

PERFORMANCE
OF THE
SASKATCHEWAN HEALTH
DENTAL PLAN

1974 - 1980

* * * * *

D. W. Lewis
February 1981

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SUMMARY
* * * * *

This review of the performance of the Saskatchewan Health Dental Plan (S.H.D.P.) after its first six years is based on the analysis of data from the Plan's annual administrative computer reports and other sources, such as the Annual Reports. The methodology employed is the indirect assessment of aggregate, historical data for which no ideal control group data are available. The analysis examines various aspects of the Plan systematically using a framework that emphasizes the link-ages among enrollment (utilization), services (care process) and various program outcomes (treatment and oral health achievements, public satisfaction, costs). The organizational structure and staffing of the Plan were not directly assessed. Nor were there any direct observations of the operation of the plan and the work performed.

The primary general objective of the S.H.D.P. is to improve dental health in Saskatchewan by making preventive and operative dental services readily accessible so as to encourage high utilization by eligible children. Since it began, the Plan has added greater numbers of children on an incremental basis according to their year of birth (age). For example, in the 1974-75 initial program year, 14,347 six-year old children were eligible and in the sixth 1978-79 year of operation, 142,182 children between ages four to thirteen years were eligible. During this period most of the dental care was provided by dental nurse-assistant teams working in school clinics. Some care was also provided by the Plan's supervising dentists and by dentists in private practice who treat eligible children on a referral basis. Administratively, six geographic dental regions in Saskatchewan have been identified, with the central administrative staff being located in Regina.

Some of the general findings of the assessment are summarized below. For further details and explanations the main report must be consulted. The overall enrollment in the Plan by eligible children has been high, averaging 83% after the initial, start-up year. Importantly, the proportion of those enrolled each year who have received complete care,

as defined by the Plan, is also high, averaging 76% to 90% after 1974-75.

Utilization by children in Saskatchewan is about 20% higher than it is in the three other universal provincial children's denticare programs (Newfoundland, Nova Scotia and Quebec) which use the fee-for-service private practice delivery model, and is equivalent to the utilization in the Prince Edward Island program which, like Saskatchewan, used in this period salaried dental personnel in (school) clinics. The extent of care completions is similar in P.E.I. and Saskatchewan but is unknown for the other three provincial programs.

By combining the enrollment and completed care data it was determined that a very high proportion of all Saskatchewan children were receiving complete dental care, for example, 73% in 1979-80. When those children partially treated under the S.H.D.P. and partially or completely treated in private offices outside the Plan are added, the level of dental care utilization by children in Saskatchewan (which, speculatively, might reach 90%) is probably higher than in any other large geographic area in North America.

Some differences among the S.H.D.P. regions in the amount and type (prevention vs. other treatments) of care received per child in any given program year and between program years were found. Such differences, on the surface, are not surprising since regional differences in oral health status also were found. However, further statistical analysis of regional treatment differences, which took into account the known differences in decay attack, revealed that in some regions treatment differences were explained by the decay differences, but in other regions they were not. In other words, factors other than decay seem partly to determine the type of treatment rendered. Similar findings elsewhere suggest that personal preferences of (dental) providers and/or patients and other factors partially determine the type and amount of health care received. This may then also be true in Saskatchewan.

Between 1974-75 and 1979-80, the number of dental services to enrolled children that were referred to private dental practitioners in Saskatchewan grew by a factor of 15.9 times, whereas the number enrolled and the number of services grew less, by factors of 9.3 times and 7.3

times, respectively. The relatively greater growth of referrals with time was of the type expected as older children with more complex problems became enrolled in greater numbers. Interestingly, the total gross costs of these referrals (which are reimbursed on a fee-for-service basis) rose by nearly 22 times over the six program years. However, when these costs are adjusted downwards for inflation, the adjusted referral cost increase of about 10.8 times nearly approximates the growth in enrollees over the same period.

The characteristics of the clinical dental services provided each year under the Plan are too detailed to be summarized adequately here. Some of the highlights in a very aggregate form, follow:

i) examinations represent 8% to 14% of all services and their average use is increasing regularly each year;

ii) there has been a dramatic drop in the average number of x-ray films per enrollee provided each year, from 2.41 films per child in 1974-75 to 0.57 films per child in 1979-80;

iii) about one-quarter of all services rendered each year are preventive in nature, with nearly every patient receiving prophylaxis, topical fluoride application and personal oral hygiene instruction, and about one-quarter receiving individual dietary counseling;

iv) the average number of fillings per enrollee has dropped by about one-half over the six years due mainly to average decreases in restorations to primary teeth and not to permanent teeth;

v) the average number of pulp treatments and extractions per enrollee has declined each year and it is especially important to note that about one-third of the extractions were for orthodontic purposes (1979-80).

Concerning the decline in x-ray utilization as the result of a policy decision after 1974-75 to provide radiographs on the basis of need rather than on a more-or-less routine basis, it was important to determine whether more severe dental treatments due to deep decay (such as pulp treatments and extractions) were consequently required.

Although no suitable control group for comparisons was available, the seemingly low and decreasing amounts of these two services being provided (needed), as well as comparisons with two other provincial children's denticare plans that provide more x-rays, were suggestive that there were no deleterious effects on the Saskatchewan children's oral health status due to the implementation of this policy.

When decay occurred the treatment levels experienced by enrollees were found to improve with increasing (longer) exposure to the Plan, and to be approximately twice as high as those of newly eligible children the same age who had previously been treated in Saskatchewan but outside the Plan.

Based on a special retreatment study in two of the dental regions, it was estimated that restorative treatment failures in primary molar teeth were low but close to those found in a 1976 direct, clinical assessment of the quality of the care provided by dental nurses. Restorative failures were found to vary according to the type of molar being treated and the type of filling being done.

The effect of the rather intensive preventive services on decay was assessed. Although without a proper control group it is difficult to draw firm conclusions, lower decay attack in permanent teeth with longer exposure to the S.H.D.P. is suggested. The actual amount of decay reductions was, however, small -- about 0.1 to 0.2 DMF teeth per year. The data did not permit any conclusions to be drawn about the effects on primary teeth.

An important outcome of the S.H.D.P. is the extent to which the parents of enrolled children are satisfied with it. The findings from a sample survey of 600 parents/guardians in 1978-79 indicated that, despite some minor concerns, there was overwhelming support for the Plan, its organization and the dental nurse services. Parents were very much satisfied.

The report next examines the costs of the S.H.D.P. The most striking finding is that, despite the large increase by a factor of nearly 3.9 times in grand total costs (from \$2.14 to \$8.31 million, unadjusted for inflation) between 1974-75 and 1979-80, the costs per enrolled child have dropped dramatically (from \$163.05 to \$68.00). Importantly, these economies of scale in per capita costs were not accomplished at the expense of lower quality as the service utilization and care completion

data amply demonstrates.

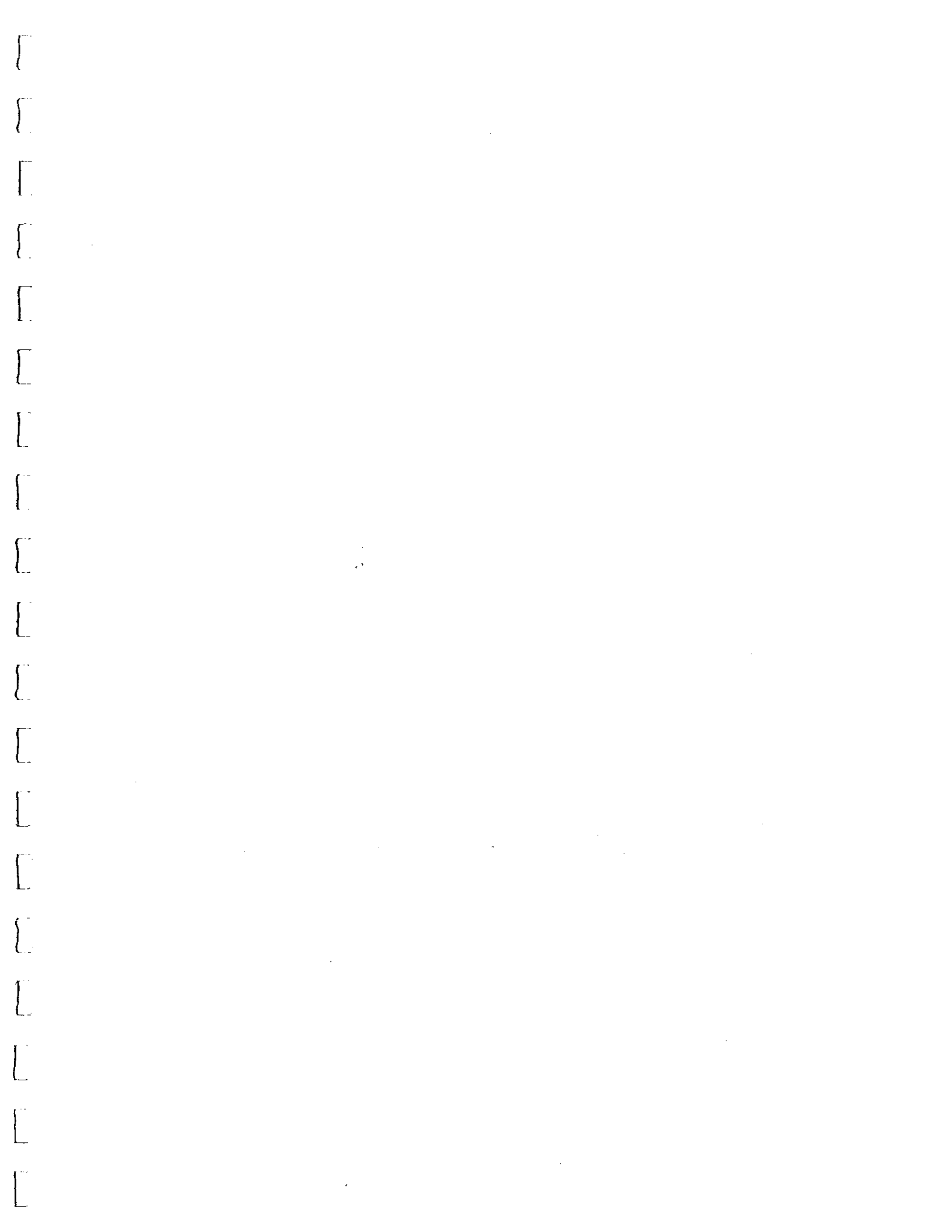
The costs per enrolled child were compared to those of Canada's four other universal children's denticare plans operating over the same time period. It was concluded that the S.H.D.P. appears now to be performing with better, or at least equal effectiveness at lower, or at least equal cost.

The report ends with some general recommendations under six categories: specific program objectives; administrative computer reports; oral health surveys; social, attitudinal surveys, further clinical studies; future evaluations.

Although the ultimate test of the S.H.D.P. will be how it influences the oral health status of the people of Saskatchewan in the long run, the performance to date gives early indications of the likely achievement of this long term goal.

PERFORMANCE OF THE SASKATCHEWAN HEALTH DENTAL PLAN 1974-1980

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PERFORMANCE OF THE SASKATCHEWAN HEALTH DENTAL PLAN 1974-1980

This review of the Saskatchewan Health Dental Plan (S.H.D.P.) is based on an analysis of historical data (computer) records produced annually by the Plan as well as other sources, the Annual Reports for example. Indirect program evaluations using records have limitations and strengths as do direct, on-site evaluations of a program's organization and structure, and the process of care provided. Previously, in 1976, a direct evaluation of the quality of specific dental services provided under S.H.D.P. was performed by Ambrose, Hord and Simpson.¹

Detailed descriptions of the background, organization, administration, staffing and other aspects of the S.H.D.P. are available in each year's Annual Report and will not be repeated here. It is, however, customary to provide a statement of general program objectives at the outset and this custom will not be ignored. The primary objective is "... to improve the dental health of the people in the Province of Saskatchewan ... by providing a program for the prevention and treatment of dental disease among children from ages three to fourteen inclusive".² The statement goes on to say that this is to be achieved by encouraging high utilization of services by making them as accessible as reasonably possible and by making the best use of the various types of dental manpower. The promotion of an increased level of public awareness of the need for dental health preventive measures at the individual and community levels, including the promotion of fluoridated public water supplies, is also a stated goal.

Nine different sets of computer output covering the first five program years, 1974-75 to 1978-79, were obtained and utilized in this analysis.³ As described later, these data cover various facets of the S.H.D.P. -- enrollment, dental health, services, visits, referrals, operator service profiles, and service and oral health data by school division. S.H.D.P. Annual Reports (1974-75 to 1979-80) were also utilized.

¹Ambrose, E.R., Hord, A.B. and Simpson, W.J. A Quality Evaluation of Specific Dental Services Provided by the Saskatchewan Dental Plan. Final Report. 1976, 19 pp.

²Source: A Review of the Saskatchewan Dental Plan System. Prepared by J.C. MacLeod. January, 1976. Revised November 1976. (Mimeo) 25+ pp.

³For the record, the identification codes of these data are: PH 8074; PH 8076; PH 8077; PH 8078; PH 8079; PH 8080; PH 8085; ALPHA; and a special study of retreatment in two regions.

CONCEPTUAL FRAMEWORK OF THE EVALUATION

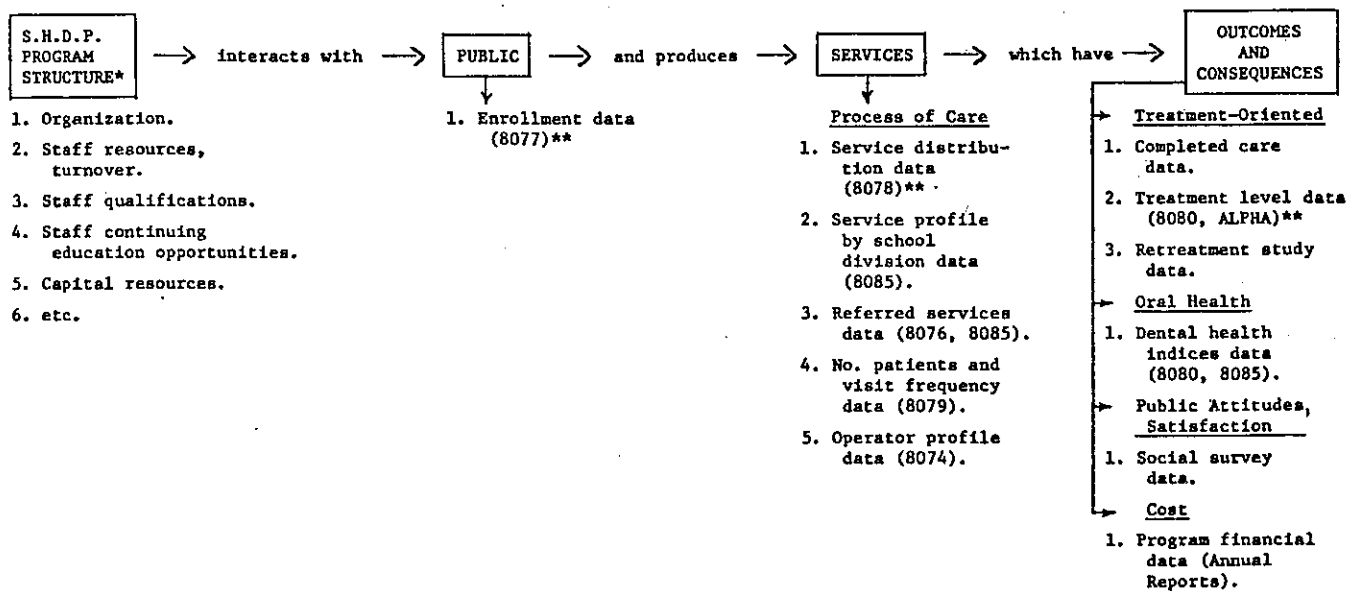
⁴The use of aggregate computer data in an indirect assessment of the process of dental care is close to, if not, a contradiction of terms. The use of patient records and on-site observations would be a more traditional and acceptable way to assess care process (e.g. the appropriateness of individual diagnoses and treatments against some standard).

The analysis was designed against a crude systems-approach representation of how the S.H.D.P. operates. This is portrayed in Figure 1 which suggests that the S.H.D.P. program structure (organization, resources, etc.) interfaces with a certain segment of the public (those with eligible children, in particular) to provide services to those eligible who enroll. Furthermore, these services have certain outcomes and consequences measurable in terms of the levels of treatment provided and oral health achieved, and of the costs generated by the S.H.D.P. There are some qualifications relative to this idealized, conceptual model and the evaluation of the S.H.D.P. which should be mentioned at the outset. There are no entirely suitable control group children to compare with the experience of Saskatchewan children treated under the S.H.D.P. This means that somewhat convoluted comparisons within the one set of data are sometimes necessary. Furthermore, the present evaluation will not include a detailed assessment of the structural and organizational aspects of the S.H.D.P. As Figure 1 indicates, certain service features resulting from the care process activities will be reviewed.⁴ However, the actual process or "activity" aspects of the dental care provision under the S.H.D.P. will not be reviewed. These latter factors can best be assessed by direct, on-site evaluation procedures rather than by the method of indirect record review of aggregated data employed here.

Despite these problems and limitations all is not lost. Hints of classical evaluative criteria (appropriateness, adequacy, accessibility, effectiveness, efficiency, etc.) are used throughout the analysis even though the fancy names may not be explicitly mentioned. And, hopefully, some worthy conclusions are presented.

The analysis attempts to follow the steps outlined in the model of Figure 1. "Enrollment" under the guise of utilization leads off, to be followed by a discussion of the various aspects of "services" and, finally, "outcomes".

FIGURE 1
MODEL OF EVALUATION
OF THE
SASKATCHEWAN HEALTH DENTAL PLAN 1974-1980



*S.H.D.P. program structural components are not being evaluated in the present analysis.

**Bracketed numbers refer to the S.H.D.P. computer code for the appropriate data. Because of the volume of data available, only parts of it are utilized in many instances. Annual Report data are also used.

UTILIZATION OF THE SASKATCHEWAN HEALTH DENTAL PLAN

Prior to the S.H.D.P., poor dental health and low use of dental services by Saskatchewan children had been observed and this was largely attributed to the geographic and/or economic inaccessibility to regular dental care for many families. Therefore, the S.H.D.P. has as a stated primary objective high utilization of its preventive and treatment services. The first step in achieving this goal of social equity in the distribution of services is that eligible children enroll in the program. However, only when enrolled children use the services, and as a further aspect of this use, have all or nearly all indicated dental care completed are the potential benefits of the Plan realized. In this section three facets of enrollment in the S.H.D.P. and dental care completions will be discussed. As well, the Saskatchewan experience will be compared briefly with that of other programs. More detailed service and visit aspects of utilization will be considered in a later Section.

Enrollment -- Consents, Refusals and Non-response

The enrollment procedure consists of mailed descriptive materials and invitations to the parents/guardians of children born in designated years to have their eligible children participate in the S.H.D.P. As well, dental teams check class lists and contact enrolled children's parents informing them when they will be in their child's school. Cohorts of children according to birth year have been phased in to the Plan over the years, beginning in 1974-75 with those born in 1968 and extending to those born between 1966 and 1975, inclusive, in the 1979-80 program year. The parents/guardians of eligible children can refuse to participate or consent to have their child partially or fully treated under the Plan. Parents/guardians may also choose not to respond to the invitation or, of course, there may be reasons other than choice for non-response. These three types of response/non-response are given for each eligible birth year group in each program year in Tables 1 to 6. The data in Tables 1, 2 and 3 refer to all eligible Saskatchewan children except those under the Department of Northern Saskatchewan and Registered Indians. The statistics for this latter group of children are found in Tables 4, 5 and 6. All these data refer only to the province since regional comparisons of the three aspects of enrollment are not possible under the present reporting system.

Table 1 indicates that after the initial year's 75% enrollment has settled at a constant 82%-83% overall in each program year. ⁵ Enrollment ⁵As stated in the footnote to this Table the overall program year totals

for each birth year group is lowest in the initial year of eligibility then rises in the second year to a level which generally remains. Examination across each program year makes it clear that those groups newly becoming eligible have lower enrollment than the others previously enrolled. Those born in 1966 and 1967 who were already about 12 and 9 years old, respectively, when first eligible have the lowest enrollment of all, from 72% to 79%. The average enrollment of those born in 1968, the longest participants in the S.H.D.P., is 85% per year. Average enrollment by birth year is 84% between 1969 and 1972, and 83% in 1973 and 1974.

As seen in Table 2, refusals to enroll were received from about six to ten percent of those eligible, overall, after the very low (1.2%) refusal rate in the first program year. The higher tendency for refusal (8.6% to 15.4%) by the parents/guardians of children born in 1966 and 1967 is noticeable but not surprising since some of these older children may already have been regularly attending private dental practitioners. (As well, there was some confusion and concern by parents of the 1966 birth year group that their children would only be treated for one or two years under the Plan.) This of course will be true of each age group and, although the extent of this unsubsidized attendance at private dentists is unknown, any additional use of dental services to that implied by Table 1 -- and this matter will be addressed shortly -- means a very, very high use of dental services by Saskatchewan children.

