Oral Health Status of Lambton County Elementary School Children

Oral Health 2011 Annual Report

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Table of Contents:

TABLES AND FIGURES: ............................................................................................................................ 2
EXECUTIVE SUMMARY: .......................................................................................................................... 3
ACRONYMS ................................................................................................................................................ 5
INTRODUCTION: ........................................................................................................................................ 6
  Background: ............................................................................................................................................. 6
  Why does oral health matter? .............................................................................................................. 6
  Why is oral health important in children? ............................................................................................. 6
  How does the County of Lambton ensure children receive dental care? ............................................ 6
  Purpose: ................................................................................................................................................... 7
METHODS: .................................................................................................................................................. 8
  Sampling Strategy: ................................................................................................................................... 8
  Screeners: ................................................................................................................................................ 8
  Data Collection: ........................................................................................................................................ 8
  Dental Indices and Analysis: .................................................................................................................... 8
  Geographic Information Systems (GIS) Mapping: ................................................................................... 8
RESULTS: ................................................................................................................................................. 10
  Demographics of the Sample Population: .............................................................................................. 10
  Dental Caries Prevalence: ..................................................................................................................... 11
  By School Year for 2009 to 2010 and 2010 to 2011: ............................................................................. 13
  By Sex for 2010 to 2011: ........................................................................................................................ 13
  By Grade for 2010 to 2011: .................................................................................................................... 14
  Untreated Caries: ................................................................................................................................... 15
  Dental Caries Severity: .......................................................................................................................... 17
  By Grade for 2010 to 2011: .................................................................................................................... 17
  Urgent Treatment Needs: ....................................................................................................................... 21
DISCUSSION: ............................................................................................................................................ 23
RECOMMENDATIONS: ............................................................................................................................ 25
APPENDICES: ........................................................................................................................................... 26
REFERENCES: ......................................................................................................................................... 29
TABLES AND FIGURES:

Tables:
Table 1: Total number of children screened by year and sex, grade and Best Start neighbourhood. ......10
Table 2: Percentage of children with two or more decayed teeth.............................................................15

Figures:
Figure 1: Caries experience distributed by severity and by grade for 2010 to 2011. ..............................11
Figure 2: GIS map showing geographical distribution of children with two or more teeth affected by caries
for 2010 to 2011. ....................................................................................................................................12
Figure 3: Prevalence of caries by experience, and by school year for 2009 to 2010 and 2010 to 2011...13
Figure 4: Prevalence of dental caries by experience and by sex for 2010 to 2011. ...............................14
Figure 5: Prevalence of caries by experience and by grade for 2010 to 2011. .................................14
Figure 6: Map showing percentage of children in neighbourhood with two or more decayed teeth in 2010
to 2011. ..............................................................................................................................................16
Figure 7: Severity of dental caries for whole sample and children with caries history for 2010 to 2011. ..17
Figure 8: Mean dmft+DMFT score for whole sample and children with caries history for 2010 to 2011...18
Figure 9: Need profile of children with caries experience for 2010 to 2011..............................................19
Figure 10: Map showing percentage of children with decay only (no filled or missing teeth) by
neighbourhood, 2010 to 2011. ...........................................................................................................20
Figure 11: Urgent dental treatment needs by grade and by school year for 2009 to 2010 and 2010 to
2011. ..................................................................................................................................................21
Figure 12: Map showing percentage of children with urgent treatment needs by neighbourhood, 2010 to
2011. ..................................................................................................................................................22

Appendices:
Appendix 1: Table Showing the 14 Best Start Neighbourhood Boundaries. .................................26
Appendix 2: A GIS Map Showing the Average Family Income by Best Start Neighbourhood in 2006. ....27
Appendix 3: Participating Schools by Best Start Neighbourhood and School Year. ...........................28
EXECUTIVE SUMMARY:

A healthy mouth can improve and sustain entire body health. Diabetes, cardiovascular disease, and respiratory illnesses can be affected by an individual's oral health status. Proper oral health maintenance can reduce the impact or burden of these diseases.

The County of Lambton Child Health & Dental Services Department strives to increase the number of children in Lambton County with optimal oral health. Bound by Ontario Public Health Standards, Child Health & Dental Services Department provides programs and services in accordance with the:

- Oral Health Assessment and Surveillance Protocol¹,
- Children in Need of Treatment Program Protocol²,
- Preventive Oral Health Services Protocol³ and;
- Protocol for the Monitoring of Community Water Fluoride Levels⁴.

This report provides an overarching picture of the oral health status of young school children in Lambton County based on dental health statistics collected between 2009 and 2011. Data will help isolate health inequalities and identify dental needs across Lambton County to improve program planning and evaluation.

The sample population, used as the basis of this report, consisted of children enrolled in Junior Kindergarten, Senior Kindergarten, and Grade two in English public and Catholic elementary schools in Lambton County. Students were screened during the 2009 to 2010 and 2010 to 2011 school years by health unit staff. Between 54.5%-58% attended school in Sarnia/Bright's Grove; the remainder attended school in other areas of Lambton.

