Is Regular Visiting Associated with Lower Costs? Analyzing Service Utilization Patterns in the First Nations Population in Canada

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Abstract

Objectives: *Using an administrative database of dental service records from the Non-Insured Health Benefits (NIHB) program of Health Canada for 1994-2001, the authors set out to test whether regular visitors had lower program expenditures.* ***Methods:*** *The age-specific mean expenditures per client were compared among those with regular examinations in 8, 7 and fewer years. The study further examined the effect of regular visiting over the first 6 years on expenditures in the last 2 years. "Continuity of care" was measured by the numbers of consecutive years prior to 2000 in which clients had a regular examination. In a "gap analysis" individuals were classified according to the number of years prior to 2000 since they last had an initial or recall examination. Mean expenditures per client were analyzed by age group and type of service.* ***Findings:*** *Over the 8-year period, clients with regular visits had the highest expenditures. In both the continuity of care and gap analyses, the findings were generally consistent; the more that clients visited over the first 6 years, the higher the expenditures in the final 2 years. Clients with more "regular" (initial and recall) examinations received a relatively standard, age-specific, pattern of service but incurred greater expenditures compared to clients with fewer regular, or longer gaps in, examinations.* ***Conclusion:*** *The observations of the authors in this client group do not support the thesis that regular visiting is associated with lower expenditures on dental care.*

Key Words: Health services research; dental records; utilization review; health services needs and demands; insurance, dental

Introduction

Regular dentist visits are held to be a requirement to achieve and maintain oral health. Visiting twice yearly has been promoted since the late 18th Century (1), and remains the advice provided by dental associations in Canada (2, 3). However, the extent of the benefits to health given the resource requirements inherent in following a policy of six-monthly visits has been questioned (4-7). In 1988, The British Association for the Study of Community Dentistry found that "... at least an annual check-up visit in dental health education..." was desirable. Allegedly, as a result of these reports, many Canadian private dental insurers lengthened the period between indemnifiable visits from 6 to 9 months. In the National Health Service in the UK, dentists continue to be reimbursed for six-monthly checks and to encourage regular visits, and NHS coverage lapses if a client fails to visit within 15 months of the last visit (8). However, a recent systematic review of the effectiveness of routine dental checks (8) found that there was... "no high-quality evidence to support or refute the practice of encouraging six-monthly dental checks in adults or children."

The authors have reviewed the potential of analyzing administrative databases to address questions of oral health policy (9). Since cost-containment is often an issue with dental health care plans, the factors that influenced the annual costs of Health Canada's Non-Insured Health Benefits (NIHB) dental program have also been examined (10). The NIHB dental program operates much like an indemnity "insurance" program where Canada's First Nation and Inuit people are eligible to attend private dentists who invoice and are paid directly by the program administrators according to a federal government, fixed, fee schedule. The services are comprehensive, including orthodontic care, and there are no co-payments or deductibles. There are limits in the frequency of the provision of removable prosthetics, and predetermination of the provision of crowns and endodontic services.

The premise that regular examination and prompt follow-up care leads to better health and better health leads to less need for services and hence lower program expenditures can be examined, at least in part, by analysis of the NIHB database. The purpose of this study is to compare the costs to the NIHB program (referred to as expenditures in the rest of this paper) between clients who were "regular" visitors and those who were not regular visitors. The working hypothesis of the study was that clients with regular dentist visits would have lower program expenditures than clients who visited irregularly. The authors felt that they could examine this question, at first using the whole 8 years and secondly, over the last 2 years. At the second stage, the authors wanted to explore

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whether the final 2-year expenditures were associated with continuity of care or gaps in care in the previous 6 years.

Methods

The methods have been fully described in a previous publication (10). Briefly, the electronic records for service utilization under the NIHB programme from Health Canada were obtained for the period 1994 to 2001. Each record contained 13 items including the service code, the tooth number, tooth surface, date of service, client identification numbers (encrypted), band number (encrypted), date of birth, sex, provider identification number (encrypted), region of provider, type of provider (denturist, dentist - whether general practitioner or specialist type), the amount paid and the laboratory fee paid. The client, provider, and band identifiers were encrypted to preserve anonymity.