Refusal to participate for birth years 1971 and earlier generally rises after the initial year or two of eligibility (Table 2). This increase is not large (about 2% to 4%) but its appearance is of interest. Upon examination of Table 3 which gives the percent not responding to the invitation, and in consideration of the stability of enrollment after 1974-75 indicated earlier, it appears that the slight rise in refusals over time may be due to a shift from non-response to refusal. Whatever the explanation, it is clear that the non-response rate overall and with each birth year cohort is improving, from 23.7% to 10.8% in the first two program years to 7.1% in 1979-80 when, incidentally, about just over eight times as many children (142,182) were eligible.

The enrollment picture for Registered Indian children as seen in Tables 4, 5 and 6 is characterized by very high non-response and very low refusals of enrollment. The net result of this is only moderate

PERCENT OF ELIGIBLE CHILDREN* ENROLLED IN SASKATCHEWAN HEALTH DENTAL PLAN BY BIRTH YEAR BY PROGRAM YEAR 1974-75 TO 1979-80

TABLE 1

Program Year	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	Total**
1974-75			76.1	80.7	80.4	81.0					75.1
1975-76		75.3	85.2	80.7	80.4	86.0	81.0				82.7
1976-77		75.3	89.0	85.4	86.0	81.0	81.0				83.4
1977-78		77.2	86.0	83.9	84.2	83.1	82.6	78.8***			82.3
1978-79	71.7	79.3	86.8	85.0	85.9	85.2	85.2	84.4	81.1	80.7	82.7
1979-80	71.9	79.0	86.7	84.8	85.9	85.5	85.8	86.0	84.5		83.0

PERCENT OF ELIGIBLE CHILDREN* REFUSING ENROLLMENT IN SASKATCHEWAN HEALTH DENTAL PLAN BY BIRTH YEAR BY PROGRAM YEAR 1974-75 TO 1979-80

TABLE 2

Program Year	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	Total**
1974-75			1.4	5.3	7.5	7.2					1.2
1975-76			4.6	7.0	7.2	7.2					6.5
1976-77		8.6	8.6	4.6	7.0	6.3	7.2				6.7
1977-78		12.4	8.6	10.2	10.1	10.5	9.8	8.4***			10.0
1978-79	13.4	12.5	8.2	9.8	8.9	9.4	9.0	8.3	7.7		9.7
1979-80	15.4	13.4	8.8	10.2	9.2	9.6	9.0	8.1	7.9	6.5	9.9

PERCENT OF ELIGIBLE CHILDREN* NOT RESPONDING TO INVITATION TO ENROLLMENT IN SASKATCHEWAN HEALTH DENTAL PLAN BY BIRTH YEAR BY PROGRAM YEAR 1974-75 TO 1979-80

TABLE 3

Program Year	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	Total**
1974-75			22.5	9.5	11.8	12.4					23.7
1975-76			9.5	11.8	12.4	11.9					10.8
1976-77		16.1	6.3	7.7	7.7	11.9					9.9
1977-78		10.4	5.4	5.9	5.7	6.4	7.6	12.8***			7.7
1978-79	14.9	8.2	5.0	5.2	5.2	5.4	5.8	7.3	11.2		7.6
1979-80	12.7	7.6	4.5	5.0	4.9	4.9	5.2	5.9	7.6	12.8	7.1

*Excluding Registered Indian children.
 **Total for program year includes Oxbow Demonstration Project Children some of whom are different ages from the other children covered in each program year.
 ***These preschoolers were not eligible prior to February 1, 1978.

TABLE 4

PERCENT OF ELIGIBLE REGISTERED INDIAN CHILDREN ENROLLED IN SASKATCHEWAN HEALTH DENTAL PLAN BY BIRTH YEAR BY PROGRAM YEAR 1974-75 TO 1979-80

Program Year	BIRTH YEAR										Program Year Total**	
	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975		
1974-75			5.7									5.7
1975-76			14.2	13.6	12.5							9.7
1976-77		19.1	24.4	25.0	25.5	21.5						19.5
1977-78		28.4	34.0	34.8	36.1	32.7	23.6	14.9*				29.8
1978-79	25.4	38.6	42.1	43.4	44.5	45.2	39.1	33.6	26.0			37.6
1979-80	32.1	42.3	48.2	48.9	48.8	50.0	47.1	42.9	35.4	20.9		41.7

TABLE 5

PERCENT OF ELIGIBLE REGISTERED INDIAN CHILDREN REFUSING ENROLLMENT SASKATCHEWAN HEALTH DENTAL PLAN BY BIRTH YEAR BY PROGRAM YEAR 1974-75 TO 1979-80

Program Year	BIRTH YEAR										Program Year Total**	
	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975		
1974-75			0.0									0.0
1975-76			1.6	1.9	2.6							1.4
1976-77		0.9	1.7	1.6	2.4	1.2						1.4
1977-78		2.7	3.0	3.5	4.3	3.3	1.9	2.5*				3.0
1978-79	1.7	2.7	3.3	2.5	4.7	2.9	1.6	2.1	1.8			2.5
1979-80	3.0	3.0	3.3	2.4	4.5	3.1	2.1	2.5	1.2	1.4		2.7

TABLE 6

PERCENT OF ELIGIBLE REGISTERED INDIAN CHILDREN NOT RESPONDING TO INVITATION TO ENROLLMENT IN SASKATCHEWAN HEALTH DENTAL PLAN BY BIRTH YEAR BY PROGRAM YEAR 1974-75 TO 1979-80

Program Year	BIRTH YEAR										Program Year Total**	
	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975		
1974-75			94.3									94.3
1975-76			84.2	84.5	84.9							88.9
1976-77		80.0	73.9	73.4	72.1	77.3						77.8
1977-78		68.9	63.0	61.7	59.6	64.0	74.5	82.6*				67.2
1978-79	72.9	58.7	54.6	54.1	50.8	51.9	59.3	64.3	73.2			59.9
1979-80	64.9	54.7	48.5	48.7	46.7	46.9	50.8	54.6	63.4	77.7		55.6

*These preschoolers were not eligible prior to February 1, 1978.

**Total for program year includes Oxbow Demonstration Project Children some of whom are different ages from the other children covered in each program year.

levels of enrollment beginning in 1977-78 and low enrollment prior to that date. However with time, the non-response rate is regularly dropping (from 94.3% in 1974-75 to 55.6% in 1979-80) and the enrollment rate is regularly increasing (from 5.7% in 1974-75 to 41.7% in 1979-80). See Tables 6 and 4. There are some particular difficulties in enrolling these children and, as demonstrated later, once they are enrolled, in treating them.

Restricted Consents

Parents/guardians may enroll their children for full treatment or for partial treatment. Restricted consent involves the following procedures: no x-rays; no treatment (e.g. preventive services only); no fluoride applications; and combinations of these procedures. Restricted consents for all children in the S.H.D.P. between program years 1974 and 1979 are given for each birth year in Table 7. The main finding is that the percent of total consents that are restricted is small,

Although these percents are all low it is of interest to note that the total percent and the percent each birth year have increased from one program year to the next later one, and to speculate whether this trend will continue.

TABLE 7

PERCENT ENROLLED WITH RESTRICTED CONSENTS

Program Year	Birth Year									
	1966	1967	1968	1969	1970	1971	1972	1973	1974	Total*
1974-75	0.40									0.40
1975-76		0.60	0.48	0.60						0.46
1976-77		0.54	0.77	0.76	0.85	0.96				0.88
1977-78		1.29	1.07	1.12	1.22	1.28	1.33	1.26		1.06
1978-79	1.21	1.57	1.31	1.42	1.50	1.59	1.57	1.61	0.93	1.34

*Total for program year includes additional birth years to those tabled.

⁶After 1974-75 the main restriction (61% to 80% of all restrictions) was the combination 'no x-rays and no treatment', i.e. wanted prevention only. It must be re-emphasized, however, that there were really very few, about 1%, wishing any restrictions.

Since the distribution of restricted consents was available for each S.H.D.P. administrative region it was possible to compare the percent of restrictions by regions for each birth year. However, there was little variation among the regions except, in general, the requests for restricted consents were slightly higher in Regina and Saskatoon. But since the amount of restricted consents in all regions is very low, these two regions differed from the others very little, usually by less than one percent.

Extent of Treatment

Treatment by the S.H.D.P. and not enrollment in it is the essential evaluative criterion of the program's achievements. To what extent are enrolled children treated? Table 8 gives the percent of all enrolled children, including Registered Indian children, who have had their treatment needs completed as defined by the treatment plan each child initially receives. Save for 1974-75 when, apparently, relatively few children had their treatment completed,⁷ between 76% and 90% of enrolled children in each program year have had their needed dental work (treatment plans) finished under the S.H.D.P. The drop in completions to 85% in 1977-78 from 90% the previous year can be explained by the new eligibility of a group of preschoolers late in that program year; otherwise the completion rate would have exceeded 90% in 1977-78. The completions again approached 90% two years later in 1979-80. The relatively low 80% in 1978-79 may be due to the notably higher child-staff ratio that year (p. 72).

For each birth year-program year group with just two exceptions, the percent of completions since 1975-76 is 80% or more, with a high of 93%. The degree of completed care generally is lower in the initial treatment year of any newly eligible group than it is in their subsequent maintenance treatment years. (The generally lower experience of 1978-79 disturbs this pattern somewhat.)

Although the rate of completed care is one measure of successful outcome of the process of care rendered under the S.H.D.P., several qualifications should be mentioned. One is that other enrolled children not designated as having completed care according to the treatment plan developed for them do receive treatment under the plan. Thus, the total

⁷ This relatively much lower rate of completions in the 1974-75 start-up year is partly explained by the fact that all the equipment, e.g. x-ray units, was not available until nearly half way through the school year.

PERCENT OF ENROLLED CHILDREN RECORDED AS COMPLETING CARE*
BY BIRTH YEAR BY PROGRAM YEAR

TABLE 8

Program Year	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	Total**
1974-75	11.3		11.3								
1975-76	77.6	77.7	71.8								
1976-77	89.8	91.4	93.1	91.5	85.3						
1977-78	92.0	89.5	91.8	89.6	90.0	86.4	51.8***				
1978-79	82.0	81.5	82.0	83.2	82.3	82.6	82.2	79.8	69.7		
1979-80	88.8	88.3	88.5	89.5	90.1	89.9	90.2	89.1	86.2	82.1	88.3

*These percents for 1974-79 were derived from the S.H.D.P. computer output PH 8078 by dividing the number classified as having treatment plans completed by the total number enrolled. Only children enrolled in the D.N.S. program are excluded.
**Total for program year includes Oxbow Demonstration Project children some of whom are different ages from the other children covered in each program year.
***These preschoolers were not eligible prior to February 1, 1978.

PERCENT OF ENROLLED REGISTERED INDIAN CHILDREN
RECEIVING SERVICES BY PROGRAM YEAR*

TABLE 9

Program Year	Number Enrolled**	Birth Year Range**	Number Receiving Services	Percent Receiving Services
1975-76	644	1962-1971	33	5.1
1976-77	1532	1967-1972	864	56.4
1977-78	2992	1966-1974	1396	46.7
1978-79	3559	1966-1975	2473	69.5

* These data include D.N.S. children and merely indicate receipt of at least one service (not complete care). The ALPHA program data used were incomplete for 1974-75
** These numbers and age ranges do not necessarily match such data from other tables.

amount of dental care children receive is higher than the treatment completions just described. This will be approached in later sections in terms of oral health and treatment levels of enrolled children and of dental visit frequencies. Secondly, the completion data include Registered Indian children. The participation of these children in the S.H.D.P. is lower; this arises partly because the dental clinics these children must attend are in non-segregated schools. Table 9 is indicative of the lower treatment achieved by Registered Indian children. The completion rate of these children is not known but it is clearly lower than the experience outlined previously in Table 8, which incorporates both Indian and non-Indian children. A third, and final comment about dental care completions is that it is not known what an acceptable level of dental care completion is. All would agree that it should be high (70%? 80%? 90%?) but that 100% is unrealistic due to many factors not able to be controlled by the dental care delivery side, including patient mobility. There simply is no standard. In such circumstances comparisons with other provincial dental care programs about the extent of completed care and utilization are elucidating.

Utilization in Other Provincial Children's Denticare Programs

In addition to S.H.D.P., universal children's denticare now operates in six provinces as follows (with the starting date of each program in brackets): Newfoundland (1950); Prince Edward Island (1971); Nova Scotia (1974); Quebec (1974); Manitoba (1976)⁸; and British Columbia (1981). Data from the first four, older programs are available. Three of these programs (Newfoundland, Nova Scotia, Quebec) are based on the private practice, fee-for-service model. The Prince Edward Island program currently utilizes a mix of private practice and direct service school clinics for providing care, although from 1971 to 1977 the salaried, clinic staff including dental auxiliaries provided nearly all of the care.

Unfortunately, the use of each program is recorded differently and estimates of dental care completions are available only for Prince Edward Island. The available data are found in Table 10, along with that

⁸At this date most but not all districts of Manitoba are covered by their children's plan so, strictly speaking, this plan should not be described as "universal".

TABLE 10

PERCENT UTILIZATION IN FIVE PROVINCIAL CHILDREN'S DENTICARE PLANS*

Province	Year	Eligible Age Group	Utilization Criterion	Utilization		Percent Patients Completing Care
				Percent	Age Group	
Newfoundland	1973-74	0-10	treated/eligible	42	4-10	?
	1974-75	0-10		43	4-10	
	1975-76	0-10		45	4-10	
	1976-77	0-10		54	4-10	
	1977-78	0-12		?	4-10	
	1978-79	0-12		59	4-12	
Nova Scotia	1975-76	0-10**	beneficiaries/insured	45.0	3-10	?
	1976-77	0-11		49.3	3-11	
	1977-78	0-12		50.9	3-12	
	1978-79	0-13		55.7	3-13	
Quebec	1974	0-7***	treated/eligible	17.2	0-7	?
	1975	0-8		43.6	5-7	
	1976	0-9		57.4	5-8	
	1977	0-11		64.8	5-9	
	1978	0-13		62.0	5-9	
Prince Edward Island	1974	4-8	participants/eligible	75.5	4-8	?
	1975	4-9		80.4	4-9	90 (est.)
	1976	3-10		79.1	3-10	?
	1977	3-11		81.9	3-11	?
	1978-79	3-13		80.3	3-13	98 (est.)
Saskatchewan	1974-75	6	enrolled/eligible	75.1	6	11.3
	1975-76	5-7		82.7	5-7	76.0
	1976-77	5-9		83.4	5-9	90.2
	1977-78	4-10		82.3	4-10	84.9
	1978-79	4-11		82.7	4-11	80.4
	1979-80	4-13		83.0	4-13	88.3

*Principal source: papers prepared by D.M. Lewis and J.W. Stamm for delivery to the American Public Health Association, November 7, 1989, New York, N.Y.
 **The percent of utilization for these age groups of Nova Scotia children from 1975-76 to 1978-79 is 31.0%, 35.6%, 38.7% and 43.4%, respectively.
 ***The percent of utilization for these age groups of Quebec children from 1974 to 1978 is 17.2%, 25.9%, 36.9%, 43.4% and 42.5%, respectively.

of Saskatchewan to facilitate comparisons. In the four 'other' provinces the utilization criterion is essentially the same -- a measure of those eligible who receive some service. Except in the case of Prince Edward Island where it appears that a very high percent (90%-98%) of those seeking care have all their needed dental work as defined by the program completed, the extent of care completions in the other three provinces is uncertain. In the very unlikely event that all of the children seeking any care in these three provinces have received complete dental care, the percent completions would equal the percent utilization. Even so, the highest percent utilization (completion??) in any program year would be 59% in Newfoundland, 56% in Nova Scotia and 65% in Quebec.⁹ The other direct service, clinic program of Prince Edward Island has utilization and completion rates similar to Saskatchewan's. Utilization in the Saskatchewan and Prince Edward Island plans is approximately 20% higher than the best performance of the three private practice provincial plans. However, it should be pointed out that the utilization of these plans is improving although the lack of information about the extent of completed care is still worrisome.

⁹The highest percent for Nova Scotia and Quebec would be lower, ~43%, if all those eligible were considered (see footnotes to Table 10).

SERVICES OF THE SASKATCHEWAN HEALTH DENTAL PLAN

The Process and Objectives of Dental Care

Parents arranging to use the S.H.D.P. seek, or should be seeking,

to maintain or achieve good oral health for their children, not dental services. Their implicit, ultimate goal is oral health; the diagnostic, preventive and restorative/surgical services rendered are the explicit

means, along with personal home care, for reaching this goal. The pro-

cess of dental care includes all the interrelated factors involved in

providing care, including diagnostic and treatment decisions, patient

handling, and all other activities concerned with the treatment. Thus,

the process of care is very broad in scope. This historical review of

the S.H.D.P. records is concerned only with a small part of the end of

the care process, dental services. More specifically, differences in

the amount and types of services, and in patient referrals and visits

in different regions over time are reviewed. The available "service"

data to be reviewed, in order, are about: patient and visit frequency

(PH 8079); school division service profiles (PH 8085); operator service

profiles (PH 8074); referred patients and services (PH 8076); and dental

service distributions (PH 8078).

Regional Patient Visit Frequency

Using the visit distribution data (PH 8079), the percent of total

patients with no visits and the mean number of visits per user (i.e.,

excluding those with 0 visits) were determined for each S.H.D.P. region

for those born in 1968, and for each of the 4, 6 and 8 year-old age cohorts.

The point of interest was variation among regions and ages, both within

and between program years. The age cohorts were selected to permit ex-

amination of visit differences between the initial care years and vari-

ous maintenance care years.

The percent of those born in the eligible year not having any visits

for all comparisons presented few remarkable findings. The percent with

no visits at each age (birth year) varied little among regions (1 to 6);

region 4 (Yorkton) usually had the lowest percent of children with no

visits recorded and regions 2 or 5 (Regina or Prince Albert) usually had

the highest percent with no visits. Of the age groups examined, the

¹⁰It should be pointed out that critics of the medical care system argue that cause-and-effect linkages between services and better "health" are not so clear cut as some imagine. No doubt similar criticisms apply to the dental care system as well.

percent with no visits ranged from between about 9% to 12%, with one major exception. This was the 36.7% experience of the four-year old group born in 1973 who didn't become eligible for care until late (February 1/78) in the 1977-78 program year.

The mean visits per user in each region are listed for the previously-mentioned age groups in Table 11. The means for region 9 (permanent referrals) are also given although these are not analyzed in the text below. It is worth noting, however, that the mean visits per user for region 9 children are lower, and often much lower, than the means for the other S.H.D.P. regions and the province as a whole.

The 1968 birth year group who were the first group to enroll in the S.H.D.P. in 1974-75 is examined at ages 6 through 10 in Table 11. The first striking thing to note is the low mean visits per user of the six-year olds. No doubt this was a start-up phenomenon. There is no particular inter-regional pattern to the means within each age or between ages. By summing the means for each region and the province, a crude approximation of the average total number of visits for Plan participants over the five program years is derived. The overall provincial mean number of visits determined in this way is 17.7 visits per user-child; Saskatoon had the highest mean (19.9) and Regina the lowest (16.6).

The six-year olds are examined next. Note that these children are broken down into five groups with the first two having been under initial care in the S.H.D.P. at age 6, and the next three under their first maintenance care year at age 6, having first enrolled at age 5. Across each age and dental care group it is seen that the mean visits per user in Swift Current are nearly always lowest but that the highest means are shared by three other regions. The most interesting finding is that the one group undergoing initial care at age 6 (ignoring the starting year lower values) had, as expected, higher mean visits per user than the other age six groups in their first maintenance year of care. It might be anticipated that more appointments (and work) are needed initially at a given age than when the initial work is done in a previous year. The difference in the initial care mean number of visits per user and the maintenance care means was 1.13 to 1.35 visits in the province overall and similar to this in four of the six regions.

TABLE 11

MEAN VISITS PER USER BY AGE AND STATE OF S.H.D.P. ELIGIBILITY FOR DENTAL REGIONS

Birth Year	Age and State of S.H.D.P. Eligibility	Region								
		Swift Current	Regina	Saskatoon	Yorkton	Prince Albert	North Battleford	9	Province	
1968	6-Initial Care Year	1.46	1.82	1.97	2.06	1.83	1.75	1.58	1.86	
"	7-1st. Maintenance Year	3.77	3.81	3.88	3.54	3.67	4.09	2.48	3.79	
"	8-2nd. " "	3.61	4.00	4.51	4.01	3.78	3.49	2.23	3.94	
"	9-3rd " "	4.01	3.49	5.09	4.09	4.37	4.40	2.68	4.26	
"	10-4th " "	4.46	3.45	4.40	4.14	3.37	3.66	2.66	3.87	
1968	6-Initial Care Year	1.46	1.82	1.97	2.06	1.83	1.75	1.58	1.86	
1969	" " "	4.03	4.86	5.42	5.42	4.87	5.70	3.04	5.12	
1970	6-1st. Maintenance Year	3.35	3.73	4.09	4.03	3.63	3.47	2.29	3.77	
1971	6- " " "	3.52	3.56	4.30	4.22	4.12	3.99	3.09	3.99	
1972	6- " " "	3.56	3.46	4.16	4.07	3.67	4.39	2.97	3.88	
1968	8-2nd. Maintenance Year	3.61	4.00	4.51	4.01	3.78	3.49	2.23	3.94	
1969	8- " " "	4.20	3.80	5.51	4.39	4.49	4.62	2.79	4.54	
1970	8-3rd. " " "	4.20	3.93	4.90	4.59	3.79	4.19	3.11	4.30	
1973	4-Initial Care Year	3.02	2.99	3.47	3.33	2.91	3.39	3.29	3.22	
1974	4- " " "	3.49	3.54	4.17	3.89	3.32	3.93	3.76	3.77	

The difference was much lower in Swift Current (0.47 to 0.68) and much higher in North Battleford (1.31 to 2.23).