Slightly more than 65% of the children screened in 2010 to 2011 were caries free. By grade, the proportion of caries-free children decreased significantly as grade level increased; conversely, the percentage of children with 2 or more teeth affected by caries (tooth decay) increased.

There were no statistically significant differences in the prevalence of dental caries experienced between the two school years studied. More than one-third of Lambton County children screened had dental caries:

- 35.2% in 2009 to 2010,
- 34.6% in 2010 to 2011.

About 7% of children screened in Lambton had two or more decayed teeth; males were significantly more likely than females to have two or more decayed teeth.

An absence of decay, coupled with a concurrent increase in the prevalence of filled and missing teeth, suggests the majority of school children received treatment while a persistent proportion of the population suffered from decay and did not access dental care.

The prevalence and severity of a preventable disease among Lambton's school children indicates that greater resources should be devoted to early prevention, before four years of age.

Recommendations for the future include:

- Offer school dental screenings to children outside of the English-speaking public and Catholic schools.
- Intensify screening programs in schools and alternative community-based sites within the Best Start neighbourhoods with greatest need.
- Intensify early identification and intervention services to preschool-aged children and their families, particularly in the Best Start neighbourhoods with greatest need.
- Work with community agencies to increase access to dental care within these communities.
- Maintain open lines of communication with dentists and independent hygienists working in these neighbourhoods to make dental care more accessible for children and families.
Acronyms

**CINOT**: Children In Need Of Treatment.

**dmft+DMFT=0**: represents those children who have no caries experience in both primary (lowercase letters) and permanent (uppercase letters) dentitions.

**dt+DT**: decayed teeth of both primary (lowercase letters) and permanent (uppercase letters) dentitions.

**ft+FT**: filled teeth of both primary (lowercase letters) and permanent (uppercase letters) dentitions.

**GIS**: Geographic Information Systems.

**HSO**: Healthy Smiles Ontario.

**JK**: Junior Kindergarten.

**MFIPPA**: Municipal Freedom of Information and Protection of Privacy Act.

**mt+MT**: teeth missing due to caries of both primary (lowercase letters) and permanent (uppercase letters) dentitions.

**OHISS**: Oral Health Information Support System.

**OPHS**: Ontario Public Health Standards.

**PHIPA**: Personal Health Information Protection Act.

**SK**: Senior Kindergarten.
INTRODUCTION:

Background:

Why does oral health matter?
Good oral health contributes to good overall health, and is a determinant of quality of life\textsuperscript{5}. Having a healthy mouth can improve and sustain the entire body's health. Dental caries, more commonly called tooth decay, is one of the most prevalent conditions in humans\textsuperscript{5}. It can lead to pain, infection, chewing problems, poor nutritional status, and gastrointestinal disorders\textsuperscript{6}. Chronic diseases such as diabetes, cardiovascular disease, and respiratory illnesses can all be linked to periodontal disease\textsuperscript{7}.

Why is oral health important in children?
Oral health is important for all ages. Young children, children, youth, adults and seniors can all be affected by oral disease\textsuperscript{8}. In children, good oral health contributes to proper development and alignment of the teeth and supporting structures. Early childhood tooth decay in toddlers and preschoolers can result in pain and infection. These symptoms of decay can affect normal eating habits, delay normal weight gain, and impede growth; impacting other stages of growth and development later in life.

Children who are missing teeth, have abscessed teeth, or decayed teeth, can develop many problems in other aspects of their life. Poor oral health can result in an inability to concentrate in school, regular absences from school\textsuperscript{9}, impaired speech development, poor nutrition habits, and self-esteem issues.

There is a correlation between tooth decay in childhood and oral health in adulthood\textsuperscript{10}. Adults with oral disease may:

- miss work,
- have a reduced psychological and social well-being,
- visit the dentist less\textsuperscript{11},
- have dental bills that may cause financial hardship.

Financial issues are more pronounced in the elderly, who may struggle with day-to-day finances. Recognizing that adult oral disease is set in part by childhood decay, more focus should be placed on prevention and treatment among children.

Some of the most effective avenues to prevent dental decay include: water fluoridation, fluoridated toothpaste, fluoride varnish, and sealants; however, many children, for various reasons, are unable to access important preventive dental interventions. These children may be more susceptible to oral disease, and as a result, more serious health conditions\textsuperscript{10,12}. It is imperative that all children have an equal chance of preventing disease.

How does the County of Lambton ensure children receive dental care?
The County of Lambton Child Health & Dental Services Department provides school dental screening to children in Lambton County in accordance with the Ontario Public Health Standards (OPHS) Oral Health Assessment and Surveillance Protocol\textsuperscript{1}. Elements of this protocol range from detection and identification of oral health issues to the collection of relevant oral health data. It was developed to standardize oral health assessment and surveillance practices and ensure consistent use of the Ontario Oral Health Information Support System (OHISS) to collect assessment and surveillance data.

