EVALUATION OF ONTARIO'S DENTAL SCREENING PROGRAM FOR SCHOOLCHILDREN

Final Report

David Locker

Program Evaluation Report No. 7

2001

Community Dental Health Services Research Unit
Faculty of Dentistry
University of Toronto

Investigator team:

Community Dental Health Services Research Unit, Faculty of Dentistry:

Dr David Locker, Dr David Matear

Ontario Health Units/Departments:

Dr Aaron Burry, Ms Carolyn Frosina, Dr Patricia Main, Ms Heather Murray, Dr David Wiebe, Dr Peter Wiebe

Participating Health Units/Departments:

Ottawa-Carleton; City of Hamilton; Durham Region; York Region; Thunder Bay; Simcoe County

Table of contents

EXECUTIVE SUMMARY

Prior to the 1997-8 school year, all Ontario Public Health Units/Departments provided dental screening to children in Junior and Senior Kindergarten and grades 2, 4, 6 and 8 in every school on an annual basis. During 1997-8 this 'universal' program was replaced by a 'targeted' approach. The main objectives of the program are to identify children who meet eligibility criteria for mandatory preventive dental services and to identify children with urgent dental care needs who are, therefore, eligible for dental care under the province of Ontario's Children in Need of Dental Treatment program.

This report describes some of the findings of a study designed to evaluate this targeted dental screening program. The study was carried out in stratified random sample of 55 schools located in six Health Unit/Department areas (Durham Region, York Region, City of Hamilton, Ottawa-Carleton, Thunder Bay and Simcoe County).

The main aims of the study were to: 1) estimate the proportion of children in Junior and Senior Kindergarten and grades 2, 4, 6 and 8 with restorative and preventive dental care needs, and 2) to determine what proportion of those children are identified by the targeted screening program. Additional aims were to: 3) compare the clinical and personal/family characteristics of children who are and are not identified by the targeted program, 4) to assess whether the decay rate among students in JK and SK is an appropriate indicator of a school's risk status, and 5) to determine whether more of these children would be identified, using the same resources, by modifying the targeting criteria. Since earlier reports addressed some of these questions, this report provides a comprehensive analysis of the data having a bearing on all of these questions. For technical reasons concerning the weighting of data for differential probabilities of selection, some questions were pursued using data from four of the participating Health Units/Departments (Durham Region, York Region, City of Hamilton, Thunder Bay), while others were addressed using data from all six Health Units/Departments included in the study. The main findings are as follows:

- 64.5% of children in the target grades were caries free.

- 21.0% had needs for dental care. This varied from 55.9% of children in Thunder Bay to 11.0% in Hamilton.

- 7.4% had urgent needs and 15.4% needed sealants and/or topical fluoride.

- 43.5% of those with dental care needs, 58.0% of those with urgent needs and 45.9% of those needing sealants/topical fluoride would be identified by the targeted program.

- There was considerable variation across Health Units/Departments in the proportion of children who would be identified. This was accounted for by differences in the distribution of schools and children with needs across the three risk strata.

- The targeted program was more successful at identifying children with needs who came from economically disadvantaged backgrounds. For example, 80.1% of children with urgent needs who lived in households receiving Ontario Works or Ontario Disability Support Program payments were identified.

- Modifying the targeting criteria changed the proportion of children identified, but had different resource implications.

- Decay rates in Grade 2 were better predictors of the proportion of children in the school overall who had dental care needs.

- When all children with needs were considered, targeting approaches involving the screening of grade 2 children in low risk schools maximized the identification rate for the least investment of additional resources.

- All Ontario Health Units/Departments should be encouraged to evaluate the screening program given the geographical differences in terms of effectiveness.

INTRODUCTION

Prior to the 1997-8 school year, all Ontario Public Health Units/Departments provided dental screening to children in Junior and Senior Kindergarten and grades 2, 4, 6 and 8 in every school on an annual basis. During 1997-8 this 'universal' program was replaced by a 'targeted' approach. The main objectives of the program are to identify children who meet eligibility criteria for mandatory preventive dental services and to identify children with urgent dental care needs who are, therefore, eligible for dental care under the province of Ontario's Children in Need of Dental Treatment program. Under the terms of the targeted program, schools are designated as high, medium and low risk with respect to dental care needs based on rates of dental decay among students in Junior and Senior Kindergarten. A school's risk level determines whether or not screening of children in grades 2, 4, 6 and 8 is undertaken. A study carried out in 1996/7 prior to the change from a universal to a targeted screening approach suggested that the latter would not identify many children with dental care needs. This study replicates and extends this research.

