with cross-sectional data in the case of physical and mental illness (so many things can go wrong with the human body). It is easier to capture mote of the dental needs of the population with cross-sectional data (fewer things can go wrong). Consequently, by introducing a dental need variable (DENTALPB) in our regression equation, we are in a better position to capture more of the full effect of oral health problems on the decision to seek or not dental treatment. Therefore, in the case of dentistry, the need variable is constructed more easily and probably represents the oral health needs of the population with more certainty. As such, the need variable becomes a very important predictor of dental care utilization, and accordingly increases the overall predictability of the equation.

Table 27

The Use or Non-Use of Dental Care Services by the Relative Significance of Factors, with Estimated Regression Coefficient. (Equation 10).

Factor	F-Ratio on Group	Variable	Estimated Coefficient	T-Statistic	
Age	73.44 (p < 0.01)	AGE014	0.259	10.78	a
		AGE1524	0.217	12.72	a
		AGE2544	0.180	12.30	a
		AGE4564	0.099	7.55	a
Education	57.74 (p < 0.01)	SECLESS	-0.215	-7.10	a
		SECDIP	-0.141	-4.42	a
		PSECDIP	-0.030	-1.29	
Dentist to pop. Ratio	38.43 (p < 0.01)	RATIO	0.002	6.20	a
Dental Problem	34.96 (p < 0.01)	DENTALPB	0.098	5.91	a
Sex	26.93 (p < 0.01)	SEXF	0.044	5.19	a
Family Income	22.24 (p < 0.01)	QUINT1	-0.194	-9.57	a
		QUINT2	-0.156	-8.83	a
		QUINT3	-0.103	-6.28	a
		QUINT4	-0.057	-4.89	a
		QUINTUNK	-0.135	-5.60	a
Family Size	18.84 (p < 0.01)	FAM1	-0.150	-7.02	a
		FAM2	-0.093	-4.90	a
		FAM3	-0.102	-5.15	a
		FAM4	-0.035	-1.75	b
Marital Status	5.80 (p < 0.01)	SEPDIVW	-0.038	-2.21	b
		MARRIED	-0.063	-3.40	a
Labour Force Status	4.29 (p < 0.01)	UNEMP	-0.022	-1.05	
		WHITEC	-0.002	-0.19	
		BLUECOL	-0.060	-3.53	a
Fluoridation	0.48 (p > 0.10	FLUOR	-0.013	-0.70	
		Intercept	0.594	14.98	a

n = 31,490
R2 = 0.5559 a: p < 0.01 b: p < 0.05 c: p < 0.10

Second, unlike physician and hospital services, there is no universal insurance scheme for dental care services in Canada. It has been demonstrated that the introduction of universal health insurance programs has been instrumental in eliminating financial barriers to health care in this country (Broyles et al., 1983; Manga et al., 1984; Barer et al., 1982). Therefore, factors such as income and socio-economic status will likely play a greater role in the utilization of dental care services. From a methodological viewpoint, this means that one is able to introduce more explanatory factors in the regression equation (income and socio-economic variables being very important variables collected through cross-sectional surveys), and therefore add to the overal predictive power of the model (more significant factors usually imply greater partial F-Ratios and consequently higher R2 values).[17]

The predictive ability of the regression equation is also judged by the predicted values derived from the regression equation in relation with the actual values for all weighted observations (table 28).

Three essential components can be derived from this table. First, it can be seen that the proportion of individuals with an actual value of one (a user) gradually increases, as the predicted values get closer to one (i.e.: 12 percent of those with a predicted value of 0 had an actual value of 1... 65 percent of those with a predicted value of .6 had an actual value of 1... and all of those respondents with a predicted score of 1 actually had an observed value of 1). According to our regression equation, the probability of tracing an actual user (value of one) increases accordingly, as the predicted value derived from the regression equation, approaches one, i.e., this trend indicates that the regression model appears to be reasonably accurate on the grounds of probability distribution.

[17] Broyles et al. (1983) and Manga et al. (1984) conducted similar analyses of physician and hospital use in Canada, both of which were derived from Canada Health Survey data files. The coefficients of determination obtained in these studies hovered around .15, depending upon the set of predictors chosen in the regression equation.

Table 28

Predicted Values Derived from the Regression Equation, Versus the Actual Values for all Observations (Equation 10).

Actual Values	Predicted Values					
	.0	.1	.2	.3	.4	.5
0	272,952 88 %	762,278 81 %	1,318,421 75 %	1,959,795 66 %	2,550,546 56 %	2,435,252 44 %
1	37,199 12 %	173,142 19 %	436,577 25 %	988,703 34 %	2,024,092 44 %	3,136,635 56 %

	.6	.7	.8	.9	1
0	1,577,226 35 %	478,089 26 %	71,879 19 %	2,992 11 %	0 0 %
1	2,978,001 65 %	1,347,012 74 %	309,922 81 %	23,548 89 %	3,380 100 %

A second way to analyze table 28, is to consider both extremes of the table: predicted and actual values of one and zero (users and non-users). Under the assumption of a "good fit", one would expect to find very little dispersion in terms of predicted and observed values near the two extremes of the regression line (0 and 1). Indeed, this is what the distribution reported in table 28 suggests. In fact, 88 percent of the cases with actual values of zero were also attributed a predicted score of zero; while 89 percent of those respondents with actual values of one were given a predicted value of .9 or one. Consequently, these findings

imply that those cases with predicted values at the two extremes of the scale (0 and 1) are located closely to the regression line.

Finally the third approach to table 28 consists in focusing on the location of the bulk of the weighted observations. As can be seen from table 28, the majority of the cases (85 %) have a predicted value ranging from .3 to .7. Under the assumption of a "perfect fit" the bulk of the cases should be located at the extremes (scores of either zero or one). Therefore, this third component of table 28 calls for prudence and reservation concerning the goodness of fit of our model. However, in view of the reservations outlined above, the trends of increasing probability and the relatively small dispersion (observed vs predicted) around the values of one and zero, combined to a large R2, suggest that the estimates derived from our model are useful, and that the overall predictive power of the regression model is quite sufficient to draw statistical inferences.

Turning next to the predictive power of each group of variable, it can be seen from table 27, that age stands out as the single most powerful predictor of dental care utilization in Canada. Such a finding is somehow different from previous findings, in which income and socioeconomic factors (occupation status, socioeconomic area) were found to exhibit greater predictive ability than age (Wan and Yates, 1975; Teh-wei-Hu, 1981; Bullen, 1982). These results are not really surprising, in view of the fact that dental problems (needs) are highly age-related (Health and Welfare Canada, 1979). Therefore, in the case of dental care utilization, the age variable can be regarded as a "need factor" as opposed to a "predisposing factor".

Education was found to be the second most powerful predictor of dental care utilization, followed, in order, by the availability of dentists measured by the dentist to population ratio; by the dental needs of respondents, sex, family income, family size, marital status and labour force status. All of these groups of variables exerted a significant influence on the use or non-use of dental care services, within the 99 percent confidence interval ($p < 0.01$). The

variable FLUOR which measures the effects of fluoridated water on utilization failed to statistically contribute to the overall model.

Given that both variables of availabilty/accessibility of dental manpower supply are highly correlated (namely because they attempt to measure the same effect), the variables RATIO and SMALLCT - MAJORCT - METROPOL could not be estimated in the same regression model. Consequently, the variables relating to the respondent's area of residency were analyzed in a subsequent computer run (Table 45, Equation 9). Although the group of variables measuring the effect of community size on utilization exerted a significant influence on the dependent variable, its overall predictive power (Partial F-Ratio), was far less than the dentist to population ratio variable. While RATIO ranked third in terms of predictive ability (Table 27, Equation 10), community size came in the eighth position with the same set of predictors (Table 45, Equation 9).

Having examined the predictive power of each group of variable, we wil now concentrate on the analysis of each variable individually, to determine its importance in the discrimination between users and non-users of dental care services.

6.5 Predisposing Factors.

6.5.1 Age

The estimated regression coefficients on the age variables (AGE014, AGE1524, AGE2544, AGE4564) are all statistically different from zero, at the 99 percent confidence interval, suggesting that a user of dental care services can be differentiated from a non-user on the basis of differing age levels. The results presented in table 27 indicate that the relative values of the coefficients decrease as age increases, suggesting that the propensity to visit a dentist decreases as one gets older. Furthermore, the magnitude of the parameter estimates on the age variable, compared to the other variables, illustrates the importance of age as the most powerful predictor of dental care utilization in Canada.

The findings reported in table 27 are in agreement with past research on dental care utilization, confirming the inverted U relationship between use and age (Canada, 1960; Health and Welfare Canada, 1970; Newman and Anderson, 1972). Such results are probably attributable to higher dental needs for children, as a consequence of a higher prevalence of dental problems, particularly caries, among children.

6.5.2 Education

The estimated regression coefficients of SECLESS and SECDIP are both statistically significant at the 0.01 level, while the T-Ratio on PSECDIP indicates that this variable fails to exert a significant influence on the dependent variable, at the same level of significance. These findings suggest that individuals in the lower education groups (SECLESS and SECDIP), behave differently in terms of dental care utilization, when compared to those in the higher education groups (PSECDIP and GRADEG -the missing group-). In addition, the results of the supplementary analysis summarized in table 29, indicate clearly that Canadians with some secondary education or less (SECLESS) exhibit a significantly different propensity to seek dental treatment than those with a secondary diploma (SECDIP).

The signs and relative values of the regression coefficients support the hypothesis that Canadians with higher education are more likely to consult a dentist at least once during the year. These findings are highly consistent with most of the findings reported earlier in the literature (U.S., DHEW, 1963; Lewis, 1980; Newman and Larsen, 1980), suggesting that the decision to consult or not a dental professional is still highly dependent upon one's level of education.

Table 29

Supplementary Analysis of the Influence of Education in the Use or Non-Use of Dental Care Services.

Null hypothesis	F	P
b(SECLESS) - b(SECDIP) = 0	35.80	p < 0.01

6.5.3 Sex

The results of the discriminant analysis suggest that the sex variable exerts a significant influence on the use or non-use of dental care services. These findings support the hypothesis that females are greater users of dental care services than their male counterparts (T-Ratio: 6.85 $p < 0.01$).

6.5.4 Marital Status

Marital status was also found to be an important predictor of dental care utilization. Both variables depicting marital status (SEPDIVW and MARRIED) are statistically different from zero at the 0.01 level, implying that the dental care behavior of single individuals (the suppressed group in this case) is significantly different from that of married, separated, divorced or widowed Canadians.

The signs and relative values of the estimated regression coefficients suggest that single Canadians are more likely to visit a dentist compared to their married, separated, divorced and widowed counterparts.

It was already noted that age is highly related to utilization, children being more likely to visit a dentist. Since all children are, by definition, included in the single group, it is possi-

ble that an "age effect" lurks in the findings described above. To examine this "age effect", two intercation terms were constructed: SING024 (single individuals, less than 25) and SING25P (single individuals 25 years and older). The results of this supplementary analysis are presented in table 30. In this case, the suppressed group is comprised of separated, divorced, widowed or married persons, regardless of their age. The results indicate clearly that single individuals in the younger age group (less than 25 years of age) are more likely to visit a dentist than single Canadians in the older age category (25 + years). In addition, the results of this supplementary analysis suggest that no statistical differences exist between single persons 25 years of age and older, and their married, separated, divorced or widowed counterparts (T-Ratio : -0.315 $p > 0.10$). Accordingly, the findings of this analysis confirm the expectation that the greater propensity to seek dental treatment on behalf of single respondents may be attributable to an "age effect", which reflects higher dental needs of younger age groups.

Given the importance of this age effect, it is important to consider the effects of marital status on a sample composed of older individuals. Consequently, it was decided to analyze the effects of marital status on utilization for all respondents 25 years of age and older.[18] The results of this supplementary analysis are presented in full in table 47, equation 12; and in part in table 31.

As can be seen from table 31, if we focus on Canadians 25 years of age or more, the marital variable fails to exert a significant influence on the use or non-use of dental care services. In other words, in the case of individuals older than 24, there are no statistical differences in utilization behaviour attributable to their marital status. This finding reinforces the earlier argument which stated that differences in utilization due to differential marital status were undoubtedly attributable to an "age effect" of younger single Canadians.

---

[18] This population was selected mainly because age 25 represents the average age when single Canadians get married, and therefore become actively involved in a marital lifestyle. Source: Statistics Canada, Vital Statistics, Catalogue 84-2005, 1979.

Table 30

Supplementary Analysis of Differences in Utilization between Single People 24 Years of Age and Less, and Single People 25 Years of Age and Older.

Variable	Coefficient	T-Statistic
SING024 *	0.109	5.31 (p < 0.01)
SING25P *	-0.006	-0.32 (p > 0.10)

* Married, separated, divorced or widowed = reference group

Null hypothesis	F	P
b(SING024) = b(SING25P) = 0	14.27	p < 0.01
b(SING024) - b(SING25P) = 0	15.45	p < 0.01

The difference between SEPDIVW and MARRIED on the full sample was also tested in another analysis (table 32), the results of which indicate that a statistical difference between separated, divorced or widowed individuals and their married counterparts, was observed at no better than the 0.10 level of siginificance. Although the regression coefficients on MARRIED and SEPDIVW suggest that the latter group is more likely to visit a dentist, such a conclusion is not supported statistically, i.e., within the desired level of confidence ($p < 0.10$). At the limit, it could be assumed that separated, divorced or widowed Canadians exhibit a slightly higher propensity to seek dental treatment, when compared to married Canadians.

Table 31

Supplementary Analysis of Differences in Utilization in Relationship to Marital Status, for People 25 Years of Age and Older.

Variable	Coefficient	T-Statistic
SEPDIVW *	0.016	0.70 (p > 0.10)
MARRIED *	0.019	0.86 (p > 0.10)

* Single, 25 years of age and more = reference group

Null hypothesis	F	P
b(SEPDIVW) = b(MARRIED) = 0	0.37	p > 0.10
b(SEPDIVW) - b(MARRIED) = 0	0.05	p > 0.10

Table 32

Supplementary Analysis of the Influence of Marital Status in the Use or Non-Use of Dental Care Services.

Null hypothesis	F	P
b(SEPDIVW) - b(MARRIED) = 0	3.17	p < 0.10

The statistical value of this relationship was further analyzed by creating two additional

interaction terms relating separated divorced or widowed individuals to two different age groups: those under 25 years of age (SEP024); and those 25 years of age and older (SEP25P). It is often assumed that separated, divorced or widowed individuals may exhibit social behaviours which resemble that of single individuals. If such is the case, it is possible that separated, divorced or widowed individuals in the younger age group (SEP024), may be as likely to visit a dentist as their single counterparts.

Table 33

Supplementary Analysis of Differences in Utilization in Relationship to Age and Marital Status.

Variable	Coefficient	T-Statistic
SEP024 *	-0.109	-1.37 (p > 0.10)
SEP25P *	-0.032	-1.78 (p < 0.10)
MARRIED *	-0.058	-3.23 (p < 0.01)

* Single = reference group

Null hypothesis	F	P
b(SEP024) - b(SEP25P) = 0	0.91	p > 0.10
b(SEP024) - b(MARRIED) = 0	0.41	p > 0.10
b(SEP25P) - b(MARRIED) = 0	3.44	p < 0.10
b(SEP024) = b(SEP25P) = b(MARRIED) = 0	3.81	p < 0.10

At first glance, the results of the supplementary analysis reported in table 33, tend to support the expectations expressed above. Indeed, of all the three variables in the equation,

it appears that SEP024 is the only one not statistically different from the reference group : SINGLE (T-Ratio: -1.366 $p > 0.10$). This result must however be analyzed with caution, in view of the fact that SEP024 also presents a fairly large standard error of the regression estimate.

A further analysis of the differences between SEP024, SEP25P and MARRIED, indicates that no statistical difference exists between SEP024 and SEP25P (F-Ratio: 0.911 $p > 0.10$). The F-Ratio between SEP024 and MARRIED (F-Ratio: 0.409 $p > 0.10$) also suggests that there is no difference between separated, divorced or widowed respondents in the younger age group, and married individuals. Finally, the results of the supplementary analysis reported in table 33 suggest that there may be differences in utilization between married Canadians and separated, divorced or widowed people, in the older age group (25 +); the latter being more likely to consult a dentist ($p < 0.10$).

Although the above findings are not supported by statistical evidence within the desired level of confidence (mainly because of small sample, high variability in the estimates, and overlapping confidence intervals), they do suggest that the possibility exists that separated, divorced or widowed Canadians are more likely to visit a dentist than married Canadians, a "dental behaviour" which would come closer to that of their single counterparts.

These results are contrary to the expection that married persons may be better disposed to consult a dentist, as a result of family preventive health habits. In summary then, it seems that the marital status variable does not represent a very strong proxy for family dental health behavior.

6.5.5 Family size

The results of the discriminant analysis indicate that the variables relating to family size (FAM1 to FAM4) exert a significant influence on the use or non-use of dental care services. The magnitude of the partial-F on FAM1 FAM2 FAM3 and FAM4 suggests that the relationship between utilization and family size is not a weak one; a finding which is somewhat

contradictory to some of the findings reported in the American literature (Mueller, 1984; Newman and Anderson, 1972; Avnet and Nikias, 1967).

However, the direction of the relationship is in agreement with some previous Canadian research, in which it was found that percentage utilization rates tend to increase as the size of the family increases up to five or six members (Bullen, 1982; Health and Welfare Canada, 1971). Indeed, the tests of significance on FAM1, FAM2, and FAM3 reveal a clear statistical difference between these variables and FAM5P (the missing group) at the 0.01 level. The variable FAM4 was found to be statistically different from FAM5P at the 0.05 level (one-tailed test). In addition, the signs and relative values of the regression coefficients confirm the hypothesis that the propensity to seek dental care increases as the respondent's family size increases up to five or six members.[19] These findings may be attributable to a "children effect" in the composition of the family. In the majority of the cases, families of five or six are comprised of three and four children respectively. Given that children are more likely to visit a dentist (namely because of greater dental needs, and also because of the existence of seven provincial children dental care plans, at the time of the survey), the probability of finding at least one user of dental services in a family, is considerably enhanced in families with more children. Furthermore, it could also be hypothesized that, within one family, the dental habits of one child (preventive check-up) may have a "snowball" effect on his/her brothers and sisters.

This "children effect" is further substantiated by the results of the supplementary analysis reported in table 34. These results indicate statistical differences in utilization between all family groups, with the exception of FAM2 and FAM3. In most cases, FAM2 will represent a husband-wife family, while FAM3 adds one child to this dimension. The F-Ratio between

[19] The suppressed group for the family variable (FAM5P) is comprised, in 80 % of the cases, of individuals whose family size is five or six. Consequently, it is highly probable that the suppressed variable FAM5P is a better representation of families with five or six members than families with seven or more members. Although it is not evident from this analysis, there is a strong probability that the likelihood of being a user decreases as the size of the family increases after six members (seven or more, as suggested in the previous chapter).

FAM2 and FAM3 (0.35 p > 0.10 ; table 34) and the values of the regression coefficients (table 27) suggest that the propensity to consult a dentist at least once, is merely the same if the respondent is a member of a family with no child (FAM2) or a member of a family with a unique child (FAM3).

Table 34

Supplementary Analysis of the Influence of Family Size in the Use or Non-Use of Dental Care Services.