Service utilization data were aggregated into client-specific records to produce a master client-level file. The accuracy of these procedures was validated by comparing the total numbers of service units in the service-level master file with those in the client-level file. In all there were records of over 1.9 million patient-years of care.

For this project, the age of clients was assigned as their age at the end of the study, so children under 8 years old were not available for all years of the study period. The age-specific numbers of clients with one or more services in each of the 8 years were derived.

Study Design. The study was conducted in two stages. First, the pattern of visits and mean expenditures per client by age group, over the whole 8 years was examined. In the second stage, the association between the visiting pattern over the first 6 years and the expenditures in the last 2 years was examined. In this stage, total expenditures were further disaggregated into expenditures by type of service and age group. The robustness of the general findings were then tested by examining the costs, by service type, in the age group with the most stable dentitions, i.e., those aged 20-39.

Dependent variable. For the first stage, the dependent variable was the mean expenditure per client measured by the mean amount per client paid to providers (dentists, dental specialists, denturists and dental laboratories) for the whole study period. For the second stage the dependent variable was the mean expenditure per client for the two years, 2000 and 2001. For the second stage continuity of care and gap analysis, the mean expenditure was further disaggregated into expenditures by service type and by age-group.

Independent variables. Provision of either initial complete or recall examinations was used as the indicator of regular (preventive) visiting. The authors assumed that the provision of emergency or specific examinations would be the result of symptomatic visits and not typical of regular visitors. However, none of the regular visitors were excluded if they also had one or more other types of examinations. Regular visitors were categorized according to three variables. At Stage 1 the number of years with regular examinations was used. At Stage 2 both the number of consecutive years receiving regular examinations and, for the gap analysis, the numbers of years without a regular examination were used.

Years with regular examinations - For Stage 1, regular visiting was categorized according to the number of years the person received one or more complete or recall examinations. These ranged from receiving a regular examination in all 8 years to having no regular examination in any of the 8 years. Since age is reported as the age at the end of the study period, the 0 - 4 year-old group could only have regular examinations for a maximum of 4 years, and only one age-cohort of those aged 5-9 could have had a regular examination in all 8 years.

Consecutive years with regular examinations (Continuity of Care) - At Stage 2, the levels of regular visiting, were defined according to the number of

TABLE 1
Mean expenditure ($) by the number of years with regular examination and age group, 1994-2001

	0 - 4 years		5 - 9 years		10-14 years		15-19 years		20-39 years		40-59 years		60 & over		All Ages	
Regular Exam	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N
All 8 years	-	0	2539	82	2626	3456	3457	2449	3228	1105	3091	841	3383	323	2925	8256
In 7 years	-	0	2013	575	2285	4897	3258	3958	2833	4293	3071	2772	3239	797	2714	17292
In 6 years	-	0	1689	1803	1962	6836	2893	5589	2765	9048	3025	5328	3194	1096	2567	28831
In 5 years	-	0	1447	3380	1676	7629	2483	6850	2581	15701	3001	7658	3128	1243	2362	43330
In 4 years	1369	30	1213	6244	1397	8970	2104	7768	2317	24355	2712	11081	2932	1756	2104	60204
In 3 years	1085	472	999	10281	1084	9719	1657	8856	1919	33549	2303	15136	2385	2494	1737	80507
In 2 years	771	2665	804	15188	810	10425	1195	9437	1431	42732	1813	20990	1889	4433	1324	105870
One year only	517	10453	595	20251	540	11303	737	9763	884	48763	1205	29674	1249	11305	864	141512
No Regular Exam	308	2627	404	3612	405	2397	727	2076	562	15319	813	16251	926	9950	679	52232
Average	543	16247	861	61416	1296	65632	1860	56746	1616	194865	1842	109731	1613	33397	1509	538034

TABLE 2
Mean expenditures ($) in 2000 & 2001 by number of years of continuous regular examinations in 1999 and before

Regular Examinations in (each of) the:	N	Mean expenditures ($) in 2000 & 2001
6 years prior (1994-1999)	16122	668.15
5 years prior (1995-1999)	5198	603.61
4 years prior (1996-1999)	7738	583.90
3 years prior (1997-1999)	17173	551.05
2 years prior (1998-1999)	32066	498.59
year prior (1999)	95257	436.31
Sub total of those with an exam in 1999	173554	492.30
Years with gaps in exams (years missed)		
1-year gap (1999 only)	96660	374.47
2-year gap (1998-1999)	58963	309.31
3-year gap (1997-1999)	41418	263.44
4-year gap (1996-1999)	37027	229.23
5-year gap (1995-1999)	22549	209.15
6 or more-year gap (1994-1999)	107863	381.80
Sub-total of those with gaps in exams of one or more years	364480	328.50
Total / Overall Mean	538034	381.34

consecutive years, prior to 2000, in which people had one or more regular examinations. This was termed "continuity of care."