The main aims of the study were to: 1) estimate the proportion of children in Junior and Senior Kindergarten and grades 2, 4, 6 and 8 with restorative and preventive dental care needs, and 2) to determine what proportion of those children are identified by the targeted screening program. Additional aims were to: 3) compare the clinical and personal/family characteristics of children who are and are not identified by the targeted program, 4) to determine whether more of these children would be identified, using the same resources, by modifying the targeting criteria, and 5) to assess whether the decay rate among students in JK and SK is an appropriate indicator of a school's risk status.

The study was carried out in stratified random sample of 55 schools located in six Health Unit/Department areas (Durham Region, York Region, City of Hamilton, Ottawa-Carleton, Thunder Bay and Simcoe County). In these schools, all students in JK, SK and grades 2, 4, 6 and 8 were screened. The parents of all children identified with preventive or restorative dental care needs were sent a questionnaire to obtained information on the personal and family characteristics of each of these children. Overall, 11,814 children were screened and 2,734 found to have dental care needs. Parental questionnaires were obtained for 1491 of these children.

An initial report (Report No. 1) described the methodology and findings from the study with data from all six Health Units/ Departments pooled for analysis. The analysis addressed questions 3 and 5. A second report (Report No. 2) described the results of analyses that were undertaken for each of the Health Units/Departments separately. The aim of these analyses was to determine if the findings based on pooled data applied to individual participating Units/Departments. A third report (Report No. 3) addressed questions 1, 2 and 4 using analyses of both pooled data and data for individual Health Units/Departments. This final report summarizes the main findings from the study and uses the data to pursue each of the five questions posed above.

RESEARCH PROCEDURES

Study locations

The study was undertaken in six Ontario Health Unit/Departments: York Region; City of Hamilton; Durham Region; Ottawa-Carleton; Simcoe County and Thunder Bay. While this is not a random sample of Ontario Health Units/Departments it covers populations living in all regions of the province and populations in metropolitan, urban, rural and northern communities. These Units/Departments were selected because of their long association with the Community Dental Health Services Research Unit and their capacity to undertake the research project described below.

Study population and sampling design

The population studied was all children in Junior and Senior Kindergarten and Grades 2, 4, 6 and 8 who attend schools in the areas covered by the six participating Public Health Units/Departments. Children of this age are eligible for dental public health services and constitute the target population for the screening program undertaken by the participating Units/Departments. Prior to the implementation of the screening program parents are informed and may refuse permission for their child to be screened.

The sampling design used to select children for the study was a stratified random cluster sample. In each health Unit/Department area, schools were stratified by risk level based on 1999-2000 screening data. In each area 9 schools were randomly selected to take part in the study – 3 high risk, 3 medium risk and 3 low risk. Schools that refused permission for the 1999-2000 screening program to be undertaken were excluded since current data on their risk level was not available. Schools in the sample that refused to be screened during the 2000-2001 school year were replaced by randomly selected schools. Where necessary, additional schools were sampled to ensure adequate numbers of children were included in the study.

In the selected schools all children in the grades designated above (JK, SK, 2, 4, 6 and 8) were screened between October 2000 and February 2001 using a common dental screening protocol. Children whose parents refused consent for screening, children who refused to be screened or children absent from schools on the day(s) the screening program was undertaken were excluded. The aim of this sampling approach was to identify approximately 300-500 children in each Health Unit area with dental care needs, half of whom would and half of whom would not be identified by the current target screening program.

Screening procedures

The six participating Health Units/Departments used a common screening protocol and diagnostic criteria to identify children with restorative and preventive dental care needs. The screening was undertaken by dental hygienists. It consisted of a visual inspection and was conducted with a mirror and tongue depressor only. Dental probes were not used. The criteria for determining need are summarized in the Appendix in Report No. 1. Data were entered on to a Screening Report Form and forwarded to the CDHSRU for entry into the computer. A database was created containing the following information for each child screened:

- Health Unit/Department identification code
- Sex
- School
- Grade
- Risk level of school in 1999-2000
- Risk level of school in 2000-2001
- Number of Dd/Mm/Ff teeth
- Need for sealants
- Need for topical fluoride treatment
- Need for scaling
- Urgent/Non-urgent restorative needs

Children were designated as having a dental care need if they fulfilled one or more of the following:

1) They had urgent dental care needs and were therefore CINOT eligible;
2) They had one or more teeth requiring restoration because of decay or defective fillings;
3) They needed sealants, topical fluorides or scaling.

Parental questionnaires

The parents of all children with dental care needs were also sent a letter explaining the aims and objectives of the study and a short two-page questionnaire. A stamped, addressed return envelope was also included.

The questionnaire collected information on the child and family as follows (See Appendix, Report No. 1).