The pattern of the mean visits for the eight-year olds and four-year olds was irregular except that the mean visits were highest in the Saskatoon region for both ages and lowest in the Yorkton region for age 4. There was little difference between the number of mean visits provided to 8 year-olds in their second and third maintenance dental care years.

School Division Dental Service Profiles

By combining appropriately the school division data of PH 8085, seven indicators of dental treatment services for each S.H.D.P. region were developed for the program years 1976-77 and 1978-79. These data are presented in Table 12. The first three service indicators refer to the amount of services (Relative Value Units or RVU) and visits per child, and the final four indicators refer to the percent mix of diagnostic, preventive and restorative services provided in each region. The indicators reflect a variety of considerations. Primarily they should represent regional differences in treatment needs of children (regional oral health needs do differ significantly, as will be shown later). The indicators may also represent regional policy and/or clinical operator differences. Certainly dental personnel elsewhere are known to differ in their emphasis towards prevention and in their ways of treating similar cases. Also, instances of over- and under-servicing have been reported in the international health literature. Although in organized, more highly structured programs with an overall central administration such as Saskatchewan's, treatment differences of these types should be smaller, the possible occurrence of such regional differences remains manifest.

The data of Table 12 will be examined firstly for regional differences within each program year, and secondly for changes between program years. This will be followed by a more detailed statistical analysis of service/visit differences among regions taking into account the fact that oral health care needs differ among regions.

Regarding the RVU's per child and visits per child in 1976-77, the means were lowest in the Prince Albert region and highest (or near highest) in the Saskatoon region. Swift Current had the second lowest means for both indicators and North Battleford was actually highest for the RVU mean but third highest re dental visits. The ratio of the two indicators, RVU's per visit, is a kind of crude efficiency measure if visit length is identical in the sense that it indicates the amount of work in RVU's performed per visit. The ratio was highest in North Battleford (2.33 RVU/visit) and lowest in Saskatoon (1.71). Prince Albert had the second highest ratio (2.15) and Swift Current the second lowest (2.04). All these findings for 1976-77 were very similar in terms of the regions just mentioned for 1978-79 except that in Prince Albert and North Battleford the ratios switched about with Prince Albert being slightly higher than North Battleford.

Differences among regions in the proportion of services classified as diagnostic, preventive or restorative can most easily be determined by examining the ratio of restorative to preventive services. In both 1976-77 and 1978-79, the Prince Albert (2.18, 1.31) and North Battleford (1.59, 1.09) regions had the highest amount of restorative services relative to preventive services. The lowest amounts of restorative relative to preventive services were provided in the Swift Current region in 1976-77 and in the Yorkton region in 1978-79 (0.81 and 0.73, respectively). In 1976-77 only in Swift Current did the relative amount of preventive services exceed the relative amount of restorative services; however, by 1978-79 in just two regions was this true and only in one of them, Prince Albert, was the difference marked (R/P ratio was 1.31).

Comparing the indices in 1976-77 with those in 1978-79 revealed mainly quantitative differences between the two program years as the qualitative rankings of the various indicators for the regions were generally very similar. Quantitatively though, many of the 1978-79 values of the seven indicators were lower than in 1976-77. This can easily be seen using the weighted means for all regions combined in Table 12. For example, in 1978-79 the RVU's per child were nearly 22% lower (10.53 vs. 8.24), the visits per child were very slightly lower (3%, 5.27 vs. 5.12) and the RVU's per visit were nearly 20% lower

¹¹1978-79 was selected because it was the latest year for which DM 8085 data were available. However, it has been shown previously that care completions were relatively low and it will be shown later that patients per dental nurse were relatively high in 1978-79.

TABLE 12

SELECTED INDICATORS OF DENTAL TREATMENT SERVICES
 BASED ON SCHOOL DIVISION DATA FOR S.H.D.P. REGIONS IN 1976-77 AND 1978-79

Program Year (eligibility)	Dental Treatment Services Indicator	Simple Means of School Division Dental Service Profiles*								Weighted Mean (all)*
		Swift Current	Regina	Saskatoon	Yorkton	Prince Albert	North Battleford			
1976-77 (ages 5-9)	RVU/child**	9.94	10.98	11.46	11.23	9.82	11.64			10.53
	No. Visits/child	4.88	5.17	6.71	5.31	4.56	5.00			5.27
	RVU/Visit	2.04	2.12	1.71	2.11	2.15	2.33			2.00
	% Diagnostic***	12.7	11.8	12.0	13.3	10.9	9.5			12.2
	% Preventive	48.2	43.7	39.7	41.1	28.0	34.9			38.9
	% Restorative	39.1	44.5	48.3	45.6	61.0	55.6			48.9
R/P Ratio***	0.81	1.02	1.22	1.11	2.18	1.59			1.26	
1978-79 (ages 4-12)	RVU/child**	8.40	7.58	9.09	8.72	7.84	9.17			8.24
	No. Visits/child	5.50	4.75	6.57	5.31	4.22	5.17			5.12
	RVU/Visit	1.53	1.60	1.38	1.64	1.86	1.77			1.61
	% Diagnostic***	19.4	16.5	15.4	17.4	13.5	16.3			16.6
	% Preventive	44.4	43.7	45.7	47.9	37.4	40.1			43.8
	% Restorative	36.2	39.8	38.9	34.8	49.1	43.6			39.5
R/P Ratio***	0.82	0.91	0.85	0.73	1.31	1.09			0.90	

*Computer output PH 8085; each weighted regional mean using the school division sample sizes was also calculated but just the total weighted mean is given here.

**RVU = Relative value units. These are units of productivity established to represent all different types of dental services on one scale. The S.H.D.P. uses a specially revised list of RVU values for each service which is not identical to that of the Canadian Dental Association and those used by provincial dental associations as the bases for their dental fee guides. Examples of RVU scores for common different types of S.H.D.P. services follow (the RVU is in brackets): Diagnostic services -- initial exam (.80); recall exam (.50); 2 bitewing x-rays (0.60); Preventive services -- prophylaxis (1.00); topical fluoride (.50); individual oral hygiene instruction (1.00); individual dietary instruction (1.00); Restorative/surgical services -- one-surface filling (.80 - 1.00); three-surface filling (1.8 - 1.9); stainless steel crown (2.0 - 2.5); one extraction (1.0 - 1.2); two extractions (1.2 - 1.4).

***These percents refer to the breakdown of diagnostic, preventive and restorative services and add to 100%.
 ****R/P is the % restorative over % preventive ratio.

(2.00 vs. 1.61). The main difference in the mix of service categories was that in 1978-79 there was a decrease in the proportion of total services classified as restorative and a concomitant increase in diagnostic and, especially, preventive services. For example, the ratio of restorative to preventive services decreased by 28.6%, from 1.26 in 1976-77 to 0.90 in 1978-79.

It should be noted that some of these overall differences between the program years probably reflect differences in the age groups covered and the greater number of children on maintenance type of care in 1978-79. Part of the difference, however, may also be due to shifts in program emphasis or other changes in the process of care within particular regions. It is of interest to note that the drop in the RVU value of the services provided to each child, on average, between 1976-77 and 1978-79 has not been paralleled by a drop in mean visits per child. This should have resulted in shorter visit times per child in 1978-79 and, thus, the possibility of an increased patient load per dental nurse team. The much higher relative emphasis on restorative services in the Prince Albert region is also of interest. While the ratio of restorative to preventive services in Prince Albert dropped dramatically between 1976-77 and 1978-79, those ratios each program year are very much higher than in all other regions.

Previously, regional differences among service indicators for each program year were assessed in a purely descriptive fashion, i.e. indicating that one region was higher or lower than all the others. It remains to be seen whether these differences are significant when the known differences among regions are accounted for. If there is more restorative work to be done because a region has more decayed teeth, then relatively higher emphasis on restorative care would be expected. Therefore, differences among regions for four of the service indicators of Table 12 (RVU, % restorative work, % preventive work, and the restorative/preventive ratio) were each analyzed separately by an analysis of covariance controlling, firstly, for the regional differences in total dental caries attack (DMF + def teeth) and, secondly, for the regional differences in decayed tooth surfaces per child. Statistically significant differences among the regions were found for each of the

¹²This possibility is, indeed, a reality as a later table (Table 35) shows that each dental nurse has, on average, an increased patient load each successive program year.

four service indicators even after the effects of total caries attack (DMF + def) per child and decayed surfaces per child were each separately accounted for in the analysis. This was true for both the 1976-77 and 1978-79 data.

This finding of statistical significance among regions for each program year is highly suggestive that factors other than disease need (or at least the two disease need factors utilized) accounted for the differences among regions in the RVU's of work performed per child and in the relative emphasis on restorative and preventive services. The responsible regional factors may be the difference in regional policies and/or clinical staff preferences but the exact reasons cannot be determined from this analysis or from the available data.

What can be done to elucidate the situation somewhat is to identify whether there are any regions where disease attack does not give the expected shift in treatment. Therefore a method was developed to compare the raw deviations of each regional mean from the overall mean with the deviations adjusted for disease attack for each of the four treatment factors analyzed. This is a rather complex and not foolproof scheme so will be reported here in a limited way for its suggestive value. One example relates to differences among regions in the relative amount of restorative treatment provided using the number of decayed surfaces determined prior to treatment as the adjusting factor (or covariate). Only those regions for which both the 1976-77 and 1978-79 data gave identical results will be mentioned. In region 1 (Swift Current) and region 6 (North Battleford) the percent of restorative services was either below the overall average (region 1) or above it (region 6); however, adjustment by the covariate, decayed surfaces, resulted in a shift of the adjusted mean percent of restorative services towards the overall mean. In other words, the amount of decay explained, as might normally be expected, the different relative amount of restorative services rendered in each region. In region 4 (Yorkton), however, the relative amount of restorative care was well below the overall average both before and after adjustment. Thus it appeared that factors other than the amount of decay explained why this region was lower in its relative emphasis on restorative care. In region 5 (Prince Albert), which had relatively more emphasis on restorative care, this high emphasis could not be explained by the initially reported amount of

decayed surfaces. Again as in region 4, other factors appeared to explain the greater emphasis on restorative care.

With each of the other treatment factors and each of the two covariates (DMF + def, and decayed surfaces) similar findings emerged. In some regions the deviations were explained by the covariate adjustment, in others they were not. Thus, the notion that other factors than disease (caries) levels and treatment (filling) needs partly influence treatment is additionally supported.

One example of the kind of information used to draw the tentative conclusions just described is summarized in Table 13.

TABLE 13

REGIONAL DIFFERENCES IN THE PERCENT OF RESTORATIVE WORK AND IN DECAYED SURFACES

Year	Region	Difference Between Regional Mean %	Unadjusted Mean	Adjusted Mean*	General Effect on Difference After Adjustment	Probable Explanatory Value of Adjusting Factor "Decayed Surfaces"
1976-77	1	-9.99%	-3.57%	-3.57%	'large'	H
	2	-4.57%	-3.34%	-3.34%	'small'	Lo
	3	-0.74%	0.21%	0.21%	+ 1%	?
	4	-3.51%	-3.04%	-3.04%	'small'	Lo
	5	11.95%	9.40%	9.40%	'small'	Lo
	6	6.51%	1.83%	1.83%	'large'	H
1978-79	1	-4.08%	0.24%	0.24%	'large'	H
	2	-0.48%	1.48%	1.48%	+ 1.5%	?
	3	-1.36%	-0.98%	-0.98%	+ 1.4%	?
	4	-5.51%	-5.55%	-5.55%	'small'	Lo
	5	8.78%	5.86%	5.86%	'small'	Lo?
	6	3.37%	0.55%	0.55%	'large'	H

*The overall mean percent of restorative services was adjusted by the covariate "decayed surfaces".

- 1 Region 1 is Swift Current
- 2 is Regina
- 3 is Saskatoon
- 4 is Yorkton
- 5 is Prince Albert
- 6 is North Battleford

Dental Operator Profiles

Data giving the distribution of 21 selected, common services provided by each dental nurse team and the overall, weighted output per team (R.V.U.'s) for these same services are available for each of the more recent S.H.D.P. program years (PH 8074). These data permit a variety of comparisons such as whether there are differences in the dental nurse team mean productivity and in the relative types of services among the S.H.D.P. regions. Year-to-year changes in productivity and service type are also of interest.¹³

Table 14 presents the average R.V.U. productivity per dental nurse team for each S.H.D.P. region in 1978-79. The range of R.V.U. productivity is listed. Both the lowest and second lowest values in the range are listed to emphasize that often the lowest value is particularly low for that region. These very low values usually represent staff who have worked only part of the year.

TABLE 14

AVERAGE R.V.U. PRODUCTIVITY PER DENTAL NURSE TEAM IN
RELATION TO 21 SELECTED DENTAL SERVICES, 1978-79

	<u>Swift Current</u>	<u>Regina</u>	<u>Sask- atoon</u>	<u>Yorkton</u>	<u>Prince Albert</u>	<u>North Battleford</u>
Average R.V.U.* Productivity per Dental Nurse Team**	3413.6	3262.1	3865.6	3515.0	3286.8	3448.8
Range per D.N. Team - Lo	1284	1001	735	702	406	1693
- 2nd Lo	2353	1661	1235	2571	1831	2692
- Hi	4476	4609	4909	6000	4751	5187
Number of Teams	(14)	(41)	(40)	(33)	(32)	(26)

Special R.V.U. scores are utilized in the PH 8074 computer analysis, not the Canadian Dental Association scores.

*Provincial average for the 186 teams is 3506.4 R.V.U.'s per team.

¹³The computer data generated in 1980 for this review were not reliable before 1978-79 because of necessary administrative changes in the historical files; therefore, the analysis of temporal changes are not possible here.

There are differences among regions in the average R.V.U. productivity per dental nurse team. For example, the productivity is 18.5% greater in the Saskatoon region than in the Regina region (the highest and lowest regional means, respectively). However, a one-way analysis of variance showed that the differences among all regional means were not statistically significant (F ratio = 2.20, $p > .05$).

Table 15 gives for each S.H.D.P. region and the province as a whole the average number per dental nurse team and the relative percent distribution of each of the 21 selected, common services. Examination of the relative percents for each listed service or group of services across regions permits assessment of differences among regions in service emphasis and/or needs, a process already begun in the preceding section on School Division service profiles.

When the specific services listed in Table 15 are aggregated into the usual major categories, the dominance of preventive services (prophylaxis, topical fluoride, individual oral hygiene instruction) as a large part of the total (listed) services in each region is very evident. However, region 6's (Prince Albert) aggregated relative percent (29.4%) is much lower than in four of the five other regions, especially region 4's (41.4% (Yorkton)). Prince Albert is also much lower in its relative amount of diagnostic services (examinations and bitewing radiographs) compared to all five other regions. Because of its lower relative percents on diagnostic and preventive services Prince Albert has, of course, much higher percents of restorative services. This contrast is particularly noticeable for amalgam fillings in permanent teeth which represent 19.1% of the total listed services in Prince Albert and 7.9% in region 1 or Swift Current (other regions -- 10% to 13%) and for stainless steel crowns (Prince Albert is 4.0% and Yorkton is 1.1%).

Such contrasts of low versus high service utilization are of interest but judgments as to whether the real dental needs of children or differing treatment philosophies or emphases are at work are unwarranted with the available data. The hints, arising from the analysis of covariance of the preceding section, which suggested that in some instances relatively low and high use of restorative services does not seem to be

TABLE 15

REGIONAL AND PROVINCIAL MEAN NUMBER OF SELECTED SERVICES* PROVIDED PER DENTAL TEAM

1978-79

Service	Region 1		Region 2		Region 3		Region 4		Region 5		Region 6		Province	
	\bar{x}	%	\bar{x}	%	\bar{x}	%	\bar{x}	%	\bar{x}	%	\bar{x}	%	\bar{x}	%
Routine Exam	400	10.8	306	9.1	305	7.6	362	10.0	154	5.1	287	7.8	301	8.2
Recall Exam	85	2.3	55	1.6	88	2.2	123	3.4	96	3.2	49	1.3	85	2.3
Bitewing (1 film)	6	0.2	4	0.1	11	0.3	4	0.1	6	0.2	4	0.1	6	0.2
Bitewing (2 films)	151	4.1	167	5.0	322	8.0	130	3.6	70	2.3	318	8.6	203	5.5
D. Prophylaxis	413	11.1	353	10.5	342	8.5	454	12.6	203	6.7	157	4.2	326	8.9
Polish Amalg.	217	5.8	187	5.5	308	7.7	237	6.6	229	7.6	235	6.3	244	6.7
Top. Fluoride	474	12.8	457	13.6	474	11.8	518	14.4	331	10.9	405	10.9	454	12.4
O. Hyg. Inst. Pers.	489	13.2	484	14.4	560	14.0	519	14.4	359	11.8	602	16.3	517	14.1
Parent Contacts	563	15.2	393	11.7	439	10.9	270	7.5	384	12.7	458	12.4	412	11.2
S.S. Crown - Space Maintainer	9	0.2	6	0.2	10	0.2	6	0.2	10	0.3	10	0.3	9	0.2
Amalg. Prim. 1s	98	2.6	104	3.1	126	3.1	119	3.3	125	4.1	107	2.9	119	3.2
Amalg. Prim. 2s	210	5.7	236	7.0	286	7.1	239	6.6	202	6.7	271	7.3	251	6.9
Amalg. Prim. 3s	20	0.5	31	0.9	29	0.7	30	0.8	18	0.6	34	0.9	29	0.8
Amalg. Perm. 1s	206	5.6	226	6.7	318	7.9	285	7.9	398	13.1	277	7.5	300	8.2
Amalg. Perm. 2s	79	2.1	98	2.9	111	2.8	112	3.1	160	5.3	170	4.6	126	3.4
Amalg. Perm. 3s	9	0.2	18	0.5	17	0.4	15	0.4	21	0.7	29	0.8	19	0.5
Compos. Rest.	29	0.8	20	0.6	17	0.4	26	0.7	24	0.8	27	0.7	24	0.7
S.S. Crown	110	3.0	79	2.3	96	2.4	33	0.9	112	3.7	104	2.8	89	2.4
Pulpotomy Prim.	52	1.4	62	1.8	61	1.5	51	1.4	71	2.3	62	1.7	63	1.7
Extraction Prim.	69	1.9	72	2.1	45	1.1	54	1.5	49	1.6	81	2.2	63	1.7
Extraction Prim. Ortho.	22	0.6	13	0.4	49	1.2	17	0.5	11	0.4	16	0.4	23	0.6
Total Services Per Team	3711	100%	3371	100%	4014	100%	3604	100%	3033	100%	3703	100%	3663	100%

*21 selected, representative services

In this period the number enrolled grew 9.3 times and the services rendered grew by a factor of 7.3. Interestingly, the total number of referred services grew by much more (15.9 times) than these standards of Plan growth. This greater growth in total referred services is very clearly due to the even larger increase in "referrals", i.e. permanent and specific referred services, which grew by a factor of 26.7 times and not to emergency service referrals which increased just 2.7 times between 1974-75 and 1979-80. It appears that about one-third of the "referrals" are permanent referrals in the early program years and that this has shifted to just over one-half in 1979-80 (data PH 8078). The

Table 16 demonstrates the growth of total and emergency referred services, with the services rendered to permanent referrals and the specific referral services combined together as "referrals". Additionally, in order to provide comparative standards, the table lists the growth of both the number of enrolled children and total services provided from 1974-75 to 1979-80.

Since its inception, some patients eligible for dental care under the S.H.D.P. have been referred to private dentists who are reimbursed on a fee-for-service basis. These referrals are of three types: patients with special, general problems not particularly amenable to treatment by dental nurses are permanently referred to private dentists and categorized as "permanent referrals"; patients requiring referral for a specific, special service or for emergency care are categorized as "specific referrals" and "emergency referrals", respectively. Thus, there are two types of service referrals and one type of patient referral. The frequency and type of referred services are incorporated into the overall service distribution data rendered under the S.H.D.P. and these overall data will be presented in the next section of this report. They are also tabulated separately (PH 8076) and reported upon annually. This section reviews changes in the amount, cost and type of referred services rendered under the S.H.D.P. between 1974-75 and 1979-80.

Referred Services

associated with the amount of decay do, nevertheless, spark one's curiosity (and perhaps, bias).