Null hypothesis	F	P
b(FAM1) - b(FAM2) = 0	8.93	p < 0.01
b(FAM1) - b(FAM3) = 0	5.81	p < 0.05
b(FAM1) - b(FAM4) = 0	30.57	p < 0.01
b(FAM2) - b(FAM3) = 0	0.35	p > 0.10
b(FAM2) - b(FAM4) = 0	16.77	p < 0.01
b(FAM3) - b(FAM4) = 0	21.42	p < 0.01

Finally, to the extent which family size represents the complexity of intrafamily resource allocation decision on dental care (Mueller, 1984), the results of the discriminant analysis, combined with those of the descriptive analysis (chapter 5), indicate that the threshold (maximum number of allocations) could be reached in families with three or four members.

6.5.6 Preventive Behaviour

As mentioned previously, the effects of the variable relating to the respondent's preventive health behaviour could only be estimated on those respondents fifteen years of age and older.

As expected, the coefficient relating the use or non-use of dental care services to the respondent's preventive behaviour is positive and significant (b = 0.016 T-Ratio: 7.929; Table 46, Equation 11). In addition, the value of the partial-F on the same variable suggests that preventive health behaviour is one of the most salient determinants of dental care utilization. Accordingly, these findings suggest that those Canadians who exhibit a stronger positive attitude towards healthy lifestyles and preventive health (exercise, seatbelt use, immunization), will also be more likely to consult a dentist.

6.6 Enabling Factors

6.6.1 Income

The results of the discriminant analysis confirm the hypothesis that Canadians in the higher income groups are more likely to seek dental treatment, than those at lower income levels.

Indeed, the test of significance on the regression coefficients relating to income indicate that all five income groups in the model are statistically different from zero, and therefore significantly different from the missing group (QUINT5). In addition, the signs and relative values of the estimated regression coefficients suggest that the likelihood of being a user of dental care services increases accordingly with family income. Such findings are in agreement with previous Canadian research (Canada, 1960; Health and Welfare Canada, 1971; Bullen, 1982), and support the contention that the decision to consult a dental professional in Canada, is still, in part, determined by the patient's ability to pay for such services.

6.6.2 Social Assistance Source of Income

The findings relating social assistance source of income to the use or non-use of dental care services indicate that social assistance recipients are less likely to visit a dentist, than those Canadians who are not welfare recipients (table 48, equation 13). Insofar as the variable SOCASS is a surrogate for those Canadians who are eligible for free dental care under the

Canada Assistance Plan, the foregoing analysis suggests that the provision of free dental care for social assistance recipients has not brought up the level of consumption of welfare recipients to that of those who are not. Of course, this is not to suggest that additional free dental benefits under CAP have not brought about an increase in the utilization of dental care services for this group.[20] Past research has demonstrated that a large proportion of the population will not visit a dentist, even when these services are free (Evans and Williamson, 1978; Avnet and Nikias, 1967; Nikias, 1969). Therefore, it might be argued that the barriers to dental care for the social assistance recipients go beyond the traditional financial barriers, and encompass a range of "dental IQ" and accessibility barriers.

6.6.3 Labour Force Status

As expected, the results of the discriminant analysis suggest that the employment status of the respondent exerts a significant influence on the use or non-use of dental care services (F-Ratio: 4.29 $p < 0.01$).

However, the results are such that no clear-cut line can be drawn between the different occupational groups. Of all the labour force variables, only the regression coefficient relating to blue collar workers (BLUECOL) is significantly different from zero at the 0.01 level. This finding suggests that unemployed Canadians (UNEMP), and white collar workers (WHITEC) are no different, in terms of utilization behaviour than Canadians not in the labour force (NOTLFST). Furthermore, the results of an additional analysis on occupational status and utilization shows no difference in utilization behaviour between the unemployed group, and white collar workers (table 35).

The negative value of the BLUECOL regression coefficient implies that blue collar workers are less likely to make at least one dental visit, compared to any other occupational group. These findings support the hypothesis that individuals with the lower opportunity

---

[20] As was mentioned in chapter 5, CHS data limitations preclude any explanatory analysis with social assistance data. Therefore, the essence of this discussion is limited to a factual description of the findings.

Table 35

Supplementary Analysis of the Influence of Labour Force Status in the Use or Non-Use of Dental Care Services.

Null hypothesis	F	P
b (UNEMP) - b (WHITEC) = 0	3.17	p < 0.10

costs (time and money lost from work, travel time, sick leave benefits, etc.) will exhibit a geater propensity to seek dental care. In addition, the findings relating to blue collar workers and lower utilization rates corroborate the findings of Suchman and Rothman (1969) and Dickson (1968), who demonstrated that dental treatment was still viewed by the working class (i.e. blue collar workers) as a luxury health service.

As was the case with marital status, it is highly probable that an "age effect" also lurks in the findings outlined above, mainly because all children are, by definition, included in the NOTLFST variable (not in the labour force). Consequently, it was decided to analyze the effects of occupational status on utilization for a sample of Canadians 25 years of age and older (an age group which marks the average age when Canadians get actively involved in the labour force). (Statistics Canada, 1971).

The results of this supplementary analysis presented in part in table 36 (and in full table 47, equation 12), suggest that white collar workers are more likely to visit a dentist than any other occupational group. The analysis also indicates that unemployed Canadians, students, housewives or retired individuals and blue collar workers are essentially similar in terms of dental care utilization behaviour. Although it is not statistically significant, the value and

negative direction of the coefficient on BLUECOL suggests that of all occupational groups, blue collar workers are less likely to seek dental care.

Table 36

Supplementary Analysis of Differences in Utilization in Relationship to Occupational Status, for People 25 Years of Age and Older.

Variable	Coefficient	T-Statistic
UNEMP *	0.02	1.01 (p > 0.10)
WHITEC *	0.03	2.43 (p < 0.05)
BLUECOL *	-0.01	-1.06 (p > 0.10)

* Not in the labour force, 25 years + = reference group

Null hypothesis	F	P
b(UNEMP) - b(WHITEC) = 0	0.23	p > 0.10
b(UNEMP) - b(BLUECOL) = 0	2.11	p > 0.10
b(WHITEC) - b(BLUECOL) = 0	6.11	p < 0.05

The test of differences between the coefficients relating to the UNEMP and WHITEC variables, indicates that there is no statistical difference between the unemployed and white collar workers (F-Ratio: 0.223 p > 0.10). Such a finding is somewhat puzzling, in the light of the results outlined above (according to the T-tests, only the WHITEC variable yielded a statistical difference from the missing group, at the desired level of confidence). In part, this finding is attributable to a larger standard error of the estimate on the UNEMP coefficient.

In addition, the value and direction of the UNEMP and WHITEC coefficients are very close, causing the confidence intervals to overlapp, and consequently leading to the fuzzy results displayed above.

In the light of these reservations, how valid are our regression estimates? Statistical evidence enables us to ascertain with 95 % certainty, that white collar workers are more likely to visit a dentist than blue collar workers, and those not in the labour force. However, differential dental behaviour between an unemployed Canadian and an employed white collar worker, is not as evident statistically. At the limit, it could be assumed that white collar workers may exhibit a slightly higher propensity to seek dental care, on the grounds of higher parameter estimate, combined to a lower standard error and therefore a greater T-Ratio.

A working hypothesis which was developed in chapter 5 suggested that perhaps the UNEMP variable could be used as a surrogate to social assistance beneficiaries. If such were the case, the findings outlined above may very well suggest that unemployed individuals are almost as likely to consult a dentist as their white collar counterparts; perhaps because they can benefit from additional dental care benefits, under the Canada Assistance Plan. However, this remains a working hypothesis beyond the data limitations of the CHS. Again, the findings of the regression analysis only enable us to stipulate that there is no difference in utilization between UNEMP and WHITEC. Such a difference cannot be explained with the data available.

To the extent that labour force status is regarded as for surrogate to opportunity costs, the results of the discriminant analysis support the hypothesis that blue collar workers incur the highest costs when visiting a dentist, and that such costs may act as a deterrent when faced with the decision to seek or not dental treatment. In addition, these findings support the contention that white collar workers may exhibit a greater propensity to consult a dental professional, not only because of lower opportunity costs (sick leave benefits, flexible schedule, etc.), but also because of their greater ability to pay for such services.

6.6.4 Industry Occupation Status

Contrary to expectations, the overall effect of the industry occupation variables on he use or non-use of dental care services was negligible (table 47, Equation 12 and table 37). None of the three variables (MANCONS - SALEFIN - TRANCOM) proved to be statistically different from the missing group (AGRIC), within the desired confidence limit ($p < 0.05$). However, in the case of MANCONS and TRANCOM, a one-tailed T-test indicates that both these variables are statistically different from zero, at the 0.10 level.

Table 37

The Utilization of Dental Care Services, in Relationship to the Respondent's Industry Occupation Status (derived from table 47, Equation 12).

Variable	Coefficient	T-Statistic
MANCONS *	0.026	1.37 (p < 0.10) a
SALEFIN *	0.0003	0.02 (p > 0.10)
TRANCOM *	0.027	1.65 (p < 0.10) a

* Those in the primary sector (AGRIC) = reference group
a : one-tailed T-test

Bearing in mind the legitimate reservations of such a test ($p < 0.10$ is indeed risky), it is however probable that Canadians employed in manufacturing and construction industries, along with those in transportation and communication activities may be more likely to visit a dentist. This finding may be related to the presence of employment-based private group dental plans in the two occupational groups mentioned above (MANCONS and TRANCOM).

At the time of the Canada Health Survey (1978-79), private group dental plans in this country represented the most rapidly growing component of employee benefits packages, especially in the highly unionized sectors of the industry (steel workers, wood-workers, retail clerks, manufacturing, etc.) (O'hara, 1977; Stamm et al., 1984). Given that, by definition, MANCONS and TRANCOM represent the two industrial sectors with the highest degree of unionization, it is possible that union members in these two groups may exhibit a greater propensity to seek dental treatment, because of insurance.[11]

In the light of the reservations expressed earlier ($p < .10$ in a one-tailed test), it appears that the overall predictive power of the industry occupation variable is extremely poor. Therefore, the use of an industrial classification variable, in this context, represents a very weak proxy to participation in employment-based private group dental plans.

6.6.5 Accessibility/Availability of dentists

Concerning the measures of availability and accessibility (RATIO and COMMUNITY SIZE), the results of the mutlivariate analysis support the expectations that higher utilization rates are in fact observed in commmunities with higher dentist to population ratios. The coefficient of the RATIO variable is highly significant, and therefore suggests that the likelihood of making at least one dental visit is considerably enhanced as the the supply of dental manpower in the community increases.

Because of high multicollinearity between community size and dentist to population (both variables essentially capture the same effect); the effect of community size on dental care utilization was measured in a subsequent computer run (table 45, equation 9). As expected, the respondent's area of residence exerted a significant influence on the use or non-use of dental care services. The two variables representing the more populated areas (MAJORCT and METROPOL) are both statistically different from zero ($P < 0.01$), while no

[11] In the case of TRANCOM, this group is largely composed of public servants, most of whom who are, by definition, white collar workers. As was already demonstrated these workers are more likely to consult a dentist. It is possible that this "white collar" effect lurks in the TRANCOM variable.

statistical difference was observed between people living in smaller communities (SMALLCT and RURAL). Furthermore, the direction of the relationship indicates that the propensity of making at least one visit to a dentist increases as the respondent's area of residence increases.

These findings, which are highly consistent with those reported earlier in the dental care literature (Bullen, 1982; Roemer, 1968; Wan and Yates, 1975) imply that an improvement in the distribution of dentists will alleviate availability and accessibility barriers to dental care services in this country.

6.6.6 Fluoridated Water

It is often claimed that demand for dental services is declining because of fluoridated water (Mueller, 1984). Therefore, if the variable FLUOR captures the alleged fluoridation effects, the direction of the variable should negatively affect use. Although the regression coefficient on FLUOR exhibits the expected sign, the estimate is not statistically different from zero. Consequently, the results of the discriminant analysis fail to support expectations concerning the significant influence of fluoridated water in the respondent's community on dental care utilization. Given that the FLUOR variable is a rather crude indicator, it is probable that this explanatory factor fails to capture the full responsiveness of utilization behaviour to the presence or absence of fluoridated water in the community. Accordingly, better indicators should be sought for future research, or perhaps one needs time series data to capture the effects.

6.7 Need Factors

The results of the discriminant analysis suggest that the dental needs of the Canadians, as measured by the presence or absence of dental problems, will significantly increase the propensity to consult a dentist at least once during the year. The positive value of the regression estimate implies that the use of dental care services is significantly influenced by the presence of dental symptoms. Such a finding reinforces the argument that many Canadians will visit their dentist mainly for symptomatic care, as opposed to preventive care.

These findings which are highly consistent with the dental literature (Bullen, 1982; Cageorge et al., 1976; Wan and Yates, 1975; Newman and Anderson, 1972), confirm that the "dental needs" variable is one of the foremost determinant of dental care utilization, and should be seriously considered as an explanatory factor in utilization studies.

Table 38

The Use or Non-Use of Dental Care Services by the Relative Significance of Factors, with Estimated Regression Coefficient. (Equation 2).

Factor	F-Ratio on Group	Variable	Estimated Coefficient	T-Statistic
Age	169.19 (p < 0.01)	AGE014	0.385	23.84 a
		AGE1524	0.290	18.04 a
		AGE2544	0.215	12.68 a
		AGE4564	0.120	7.88 a
Education	56.71 (p < 0.01)	SECLESS	-0.239	-7.33 a
		SECDIP	-0.157	-4.63 a
		PSECDIP	-0.054	-1.55 b
Family Income	14.12 (p < 0.01)	QUINT1	-0.172	-8.12 a
		QUINT2	-0.132	-6.81 a
		QUINT3	-0.086	-4.80 a
		QUINT4	-0.045	-3.93 a
		QUINTUNK	-0.108	-4.22 a
		Intercept	0.543	14.93 a

n = 31,490
R2 = 0.5434 a: p < 0.01 b: p < 0.05 c: p < 0.10

Table 39

The Use or Non-Use of Dental Care Services by the Relative Significance of Factors, with Estimated Regression Coefficient. (Equation 3).

Factor	F-Ratio on Group	Variable	Estimated Coefficient	T-Statistic
Age	179.05 (p < 0.01)	AGE014	0.388	24.66 a
		AGE1524	0.293	18.24 a
		AGE2544	0.218	12.90 a
		AGE4564	0.122	8.07 a
Education	57.09 (p < 0.01)	SECLESS	-0.247	-7.70 a
		SECDIP	-0.169	-5.14 a
		PSECDIP	-0.063	-1.84 b
Sex	45.09 (p < 0.01)	SEXF	0.056	6.71 a
Family Income	15.03 (p < 0.01)	QUINT1	-0.177	-8.41 a
		QUINT2	-0.135	-6.99 a
		QUINT3	-0.088	-4.93 a
		QUINT4	-0.048	-4.13 a
		QUINTUNK	-0.109	-4.24 a
		Intercept	0.524	14.59 a

n = 31,490
R2 = 0.5449 a: p < 0.01 b: p < 0.05 c: p < 0.10

Table 40

The Use or Non-Use of Dental Care Services by the Relative Significance of Factors, with Estimated Regression Coefficient. (Equation 4).

Factor	F-Ratio on Group	Variable	Estimated Coefficient	T-Statistic
Age	73.79 (p < 0.01)	AGE014	0.336	13.60 a
		AGE1524	0.254	12.37 a
		AGE2544	0.212	12.34 a
		AGE4564	0.120	7.89 a
Education	57.53 (p < 0.01)	SECLESS	-0.245	-7.64 a
		SECDIP	-0.165	-5.06 a
		PSECDIP	-0.062	-1.83 b
Sex	50.09 (p < 0.01)	SEXF	0.059	7.08 a
Family Income	14.61 (p < 0.01)	QUINT1	-0.176	-8.29 a
		QUINT2	-0.133	-6.87 a
		QUINT3	-0.086	-4.80 a
		QUINT4	-0.047	-3.99 a
		QUINTUNK	-0.111	-4.39 a
Marital Status	6.90 (p < 0.01)	SEPDIVW	-0.068	-3.71 a
		MARRIED	-0.050	-2.98 a
		Intercept	0.570	15.22 a

n = 31,490
R2 = 0.5454 a: p < 0.01 b: p < 0.05 c: p < 0.10

Table 41

The Use or Non-Use of Dental Care Services by the Relative Significance of Factors, with Estimated Regression Coefficient. (Equation 5).

Factor	F-Ratio on Group	Variable	Estimated Coefficient	T-Statistic
Age	84.22 (p < 0.01)	AGE014	0.334	13.35 a
		AGE1524	0.267	14.16 a
		AGE2544	0.225	13.31 a
		AGE4564	0.130	8.63 a
Education	57.24 (p < 0.01)	SECLESS	-0.224	-7.28 a
		SECDIP	-0.150	-4.73 a
		PSECDIP	-0.052	-1.57 c
Sex	28.88 (p < 0.01)	SEXF	0.045	5.37 a
Family Income	15.42 (p < 0.01)	QUINT1	-0.177	-8.44 a
		QUINT2	-0.133	-7.05 a
		QUINT3	-0.085	-4.81 a
		QUINT4	-0.047	-4.05 a
		QUINTUNK	-0.108	-4.34 a
Marital Status	6.72 (p < 0.01)	SEPDIVW	-0.065	-3.66 a
		MARRIED	-0.047	-2.86 a
Labour Force Status	5.06 (p < 0.01)	UNEMP	-0.022	-1.08
		WHITEC	-0.007	-0.70
		BLUECOL	-0.060	-3.55 a
		Intercept	0.556	15.20 a

n = 31,490
R2 = 0.5462 a: p < 0.01 b: p < 0.05 c: p < 0.10

Table 42

The Use or Non-Use of Dental Care Services by the Relative Significance of Factors, with Estimated Regression Coefficient. (Equation 6).

Factor	F-Ratio on Group	Variable	Estimated Coefficient	T-Statistic
Age	86.83 ($p < 0.01$)	AGE014	0.337	13.63 a
		AGE1524	0.267	14.06 a
		AGE2544	0.224	13.42 a
		AGE4564	0.129	8.48 a
Education	58.36 ($p < 0.01$)	SECLESS	-0.225	-7.31 a
		SECDIP	-0.150	-4.70 a
		PSECDIP	-0.053	-1.57 c
Dental Problem	28.00 ($p < 0.01$)	DENTALPB	0.091	5.29 a
Sex	26.31 ($p < 0.01$)	SEXF	0.044	5.13 a
Family Income	15.67 ($p < 0.01$)	QUINT1	-0.181	-8.50 a
		QUINT2	-0.133	-7.07 a
		QUINT3	-0.086	-4.80 a
		QUINT4	-0.047	-3.98 a
		QUINTUNK	-0.106	-4.27 a
Marital Status	7.36 ($p < 0.01$)	SEPDIVW	-0.067	-3.83 a
		MARRIED	-0.048	-2.95 a
Labour Force Status	5.11 ($p < 0.01$)	UNEMP	-0.025	-1.21
		WHITEC	-0.006	-0.66
		BLUECOL	-0.061	-3.54 a
		Intercept	0.555	15.02 a

n = 31,490
R2 = 0.5473 a: $p < 0.01$ b: $p < 0.05$ c: $p < 0.10$

Table 43

The Use or Non-Use of Dental Care Services by the Relative Significance of Factors, with Estimated Regression Coefficient. (Equation 7).