- Availability of a regular dental care provider
- Time since child's last dental visit
- Experience of toothache/other tooth-related pain in last 3 months
- Parental rating of child's dental health
- Place of birth of child

- Years living in Canada (if birth place not Canada)
- Family size
- Dental insurance coverage of family (Private or Government Program)
- Educational attainment of child's mother
- Receipt of Ontario Works or Ontario Disability Support Program
- Household income

When completed, the questionnaire was returned to the Health Unit/Department from which it was sent. Data on the number of Dd/Mm/Ff teeth and dental care needs were abstracted from the screening database and recorded in a special section on the questionnaire. Once the questionnaire phase of the study was complete, screening data were added to a blank questionnaire for each child whose parent did not respond or refused to participate. All questionnaires were forwarded, without identifiers, to the CDHSRU for data entry.

Databases and data analysis

Two databases were created. The first contained dental screening data for all children who were screened, and the second contained parental questionnaire and dental screening data for all children who were identified as having a need for dental care, irrespective of whether or not a parental questionnaire was returned.

Because equal numbers of schools were randomly selected from the three risk strata, and the strata differ in size, some of the analyses required that the data were weighted to take account of the differential probabilities of selection of schools and children. These weights were calculated for each risk stratum in each Health Unit/Department by dividing the total number of children in the designated grades for all schools in the stratum by the number of children in those grades who participated in the study.

For example, in Durham Region, there were 3315 students in the designated grades (JK, SK and Grade 2, 4, 6 and 8) in high-risk schools of whom 358 were included in the study sample. For medium and low risk schools the corresponding figures were 7080 and 586, and 33,720 and 1479 respectively. Consequently the probability weights for high, medium and low risk strata for Durham Region were 9.3, 12.1 and 22.5.

The calculation of probability weights required that JK and SK students in all schools in each Health Unit area were screened and allocated to a risk stratum according to the Ministry of Health criteria as defined in the introduction. Two Health Units/Departments, Ottawa-Carleton and Simcoe County screen schools according to a locally designed protocol. Consequently, since these data were not available for schools in these areas probability weights could not be calculated. These Health Units have been excluded from analyses where weighting of data is necessary. However, they have been included in those analyses where weighting is not required.

When questionnaire data were used in the analyses, these probability weights were adjusted to take account of patterns of non-response and correct for non-response bias.

Data were analyzed using the survey estimation procedures from STATA 7. These procedures allow point estimates to be adjusted for differential probabilities of selection and standard errors to be adjusted for design effects. Design effects refer to the stratification and clustering involved in the selection of the study sample. Because of the large sample size, all differences, however small, between Health Units/Departments were statistically significant. Consequently, p-values have not been added to the tables.

RESULTS

Number of schools in the study

The total number of schools selected was 55. The risk designation of these schools at the time of screening is shown in Table 1.

Table 1: Number of schools by Health Unit/Department and risk stratum

Health Unit/Department:	High risk	Medium risk	Low risk
Durham Region	2	2	5
York Region	2	2	5
City of Hamilton	4	5	5
Ottawa-Carleton	4	2	3
Thunder Bay	2	3	1
Simcoe County	3	1	4

Number of students screened

Overall, 11, 814 students were screened (Table 2). Of these, 2734 were identified as having dental care needs.

Table 2: Number of students in the study by Health Unit area

Health Unit:	Screened	Number and percent with needs	Parental questionnaires
Durham Region	2441	664	441
York Region	2721	495	225
City of Hamilton	2190	259	191
Ottawa-Carleton	1562	275	123
Thunder Bay	1262	670	262
Simcoe County	1638	371	249
TOTAL	**11814**	**2734**	**1491**

Parental questionnaires returned

Parental questionnaires were obtained for 1491 or 54.5% of students with dental care needs. The mean Dd/Mm/Ff tooth scores of children for whom parental questionnaire data were and were not obtained were 2.91 and 3.35 respectively ($p<0.001$). Conversely, 58.6% of parents of children with Dd/Mm/Ff scores of 0 to 2 returned questionnaires compared with 51.6% of parents of children with scores of 3 or more. Consequently, parental questionnaire data were weighted to take account of differences in response rates for children with high and low Dd/Mm/Ff tooth scores.

What proportion of children in JK, SK and grades 2, 4, 6 and 8 have restorative and preventive needs?

Since the estimation of population treatment needs requires that the data are weighted to take account of differential probabilities of selection of children from different risk strata, these estimates are based on data from Durham Region, York Region, the City of Hamilton and Thunder Bay only. The estimates are based on an unweighted sample of 8,613 students and a weighted sample of 134,736.

Overall, 64.5% of students in JK, SK and grades 2, 4, 6 and 8 in the four Health Units/Departments were caries free (i.e. a Dd/Mm/Ff tooth score of zero) and the mean Dd/Mm/Ff tooth score was 1.27 (SD=2.40). Just over one-tenth, 11.8%, had one or more decayed teeth and 6.2% had two or more decayed teeth. Table 3 shows the percent caries free and the mean Dd/Mm/Ff tooth score for children in each of the four study locations.