The protocol mandates that every child in Junior Kindergarten (JK), Senior Kindergarten (SK), and Grade two receive an oral health assessment or dental screening. Screening intensity of each school is decided by Grade two assessment results:
- **Low intensity schools** have a prevalence of Grade two students with at least two teeth affected by decay below 9.5%.
- **Medium intensity schools**, where the prevalence of Grade two students with at least two teeth affected by decay is between 9.5% and 14%, Grade eight students must also be screened.
- **High intensity schools**, where the prevalence of Grade two students with at least two teeth affected by decay is greater than 14%, students in grades JK, SK, two, four, six, and eight are screened.

Parents, who want their children excluded from dental screening, can withdraw their consent and children will not be screened.

The County of Lambton Board of Health is responsible for the OPHS *Children in Need of Treatment* (CINOT) *Program Protocol*. This protocol standardizes case management for screened children identified with urgent dental needs. The Child Health & Dental Services Department must administer and offer the CINOT program to these children. CINOT-eligible children are referred to the local dental community and their treatment is monitored. A child’s case is considered complete upon receiving treatment or referral to the Children’s Aid Society.

Children identified as eligible for preventive services through school screening must be offered essential clinical preventive oral health services at least annually in accordance with the OPHS *Preventive Oral Health Services Protocol*. Preventive services include professionally applied topical fluoride, sealants, and scaling, provided by Child Health & Dental Services, 160 Exmouth St., Point Edward, ON.

Dental screening and communication with the parents of participating children offers an opportunity to provide information about *Healthy Smiles Ontario* (HSO), another provincially-funded dental program administered by Child Health & Dental Services. Healthy Smiles Ontario, which is outside the mandate of the OPHS, targets low-income children 17 years of age and younger, and provides access to basic dental care including: diagnostic, preventive, and treatment services.

**Purpose:**

This report provides an overarching picture of oral health among young school children in Lambton County and uses dental health statistics collected during the 2009 to 2010 and 2010 to 2011 school years to identify dental needs. Identifying needs will help isolate health inequalities and identify community requirements across Lambton County and improve program planning and evaluation. As a result, health promotion activities and clinical interventions can be utilized to affect behaviour change and improve oral health for all residents of Lambton County.
METHODS:

Sampling Strategy:
The sample group consisted of all children enrolled in JK, SK and Grade two in English public and Catholic elementary schools in Lambton County. Students were screened during the 2009 to 2010 and 2010 to 2011 school years by health unit staff. Children, whose parents did not consent to participation, were excluded from school screening and any data collection. Although children from other grade levels were screened, data were not considered for this report.

Screeners:
School screenings were conducted by one of two part-time registered dental hygienists and by one full-time dental assistant. The hygienists were given a training session at the start of the school year with additional updates throughout the period of time under study.

Data Collection:
Data were collected in accordance with the Ontario Public Health Standards (OPHS): Oral Health Assessment and Surveillance Protocol. Demographics, eligibility for services, and clinical findings were recorded in a Microsoft Excel 2007 spreadsheet and transferred into the Ministry of Health and Long-term Care’s Oral Health Information Support System (OHISS) as aggregate data. Of specific importance to this report, the number of decayed teeth (dt+DT), teeth missing due to caries (mt+MT), and filled teeth (ft+FT) of both primary and permanent dentitions were recorded. Lower case letters refer to counts of primary teeth and upper case letters refer to counts of permanent teeth.

Appropriate measures were followed to protect personal health information as per the Municipal Freedom of Information and Protection of Privacy Act (MFIPPA) and Personal Health Information Protection Act (PHIPA).

Dental Indices and Analysis:
Dental caries prevalence is defined as the percentage of sample with dental caries experience in the form of decayed, missing due to caries, and/or filled teeth. Conversely, the percentage of caries-free children represents those children who have no caries experience, i.e. dmft+DMFT=0. The severity of dental caries was assessed using the mean dmft+DMFT, or the mean sum of counts of decayed, missing due to caries, and/or filled teeth.

Stata 11 was used for all analyses, including descriptive statistics, cross-tabulations and statistical tests. Chi-square tests were used to test the difference between proportions. Mean scores of prevalence and severity were computed along with 95% confidence intervals. The difference between two groups was considered statistically significant if the two confidence intervals did not overlap.

Geographic Information Systems (GIS) Mapping:
Map boundaries were set according to Best Start neighbourhood boundaries. The Best Start neighbourhood placement was based on the location of the school where the child was registered at the time of screening. It is important to note that children may attend a school located in a different Best Start neighbourhood than the one they live. Best Start neighbourhoods include all First Nation communities located in Lambton County; no First Nation schools were screened in the 2009 to 2010 or 2010 to 2011 school years.
Best Start neighbourhoods were chosen due to their relevance and relative anonymity. Every Best Start neighbourhood has at least one school within its boundaries, adding a layer of privacy to any school bodies in a neighbourhood found to have a high prevalence or severity of caries.