Factor	F-Ratio on Group	Variable	Estimated Coefficient	T-Statistic
Age	65.91 ($p < 0.01$)	AGE014	0.266	11.55 a
		AGE1524	0.217	12.95 a
		AGE2544	0.180	10.70 a
		AGE4564	0.101	7.19 a
Education	63.68 ($p < 0.01$)	SECLESS	-0.235	-7.57 a
		SECDIP	-0.152	-4.71 a
		PSECDIP	-0.052	-1.51 c
Dental Problem	33.14 ($p < 0.01$)	DENTALPB	0.098	5.76 a
Sex	28.54 ($p < 0.01$)	SEXF	0.047	5.34 a
Family Income	20.50 ($p < 0.01$)	QUINT1	-0.194	-9.34 a
		QUINT2	-0.153	-8.49 a
		QUINT3	-0.105	-6.24 a
		QUINT4	-0.056	-4.80 a
		QUINTUNK	-0.134	-5.49 a
Family Size	15.16 ($p < 0.01$)	FAM1	-0.135	-6.41 a
		FAM2	-0.082	-4.31 a
		FAM3	-0.096	-4.88 a
		FAM4	-0.026	-1.31
Marital Status	7.12 ($p < 0.01$)	SEPDIVW	-0.038	-2.10 b
		MARRIED	-0.066	-3.71 a
Labour Force Status	4.63 ($p < 0.01$)	UNEMP	-0.021	-1.05
		WHITEC	-0.012	-1.24
		BLUECOL	-0.054	-3.16 a
		Intercept	0.676	18.39 a

n = 31,490
R2 = 0.5503 a: $p < 0.01$ b: $p < 0.05$ c: $p < 0.10$

Table 44

The Use or Non-Use of Dental Care Services by the Relative Significance of Factors, with Estimated Regression Coefficient. (Equation 8).

Factor	F-Ratio on Group	Variable	Estimated Coefficient	T-Statistic
Age	63.26 ($p < 0.01$)	AGE014	0.261	10.99 a
		AGE1524	0.214	12.49 a
		AGE2544	0.176	10.80 a
		AGE4564	0.099	7.24 a
Education	64.84 ($p < 0.01$)	SECLESS	-0.233	-7.37 a
		SECDIP	-0.150	-4.63 a
		PSECDIP	-0.051	-1.50
Dental Problem	33.67 ($p < 0.01$)	DENTALPB	0.097	5.80 a
Sex	28.62 ($p < 0.01$)	SEXF	0.042	5.35 a
Family Income	21.22 ($p < 0.01$)	QUINT1	-0.194	-9.46 a
		QUINT2	-0.154	-8.77 a
		QUINT3	-0.104	-6.19 a
		QUINT4	-0.057	-4.93 a
		QUINTUNK	-0.133	-5.59 a
Family Size	15.70 ($p < 0.01$)	FAM1	-0.139	-6.48 a
		FAM2	-0.085	-4.41 a
		FAM3	-0.100	-4.98 a
		FAM4	-0.030	-1.49
Marital Status	6.80 ($p < 0.01$)	SEPDIVW	-0.039	-2.16 b
		MARRIED	-0.066	-3.65 a
Labour Force Status	4.30 ($p < 0.01$)	UNEMP	-0.021	-1.02
		WHITEC	-0.009	-0.91
		BLUECOL	-0.054	-3.19 a
Fluoridation	3.66 ($p > 0.10$	FLUOR	-0.037	-0.91
		Intercept	0.661	17.01 a

n = 31,490
R2 = 0.5510 a: $p < 0.01$ b: $p < 0.05$ c: $p < 0.10$

Table 45

The Use or Non-Use of Dental Care Services by the Relative Significance of Factors, with Estimated Regression Coefficient. (Equation 9).

Factor	F-Ratio	Variable	Coefficient	T-Statistic
Age	65.16 (p < 0.01)	AGE014	0.259	11.05 a
		AGE1524	0.213	12.17 a
		AGE2544	0.175	11.15 a
		AGE4564	0.124	7.56 a
Education	55.64 (p < 0.01)	SECLESS	-0.218	-6.58 a
		SECDIP	-0.146	-4.40 a
		PSECDIP	-0.459	-1.32 c
Dental Problem	39.12 (p < 0.01)	DENTALPB	0.094	6.25 a
Sex	28.44 (p < 0.01)	SEXF	0.046	5.33 a
Family Income	25.57 (p < 0.01)	QUINT1	-0.208	-10.63 a
		QUINT2	-0.163	-9.07 a
		QUINT3	-0.109	-6.45 a
		QUINT4	-0.063	-5.25 a
		QUINTUNK	-0.137	-5.88 a
Family Size	16.61 (p < 0.01)	FAM1	-0.143	-6.62 a
		FAM2	-0.090	-4.67 a
		FAM3	-0.101	-4.99 a
		FAM4	-0.033	-1.68 c
Community Size	5.82 (p < 0.01)	SMALLCT	0.025	0.62
		MAJORCT	0.002	2.69 a
		METROPOL	0.119	3.53 a
Marital Status	5.59 (p < 0.01)	SEPDIVW	-0.037	-2.09 b
		MARRIED	-0.061	-3.33 a
Labour Force Status	3.70 (p < 0.01)	UNEMP	-0.016	-1.02
		WHITEC	0.0002	0.03
		BLUECOL	0.017	-3.27 a
Fluoridation	0.48 (p > 0.10)	FLUOR	-0.005	-0.26
		Intercept	0.617	13.41 a

n = 31,490 R2= 0.55 a: p< 0.01 b: p< 0.05 c: p< 0.10

Table 46

The Use or Non-Use of Dental Care Services by the Relative Significance of Factors, with Estimated Regression Coefficient. (N = Canadians, 15 Years of Age and Older) (Equation 11).

Factor	F-Ratio on Group	Variable	Estimated Coefficient	T-Statistic
Preventive Behaviour	64.86 ($p < 0.01$)	PREVENT	0.016	7.93 a
Age	65.16 ($p < 0.01$)	AGE1524	0.186	10.40 a
		AGE2544	0.160	9.49 a
		AGE4564	0.083	6.24 a
Education	52.53 ($p < 0.01$)	SECLESS	-0.211	-6.10 a
		SECDIP	-0.143	-4.18 a
		PSECDIP	-0.048	-1.35 c
Dental Problem	36.95 ($p < 0.01$)	DENTALPB	0.096	6.08 a
Sex	29.48 ($p < 0.01$)	SEXF	0.050	5.43 a
Family Income	17.00 ($p < 0.01$)	QUINT1	-0.168	-8.48 a
		QUINT2	-0.162	-8.12 a
		QUINT3	-0.105	-5.50 a
		QUINT4	-0.064	-4.64 a
		QUINTUNK	-0.122	-4.96 a
Family Size	9.90 ($p < 0.01$)	FAM1	-0.113	-5.42 a
		FAM2	-0.051	-2.83 a
		FAM3	-0.029	-1.68 b
		FAM4	-0.077	-0.33
Marital Status	7.39 ($p < 0.01$)	SEPDIVW	-0.041	-2.34 b
		MARRIED	-0.068	-3.76 a
Community Size	5.82 ($p < 0.01$)	SMALLCT	0.021	0.42
		MAJORCT	0.065	1.858 b
		METROPOL	0.093	2.35 b
Labour Force Status	2.63 ($p < 0.05$)	UNEMP	-0.018	-0.87
		WHITEC	0.010	0.91
		BLUECOL	-0.036	-2.50 a
Fluoridation	0.005 ($p > 0.10$)	FLUOR	-0.001	-0.07

500			
	Intercept	0.552	11.19 a

n = 23,654
R2 = 0.5374 a: p < 0.01 b: p < 0.05 c: p < 0.10

Table 47

The Use or Non-Use of Dental Care Services by the Relative Significance of Factors, With Estimated Regression Coefficient (N = Canadians, 25 Years of Age and Older) (Equation 12).

Factor	F-Ratio on Group	Variable	Estimated Coefficient	T-Statistic
Education	47.13 ($p < 0.01$)	SECLESS	-0.233	-6.17 a
		SECDIP	-0.126	-3.63 a
		PSECDIP	-0.039	-1.03 c
Age	46.57 ($p < 0.01$)	AGE2544	0.160	9.44 a
		AGE4564	0.079	6.25 a
Sex	31.76 ($p < 0.01$)	SEXF	0.054	5.64 a
Dental Problem	25.75 ($p < 0.01$)	DENTALPB	0.079	5.07 a
Family Income	15.59 ($p < 0.01$)	QUINT1	-0.181	-7.73 a
		QUINT2	-0.168	-7.17 a
		QUINT3	-0.103	-4.57 a
		QUINT4	-0.052	-3.38 a
		QUINTUNK	-0.134	-5.92 a
Community Size	3.00 ($p < 0.01$)	SMALLCT	0.004	0.07
		MAJORCT	0.052	1.41 c
		METROPOL	0.085	2.17 b
Labour Force Status	2.37 ($p < 0.10$)	UNEMP	0.026	1.01
		WHITEC	0.038	2.44 b
		BLUECOL	-0.015	-1.06
Family Size	2.00 ($p > 0.10$)	FAM1	-0.066	-2.17 b
		FAM2	-0.038	-1.79 c
		FAM3	-0.038	-1.62 c
		FAM4	-0.006	-0.23
Industry Occupation Status	0.91 ($p > 0.10$)	MANCONS	0.026	1.37 c
		SALEFIN	0.0003	0.023
		TRANCOM	0.019	1.65 c
Marital Status	0.37 ($p < 0.01$)	SEPDIVW	0.159	0.70
		MARRIED	0.019	0.86
Fluoridation	0.05 ($p > 0.10$)	FLUOR	-0.005	-0.21

	Intercept	0.487	8.99 a

n = 17,558
R2 = 0.5095 a: p < 0.01 b: p < 0.05 c: p < 0.10

Table 48

The Use or Non-Use of Dental Care Services by the Relative Significance of Factors, with Estimated Regression Coefficient. (N = Canadians, 15 Years of Age and Older) (Equation 13).

Factor	F-Ratio	Variable	Coefficient	T-Statistic
Preventive Behaviour	71.83 (p < 0.01)	PREVENT	0.018	8.47 a
Education	60.95 (p < 0.01)	SECLESS	-0.250	-7.02 a
		SECDIP	-0.168	-4.75 a
		PSECDIP	-0.065	-1.81 c
Age	58.76 (p < 0.01)	AGE1524	0.200	11.27 a
		AGE2544	0.183	9.57 a
		AGE4564	0.118	8.79 a
Dental Problem	31.48 (p < 0.01)	DENTALPB	0.089	5.61 a
Sex	29.87 (p < 0.01)	SEXF	0.050	5.46 a
Social Assistance	21.04 (p < 0.01)	SOCASS	-0.120	-4.58 a
Marital Status	11.31 (p < 0.01)	SEPDIVW	-0.055	-3.27 a
		MARRIED	-0.083	-4.75 a
Family Size	6.46 (p < 0.01)	FAM1	-0.090	-4.01 a
		FAM2	-0.010	-0.53
		FAM3	-0.006	-0.37
		FAM4	-0.004	-0.23
Labour Force Status	4.43 (p < 0.05)	UNEMP	-0.013	-0.65
		WHITEC	0.043	3.26 a
		BLUECOL	-0.011	-0.75
Community Size	2.21 (p < 0.05)	SMALLCT	0.017	0.33
		MAJORCT	0.060	1.68 c
		METROPOL	0.077	1.87 c
Fluoridation	0.045 (p > 0.10)	FLUOR	0.002	0.10
		Intercept	0.050	8.74 a

n = 23,654 R2= 0.54 a: p< 0.01 b: p < 0.05 c: p< 0.10

6.8 Presence or Absence of Dental Problems: An Additional Analysis.

Given the importance of the "need" factor as a strong predictor of dental care utilization, it was decided to analyze the "dental problem" (DENTALPB) variable in a multivariate model. More precisely, an attempt was made to estimate the probability of having at least one dental problem during the year (the dependent variable), in relationship to several socio-economic and demographic variables (independent variables). The objective of this analysis is to identify those groups in the Canadian population who are more likely to experience one or more dental problems during the course of a year.

The results of the discriminant analysis suggest that sex, family size, family income, education, age, labour force status and marital status were all predictors of the presence or absence of dental problems, within the 95 + percent confidence interval. Water fluoridation and dentist to population ratios both failed to exert a significant influence on the presence or absence of dental problems (table 49).

The signs and values of the coefficient estimates on the income variables, indicate that Canadians in the lower income groups are more likely to experience some form of dental morbidity during a year, than those in higher income classes. In addition, the results of the discriminant analysis suggest that dental needs (insofar as DENTALPB is used as a surrogate for need) are significantly greater for Canadians with lower levels of education, for females, for married individuals, for the unemployed, for those in the older age groups, and for Canadians in small families (table 49).

What is really striking from the foregoing analysis, is the finding that Canadians in lower socio-economic groups (low income earners, unemployed, lower education levels) exhibited a greater need for dental care services. Yet, the discriminant analysis of the use or non-use of dental care services suggested that individuals belonging to these groups are also among the ones who are less likely to visit a dentist. The rationale goes on that these social groups are more subject to the economic and other barriers to dental care, and hence, may delay or redefine their felt needs (Leverett, 1974).

The findings relating age to dental problems suggest that people in the older age groups are more likely to experience at least one dental problem during the course of the year. The inverse relationship between utilization and age has already been demonstrated at the beginning of this chapter (table 27, equation 10). Therefore, it might be argued that people in the older age groups may place less emphasis on dental care, compared to health care in general, despite the fact that they exhibit a greater need for dental services, as measured by the presence or absence of dental symptoms.

It was also found that females and Canadians living in small families exhibited a greater propensity to seek dental care treatment (table 27, equation 10). The foregoing analysis of the presence or absence of dental problems suggests that these two groups are also more likely to have had at least one dental problem during the course of a year. By extrapolating it might be argued that females and individuals belonging to small families are more likely to visit a dentist for therapeutic reasons as opposed to preventive visits.

Table 49

The Presence or Absence of Dental Problems by the Relative Significance of Factors, with Estimated Regression Coefficient. (Equation 14).

Factor	F-Ratio on Group	Variable	Estimated Coefficient	T-Statistic
Sex	12.54 (p < 0.01)	SEXF	0.014	3.54 a
Family Size	11.32 (p < 0.01)	FAM1	0.052	5.16 a
		FAM2	0.033	4.31 a
		FAM3	0.008	1.06
		FAM4	0.006	1.03
Family Income	9.30 (p < 0.01)	QUINT1	0.041	3.98 a
		QUINT2	0.013	1.81 c
		QUINT3	0.016	2.61 a
		QUINT4	0.007	0.89
		QUINTUNK	-0.006	-0.73
Education	3.48 (p < 0.05)	SECLESS	0.020	1.67 c
		SECDIP	0.003	0.30
		PSECDIP	0.002	0.25
Marital Status	2.96 (p < 0.05)	SEPDIVW	0.011	0.90
		MARRIED	2.424	2.41 b
Age	2.71 (p < 0.05)	AGE014	0.006	0.56
		AGE1524	0.026	1.84 c
		AGE2544	0.029	2.69 a
		AGE4564	0.024	2.60 a
Labour Force Status	2.64 (p < 0.05)	UNEMP	0.030	2.69 a
		WHITEC	0.002	0.26
		BLUECOL	0.005	0.71
Fluoridation	0.69 (p > 0.10)	FLUOR	0.005	0.84
Dentist to pop Ratio	0.14 (p > 0.10)	RATIO	-0.00004	-0.37
		Intercept	-0.015	-0.63

n = 31,490
R2 = 0.0869 a: p < 0.01 b: p < 0.05 c: p < 0.10

6.9 A Special Analysis: Denture-Wearing and Dentate Population.

There are essentially three theoretical approaches in studying the determinants of dental care utilization. The first approach consists in examining the entire population. This approach lends itself best for policy analysis, as it takes into account the dentate and the denture-wearing population, all of which are potential users, despite the fact that they might have lower needs. This is was has been done up to this point in this chapter.

The second approach consists in isolating the denture-wearing population. Because of small volume and variance in utilization on behalf of this group, it is impractical to treat this group alone in a multivariate analysis. However, given that the denture variable is a proxy for oral health status, it is important to include it as a dummy (1,0) independent variable. Consequently, such an approach enables us to isolate the denture-wearing population within the full sample, and to measure the impact of denture, as a measure of oral health status, on the use or non-use of dental care services.

The third approach, inspired by the work of Bullen (1982), consists in examining the dentate population as a separate group, in order to compare the factors which explain the use of dental care services within the total population, and within the dentate population. It should be noted that this approach is not very well suited for policy analysis, as it excludes one group from the analysis, namely the denture-wearing population. Although it may be argued that the individuals who wear dentures have very little need for dental services, they should still be included for policy questions, because their need, however small, is not zero. In addition, it is important to consider this group for policy issues, because they are probably the ones, who, at some point in time, exhibited a greater need for dental care, and therefore must face the consequences today (wearing a full denture).

6.9.1 Isolating the Denture-Wearing Population.

The introduction of the denture variable as an independent variable in the final regression model (equation 10, table 27), causes some changes as to the importance of factors explaining the use or non-use of dental care services.

The findings reported in table 50 (equation 15) suggest that the denture variable becomes the single most important predictor of utilization, when it is introduced in the regression model. The negative sign of the regression coefficient, along with its significant t-statistic, suggest that Canadians who wear a full denture (both lower and upper plates), are less likely to visit a dentist than their dentate counterparts. These findings, consistent with the review of the literature (Bullen, 1982; Wan and Yates, 1975) are in accordance with the expectations expressed earlier.

With the exception of the age variable, the explanatory power of the other variables is not significantly altered, when the denture-wearing population is isolated as an independent variable. In fact, as was the case with equation 10, education, dental problem, dentist to population ratio, sex and family income are all strong predictors of utilization, whereas the explanatory power of family size, labour force status and marital status still remains moderate.

The most significant change in explanatory power occurs with the age variable. While this variable was the single most important predictor of use when the denture variable was ignored (equation 10), its predictive ability is relegated to the last place when DENTURE is taken into account. This finding suggests that, while there are significant differences in utilization between age groups, these differences are in part attributable to the presence of Canadians who wear dentures in the older age groups, the dental needs of which are very little.

This is not to say that the differences in utilization between the young and the elderly are not significant. The regression analysis still indicates that the young are higher users of dental services. However, while equation 10 seemed to indicate that the differing utilization rates were essentially due to differing needs between the young and the old; equation 15

suggests that other factors such as education, sensitiveness to good oral health, and children dental plans, have to be taken into account in explaining higher utilization on behalf of the young.

From a statistical perspective, the strong correlation between ages 45 and more and denture-wearing population probably accounts for the weak predictive ability of the age variable in equation 15, compared to what it was when DENTURE was removed from the model (equation 10).

A close examination of the regression coefficients on equation 15 indicates that the trends within a group of variables remain virtually unchanged (compared to equation 10), even in the case of the age variable. For example, the results of the discriminant analysis sugesst that utilization of dental care services increases with income and education; increases with family size up to four members; decreases with age; and is greater for white collar workers and single individuals. In essence, such findings are very similar to those obtained with equation 10, when the denture variable was not accounted for.

Table 50

The Use or Non-Use of Dental Care Services by the Relative Significance of Factors, with Estimated Regression Coefficient, Adding the DENTURE Variable (Equation 15).