Table 3: Percent caries free and mean Dd/Mm/Ff tooth scores by Health Unit

Health Unit:	% Caries free	Mean Dd/Mm/Ff teeth	% with one or more decayed teeth	% with 2 or more decayed teeth
Durham	66.0	1.11	11.8	5.4
York	67.3	1.10	10.9	6.5
Hamilton	64.1	1.24	9.5	5.0
Thunder Bay	48.5	2.61	21.3	11.5

Overall, 21.0% of students had a need for dental care. Just over one tenth had restorative needs and one-seventh needs for preventive services (Table 4).

Table 4: Percent with dental care needs

Dental care need*	21.0
Restorative need	11.7
Urgent	7.4
Non-urgent	4.4
Preventive need	15.4
Sealants	7.1
Topical fluoride	9.9

*Includes restorative and preventive needs

The percent of children with dental care needs varied across the four Health Units/Departments. For example, 55.9% of children in Thunder Bay had dental care needs compared with 11.0% in Hamilton (Table 5).

Table 5: Percent with dental care needs by Health Unit/Department

Health Unit:	**Dental Care Need**	**Restorative need**	Urgent	Non-urgent	**Preventive need**	Sealant	Topical F
Durham	24.2	11.2	3.2	8.1	19.0	12.0	8.5
York	15.7	11.1	9.4	1.8	11.6	2.9	9.8
Hamilton	11.0	9.6	7.0	2.6	9.7	1.8	8.7
Thunder Bay	55.9	21.5	15.0	6.5	32.2	19.9	18.4

What proportion of children with dental care needs would be identified by the targeted screening program?

Based on the risk level of the school and the grade, children with dental care needs were divided into two groups; those who would be identified by the targeted screening program and those who would not.

Table 6: Percent with dental care needs who would be identified

Dental care need*	43.5
Restorative need	52.5
Urgent	58.0
Non-urgent	42.7
Preventive need	45.9
Sealants	36.1
Topical fluoride	52.9

*Includes restorative and preventive needs

Of those with dental care needs, 43.5% would be identified by the targeted program and 56.5% would not. Of those with urgent needs, 58.0% would be identified and of those needing sealants and/or topical fluoride treatment 45.9% would be identified (Table 6). Table 7 indicates that there was considerable variation across the four Health Units/Departments in the proportion of children with needs who would be identified.

For example, if children with urgent needs are considered, 75.5% would be identified in Thunder Bay compared to 44.3% of those in York Region.

Table 7: Percent of children with dental needs who would be identified by Health Unit/Department

Health Unit:	**Dental Care Need**	**Restorative need**	Urgent	Non-urgent	**Preventive need**	Sealant	Topical F
Durham	39.1	47.4	63.1	41.0	38.4	31.4	49.4
York	37.5	44.9	44.3	45.1	38.8	18.9	41.3
Hamilton	57.7	62.5	70.6	41.3	61.8	34.0	66.3
Thunder Bay	50.9	67.5	75.6	48.9	62.4	57.7	68.6

These area differences in the proportion of children with needs who would be identified occurs because of 1) differences in the distribution of schools across risk strata, and 2) differences in the distribution of children with needs across the risk strata.

For example, Table 8 indicates that only 3.2% of schools in York Region were classified as high risk compared to 37.3% of schools in Thunder Bay. Conversely, 80.1% of schools in York Region were low risk compared to 36.1% in Thunder Bay.

Table 8: Distribution of schools across risk strata by Health Unit/Department

Health Unit:	**High risk**	**Medium risk**	**Low risk**
Durham	18 (10.3%)	26 (14.9%)	131 (74.8%)
York	6 (3.2%)	31 (16.9%)	149 (80.1%)
Hamilton	31 (22.0%)	29 (20.6%)	81 (57.4%)
Thunder Bay	31 (37.3%)	22 (26.5%)	30 (36.1%)

This means that there is variation across Health Units/Departments in the proportion of children included in the screening program. In Durham 44.4% of the target population would be screened, in York 38.9% would be screened, in Hamilton 53.2% would be screened and in Thunder Bay 59.1% would be screened.

Tables 9 to 11 show the distribution of children with needs across the risk strata for each of the Health Units/Departments.