Maps were developed using Arc Catalog and ArcMap (GIS [Geographic Information Systems]) programs involved with spatial planning and analysis. Data were imported by these programs from Microsoft Excel 2007 and mapped based on the appropriate Best Start neighbourhood.
RESULTS:

Demographics of the Sample Population:
The sample population consisted of children enrolled in English public and Catholic elementary schools in Lambton County. They were screened during the 2009 to 2010 and 2010 to 2011 school years by health unit staff. Health unit staff screened nearly 1000 more students in 2010 to 2011 compared to the previous year (Table 1). The numbers of male and female children seen in both years was approximately equal. Also screened in almost equal proportions were JK, SK and Grade two students. Geographical distribution of students is reflective of the distribution in total population, with 54.5%-58% attending school in Sarnia/Bright’s Grove; the remainder attended school elsewhere in the county.

Table 1: Total number of children screened by year and sex, grade and Best Start neighbourhood.

<table>
<thead>
<tr>
<th></th>
<th>2009 to 2010</th>
<th>%</th>
<th>2010 to 2011</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender: Male</td>
<td>964</td>
<td>49.4%</td>
<td>1503</td>
<td>51.8%</td>
</tr>
<tr>
<td>Gender: Female</td>
<td>989</td>
<td>50.6%</td>
<td>1399</td>
<td>48.2%</td>
</tr>
<tr>
<td><strong>Grade</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade: Junior Kindergarten</td>
<td>671</td>
<td>34.4%</td>
<td>973</td>
<td>33.5%</td>
</tr>
<tr>
<td>Grade: Senior Kindergarten</td>
<td>635</td>
<td>32.5%</td>
<td>958</td>
<td>33.0%</td>
</tr>
<tr>
<td>Grade two</td>
<td>647</td>
<td>33.1%</td>
<td>971</td>
<td>33.5%</td>
</tr>
<tr>
<td><strong>Best Start Neighbourhood</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bright's Grove</td>
<td>52</td>
<td>2.7%</td>
<td>124</td>
<td>4.3%</td>
</tr>
<tr>
<td>North East Sarnia</td>
<td>500</td>
<td>25.6%</td>
<td>645</td>
<td>22.2%</td>
</tr>
<tr>
<td>South East Sarnia</td>
<td>207</td>
<td>10.6%</td>
<td>313</td>
<td>10.8%</td>
</tr>
<tr>
<td>South West Sarnia</td>
<td>195</td>
<td>10.0%</td>
<td>268</td>
<td>9.2%</td>
</tr>
<tr>
<td>North West Sarnia</td>
<td>178</td>
<td>9.1%</td>
<td>233</td>
<td>8.0%</td>
</tr>
<tr>
<td>Aamjiwinaang/Corunna</td>
<td>148</td>
<td>7.6%</td>
<td>271</td>
<td>9.3%</td>
</tr>
<tr>
<td>Brigden/Mooretown/Courtright</td>
<td>0</td>
<td>0.0%</td>
<td>76</td>
<td>2.6%</td>
</tr>
<tr>
<td>Sombra/Port Lambton/Rural St. Clair</td>
<td>55</td>
<td>2.8%</td>
<td>77</td>
<td>2.7%</td>
</tr>
<tr>
<td>Petrolia/Oil Springs/Enniskillen</td>
<td>224</td>
<td>11.5%</td>
<td>286</td>
<td>9.9%</td>
</tr>
<tr>
<td>Watford/Warwick</td>
<td>113</td>
<td>5.8%</td>
<td>112</td>
<td>3.9%</td>
</tr>
<tr>
<td>Brooke-Alvinston/Dawn-Euphemia</td>
<td>85</td>
<td>4.4%</td>
<td>99</td>
<td>3.4%</td>
</tr>
<tr>
<td>Wyoming/Camlachie</td>
<td>85</td>
<td>4.4%</td>
<td>147</td>
<td>5.1%</td>
</tr>
<tr>
<td>Forest</td>
<td>69</td>
<td>3.5%</td>
<td>144</td>
<td>5.0%</td>
</tr>
<tr>
<td>Grand Bend/Port Franks/Thedford/Arkona</td>
<td>42</td>
<td>2.2%</td>
<td>107</td>
<td>3.7%</td>
</tr>
<tr>
<td><strong>TOTAL COUNT</strong></td>
<td><strong>1953</strong></td>
<td></td>
<td><strong>2902</strong></td>
<td></td>
</tr>
</tbody>
</table>
Dental Caries Prevalence:

Overall Caries Experience
Slightly more than 65% of the 2010 to 2011 children screened were caries-free. When stratified by grade, the percentage of caries-free children decreased significantly with increasing grade level: Conversely, the percentage of children with two or more teeth affected by caries increased (Figure 1).

Figure 1: Caries experience distributed by severity and by grade for 2010 to 2011.

Figure 2 shows the geographical distribution of children in Lambton County with at least two teeth affected by caries in 14 Best Start neighbourhoods. In areas shaded red 29.18-39.39% of the sample population had at least two teeth affected by caries. Peach areas had 25.82-29.17% of children presenting with at least two teeth affected by caries; light peach areas had 17.12%-25.81%; and light yellow had 16.33-17.11%.