Factor	F-Ratio	Variable	Coefficient	T-Statistic
Oral Heatlh Status	958.97 (p < 0.01)	DENTURE	-0.380	-30.97 a
Education	44.41 (p < 0.01)	SECLESS	-0.172	-6.22 a
		SECDIP	-0.120	-4.07 a
		PSECDIP	-0.031	-0.99
Dental Problem	41.60 (p < 0.01)	DENTALPB	0.105	6.45 a
Dentist to pop Ratio	39.44 (p < 0.01)	RATIO	0.002	6.28 a
Sex	34.46 (p < 0.01)	SEXF	0.055	5.87 a
Family Income	26.65 (p < 0.01)	QUINT1	-0.184	-9.94 a
		QUINT2	-0.143	-9.85 a
		QUINT3	-0.097	-6.23 a
		QUINT4	-0.051	-4.38 a
		QUINTUNK	-0.121	-4.88 a
Family Size	16.91 (p < 0.01)	FAM1	-0.137	-6.72 a
		FAM2	-0.085	-4.67 a
		FAM3	-0.100	-5.21 a
		FAM4	-0.034	-1.81 c
Labour Force Status	7.39 (p < 0.01)	UNEMP	-0.043	-1.95 c
		WHITEC	0.013	-1.41 c
		BLUECOL	-0.068	-4.36 a
Marital Status	5.69 (p < 0.01)	SEPDIVW	-0.016	-0.99
		MARRIED	-0.054	-2.97 a
Age	5.36 (p < 0.01)	AGE014	0.071	2.92 a
		AGE1524	0.050	3.04 a
		AGE2544	0.040	3.30 a
		AGE4564	0.029	2.71 a
Fluoridation	0.045 (p > 0.10)	FLUOR	-0.013	-0.81
		Intercept	0.074	21.11 a

n = 31,490 R2= 0.58 a: p< 0.01 b: p < 0.05 c: p< 0.10

6.9.2 Focusing on the Dentate Population

If we remove the denture-wearing group from the study population, we observ that the explanatory power of the independent variables remains virtually unchanged (compared to equation 10), with the exception of the age variable (equation 16, table 51). Within the dentate population, factors such as education, dentist to population ratio, sex, dental problems, and family income are all very strong predictors of utilization. Family size and age both exhibit a moderate predictive ability, while the explanatory power of labour force and marital status appears to be weaker.

As was the case with equations 10 and 15, the trends within a group of variables are essentially the same with the three models. The analysis of dental care utilization on the dentate population suggests that utilization increases with income and education; decreases with age; and is higher for single Canadians, white collar workers, and for Canadians who manifested some kind of dental problem.

When comparing the dentate and the total population, the major difference in utilization resides in the age variable. While there are differences in utilization between individuals of different age within the dentate population (utilization decreases with age), these differences are not as considerable as they are when focusing on the entire population. These findings corroborate the ones obtained with equation 15, suggesting that differences in utilization between the young and the elderly (on the total sample), are in part attributable to a large number of denture-wearing Canadians in the older age groups.

Table 51

The Use or Non-Use of Dental Care Services by the Relative Significance of Factors, with Estimated Regression Coefficient, for the Dentate Population (Equation 16).

Factor	F-Ratio	Variable	Coefficient	T-Statistic
Education	44.34 (p < 0.01)	SECLESS	-0.183	-6.27 a
		SECDIP	-0.117	-3.77 a
		PSECDIP	-0.024	-0.76
Dentist to pop Ratio	39.09 (p < 0.01)	RATIO	0.002	6.25 a
Sex	35.94 (p < 0.01)	SEXF	0.061	5.99 a
Family Income	30.52 (p < 0.01)	QUINT1	-0.208	-10.12 a
		QUINT2	-0.154	-10.08 a
		QUINT3	-0.103	-5.90 a
		QUINT4	-0.059	-4.63 a
		QUINTUNK	-0.133	-4.92 a
Dental Problem	30.32 (p < 0.01)	DENTALPB	0.111	5.50 a
Family Size	18.16 (p < 0.01)	FAM1	-0.155	-6.99 a
		FAM2	-0.089	-4.39 a
		FAM3	-0.110	-5.33 a
		FAM4	-0.040	-2.01 b
Age	10.16 (p < 0.01)	AGE014	0.125	4.52 a
		AGE1524	0.102	4.79 a
		AGE2544	0.104	4.65 a
		AGE4564	0.089	5.54 a
Labour Force Status	8.17 (p < 0.01)	UNEMP	0.055	-2.33 b
		WHITEC	-0.022	-2.15 b
		BLUECOL	-0.078	-4.33 a
Marital Status	5.32 (p < 0.01)	SEPDIVW	-0.010	-0.49
		MARRIED	-0.055	-2.92 a
Fluoridation	0.088 (p > 0.10)	FLUOR	-0.015	-0.94
		Intercept	0.069	17.76 a

n = 26,891 R2= 0.59 a: p< 0.01 b: p < 0.05 c: p< 0.10

6.9.3 Comparing all Three Models.

In the light of the foregoing analyses, it is clear that the determinants of dental care utilization are essentially the same, whether one examines the total sample, the dentate population or isolates the denture-wearing group in a multivariate model. While the first approach ignored the denture variable (equation 10), the second model (equation 15) confirmed that oral health status is an important predictor, and should be considered as such in a multivariate model which attempts to measure the impact of predisposing, enabling and need factors on the use or non-use of dental care services. The third model (equation 16) suggests that the determinants of dental care utilization are essentially the same for the dentate and the total population, the size and direction of each regression coefficient remaining almost unchanged from one model to the other (table 52).

In fact, as can be seen from table 52, the major effect of focusing on the denture-wearing (introducing the DENTURE variable) and the dentate population in a discriminant model, boils down to reducing the predictive ability of the age factor. Nevertheless, all three models confirm that there exist significant differences in utilization between Canadians of different ages, a finding which is worthy of policy analysis. In addition, by introducing the denture variable and by focusing on the dentate population, one might suggest that differences in utilization between age groups are not only due to higher needs (the age-need relationship), but may also be attributable to factors such as children dental care plans, greater awareness of a good oral health, education, and different lifestyles and mores in different generations.

Finally, as can be seen from table 52, all three models produce very similar results in terms of regression coefficients and t-statistics for all independent variables, with the exception of the age variables, and one other factor: SEPDIVW (separated divorced and widowed individuals).

The analysis of the SEPDIVW variable on the full sample suggested that separated, widowed or divorced Canadians exhibited a lower propensity to visit a dentist, compared to their single counterparts (equation 10). However, when DENTURE is introduced in the model, and when the denture-wearing group is removed from the analysis, the SEPDIVW group behaves more like the SINGLE group, in terms of dental utilization (table 52, t-statistic).

In part, this can be explained by the fact that, once we remove (or isolate) the denture-wearing group from the total sample, we are essentially removing older Canadians, some of which are probably widowed. Therefore, in these instances, the SEPDIVW group represents more of the separated or divorced Canadians, the behavior of which closely resembles that of single Canadians.

Table 52

Comparison of the Regression Coefficients and the T-Statistic for Three Models. (Equations 10, 15 and 16).

Variable	Dentate (equation 16)		Denture (equation 15)		Total Sample (equation 10)	
	beta	t	beta	t	beta	t
SECLESS	-0.183	-6.27	-0.172	-6.22	-0.215	-7.10
SECDIP	-0.117	-3.77	-0.120	-4.07	-0.141	-4.42
PSECDIP	-0.024	-0.76	-0.031	-0.99	-0.030	-1.29
RATIO	0.002	6.25	0.002	6.28	0.002	6.20
SEXF	0.061	5.99	0.055	5.87	0.044	5.19
QUINT1	-0.208	-10.12	-0.183	-9.94	-0.194	-9.57
QUINT2	-0.154	-10.08	-0.142	-9.85	-0.156	-8.83
QUINT3	-0.103	-5.90	-0.096	-6.23	-0.103	-6.28
QUINT4	-0.059	-4.63	-0.051	-4.37	-0.057	-4.89
QUINTUNK	-0.133	-4.92	-0.121	-4.88	-0.135	-5.60
DENTALPB	0.111	5.50	0.105	6.45	0.098	5.91
FAM1	-0.155	-6.99	-0.137	-6.72	-0.150	-7.02
FAM2	-0.089	-4.39	-0.085	-4.67	-0.093	-4.90
FAM3	-0.110	-5.33	-0.100	-5.20	-0.102	-5.15
FAM4	-0.040	-2.01	-0.034	-1.81	-0.035	-1.75
AGE014	0.125	4.52	0.071	2.92	0.259	10.78
AGE1524	0.102	4.79	0.050	3.04	0.217	12.72
AGE2544	0.104	4.65	0.040	3.30	0.180	12.30
AGE4564	0.089	5.54	0.029	2.71	0.099	7.55
UNEMP	0.055	-2.33	-0.043	-1.96	-0.022	-1.05
WHITEC	-0.022	-2.15	-0.013	-1.41	-0.002	-0.19
BLUECOL	-0.078	-4.33	-0.068	-4.36	-0.060	-3.53
SEPDIVW	-0.010	-0.49	-0.016	-0.99	-0.038	-2.21
MARRIED	-0.055	-2.92	-0.054	-2.97	-0.063	-3.40
FLUOR	-0.015	-0.94	-0.013	-0.87	-0.013	-0.70
DENTURE	-	-	-0.380	-30.96	-	-
INTERCEPT	0.696	17.76	0.735	21.11	0.594	14.98

6.10 Discussion

The results of the discriminant analysis illustrate the relative importance of the "need" factors (age being used as a surrogate for need, and "denture" being used as a proxy for oral health status), in relationship to the use or non-use of dental care services. The findings reported in this study support the contention that the bulk of the utilization of health care services in general, is by people who do have health problems, leaving only a very small proportion of the population who use health care services inappropriately (Mustard, 1984). In fact, such a conclusion is even truer of the utilization of dental care services. By nature, dental problems do not have the same degree of uncertainty as physical or mental problems. Therefore, in the case of dental care, the patient is not as "ill-informed" and can usually assess his/her own dental needs with more precision, and react accordingly. Of course, why the patient does or does not seek dental treatment, when in need, is governed by a host of external factors and barriers, as was demonstrated by the discriminant analysis. The importance of a "need variable" as a powerful predictor of utilization is in agreement with most studies in the field which attempted to assess the impact of need and demand on the use and non-use of dental care services (Bullen, 1982; Wan and Yates, 1975; Lawton, 1974).

Predisposing factors also proved to be very important factors in discriminating between users and non-users of dental care services. Given that, in this case, age is more representative of a need factor, the education variable proved to have, by and large, the greatest predictive ability over all predisposing factors.

The findings relating education to the dependent variable are in accordance with the Canadian literature, both in terms of the expected direction and differences between educational groups (Bullen, 1982; Cageorge et al., 1976; Health and Welfare, 1977). What is somewhat surprising, however, is the major role that education plays as a determinant of dental care utilization. Such a finding is unique, in that the literature usually points to education as a moderate or weak explanatory factor (U.S. DHEW, 1978). Andersen et al.,

(1970) and Cole and Cohen (1971) did find that education, combined to income, contribute to explain more than 50 percent of the variance in the use or non-use of dental care services. However, in both cases, the total explained variance was rather small, and nowhere comparable to the R2 reported in this study.

Education is an essential explanatory factor of dental care utilization for basically two reasons. First, because it is highly correlated to income, the education variable may be overshadowed by an income effect, when attempting to measure its impact on utilization. Consequently, the education variable does not only reflect a broader awareness of the benefits of a good oral health, but it may also reflect one's ability to pay to maintain the desired level of dental health. Second, and most importantly, it is often claimed that Canadians are becoming increasingly aware of the benefits of a good oral health (a higher dental IQ[22]), which begins with preventive measures. Consequently, those Canadians with higher education may be more aware of the need to upgrade their oral health, and therefore may exhibit a greater disposition to obtain such services.

One predisposing factor which is often overlooked in the dental literature, is the one relating family size and composition to the use or non-use of dental care services. The findings of the discriminant analysis suggest that peer influence, especially with children, has an important impact on a family's dental health habits. This "family concern" for good oral-health may be translated into demand for public or private dental insurance, in order to alleviate the risks of heavy dental costs, especially in larger families. In fact, it was found that the propensity to seek dental care decreases as family size increase beyond five members, a finding which might indicate heavier economic risks for larger families.

One finding of particular interest concerns the strong and positive relationship between a positive preventive behaviour and the use of dental care services. This result has important ramifications with regards to promotion and prevention strategies in dental care. The early

---

[22] In the words of Dr. Robert Turnbull, scientific editor of the Journal of the Canadian Dental Association. Source: Globe and Mail, August 19, 1985.

works of the Canada Health Survey coincide with the release of the Lalonde Report (1974) which emphasized strongly the promotion of healthy lifestyles. Evidence shows that the last decade was marked with dramatic changes in Canadians' awareness concerning healthy lifestyles (exercise, seatbelt useage, diet, moderate drinking and smoking, etc.). In the light of the findings outlined above, it is suggested that "healthy" dental habits can also be included in the list of those activities and habits which predispose an individual towards healthy lifestyles. In such a context, the place of preventive dentistry will become increasingly important on the Canadian scene, along with its numerous policy implications (education, promotion, accessibility, manpower substitution, insurance, etc.).

Concerning the enabling factors, the present study confirmed what previous studies have already demonstrated: financial and accessibility barriers are omnipresent, with respect to dental care utilization in Canada. Although the results of the discriminant analysis suggest that the propensity to seek dental treatment is enhanced by one's ability to pay, it appears that the income variable is not as important as it was thirty years ago (Canada, DHW, 1960); nor is it as important a predictor as reported in the U.S. dental care literature. In part, this assertion is attributable to the development of provincial children dental care plans, combined to the rapid proliferation of private dental care plans in this country, during the last decade (Globe and Mail, August 16, 1985).

The results of the present study have also highlighted the considerable influence that the availability and accessibility of dental manpower resources may exert on the use or non-use of dental care services. Consistent with the dental care literature, our findings support the contention that the regional maldistribution of dentists is still a problem in this country, as it was thirty years ago (Canada, DHW,1960), despite an overall increase in the number of dentists.

The findings relating occupation to utilization have also emphasized the importance of time and money, in terms of, not only one's ability to pay for dental care services, but also

with respect to one's own availability (and the associated opportunity costs) to seek dental treatment.

From a methodological perspective, the results of the discriminant analysis have highlighted the importance of including some essential variables in a multivariate model of dental care utilization. By the same token, the present study has also demonstrated the potential drawbacks in the use and interpretation of proxy variables.

Perhaps the most severe omission with regards to the present report is portrayed by the absence of a "dental insurance status" at the micro (respondent) level of analysis. The review of the literature suggests that dental insurance status is an important predictor of utilization, not only in terms of participation in dental plans, but also in terms of voluntary and automatic coverage, degree of monetary contribution to the plan, and presence of a third-party payment (Avnet and Nikias, 1967; Bullen, 1982; Teh-wei-Hu, 1981). Given that the dental insurance schemes in Canada consist of an amalgam of private and public plans with different target groups and varying ranges of benefits (Stamm et al., 1984), the lack of information on this issue can have serious implications on the overall analysis.

For the purposes of a purely descriptive analysis, this deficiency in the data was overcome by analyzing the available data at the macro (province) level. With these limitations in mind, the descriptive analysis proved very useful in the evaluation of dental care utilization with respect to provincial enrolment rates in both public and private plans. Despite the fact that the analysis was performed at the macro level only, the results of the analysis, combined to the findings of past research (with which they were in agreement), have enabled us to assess to a reasonable degree the influence of dental insurance status on the use or non-use of dental care services.

The absence of a dental insurance variable is obviously more problematic in the case of a multivariate analysis. This difficulty was handled through the use of proxy variables. The analysis of the effects of dental insurance status on utilization was made possible by relating

our findings to those of other researchers, in conjunction with insurance status and some of its socio-demographic characteristics. Although not always evident, dental insurance status was transparent in several findings of the regression analysis. For instance, it is believed that the overwhelming presence of an age effect in several other explanatory variables, is not only a translation of a "need - age'" relationship but may also be attributed to the existence of provincial dental care plans which focus on children. This was especially obvious when the denture variable was introduced as an independent factor, the immediate result of which was to attenuate the importance of age as one of the foremost predictors of dental care utilization. It has also been suggested that the additional dental benefits to social welfare recipients (CAP) may also be confounded in the variable relating unemployment to dental care utilization. This hypothesis still remains to be tested with more reliable data.

Under the same assumption, the occupational and industry variables are believed to have great potential, in approximating the influence of private dental insurance on utilization at the micro level. Although the findings of the discriminant analysis did not yield the expected results with regards to these two proxies, some exploratory analysis has enabled us to estimate further their potentialities. In this case, the challenge faced by the researcher remains essentially a definitional and refinement problem: how does one classify the occupational and industry variables, in such a way to capture the alleged "employment-based insurance" effects on the use or non-use of dental care services?

Finally, while the DENTURE variable represents a fair proxy for oral health status, it also has some limitations with respect to CHS data files. In fact, this proxy isolates only a very specific group of the population, namely the older adults. Therefore, the study group is divided into two distinct sub-populations: the denture-wearers and the dentate. While the dentate group may have all their teeth, their actual oral health status could range from very poor to excellent. Unfortunately, such a measure, which would be more evenly spread among the total population, is not available from the Canada Health Survey. The oral health

status of Canadians was, at best, approximated by the DENTALPB variable. It is believed that a "self-reported" (or actual measure) oral health status variable would represent a better estimator, and would apply to all age classes, not only the adult population (Bullen, 1982; Wan and Yates, 1975). This option should be considered for future dental surveys.

The second methodological drawback with the present study stems from the immense difficulty in obtaining data at a family level variable from Canada Health Survey data files. The problems encountered when analyzing the influence of marital status and occupational status on utilization, are certainly germane to this difficulty. As was already mentioned, it is believed that the presence of an "age effect" on these two variables probably contributes to overshadow the predictive ability of marital and occupational status. Although this difficulty was, in part, surmounted via the combination of several interaction terms, the lessons drawn from the review of the literature suggest that the influence of the marital and occupational variables could have been better captured with information pertaining to the head of household's (or parents) marital and occupational status.

In addition, the findings yielded by the "family size" variable suggest that family composition represents an important predictor of dental care services utilization. Therefore, the study of dental care utilization (and of health care in general), at the family level becomes increasingly important, as the family represents a social structure variable, with varying impact on utilization as a result of a predisposition due to a a specific lifestyle (Andersen et al., 1970).

Finally, from a monetary resource allocation point of view, a family variable level of analysis is perhaps more meaningful in the case of dentistry, where most expenses are direct out-of-pocket expenses, contrary to medical and hospital care. While it is true that the individual is the beneficiary of dental care received, the externalities to the rest of the family members are obvious (Manga, 1978, p. 55). Thus the importance of being able to link individuals of a same family, and compare them on a family basis in terms of size and composi-

tion and socio-demographic characteristics (income, employment, married couple or single parent family, etc.).

In spite of the problems encountered, the present analysis has enabled us to demonstrate a number of important characteristics about the utilization of dental care services by the Canadian population. By controlling for the effects of other factors, it was possible to capture the separate effect of each independent variable, an effort which, until now, had not been well demonstrated at the national level in the Canadian dental care literature.

Chapter 7

POLICY IMPLICATIONS

7.1 The major findings restated

The findings reported in chapters five and six suggest that there are significant variations in the use or non-use of dental care services in Canada.

Consistent with previous findings, it was found that dental needs, oral health status, education, income and sex were among the most important determinants of dental care utilization in Canada (Bullen, 1982; Wan and Yates, 1975; Okada and Wan, 1979). The results of the descriptive and regression analysis both confirmed the existence of an inverse relationship between age and dental care utilization. This relationship was found in three different model specifications: examining the entire sample; examinig the entire sample, but adjusting for the denture-wearing group; and examining the dentate population only. It should be noted that this inverse relationship was more pronounced in the first model. Futhermore, as was made obvious in chapter 4, it is the elderly who predominantly are the denture-wearers, and while they are not currently high consumers of dental services, they are the ones who certainly had greater dental care needs for most of their lives.