Table 9: Distribution of students with dental care needs across risk strata by Health Unit/Department

	Durham	York	Hamilton	Thunder Bay
High	11.0	3.6	30.5	34.2
Medium	26.2	23.1	27.0	28.6
Low	62.8	73.3	42.5	37.2

Table 10: Distribution of students with urgent needs across risk strata by Health Unit/Department

	Durham	York	Hamilton	Thunder Bay
High	15.4	3.4	32.2	53.3
Medium	37.5	26.1	31.0	21.4
Low	47.1	70.4	36.8	25.3

Table 11: Distribution of students with needs for sealants and/or topical fluoride across risk strata by Health Unit/Department

	Durham	York	Hamilton	Thunder Bay
High	12.6	3.3	32.9	42.9
Medium	25.8	22.6	30.3	26.2
Low	61.6	74.1	36.8	30.9

These data indicate that in York Region, for example, only 3.6% of children with needs are in high-risk schools and 73.3% are in low risk schools. Under the terms of the screening program, all of those in high-risk schools would be identified. However, of those in low-risk schools, only students in JK and SK, or 23.9% of those with needs, would be identified. This occurs because in low-risk schools in York Region children with dental care needs are distributed more or less evenly across JK, SK and Grades 2, 4, 6 and 8.

The situation is somewhat different in Thunder Bay, where 34.2% of children with dental care needs are in high-risk schools and only 37.2% are in low risk schools. This accounts for the higher ‘yield’ from the targeted program in Thunder Bay.

Social and family characteristics of children with dental care needs

Table 12 shows some of the social and family characteristics of children with dental care needs. One fifth had no regular source of dental care and one quarter did not make a visit to a dental care provider in the previous year (a year when they would have been in grades not included in the screening program). Almost one third came from household without dental insurance coverage and just over one tenth came from disadvantaged households, that is, households with annual incomes of less than $20,000 and no dental insurance. Table 13 indicates that that children with needs who came from economically disadvantaged backgrounds were the least likely to have a regular source of care or to have a visited a dental care provider in the previous year. For example, more than half of those with needs who lived in low income households without insurance did not have a regular source of dental care and had not made a dental visit in the previous year.

Table 12: Social and family characteristics of children with dental care needs

	%
% with no usual dentist	20.1
% not making dental visit in last year	24.6
% without dental insurance	30.7
% from households receiving Ontario works or ODSP	9.9
% low income households (<$20,000 per annum)	14.3
% from disadvantaged households (low income/no insurance)	12.8

Table 13: Association between economic disadvantage and access to dental care among children with dental care needs

	Low income household		**Disadvantaged household**		**Receive Ontario Works or ODSP**	
	No	**Yes**	**No**	**Yes**	**No**	**Yes**
% without a regular source of dental care	15.1	50.2	16.0	58.6	17.9	41.3
% not making a dental visit in the previous year	20.1	51.9	21.7	56.0	22.3	48.5

These data suggest that economically disadvantaged children with dental care needs are likely to be the main beneficiaries of a dental screening program that promotes access to preventive and restorative services. Consequently, what proportion of these children are identified by the targeted screening program as currently designed? Table 14 indicates that the targeted program would identify 56.3% of children with dental care needs who lived in low-income households and 70.7% of those with urgent needs would be identified. For children living in households receiving Ontario Works or ODSP, the

corresponding percentages are 59.0% and 80.1%. These data confirm that the targeted program is more successful at identifying children with needs who come from economically disadvantaged backgrounds.

Table 14: Percentage of children with needs from economically disadvantaged backgrounds identified by the targeted program

	Dental Care Need	**Restorative need**	Urgent	Non-urgent	**Preventive need**	Sealant	Topical F
Low income household	56.3	66.7	70.7	52.8	62.4	59.7	64.3
Disadvantaged household	51.3	64.2	67.5	50.7	57.5	56.8	57.9
Receiving Ontario Works or ODSP	59.0	67.9	80.1	50.1	66.1	51.4	74.6

Clinical and social characteristics of children with needs who would and would not be identified by the targeted screening program

Another way of assessing the effectiveness of the current targeted program is to compare the clinical and social characteristics of children who would and would not be identified. Tables 15 and 16 use weighted data from four Health Units to make these comparisons.

Table 15 indicates that those who would not be identified have better oral health in terms of their experience of decay and are less likely to need urgent care. They were also less likely to need both restorative and preventive care.

Table 16 indicates that those who would not be identified have better access to dental services and are less likely to come from economically disadvantaged and single parent households. Only 4% of those not identified come from low-income households with no dental insurance and had one or more decayed teeth.