Gap in care - Also at Stage 2, clients were classified according to the "gap in care" which was operationally defined as the interval (number of years), prior to 2000, since their previous initial or recall examination. Thus, someone who had a regular examination in 1999 had no gap, but someone who had an examination in 1998 and no examination in 1999 had a one-year gap.

At this stage, the patterns of regular visiting by age-group and by type of service provision were also examined.

Findings

Mean expenditures over 8 years by years of regular examination. Table 1 shows the eight-year mean expenditures per client, for all ages and by age group, by the number of years with one or more regular examinations. The mean expenditure for all clients ("all ages" column) with initial or recall examinations in all 8 years was $2925 - more than for clients with fewer years of regular examinations. The pattern is direct; the fewer the years with regular visits, the lower was the 8 year expenditure. The pattern is also consistent for all of the 7 age groups.

Mean expenditure in the last 2 years by continuity of care. The stage 2 operational definitions of regular visiting ("continuity of care" and "gap in care") complement each other. Using the "continuity of care" criteria, a minority of clients (173,554, or 32%) had regular examinations in 1999 and 364,480, or 68%, did not have a regular examination in 1999.

Table 2 shows that the mean expenditures in 2000 and 2001 were highest for clients with regular examinations in each of the 6 previous years ($668.15) and declined with decreasing number of consecutive years of regular examinations. Expenditures were lowest ($436.31) for clients who had only one year (1999) with a regular examination prior to 2000.

For those with a one or more-year gap in receipt of a regular examination expenditures in 2000 and 2001 decreased as the gap increased, up to 5 years. For a gap of 6 or more years (the data is censored before 1994) the mean expenditure ($381.80) exceeded the mean expenditure for clients with a one-year gap ($374.47) but not for those with no gap ($492.30).

Mean expenditures in the last 2 years by continuity, gaps and type of care. Table 3 shows that for all ages, the 6-year, continuously examined clients had the highest expenditures in 2000 and 2001 for three categories: preventive; surgical; and orthodontic services. These same clients had expenditures that were close to (85% or more of) the highest category for diagnostic, restorative, periodontal, and adjunctive services. They were in the lower tier of expenditures only for endodontic and fixed and removable prosthetic services.

Expenditures on orthodontic services varied the most, from $204 per client for the highest level of continuity to $13 per client for the lowest level of continuity. Restorative, surgical and adjunctive care expenditures were relatively stable for all levels of continuity. Generally, removable prosthetic expenditures increased as continuity fell. Even though endodontic and surgical care can to some degree be substituted, endodontic care followed the expected pattern (higher expenditures among those with only one year of prior utilization) but surgery amounts were relatively stable across continuity levels.

Detailed service-specific expenditures for all age-specific groups are not shown in tables for this report. However, the type of care was found to be one of the major explanatory variables. In children, aged 10 to 14 years, and adolescents aged 15 to 19 years, orthodontic services in 2000 and 2001 were the single largest category of expenditures for those with high continuity. Restorative care and surgical care expenditures remained relatively stable across different levels of continuity and age groups. In the two oldest age groups, the variability in the mean total expenditures was largely a function of the differences in expenditures on preventive, removable prosthetic and periodontal services. In the oldest group, those with no services in 1999 had much lower expenditures for preventive, diagnostic, restorative and periodontal services, but similar expenditures for removable prosthetic services.