Obviously, the age-related assessment of dental diseases is certainly germane to such findings (Health and Welfare Canada, 1979). Consequently, it appears that age represents a well designated factor for the identification of target groups in dentistry. From an epidemiologic perspective, researchers have demonstrated that dental needs are more critical for children (4 to 8); young adolescents (11 to 18); and the elderly (55 to 65) who are more susceptible to periodontal diseases (Carlos and Gittelsohn, 1965; Christianson, 1977).

The policy ramifications of this age and dental need relationship will encompass a wide variety of issues, ranging from target group identification, promotion and prevention strategies, to full and partial dental insurance plans.

The results of the descriptive and multivariate analyses have also confirmed the existence of inequalities in dental care utilization, as a result of income and education differentials. These findings corroborate those reported elsewhere in the literature, where, in general, it has been found that the propensity to seek dental treatment is highly dependent upon one's income and education level (Teh-Wei-Hu, 1981; Bullen, 1982; Health and Welfare Canada, 1971). Policy implications emanating from these findings will deal essentially with issues such as pricing mechanisms, methods of payments and co-payments, methods of alleviating financial barriers through various dental insurance schemes, along with promotion and prevention strategies, in concert with the goal of rising the dental IQ of the Canadian population.

With respect to the availability of dental manpower, the present study did demonstrate the existence of accessibility barriers to care. These findings, consistent with the Canadian dental care literature (Dental Report, 1977; Cageorge et al., 1976; Bulien, 1982), suggest that there are significant variations in utilization, to the detriment of Canadians who reside in areas with a low concentration of dental manpower supply. The policy implications of these findings will deal with contentious issues such as maldistribution of manpower, use and underuse of dental auxiliaries, expansion in underserviced areas, and expansion in dental care plans.

Concerning the influence of dental insurance status, the present report focused only on a descriptive analysis at the macro level, mainly because of data limitations. However, the findings reported in chapter five confirm the advantage of a school-based publicly funded dental care plan for children, over a similar plan providing care in a private setting. In addition, the descriptive analysis emphasized the strong and positive correlation between utili-

zation and enrolment in private dental plans. Although the review of the literature makes it difficult to draw any definite conclusions about the effects of insurance on utilization, it appears that the more out-of-pocket money an individual contributes in an insurance plan, the more likely this same individual will be to visit a dentist (Avnet and Nikias, 1967; Nikias, 1969; Manning and Phelps, 1977; Evans and Williamson, 1978). Consequently, the policy ramifications of such findings will focus essentially on the various components of dental care insurance, with its multi-faceted delivery mechanisms (target groups, enrolment conditions, public vs private, type of setting, type of coverage, fee schedule, etc.).

The findings of the multivariate analysis have also highlighted the importance of including opportunity costs in a model of dental care utilization. In the absence of direct measures on that matter, employment was used as a surrogate for opportunity costs. Consistent with previous findings (Broyles, et al., 1983; Newman and Anderson, 1972), the present report suggests that, among employed individuals, blue collar workers are more likely to incur the highest opportunity costs. The policy implications of such findings are important and will essentially focus on time and costs barriers, along with the different pricing mechanisms to offset such barriers (Grembowski, 1984; House, 1978).

The use and non-use of dental care services has also been found to be highly related to one's attitude towards preventive health behavior and lifestyles in general. This finding is particularly interesting, in view of the fact that dental visits and preventive medical behavior can be regarded as comparable behaviours (Suchman and Rothman, 1969). The policy question in this case focuses on promotion and education programs to sensitize Canadians to the benefits of healthy dental habits. In addition, the strong parental influence on children's dental health practices reported by Freeman and Lambert (1965) and Lawton et al. (1973), has also been substantiated by the foregoing analysis. The implications of such findings re-emphasize the important role played by the family nucleus in developing and implementing effective preventive dentistry.

Obviously, the findings summarized above, along with their policy implications, have to be considered with the conceptual framework and data limitations in mind. The foregoing methodology draws upon a behavioral model of health services in which utilization is dependent upon need factors, as well as predisposing and enabling conditions (Anderson et al., 1970). The major analytical advantage of this approach is that the variables of the model can be readily quantified. In addition, the model isolates the major components from which dental care policy issues can be drawn (needs, predispositions, and enabling factors). A better understanding of need factors will enable us to identify target populations for dental care planning strategies. By examining the effects of enabling factors on dental care, one is able to identify the major barriers to dental care, and consequently suggest potential mechanisms to alleviate such barriers (the issue of dental insurance and manpower distribution). A more comprehensive understanding of the effects of predisposing factors on utilization can also prove useful in developing and implementing promotion and prevention strategies in dental care.

However, the weakness of such an approach is that very little emphasis is placed on attitudes and beliefs with respect to dental care utilization. This perspective is illustrated by the Health Belief model and the research of its proponents (Janz and Becker, 1984). It follows that our model fails, to a certain degree, to measure the importance of psychological factors (perceived illness, level of tolerance of pain, fear of dentists, etc.), which may have important ramifications with respect to prevention, promotion and the delivery mechanisms.

The data limitations of the Canada Health Survey have serious drawbacks with respect to important policy issues. For instance, the absence of dental insurance status indicator at the respondent level makes it very difficult to draw conclusions about the effects of dental care insurance on utilization. In addition, the lack of dental insurance data at the micro level impedes upon any serious attempt to analyze the socio-economic and demographic characteristics of those Canadians who benefit from dental insurance coverage.

The problems engendered by the difficulty in linking Canada Health Survey records at the family level attenuates the possibilty of examining policy questions in dentistry which focus essentially on the family nucleus (parental influence, head of family's occupation, education, marital status, etc.).

The absence of oral health status indicator from the Canada Health Survey will also hamper any effort to assess the overall dental health status of the Canadian population. In the absence of such indicators, it becomes impossible to draw interprovincial comparisons, and accordingly assess the influence of publicly funded provincial dental care plans on a sub-population's oral health status.

The availability of data on water fluoridation at the macro level only, along with the difficulty of linking these data with CHS respondents, and especially the use of cross sectional data, has unavoidably prevented us from measuring the alleged effects of water fluoridation on dental care utilization. As a consequence, the foregoing analysis is missing out on one very important policy issue in dental care.

Bearing in mind all these methodological problems, it has, however, been possible to estimate the alleged effects of these variables on dental care utilization, via the use of several proxies. In essence, the utilization of surrogates has proven successful in presenting a clear enough picture of the situation, so that important policy issues emanating from a study of the determinants of dental care utilization, can be put forward and discussed.

7.2 Identification of target groups

One very crucial policy issue in dentistry, as in health care in general, focuses on the identification of those groups in society at higher risk. Epidemiologic and clinical observations show clearly that dental diseases vary in kind and severity with patient age (Health and Welfare Canada, 1979). Knowledge about dental need is important but impractical unless coupled with information about people's utilization of dental care services.

The findings reported in the present study confirm the importance of the age-need relationship in dentistry. Although the data limitations of the Canada Health Survey do not enable us to identify the types of utilization with certainty, i.e., preventive versus curative care, the correlation between young age and utilization suggests the predominance of restorative treatments. Consequently, it follows that proper dental hygiene and education must be initiated at an early age, to avoid increasing future costs (Schicke, 1975). Indeed, money invested to look after children's teeth represents money saved, because those children, as they grow in adulthood, will likely not require expensive restorative dental work, due to early neglect. One estimate of such cost, provided for Ontario in 1975, suggested that for each dollar spent on preventive dentistry, 10 dollars could ultimately be saved on restorative work (Toronto Star, May 26, 1975).

Undoubtedly, worthy public policies will focus on children's dental care needs as the starting point for preventive dentistry, with the ultimate goal of long term benefits on oral health (Davis, 1979). Such policy concerns have been discussed for a long time on the Canadian scene. In Volume I of the Royal Commission on Health Services (1964), the Commission highlighted the importance of concentrating on children's oral health, by recommending the introduction of dental care programs aimed at children. This recommendation was further re-formulated in Hall's Review of Health Services in 1980. Between now and then, such a strategy has been implemented with varying degrees in the ten provinces (see Appendix 1).

The findings of the multivariate analysis have also highlighted the existence of several other target groups. The analysis of variance on dental problems suggested that low socio-economic groups appeared to be in greater need for dental care services. It is argued that their poor oral health might be a consequence of lower utilization of dental care services. These social groups are more subject to the economic and other barriers to dental care. Since dental care, except for the relief of acute pain and infection is avoidable, it is possible

that these individuals may delay or redefine their felt needs (Leverett, 1974). These felt needs are not necessarily a reflection of actual needs which are determined by untreated pathological conditions in the oral cavity. As a consequence, restrained by barriers to care, Canadians in lower socio-economic groups may be eliminated as potential patients, refuting their real dental needs, and perhaps aggravating an already deteriorating oral health status (Festinger, 1962). In addition, the findings of the multivariate analysis suggest that Canadians in larger families (5 members or more) make less usage of dental care services. It might be argued that these families face heavier economic risks and oultays, with respect to dental care. Because of lower per capita family income, it is possible that dental care treatment ranks much lower, in terms of priorities, in the family budget.

Obviously, these social groups will represent critical target populations for public policy in dentistry. The several mechanisms in place to eliminate the barriers to care for these groups will deal essentially with insurance options (provincial and municipal), delivery mechanisms, pricing mechanisms and manpower distribution and regulation. These policy issues are discussed in greater details in subsequent sections of this chapter.

In marked contrast with research on children's dental care, little or no attention has been given to potential variations in the structure of the dental care delivery system for adult patients (Evans and Williamson, 1978). Stamm (1984) argues that the present generation of elderly may place little value on oral health. This argument is reinforced by Read et al., (1977), Gift (1979) and Beck et al., (1981) who reported that the majority of the elderly perceived very little need for dental care. The present study has also confirmed the above mentioned findings by reporting very low utilization among the elderly, even in Alberta where a publicly funded dental care plan for senior citizens has been implemented.

Low utilization rates on behalf of the elderly is also explained by the assertion that the present cohort of elderly may have developed their concept of oral health status at a time when the issue of good oral health may have received less emphasis than today (Stamm et

al., 1984). At the same time, the elderly may view a deteriorating dental condition as an unavoidable corollary of aging (Kiyak and Miller, 1982). Furthermore, the elderly are comprised, in a great proportion, of edentulous people with little or no need for dental care treatment. In light of these observations, it still remains unclear whether low utilization on behalf of the elderly is in response to lower dental needs or in response to increased economic and geographic barriers.

The dental communnity has recently manifested a much greater concern about the elderly's needs and awareness concerning dental care (The Gazette, May 29, 1985). Researchers have also found very significant discrepancies between perceived need and objective need for dental care among older individuals (Banting, 1971).

Today's improvements in preventive dental care (water fluoridation, children care, education, sugar-free diets, etc.), coupled with increasing education level, has caused the epidemiology of dental diseases to rapidly take another direction. More action and research are now forwarded to issues such as periodontal disease, prevention and treatment of root surface caries, and adequate use of dentures (A.D.A., 1985; AAPHD, 1983). In a rapidly aging society such as ours, it is expected that the benefits of good oral health habits developed in childhood by today's young may have an impact on the dental requirements of future generations. Dunning (1982) suggests that periodontal and endodontic treatment, along with other methods applicable to natural teeth will be more needed in the future.

In addition, it is expected that the next generation of elderly will be comprised of a greater proportion of dentate Canadians. This, in turn, could generate an increasing demand for dental care services (both preventive and therapeutic) and consequently imply a greater need for dental manpower. Therefore, in such a context, the elderly are, and will increasingly become a key target population in dental care prevention, education and treatment strategies.

7.3 Manpower Supply and the Question of Availability and Accessibility

Another policy issue which deserves further discussion concerns the problems of maldistribution and accessibility/availability of dental manpower. The findings of the descriptive and multivariate analyses were both conclusive: there exist significant geographic barriers to dental care utilization in Canada. The policy implications emanating from such findings are multifaceted and encompass a wide range of issues. Where are the underserviced areas? What are some of the policy measures that can be adopted to reduce disparities in manpower distribution? What is the status on the use and/or under-use of dental auxiliaries? What are the implications of unmet demand?

If utilization rates are used as indicators of the amount of dental demand that is met, the present study suggests that greater dental needs are being filled in large urban centers, where there is a greater supply of dentists. It follows that there is a larger proportion of unmet demand in smaller towns and rural areas.

From a policy point of view, policy analysts are increasingly questioning the conventional wisdom that rural people are being denied access to dental care because of supply shortage. It is true that people in rural areas frequently present lower levels of dental health status, and therefore greater needs for dental care (C.D.A., 1980; Cageorge et al., 1975). However, the argument that "ruralness" is merely a proxy for lower income, lower education, less water fluoridation, different lifestyles, etc., all of which were found to be determinants of utilization, may be confounded in the relationship of rural living to dental health (C.D.A., 1980). Nevertheless, there remains the concern that the disparity in the concentration of dentists between urban and rural areas leads to lower utilization rates, and hence a greater degree of unmet demand, and possibly poorer dental health to the detriment of rural residents.

In addition, from the consumer's point of view, a greater availability of dental manpower supply implies a greater pool to select from. Obviously, such a freedom of choice, with respect to a dental practitioner, is limited for residents of small centers, since the pool they may choose from is smaller to begin with.

The situation of dental manpower in Canada has considerably improved over the last decade. It is fair to say that during the 1960's there existed considerable unanimity that access to dental care was seriously handicapped by a serious shortage of dentists (Mc Farlane, 1964). Today, there appears to be less agreement on the question of whether Canada still has a shortage of dentists. Over the years, the dentist to population ratio in this country has considerably increased, despite a significant decrease in tooth decay (Globe and Mail, August 19, 1985). Today's ratio hovers around 1:2,000[23] for Canada in general. This figure, as Schoen (1979) attempted to demonstrated, suggests very high potential in meeting the dental problems of the vast majority of the population. As highlighted by the present study, this ratio fluctuates considerably between provinces and between communities within a province.

The issue in itself does not seem to be a problem of manpower shortage, but rather a more severe problem of maldistribution. Leverett (1974) argues that, as long as the profession itself exercises its prerogative to control demand, it is merely impossible to talk about any supply shortage. Leverett adds that dentists have controlled demand over dental care by refusing to accept new patients in saturated practice. This barrier (control over demand by the profession) is even more critical in smaller urban centers, because the patient in larger urban centers, assuming no other barriers, usually can find another dentist who will accept a new patient (Leverett, 1974).

The search for "optimal" dentist to population ratios continues to be a popular way to design manpower planning frameworks in a public policy context. However, the optimality achieved by such ratios is not always a sound reflexion of how much manpower is actually available and/or possible (Evans, 1984). The question of optimality and accessibility in dentistry opens the door to yet another contentious policy issue : the use and underuse of dental auxiliaries.

---

[23] The latest available figure is for the year 1982, and shows a ratio of 1:2,087. Source: Health and Welfare Canada, Canada Health Manpower Inventory, 1983.

Policy analysts will agree that larger increases in utilization, and hence greater availability and accessibility, are only possible if the efficiency of the delivery system is concurrently increased (Evans and Williamson, 1978). Such an increase in efficiency is judged by the system's capacity to expand in terms of improved productivity and utilization of dental auxiliaries. The potentiality of large expansion in productivity due the impact of using dental auxiliaries has long been documented (Hankin, 1977; Mullins et al., 1979; Lipscomb, 1982). However, the current practice of owner-managed enterprise in Canadian dentistry does not provide a setting in which such an evolution is likely to occur (Evans and Williamson, 1978). Dentists have been relatively slow in adopting organizational concepts such as group practice which encourages auxiliary utilization, with the emphasis on preventive care, all of which could have overall beneficial impacts on access.

The utilization of dental auxiliaries has also been subjected to the prediction of the monopoly model which stipulates that the established professions (in this case dentistry) will attempt to suppress entry to new types of professional "firms" in the field (Evans, 1984). This is illustrated by the fact that, only in Quebec is dental hygiene a self-regulating profession. In most other provinces, dentistry still regulates dental hygiene (Forgay, 1985). Nevertheless, the popularity of dental hygienists as "dental practitioners" has gained significant grounds over the last decade, as illustrated by the rapid growth in their numbers.[24]

The efficient use of dental auxiliaries in response to a demand expansion is best illustrated by the Quebec experience. In 1982, in response to a greater concern for prevention oriented dental services to children, and also in response to dramatic low utilization rates on behalf of children eligible for free coverage under Quebec's Children Dental Care Program, the Quebec government decided to alter the delivery mechanism via a more public system by considering the use of dental hygienists in community-based health care centers (CLSC). This approach resulted in a more effective and efficient provision of preventive and primary

[24] The number of dental hygienists in Canada has nearly quintupled from 987 in 1972 to 4,398 in 1982, the largest increases being observed in Quebec. Source: Health and Welfare Canada, Canada Health Manpower Inventory, 1984.

dental care to a target population. The overall result was an increase in utilization, a decrease in tooth extraction, and a more equitable regional distribution of dental manpower supply. Such an expansion in the program was possible despite the fact that Quebec had a relatively low dentist to population ratio, most of whom where heavily concentrated in urban areas. This emphasizes that, in dental care, as in the case of health care in general, the availability of services depends not only on the manpower supply, but also on how practices are organized in relationship to auxiliary use (Evans and Williamson, 1978).

In its brief presented to the Health Services Review of 1979, the Canadian Dental Hygienists' Association suggested that further developments be made in the regulation and licensure of dental hygienists. These developments, coupled to improvements in practice standards and quality assurance programs may give birth to the possibility of dental hygienists establishing independent practices conforming to pre-established standards (C.D.H.A., 1980).

There is little doubt that dental auxiliaries have been underutilized in the traditional dental care delivery system (Evans and Williamson, 1978; Dunning, 1982). The judicial utilization of existing auxiliary personnel represents a powerful potential workforce to alleviate the problems of maldistribution (or shortage) of supply and inequity in geographic access to dental care in this country. With growing emphasis on preventive denial care, the utilization of dental care auxiliaries as dental educators and primary dental care providers, has never looked so promising.

Another aspect of unequal access to dental care is further substantiated by time barriers and opportunity costs incurred by the patients. Given the limitations of the Canada Health Survey, it was not possible to measure the impact of time barriers on utilization. Nevertheless, the use of proxies has enabled us to assess the influence of opportunity costs, at least in one dimension (blue collar workers), in the decision to seek or not dental treatment.

House (1978) identified three essential components of the time barrier: transportation time, waiting time, and treatment time. The policy implications of these time barriers are reflected in government, patient and provider's response to such barriers.

Governments' incentives will be to attempt to redistribute wealth through various delivery mechanisms and insurance programs. On the supply side, governments will be concerned with policies aimed at improving access by considering avenues such as increasing supply, improving productivity, exploring the utilization of auxiliary personnel, and altering location decisions (reverse compulsion) (House, 1978).

The patient's incentive will be to reduce the restrictiveness of barriers by searching less expensive dental care, minimizing transportation costs and waiting time, and by seeking eligibility in various dental care programs (private or public). The examination of time barriers leads to the identification of those individuals whose time barriers appear most restrictive. The foregoing regression analysis suggests that time cost is probably higher for blue collar workers (i.e., self-employed, wage earners, etc.), who would be more likely to lose net income during their dental visit, compared to the welfare recipient who merely gives up daytime television viewing for the same type of visit.