Table 15: Clinical characteristics and dental care needs of children who would and would not be identified

	Not identified	Identified	P*
% with 1+ decayed teeth	46.4	67.4	<0.01
% with DMFT >=3	36.6	48.9	<0.01
% with urgent need	25.9	46.5	<0.01
% with non-urgent need	21.4	20.8	NS
% needing restorative care	43.3	66.4	<0.01
% needing sealant	38.3	28.1	NS
% needing topical fluoride	39.3	57.1	<0.01
% needing sealant or fluoride	70.3	77.3	<0.01
% needing restorative and preventive care	36.1	53.5	<0.01

*P-values from Chi-square tests. Standard errors adjusted for design effects

Table 16: Personal and family characteristics of children who would and would not be identified

	Not identified	Identified	P*
% with no usual dentist	15.6	26.3	<0.05
% not making dental visit in last year	20.0	30.9	<0.05
% with pain from cavity in last 6 months	11.4	13.9	NS
% with fair/poor oral health	30.0	36.9	NS
% born outside Canada	9.6	7.5	NS
% without dental insurance	27.6	30.0	NS
% receiving Ontario Works/ODSP	6.7	14.2	<0.05
% mothers with <high school education	11.0	18.8	<0.05
% low income (<$20,000 per annum)	13.9	23.2	NS
% disadvantaged (low income, no insurance)	11.2	15.2	NS
% single parent from single parent family	10.9	18.7	<0.05
% disadvantaged with urgent needs	3.2	8.8	<0.05
% disadvantaged with 1+ decayed teeth	4.2	11.3	<0.05

*P-values from Chi-square tests. Standard errors adjusted for design effects

Should a school's risk level be based on decay rates in JK and SK students?

The way in which schools are allocated to risk strata assumes that the decay rate in JK and SK students accurately reflects the restorative and preventive needs of children in the school as a whole. This assumption was examined using data for all 55 schools and all 11,814 students who were screened during the study. The approach was to examine the correlation between rates of decay in JK and SK and Grade 2 students in each school and the percentage of children in each school who were identified as having dental care needs. Table 17 shows these correlations.

Table 17: Predictors of percent of children in each school with treatment needs

Disease parameter:	Correlation with percent of children with dental care needs
JK&SK: percent with 2 or more decayed teeth	0.54**
JK&SK: percent with 1 or more decayed teeth	0.58**
Grade 2: percent with 2 or more decayed teeth	0.69**
Grade 2: percent with 1 or more decayed teeth	0.72**

**p<0.001

These correlations suggest that decay rates in Grade 2 students are somewhat better predictors of overall dental care needs than decay rates in JK and SK. However, the differences in the correlation coefficients are not large.

Can more children with dental care needs be identified by modifying the targeting criteria?

The targeting criteria currently employed consist of four components;

- The grades initially screened in order to allocate a school to a risk stratum (currently JK and SK);
- A disease parameter (currently two or more decayed teeth);
- Cut-off points based on the prevalence of the disease parameter (Currently - Low risk: 0-9.4%; Medium risk: 9.5-13.9%; High risk: 14.0% or more);
- Additional grades that are screened based on the risk designation of the school (Currently – High risk: 2,4,6,8; Medium risk: 2,8; Low risk – none).

Each of these components can be modified in order to determine the effect on the distribution of schools across risk strata and the percentage of students with dental needs who would be identified as a result of these modifications. Since there are numerous possible permutations, five different options were explored using data from all six

participating Health Units/Departments. These options were compared with the current targeting approach. For technical reasons, unweighted data were used in these analyses. Since high and medium risk schools were over-sampled, the analyses over-estimate the percentage of children with needs identified (see below). Consequently, the analyses allow the relative rather than the absolute effect of different targeting strategies to be assessed. The five options considered were as follows.

Option:	**Grades initially screened**	**Disease parameter**	**Percent cut-off points for risk strata**	**Additional grades screened**
Current approach	JK and SK	2 or more decayed teeth	High: 14+ Medium: 9.5-13.9 Low: 0-9.4	High: 2,4,6,8 Medium: 2,8 Low: None
Option 1	JK and SK	2 or more decayed teeth	As above	High: 2,4,6,8 Medium: 2,8 Low: 2
Option 2	JK and SK	2 or more decayed teeth	As above	High: 2,4,6,8 Medium: 2,8 Low: 2, 8
Option 3	JK and SK	1 or more decayed teeth	As above	High: 2,4,6,8 Medium: 2,8 Low: None
Option 4	Grade 2	2 or more decayed teeth	As above	High: 2,4,6,8 Medium: 2,8 Low: None
Option 5	Grade 2	2 or more decayed teeth	As above	High: 2,4,6,8 Medium: 2,8 Low: 2

In designing these different approaches, most consideration was given to students in grade 2 since grade 2 contained 26.5% of all children with dental care needs, 28.9% of children with urgent needs and 31.1% of children with needs for preventive care.

Options 1 and 2 are similar to the current approach except that additional grades are screened in low risk schools. Under these options the number of schools in each risk stratum remains the same. For options 3, 4 and 5, the changes in the targeting criteria change the number of schools in each stratum (Table 18).