TABLE 16

GROWTH OF THE S.H.D.P. REFERRALS 1974-75 TO 1979-80

Program Year	Number Enrolled	Grand Total of No. of Services	No. of Referred Services		Cost of Referrals in Real Dollars		Ratio No. Ref/ No. Emerg.	% Grand Total S.H.D.P. Services That are Referrals			
			Total	Referrals*	Emergency	Total			Referrals*	Emergency	
1974-75	100.0** (=13,140)	100.0** (=160,120)	100.0** (=962)	100.0** (=496)	100.0** (=466)	100.0** (=10,916)	100.0** (=1,242)	1.06	0.60%		
1975-76	285.9	272.3	246.2	280.2	209.9	296.5	246.1	235.0	726.2	1.42	0.54%
1976-77	458.4	438.6	419.4	653.8	170.0	623.6	838.9	178.8	969.1	4.09	0.57%
1977-78	639.7	599.3	617.5	1009.9	199.8	980.7	1418.1	238.4	1544.3	5.38	0.62%
1978-79	835.2	732.8	1192.3	2100.0	226.7	1756.2	3032.6	302.6	1002.3	9.88	0.98%
1979-80	929.5 (=122,139)	732.2 (=1,172,444)	1590.7 (=14,523)	2671.4 (=13,250)	273.2 (=1,273)	2168.7 (=236,734)	3730.4 (=204,950)	369.7 (=15,450)	1315.1 (16,333)	10.41	1.24%

*These "referrals" include specific service referrals and permanent patient referrals; about one-third are permanent referrals in the early program years and about one-half are permanent referrals in the later program years.

**The columns of numbers are index numbers, with the top figures in brackets equal to 100.0 in the 1974-75 base year; the figures in brackets opposite 1979-80 represent the values that year with the appropriate index number indicated above them.

much higher growth of the number of "referrals" relative to the numbers enrolled is, of course, partially (and perhaps totally) explained by the greater complexity of patient needs as older children and greater numbers of them become enrolled.

As might be expected, the fee-for-service costs of these referred services display even greater relative increases than the increase in numbers. Table 16 shows that these costs in real dollars, unadjusted for the effects of inflation, increased by 21.7, 37.3 and 3.7 times for the total, "referral", and emergency referred services, respectively. If, in a very crude fashion, these growth factors are adjusted downwards to control for inflation by approximately 50% (i.e., 10% inflation for the five years after 1974-75), then the cost growth rates in terms of constant 1974-75 dollars would be about 10.8, 18.6 and 1.8 times for the above three referred services. These latter "adjusted" cost growth factors then begin more to resemble the growth in numbers of referred services mentioned previously; in fact, they are each about one-third lower than the growth in the numbers of referred services.

Table 16 also gives the ratio of the number of "referral" services to emergency referred services each program year. After a fairly even balance between these two sorts of referred services in 1974-75 and 1975-76, the number of referral services (permanent plus specific) greatly outnumbered the emergency services by 4, 5, and 10 times in the last four program years. The very last column of Table 16 indicates the relative relationship between the numbers of referred and the grand total services rendered under the S.H.D.P. In the first four program years referred services represented about 0.5% to 0.6% of all services. This percent grew to from 1.0% to 1.2% in 1978-79 and 1979-80, still a relatively small amount but 50% larger than in the first four S.H.D.P. years.

To further understand the growth in referred services it was decided to examine whether there were any remarkable shifts in the major types of referred services being provided from year-to-year. Therefore, Table 17 presents the relative percent distribution of the types of services being paid for each year for all three categories of referral. The findings are generally unremarkable. Thus, ignoring the 1974-75

TABLE 17

TOTAL NUMBER OF REFERRED SERVICES AND PERCENT DISTRIBUTION BY TYPE OF SERVICE 1974-75 TO 1979-80

Program Year	Total Number of Referred Services* N	Exams %	X-rays %	Diag. Models %	Prevention %	Sed. Dress. %	Fillings %	Crowns %	Pulp., Rt. Can. %	Part. Dent. %	Surg., Ext. %	Minor Ortho. %	Other %	Total %
1974-75	962	7.8	10.1	0.1	3.1	-	30.2	2.7	6.2	-	36.4	3.3	-	99.9
1975-76	2,368	11.1	16.1	0.2	3.2	-	30.1	3.6	3.7	-	29.8	2.2	-	100.0
1976-77	4,035	12.9	17.8	1.0	3.9	0.2	18.8	5.9	3.1	0.1	27.1	9.2	-	100.0
1977-78	5,940	14.8	17.8	0.7	4.7	0.9	19.8	4.8	4.2	0.1	15.7	9.7	6.9	100.1
1978-79	11,470	12.2	18.3	0.6	4.7	0.9	22.5	6.0	4.8	0.1	21.5	6.6	1.8	100.0
1979-80	14,523	11.2	17.5	0.6	6.7	0.5	19.6	5.0	4.3	0.2	20.7	5.3	8.3	99.9

*Total referred services include specific (service) referrals, permanent (patient) referrals and emergency (service) referrals.

14 Those who believe that clear-cut, unequivocal dental practice guidelines are inappropriate might examine the Report of the Working Group on Preventive Dental Services, Department of National Health and Welfare, Ottawa, 1980. Although only diagnostic and preventive guidelines are examined, this Report demonstrates that great variations exist among individual practitioners and that in many instances the scientific rationale for certain dental practices is lacking.

A wide variety of diagnostic, preventive and clinical treatment services are provided to enrolled children using the S.H.D.P. The type and frequency of services utilized is related to the needs of the individual patient as assessed by the supervising dentist in the child's initial year of enrollment and in subsequent years mainly by the dental nurse, plus the supervising dentist as required. The decisions as to the specific services contained in each patient's treatment plan are determined by a combination of practice standards and guidelines, personal preferences of the providers where leeway within these guidelines is possible, and Plan policies. ¹⁴ Regarding policy, there have been central management decisions to cut back on the routine use of radiographs, and the amount of space maintenance and minor orthodontics

Dental Services Provided

Plan start-up year, the distribution of different types of services is very similar except for small drops in the relative amount of fillings and extractions and slight increases in the provision of crowns and minor orthodontic services after 1975-76. These latter two increases in generally more expensive services would, however, tend to contribute relatively more to costs than their numbers alone would suggest. There may be some differences among the S.H.D.P. regions in patient need for referrals and the tendency of staff to make them, as well as the availability of private dentists to refer children to (dental specialists, for example). Because of difficulties encountered in the availability of the complete data in the historical record files, it was not possible to assess such regional differences in detail. Using a nearly complete file of 1978-79 data (PH 8076) revealed a range of cost per referred service of \$14.64 to \$21.66 among the six regions. Taking into consideration the different number of enrolled children in each region, it appeared that the tendency to refer services was slightly higher than the average in the Yorkton and Prince Albert regions and slightly lower than the average in the North Battleford and Regina regions.

provided unless there is clear evidence of need. And in the last year or so, the increased use of fluoride mouthrinsing has been stressed.

Data on the services provided to children enrolled in the S.H.D.P. by the Plan's clinical staff and by private dentists treating referred patients are tabled in each Annual Report in some detail. Even more detailed information on each specific service rendered in each of the S.H.D.P. regions is generated annually by computer (PH 8078). Table 18 gives a summary of the dental service data from each Annual Report. The data have been simplified for discussion purposes into various major groups of services. The average utilization per enrolled child and relative percent for each service group are presented, along with the totals of the numbers enrolled and services provided each program year. Changes over time in the number of services and the distribution of service types will be examined. The wide variety and dissimilarity of the listed service groups must be stressed. For example, a parental contact, a single x-ray film and a stainless steel crown are each listed separately as one service despite their varying purposes, and the qualitative and clinic time differences among them.

The first noteworthy thing is that there has been a nine-fold enrollment growth (9.29 times, 13,140 to 122,139) and a seven-fold service growth (7.32 times, 0.16 to 1.172 million) between 1974-75 and 1979-80. Beyond this aggregate growth it is of some interest to see what shifts in service types have occurred, keeping in mind that new age groups with different treatment needs have been added each year (age 6 in 1974-75 versus ages 4 to 13 in 1979-80 are eligible).

Parent contacts have been a major feature of clinic activities each program year; they represent, after 1974-75, from 21% to 29% of all services (Table 18). There are from about 2.5 to 3.0 personal or phone/letter contacts per enrollee by Plan staff with parents each program year. This may partially explain the high rate of enrollment described earlier and parental satisfaction with the Plan to be described later. It would be of interest to know the amount of time the dental nurse team staff spend in this activity even though it appears to have worthwhile results.

Diagnostic services are represented in Table 18 as the number of examinations and single x-ray films provided. Examinations make up from 8% to 14% of all services and have increased from 1974-75 to 1979-80. The mean per enrolled child has increased regularly from nearly one in the first two program years to over one after that (1.32 in 1979-80). Based on an assessment of the different types of examinations, this increase is almost entirely due to the greater number of specific oral examinations performed per child, a finding apparently consistent with the greater tendency for patient referrals just pointed out in the previous section of this report. The mean number of x-ray films per child has dropped dramatically and (almost) regularly from program year to program year (from 2.41 films in 1974-75 to 0.57 films in 1979-80 per enrolled). This pattern of use results from the decision taken after 1974-75 to alter the policy from one of more-or-less routine use of bitewing and periapical radiographs to one of need. Whatever its motivation(s), this was an important and critical decision which will be mentioned again shortly.

Roughly one-quarter of all services are preventive in nature (Table 18). On average, nearly all child patients have received a dental prophylaxis and topical fluoride application (0.8 to 0.85 per enrolled) and individual oral hygiene instruction (0.8 to 1.06 per enrolled). In addition, after the first two years when its use was very low, about one-quarter of the children (0.24 to 0.3 per enrolled) undertook individual nutrition counseling. Presumably it is, but it would be interesting to see if the use of this latter service is targeted on need or risk, that is, patients with persistently high dental caries attack. And what benefits accrue as a result of these personal dietary educational efforts is an important question.

Both the mean number and percent of restorations have dropped regularly each year and to a level of about one-half from the first to the last program years. This, clearly, is a desirable trend. Examination of the means of the various types of restorations (not shown in Table 18) reveals that the drop is almost entirely due to the decreasing number of amalgam restorations placed in primary teeth as the mean number of

permanent amalgams has not dropped (0.61 per enrollee in 1975-76 versus 0.65 in 1979-80). Also, the mean number of stainless steel crowns has dropped in the last two program years but the mean number of composite restorations has increased in the same period.

The mean numbers of pulp treatments and extractions have decreased each year from 0.31 pulp treatments and extractions per enrollee in 1974-75 to 0.1 pulp treatments and 0.18 extractions per enrollee in 1979-80 (Table 18). It is very important to note that, starting in 1979-80, extractions required for orthodontic, space reasons were recorded separately and that such extractions accounted for one-third of all extractions. No doubt in the preceding few program years a similar proportion of orthodontic extractions were also undertaken through the S.H.D.P.

Space maintenance and minor orthodontic services seem to have levelled off at about 0.05 per enrollee (i.e., one in 20) after 1976-77.

The yearly grand total mean number of services (as listed in Table 18) changed very little between 1975-76 and 1977-78, then decreased to 10.7 in 1978-79 and 9.6 in 1979-80.

In summary, the frequency per child of restorations, extractions, pulp treatments and particularly radiographs provided to users of the S.H.D.P. has declined since 1974-75. The amount per child of parental contacts, examinations, preventive services and minor orthodontic work has, essentially, remained the same or increased with time. Two particular types of services might be singled out for further comment -- preventive and radiographic services.

While the high emphasis given to prevention under the S.H.D.P. is commendable, the effect of the various components of the available preventive package of services and to whom each or all of these components should be provided, should be studied. Preventive services use expensive resources on a continuing basis, and it would seem that selectivity rather than administrative convenience should be utilized as the criterion for their use in the future. There is no evidence from the available data that this is not being considered but if clinical treatment needs continue to decline, the potential for (dare one say it?)¹⁵ preventive

¹⁵Dare one say it, that is, in an era of intense emphasis on prevention and self-responsibility for one's own health.

TABLE 18

MEAN SERVICE PER ENROLLED CHILD AND PERCENT DISTRIBUTION OF SERVICES -- S.H.D.P. 1974-75 TO 1979-80

Service	1974-75		1975-76		1976-77		1977-78		1978-79		1979-80	
	\bar{x}	%	\bar{x}	%	\bar{x}	%	\bar{x}	%	\bar{x}	%	\bar{x}	%
1. Parent Contacts (in person/ phone/letter)	1.52	12.4	2.48	21.4	3.09	26.5	3.28	28.8	3.17	29.6	2.82	29.4
2. Examinations (init., spec., emerg., recall)	0.98	8.0	0.99	8.5	1.06	9.1	1.21	10.6	1.24	11.6	1.32	13.8
3. No. Single Radiographs (p.a., B.W., occ., pan.)	2.41	19.8	1.41	12.1	0.76	6.6	0.96	8.4	0.89	8.4	0.57	6.0
4. Preventive Services	2.56	21.0	2.72	23.5	3.05	26.2	2.97	26.0	2.78	26.0	2.73	28.4
a. dental prophylaxis	(0.86)	(7.1)	(0.87)	(7.5)	(0.86)	(7.4)	(0.83)	(7.3)	(0.79)	(7.4)	(0.77)	(8.0)
b. topical fluoride	(0.85)	(6.9)	(0.80)	(6.9)	(0.84)	(7.2)	(0.84)	(7.3)	(0.82)	(7.6)	(0.84)	(8.7)
c. Individ. nutrition couns.	(0.06)	(0.5)	(0.03)	(0.3)	(0.29)	(2.5)	(0.30)	(2.6)	(0.25)	(2.4)	(0.24)	(2.5)
d. Individ. oral hyg. inst.	(0.79)	(6.5)	(1.02)	(8.8)	(1.06)	(9.1)	(1.00)	(8.8)	(0.92)	(8.6)	(0.88)	(9.2)
5. No. Restorations (amalg., comp., crowns)	3.71	30.4	2.99	25.8	2.51	21.5	1.98	17.3	1.70	15.9	1.40	14.6
6. Pulp Treatment (p. cap, r.c.t., pulpot.)	0.31	2.5	0.34	2.9	0.21	1.8	0.19	1.7	0.13	1.2	0.10	1.1
7. No. Extractions (prim., perms., ortho.*)	0.31	2.5	0.22	1.9	0.24	2.0	0.18	1.6	0.20	1.9	0.12	1.3
8. Space Maintenance and Minor Orthodontics	0.03	0.2	0.01	0.1	0.06	0.5	0.05	0.5	0.05	0.5	0.05	0.5
9. Other**	0.37	3.1	0.45	3.8	0.68	5.9	0.59	5.1	0.51	4.8	0.42	4.4
10. Totals	12.20	99.9	11.61	100.0	11.66	100.1	11.41	100.0	10.67	99.9	9.59	100.1
Grand Total No. Services	160,120		436,007		702,212		959,562		1,173,322		1,172,444	
Total No. Children Enrolled	13,140		37,571		60,231		84,052		109,751		122,139	

**This includes a number of less frequently performed diagnostic, preventive, restorative, periodontal and surgical services such as: diagnostic models; polish amalgam; fissure sealants; discing and slicing; sedative dressing; retentive pin placement; periodontal services; other surgical services.

over-servicing grows. As is shown in a later section, increased exposure to the S.H.D.P. seems to be associated with slightly lower permanent tooth decay attack and a separate examination of the service data of children born in 1968 and 1969 who have been enrolled longer in the Plan than other children, and of eight year-olds who have been exposed for varying lengths of time to the Plan, demonstrated that those with more experience with the Plan have lower annual restorative needs (roughly 0.5 per child). This may reflect the influence of the greater amount of preventive services such children have received but assessment of the preventive effect is confounded by the other clinical treatments (fillings) these children also have received, i.e. a treatment effect may also have been influential.

The effect that the decreased use of radiographs has had on oral health is of great interest.¹⁶ Is there evidence that the criterion of need for x-rays (versus more routine use) has resulted in the need for more serious treatments than would otherwise have been the case? There can be no really good evidence either way since the question can only be truly answered by an appropriately designed randomized controlled clinical trial. Barring this, the next-to-best answer can be derived from evaluative studies with the S.H.D.P. records of certain groups who have and have not received radiographs. With the aggregate data available, however, all that can be done is to examine the extraction and pulp treatment data of enrolled children in the later program years to see if these seem unacceptably high. Children born in 1968 and 1969 have been enrolled longer than the other children and, therefore, for several years now have had lower numbers of radiographs (at or just under the program means from 1976-77 on). Since 1976-77 their mean number of extractions has been 0.2 to 0.26 per enrollee per year and 0.02 to 0.1 pulp treatment per year. (About one-third of the extractions are for orthodontic purposes.) Well, these numbers seem low, e.g. one tooth extracted, on average, for orthodontic and non-orthodontic purposes for every four to five children. There is no comparative standard however, so despite the disadvantages of such comparisons it becomes necessary to contrast

¹⁶It is recognized that exposure to radiation is of broader interest than its oral health implications.

Saskatchewan's experience with that of other provincial children's plans. Only for the Quebec and Prince Edward Island programs are the specific number of radiographs available.

TABLE 19

SELECTED MEAN* SERVICE DISTRIBUTION IN THE QUEBEC, PRINCE EDWARD ISLAND AND SASKATCHEWAN CHILDREN'S DENTICARE PLANS

Program	Year	Age Group	Mean No. X-rays	Mean No. Pulp Treatments	Mean No. Extractions**
Quebec	1976	5-9	3.16	0.14	0.88
	1977	5-11	3.33	0.14	0.74
	1978	5-13	2.79	0.14	0.63
P.E.I.	1976	3-10	1.3	0.12	0.25
	1977	3-11	1.7	0.07	0.25
	1978	3-12	1.6	0.10	0.19
	1978/79	3-13	1.6	0.09	0.18
	1976/77	5-9	0.76	0.21	0.24
Saskatchewan	1977/78	4-10	0.96	0.19	0.18
	1978/79	4-12	0.89	0.13	0.20
	1979/80	4-13	0.57	0.10	0.18

*Mean per user or patient in Quebec and P.E.I. and per enrollee in Saskatchewan. **Includes extractions for orthodontic purposes.

Source: J.W. Stamm and D.W. Lewis -- data gathered for papers delivered to the American Public Health Association, November 7, 1979. New York, N.Y.

Table 19 gives the essential information. Although such comparisons are fraught with difficulties some tentative conclusions are possible.

In the Quebec plan some three to five times as many radiographs per child are taken annually relative to Saskatchewan; however, three to four times as many teeth are extracted and slightly fewer pulp treatments are performed per Quebec child. In Prince Edward Island about two

times more radiographs per child are taken than in Saskatchewan; however, the extractions per child in Prince Edward Island are about equal to or slightly higher than Saskatchewan's while the pulp treatments are slightly lower.

Whatever tenuous conclusions one might draw from these data, it cannot be said that the policy of less frequent use of radiographs has resulted in greater than usual pulp treatments due to deep cavities or extractions of teeth which with radiographs could have been saved. At least, it seems that programs utilizing many more radiographs than Saskatchewan nevertheless have similar or higher pulp treatment and extraction experience.

This section concerns the extent to which presumably needed dental

services are completed under the S.H.D.P., and of retreatment, that is,

work previously done which must be re-done. Because enrollment and

completed care are intrinsically linked as argued earlier, much of this

information appeared before in the enrollment section and will not be

repeated. Just one further aspect of the enrollment-completion rela-

tionship will be reviewed here. Another consideration about completed

care which previously referred only to treatment plan completions, con-

cerns the extent to which disease diagnosed in the annual dental survey

has, in fact, been treated previously by restorations or extractions.

Data of this type from these dental surveys will be presented. And,

finally, the findings of a special study into restorative retreatments

conducted in two S.H.D.P. regions in 1979 will be discussed.

S.H.D.P. UTICOMP -- An Index of Enrollment and Care Completions

Although as discussed in an earlier section on utilization, some

Saskatchewan children who are not enrolled in the S.H.D.P. do get

dental care from private dental practitioners and some enrolled children

get partial but not complete dental care from the plan, the two elements

of enrollment and care completions remain critical, evaluative measures

of the S.H.D.P. effectiveness. If enrollment is low or if those enrolled

do not receive the care their treatment plans indicate,¹⁷ then the program is deficient. A composite of these two measures -- enrollment and completions -- would seem then to be an important evaluative criterion in assessing together the enrollment and treatment capabilities of the S.H.D.P. Table 20 illustrates this pervasiveness and impact of the Plan on Saskatchewan children under the acronym UTICOMP (utilization and care completions). The percents in the table are the products of and percents in Tables 1 and 8 and represent the percent of eligible Saskatchewan children at each age (birth year) receiving complete care.

TABLE 20

UTICOMP -- ENROLLMENT AND CARE COMPLETION UNDER
THE SASKATCHEWAN HEALTH DENTAL PLAN

Percent of Total Eligible Population Receiving Complete Dental Care

Program Year	BIRTH YEAR										Program Year Total**	
	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975		
1974-75			8.6									8.5
1975-76			66.1	62.7	57.7							62.9
1976-77		67.8	81.3	79.5	78.7	69.1						75.2
1977-78		71.0	77.0	77.0	75.4	74.8	71.4	40.8*				69.9
1978-79	58.8	64.6	71.2	70.7	70.7	70.4	70.0	67.4	56.5			66.5
1979-80	63.8	69.8	76.7	75.9	77.4	76.9	77.4	76.6	72.8	66.3		73.3

*These preschoolers were not eligible prior to February 1, 1978.

**Total for program year includes Oxbow Demonstration Project children some of whom are different ages from the other children covered in each program year.