Best Start neighbourhoods "three, four, nine, and 11" had the highest percentages of children with at least two teeth affected by caries. Best Start neighbourhoods "seven and 12" had the lowest percentages of children with two or more caries.
Figure 2: GIS map showing geographical distribution of children with two or more teeth affected by caries for 2010 to 2011.
By School Year for 2009 to 2010 and 2010 to 2011:

There were no statistically significant differences in the prevalence of dental caries experience between the two school years studied (Figure 3). More than one-third of Lambton County children screened had ever experienced dental caries: 35.2% in 2009 to 2010 and 34.6% in 2010 to 2011. Decayed, untreated teeth were present in at least 11.7% of children in 2009 to 2010 and 13.1% of children in 2010 to 2011. In both years, approximately one-quarter had at least one filled tooth, 26.3% and 25.1% respectively. Additionally, around 8% of children in each cohort were missing teeth due to decay.

![Figure 3: Prevalence of caries by experience, and by school year for 2009 to 2010 and 2010 to 2011.](image)

Data Source: Lambton Child Health & Dental Services Department, Oral Health Screening Program
Sample size: 2009 to 2010 (n=1953), 2010/11 (n=2902)

By Sex for 2010 to 2011:

Males were slightly more likely than females to have ever had caries, to have filled teeth and to have decayed teeth (Figure 4). This difference was only statistically significant with respect to whether they had ever had caries.
By Grade for 2010 to 2011:

The prevalence of dental caries experience increased with statistical significance with increasing grade level. The same significant trends were evident with respect to the prevalence of having at least one filled or one missing tooth: as grade level increased, the prevalence of filled teeth and missing teeth due to caries increased. The proportion of children with one or more teeth with decay did not differ by grade, remaining constant at approximately 13% (Figure 5).
Untreated Caries:
Approximately 7% of young school children screened in Lambton County had two or more decayed teeth (i.e. dT+DT≥2). Males were significantly more likely than females to have two or more decayed teeth. While there were no significant differences by grade, children in Grade two appeared to be least likely to have two or more decayed teeth. The prevalence of two or more decayed teeth appears also to have increased from 2009 to 2010 to 2010 to 2011 (Table 2).

Table 2: Percentage of children with two or more decayed teeth.

<table>
<thead>
<tr>
<th>Gender</th>
<th>2009 to 2010</th>
<th>2010 to 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td>8.2</td>
<td>8.4</td>
</tr>
<tr>
<td>Females</td>
<td>5.4</td>
<td>6.4</td>
</tr>
<tr>
<td>Grade</td>
<td>2009 to 2010</td>
<td>2010 to 2011</td>
</tr>
<tr>
<td>JK</td>
<td>7.0</td>
<td>8.0</td>
</tr>
<tr>
<td>SK</td>
<td>7.9</td>
<td>7.6</td>
</tr>
<tr>
<td>Grade two</td>
<td>5.4</td>
<td>6.6</td>
</tr>
<tr>
<td>Total</td>
<td>6.8</td>
<td>7.4</td>
</tr>
</tbody>
</table>

**Bold** indicates a significant difference between males and females (Chi-Square test, p<0.05).
Data Source: Lambton Child Health & Dental Services Department, Oral Health Screening Program.

Figure 6 is a GIS map showing the percentage of children in the Best Start neighbourhood with two or more teeth having decay for 2010 to 2011. Only Best Start neighbourhood four had greater than 14% of children with decay in two or more teeth. Additionally, Best Start neighbourhoods three and 11 had between 9.5% and 14% of children respectively with decay in two or more teeth. The remaining Best Start neighbourhoods had fewer than 9.5% of children present with decay in two or more teeth at the time of screening.
Figure 6: Map showing percentage of children in neighbourhood with two or more decayed teeth in 2010 to 2011.
Dental Caries Severity:
The mean number of teeth affected by dental caries was 1.42 for all children, but increased to 4.10 when only those with caries experience were included in the analysis (Figure 7). Similarly, the mean numbers of decayed, missing, and filled teeth individually were at least two times greater for the group who had experienced caries. Among those who had experienced caries, the mean numbers of decayed, missing, and filled teeth were 0.89, 0.54, and 2.67, respectively.

Data Source: Lambton Child Health & Dental Services Department, Oral Health Screening Program.
Sample size: All Children (n=2902), Children with dmft+DMFT>0 (n=1005).

By Grade for 2010 to 2011:
The mean number of teeth affected by caries increased with grade when the entire sample was examined. However, when only those who had experienced dental caries were analyzed, there was an increase in mean number of teeth affected by caries from JK to SK, but no difference between those of the children in SK and Grade two (Figure 8).
To further characterize the distribution of caries, the caries experiences were examined more closely (Figure 9). Of those children who had ever experienced caries (n=1005), 23.8% had not received any fillings nor had any missing teeth, and only had decay at the time of screening. This represents a subset of the population with unmet dental needs, equal to approximately 8% of the total screened JK, SK and Grade two population in 2010 to 2011. Among these children, the average number of decayed teeth was 2.49 (95% CI: 2.24-2.75), ranging from one to 12 decayed teeth. Approximately 14% of children with caries experience appeared to have partially met dental needs; that is, they had a combination of decayed, filled and missing teeth. Finally, the majority of children with caries experience had fully met dental treatment needs (62%), having only filled or missing teeth with no decay.
Figure 9: Need profile of children with caries experience for 2010 to 2011.