Table 18: Number of schools in each risk stratum under each targeting option

Option:	**High risk**	**Medium risk**	**Low risk**
Current approach, Options 1 and 2	17	15	23
Option 3	32	9	14
Options 4 and 5	14	17	24

The percent of children with dental care needs who were identified by the current approach and by each of the five options is shown in Table 19. The bottom line of the table indicates the resource implications of each option compared to the current approach in terms of the number of grades screened in the 55 schools in the study.

Table 19: Percent of children identified by different targeting strategies: Unweighted estimates

	Current	Option 1	Option 2	Option 3	Option 4	Option 5
Dental care needs	57.8	67.6	73.2	77.5	63.0	72.2
Restorative needs	62.1	71.0	73.9	80.8	65.9	74.0
Urgent needs	71.8	81.0	83.6	84.5	71.4	81.6
Non-urgent needs	48.8	57.4	60.8	75.0	57.7	62.9
Preventive needs*	60.2	72.1	77.5	78.6	64.0	75.0
Sealants	48.3	66.6	76.1	76.9	61.5	77.0
Topical fluoride	62.3	72.5	74.7	80.1	66.7	75.8
Number of grades screened	208	231	254	256	200	224

*Sealants and topical fluoride

Of the five options examined, option 3 would maximize the percentage of children with needs who are identified. However, when compared with the current approach, this option involves screening an additional 48 grades. Assuming that the number of children in each grade is approximately equal, this entails an additional 23% effort. Option 5 achieves almost the same increase in the identification rate for an additional 8% effort. Option 4 would achieve a modest increase in the identification rate for a reduction of 4% effort. If the aim were to maximize the percentage of children identified with the least additional investment in resources, Option 5 would be the preferred approach.

These analyses were repeated to determine the proportion of low-income children with selected needs who would be identified by each targeting strategy.

Table 20: Percent of low-income children identified by different targeting strategies

	Current	Option 1	Option 2	Option 3	Option 4	Option 5
Dental care needs	72.6	78.0	79.7	85.5	63.9	72.6
Urgent needs	83.6	87.1	88.1	84.6	76.2	83.2
Preventive needs	77.2	82.2	82.8	85.9	67.4	76.6
Number of grades screened	208	231	254	256	200	224

Again, option 3 maximized the percentage of low-income children with needs who would be identified but involved the greatest increase in effort. Option 4 would reduce identification rates for low-income children while option 5 had little effect on identification rates for these children. Option 1 resulted in a modest increase in identification rates for an 11% increase in effort. Consequently, if low-income children are the main target of the screening program, option 1 would be the preferred approach.

Two further options were considered in which a school's risk level was based on the percentage of Grade 2 students with 1 or more decayed teeth. However, using the current percentage cut-off points for defining risk strata, the distribution of schools across risk strata was as follow: high risk=38 schools; medium risk=7; schools, low risk=10 schools. Since these options were close to universal screening they were not considered further.

In order to explore the extent to which unweighted data lead to an over-estimation of the proportion of students with needs who are identified further analysis was undertaken using data from the four Health Units for whom weighted data were available. These analyses allowed unweighted and weighted estimates to be generated for the current approach and Options 1 and 2 only. Similar comparisons could not be made for Options 3 through 5 since these changed the distribution of schools across risk strata. This meant that the probability weights did not apply. Table 21 shows the results of these analyses.

Table 21: Percent of children with needs identified by targeted program – unweighted and weighted estimates: (Durham, York, Hamilton, Thunder Bay)

	Current		Option 1		Option 2	
	Unweighted	Weighted	Unweighted	Weighted	Unweighted	Weighted
% with dental care need	56.3	43.5	65.6	59.9	71.3	70.0
% urgent needs	71.8	58.0	81.0	75.2	83.1	79.2
% need seal/TP	59.9	45.9	71.4	65.6	76.6	74.7

* Urgent, nonurgent, sealants, topical fluoride

These analyses suggest that the differences between the weighted and unweighted estimates are small for Options 1 and 2.

These estimates in Tables 15 and 16 should be treated with due caution since they are based on the 55 schools included in the study and may not apply to all schools in the participating Health Units/Departments. Since the analyses are based on aggregated data, they may also not apply to each of the Health Units/Departments involved in the study. Since there was variation in identification rates across Health Units/Departments under the current targeting approach, it is likely that there will be variations under the different targeting strategies examined. The effect of these strategies will be depend on the distribution of children with needs across risk strata and grades. Table 22 shows the proportion of all children with dental care needs (unweighted estimates) who would be identified by each option for each of the six participating Health Units.