The dentist's objective will be to minimize the barriers to access by locating within close proximity of the patient, i.e. in heavily populated areas, in order to promote growth in practice size. In addition, dentists will be inclined to choose a market where potential users are in large numbers. The descriptive analysis in chapter five illustrated that the distribution of dentists is more concentrated in provinces where a greater proportion of individuals are covered by private dental care insurance plans. Finally, the dentist will also have sufficient economic incentive to reduce waiting time on the grounds of patient satisfaction (a satisfied costumer is a renewed costumer).

The incentive of reducing waiting time is very important as far as organizational concepts are concerned. House (1978) suggests that, on the whole, the net impact of insurance programs upon barriers to care remains in question. He adds that patients may increase utilization through expanded third party payment, and therefore may necessitate longer waiting time in dentists' offices (House, 1978). There is little doubt that insurance programs are successful

in reducing fee barriers. However, it is not clear whether decreases in fees in the future, when, on average, patients will value time more, will have much less impact on utilization than will reductions in waiting time (House, 1978). In essence, a delivery system designed to reduce economic barriers only may prove successful today in increasing dental care utilization. However, its future performance in a market where patient time is increasingly becoming a major determinant of utilization, may be less satisfactory, and should be carefully thought in terms of improvements in productivity, technological advances and more intense use of time (House, 1978).

7.4 Utilization and the Issue of Dental Insurance

The issue of dental care insurance in Canada is not a recent one. In fact, early organized dental programs were implemented at the turn of the century (1900), when two Canadian dentists were sent by the military services to provide dental treatment for Canadians who were fighting in the South African war (Gullet, 1971). Since then, tremendous progress has marked our dental care delivery system, so that today, the Canadian experience represents a true laboratory for evaluating different approaches in providing oral health services (Stamm et al., 1984). While developments in the direction of denticare has been most phenomenal in the mid-seventies, the tempo today, has clearly slowed (Globe and Mail, August 16, 1985; Evans and Williamson, 1978).

The main purpose of insurance is to provide financial protection against losses that are unpredictable for the individual (Friedman, 1980). In the case of dentistry, it has been argued that almost all people suffer, at some point in time, from some form of treatable disease; hence the traditional view that dental care is not insurable, simply because it represents a common, predictable and controllable loss (Evans and Williamson, 1978; U.S., D.H.E.W., 1965). In such a context, dental insurance has a different meaning from hospital, medical or life insurance, all of which have a high degree of unpredictability. Therefore, it

can be argued that dental insurance rather represents a prepaid budget plan with premiums paid by the insured groups, with the ultimate objective of reducing out-of-pocket expenses or heavy outlays for dental care, at the time when dental treatment is needed (Baillit, 1979). In other words, dental insurance with its private and public components represents a policy issue whose main objective is to eliminate some of the financial barriers to dental care.

In addition to the argument that dental insurance can not be justified on the grounds of risk spreading, Evans and Wiliamson (1978) argue that universal denticare cannot be justified under the traditional argument of wealth transfer. In fact, some researchers have found that, even with insurance, higher socio-economic groups tend to be greater users of dental care services (Ellis, 1970; Lewis and Brown, 1973; Nikias, 1968). It follows that in such a context, public dental insurance plans would in fact serve to subsidize relatively higher-income classes, unless the plan proves to augment utilization significantly accross all social groups. Consequently, it follows that the social objective of public intervention in dental care must be justified on the grounds of increased utilization, as long as such an increase leads to an improvement in society's health status.

Obviously, the objective of increased utilization will run into the major short-run constraints that dental resources are simply not available (Evans and Williamson, 1978). Therefore, large increases in utilization are only possible if the system has enough room for expansion. Such a capacity for expansion will be judged by the program's ability to stimulate both productivity and use of dental auxiliary.

The present study confirmed what all other studies of dental care utilization have already reported: the existence of severe financial barriers with respect to the use or non-use of dental care services. In addition, it was found that Canadians in lower socio-economic groups were not only more subject to these barriers, as witnessed by their lower utilization, but also were they more likely to have greater dental needs. In light of the above observations, it is clear that dental insurance policies are imperative issues in any attempt to alleviate

such financial barriers. In such a context, it appears that the existing private and public mixture of dental care insurance in Canada is unavoidable. Developments of municipal dental insurance plans (such as Hamilton and Ottawa) represent a response in alleviating financial barriers for low income earners, especially those in larger families or in single parent families.

An estimated 8.9 million people were covered by private group dental plans in this country, in 1981 (Stamm et al., 1984). However, it has been found that the probability of being covered by a private insurance plan is highly related to income, and education (Bullen, 1982; Teh-wei-Hu, 1981); all of which are strong determinants of dental care utilization to begin with. Furthermore, not everyone can afford the premiums or co-payments of private dental care plans, nor is every Canadian a member of a unionized workforce which carries extra benefits for its employees, such as group dental insurance. There still remains a large proportion of Canadians who have little access to dental insurance, and whose financial barriers to dental services are even more pronounced: the poor, the "working poor", the unemployed, the low educated, etc. In addition, some researchers have also demonstrated that the effect of dental insurance, per se, did not contribute to significantly increase utilization levels, but rather augmented the utilization of the more expensive elective services (Avnet and Nikias, 1967; Friedman, 1980, Stamm et al., 1984).

Although the review of the literature does not permit us to draw a clear-cut line between dental insurance coverage and its impact on utilization, empirical research has demonstrated that the degree of contribution by an insured individual (i.e. employee) to a premium, along with the degree of voluntary versus automatic coverage, both have a significant influence on dental care utilization (Nikias, 1969; Avnet and Nikias, 1967). These empirical findings demonstrated that, individuals who incur the highest out-of-pocket expenses when they adhere to a dental insurance plan (voluntary coverage, premiums, co-payments, opportunity costs of foregone benefits, etc.), will exhibit a greater propensity to seek dental care. The

correlation analysis between utilization and insurance coverage at the macro level, reported in chapter five, tend to support the findings of Avnet (1969) and Avnet and Nikias (1967). Indeed, higher utilization rates were observed in those provinces with higher enrolments in private dental care plans (Ontario, British Columbia), where it is assumed that participants are voluntary engaging in such plans (directly or indirectly through their union negotiators), and are incuring some kind of cost (premium, co-payment or foregone benefits).

It is encouraging to note that private dental care plans play a dominant role in attaining high utilization levels, thus suggesting that prepaid dental programs may be quite effective in generating an acceptably high utilization level (Stamm et al., 1984). However, it must be recognized that in most cases, the eligible group comprises the employed, the urban, and most prosperous groups in society, all of whom are more likely to visit a dentist in the first place (Stamm et al., 1984; Bullen, 1982; Teh-wei-Hu, 1981).

In addition, Stamm (1984) points out that the major difficulty with coverage under private group dental care plans remains one of consumer information. Stamm argues that, the consumers generally employer-employee groups, are not demanding the type of dental plan most suited to their needs. Consequently, dental groups are "over-insuring" themselves for the smaller more predictable and usually less expensive dental bills -preventive services, x-rays, extractions- leaving insufficient coverage for larger, less predictable dentist charges (Stamm et al., 1984. pp. 268-269).

Evans (1984) carries the discussion further by arguing that the dynamics of collective bargaining in the Canadian tax system may be such to encourage the spread of insurance, even though its benefits to the insured employee may be minimal or non-existent.

In essence, this malaise is germane to the entire field of health care, where adverse selection is a problem of asymetry of information between the consumer and the provider and/or between the buyer and seller of insurance (Evans, 1984). It follows that adverse selection will likely emerge in such a context, leading to a level of coverage which eventually

falls short of universality and comprehensiveness, and which ultimately leads to what Evans (1984) refers to as "cream-skimming". Although the purists of insurance argue that dental disease is not an insurable loss in its purest sense, there is little doubt that the private market fails in distributing "protection" in an equitable fashion; a failure which consequently calls for some type of public intervention in dental care insurance.

Public involvment in dental care insurance has been a matter of concern to policy makers for quite some time now. In its most recent review of the Canadian health care sector, the Hall Commission (1980), recommended that highest priorities should be assigned to the development of dental care programs for children, using a mix of dentists services and dental auxiliaries (Hall, 1980).

This recommendation has been implemented with varying degrees in some provinces. Provincial involvement in publicly funded dental care insurance in this country have focused on specific sub-population, namely on children, and in one case on the elderly. Understandably, because of the long term benefits of early prevention and treatment, public dental plans aimed at children represent a highly appealing and economic policy issue.

There are essentially three major options for public policy in providing dental care for target sub-populations. These policy decisions turn upon whether the existing private delivery system should be relied upon; or whether a publicly administered service using a team of salaried personnel should be put forward; or a combination of both concepts.

The findings of the foregoing descriptive analysis (chapter five) reinforce the argument that the organizational patterns (type of setting, practice, personnel, etc.) and manpower supply (number and mix of resources) within a publicly financed dental care plan, are highly determinant in the plan's rate of success in achieving its social objective of reaching a higher percentage of its target population (increasing utilization rates and reducing financial and geographic barriers). In accordance with previous findings (Saskatchewan, 1975; Quebec, 1975), the present study confirmed the net advantage of a public school-based delivery system

which relies extensively on dental auxiliaries, as opposed to the existing private delivery system, in attaining "optimal" utilization rates for a children dental care program.

Such a conclusion is not intended to condemn the private delivery system to the advantage of a school-based system. It simply re-emphasizes the argument that the objective of increasing utilization within the target group (children), is highly dependent upon the conditions in which the dental plan is implemented. If there is a shortage of resources at the time the plan was implemented, the desired levels of utilization will, of course, be influenced by the unavailability of dental manpower (Evans and Williamson, 1978).

In 1985, the denticare issue is not as hotly debated as it was in the seventies. Unlike fifteen years ago, there are few who would argue for the establishment of a universal, comprehensive denticare program a la medicare (Toronto Star, April 18, 1985). Years of stagnation in the economy, considerable expansion in private dental care plans, overall improvement in dental health (mostly due to water fluoridation, sugar free diets, preventive dental habits), and increasing unrest over the administration of health care services, have essentially ruled out publicly funded universal denticare in the near to moderate term (Stamm et al., 1984). The position of policy makers today appears to be guided by the commitment to expand on existing provincial programs, with the ultimate goal to remove financial and accessibility barriers, and to concentrate on the growing needs for educational and preventive programs.

The trends in dental care insurance issues were marked by significant gains in the last decade, and by signs of erosion in the early eighties. To avoid the damaging effects that such an erosion may have on the entire issue of dental care, governments at both levels are encouraged to commit themselves to the principle of continued expansion in dental care programs for target population (Stamm et al., 1984).

In the light of the present study, it appears that the choice of target groups for specific publicly funded dental care programs -insofar as only publicly-financed programs can assure universal eligibility- should be influenced by considerations such as susceptibility to disease,

inadequate access to care (financial and geographic) priority for primary and secondary care, and cost-effectiveness. As illustrated by our findings, such programs must be carefully designed in terms of resource mix and allocation, and especially with regards to the type of setting in which they are allocated.

7.5 Prevention and Promotion Strategies

The descriptive and multivariate analyses presented in this report both highlighted some key issues related to promotion and prevention in dental care. Even though the foregoing analyses are affected by the limitations of the data, it is assumed that there would be very little discrepancy between our findings and those of Kegeles (1975), Richards (1971) and O'Shea (1968), who observed that the determinants of preventive dental care are almost identical to those of dental visits in general, i.e., income, education, sex, maternal influence, and positive predisposition to preventive activity in general.

It is recognized that such characteristics are essentially similar to those of people who normally undertake preventive health activities, and who, eventually, exhibit good health habits (Health and Welfare Canada, 1979). Those people are really not the ones in dire needs of preventive dental initiatives, as suggested by Chambers (1977) and the present report.

Gift and Milton (1975) argue that dentists' attitudes and especially the way in which dental care is organized may have an overall impact on prevention. It follows that successful preventive strategies in dentistry will be dependent upon the setting in which they are implemented. The descriptive analysis reported in chapter five of this report has demonstrated that a school-based environment (the Saskatchewan and P.E.I. experiences) has a net advantage in reaching a larger proportion of its population for purposes of preventive and therapeutic dental care.

In part, the success of the Saskatchewan Health Dental Plan (SHDP) is attributable to the structural organization of its delivery system. In marked contrast with the traditional solo practice in dentistry, the SHDP has succeeded in exploiting the naturally "captive" populations that exist in our industrial society. Indeed, by providing basic preventive and primary dental care to children in school-based clinics, the Saskatchewan (and P.E.I.) system has been capable of reaching and maintaining marginal groups in the dental care system.

In light of these observations, it could be argued that places of work also represent a potential "captive" site, which would be easily accessible and well suited for preventive dental services. The equipment and personel required in the average practice permits considerable mobility, and the work site lends itself to flexible administrative arrangements (Davis, 1980). While proliferation of group dental plans as a form of social benefit to unionized workers has marked the seventies, perhaps the initiative could be carried on with prevention-oriented clinics located in the workplace. In fact, data from the United States suggest that very high levels of dental utilization can be attained with dental services located at the work site (Silversin and Coombs, 1980).

The findings relating dental care utilization to positive predisposition vis a vis preventive health care in general, reinforces the argument that preventive strategies should be aimed at the unmotivated non-users and negative patients, by reinforcing favorable attitudes and behaviors among those target audiences (Millenson, 1980). Obviously, prevention and promotion campaigns belong to the realm of preventive dentistry, which falls beyond the scope of this study. However, the point to remember, is that non-users are generally not inclined to preventive health care in general. Therefore, it may be suggested that preventive health and dental care strategies should be drawn in parallel, in order to reach those target groups in society who are essentially similar in terms of prevention and utilization behavior.

The results of the discriminant analysis have also emphasized the importance of education as a powerful predictor of dental care utilization. As already mentioned, the position of

policy makers in Canadian dentistry appears to be guided by a commitment to concentrate on educational programs and preventive strategies (Stamm et al., 1984). It follows that, knowing the important role played by education as a determinant of utilization, greater emphasis should placed on educating the public on dental care matters.

In its brief presented to the Hall Review of Health Services in 1980, the Canadian Dental Association pointed out that Canada had not deployed serious efforts in promoting dental education among the public (CDA, 1980). In fact, the Canadian Dental Association argue that the only effective way to augment the population's "dental IQ", is to influence the individual's behaviour by means of public attention.

The foregoing analysis has stressed the importance of education (and broader awareness) with respect to dental care utilization, suggesting that an enormous potential exists if non-users are motivated by means of increased public attention. Campaigns aimed at reducing cigarette and alcohol consumption, along with promotion of physical fitness and seatbelt usage are all examples which have resulted in beneficial impacts on health status in general (Stevens, 1985).

Although dental diseases are not as life-threatening, they still affect the majority of Canadians and carry an expensive bill to society. It follows that prime importance should be given to public education with respect to oral health prevention and promotion (C.D.A., 1980).

The findings presented in this report suggest that the family nucleus represents an ideal starting point for designing and implementing promotive and preventive dental care campaigns. The strong correlation observed between a mother's dental health practice and her children's utilization behaviour indicates that the family nucleus has a great potential for exploiting another "captive" population. By focusing on the mother as a target person for public dental education, it is believed that overall beneficial effects can be transmitted to the members of the family, and especially the children.

Even though the foregoing discriminant analysis failed to support the assertion that water fluoridation has a direct negative influence on dental care utilization, evidence suggets that water fluoridation does indeed reduce the incidence of dental caries and dental disorders (Grembowski, 1984; Health and Welfare Canada, 1979; C.D.A., 1980). It follows that, although little is known about fluoridation effects on dental demand, it is still one of the foremost preventive measure recognized by the dentist community. The results presented in chapter six (discriminant analysis) illustrate the major difficulty which stems from the analysis of fluoridation and dental utilization with cross-sectional data. The data limitations of "snapshot" health surveys reinforce the argument that longitudinal data are absolutely necessary to fully analyze and understand the impact of large scale preventive measures such as water fluoridation on the demand for dental care.

7.6 Oral Disease and the Quality of Life

All too often, oral health appears to be given relatively low priority issue for government policy. Is this because the impact of oral health diseases and conditions on society is negligible, or is it because researchers have failed to measure its full impact?

Although oral health problems are rarely life-threatening or particularly debilitating, there are indications that they can have significant consequences on an individual's quality of life (Reisine, 1984; Shaw et al., 1980).

As already mentioned in the chapter describing the conceptual framework (chapter 3), data from Canada Health Survey files (CHS) did not permit us to assess the overall oral health status of the Canadian population. However, CHS data files did provide some insight on the consequences of dental problems. The findings of the Canada Health Survey indicate that dentally related disability may in fact be greater than anticipated. The figures show that, in 1978-79, dental problems resulted directly in 3.7 million days of disability, restricted activity, or days of work loss. In addition, the same data source reveals that 46 percent of

Canadians with dental problems did not consult a dentist, high costs being cited as the major reason for not doing so.

In addition to disability, there are numerous other social consequences from oral disease which are worthy of public policy concern. These include the effects on interpersonal relations, life, leisure and recreational activities, societal costs (loss of productivity, time lost from work); along with several psychological consequences ranging from pain, discomfort, orofacial appearance, self-concept, to emotional well-being (Nikias, 1985).

Contrary to health care in general, it seems difficult to delineate clear-cut social policy objectives in dentistry. This difficulty stems essentially from the under-development in social indicators of dental disease, along with the traditional arbitrary distinction between oral health and physical (and mental) health in general. It is assumed that such under-development also results from the traditional triviality of dental conditions. While it is accepted that cancer, heart disease and stroke all have serious societal consequences (morbidity, mortality, treatment costs, etc.), the same societal consequences, which may be as great and which may affect more people, are not necessarily recognized in the case of dentistry (Reisine, 1985).

If oral health status is presented in terms of social consequences and quality of life, then a more effective argument can be made to secure public and private funds to support dental research along with preventive and therapeutic programs. It follows that such an approach may provide dentistry with greater visibility and legitimacy in the public's view (Reisine, 1985).

In such a context, the policy measures should aim at bringing high risk groups and target audiences into the dental care system, by means of greater exposure to public education and prevention messages, not only in dental care, but parallel to health care in general. Of course, the success of such interventions goes hand in hand with delivery mechanisms proven successful in alleviating economic and geographic barriers to dental care.

Appendix A

PROVINCIAL CHILDREN'S DENTAL CARE PLANS, CANADA, 1978-79.

A.1 Manitoba Children's Dental Program

Eligibility:	Age: 5-9, Residence: Specific rural (remote areas).
Services Covered:	Diagnostic and preventive services. Restorative, endodontic, periodontic, orthodontic and oral surgical services.
Providers:	Dental nurses and dental assistants. Private dentists (as of 1978).
Delivery Mechanisms:	School and mobile clinics. Private practice.

A.2 New Brunswick Dental Health Services Program

Eligibility:	School, grades 1-6 (prevention). School, grades 1-3 (treatment).
Services Covered:	Diagnostic, preventive, therapeutic.
Providers:	Dental hygienists (prevention). Private dentists (treatment).
Delivery Mechanisms:	Private practice. Regional dental clinics. Mobile clinics.

A.3 Newfoundland Children's Dental Program

Eligibility:	Age: Universal for children 0-12. Extended up to 17 years for underpriveledged, or severe dental problem.
Services Covered:	Diagnostic preventive and therapeutic.
Providers:	Private dentists. Dental hygienists.
Delivery Mechanisms:	Private practice.

A.4 Nova Scotia Children's Dental Care Plan

Eligibility:	Age: Universal for children 0-12.
Services Covered:	Diagnostic preventive and restorative.
Providers:	Private dentists.
Delivery Mechanisms:	Private practice.