Data Source: Lambton Child Health & Dental Services Department, Oral Health Screening Program.
Sample size: Children with DMFT>0 (n=1005).

Figure 10 is a GIS map showing the percentage of children in 2010 to 2011 with teeth affected by decay only, i.e. no missing or filled teeth due to caries. Best Start neighbourhoods four, nine and 11 had the highest percentage of children with teeth affected by decay with percentages between 9.88% and 16.16%. Best Start neighbourhoods one, two, six, and 12 had the lowest percentage of children with decay.
Figure 10: Map showing percentage of children with decay only (no filled or missing teeth) by neighbourhood, 2010 to 2011.
Urgent Treatment Needs:
Urgent treatment needs are defined in terms of Children in Need Of Treatment (CINOT) eligibility requirements. Any of the following conditions will qualify the child as in need of urgent treatment: pain, infection, hemorrhage, trauma, large open caries in permanent teeth or in crucial primary teeth, pathology requiring further investigation, and irreversible periodontal disease.

Overall, 5%-6% of the children screened in Lambton County had urgent dental treatment needs in each school year (Figure 11). The need for urgent care appears to decrease from JK to Grade two; however, this difference was not statistically significant. Also, while the proportion of children with urgent dental needs was slightly lower in 2010 to 2011 compared to 2009 to 2010, this difference was not significant.

Figure 11: Urgent dental treatment needs by grade and by school year for 2009 to 2010 and 2010 to 2011.

Figure 12 shows the percentage of children in Lambton County with urgent treatment needs for 2010 to 2011 according to the 14 Best Start neighbourhoods. 'Red' areas, namely Best Start neighbourhoods four and 11, had the highest percentage of children with urgent treatment needs, with between 6.5% and 13.01% presenting with urgent treatment needs. Best Start neighbourhoods one and 12 had the lowest percentages of children with urgent treatment needs.
Figure 12: Map showing percentage of children with urgent treatment needs by neighbourhood, 2010 to 2011.
DISCUSSION:

This report confirms that while many children have been able to access dental services in Lambton County, more than one third of young school children screened by the Child Health & Dental Services Department required basic dental care; some with urgent assessed needs. Despite drastic declines in dental disease overall, early childhood caries persists as a public health problem.

When stratified by grade, the prevalence of dental caries experience increased with statistical significance (Figure 1 and Figure 5). This finding is expected since teeth are at greater risk of developing decay the longer they are present in the oral cavity and exposed to the acidic environment created by bacteria and leftover food. Also, since the caries process is irreversible once cavitation of the enamel has occurred, DMF rates will tend to rise with increasing age. While there is a lack of increase in decay, a concurrent increase in the prevalence of filled and missing teeth suggests the majority of school children are receiving treatment and a persistent proportion of the population continues to suffer from decay.

An absence of increase in the prevalence of decay is characteristic of a successful screening program for young school children that alerts parents of dental problems and directs them to dental providers to control disease in the population.

Further, the concurrent increase in the prevalence of filled and missing teeth shows that young families in Lambton County could benefit from increased prevention and health promotion interventions. Figure 11 suggests the same.

The data show that screened male children had significantly greater caries experience. Dental literature, which concentrated on adolescents and pre-adolescents, suggests that males have worse oral hygiene practices and require greater hygiene instruction after controlling for confounding factors. On the other hand, social science research has long acknowledged that industrialized nations’ standards of cleanliness for girls are higher than boys, particularly for children younger than five years of age. No statistically significant difference, between the sexes, was found for filled and missing teeth, suggesting that parents are bringing sons and daughters for dental care equally.

The GIS mapping of caries severity by Best Start neighbourhood illustrates that dental disease is not distributed evenly across Lambton County (Figure 2, Figure 6, Figure 10 and Figure 12). Globally, it has been demonstrated that oral health status is influenced by key determinants of health. In fact, family income levels, food security, the built environment, and maternal education are all known to affect opportunities for some populations to achieve optimal oral health. Unequal access to and utilization of dental services also plays a role in disease incidence and progression. Further, utilization of health services is thought to be a function of three characteristics:

1) predisposing factors like social structure, health beliefs, and demographics;  
2) enabling factors or the logistical aspects of obtaining care;  
3) perceived and evaluated needs.