The whole business of treatment plans is difficult. It must be assumed that each treatment plan reaches an acceptable standard. However, the guidelines for this standard are not well documented in the dental literature (for a review in respect to diagnostic and preventive services see the Report of the Working Group on Preventive Dental Services, Department of National Health and Welfare, Ottawa, 1980). Surely, though the principle should prevail that the treatment plan must contain the minimal number of services required for the best possible future oral health of the patient (i.e. no under- or over-servicing). In this assessment of the central, historical records of the S.H.D.P. it is assumed that this "quality" of treatment planning exists and, therefore, that completing such treatment plans is a very desirable goal.

The penetration of the S.H.D.P. on the children of Saskatchewan in terms of the proportions of children receiving complete dental care is very high. Ignoring the start-up year and the year when one group became eligible late in the program year, between 57% and 71% of the province's children received complete dental care in their initial year of eligibility under the S.H.D.P. After these initial years of eligibility even higher percentages of the province's children, between 64% and 81% of each birth year cohort, got complete dental care.

The figures for the program year totals are equally noteworthy. For example, in 1979-80, 73.3% of all Saskatchewan children between the ages of four and thirteen years got complete dental care (as previously defined) under the S.H.D.P. When those in this age range partially treated under the S.H.D.P. and partially and completely treated by private practitioners are added, the level of dental care utilization (which, speculatively, might reach 90%) by Saskatchewan children is, apparently, higher than in any other large geographic area in North America. The questions of the oral health of Saskatchewan children and the impact of treatment on it are addressed later.

Dental Survey Treatment Levels

The annual dental health statistics provide a number of indicators which assess the level of treatment outcomes. These include: the number of previously filled teeth that have redecayed; the ratio of extracted to filled teeth; and the percent of dent and DMFT that are filled. Information of this type will first be presented for each S.H.D.P. region and then for selected age groups.

The regional analysis using the oral health data shows differences in treatment levels among regions. For all three treatment measures to be presented it should be pointed out that in the first two program years, 1974-75 and 1975-76, only one of the four age groups covered had previously been treated under S.H.D.P. Not until 1976 and later were the majority of children for whom data are presented treated under the S.H.D.P.

The mean number of filled and redecaied teeth per child has dropped in each region particularly from the high values between 1974 and 1976 to between .09 and .14 redecaied teeth per child in 1978-79. As this range suggests, the variation among regions is not great -- Yorkton has the lowest mean and Saskatoon, Prince Albert and North Battleford have the highest.

The ratio of extractions to fillings has declined even more rapidly over time in each region except for Saskatoon where it was always relatively low.¹⁸ For example, in 1974-75 for every 100 filled teeth in the Prince Albert and North Battleford regions about 55 extracted teeth were recorded. A year later in 1975-76 the ratio in these two regions had dropped but only to 36/100 and 26/100, respectively. In 1978-79, after several years of operation of the S.H.D.P., the ratio was 7 extracted teeth per 100 filled in Prince Albert and 10 per 100 in North Battleford. This latter ratio along with that of Saskatoon, 9/100, was the highest in 1978-79. It would be of interest to know whether these ratios are similar across all ages in each region or are higher in newly eligible children each program year.

Restorative treatment levels, as expressed by the percent of all decayed (and treated) teeth that are filled, have also improved from the very low levels of 1974 to 1977, when only one of the six regions reported a percent higher than 50%, to the highest regional values yet recorded from 57% to 69% in 1978-79.¹⁹ Again, the Prince Albert and North Battleford regions which have been shown to have both the highest decay attack rates and the highest proportions of restorative services provided, have nevertheless the lowest restorative treatment levels, 57% and 58%. Three other regions, however, displayed percents only slightly higher (62%, 63%) in this same year 1978-79.

In general then, the variation among S.H.D.P. regions regarding the three treatment levels reviewed here is currently rather narrow. Certain regions, however, seem to be slightly worse off than others.

¹⁸It is important to note that nearly one-third (31.4%) of all primary and permanent tooth extractions in 1979-80 were for orthodontic reasons. Although the reason for extraction was not recorded before 1979-80, many previous extractions would have been for orthodontic purposes.

¹⁹S.H.D.P. policy discourages filling decayed anterior primary teeth and loose primary teeth estimated to be normally shed within six months.

Figures 2 and 3 portray the breakdown of the decayed, missing and filled components of caries attack at various ages for all enrollees surveyed at the various times indicated. Figure 2 examines the percent-
age of each caries component at ages 6, 8 and 10. Differences in the
total amount of caries are ignored since the point of interest here is
whether, at each age, increased S.H.D.P. exposure makes any difference
to the percent distribution of the def and/or DMFT components. At age
6 upon entry to the Plan only 18-19% of decayed teeth have been filled.
This presumably represents treatment (filling) levels made available by
the regular dental care system prior to the onset of the S.H.D.P. Six

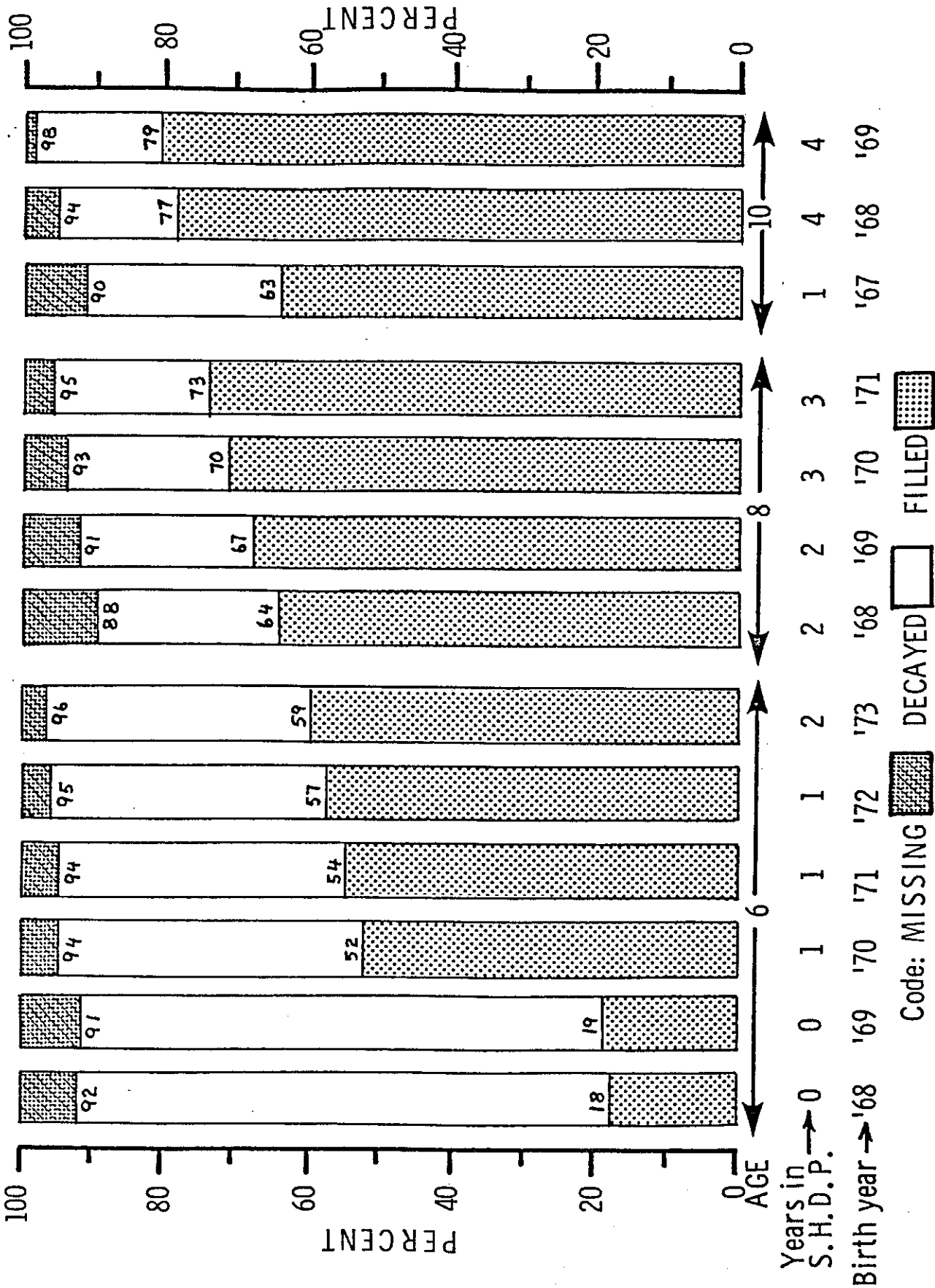
year-old children with one or two years of eligibility for treatment
under the Plan²⁰ have much higher levels of their decayed teeth filled
(52% to 59%) and relatively fewer of them extracted. Similarly, at
age 8 children who by the phasing-in process operating in the S.H.D.P.
over the years had been eligible to be in the program for three years
previously (beginning at age 5) have slightly more of their decayed
teeth filled and slightly fewer extracted than those eligible for two
years. And the same findings hold true for ten year-olds; those with
four prior years of program eligibility (and probable treatment) are
better off regarding the amount of restorative and surgical (extractions)²¹

care they have received than those with one prior year of eligibility.
In Figure 3 the DMF tooth scores and components of three birth year
cohorts (1968, 1967, 1966) are followed longitudinally over each age of
their eligibility in the S.H.D.P. Those born in 1968 were the first
group to enter the Plan (left part, Fig. 3). They display a high level of
restorative care (and had low levels of extractions at each age). Much of the
unmet treatment need (D) at each age apparently represents the accumu-
lation of decay in the one year between the end of the preceding round
of treatment and the initial visit of the new treatment series when the
survey was done. The accumulation of decay is enhanced by the new eruption
at certain ages of some teeth very susceptible to decay.

²⁰Not all of these children at age 4 or 5 necessarily used the plan,
however.

²¹It should be stressed again that S.H.D.P. policy discourages the filling
of decayed anterior primary teeth and loose primary teeth which are
estimated to be normally exfoliated within six months. This will auto-
matically depress the filling levels achieved by children with primary
teeth.

PERCENT OF MISSING, DECAYED AND FILLED TEETH BY AGES 6, 8, 10 AND APPROXIMATE NUMBER OF YEARS ENROLLED IN S.H.D.P.



The argument can be made that the lower treatment levels (F/DMF) of children at entry to the S.H.D.P. were caused by parents who, anticipating their children's eligibility, held back on the amount of care their children received. It is very unlikely, however, that the large differences observed are due solely to this.

22

In the summer of 1979, the dental nurses in the North Battleford and Swift Current dental regions were asked to review the dental charts of the first 100 patients on their lists who had been enrolled since 1974 or 1975. All the subsequent treatment performed under the S.H.D.P. on these patient's molars was then recorded. The resulting data which

Special Longitudinal Retreatment Survey

In summary, it seems that, in general, participation in the S.H.D.P. results in a much higher level of restorative care than newly eligible children had received outside it. In view of the easier economic and geographic accessibility built into the organization and structure of the S.H.D.P., this is not a surprising finding. It is, however, important to document it. Another general finding was that treatment levels improved as the length of enrollment in the plan increased.

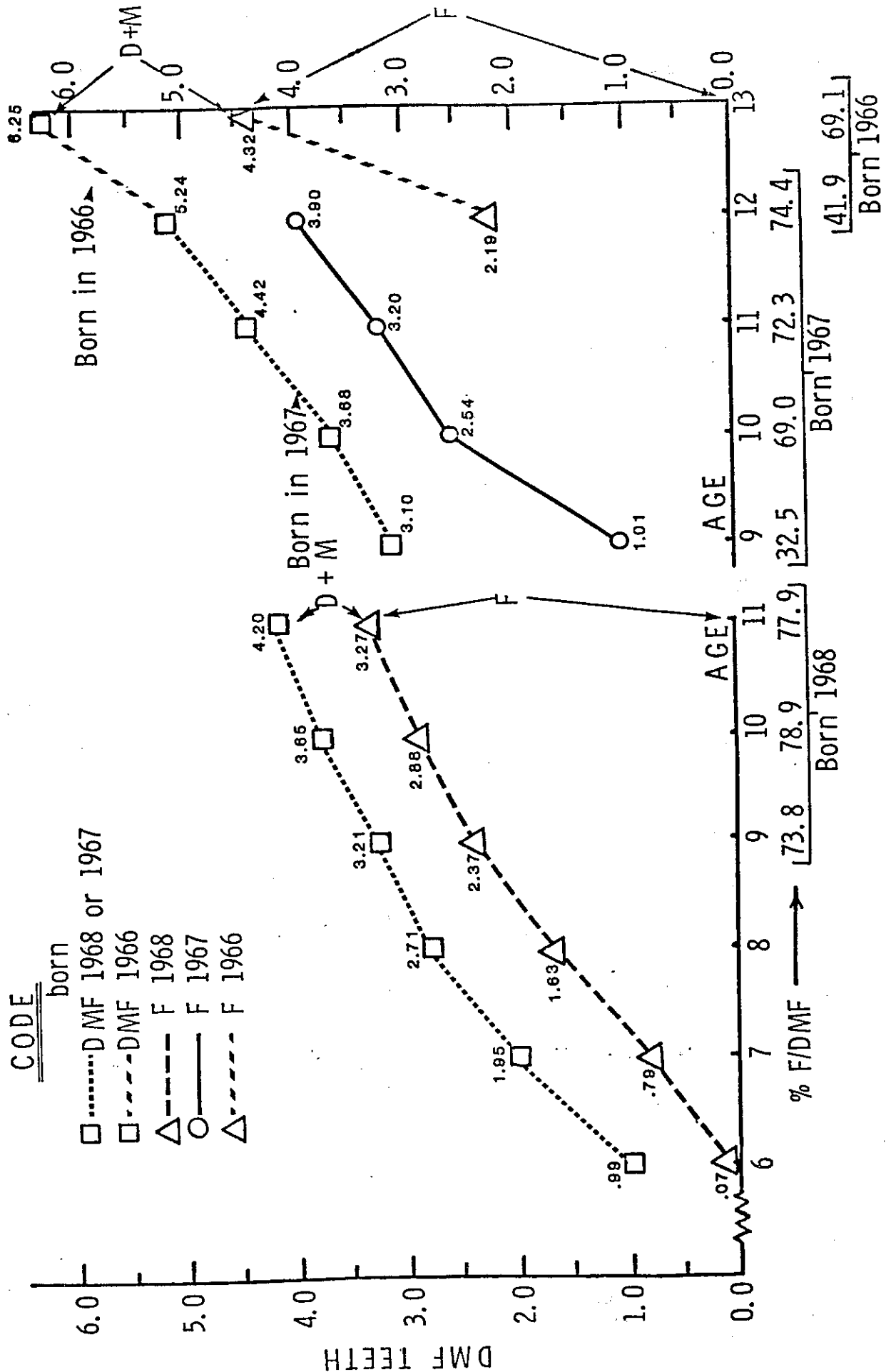
second comparison involves the 1966 and 1967 birth cohort data found in the right diagram of Figure 3. The 1966 birth cohort became eligible at age 12. Their total DMF caries attack was almost identical to that of the 1967 birth cohort at age 12 who had been eligible for enrollment in the S.H.D.P. since age 9 (see Figure 3). However, 74% of the 1967 birth group's decayed teeth were filled at age 12 whereas just 42% of the newly eligible 12 year olds born in 1966 were. And after one year of participation in S.H.D.P. the percent of decayed teeth that were filled of those born in 1966 and enrolled in the program rose from 42% to 69%.

left diagram's 1968 birth cohort who had participated in the Plan since age 6. The total DMF tooth attack at ages 9, 10 and 11 is reasonably similar overall; however, nearly 74% of the decayed teeth at age 9 of the 1968 birth year group were restored in contrast to only 33% of the 1967 birth year group just newly enrolled in the Plan at age 9. The second comparison involves the 1966 and 1967 birth cohort data found in the right diagram of Figure 3. The 1966 birth cohort became eligible at age 12. Their total DMF caries attack was almost identical to that of the 1967 birth cohort at age 12 who had been eligible for enrollment in the S.H.D.P. since age 9 (see Figure 3). However, 74% of the 1967 birth group's decayed teeth were filled at age 12 whereas just 42% of the newly eligible 12 year olds born in 1966 were. And after one year of participation in S.H.D.P. the percent of decayed teeth that were filled of those born in 1966 and enrolled in the program rose from 42% to 69%.

The right diagram of Figure 3 is more interesting in an evaluative sense. It shows the total DMF and its F component for those born in 1967 who became eligible for the Plan at about age 9 and for those born in 1966 who became eligible for the Plan at age 12. Two important comparisons are possible. First the DMF of those born in 1967 at ages 9, 10 and 11 can be compared with the age 9, 10 and 11 experience of the 1968 birth cohort who had participated in the Plan since age 6. The total DMF tooth attack at ages 9, 10 and 11 is reasonably similar overall; however, nearly 74% of the decayed teeth at age 9 of the 1968 birth year group were restored in contrast to only 33% of the 1967 birth year group just newly enrolled in the Plan at age 9. The second comparison involves the 1966 and 1967 birth cohort data found in the right diagram of Figure 3. The 1966 birth cohort became eligible at age 12. Their total DMF caries attack was almost identical to that of the 1967 birth cohort at age 12 who had been eligible for enrollment in the S.H.D.P. since age 9 (see Figure 3). However, 74% of the 1967 birth group's decayed teeth were filled at age 12 whereas just 42% of the newly eligible 12 year olds born in 1966 were. And after one year of participation in S.H.D.P. the percent of decayed teeth that were filled of those born in 1966 and enrolled in the program rose from 42% to 69%.

FIGURE 3

DMF TEETH AND COMPONENTS BY AGE FOR THREE BIRTH YEAR GROUPS - 1968, 1967, 1966.



are reported here consist of following the subsequent treatment experience of 10,488 primary molar teeth first treated in 1974, 1975, 1976 or 1977 for four, three, two or one year(s), respectively. Although such longitudinal dental treatment data may not be unique, they certainly are rare. The data are presented here for two main reasons. The first is to set down for the record, part of the available, great detail on the distribution of specific services to specific teeth over a five-year period. The second reason is more evaluative in its intent and that is to examine the type and extent of retreatment under the S.H.D.P. in the two regions surveyed. 23

The amount of care which needs to be replaced due to failure is an important program (treatment) outcome measure. Although this will be mentioned again, it should be stressed at the outset that retreatment of a tooth, as the term is utilized here, is of two major types. The first is merely the continuing treatment of a tooth with time due, for example, to new areas of decay developing on other surfaces; this decay (presumably) was not present at the time of the earlier restoration. The need for such continuing treatment with time is consistent with the findings of the epidemiology of dental caries that different tooth surfaces vary in susceptibility. The data of this type presented here is of clinical interest and may be useful for clinic program planning and developing treatment guidelines but is of no particular consequence to this report. The second type of retreatment -- replacement of failed restorations -- is important to this report. Two main kinds of failures can occur -- those of operator and/or patient origin. The dental operator's clinical preparation of the tooth and/or choice, manipulation, placement and carving of the filling material may have been faulty. Or, more acceptably, the clinician may have made an heroic effort to save a badly broken down tooth with a large filling that later fails. The patient's poor behaviour ("acting up") during the procedure or following it (chewing sooner than instructed on the filling, very poor oral hygiene) may also contribute to or cause the failure. The extent of failed restorations can be inferred from the statistical data to be presented but the real cause -- dental operator and/or patient -- cannot.

23 The retreatment data were only available in aggregate form; thus, no differences between the two regions could be assessed.

Although its appearance is quite formidable at first glance (and maybe after a second glance as well), Table 21 presents the interesting and detailed account of the dynamics of the interrelationship of each of the various types of service provided initially in 1974, 1975, 1976 or 1977 and the following year for the 10,488 "tracer" teeth. The first column of the table, labelled '-', gives the distribution of how all teeth sound at year 1 had been treated in the initial year '0'. For example, 82.1% or 115 of the 140 teeth receiving a buccolingual filling (BL) at year '0' required no treatment one year later. With a more common type of filling in primary molars, occlusals (labelled 00), 87.6% of those filled at year '0' required no further treatment in the next year; the distribution of the 12.4% requiring further treatment is listed along the 00 row. Moving from left to right in this row it can be seen that 2.9% of the occlusal fillings at year '0' required extension to include the back, distal part of the tooth (DO) in one year, two or 0.2% were extracted, 68 or 5.1% required extension to the front, mesial part of the tooth (MO), and 8 occlusals were replaced solely by occlusals (00). And so it goes with the occlusal and, of course, the other types of year '0' restorations. Retreatment from a 00 to MO or DO filling and to other surfaces represents a normal, expected shift in clinical treatment because of known patterns of decay incidence; however, ordinarily, replacement of a filling with an identical one in a short period of time implies unnecessary retreatment (either clinician- or patient-induced as mentioned previously). The extent of such replacements can be seen, roughly, along the diagonal of the table running from the upper left corner down to the lower right. There were 235 replacements of apparently identical fillings (identical from the code designation, at least) in the one-year period.²⁴ This works out to a replacement rate of 2.35%, meaning 2.35% of the 10,004 total available restored teeth (10,488 - 484 year '0' extractions) were replaced with identical code-designated fillings (MO with MO, etc.). Other situations that potentially represent treatment failures might be identified, such as a tooth filled in one year and extracted one year later. There were 99 such extractions after one year; however, it is risky to assume that all of these represent failures by the clinician (even if as many as one-half did, this only amounts to nearly 0.5%). Treatment failures after one year for whatever cause then amount to 2.85% -- arbitrarily defined as the 2.35% having identical restoration replacement plus 0.5%, one-half of the percent of restored teeth extracted one year later.