A.5 Prince Edward Island Children's Dental Care Program

Eligibility:	Age: Universal for children 3-13.
Services Covered:	Diagnostic preventive and treatment.
Providers:	Salaried dental team: dentist, dental hygienist, dental assistant.
Delivery Mechanisms:	Mobile and stationary public health clinics. Private office.

A.6 Quebec Children's Dental Care Program

Eligibility:	Age: Universal for children 0-13.
Services Covered:	Diagnostic, x-ray, preventive services, restorative dentistry, endodontics, oral surgery.
Providers:	Private dentists.
Delivery Mechanisms:	Private practice.

A.7 Saskatchewan Health Dental Plan

Eligibility:	Age: Universal for children 3-13.
Services Covered:	Diagnostic, preventive and therapeutic.
Providers:	Salaried team of dentists, dental hygienist, dental therapists and dental assistants. Emergency and referral: private dentist.
Delivery Mechanisms:	School clinics and mobile clinics.

Appendix B

ABSTRACTS FROM THE CANADA HEALTH SURVEY QUESTIONNAIRE.

13 - The next few questions refer to contacts with health professionals during the past 2 weeks.
During those 2 weeks did anyone in the family see or talk to any of the following health professionals about their health:

				HEALTH PROFESSIONAL CODE
A - A medical doctor?	No	Yes	Who? →	A Anyone else? →
B - A dentist?	No	Yes	Who? →	B Anyone else? →
C - A nurse?	No	Yes	Who? →	C Anyone else? →
D - A pharmacist or druggist for advice (exclude prescriptions)?	No	Yes	Who? →	D Anyone else? →
E - An optometrist or optician?	No	Yes	Who? →	E Anyone else? →
F - A chiropractor?	No	Yes	Who? →	06 F Anyone else? →
G - A psychologist, social worker or other counsellor?	No	Yes	Who? →	G Anyone else? →
H - Any other health professional?	No	Yes	Who? →	08 H Specify

IF NO CONTACT REPORTED FOR ALL FAMILY MEMBERS - GO TO 15

09 Anyone else? →

14 - FOR EACH PERSON WHO INDICATED CONTACT ASK:

a) Which health professional did ______ see or talk to most recently?

ENTER CODE FROM ABOVE A → H

10 HEALTH PROFESSIONAL CODE ☐

b) Please refer to Block B of your Reference Card. Where did ______'s most recent contact take place?

PLACE CODE
- 0 Health professional's office
- 1 Community health center
- 2 Hospital emergency room
- 3 Hospital outpatient dept. or hospital clinic
- 4 While patient in hospital

PLACE CODE
- 5 At work or industrial clinic
- 6 At school
- 7 At home
- 8 Telephone only (except to make an appointment)
- 9 Other (please specify)

ENTER CODE 0 → 9

11 PLACE CODE ____
If 9, specify ____

12 ____

c) What was the main health problem for this contact?

13 1 None (14e)
2 Entered above: "problem 14"

d) How long has ______ had the problem?

14 1 Less 2 wk
2 2 wk - 1 mo
3 1 mo - 1 yr
4 More 1 yr
5 Since birth
(NP-14e)

e) Please refer to Block C of your Reference Card.
What was the reason for this contact?

REASON CODE
- 1 Medical check-up with blood pressure check
- 2 Medical check-up without blood pressure check
- 3 Dental check-up
- 4 Pre or post natal care

REASON CODE
- 5 Eye examination
- 6 Shots, inoculation or vaccination
- 7 Other (please specify)

ENTER CODE 1 → 7

15 REASON CODE ☐
If 7, specify
(NP-14e)

16

15 - Now I would like to ask you about contacts with health professionals during the past 12 months.

ASK THE FOLLOWING QUESTIONS FOR EACH PERSON

a) During the past 12 months how many times did _____ see or talk to a medical doctor about his(her) health? Include any visits in the last 2 weeks

17 ___ Times (16a)
18 ___ or None

b) How long has it been since _____ saw or talked to a medical doctor about his(her) health?

19 ___ Years
20 ___ or Never

16 - a) During the past 12 months, how many times did _____ see or talk to a dentist? Include any visits in the last 2 weeks.

21 ___ Times (17)
22 ___ or None

b) How long has it been since _____ saw or talked to a dentist?

23 ___ Years
24 ___ or Never

17 - During the past 12 months, how many times did _____ see or talk to the following health professionals about his(her) health?

a) A nurse

25 ___ Times

b) A pharmacist or druggist for advice (excludes prescriptions)

26 ___ Times

c) An optometrist or optician

27 ___ Times

d) A chiropractor

28 ___ Times

e) A psychologist, social worker or other counsellor

29 ___ Times

(NP-15a)

104

18 - a) In the past 12 months, was anyone in the family a patient in a hospital, a nursing home or a convalescent home? No (19) Yes Who?→

30 Hospital
31 Nursing home
32 Convalescent home
anyone else?→

b) How many times was _____ in a { hospital / nursing home / convalescent home } in the last 12 months? 33 ___ Times

c) How many nights did _____ spend in a { hospital / nursing home / convalescent home } in the last 12 months? ___ Nights

d) How many of these nights were in the last 2 weeks? ___ Nights (NP-18b)

19 - The next few questions refer to immunizations, shots or vaccinations.

Has _____ ever had any immunizations? No (NP) Yes ? (NP)

20 a) Has _____ ever been immunized against polio? No (20c) Yes ? (20c)

INCLUDES D.P.T.P., QUAD., "4-in-1", SABIN, SALK

b) Was this in the last 5 years? No Yes

c) Has _____ ever been immunized against

diphtheria? No Yes

INCLUDES D.T., D.P.T., D.P.T.P., QUAD. - 4-in-1

tetanus? No Yes

INCLUDES D.T., D.P.T., D.P.T.P., QUAD. - 4-in-1, T.A.B.T., TETANUS TOXOID

red measles? No Yes

German measles or rubella? No Yes

(NP-19) (NP-19) (NP-19)

PAGE 8

SECTION VI - DENTAL, HEARING, VISION

34 - The next few questions refer to your family's dental health, hearing and vision

Does anyone in the family have:

a) crowns or bridges? — No — Yes, Who? → 01 Crown bridge; Anyone else? →

b) partial dentures or plates? — No — Yes, Who? → 02 Partial denture; Anyone else? →

c) full upper or lower dentures or plates? — No (35) — Yes, Who? → 03 Upper / Lower / Both; Anyone else? →

FOR EACH PERSON INDICATING FULL UPPER OR LOWER DENTURES, ASK:

d) Does _____ wear his(her) denture(s) every day? → 04 No (NP) / Yes (NP)

35 - Does anyone in the family have difficulty or discomfort with their teeth, gums, dentures or plates? — No — Yes, Who? → 05 Entered above: "DT, 35"; Anyone else? →

36 - a) Does anyone in the family use a hearing aid? — (37) — Yes, Who? → 06 Hearing aid; Anyone else? →

FOR EACH PERSON INDICATING A HEARING AID, ASK:

b) Does _____ have any trouble hearing even when he(she) is wearing the hearing aid? → 07 1 No trouble / 2 Entered above "HT, 36" (NP)

37 - Does anyone who does not use a hearing aid have any trouble hearing normal conversation? — No — Yes, Who? → 08 Entered above: "HT, 37"; Anyone else? →

SECTION VIII - HEALTH PROBLEM PROBES

IF NO (MORE) HEALTH PROBLEMS REPORTED FOR ANY OF THE FAMILY MEMBERS, SKIP TO SECTION IX
FOR EACH PERSON SCAN HEALTH PROBLEM RECORDING AREA AND CHECK THAT ALL HEALTH PROBLEMS HAVE BEEN UNDUPLICATED.

COMPLETE ONE PROBE FOR EACH UNIQUE HEALTH PROBLEM

BEGIN BY COPYING
— PERSON NUMBER FROM IDENTIFICATION SECTION
— Problem question number(s) FROM HEALTH PROBLEM RECORDING AREA

PROBE 1

I would now like to ask some further questions on the health problems you mentioned earlier

PERSON NUMBER

Problem question number(s)

NOTE IF ANY QUESTION NUMBER IS 14 SKIP TO NEXT PROBE

a) How long has _____ had his (her) (health problem)?

- 1 2 days or less
- 2 3 days to 2 weeks
- 3 2 weeks to 1 month
- 4 1 month to 1 year
- 5 More than 1 year
- 6 Since birth

b) When did _____ last see or talk to a health professional about his (her) (health problem)?

- 1 During the last 12 months (Probe 2)
- 2 1 to 2 years ago
- 3 2 to 5 years ago
- 4 More than 5 years ago
- 5 Never
- 7 ?

c) What is the main reason that _____ has not seen a health professional recently about his (her) (health problem)?

- 1 Problem not serious enough
- 2 Costs too much
- 3 Takes too much time
- 4 Under control
- 5 Other specify

PROBE 2

This section was not organized in columns as was the rest of the questionnaire. The probes were repeated 10 times on each survey form

PERSON NUMBER

Problem question number(s)

NOTE IF ANY QUESTION NUMBER IS 14 SKIP TO NEXT PROBE

a) How long has _____ had his (her) (health problem)?

- 1 2 days or less
- 2 3 days to 2 weeks
- 3 2 weeks to 1 month
- 4 1 month to 1 year
- 5 More than 1 year
- 6 Since birth

b) When did _____ last see or talk to a health professional about his (her) (health problem)?

- 1 During the last 12 months (Probe 3)
- 2 1 to 2 years ago
- 3 2 to 5 years ago
- 4 More than 5 years ago
- 5 Never
- 7 ?

c) What is the main reason that _____ has not seen a health professional recently about his (her) (health problem)?

- 1 Problem not serious enough
- 2 Costs too much
- 3 Takes too much time
- 4 Under control
- 5 Other, specify

12

05 78

67 - We are now finished with the questions on your health
These last few questions will provide important background information about you and youf family.

ASK THE FOLLOWING QUESTIONS FOR EACH PERSON

a) Where was _____ born?

ENTER CODE 01 → 11

PROVINCE CODE		PROVINCE CODE	
01	NEWFOUNDLAND	07	MANITOBA
02	PRINCE EDWARD ISLAND	08	SASKATCHEWAN
03	NOVA SCOTIA	09	ALBERTA
04	NEW BRUNSWICK	10	BRITISH COLUMBIA
05	QUEBEC	11	YUKON OR N.W.T.
06	ONTARIO		

PROVINCE CODE
01 ___ (67c)
or
02 Outside Canada
(specify)
03 _____

b) When did he (she) first come to live in Canada?
04 ____ Year

c) What language or languages did _____ first learn and use in childhood?

05 English
06 French
07 German
08 Italian
09 Ukrainian
10 Other (specify)
11 _____

d) Please refer to Block G of your reference card
Which best describes ____ ____ s background?

NOTE. MORE THAN ONE RESPONSE CAN BE RECORDED

12 European
13 Asian Oriental)
14 African
15 Native American (Indian Inuit)
(NP. 67a)

71 - a) Who in the family worked or had a job in the past 2 weeks? No one (72) or Who? — Had a job Anyone else?

ASK THE FOLLOWING QUESTIONS FOR EACH PERSON WHO HAD A JOB

b) What kind of work does _____ do?
(Give full description: e.g. posting invoices, selling shoes teaching primary school)

c) For whom does _____ work?
(Name of business, government department or agency, or person, or is he (she) self-employed?)

d) What kind of business, industry or service is this?
(Give full description: e.g. paper-box manufacturing, retail shoe store, municipal board of education)

e) How many hours per week does _____ usually work at this job? Hours (NP-71b)

72 - ASK THE FOLLOWING QUESTIONS FOR EACH PERSON 15 AND OVER WHO DID NOT HAVE A JOB

a) Did _____ look for work in the past 12 months? No (72c) Yes

b) Which of the following experiences has _____ had while looking for work in the past 12 months: accepted an offer, received only unacceptable offers, no jobs available, or something else?
- Accepted offer
- Unacceptable offers
- No jobs available
- Something else

c) Has _____ had a paying job within the last 5 years? No (72e) Yes

d) If a job similar to _____'s last one were available this week, is there any reason why he (she) could not take it?
- No reason
- Out of season
- Own illness / disability
- Personal / family reasons
- Going to school
- No longer suitable
- Other

e) Has _____ worked full-time during at least 5 years of his (her) life? No (NP-72a) Yes

f) What kind of work did _____ do for the longest time?
(Give full description e.g. posting invoices, selling shoes, teaching primary school)

g) How many years did he (she) do this kind of work? Years

h) For whom did _____ work for the longest time?
(Name of business, government department or agency, or person, or is he (she) self-employed?)

i) What kind of business, industry or service was this?
(Give full description: e.g. paper-box manufacturing, retail shoe store, municipal board of education) (NP-72a)

73 - Now, the last topic. Although many health expenses are covered by provincial insurance programs, there still continues to be a relationship between a person's health status and income. We would appreciate your answering a few questions on your income to help us study this situation. Please be assured that, like all the other information you provide these answers will be kept in strictest confidence.

ASK THE FOLLOWING QUESTIONS FOR EACH PERSON 15 AND OVER

a) What was _____ 's income before taxes from wages, salaries and self-employment during the past 12 months?

42 $ |_|_|_|_|_| 00

43 1 $100 000 and over
2 Refusal
3

b) Please refer to Block I of your Reference Card. From which of these other sources did _____ receive income during the past 12 months?

44 Interest, dividends
45 Family allowance
46 UIC
47 Social assistance
48 OAS GIS
49 CPP QPP
50 Retirement pension
51 Other govt sources
52 Other sources
53 None (NP-73a)

c) What was _____ 's income before taxes from these sources during the past 12 months?

54 $ |_|_|_|_|_|

55 $100 000 and over
7 Refusal
9

NP 73a

INDICATE FOR EACH PERSON

56 This person was
Present for all of the interview
Present for part of the interview
Absent

68 - INDICATE EACH PERSON WHO IS 15 AND OVER AND NOT LIVING WITH A SPOUSE

15 and over not living with spouse

FOR EACH PERSON INDICATED ASK

a) Has _____ ever lived with a spouse? (include common-law relationships of at least 3 months)

No (NP) Yes

b) Within the last 12 months?

No Yes

c) Was his (her) spouse lost through death?

No (NP-68a) Yes (NP-68a)

69 - What is the highest level of education _____ has reached?

IF BABY OR CHILD 6 AND UNDER, INDICATE HERE

IF IN ELEMENTARY SECONDARY SCHOOL, INDICATE GRADE

IF NOT IN ELEMENTARY SECONDARY SCHOOL, INDICATE LEVEL

20 Baby, Child

21 Grade

22
- Some secondary or less
- Secondary diploma
- Some post secondary
- Post secondary certificate or diploma
- Bachelor's degree or post graduate degree

(NP)

70 - a) Has anyone in the family lived at this address less than 12 months? (excluding babies under 1 year) No (71) Yes Who? → 23 Less than 12 months Anyone else? →

FOR THOSE HERE LESS THAN 12 MONTHS SAY

b) Please refer to Block H of your Reference Card
What best describes the place where _____ lived before?

ENTER CODE 1 to 8

PLACE CODE

24 (NP)

PLACE CODE Same municipality or urban area

1 Same neighbourhood or locale

2 Same municipality or urban area but different neighbourhood or locale

PLACE CODE Different municipality or urban area

3 Different place under 1,000 population or rural area

4 Different place 1,000 - 9,999 population

5 Different place 10,000 - 99,999 population

6 Different place 100,000 - 1,000,000 population

7 Over 1,000,000 population (e.g. Montreal - Toronto - Vancouver)

8 Don't know

YOUR ACTIVITIES

The following questions ask about some of your activities during your leisure time.

1. Which of the following best describes how you spent your leisure time during the last two weeks? (Please check one box only)

- ☐ Almost all of it by myself
- ☐ A lot of it by myself
- ☐ About half of it by myself and half of it with others
- ☐ A lot of it with others
- ☐ Almost all of it with others

2. During the last two weeks, how many times did you do any of the following exercises, sports or recreational activities?

2a About how much time did you spend on each occasion?

	Times in last two weeks	Minutes usually spent			
		1 to 15	16 to 30	31 to 60	More than 60
Walking (including to and from work or school)	☐☐	☐	☐	☐	☐
Jogging or running	☐☐	☐	☐	☐	☐
Calisthenics	☐☐	☐	☐	☐	☐
Bicycling (including to and from work or school)	☐☐	☐	☐	☐	☐
Bowling	☐☐				
Vigorous dancing	☐☐	☐	☐	☐	☐
Skating	☐☐	☐	☐	☐	☐
Skiing (downhill, cross-country)	☐☐	☐	☐	☐	☐
Curling	☐☐	☐	☐	☐	☐
Racquet sports (tennis, badminton, squash, racquetball)	☐☐	☐	☐	☐	☐
Baseball, Softball	☐☐	☐	☐	☐	☐
Other team sports (hockey, basketball, football, soccer, volleyball)	☐☐	☐	☐	☐	☐
Golf	☐☐	☐	☐	☐	☐
Swimming	☐☐	☐	☐	☐	☐
Other (please specify) ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐	☐☐	☐	☐	☐	☐

OR ➔ ☐ I did nothing like this in the last two weeks

YOUR TRANSPORTATION

1. During the last two weeks about how many miles kilometers have you travelled as a passenger?

1a. About how often did you fasten the seatbelt?

	Number of miles kilometers	Always	Most of the time	Rarely	Never or no seatbelt
In automobiles	miles OR km				
In trucks or vans	miles OR km				
On motorcycles	miles OR km				

OR ☐ I was not a passenger in the last two weeks

2. During the last two weeks about how many miles kilometers have you travelled as a driver?

2a. About how often did you fasten the seatbelt?

	Number of miles kilometers	Always	Most of the time	Rarely	Never or no seatbelt
In automobiles	miles OR km				
In trucks or vans	miles OR km				
On motorcycles	miles OR km				

OR ☐ I was not a driver in the last two weeks

3. Which of the following vehicles have you driven during the last 12 months?

3a. How many years have you been driving each of these?

	Vehicles you drove	Number of years you have been driving
Automobiles	☐	years OR ☐ Less than a year
Trucks or vans	☐	years OR ☐ Less than a year
Motorcycles	☐	years OR ☐ Less than a year

OR ☐ I did not drive any of these in the last twelve months

BIBLIOGRAPHY

1. American Association of Public Health, Subcommittee on Preventive Periodontics. "Periodontal Disease in America: A Personal and National Tragedy". *Journal of Public Health Dentistry*, 43 (2):106-117 Spring 1983.
2. American Dental Association. "Future of Dentistry Document". *American Dental News*, (2) August 30, 1982.
3. Andersen, R., Anderson, O.W. *A Decade of Health Services: Social Survey Trends in Use and Expenditure*, Chicago: University of Chicago Press, 1967.
4. Andersen, R., Smedby, B., Anderson, O.W. *Medical Care Use in Sweden and The United States: A Comparative Analysis of Systems and Behavior*, Chicago: Research Series no. 27, Center for Health Administration Studies, University of Chicago, 1970.
5. Anderson, O.W., Andersen, R.M. "Patterns of Use of Health Services" in *Handbook of Medical Sociology*, Freeman H.E., Levine S. and Reeder L.G. editors, Englewood Cliffs, Prentice Hall, 1972, pp. 386-406.
6. Avnet, H.H., Nikias, M.K. *Insured Dental Care: A Research Project Report*, New York, GHDI, 1967.
7. Bailit, H.L., Raskin, M., Reisine, S., Chiriboga, D. "Controlling the Cost of Dental Care". *AJPH*, Vol.69, No. 7, July 1979.
8. Banting, D.W. "Dental Care for the Aged". *Canadian Journal of Public Health*, 62:503-508, 1971.
9. Barer, M.P., Manga, P., Shillington, R.E., Siegel, G.C. *Income Class and Hospital Use in Ontario*, Ontario Economic Council, Toronto, 1982.