GIS mapping enabled cross-referencing average family before tax income and disease prevalence against geographic area (Appendix 2). It is not surprising, given the relationship between socio-economic status and oral health status, to find that the Lambton County Best Start neighbourhoods of greatest dental need and highest disease prevalence are also those with the lowest average before tax incomes. Likewise, rural Best Start neighbourhoods also show problematic access to dental care. Outside of Sarnia, fewer dental providers and geography are potential barriers to care. These findings are also consistent with the literature.
The prevalence and severity of an entirely preventable disease among Lambton County’s young school children indicates that greater resources should be devoted to early prevention, prior to four years of age. Current research shows that clinical interventions and anticipatory guidance to expectant parents, parents and caregivers of infants and toddlers can prevent or curb dental disease through childhood\textsuperscript{23,24,25}. Studies also revealed that dental disease in the primary dentition is correlated with later caries development in the adult dentition\textsuperscript{10}.

Overall, there was greater coverage in 2010 to 2011 compared to 2009 to 2010 (Appendix 3) with nearly 1000 more students screened. It should be noted that this could affect year-to-year estimates, particularly within a small neighbourhood. The presence or absence of a single school within a neighbourhood with few schools could skew the results for that neighbourhood. Additional estimates could be skewed due to the amalgamation of St. Therese and St. Margaret Catholic schools forming St. Matthew in 2010 to 2011. For this reason, the authors have refrained from drawing comparisons between the two cohorts.

This report recognizes the statistics for Best Start neighbourhood 13 and Lambton County do not include the children attending the aboriginal school serving Kettle and Stony Point First Nation. The prevalence and severity of decay reported may be non-representative of the population.

Another consideration is the definition of active decay. The definition used in this study counts only caries that have progressed into enamel and dentin as endorsed by the World Health Organization\textsuperscript{26} for epidemiological research and may underestimate caries prevalence and severity\textsuperscript{27}. Due to the growing use of tooth-coloured composite restorations, the number of filled teeth may be underestimated because of the difficulty to identify under screening conditions. Nevertheless, the wide use of the dmft and DMFT method of data collection offers standardization from provider to provider, and over time.

Classification of dental need as urgent or non-urgent is based on the eligibility criteria of the provincial CINOT program and should in theory be independent of provider. Although some calibration of public health dental hygienists is attempted, in reality, the influence of clinical expertise may sway a classification decision.
RECOMMENDATIONS:
It is recommended that County of Lambton, Child Health & Dental Services Department broaden its scope in identifying and referring children in need by offering school dental screenings to children outside of the English-speaking public and Catholic schools systems. Screening should be offered to children attending:
  - French-speaking public and separate schools,
  - private and/or alternative schools.

Further, if resources allow, Child Health & Dental Services should intensify its screening program in schools and alternative community-based sites within the Best Start neighbourhoods with greatest need.

It is recommended that Child Health & Dental Services:
  - Intensify early identification and intervention services for the younger than school-aged population and their families, particularly in the Best Start neighbourhoods with greatest need.
  - Work with community agencies to increase access to dental care within these communities (e.g. Inn of the Good Shepherd helps distribute information on publicly funded child and youth dental programs and services).
  - Maintain open lines of communication with dentists and independently practising hygienists already working in these neighbourhoods to make dental care more accessible for children and families.
  - Maintain its current level of data collection and continue to develop expertise in the use of the Ministry of Health and Long-term Care’s Oral Health Information Support System (OHISS) to facilitate trend analysis, program planning, implementation and evaluation both locally and provincially.
  - Design and implement a formal procedure for training registered dental hygienists to standardize assessments in line with other hygienists in Ontario.
APPENDICES:

Appendix 1: Table Showing the 14 Best Start Neighbourhood Boundaries.

<table>
<thead>
<tr>
<th>Best Start Neighbourhood</th>
<th>Boundaries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neighbourhood 1</td>
<td>Bright’s Grove</td>
</tr>
<tr>
<td>Neighbourhood 2</td>
<td>North East Sarnia</td>
</tr>
<tr>
<td>Neighbourhood 3</td>
<td>South East Sarnia</td>
</tr>
<tr>
<td>Neighbourhood 4</td>
<td>South West Sarnia</td>
</tr>
<tr>
<td>Neighbourhood 5</td>
<td>North West Sarnia</td>
</tr>
<tr>
<td>Neighbourhood 6</td>
<td>Aamjiwnaang and Corunna</td>
</tr>
<tr>
<td>Neighbourhood 7</td>
<td>Mooretown, Courtright and Brigden</td>
</tr>
<tr>
<td>Neighbourhood 8</td>
<td>Sombra, Port Lambton, Rural St. Clair and Becher</td>
</tr>
<tr>
<td>Neighbourhood 9</td>
<td>Petrolia, Oil Springs, Oil City and Former Dawn Township</td>
</tr>
<tr>
<td>Neighbourhood 10</td>
<td>Watford and Warwick (Warwick Township)</td>
</tr>
<tr>
<td>Neighbourhood 11</td>
<td>Brooke-Alvinston, Former Euphemia Township and Inwood</td>
</tr>
<tr>
<td>Neighbourhood 12</td>
<td>Wyoming, Camlachie and rural surrounding area</td>
</tr>
<tr>
<td>Neighbourhood 13</td>
<td>Forest and rural surrounding area</td>
</tr>
<tr>
<td>Neighbourhood 14</td>
<td>Thedford, Grand Bend, Arkona and Port Franks</td>
</tr>
</tbody>
</table>
### Appendix 3: Participating Schools by Best Start Neighbourhood and School Year.