²⁴The 235 were made up of: BL (1); DO (100); DOLM (1); MOD (3); MO (58); NOBL (10); O,L (3); OO (8); and SSC (51).

TRANSITION BETWEEN SERVICES PROVIDED IN 1974, 1975, 1976 OR 1977 (YEAR 0) AND ONE YEAR LATER

TABLE 21

1 YEAR LATER

YEAR '0'

YEAR '0'	YEAR '1'	AM	BL	BOD	D.M	DO	DOL	DOLM	MOD	EXT	MO	MOB	MOBL	MOD,B	O.I.	OLM	OO	SSC	TOTALS	90.63
.09	9	44.4	0	0	0	0	0	0	0	0	22.2	0	0	0	0	0	0	0	0	0.02
.08	8	50.0	0	0	0	0	0	0	0	0	12.5	0	0	0	0	0	0	0	0	0.18
1.33	140	115	0	1	0	1	2	0	0	0	5.0	0	0	0	0	0	0	0	0	0.35
.23	24	28	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.12
.11	12	91.7	0	0	0	0	0	0	0	0	8.3	0	0	0	0	0	0	0	0	0.04
28.88	3,029	2775	1	2	0	2	100	1	0	0	12	0	0	0	0	0	0	0	0	0.94
.24	25	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.78
.23	24	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.03
2.71	284	241	0	2	0	0	2	0	0	0	4	0	0	0	0	0	0	0	0	0.05
4.61	484	478	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0.01
21.86	2,293	2076	0	28	0	0	25	0	1	22	11	58	1	0	2	2	5	1	0	1.67
1.90	199	179	0	0	0	0	2	0	0	0	2	0	0	1	2	0	0	0	0	0.03
4.34	465	400	0	7	0	0	1	3	0	1	2	12	0	2	0	2	2	2	0	0.46
0.18	21	76.2	0	4.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.03
4.34	455	391	0	4	0	0	4	1	0	0	1	22	0	7	0	0	0	0	0	0.05
0.02	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.03
12.60	1,321	1157	0	4	0	0	38	0	0	10	2	68	1	3	0	0	0	0	0	0.03
16.14	1,693	1592	0	0	0	0	0	0	0	47	1	1	0	0	0	0	0	0	0	0.01
90.63	9505	9400	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.01
90.63	9505	9400	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.01

In all cases figures in this position represent the % of each row (Year 0) total.

Using the one-year replacement and extraction data just described, Table 22 examines the breakdown of these statistics by type of molar and by the initial year of treatment to see if there are any obvious time- or tooth-related patterns. Replacement by the same type (code) of restoration was higher in teeth initially treated in 1974 (3.5%) and in 1977 (2.8%) than in the two intervening years (2.2% and 2.0%). However, the extraction rate one year later was lowest in teeth restored in 1974. The most striking finding in regard to treatment failures, as previously defined, is the relatively very high failure experience of the lower first primary molar teeth. This was 4.45% (3.67% replacement plus 1.56%/2 extraction). The adjacent lower second primary molars had the lowest failure rate, 1.72%, whereas the rates for the upper first and second primary molars were almost identical, 2.67% and 2.62% respectively. The relatively high "failures" with the lower first primary molars prevailed following each treatment year, 1974 through 1977.

TABLE 22

RETREATMENT DATA
IDENTICAL RESTORATION AND EXTRACTION RATES AFTER ONE YEAR FOR
PRIMARY TEETH RESTORED IN 1974, 1975, 1976 OR 1977 -- BY DECIDUOUS MOLAR TYPE

Year of Treatment (yearly replacement %)	AFTER ONE YEAR							
	Identical Restoration Code Replacement				Extraction***			
	Upper Molars		Lower Molars		Upper Molars		Lower Molars	
	1st	2nd	1st	2nd	1st	2nd	1st	2nd
1974 (3.5)	4/220* (1.8)	12/278 (4.3)	15/246 (6.1)	5/278 (1.8)	2/220** (0.9)	0/278 (0.0)	0/246 (0.0)	0/278 (0.0)
1975 (2.2)	15/921 (1.6)	30/1263 (2.4)	41/1152 (3.6)	15/1225 (1.2)	9/921 (1.0)	8/1263 (0.6)	21/1152 (1.8)	11/1225 (1.0)
1976 (2.0)	18/711 (2.5)	16/955 (1.7)	17/692 (2.5)	13/829 (1.6)	7/711 (1.0)	3/955 (0.3)	12/692 (1.7)	8/829 (1.0)
1977 (2.8)	11/336 (3.3)	9/364 (2.5)	12/225 (5.3)	2/309 (0.6)	5/336 (1.5)	5/364 (1.4)	3/225 (1.3)	2/309 (0.6)
Totals	48/2188 (2.19)	67/2860 (2.34)	85/2315 (3.67)	35/2641 (1.32)	23/2188 (0.96)	16/2860 (0.56)	36/2315 (1.56)	21/2641 (0.80)

*This means 4 of 220 teeth at risk to further treatment one year later were restored with the same type of restoration, i.e. MO with MO, SSC with SSC, etc. The figure in brackets is the percent so restored.

**This means 2 of 220 teeth at risk to further treatment one year later were extracted; the appropriate percent is in brackets.

***The total number of extractions is 96 (23 + 16 + 36 + 21) rather than the total of 99 in a previous table since the individual molar tooth year '0' to 1 year later transitions omitted 3 '-' or AM to EXT cases.

As mentioned previously, the retreatment data traced the restorative experience of primary molar teeth for up to four years after they were initially restored. The MO, DO and SSC types of restoration re-presented just over two-thirds of the total initial year treatments. Tables 23, 24 and 25 present, in turn, the distributions of the various subsequent treatments for the teeth having each of these three types of initial restorations after one, two, three and four years. These data are presented here more because of their uniqueness and possible future administrative use than for their evaluative utility. The treatment failures after one year in these three types of restoration and all other kinds have just been reviewed. The present tables do permit the assessment of the extent of replacement with the identical filling type after two (and more) years. With MO's (Table 23) the MO replacement percent two years later was 2.4% which when added to the 2.5% after one year, indicates that nearly 5% of initial year MO's were subsequently refilled with MO's in the next two years. (Since some of these restorations after one and after two years may have been in the same teeth, it cannot be claimed that 5% of teeth initially receiving MO's were replaced with MO's over the two year period.) Similarly, Table 24 indicates that 6.4% of initial year DO's (3.3% + 3.1%) were replaced with DO's over the two years. The two-year replacement rate for stainless steel crowns (SSC) was 5.2% (3.0% + 2.2%, Table 25). The extraction rate for SSC within two years of their initial placement was much higher, nearly 6% (2.78% + 3.19%), than it was for MO's (1.4%) and DO's (2.4%). This difference is not really surprising in that SSC's are usually provided for more severely carious and broken-down teeth. On the positive side, it must be stressed that very high percentages of teeth required no treatment one, two, three or four years later. These percentages are at or just under 90% each year for MO's, at or over 90% for DO's and from 94% to 97% for SSC's. Thus, lack of need for further treatment rather than retreatment dominates each year. The questions of interest are not whether any unnecessary retreatment occurs but whether the methods used for determining replacement and failure rates are reasonable and, if reasonable, whether the rates so determined are unacceptably high. The question of the reasonableness

of the method, given the available data, is for others to determine. The question of the acceptability of the rates relates to specific standards which, apparently, for such programs do not exist. The dental literature suggests that high levels of defective restorations, much higher than estimated here (assuming perhaps too glibly that all defective restorations in S.H.D.P. are replaced), exist in the general and child population. It has also been suggested that general dentists spend an inordinate amount of their time replacing presumably defective fillings. While this literature is in a perverse sense, reassuring, its applicability to the S.H.D.P. is somewhat strained as the circumstances of these other "quality" surveys differ so much. Of direct applicability are the findings of the previous quality evaluation of the S.H.D.P. in 1976, 18 months after the Plan started.²⁵ It was reported that 3.7% of one-surface fillings and 5.6% of two-surface fillings placed in primary teeth by the Saskatchewan Dental Nurses were "unsatisfactory" which usually meant they should be re-done. (The "unsatisfactory" figure for Saskatchewan dentists was 23%.) The unsatisfactory rates for the dentists and dental nurses were much higher for stainless steel crowns. It would seem then that the failure rate estimated here of 2.9% for all types of restorations after 12 months is relatively low. After two years the failure rate for the special sub-group of restorations was about twice as high (6-7%) which is close to the unsatisfactory rate for restorations completed by dental nurses in the previous quality study.

²⁵See footnote 1 for reference.

TABLE 23

TRANSITIONS BETWEEN MESOCLUSAL (MO) RESTORATIONS PLACED IN 1974, 1975, 1976 OR 1977 AND TREATMENTS NEEDED ONE, TWO, THREE OR FOUR YEARS LATER (PRIMARY MOLARS)

MO	One Year Later										Two Years Later										Three Years Later										Four Years Later																												
	BL	DO	DOIM	EXT	MO	MOB	MOD	MOD,B	O	O,L	SSC	TOTAL	BL	DO	DOIM	EXT	MO	MOB	MOD	MOD,B	O	O,L	SSC	TOTAL	BL	DO	DOIM	EXT	MO	MOB	MOD	MOD,B	O	O,L	SSC	TOTAL	BL	DO	DOIM	EXT	MO	MOB	MOD	MOD,B	O	O,L	SSC	TOTAL											
1974	249	3	1	1	15	1	1	1	-	2	273	240	7	4	-	7	1	-	1	-	3	1	9	241	1	-	12	3	4	-	3	3	1	8	273	245	1	-	9	4	6	-	2	2	4	53	1364	245	1	-	9	4	6	-	2	2	4	53	1364
	(91.2)*	(1.1)	(0.4)	(0.4)	(5.5)	(0.4)	(0.4)	(0.4)	(0.7)	(0.7)		(87.9)	(2.6)	(0.4)	(1.5)	(2.6)	(0.4)	(0.4)	(0.4)	(1.1)	(0.4)	(3.3)		(88.3)	(0.4)	(4.4)	(4.4)	(1.1)	(1.5)	(1.1)	(1.1)	(0.4)	(2.9)	(2.9)		(89.7)	(0.4)	(1.8)	(3.3)	(1.5)	(2.2)	(0.7)	(1.7)	(2.1)	(0.3)	(4.1)	(100.0)	(89.7)	(0.4)	(1.8)	(3.3)	(1.5)	(2.2)	(0.7)	(1.7)	(2.1)	(0.3)	(4.1)	(100.0)
1975	1013	13	5	4	19	-	5	1	3	26	1091	929	13	31	-	22	-	2	23	2	5	3	50	895	3	3	34	3	23	2	18	2	3	45	1091	895	3	3	34	3	23	2	18	2	3	45	1091												
	(92.9)	(1.2)	(0.5)	(0.4)	(1.7)	-	(0.5)	(0.1)	(0.3)	(2.4)		(85.2)	(1.2)	(2.8)	(0.1)	(2.0)	(0.2)	(0.2)	(2.1)	(0.2)	(0.5)	(0.3)	(4.6)	(82.0)	(0.3)	(0.3)	(3.1)	(0.3)	(2.1)	(0.2)	(1.7)	(2.1)	(0.2)	(0.3)	(4.1)	(82.0)	(0.3)	(0.3)	(3.1)	(0.3)	(2.1)	(0.2)	(1.7)	(2.1)	(0.2)	(0.3)	(4.1)												
1976	603	11	11	3	15	1	2	1	4	23	676	567	10	19	1	20	1	3	17	-	3	6	23	1136	4	3	46	3	27	2	21	2	4	53	1364	1136	4	3	46	3	27	2	21	2	4	53	1364												
	(89.2)	(1.6)	(1.6)	(0.4)	(2.2)	(0.1)	(0.3)	(0.1)	(0.6)	(3.4)		(83.9)	(1.5)	(2.8)	(0.1)	(3.0)	(0.1)	(0.4)	(2.5)	(0.4)	(0.4)	(2.5)		(83.28)	(0.29)	(0.22)	(3.37)	(0.22)	(1.98)	(0.15)	(1.54)	(1.98)	(0.15)	(0.29)	(3.89)	(83.28)	(0.29)	(0.22)	(3.37)	(0.22)	(1.98)	(0.15)	(1.54)	(1.98)	(0.15)	(0.29)	(3.89)												
Subtotal	2076	28	25	11	58	1	22	2	8	57	2293	1736	30	54	1	49	2	5	41	2	11	3	82	1136	4	3	46	3	27	2	21	2	4	53	1364	1136	4	3	46	3	27	2	21	2	4	53	1364												
	(90.54)	(1.22)	(1.09)	(0.04)	(2.53)	(0.04)	(0.96)	(0.09)	(0.35)	(2.49)	(100.0)	(85.10)	(1.47)	(2.65)	(0.05)	(2.40)	(0.10)	(0.25)	(2.01)	(0.10)	(0.54)	(0.15)	(4.02)	(83.28)	(0.29)	(0.22)	(3.37)	(0.22)	(1.98)	(0.15)	(1.54)	(1.98)	(0.15)	(0.29)	(3.89)	(83.28)	(0.29)	(0.22)	(3.37)	(0.22)	(1.98)	(0.15)	(1.54)	(1.98)	(0.15)	(0.29)	(3.89)												
1974	240	7	1	4	-	-	-	-	-	7	273	240	7	4	-	7	1	-	1	-	3	1	9	241	1	-	12	3	4	-	3	3	1	8	273	245	1	-	9	4	6	-	2	2	4	53	1364												
	(87.9)	(2.6)	(0.4)	(1.5)	-	-	-	-	-	(2.6)	(3.3)	(87.9)	(2.6)	(1.5)	-	(2.6)	(0.4)	(0.4)	(0.4)	(1.1)	(0.4)	(3.3)		(88.3)	(0.4)	(4.4)	(4.4)	(1.1)	(1.5)	(1.1)	(1.1)	(0.4)	(2.9)	(2.9)		(89.7)	(0.4)	(1.8)	(3.3)	(1.5)	(2.2)	(0.7)	(1.7)	(2.1)	(0.3)	(4.1)	(100.0)												
1975	929	13	1	31	1	1	8	2	-	23	1091	929	13	31	-	22	-	2	23	2	5	3	50	895	3	3	34	3	23	2	18	2	3	45	1091	895	3	3	34	3	23	2	18	2	3	45	1091												
	(85.2)	(1.2)	(0.1)	(2.8)	(0.1)	(0.1)	(0.7)	(2.0)	(0.2)	(2.1)	(4.6)	(85.2)	(1.2)	(2.8)	(0.1)	(2.0)	(0.2)	(0.2)	(2.1)	(0.2)	(0.5)	(0.3)	(4.6)	(82.0)	(0.3)	(0.3)	(3.1)	(0.3)	(2.1)	(0.2)	(1.7)	(2.1)	(0.2)	(0.3)	(4.1)	(82.0)	(0.3)	(0.3)	(3.1)	(0.3)	(2.1)	(0.2)	(1.7)	(2.1)	(0.2)	(0.3)	(4.1)												
1976	567	10	-	19	2	-	10	20	1	17	676	567	10	19	1	20	1	3	17	-	3	6	23	1136	4	3	46	3	27	2	21	2	4	53	1364	1136	4	3	46	3	27	2	21	2	4	53	1364												
	(83.9)	(1.5)	-	(2.8)	(0.3)	-	(1.5)	(3.0)	(0.1)	(2.5)	(3.4)	(83.9)	(1.5)	(2.8)	(0.1)	(3.0)	(0.1)	(0.4)	(2.5)	(0.4)	(0.4)	(2.5)		(83.28)	(0.29)	(0.22)	(3.37)	(0.22)	(1.98)	(0.15)	(1.54)	(1.98)	(0.15)	(0.29)	(3.89)	(83.28)	(0.29)	(0.22)	(3.37)	(0.22)	(1.98)	(0.15)	(1.54)	(1.98)	(0.15)	(0.29)	(3.89)												
Subtotal	2076	28	25	11	58	1	22	2	8	57	2293	1736	30	54	1	49	2	5	41	2	11	3	82	1136	4	3	46	3	27	2	21	2	4	53	1364	1136	4	3	46	3	27	2	21	2	4	53	1364												
	(90.54)	(1.22)	(1.09)	(0.04)	(2.53)	(0.04)	(0.96)	(0.09)	(0.35)	(2.49)	(100.0)	(85.10)	(1.47)	(2.65)	(0.05)	(2.40)	(0.10)	(0.25)	(2.01)	(0.10)	(0.54)	(0.15)	(4.02)	(83.28)	(0.29)	(0.22)	(3.37)	(0.22)	(1.98)	(0.15)	(1.54)	(1.98)	(0.15)	(0.29)	(3.89)	(83.28)	(0.29)	(0.22)	(3.37)	(0.22)	(1.98)	(0.15)	(1.54)	(1.98)	(0.15)	(0.29)	(3.89)												

* () are X's of each row total.

TABLE 24

TRANSITIONS BETWEEN DISTOCCLUSAL (DO) RESTORATIONS PLACED IN 1974, 1975, 1976 OR 1977 AND TREATMENTS NEEDED ONE, TWO, THREE OR FOUR YEARS LATER (PRIMARY MOLARS)

DO	One Year Later										SSC	TOTAL	
	AM	BL	D ₁ M	DO	DOL	EXT	MO	MOBL	MOD	O			
1974	311 (92.8)*	1 (0.3)	-	13 (3.9)	-	-	-	-	-	-	-	10 (3.0)	335
1975	1263 (91.7)	1 (0.1)	1 (0.1)	42 (3.1)	1 (0.1)	14 (1.0)	5 (0.4)	-	4 (0.3)	2 (0.1)	44 (3.2)	28 (3.2)	1377
1976	809 (91.9)	1 (0.1)	1 (0.1)	25 (2.8)	-	4 (0.5)	7 (0.8)	-	2 (0.2)	3 (0.3)	28 (3.2)	16 (3.7)	880
1977	392 (89.7)	-	-	20 (4.6)	-	5 (1.1)	-	1 (0.2)	3 (0.7)	-	16 (3.7)	98 (3.24)	437
Subtotal	2775 (91.61)	1 (0.03)	2 (0.06)	100 (3.30)	1 (0.03)	23 (0.76)	12 (0.40)	1 (0.03)	9 (0.30)	5 (0.17)	98 (3.24)	3029 (100.0)	

DO	Two Years Later										SSC	TOTAL
	BL	D ₁ M	DO	DOL	EXT	MO	MOD	O	SSC	TOTAL		
1974	297 (88.7)	-	11 (3.3)	-	7 (2.1)	1 (0.3)	-	-	19 (5.7)	5 (1.5)	19 (5.7)	335
1975	1226 (89.0)	1 (0.1)	1 (0.1)	48 (3.5)	16 (1.2)	5 (0.4)	3 (0.2)	3 (0.2)	74 (5.4)	3 (0.2)	74 (5.4)	1377
1976	801 (91.0)	1 (0.1)	22 (2.5)	1 (0.1)	20 (2.3)	6 (0.7)	2 (0.2)	-	27 (3.1)	-	27 (3.1)	880
Subtotal	2324 (89.66)	2 (0.08)	1 (0.04)	81 (3.12)	1 (0.04)	12 (0.46)	5 (0.19)	3 (0.12)	120 (4.63)	3 (0.12)	120 (4.63)	2592 (100.0)

DO	Three Years Later										SSC	TOTAL
	BOD	DO	EXT	MO	MOD	O	SSC	TOTAL				
1974	314 (93.7)	-	6 (1.8)	5 (1.5)	1 (0.3)	-	9 (2.7)	335				
1975	1227 (89.1)	2 (0.1)	46 (3.3)	28 (2.0)	5 (0.4)	2 (0.1)	61 (4.4)	1377				
Subtotal	1541 (90.01)	2 (0.12)	52 (3.04)	33 (1.92)	6 (0.35)	2 (0.12)	70 (4.09)	1712 (100.0)				

DO	Four Years Later										SSC	TOTAL
	DO	EXT	MO	SSC	TOTAL							
1974	318 (94.9)	4 (1.2)	7 (2.1)	2 (0.6)	4 (1.2)	335 (100.0)						

*() are %'s of each row total.