10. Beck, J. et al. "Iowa Survey of Dental Health : Utilization Behavior" *Journal of Dental Resources*, 600-617, March, 1981.

11. Becker, M.H., Mainman L.H. "Socio-Behavioral Determinants of Compliance with Health and Medical Care Recommendations". *Medical Care*, 13:10-24, 1975.

12. Bene, A.A., Novasky, W.E., Geldart, S.G. "Dental Care in Alberta: Public Attitudes, Utilization Patterns and Socio-Economic Determinants" *Journal of Canadian Dental Association*, No.6, 1974.

13. Borhani, N.O., Kaus, J.F. "Use of Health Services in a Rural Community".*Health Services Reports*, 88: 275-288, March 1973.

14. Bradshaw, J. "A Taxonomy of Social Need" in *Problems and Progress in Medical Care (Essays in Current Research, 7th Series)*, McLachlon editor, London, Oxford University Press, 1972.

15. Broyles, R.W., Manga, P., Binder, D.A., Angus, D.E., Charette, A. "The Use of Physician Services Under a National Health Insurance Scheme: An Examination of the Canada Health Survey". *Medical care*, vol. 21, no.11, November 1983.

16. Bullen, M.E.B. *The Utilization of Dental Services by Ontario Adults, 1979-80*. Thesis submitted for the Degree of Master of Science, Faculty of Dentistry, University of Toronto, 1982.

17. Cageorge, S.M., Ryding, W.H., Leake, J.L., "Dental Health Status Survey of Manitoba Children". *Journal of Canadian Dental Association*, February, 1980.

18. Canada, Department of National Health and Welfare and Dominion Bureau of Statistics. *Illness and Health in Canada: The Canadian Sickness Survey 1950-51*.Dominion Bureau of Statistics, Catalogue No.82-518, Ottawa, Queen's Printer, 1960.

19. Canada, Dominion Bureau of Statistics. *Dental Care in Canada: A Supplement to the Labour Force Survey, February 1967*, Ottawa, 1971.

20. Canada, Royal Commission on Health Services (Hall Commission). *Report, VOL. I*, Ottawa, Queen's Printer, 1964.

21. Canadian Dental Association. *Dental Health of Canadians - A Perspective* , Brief presented to the Health Services Review 1979, Ottawa, March, 1980.

22. Canadian Dental Association. "CDA Policy Statement on Water Fluoridation". *Journal of Canadian Dental Association*, supplement, February 1981.

23. Canadian Dental Hygienists Association. *Brief Presented to the Health Services Review'79*, April, 1980.

24. Carlos, J.P., Gittlesohn, A.M. "Longitudinal Studies of the Natural History of Caries II", *Arch Oral Biol*, 10:739-751, 1965.

25. Chambers, D.W., "Patient Susceptibility Limits to the Effectiveness of Preventive Oral Health Education". *Journal of the American Dental Association*, 95:1159-1163, 1977.

26. Christianson, M.L., *Lifetime Dental Health Monitoring: an Age-Related Preventive Strategy. Epidemiologic and Clinical Evidence and Policy Implications*, San Francisco Health Policy Program, University of California, September 1977.

27. Cole, R.B., Cohen, L.K. "Dental Manpower" *Milbank Memorial Fund Quarterly*, 49 (3):29-62, July 1971.

28. Davis, P. "Converting the Need for Care into Demand for Services", *New Zealand Dental Journal*, Vol. 32, No.3, 1980.

29. Dickson, S. "Class Attitudes to Dental Treatment". *British Journal of Sociology*, (19):206-211, 1968.

30. Douglas, B.L., Wallace, D.A., Lerner, M., Coopersmith, S.B., "The Impact of Fluoridation on Patterns of Dental Treatment". *Journal of Public Health Dentistry*, (31):225-250, Fall 1971.

31. Doyle, M. "Dentists' Free Checkup Project to Help Senior Citizens". *The Gazette*, Montreal, May 29, 1985.

32. Duffy, R. "$120 Million Tab Keeps Denticare a Quiet Issue in Election Campaign". *Toronto Star*, April 18, 1985.

33. Dunning, J.M. "Dentistry on the Crossroads: A Study of Professionalism". *American Journal of Public Health*, 72 (7):651-652, July, 1982.

34. Ellis, R.L. *A Study and Appraisal of Developments in Voluntary Dental Prepayment and Insurance Plans in North America*, Unpublished MSc. Thesis, School of Hygiene, University of Toronto, 1970

35. Evans, R.G., Williamson, M.F., *Extending Canadian Health Insurance: Options for Pharmacare and Denticare*, Ontario Economic Council Research Studies, University of Toronto Press, 1978.

36. Evans, R.G., *Strained Mercy: The Economics of Canadian Health Care*, Butterworths, Toronto, 1984.

37. Feldstein, P.J., *Financing Dental Care: An Economic Analysis*, Lexington, Massachussets, D.C. Health and Company, 1973.

38. Festinger, L. "Cognitive Dissonance". *Sci. Amer.*, 207:93-102, Oct. 1962.

39. Forgay M. "Influencing Factors", in *Working Document on the Dental Hygienist Profession*, prepared for Health and Welfare Canada, mimeo, April 1985.

40. Freeman, H.E., Lambert, J.C. "Preventive Dental behavior of Urban Mothers". *Journal of Health and Human Behavior*, 6:141-147, Fall 1965.

41. Friedman, J.W. "The Effects of Dental Insurance on Private Dental Practice". *New Zealand Dental Journal*, Vol.77, no.347, 1980.

42. Gift, H.C., Milton, B. "Comparison of Two National Preventive Dentistry Surveys: 1975 and 1974". *Journal of Preventive Dentistry*, 2:25-27, 1975.

43. Gift, H.C. "The Seventh Age of Man: Oral Health and the Elderly". *Journal of American College Dentistry*, 40:204-213, Oct. 1979.

44. Goldberger, A.S. *Econometric Theory*, John Wiley and Sons Inc., New York, 1964.

45. Greene, R. "What's Good for America Isn't Necessary Good for the Dentists". *Forbes*, August 1984.

46. Grembowski, D. "The Effects of Fluoridation on Dental Care Demand". *The Compendium of Continuing Education*, Vol. 5, no.8, September, 1984.

47. Grossman, M. *The Demand for Health: A Theoretical and Empirical Investigation*, National Bureau of Economic Research, Occasional Paper 119, Columbia University Press, 1972.

48. Gullet, D.W. *A History of Dentistry in Canada*, University of Toronto Press, Toronto, 1971.

49. Hall, E.M., *Canada's National-Provincial Health Program for the 1980's. A Commitment for Renewal*, Health Services Review'79, Saskatoon, 1980.

50. Hankin, R.A. "The Cost of Providing Restorative Dentistry in an Alternative Delivery Mode", *Journal of Public Health Dentistry*, 37 (3):217-223, 1977.

51. Harris J. "An Ontario Perspective" in *Dental Plans in Canada: A Growing Employee Benefit*, a report from the Compensation Research Centre of the Conference Board in Canada, Jepson A.E. editor, Montreal, Oct. 1977.

52. Health and Welfare Canada, *Nutrition Canada, Dental Report*, Ottawa, 1977.

53. Health and Welfare Canada. *Fluoridation in Canada as of December 31, 1976*, Ottawa, 1977.

54. Health and Welfare Canada. *Preventive Dental Services: Practices Guidelines and Recommendations*, Ottawa, Sept. 1979.

55. Health and Welfare Canada. *Canada Health Manpower Inventory, 1983*, Ottawa, March 1984.

56. Health and Welfare Canada and Statistics Canada. *The Health of Canadians: Report of the Canada Health Survey 1978-79*, Statistics Canada, Catalogue No. 82-538E, Ottawa, June, 1981.

57. House, R. *Dentistry in Ontario*, A study Prepared fot the Ontario Commitee on the Healing Arts, Queens' Printer, Toronto, 1970.

58. House, D.R. "Barriers to Access to Dental Care: An Economic Examination". *Journal of the American College of Dentists*, Vol.45, No.3, July 1978.

59. Hunt, A.M., Lewis, D.W., Banting, D., Foster, M.K. "Ontario Dental Health Survey 1978". *Canadian Dental Association Journal*, Vol.46, No.2, 1980.

60. Janz, N.K., Becker, M.H. "The Health Belief Model: A Decade Later". *Health Education Quarterly*, Vol.11, No.1, Spring 1984.

61. Kegeles, S.S. "A Critical Examination of the Barriers to the Receipt of Dental Care". *Journal of Public Health Dentistry*, 35:28, 1975.

62. Kiyak, A.H., Miller, R.R. "Age Differences in Oral Health Attitudes and Dental Service Utilization". *Journal of Public Health Dentistry*, Vol.42, No.1, Winter, 1982.

63. Kronenfeld, J. "Access to Dental Care: A Comparison of Medicine/Dentistry and the Role of a Regular Source". *Medical Care*, Vol. 27, No.10, October 1979.

64. Lalonde, M. *A New Perspective on the Health of Canadians*, Ottawa, Department of National Health and Welfare, 1974.

65. Lapierre, L. *Canadian Women: Profile of their Health*, Statistics Canada, Catalogue 82-524E, April 1984.

66. Lawton, D.M., Williams, I.J., Martinello, B.P. "Determinants of Dental Care". *Canadian Journal of Public Health*, Vol.64, July/August 1973.

67. Leverett, D.H. "A Critical Examination of the Barriers to the Receipt of Dental Care". *Journal of Public Health Dentistry*, Vol.35, No.1, Winter Issue, 1974.

68. Leverett, D.H., Hooper, S.D., Russel, W.N. "Variations in Utilization of a Multi-State Company Dental Plan". *American Journal of Public Health*, 67:1173-1178, 1978.

69. Lewis, D.W., Brown, B.I. "Demand for Dental Services". *Dental Manpower/Population Ratio Estimates for Canada Under Four Situations*, Issued as Health Manpower Report 1-73 by the Department of National Health and Welfare, Ottawa, 1973.

70. Lewis, D.W. *The Effects of Preventive Measures on the Demand for Dental Care on Children*, Symposium/Workshop on Post Graduate Pedodontic Specialty Education, Eastman Dental Center, Rochester, New York, Oct. 1978.

71. Lewis, D.W. *Ontario Adult Dental Visits - Priorities, Attitudes and Insurance*, Research Report 38, Dental Health Care Services and Epidemiology Research Unit, University of Toronto, Toronto, 1980.

72. Lipscomb, J. "Deregulation of Professionals and Health Care Cost Containment: The Case of Dentistry". *Policy Studies Review*, pp.523-531, 1982.

73. Manga, P., Broyles, R.W., Angus, D.E. "The Use of Hospital and Physician Services Under a National Health Insurance Program: An Examination of the Canada Health Survey". *Proceedings of the Second Canadian Conference on Health Economics*, Boen T.A., editor, Regina, 1984.

74. Manga, P. *The Income Distribution Effect of Medical Insurance in Ontario.* Ontario Economic Council, Occasional Paper, Toronto, 1978.

75. Manning, W.G., Phelps, C.E. *The Demand for Dental Care: Putting your Money Where your Moith is.* Rand Corporation, Santa Monica, 1977

76. Maurizi, A. R. *Public Policy and the Dental Care Market*, American Institute for Public Policy Research, Washington, Nov. 1975.

77. Mc Farlane, B.A. "Dental Manpower in Canada". *Royal Commission on Health Services*, Queen's Printer, Ottawa, 1964.

78. Millenson, L.J. "Increasing Demand for Dental Care: Motivating New Behavior". *General Dentistry*, 28(5):20-38, 1980.

79. Mueller, C.D. "Medicaid and Use of Dental Services by Children". *National Center for Human Services Research*, Rockville, 1984.

80. Mullins, M.R., Kaplan, A.L., Miltry D.J., Armstrong, S.R., Longe, K.W., Steuer, R.E., and Johnson, K.H. "Production Economic Effects of Delegation and Practice Size in a

Private Dental Office". *Journal of the American Dental Association*, 98:572-577, April, 1979.

81. Mustard, J.F. "The Use of Hospital and Physician Services Under a National Insurance Program: An Examination of the Canada Health Survey". Discussant in *Proceedings of the Second Canadian Conference on Health Economics*, Boen T.A., editor, Regina, 1984.

82. Newhouse, J.P., Phelps C.E. "New Estimates of Price and Income Elasticities of Medical Care Services" in *The Role of Health Insurance in the Health Service Sector*, Rosset, R.N., editor, New York, NBER, 1976.

83. Newman, J.F., Anderson, O.W. "Patterns of Dental Services Utilization in the United States: A Nationwide Social Survey". *Center for Health Administration Studies. Research Series no.30*, University of Chicago, 1972.

84. Newman, J.F., Larsen, A. *A Decade of Dental Service Utilization 1964 - 1974*, Publication (HRA) 80-56, U.S. Department of Health and Human Services, Maryland, 1980.

85. Nikias, M.K. "Social Class and the Use of Dental Care Under Prepayment". *Medical Care*, 6:381-393, Sept. - Oct., 1968.

86. Nikias, M.K. "Prepaid Dental Care: Patterns of use and Source of Premium Payment". *American Journal of Public Health*, 59:1088-1103, July, 1969.

87. Nikias, M.K. "Trends and Patterns of Dental Care in an Urban Area Before Medicaid". *HSMHA Health Reports*, 85:52-65, 1971.

88. Nikias, M.K. "Oral Disease and Quality of Life". *AJPH*, Vol. 75, No.1, January 1985.

89. O'Hara, J.M. "Bargaining for Dental Plans" in *Dental Plans in Canada: A Growing Employee Benefit*, a report from the Compensation Research Centre of the Conference Board in Canada, Jepson A.E. editor, Montreal, Oct. 1977.

90. Okada, M.L., Wan, T.H. "Factors Associated with Increased Dental Care Utilization in Five Urban, Low-Income Areas". *AJPH*, Vol.69, No.10, October 1979.

91. O'Shea, R.M., Gray, S.B. "Dental Patient's Attitudes and Behavior Concerning Prevention ". *Public Health Reports*, 83:406-410, 1968.

92. Quebec, Ministere des Affaires Sociales. *Programme de Sante Dentaire en Milieu Scolaire*, Document de travail, Service de la Conception des Programmes, Direction de la Planification des Services de Sante, Quebec, 1975.

93. Quebec, Regie de l'Assurance Maladie du Quebec. *Statistiques Annuelles 1974*, Quebec, 1975.

94. Praught, E. "Examination of the Relationship Between Sample Size, Weighted Estimates and Coefficient of Variation in the Canada Health Survey". *Working Paper*, Statistics Canada, Health Division, September 1981.

95. Read, W. et al. *Elderly Person's Self-Reports on Oral Health: Comparisons to Clinical Findings*, Paper delivered at the Annual General Session of the American Association of Dental Research Behavioral Sciences Group, Las Vegas, Nevada, June 23-26, 1977.

96. Reisine, S.T. "Social, Psychological and Economic Impacts of Dental Conditions and Treatments " in *Social Science and Dentistry, Vol. 2,* , Cohen L.B., and Bryant P., editors, The Hague: Quintessence Publishing Co., Surrey, 1984.

97. Reisine, S.T. "Dental Health and Public Policy: The Social Impact of Dental Disease". *AJPH*, Vol. 75, No.1, January, 1985.

98. Richards, N.D. "Demand and Need for Dental Care: A Comparison of Self Assessments and Clinical Assessments of Oral Conditions". *Abstracts of contributed papers, Medical Care Section, American Public Health Association*, Miami, 1967.

99. Roemer, M.I. "Health Needs and Services of the Rural Poor". *Medical Care Review*, 25:371-385, 461-491, May-June, 1968.

100. Rosenfelt, E. "Dentists' Numbers Rise and Incomes Hold up as Tooth Decay Drops". *The Globe and Mail*, August 19, 1983.

101. Rosenstock, I.M. "Why People Use Health Services". *Milbank Memorial Fund Quarterly*, 44:94-124, 1966.

102. Saskatchewan, Saskatchewan Health Dental Plan. *Annual Report, 1974-1975*, Regina, 1976.

103. Schicke, R.K. "Prevention and the Demand for Dental Care in an International Perspective". *Paper presented at the world congress on health economics*, 8-11, September, 1980.

104. Schoen, M. "Dental Care and the Health Maintenance Concept". *Milbank Memorial Fund Quarterly*, 53:173-193, 1975.

105. Shaw, O., et al. "Dental and Social Effects of Malocclusion and Effectiveness of Orthodontic Treatment: A Review". *Comm Dent Oral Epidemiol*, 8:36-45, 1980.

106. Silversin J., Coombs J. *Institutions and Oral Health Behavior*, Unpublished paper presented at the National Research Conference on Oral Health Behavior, Warrenton, 1980.

107. Stamm, J.W., Waller, M., Lewis, D.W., Stoddart, G.L. "Dental Care Programs in Canada: Historical Development, Current Status and Future Directions". *A Report Prepared for the Minister of National Health and Welfare*, mimeo, Montreal, march 1984.

108. Statistics Canada, *Canada Health Survey Exclusions*, Working Paper Series No. 76-1, Ottawa, 1976.

109. Statistics Canada, *The Labour Force*, Catalogue 71-001, November, 1978.

110. Statistics Canada, *Vital Statistics, Vol. II, Marriages and Divorces*, Catalogue 84-205, Ottawa, 1979.

111. Stephens T. "Health Practices and Health Status: Evidence from the Canada Health Survey", NCHS, Hyattsville, Maryland, mimeo, 1985.

112. Suchman, E.A., Rothman, A.A. "The Utilization of Dental Services". *Millbank Memorial Fund Quarterly*, 49:56-63, 1969.

113. Teh-Wei-Hu "The Demand for Dental Care, by Income and Insurance Status" in *Advances in Health Economics and Health Services Research*, (2):143-195, Greenwich, JAI Press, 1981.

114. Upton, C., Silverman, W. "The Demand for Dental Services". *Journal of Human Resources*, (7):250-261, 1972.

115. U.S., Department of Health Education and Welfare. *Factors Which Affect the Utilization of Dental Services: A Review of the Literature*, Hyattsville, Maryland, May 1978.

116. U.S., Department of Health Education and Welfare, Public Health Service. *An Experiment in Dental Prepayment: The Naismith Dental Plan*, PHS Publication, No. 970, U.S., Government Printing Office, 1963.

117. U.S., Department of Health Education and Welfare. *Volume of Dental Visits*, Reports from the National Health Surveys, National Center for Health Statistics, Series 10, 1965, and 1970 to 1981.

118. U.S., Department of Health and Human Services. *Dental Visits, Volume and Interval Since Last Visit: United States, 1978 and 1979*, National Centre for Health Statistics, Series 10, No. 138, Hyattsville, 1982.

119. Wan, T.T.H., Yates, S.A. "Prediction of Dental Services Utilization: A Multivariate Approach". *Inquiry*, Vol. 12, No.2, June 1975.

120. Wilson, R.W., White, E.L. "Changes in Morbidity, Disability, and Utilization Differentials Between the Poor and the Nonpoor". *Medical Care*, 15:636-646, August 1977.

121. Younger, M.S., *A Handbook For Linear Regression*, Duxburry Press, Wadsworth Inc., Belmont, 1979.

122. "Saving Children's Teeth Still a Basic Goal". *Toronto Star*, May 26, 1975.