Table 22: Percent of all children with dental care needs identified by different options by Health Unit: Unweighted estimates

	Current	Option 1	Option 2	Option 3	Option 4	Option 5
Durham	50.8	65.8	73.0	73.3	48.6	62.2
York	59.0	70.9	78.0	79.2	56.6	71.9
Hamilton	62.9	70.3	75.3	73.0	55.6	68.0
Ottawa-Carleton	75.6	80.4	80.4	83.3	67.6	73.8
Thunder Bay	57.2	59.4	63.0	81.6	81.6	81.6
Simcoe	32.3	48.8	58.2	74.4	65.2	74.2

Since the resource implications of the different options also depends on the distribution of schools across risk strata under the different options, some Health Units will need to invest more resources than others to increase the proportion of students identified. For example, the current approach requires that Durham screens 474 grades. Option 1 would entail screening 605 grades, an increase of 28%. Option 1 requires York to screen 33% more grades, Hamilton 14% more and Thunder Bay 9% more. These differences arise because Durham and York have more low risk schools than Hamilton and Thunder Bay (see Table 7).

Discussion

This report describes some findings from a study designed to evaluate Ontario's targeted dental screening program. The main objectives of this program are to identify children who meet eligibility criteria for mandatory preventive dental services and to identify children with urgent dental care needs who are, therefore, eligible for dental care under the province of Ontario's Children in Need of Dental Treatment program.

Under the terms of the targeted program, schools are designated as high, medium and low risk with respect to dental care needs based on rates of dental decay among students in Junior and Senior Kindergarten. A school's risk level determines whether or not screening of children in grades 2, 4, 6 and 8 is undertaken. In high-risk schools all children in these grades are screened; in low risk schools only children in grades 2 and 8 are screened, and in low risk schools no further screening is undertaken.

The main aims of the analyses reported here were to estimate the proportion of children in Junior and Senior Kindergarten and grades 2, 4, 6 and 8 with restorative and preventive dental care needs, to determine what proportion of these children are identified by the targeted screening program and to determine whether more of these children would be identified, using the same or similar resources, by modifying the targeting criteria.

The study was carried out in stratified random sample of 55 schools located in six Health Unit/Department areas. In these schools, all students in JK, SK and grades 2, 4, 6 and 8 were screened and the parents of all children identified with preventive or restorative dental care needs were sent a questionnaire to obtained information on the personal and family characteristics of each of these children. Overall, 11,814 children were screened and 2,734 found to have dental care needs. Parental questionnaires were obtained for 1491 of these children. All children taking part in the study were allocated to one of two groups: those who would be identified by the targeted screening approach and those who would not.

Because of the stratified sampling design, some aims required that the data were weighted to take account of differential probabilities of selection of schools and children. Since probability weights could be calculated for only four of the six participating Health Units/Departments, the analyses were conducted with data from these four areas only. Unweighted data were used in the analyses addressing other aims and included all six participating Health Units/Departments.

Based on weighted data, it was estimated that 21.0% of children in JK, SK and grades 2, 4, 6 and 8 had needs for dental care, with 7.4% having urgent needs and 15.4% needing sealants and/or topical fluoride treatments. Of those with dental care needs, 43.5% would be identified by the targeted program, 58.0% of those with urgent needs would be identified and 45.9% of those with preventive needs. There was evidence that the percent of children with needs identified varied considerably across the Health

Units/Departments included in the analysis. These variations occurred because of differences in the distribution of schools and children with needs across risk strata.

Since it is inevitable that targeted screening approaches will miss some students with dental care needs, it is perhaps of most importance to ensure that those with the most severe needs and children who would not otherwise access dental services are identified and referred to an appropriate source of care. Children with needs from economically disadvantaged backgrounds were less likely to have a regular source of dental care and less likely to have made a visit in the previous year when they would not have been included in the screening program. This suggests that these children are likely to be the main beneficiaries of a dental screening program designed to ensure access to care. The data indicated that identification rates were higher for these children and highest of all for those with urgent needs. For example, 80.1% of children from households receiving Ontario works or ODSP who had urgent needs would be identified. Consequently, the targeted program is most effective with respect to economically disadvantaged children.

In the 55 schools that were included in the study, grade 2 contained the highest percentage of children with dental care needs. One third of children with preventive needs were in grade 2. Grade 2 students in high and medium schools are screened under the current approach but grade 2 students in low risk schools are not. Consequently, in designing different five targeting strategies three included the screening of grade 2 students in low risk schools. Also explored were strategies in which the risk level of a school was determined on the basis of disease rates in grade 2 rather than JK and SK. The limited analyses possible with the current data set indicated that strategies which give a more central role to grade 2 students increase identification rates with only a modest investment of additional resources. However, since the analyses were based on unweighted data further research is indicated in which data can be weighted to take account of different probabilities of selection. It is also the case that the effect of different targeting strategies differed across Health Units involved in the study. Consequently, all Health Units/Departments should be encouraged to assess the effectiveness of the targeted screening program and the effect on identification rates of modifications to the targeting criteria.