TRANSITIONS BETWEEN STAINLESS STEEL CROWNS (SSC) PLACED IN 1974, 1975, 1976 OR 1977 AND TREATMENTS NEEDED ONE, TWO, THREE OR FOUR YEARS LATER (PRIMARY MOLARS)

TABLE 25

		One Year Later						Two Years Later						Three Years Later						Four Years Later									
		SSC	EXT	MO	MOB	MO	MOB	SSC	EXT	MO	MOB	SSC	EXT	MO	MOB	SSC	EXT	MO	MOB	SSC	EXT	MO	MOB	SSC	EXT	MO	MOB		
1974	SSC	137	=	2	-	-	-	5	137	19	704	133	=	7	-	-	-	137	7	137	7	137	7	137	7	137	7		
		(95.1)*	(1.4)	(1.4)	-	-	-	(3.5)	(92.4)	(2.5)	704	(92.4)	(2.4)	(4.9)	(2.8)	(2.8)	(2.8)	(94.0)	(0.1)	704	(94.0)	(0.1)	133	(92.4)	(2.4)	(4.9)	(2.8)		
1975	SSC	704	19	704	19	704	19	26	704	19	704	19	704	19	704	19	704	704	1	704	1	704	1	704	1	704	1	704	1
		(94.0)	(2.5)	(94.0)	(2.5)	(94.0)	(2.5)	(3.5)	(92.4)	(2.5)	704	(92.4)	(2.4)	(4.9)	(2.8)	(2.8)	(2.8)	(94.0)	(0.1)	704	(94.0)	(0.1)	133	(92.4)	(2.4)	(4.9)	(2.8)	(2.8)	
1976	SSC	603	22	603	22	603	22	17	603	22	603	22	603	22	603	22	603	603	1	603	1	603	1	603	1	603	1	603	1
		(93.5)	(3.4)	(93.5)	(3.4)	(93.5)	(3.4)	(2.6)	(92.4)	(2.5)	603	(92.4)	(2.4)	(4.9)	(2.8)	(2.8)	(2.8)	(94.0)	(0.1)	603	(94.0)	(0.1)	133	(92.4)	(2.4)	(4.9)	(2.8)	(2.8)	
1977	SSC	148	4	148	4	148	4	3	148	4	148	4	148	4	148	4	148	148	1	148	1	148	1	148	1	148	1	148	1
		(95.5)	(2.6)	(95.5)	(2.6)	(95.5)	(2.6)	(1.9)	(92.4)	(2.5)	148	(92.4)	(2.4)	(4.9)	(2.8)	(2.8)	(2.8)	(94.0)	(0.1)	148	(94.0)	(0.1)	133	(92.4)	(2.4)	(4.9)	(2.8)	(2.8)	
Subtotal		1592	47	1592	47	1592	47	51	1592	47	1592	47	1592	47	1592	47	1592	1452	1	1452	1	1452	1	1452	1	1452	1	1452	1
		(94.03)	(2.78)	(94.03)	(2.78)	(94.03)	(2.78)	(3.01)	(92.4)	(2.5)	1452	(92.4)	(2.4)	(4.9)	(2.8)	(2.8)	(2.8)	(94.40)	(0.07)	1452	(94.40)	(0.07)	133	(92.4)	(2.4)	(4.9)	(2.8)	(2.8)	
1974	SSC	144	=	144	=	144	=	144	144	=	144	144	=	144	144	144	144	144	0	144	0	144	0	144	0	144	0	144	0
		(95.1)	(4.9)	(95.1)	(4.9)	(95.1)	(4.9)	(3.5)	(92.4)	(2.5)	144	(92.4)	(2.4)	(4.9)	(2.8)	(2.8)	(2.8)	(94.0)	(0.1)	144	(94.0)	(0.1)	133	(92.4)	(2.4)	(4.9)	(2.8)	(2.8)	
1975	SSC	714	27	714	27	714	27	17	714	27	714	27	714	27	714	27	714	714	1	714	1	714	1	714	1	714	1	714	1
		(95.3)	(3.6)	(95.3)	(3.6)	(95.3)	(3.6)	(2.6)	(92.4)	(2.5)	714	(92.4)	(2.4)	(4.9)	(2.8)	(2.8)	(2.8)	(94.0)	(0.1)	714	(94.0)	(0.1)	133	(92.4)	(2.4)	(4.9)	(2.8)	(2.8)	
1976	SSC	851	34	851	34	851	34	17	851	34	851	34	851	34	851	34	851	851	1	851	1	851	1	851	1	851	1	851	1
		(95.30)	(3.81)	(95.30)	(3.81)	(95.30)	(3.81)	(3.01)	(92.4)	(2.5)	851	(92.4)	(2.4)	(4.9)	(2.8)	(2.8)	(2.8)	(94.0)	(0.1)	851	(94.0)	(0.1)	133	(92.4)	(2.4)	(4.9)	(2.8)	(2.8)	
Subtotal		140	=	140	=	140	=	144	140	=	140	140	=	140	140	140	140	140	8	140	8	140	8	140	8	140	8	140	8
		(97.2)	(2.8)	(97.2)	(2.8)	(97.2)	(2.8)	(3.01)	(92.4)	(2.5)	140	(92.4)	(2.4)	(4.9)	(2.8)	(2.8)	(2.8)	(94.0)	(0.1)	140	(94.0)	(0.1)	133	(92.4)	(2.4)	(4.9)	(2.8)	(2.8)	
1974	SSC	144	=	144	=	144	=	144	144	=	144	144	=	144	144	144	144	144	0	144	0	144	0	144	0	144	0	144	0
		(100.0)	(2.8)	(100.0)	(2.8)	(100.0)	(2.8)	(3.01)	(92.4)	(2.5)	144	(92.4)	(2.4)	(4.9)	(2.8)	(2.8)	(2.8)	(94.0)	(0.1)	144	(94.0)	(0.1)	133	(92.4)	(2.4)	(4.9)	(2.8)	(2.8)	

* () are %'s row total.

ORAL HEALTH OUTCOMES

One of the major stated objectives of the S.H.D.P. is to improve dental health in Saskatchewan through the preventive and treatment services of the Plan. Dental caries survey data are gathered prior to treatment at the first appointment of each child in each program year. These data are then converted into 23 different indicators of dental decay attack and treatment levels. Most of these dental health indices are reported upon annually by birth year for all enrolled children.

From an evaluative perspective, the extent of decay reduction and of treatment for decay directly attributable to the S.H.D.P. is the point of interest of this section of the report. Eleven of the indices from the computer data were selected for examination and arrayed by dental plan region, by three large communities, by birth year and by age for each program year. These data are available in tables separate to this report; only selected indices on dental caries attack and treatment levels are reproduced and analyzed here. First, differences among dental plan regions and, second, specific age groups are examined to see what effects on oral health the S.H.D.P. has had.

Dental Plan Regional Differences

Regional differences in oral health (def + DMF teeth and decayed surfaces) were previously utilized in the analysis of differences among regions in dental services provided under the S.H.D.P. for two program years, 1976-77 and 1978-79. Regional data are presented here for three reasons. The first is simply that regional oral health statistics are generally not available. The Annual Reports for understandable reasons have presented the aggregated dental health statistics on all enrolled children so that the presence or absence of regional differences is unexplored. The second reason is that it is necessary to be aware of regional differences in the attack of dental decay when evaluating regional treatment level differences. All other things being equal, if disease attack is low, achievement of high treatment levels is easier to reach than when disease attack is high. The third reason relates to

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1979-80 regional data were not available at the time of this analysis.

The dental caries treatment level ratios found by the surveys at the beginning of each program year (prior to treatment) indicate that regions 6 and 5, in that order, have the lowest treatment levels (Table 27). These are interesting regions inasmuch as it was just shown that they also have the highest caries attack. And, in a previous part of this report about regional differences in the provision of dental services, it was shown that these same two regions (understandably, it

received care under the Plan. after 1975-76 when most of the age groups eligible had previously received about to get their first treatments under the Plan, than in the period the first program years, when three of the four age groups covered were region. The pattern of the rankings is less regular in 1974-75 and 1975-76, to 21% more children with no carious teeth at all than the lowest caries has about 1.5 more decayed teeth per child (1.0 in 1978-79) and from 5% As the "differences" row indicates, the region with the highest caries 4, 5 and 6 (Yorkton, Prince Albert and North Battleford, respectively). (Swift Current). Dental decay attack is progressively higher in regions region 2 (Regina) and slightly higher in regions 3 (Saskatoon) and 1 and treatment ratios (Table 27). Decay attack, overall, is lowest in There are differences among regions in both decay attack (Table 26)

scores for each measure are listed beneath each program-year column. To permit some assessment of quantitative differences among regions that decay and its treatment, and of systematic year-to-year changes in ranks, from actual scores available elsewhere and are utilized here to permit examination in a simple way of the questions of regional differences in and two treatment level ratios (Table 27). These ranks were derived 1974-75 to 1978-79 on two measures of dental caries attack (Table 26) Tables 26 and 27 present the ranks of each dental plan region from

whether over the five years of the Plan's operation there were shifts in the relative position of regions on various oral health measures from year-to-year. Or was the relatively "best" region always best and the relatively "worst" region always worst?

TABLE 26

DIFFERENCES AMONG SASKATCHEWAN DENTAL PLAN REGIONAL RANKINGS ON THE EXTENT OF DENTAL CARIES ATTACK BY PROGRAM YEAR

S.D.P. Region	Ranks (best=1, worst=6) on Two Measures of Caries Attack										Totals of Ranks All Years		Overall Summary Ranking
	1974-75		1975-76		1976-77		1977-78		1978-79				
1.	3*	5**	5*	1**	1*	1**	3*	3**	3*	3**	15*	13**	3
2.	2	3	2	6	2	2	2	2	1	1	9	14	1
3.	4	4	1	5	3	3	1	1	2	2	11	15	2
4.	6	1	6	4	4	4	4	4	4	4	24	17	4
5.	1	2	4	3	5	5	5.5	5	5	5	20.5	20	5
6.	5	6	3	2	6	6	5.5	6	6	6	25.5	26	6

Difference (Hi-Lo) 1.5 21% teeth 1.6 9% teeth 1.5 5% teeth 1.4 6% teeth 1.0 18% teeth

* Average def + DMF teeth per child (i.e. decayed, missing and filled teeth per child).

** % of children with def and/or DMF = 0 (i.e. % of children with no evidence of any decay).

TABLE 27

DIFFERENCES AMONG SASKATCHEWAN DENTAL PLAN REGIONAL RANKINGS IN TREATMENT LEVEL RATIOS BY PROGRAM YEAR

S.D.P. Region	Ranks (best=1, worst=6) on Two Measures of Treatment Levels										Total of Ranks All Years		Overall Summary Ranking	
	1974-75		1975-76		1976-77		1977-78		1978-79				'74-'79	'76-'79
1.	2.5*	2**	6*	5**	1*	1**	3*	3**	1*	1*	13.5*	12**	2	1
2.	4	4	2	2	2.5	2.5	4	4	2.5	2	15	14.5	3.5	3
3.	2.5	3	3	3	4	4	1	1	4	4	14.5	15	3.5	4
4.	1	1	1	1	2.5	2.5	2	2	2.5	3	9	9.5	1	2
5.	6	6	5	6	6	6	6	6	6	6	29	30	6	6
6.	5	5	4	4	5	5	5	5	5	5	24	24	5	5

Difference (Hi-Lo) 14% - 24% - 19% - 11% - 12% -

* Restorative treatment level: (filled teeth/def + DMF teeth) x 100

** Ratio of decayed teeth to filled teeth

²⁷These school division data were used because they contained two oral health indices not available in the Dental Health data (8080), and their format permitted tests of significance (ANOVA) among regions.

now appears) dedicated a much higher relative proportion of their services to restorations (at least in 1976-77 and 1978-79). The relative rank of regions 5 and 6 has not really improved over the five program years. However, it appears that the gap or difference between region 5 and the best region in each program year is improving with time (to a difference of 11% - 12% in 1977-78 and 1978-79 in the percent of decayed teeth at the beginning of the program year that are filled). From this review of historical records it is difficult to pin down the exact problem(s) regarding these two regions. It may be a question of resource allocation, staff turn-over, relative lack of emphasis on prevention, etc. The available data merely suggest an anomaly. The possibilities for improvement are apparent since in region 4 (Yorkton) dental decay was the fourth highest and yet as Table 27 shows, its treatment levels are the best overall or second best in the more stable period after 1975-76. Thus relatively high disease does not preclude achievement of relatively high treatment levels (also see p. 21, however, re Yorkton). That regional differences in children's dental caries prevalence exist in Saskatchewan is of no particular surprise; regional differences are found routinely in dental surveys of large geographic areas in Canada. The question of how large these differences are within Saskatchewan is partially answered by the data in Table 28. This table lists selected indicators of decay and its treatment for the years 1976-77 and 1978-79 in the province's school divisions within the six S.H.D.P. regions (computer data 8085).²⁷ In one-way analyses of variance the differences among regional means for six of the eight dental caries indicators over the two-year period were highly significant, with the remaining two close to being significant (at $p = 5\%$). This simply means that the regional differences are real and unlikely due to chance factors.

TABLE 28

SELECTED INDICATORS OF DENTAL CARIES ATTACK AND TREATMENT BASED ON
SCHOOL DIVISION DATA FOR S.H.D.P. REGIONS 1976-77 AND 1978-79

Simple Means of School Division Oral Health Data*

Program Year (eligible ages)	Dental Caries Indicator	Swift Current	Regina	Saskatoon	Yorkton	Prince Albert	North Battleford	One-way ANOVA	
								F	P
1976-77 (ages 5-9)	deft + DMFT	7.46	7.69	7.61	8.20	7.91	8.41	2.28	.06 (n.s.)
	decayed surf.	3.68	5.07	5.14	5.27	6.08	6.65	13.76	<.0001
	filled surf.	7.10	6.23	5.93	6.72	4.98	6.00	4.91	.0009
	% with 0 deft + DMFT	10.5%	9.0%	8.8%	8.3%	6.8%	6.2%	3.30	.011
1978-79 (ages 4-12)	deft + DMFT	6.05	5.98	6.30	6.57	6.77	7.05	3.90	.004
	decayed surf.	2.11	2.62	2.97	3.06	3.69	3.67	9.76	<.0001
	filled surf.	7.09	6.19	6.14	6.77	6.36	6.88	2.30	.057 (n.s.)
	% with 0 deft + DMFT	12.8%	12.5%	11.2%	11.5%	8.0%	7.9%	5.55	.0003

*Computer output PH 8085; weighted means using the school division sample sizes were also calculated.

This section addresses questions about the direct effect²⁸ of the

S.H.D.P. on the oral health of children participating in it. And, on the basis of the data available, oral health refers to dental caries attack. The survey data are examined for evidence that the Plan's services, primarily the preventive services such as the oral hygiene instruction and topical fluoride applications provided to most participating children, have decreased the attack (incidence) of dental decay. The analysis of this question would be greatly facilitated if survey data from a control group of Saskatchewan children similar in all respects except their participation in the S.H.D.P., or if large, representative baseline survey data were available for comparison. This is not the case however, so the analysis must be done by manipulations of the present data base.

Table 29 gives six measures of dental caries attack for the

primary and permanent teeth for each age (birth year) group and each program year. Each cell or box in the table is derived from dental

examinations of about 10,000 children. The most attractive temptation with these data is to follow one specific age group, e.g. six year-olds, over successive program years to see how caries attack changes as the influence on this age group by the S.H.D.P. grows by the increasingly greater involvement of this age group in the Plan at earlier ages.

However, perusal of initial differences in caries attack of children at the same age upon entry to the program (the top 'box' in each column of Table 29) suggests that this temptation should be avoided. This is because initial decay attack for children the same age entering the

program varies. The most striking example is the four year-old children who consistently show reductions in caries attack according to these data at program entry. These reductions of course cannot be attributed to

the program.²⁸ Other smaller differences at entry for five and six year-olds are apparent. Without adjusting the data for these initial deviations, another means for assessing caries attack is necessary.

²⁸ Indirect or "spin-off" effects of S.H.D.P. are not unimportant evaluative considerations; however, this historical review of records permits no such assessment.

TABLE 29

DENTAL CARIES ATTACK IN PRIMARY AND PERMANENT TEETH OF CHILDREN ENROLLED IN S.H.D.P. BY PROGRAM YEAR AND BIRTH YEAR*

Born 1968

5.63	1.39			
.99	6.08	△ 6		
6.62	1.18			

Born 1969 Born 1970

5.56	10.1	4.94	9.2	
.80	65.9	△ 6	1.5	91.9
6.36	13.4	5.09	1.93	

Born 1971

5.20	12.6	5.02	15.9	5.02	2.06
1.81	35.8	△ 7	.72	68.7	△ 5
7.02	9.0	5.74	14.1	5.21	2.01

Born 1972 Born 1973

5.02	11.1	4.78	22.3	3.98	3.07
2.54	21.5	△ 8	1.52	4.32	△ 5
7.56	6.0	5.47	9.9	4.92	21.9

Born 1966

5.23	10.3	△ 12			
4.42	7.9	△ 11			

Born 1974

4.82	11.6	4.70	1.41	4.46	1.89
2.26	26.5	△ 8	1.46	4.52	△ 6
7.09	6.9	6.16	6.2	5.03	16.9

Born 1975

4.45	13.1	4.38	16.6	4.21	2.14
2.08	29.6	△ 8	2.08	1.24	△ 7
6.53	7.9	5.62	12.7	4.74	1.90

Under age 9 Code: Over age 9

% with deft "0" def
DMFT "0" DMF
Both "0" Both

DMFT "0" DMF

* Source: S.H.D.P. computer data PH 8080.

△ = Approx. age of children

Program Year

'74-'75

'75-'76

'76-'77

'77-'78

'78-'79

'79-'80

One such method is to follow each birth year group separately from their first year of enrollment forward to the present and to observe

its annual incidence of dental caries (i.e., the decay increments each year). This required calculating the year-to-year mean differences

for each of the six dental caries indices for each birth year group.²⁹

These age interval increments are found in Tables 30 and 31.

As Table 30 shows, the age interval decay increments for the pri-

mary teeth are not reliable. In many age-interval groups, dental caries incidence appears to be negative from year-to-year,³⁰ an impossibility.

This unexpected finding may be due to the need to subtract cross-sectional data to derive these increments. Also, the transitory nature of the pri-

mary teeth, some of which are normally shed at these ages, makes examiner decisions about the reasons for their loss difficult in dental surveys.

What ever the reason(s) the dental health data for the primary teeth

cannot be further analyzed.

With the qualification that the cross-sectional nature of the data

still may be a problem, the decay increments of the permanent teeth

consistently increase with age in what appears to be a reasonable fashion

(Table 31). (The percent of children with no decay or restorative treatment

in the permanent teeth consistently decreases, also in the expected way.)

The analytical approach is to compare appropriate age interval decay

increments across birth years to see if there is consistency where the

levels of the S.H.D.P. service intervention is similar, and dissimilar-

ties (in the expected direction) where the S.H.D.P. service intervention

differs. Tentative conclusions might then be drawn.³¹

The age 4 to 5 interval shows good, expected consistency. Between

ages 5 and 6 the differences in mean increments and percents are fairly

consistent with the 1973 birth year group, the only one of the four

groups treated earlier at age 4, having very slightly lower caries attack.

²⁹ Although the available data for each birth year cohort are cross-

sectional and do not represent exactly the same children, most of them are the same so with such large sample sizes this method should

provide sufficiently reliable estimates.

³⁰ Closer examination of the "parent" data in Table 29 clearly demonstrates the reasons for these negative increments; only for birth years 1970,

1973 and 1974 do the average def tooth scores increase with time.

³¹ It should be stressed that if dental caries attack after entry into the Plan really differs among both year groups due to factors unrelated to the S.H.D.P., then these unknown factors would be the cause of any observed differences.

The age 6 to 7 interval demonstrates that the three birth year groups who first received treatment under the S.H.D.P. earlier when they were 5 years old have about a 24% lower caries increment than the two birth year groups who began treatment under the S.H.D.P. only at age 6 years (on average, .75 DMFT increments versus .99). The age 7 to 8 interval and the age 8 to 9 interval show, as expected, similar increments when the previous exposure to the program is identical (in birth years 1968 and 1969) and slightly lower increments with increased exposure to the program in 1970 and 1971 (with one exception, 7 to 8 interval for 1970.) The 9 to 10 interval and 10 to 11 intervals indicate a 26% lower decay increments for those having three or four years of prior exposure to the program over those having less exposure (one or two years). This was about .43 DMFT increments versus .58 for the age 9 to 10 interval, and .55 DMFT increments versus .74 for the age of 10 to 11 interval.

In view of these various single year age interval findings it is not surprising that when intervals longer than one year are examined, similar program effects on dental caries increments³² are observed. For example, for the age 6 to 8 interval about 15% lower increments (on average, 1.48 DMFT increments versus 1.73) and for the age 9 to 11 interval about 25% lower increments (on average, .99 DMFT increments versus 1.32) in favour of the groups participating longer in the program is found.

In summary, it appears that by using an age interval approach with cross-sectionally determined permanent tooth decay increments, lower dental caries incidence with increased exposure to the S.H.D.P. service interventions can be demonstrated. Although these reductions have been shown to be of the order of 25%, the absolute decrements are small -- a difference of about .19 to .24 DMFT per child over one year, .25 DMFT over two years and .33 DMFT over three years.

³²The findings with respect to the percent of children with no evidence of permanent tooth decay or treatment are less marked and consistent but, in general, support the notion of greater improvements with greater program exposure.