TABLE 3
Mean expenditures ($) in 2000 & 2001 by continuity of regular examinations and service category (all ages)

	Regular Examinations						No exam	
Care Provided:	In all 6 years prior	In all 5 years prior	In all 4 years prior	In all 3 years prior	In two years prior	In the year prior	In the year prior	Overall mean
N	16122	5198	7738	17173	32066	95857	364480	538034
Diagnostic	91.4	94.5	87.8	76.2	64.5	51.4	43.4	49.7
Preventive	111.9	98.7	96.0	93.5	73.9	52.9	33.9	45.4
Restorative	176.3	165.1	166.1	179.3	181.4	172.3	126.4	142.0
Endodontic	16.6	14.2	14.9	21.5	24.7	28.5	21.3	22.5
Periodontic	13.1	8.3	9.4	14.6	13.9	11.6	6.2	8.2
Removable Prosthetic	13.0	9.4	14.6	29.0	35.2	47.7	48.4	44.9
Fixed Prosthetic	1.0	0.2	0.7	1.7	2.3	2.0	1.3	1.5
Surgery	33.7	30.4	32.2	26.8	27.0	30.1	27.9	28.4
Orthodontic	204.0	176.8	153.5	102.4	69.1	32.8	13.5	32.4
Adjunctive	7.3	6.1	8.6	6.1	6.6	6.9	6.1	6.4
All Services	668.2	603.6	583.9	551.0	498.6	436.3	328.5	381.3

Note: All dollar amounts rounded to nearest ten cents and no final zeros printed

TABLE 4
Mean expenditures ($) in 2000 & 2001 by continuity of regular examinations and service category (20- to 39-year-olds)

	Regular Examinations						No exam	
Care Provided:	In all 6 years prior	In all 5 years prior	In all 4 years prior	In all 3 years prior	In two years prior	In the year prior	In the year prior	Overall mean
N	2932	639	1286	4365	10362	36549	138732	194865
Diagnostic	63.9	56.5	60.8	58.5	54.1	47.1	44.7	46.4
Preventive	114.5	93.8	92.9	91.4	71.8	52.5	37.4	45.0
Restorative	209.2	189.0	208.4	223.6	216.9	187.5	130.0	149.4
Endodontic	29.2	25.0	32.2	35.0	36.9	38.6	26.7	29.7
Periodontic	23.4	20.3	25.3	26.3	22.0	16.6	8.9	11.8
Removable Prosthetic	10.1	22.6	18.5	25.0	29.4	34.0	25.9	27.3
Fixed Prosthetic	0.9	0.0	2.2	2.1	3.0	2.6	1.6	1.9
Surgery	32.1	33.1	29.1	25.3	30.0	34.5	33.3	33.1
Orthodontic	14.1	4.1	9.0	11.0	5.9	2.6	1.7	2.6
Adjunctive	7.2	4.5	7.1	4.9	5.9	6.1	5.7	5.8
All Services	504.6	448.8	485.6	503.2	475.8	422.0	315.9	352.9

Note: All dollar amounts rounded to nearest 10 cents and no final zero's printed

The expenditures for the 20- to 39-year-olds were less affected by the provision of orthodontic or prosthodontic services and are presented in Table 4. In this group with the more stable dentitions, the general trend held; those with examinations in each of the previous 6 years had highest expenditures ($505) overall and for diagnostic, preventive, orthodontic and adjunctive services. The regular visitors also had expenditures of 85% or more of the highest expenditure for restorative, periodontal, and surgical care. The only service type for which clients with regular examinations in all 6 prior years had the lowest expenditures was removable prosthetics.

Mean expenditures in the last two years by gaps and type of care. As seen in Table 5, clients with no gap in service had the highest 2000 and 2001 expenditures overall ($492) and in all service categories except for removable prosthetics, surgery and adjunctive services. For those service categories, clients with a 6 or more year gap had the highest expenditures and they had the second highest level of overall expenditure ($382).