<table>
<thead>
<tr>
<th>Best Start neighbourhood</th>
<th>2009 to 2010</th>
<th>2010 to 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Bright's Grove</td>
<td>St. Michael</td>
<td>St. Michael</td>
</tr>
<tr>
<td></td>
<td>Bright's Grove</td>
<td>Bright's Grove</td>
</tr>
<tr>
<td>2. North East Sarnia</td>
<td>Lakeroad</td>
<td>Lakeroad</td>
</tr>
<tr>
<td></td>
<td>Errol Road</td>
<td>Errol Road</td>
</tr>
<tr>
<td></td>
<td>Gregory Hogan</td>
<td>Gregory Hogan</td>
</tr>
<tr>
<td></td>
<td>St. Anne</td>
<td>St. Anne</td>
</tr>
<tr>
<td></td>
<td>Rosedale</td>
<td>Rosedale</td>
</tr>
<tr>
<td></td>
<td>High Park</td>
<td>High Park</td>
</tr>
<tr>
<td>3. South East Sarnia</td>
<td>Queen Elizabeth II</td>
<td>Queen Elizabeth II</td>
</tr>
<tr>
<td></td>
<td>Holy Trinity</td>
<td>Holy Trinity</td>
</tr>
<tr>
<td></td>
<td>Confederation Central</td>
<td>Confederation Central</td>
</tr>
<tr>
<td>4. South West Sarnia</td>
<td>P.E. McGibbon</td>
<td>P.E. McGibbon</td>
</tr>
<tr>
<td></td>
<td>St. Therese</td>
<td>St. Matthew*</td>
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<tr>
<td></td>
<td>St. Margaret</td>
<td>Hanna Memorial</td>
</tr>
<tr>
<td>5. North West Sarnia</td>
<td>London Road</td>
<td>London Road</td>
</tr>
<tr>
<td></td>
<td>King George</td>
<td>King George</td>
</tr>
<tr>
<td></td>
<td>Sacred Heart Sarnia</td>
<td>Sacred Heart Sarnia</td>
</tr>
<tr>
<td></td>
<td>Bridgeview</td>
<td>Bridgeview</td>
</tr>
<tr>
<td>6. Corunna</td>
<td>Colonel Cameron</td>
<td>Colonel Cameron</td>
</tr>
<tr>
<td></td>
<td>St. Joseph</td>
<td>St. Joseph</td>
</tr>
<tr>
<td></td>
<td>Sir John Moore</td>
<td>Sir John Moore</td>
</tr>
<tr>
<td>7. Brigden/Mooretown/Courtright</td>
<td>No schools</td>
<td>Brigden</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mooretown-Courtright</td>
</tr>
<tr>
<td>8. Sombra/Port Lambton/Becher/Rural St. Clair</td>
<td>Riverview</td>
<td>Riverview</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sacred Heart Port Lambton</td>
</tr>
<tr>
<td>9. Petrolia/Oil Springs/Enniskillen</td>
<td>Hillcrest</td>
<td>Hillcrest</td>
</tr>
<tr>
<td></td>
<td>Lambton Centennial</td>
<td>Lambton Centennial</td>
</tr>
<tr>
<td></td>
<td>St. Philip</td>
<td>St. Philip</td>
</tr>
<tr>
<td>10. Watford/Warwick</td>
<td>East Lambton</td>
<td>East Lambton</td>
</tr>
<tr>
<td></td>
<td>St. Peter Canisius</td>
<td>St. Peter Canisius</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dawn-Euphemia</td>
</tr>
<tr>
<td>12. Wyoming/Camlachie</td>
<td>Aberarder</td>
<td>Aberarder</td>
</tr>
<tr>
<td></td>
<td>Holy Rosary</td>
<td>Holy Rosary</td>
</tr>
<tr>
<td></td>
<td></td>
<td>John Knox</td>
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<tr>
<td></td>
<td></td>
<td>South Plympton</td>
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<tr>
<td></td>
<td></td>
<td>Wyoming</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Errol Village</td>
</tr>
<tr>
<td>13. Forest</td>
<td>Kinnwood</td>
<td>Kinnwood</td>
</tr>
<tr>
<td></td>
<td></td>
<td>St. John Fisher</td>
</tr>
<tr>
<td>14. Grand Bend/Port Franks/Thedford/Arkona</td>
<td>Grand Bend</td>
<td>Bosanquet</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Grand Bend</td>
</tr>
</tbody>
</table>

* St. Therese and St. Margaret amalgamated to form St. Matthew in 2010 to 2011.
REFERENCES:


21 Equity to access to medical care: a conceptual and empirical overview. L.A. Aday, R.M. Andersen. 1981, Medical Care, Vol. 9(supplement), pp. 4-27.