TABLE 30

CROSS-SECTIONAL CARIES ATTACK AGE INTERVAL INCREMENTS* FOR PRIMARY TEETH

Caries Attack Increments by Birth Year -- Primary Teeth**

Interval Years	1966	1967	1968	1969	1970	1971	1972	1973	1974
4 - 5	-	-	-	-	-	-	-	.09/-4.5%	.37/-
5 - 6	-	-	-	-	.08/+6.7%	-.23/-3.5%	-.32/-3.4%	.14/-4.8%	-
6 - 7	-	-	-.12/-4.0%	-.36/+2.5%	.01/-2.9%	-.09/-3.0%	-.08/-2.3%	-	-
7 - 8	-	-	-.22/-1%	-.18/-1.5%	-.21/-1.4%	-.25/-1.0%	-	-	-

* Note: '-' deft is questionable

** Code: '+' & with '0' deft is questionable
 ** Code: deft difference/'0' deft difference

TABLE 31

CROSS-SECTIONAL CARIES ATTACK AGE INTERVAL INCREMENTS FOR PERMANENT TEETH

Caries Attack Increments by Birth Year -- Permanent Teeth*

Age Interval Years	1966	1967	1968	1969	1970	1971	1972	1973	1974
4 - 5	-	-	-	-	-	-	-	.04/-2.9%	.04/-3.2%
5 - 6	-	-	-	-	.57/-23.2%	.49/-19.8%	.43/-19.0%	.40/-18.4%	-
6 - 7	-	-	.96/-27.2%	1.01/-30.1%	.80/-25.5%	.79/-25.9%	.67/-24.2%	-	-
7 - 8	-	-	.76/-15.4%	.73/-14.3%	.74/-16.7%	.62/-15.6%	-	-	-
8 - 9	-	-	.50/-5.3%	.47/-6.8%	.43/-7.8%	-	-	-	-
9 - 10	-	-	.58/-4.5%	.44/-3.6%	.42/-3.6%	-	-	-	-
10 - 11	-	-	.74/-2.8%	.55/-1.7%	-	-	-	-	-
11 - 12	-	-	.82/-1.8%	-	-	-	-	-	-
12 - 13	1.02/-3.5%	-	-	-	-	-	-	-	-

* Code: DMFT difference/'0' DMFT difference

PUBLIC ATTITUDES AND SATISFACTION

The parents of enrolled children have experienced the administration and organization of the S.H.D.P. and have interacted with its staff, either directly through personal contacts or indirectly through their children and mailings from the Plan. As a result of this interaction attitudes, expressed as satisfaction or dissatisfaction with various Plan aspects, are formed. Satisfaction thus becomes an important evaluative criterion or outcome measure of the performance of the S.H.D.P. Indirectly, hints of general satisfaction with the Plan are evident from the continuing high enrollment of eligible children by their parents, by the continuance of the originally planned phase-in of new age groups, and by the recent extension of coverage to adolescents. Direct satisfaction is, however, best assessed through social, attitudinal surveys.

One such survey was conducted by telephone interviews with a randomly selected sample of 600 families having children enrolled in the S.H.D.P. in March, 1978. The interview was designed to assess the following four areas:

- (i) the level of general satisfaction with the Plan;
- (ii) the level of satisfaction with the services provided by the Plan staff;
- (iii) the level of satisfaction with the organization and delivery of dental services under the Plan;
- (iv) the use and cost of private (or uninsured) dental services.

The detailed findings of the study were published in a report dated October, 1979 -- "An Attitude Survey of Families Enrolled in the Saskatchewan Dental Plan". A summary of these findings published as "survey highlights" in this report follow.

- 84.7% of the respondents had been invited to visit a dental clinic; 80.5% had visited a clinic, with Swift dental clinic recording the highest number (90.3%).
- Inconvenience was the major obstacle to visiting a dental clinic (6.3%).

Levels of Satisfaction with the Organization and Delivery of Dental Services

3. Levels of Satisfaction with the Organization and Delivery

- Only 55.8% were aware that dental nurses are supervised by dentists; the highest level of awareness was found in Swift Current Health Region and the lowest in urban areas.
- 90.5% were satisfied with the dental health education program; 3.5% were not satisfied, while a further 3.2% had not received any dental health education.
- 94.3% reported that they were satisfied with the handling of their children by dental staff.
- 85.5% indicated that they were satisfied with treatment plans prepared by dental staff.
- Dissatisfaction with treatment plans centered on the provision of too many services; however, only 3.5% pointed to this concern.
- 94.3% were satisfied with the dental health education program; 3.5% were not satisfied, while a further 3.2% had not received any dental health education.
- Only 55.8% were aware that dental nurses are supervised by dentists; the highest level of awareness was found in Swift Current Health Region and the lowest in urban areas.
- 89.2% felt that dental nurses provide satisfactory services; respondents served in rural areas recorded the highest level of satisfaction with dental nurses in the province (94.0%) and respondents whose children receive services at the MASCANA Institute of Applied Arts and Science (WIAAS) registered the lowest level (86.0%).
- Pain experienced by children was the major source of dissatisfaction with dental nurses; 1.8% cited this as the cause for their lack of satisfaction.
- 94.3% reported that they were satisfied with the handling of their children by dental staff.
- 85.5% indicated that they were satisfied with treatment plans prepared by dental staff.
- Dissatisfaction with treatment plans centered on the provision of too many services; however, only 3.5% pointed to this concern.
- 90.5% were satisfied with the dental health education program; 3.5% were not satisfied, while a further 3.2% had not received any dental health education.
- Only 55.8% were aware that dental nurses are supervised by dentists; the highest level of awareness was found in Swift Current Health Region and the lowest in urban areas.

Plan Staff

2. Level of Satisfaction with Services Provided by Dental

- 89% of the respondents were satisfied in general with the Saskatchewan Dental Plan, while 7.8% indicated that they were not satisfied; the high level of general satisfaction was found in all parts of the province served by the Dental Plan.
- 39.7% stated that they had recommended the Dental Plan to other parents.
- 79.5% thought that the provincial dental plan should be expanded to include children up to 18 years of age; 10% were not in favour of such an extension.
- 56.8% had noted an improvement in the dental health of their children since enrollment in the Dental Plan.

1. Level of General Satisfaction with the Dental Plan

- 91.9% of those who had visited a clinic found the visit worthwhile.
- 87.7% stated that they were satisfied with the dental offices.
- 85.6% indicated that they would like to be notified, ahead of time, of their child's appointment.

4. Use and Cost of Private (or uninsured) Dental Services

- 13.2% had children requiring private dental services.
- 3.7% of the respondents had not received the required private dental services.
- 94.5% received the necessary dental services, be it from the SDP or private dentists.
- 90.6% reported that they had not incurred any direct costs for children's dental services in the past year.

These findings speak for themselves. It is very evident that although there were some minor concerns expressed, there was overwhelming support for the Plan, its organization and its dental nurse services. The patients' parents are satisfied.

Especially now that older children are enrolled and more of them will continue to be enrolled in the near future, it would be of interest to do social surveys of these older patients on a regular basis. The findings could serve as useful administrative feedback to the Plan's managers. The satisfaction of the children as well as their parents is important. It would also be of interest to interview in more detail those relatively few parents of enrolled children who expressed concerns. Similarly, it is important to determine the reasons and attitudes of those parents of eligible children who chose not to enroll their children in the S.H.D.P.

SASKATCHEWAN HEALTH DENTAL PLAN COSTS

An inevitable consequence of all the activities and treatments rendered under the S.H.D.P. is their cost. In its first few years of operation the expenditures for capital equipment purchases, administration, and field staff salaries and travel were understandably high relative to the number of children initially enrolled. The resultant high cost per enrolled child in the early program years of the S.H.D.P. raised some legitimate, albeit premature, concerns in the national and international dental care communities about the Saskatchewan delivery system. Thus, an assessment of the S.H.D.P. performance would be incomplete without considering its money costs. The Annual Reports form the basis for this cost review. Real dollar costs, unadjusted for inflation, are utilized. Indirect program costs such as those associated with the dental nurse training program at the Wascana Institute of Applied Arts and Sciences are not included.

Table 32 presents the financial statistics from the Annual Reports between 1974-75 and 1979-80. In an attempt to provide as complete a financial picture of direct costs as possible, the Department of Education's clinic establishment costs have been included and the offsetting revenues generated by the S.H.D.P. (such as the registration and licensure of dental nurses, and reimbursements from the Department of National Health and Welfare for care to enrolled registered Indian children) have been deleted to give "grand total cost" estimates (Item 7, Table 32). The most striking observation is the contrast between the overall large growth in total expenditures and the high decrease in the various cost components on a per capita basis over time as enrollment in the S.H.D.P. enlarges. Thus, while "grand total costs" have risen from \$2,142,541. in 1974-75 to \$8,305,320. in 1979-80, the costs per enrolled child have dropped dramatically from \$163.05 to \$68.00 over the same period. This latter finding merely reflects the anticipated effects of economy of scale attributable to the greatly increased numbers of enrolled children and their consequently greater concentration in each school for treatment. These and other selected cost changes are summarized in Table 33 which uses an index number approach.

TABLE 32
SUMMARY FINANCIAL STATEMENT OF S.H.D.P. 1974-75 TO 1979-80

	1974-75	1975-76	1976-77	1977-78	1978-79	1979-80
	Total	Per Enrollee	Total	Per Enrollee	Total	Per Enrollee
	\$	(n=13,140)	\$	(n=84,032)	\$	(n=122,139)
1. OPERATING EXPENSES*						
Central Administration (argins)	341,519.	25.99	389,495.	468,346.	542,983.	663,735.
Program Expenses						
-Salaries	1,348,235.	102.61	3,511,425.	4,411,455.	5,649,039.	6,121,084.
-Travel	196,391.	14.95	482,292.	543,597.	606,512.	596,678.
-All other	471,797.	36.06	621,166.	707,195.	937,653.	976,770.
Subtotal	2,016,423.	153.62	4,614,883.	5,662,247.	7,193,204.	7,694,532.
Total Operating Expenditure	2,357,945.	180.24	5,054,378.	6,130,594.	7,736,188.	8,358,267.
Capital Equipment Purchases	467,397.	35.63	14,320.	68,073.	47,730.	158,811.
1. TOTAL EXPENDITURE**	2,825,342.	215.87	5,068,698.	6,198,667.	7,783,919.	8,517,079.
2. ACTUAL COST OF SERVICES**	3,079,968.	235.29	5,030,521.	6,250,163.	7,758,578.	8,429,429.
3. DEPARTMENT EDUCATION**						
Accumulative Costs to Date of Establishing Dental Clinics	170,000.		1,502,253.	1,557,652.	1,683,156.	1,910,500.
Plus Current Fiscal Year Costs	1,081,459.		55,398.	125,504.	227,344.	397,291.
Cost of Above Using IX	62,573.	4.76	77,882.	84,158.	95,525.	115,390.
Depreciation	-		-67,283.	-128,412.	-170,327.	-239,499.
3. TOTAL OFFSETTING REVENUES**	-	-	-67,283.	-128,412.	-170,327.	-239,499.
4. GRAND TOTAL COSTS (3+5-6)	2,142,541.	163.05	5,041,120.	6,205,909.	7,683,776.	8,305,320.

* Statement 1 of S.H.D.P. Annual Reports.

** Statement 3 of S.H.D.P. Annual Reports.

*** Introduction to expenditure statements in S.H.D.P. Annual Reports.

INDEX NUMBERS FOR SELECTED S.H.D.P. COSTS* 1974-75 TO 1979-80

TABLE 33

S.H.D.P. Program Year	Grand Total Costs**	Actual Cost of Services***	Central Ad- ministration	Staff	Travel	Establish ments***	Cost per Enrolled Child
1974-75	100.0 (\$2,142,541)	100.0 (\$2,079,968)	100.0 (\$25.99)	100.0 (\$14.95)	100.0 (\$4.76)	100.0	100.0 (\$163.05)
1975-76	192.0	194.8	40.9	65.2	42.0	67.1	51.3
1976-77	235.3	241.9	28.1	53.6	27.1	51.3	45.3
1977-78	289.7	300.5	21.4	43.3	21.0	45.3	49.9
1978-79	358.6	373.0	19.0	37.0	18.3	49.9	41.7
1979-80	387.6 (\$8,305,320)	405.3 (\$8,429,429)	20.9 (\$5.43)	32.5 (\$4.86)	19.7 (\$0.94)	41.7	41.7 (\$68.00)

*Real dollars
**Grand total costs" are derived in Table 32 while "actual total costs of services"
originate from Statement 3 of the S.H.D.P. Annual Reports.
***Costs incurred by Department of Education for establishment of dental clinics.

Equating the initial program year costs to 100 in each instance, Table 33 shows that program costs have grown by about 300% whereas, concomitantly, the costs per enrollee have dropped by about 58% between 1974-75 and 1979-80. Part of this change in costs per child is attributable to even greater decreases in certain program components. For example, Table 33 indicates that the per child costs of both the central administration and (amortized) clinic establishment have dropped by nearly 80%, while field staff travel costs are now lower by two-thirds. The foregoing data seem to indicate a more efficient operation of the S.H.D.P. with time. However, this efficiency could simply be a statistical artifact because enrollment in the Plan has increased by some 109,000 children since 1974-75. Thus costs per child would automatically drop even with a low level of care per child. It is necessary to assess other process and outcome measures of the Plan in combination

with costs to assure improved efficiency. The continuing high level of completed cases and slight improvements in oral health status documented previously along with the lower costs per child support the notion of greater program efficiency, i.e. lower unit costs over time with equal or better service/health performance.

Table 34 gives a more direct assessment of two efficiency criteria, cost per visit and cost per service, with the real, unadjusted costs used.

TABLE 34
COST PER VISIT AND COST PER SERVICE

<u>S.H.D.P. Program Year</u>	<u>Cost Per Visit*</u> \$	<u>Cost Per Service**</u> \$
1974-75	-	12.99
1975-76	28.89	9.30
1976-77	21.63	7.16
1977-78	20.24	6.51
1978-79	19.07	6.61
1979-80	20.03	7.19

*Determined by dividing Actual Cost of Services by number of visits for appropriate program years (PH 8079). Necessary visit data unavailable for 1974-75.

**Determined by dividing Actual Cost of Services by Grand Total of Services for appropriate program years (Table 32).

Cost per visit decreases to 1978-79 then rises. Costs per service decline rapidly in the first three program years then level off and rise slightly after 1977-78, the year of lowest per service cost. Although these time series data seem to point to improving efficiency over the first four or five program years followed by an apparent levelling off, it should be stressed that both the content of visits and characteristics of the services provided are probably changing with time. This complicated the interpretation of the time series. A standardized aggregate measure of annual productivity, such as the number of RVU's produced each program year, compared to annual costs would allow improved interpretation.

The salaries of the regional field staff make up a very high pro-
 portion of Plan costs -- from 63% to 74% of the Grant Total Costs listed
 in Table 32. Much of these salaries consist of the salaries paid to the
 staff of the dental nurse teams. It is important, therefore, to examine
 efficiency aspects of the dental nurse teams. With time, were the dental
 nurses able to care for more patients? Table 35 presents the ratio of
 enrolled children to dental nurses (in terms of permanent position
 equivalents).³³

TABLE 35
 ENROLLED CHILDREN PER DENTAL NURSE BY PROGRAM YEAR

Program Year	Number	Index
1974-75	262	71.2
1975-76	368	100.0
1976-77	494	134.2
1977-78*	539	146.5
1978-79	705	191.6
1979-80	638	173.4

*Ratio is distorted because children born in 1973 only became
 eligible to enroll in February, 1978.

Using 1975-76 as the base year (rather than the 1974-75 start-up
 year), Table 35 indicates that in each following year greater numbers of
 enrollees/patients were treated per dental nurse. The gain was 34% in
 1976-77 and 73% in the fourth year after the base year. Thus it is very
 evident that each dental nurse cared for more children, on average, over
 time without, as has been shown previously any noticeable sacrifice of
 care completions.³⁴ This greater efficiency undoubtedly arose from a
 variety of reasons, including lower child dental care needs and staff
 travel time.

³³After 1974-75 there was a vacancy rate each year in these positions of
 about 11%; thus the number of children per nurse would be about 11%
 lower if there had been no vacancies.

³⁴It is interesting that in 1978-79 the number of children per nurse rose
 sharply. This may explain why the rate of completions that year was
 relatively low (see earlier Table 8).

Another way of assessing the S.H.D.P. costs is to compare them with the costs of other provincial children's denticare plans. This comparison is presented in Table 36. The footnotes of this table are particularly important to its proper interpretation as is the recollection of previously described lower utilization and unknown patient completion rates of the Quebec, Nova Scotia and Newfoundland private, insurance plans relative to Prince Edward Island's and Saskatchewan's public, direct service plans. The costs per user child after 1978, except for the recent Quebec estimate, are similar. The appropriate amount to add on to the costs of each of the other programs for administration to make the comparison among plans fairer is unknown. The central administrative costs of the S.H.D.P. from 1977-78 onwards are from about \$5.00 to \$5.50 per child per year. Adjusting the S.H.D.P. costs downwards by this amount and, as well, for capital expenditures suggests that the Saskatchewan costs, despite the provision of more services and wider coverage (utilization) under the S.H.D.P. are actually lower than or equal to the costs of the other provincial insurance children's plans.

The S.H.D.P. appears now to be performing with better, or at least equal effectiveness at lower, or at least equal cost per child.

TABLE 36

PROVINCIAL CHILDREN'S DENTICARE COST* COMPARISONS 1974-80

Year	Quebec Cost/ Beneficiary	P.E. Island Cost/ Clinic Patient	Program Year	Nova Scotia Cost/ Beneficiary	Newfoundland Cost/ Treat. Child	S.H.D.P. Cost/ Enrollee
1974	\$52.92	about	1974-75	-	\$28.25	\$163.05
1975	60.80	\$50.	1975-76	\$56.06	44.09	109.48
1976	64.35	-	1976-77	48.63	45.49	83.70
1977	65.30	-	1977-78	53.13	42.86	73.83
1978	59.23**	55.-60..	1978-79	58.61	54.41	70.01
1979	85.74 (est.)	-	1979-80	65.28	-	68.00

- *Notes: (i) only for S.H.D.P. are administrative travel and capital costs included;
(ii) S.H.D.P. appears to provide about 33% to 50% more services per patient, and about the same number per patient as in Quebec;
(iii) each program now treats children up to age 13 or 14 years.

**Expenditures affected by dentists temporarily opting out of denticare program to speed up fee schedule revision.

RECOMMENDATIONS

A number of general recommendations organized under six sub-headings follow.

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1. Specific Program Objectives

To aid future evaluations and, more importantly, to help on-going administrative program monitoring and planning, specific program objectives using measurable criteria are needed. The areas where specific objectives need to be defined include: utilization; care completions; oral health status; treatment levels achieved; and various dental service parameters. (It is believed that some more specific program objectives have already been identified; this is commendable.)

2. Administrative Computer Reports

Some modification of present computer programming to improve the administrative usefulness of the computer output and to facilitate report development is desirable. Changes and/or additions are especially needed in view of the expansion of the S.H.D.P. to include adolescents and greater numbers of participating private dental practitioners.

3. Oral Health Surveys

Because of the Plan's expansion to include adolescents and for other reasons, it would be desirable to include other aspects of dental health beyond the present very detailed assessments of dental decay. Also, current dental survey methodology suggests that reliable and valid data are best achieved by using a smaller number of trained and calibrated dental examiners. Therefore, it is recommended that more detailed sample surveys of Saskatchewan children and adolescents be undertaken periodically (perhaps every five years) using a small group of trained dental examiners.

³⁵In addition, there are several suggestions for further inquiry specified or alluded to previously in other sections of this report.

4. Social, Attitudinal Surveys

Periodic social surveys both of parents and selected groups of child/adolescent enrollees are recommended as important ways of determining satisfaction with the Plan and of identifying problems. This is especially important as the Plan expands to include new, older patients and more private dentists. Additionally, special surveys into the reasons for non-enrollment and restricted consent are needed along with detailed follow-ups on those who express dissatisfaction and problems in the overall, enrollee surveys.

5. Further Clinical Studies

The S.H.D.P. offers great opportunity for selected clinical studies of direct benefit to the Plan's continued efficiency and effectiveness. Examples are: further retreatment studies in other S.H.D.P. regions; assessment of regional differences in treatment service patterns; the need for a closer linking of oral health status and treatment level survey findings with clinical practices; explanatory evaluations of the differences in dental nurse team productivity; detailed follow-up on any subsequent oral health differences between those getting and not getting diagnostic radiographs; the evaluation by controlled clinical trials of different clinical procedures and materials.

It must be emphasized in the strongest possible way that the clinical studies are being recommended only to the extent that legitimate uncertainties exist in some dental practice areas and that clarification of these uncertainties would result in better, more efficient and effective services to all Saskatchewan children in the future. The studies would be based on practical needs and not merely academic interests. The most appropriate mix of resource-intensive preventive measures and the targetting by risk groups of such services is an excellent example of a very important and increasing concern of the S.H.D.P. where uncertainty abounds in the general dental community. The earliest answer(s) may arise from within the S.H.D.P. which has an almost unique opportunity for such dental health services research.

6. Future Evaluations

It is recommended that the present, internal evaluations by the S.H.D.P. staff be continued and expanded. (The retreatment study in two S.H.D.P. regions and the dental team work review assessments are good examples of this.) The need for greater, internal monitoring (evaluation) as an inherent part of the program planning process will increase as the Plan's enrollees (adolescents) and providers (private dentists) expand. Consideration might be given to the setting up of a very small internal evaluation unit consisting of (present) central and regional staff to give particular emphasis to this anticipated growing need.

Periodic external evaluations are also recommended. With one possibility next considered being the on-site, direct assessment of the process of care ranging broadly through from diagnosis, treatment planning, and service provision to the patient-staff interpersonal relationships. This would complement the on-going internal assessments of this nature.