When the service-specific expenditures were examined by gap and by age group (not shown in the tables), expenditures were lower for every category of service among those with wider gaps until the gap in care reached the maximum of 6 or more years. For example, among older children, even though orthodontic care expenditures were highest in clients with no gap and declined significantly with each wider gap, the same applied to diagnostic, preventive, restorative and, to a lesser extent, surgical services. This trend is illustrated

TABLE 5
Mean expenditure ($) in 2000 & 2001 by gap and service category (all ages)

	Regular Examinations							
	In 1999 (no gap)	In 1998 (one-year gap)	In 1997 (two-year gap)	In 1996 (three-year gap)	In 1995 (four-year gap)	In 1994 (five-year gap)	Not in 1995-99 6 or more year gap)	Overall Mean
N	173554	96660	58963	41418	37027	22549	107863	538034
Diagnostic	62.9	50.2	42.3	36.2	31.5	28.5	48.1	49.7
Preventive	69.6	48.8	35.5	27.5	22.5	18.5	29.4	45.4
Restorative	174.6	146.9	123.6	102.0	85.4	73.3	144.3	142.0
Endodontic	25.0	23.4	21.1	18.6	17.1	14.6	23.4	22.5
Periodontic	12.3	9.2	7.3	5.8	5.0	4.4	3.9	8.2
Removable Prosthetic	37.7	36.8	36.9	37.7	37.8	41.3	74.2	44.9
Fixed Prosthetic	1.8	1.6	1.5	1.3	1.1	0.9	1.1	1.5
Surgery	29.6	25.5	23.8	23.4	21.0	20.6	37.9	28.4
Orthodontic	72.0	27.5	13.2	7.2	4.7	3.9	8.6	32.4
Adjunctive	6.8	4.8	4.2	3.7	3.2	3.1	11.0	6.4
All Services	492.3	374.5	309.3	263.4	229.2	209.2	381.8	381.3

Note: All dollar amounts rounded to the nearest ten cents and no final zeros printed

TABLE 6
Mean expenditure ($) in 2000 & 2001 by gap and service category (20- to 39-year-olds)

	Regular Examinations							
	In 1999 (no gap)	In 1998 (one-year gap)	In 1997 (two-year gap)	In 1996 (three-year gap)	In 1995 (four-year gap)	In 1994 (five-year gap)	Not in 1995-99 6 or more year gap)	Overall Mean
N	56133	39359	25996	18457	16766	10108	28046	194865
Diagnostic	20.6	49.2	43.4	38.7	34.9	33.0	53.9	46.4
Preventive	63.7	51.1	38.3	30.2	25.8	23.1	34.1	45.0
Restorative	197.4	161.4	135.0	111.4	96.2	84.7	129.2	149.4
Endodontic	37.2	30.3	26.8	23.6	21.9	19.7	28.7	29.7
Periodontic	18.9	12.4	9.7	7.1	6.0	5.7	7.4	11.8
Removable Prosthetic	30.7	24.7	24.3	21.2	19.3	19.4	38.4	27.3
Fixed Prosthetic	2.5	2.1	1.5	1.3	0.9	1.2	1.9	1.9
Surgery	32.7	29.6	27.8	27.6	25.6	27.9	53.7	33.1
Orthodontic	4.6	3.7	2.0	1.0	0.9	0.3	0.2	2.6
Adjunctive	6.0	5.0	4.5	4.6	4.1	4.6	10.1	5.8
All Services	414.3	369.4	313.4	266.7	235.6	219.9	357.6	352.9

Note: All dollar amounts rounded to the nearest ten cents and no final zeros printed

in Table 6, for those aged 20-39. As seen, expenditures overall and by service type, declined as the interval in regular examinations widened until the gap reached 5 years, but there was little or no difference in the proportion of expenditures by service type. However, once the gap was 6 years or more, clients had the highest expenditures in 2000 and 2001 for diagnostic, removable prosthetics, surgery and adjunctive services. While these same trends were observed for clients aged 40-59, for the oldest age group, higher expenditures were found for removable prosthetics for all groups, especially those with a 5 or 6 (or more)-year gap.

Discussion

The authors hypothesized that expenditures would be lower for clients with regular visits as compared to clients whose visits were irregular. The study did not find support for this hypothesis when the NIHB service data was examined either across the full 8-year study period, or over the last 2 years employing either "continuity of care" or "gap" analyses. Generally, the study found that NIHB expenditures were the highest for clients with more consecutive years of regular visits and lower for clients with visits in fewer years. The exception was for older age groups where expenditures for removable prosthetics were higher for clients with 6 (or more)-year gaps prior to 2000.

In the first stage cross-tabulation of expenditures for all ages, the study found that the clients with regular vis-

its in each of the 8 years had the highest expenditures overall. This general finding applied to the younger children even though they were not available for all 8 years.

For the exploration of the effect of continuity and gaps in care, it was felt that measuring the expenditures over the last 2 years would provide valid measures of expenditure and include treatment plans that spread over 2 years. Yet at the same time, this cut-off would provide enough years (6) to maximize the variability in the exposure to regular examinations. The authors hypothesized that expenditures over the last 2 years should be less for clients with regular visits. Specifically, 2000 and 2001 expenditures should be lowest for clients with at least one "regular" examination in each previous year and highest for clients with examinations less frequently or who received services more intermittently. Similarly, in the "gap analysis," the authors expected to find that the longer the gap since previous examination prior to 2000, the greater would be the 2000 and 2001 expenditure. This would be expected if the gaps in examination and subsequent care lead to the accumulation of more serious problems requiring more, or higher cost services in the last 2 years. However, the hypotheses were not supported in either the "continuity of care" or "gap" analyses for the group as a whole.

Accordingly, the authors considered whether the higher expenditures to clients with regular visits could be explained by different types of services received. In the "continuity of care" analysis, it was found that, among younger clients, the requirement for frequent adjustments meant that among clients with regular examinations in more years (high continuity), orthodontic care expenditures were highest. To avoid the influence of frequent recalls for orthodontic adjustments the authors looked at the 20- to 39-year-old age group, and again found that high continuity clients had highest expenditures for every type of service except for removable prosthetics. Thus it seems that clients with more frequent visits did receive either more, or more expensive, services.

In the "gap analysis," it was observed that expenditures were highest for clients with no gap in examinations, and that they declined with each wider interval since the client's last examination. That gradient held until a 6-year or longer gap was encountered, at which point the 2000/01 expenditures increased, but still were less than for those with no gap. The higher average expenditures in the "6-year or longer gap" clients was primarily the result of higher expenditures for diagnostic, removable prosthodontic, surgical and adjunctive (usually sedation and anaesthetic) procedures. In comparing the expenditures by type of care for the different age-groups, the same expenditure trends held even though the service profile shifted, from having large expenditures for orthodontic care in the adolescents to removable prosthetics in the older ages. The authors had no information upon which to identify which patients were edentulous and therefore could not examine the care patterns separately for those who were dentate and edentulous. However, the pattern of care in the "6-year or longer gap" group is consistent with needs accumulating to the extent that more surgical services and dentures would be needed. The increase in expenditures for removable dentures for the "6-year or longer gap group" is also consistent with the program's five-year frequency limitation for provision of new removable dentures and was seen to be greatest among the older age-groups.

Given the nature of the data, the authors cannot assert or deny that improved health (appearance, function, or satisfaction) resulted from the additional expenditures for clients who visit on a regular basis. However, to the extent that services were provided to meet clients' clinically-defined needs, these findings question whether dental services affect the natural history of dental problems. If the service patterns did reflect client needs, then clients with the least needs in 2000 and 2001 were those with less continuity of, or wider gaps in, care prior to 2000.

The possibility that clients with progressively less frequent visits were those who increasingly refused aspects of care recommended by their provider(s) in 2000 and 2001 cannot be excluded. In other words, irregular attending clients may need more care but refuse it, and the study's categories of continuity of care and gaps in care may represent measures of non-compliance with provider recommendations. However, this explanation seems unlikely given that the NIHB program provides first dollar coverage to clients for a comprehensive range of services and clients from remote areas are eligible for reimbursement for the costs of transportation. Time costs and fear of procedures would not be expected to reduce client compliance to the degree we have observed.

Further, without data on health status, the authors cannot explore the possibility that client self-selection might explain the findings. In particular, clients who perceived themselves to be in good health, or at low risk for oral health problems may not attend for care, leaving clients with greater problems or higher risks to attend most frequently for examinations. Also with these aggregate service data, it was not possible to examine other patient or provider characteristics (11) that have been shown to strongly influence the provision of care.

In summary, the authors' observations, in this client group, do not support the thesis that regular visits for preventive care reduce dental expenditures. Further research on the influence of providers and their pattern of care is needed, especially since others have noted that service provision has been driven by provider characteristics (11). Finally, linking these service data to measures of health status would enable an examination of the influence of health needs on the expenditures.

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