

# 2015 Smile Survey Summary King County

June 29, 2017



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## Introduction and Key Findings

Dental disease is a preventable but common chronic problem in children that affects their ability to eat, sleep and learn, according to the *2000 Surgeon General's Report on Oral Health*. The Report highlights that dental problems are more prevalent in certain racial/ethnic and socio-economic groups. Public Health – Seattle & King County monitors the oral health of children to provide data to communities and agencies to help address this problem.

In 2015, as part of an oral health assessment conducted every five years, the Washington State Department of Health conducted a statewide oral health Smile Survey of 13,704 elementary school children in kindergarten, 2<sup>nd</sup> and 3<sup>rd</sup> grades and 1,479 children in Head Start/ECEAP preschool programs. Dental hygienists examined the teeth of children in a sample of schools, looking for treated and untreated decay (which together constitute “caries experience”), rampant decay (treated or untreated decay on 7 or more teeth), and use of dental sealants on permanent molars.

### Key findings from the 2015 King County Smile Survey of preschool and elementary children include:

1. King County children enjoy relatively good oral health.
  - King County **children age 6 to 9** exceeded the Healthy People 2020 child oral health objectives in caries experience, untreated decay and use of dental sealants.
  - HeadStart/ECEAP (**preschool**) children surpassed the Healthy People 2020 oral health objective for untreated decay for 3 to 5 year olds, and met the standard for caries experience.
  - **Kindergarten** children in the King County sample had lower rates of caries experience and rampant decay than did those in the Washington State sample. There was no difference in rate of untreated decay in the two groups.
  - **Second and third graders** in the King County sample also had less caries experience and rampant decay than those in the Washington State sample. King County children had a higher rate of untreated decay—an indicator of limited access to care-- than did Washington children.
2. Children’s oral health is improving modestly.
  - In the time since the 2005 and 2010 Smile Surveys, three of the four oral health measures (caries experience, treated decay and rampant caries) have **modestly improved**. There has been no change in untreated decay.
  - Most gains have occurred among children at higher risk for poor oral health: those from low income families, minority children (those who are non-white or Latino), and those whose families speak a language other than English at home.

3. Despite gains over time, disparities in oral disease persist for elementary children.
  - Children in low income families (those who are eligible for Free/Reduced Lunch) have nearly double the rate of oral disease measures of higher income children. Poverty is the strongest predictor of poor oral health in the Smile Survey.
  - Minority children also have higher rates of oral disease. Most of this disparity is a result of their relatively higher poverty rate rather than race/ethnicity itself.
  - Children who speak a language other than English at home also have a disadvantage in oral health relative to those who speak English. Language is a less powerful predictor than poverty or race/ethnicity.
4. There are no disparities in dental sealants, the only prevention measure included in the survey.
  - Dental sealants are typically applied to permanent molars, and were recorded for 2<sup>nd</sup> and 3<sup>rd</sup> graders.
  - In 2015 there were no differences among children by income, race/ethnicity or language spoken at home, reflecting a significant effort to target services to those at greatest risk.

## **Background and Methods**

In 1996, the Washington State Department of Health (DOH) conducted its first statewide survey to help monitor the trends of dental disease in children. The survey was a school-based oral health screening of children by dental professionals.

- In 2000, as part of the second statewide survey, Public Health –Seattle & King County (Public Health) conducted its first random sample survey of 2<sup>nd</sup> and 3<sup>rd</sup> grade students throughout King County.
- In 2005, Public Health participated in the third Smile Survey, conducting a county wide random survey of 2<sup>nd</sup> and 3<sup>rd</sup> grade students, as well as a random survey specific to Seattle students. In 2005, DOH added a survey of children in a random sample of Head Start and Early Childhood and Education Assistance Programs (ECEAP). Public Health also surveyed children in a random sample of preschool sites throughout King County.
- In 2010, DOH changed the survey to obtain information that could be used to compare Washington State data to those of other states nationwide. Kindergarten and 3<sup>rd</sup> grade students were targeted since these are the groups surveyed by other states. DOH also surveyed children in Head Start/ECEAP programs. DOH drew random samples of schools for the State survey and the King County survey.

### **2015 Survey Methodology**

The Department of Health drew samples of schools in which to conduct the state survey of elementary and preschool children. For both the preschool and elementary school samples a cluster sampling

design was used. The unit of sampling is the preschool/elementary school. All the eligible children in the sampled programs/schools are included in the surveyed population.

### ***Preschools***

Department of Early Learning supplied Washington State Department of Health (DOH) with a list of Head Start programs and ECEAP programs. From these two lists all preschools in King County were identified. The programs were randomly sorted and the first 24 were selected. One preschool was added as part of the statewide sample for a total of 25 preschools in King County. The number of preschools selected was based on a power calculation that took estimated non-response into account. The selected preschool programs were contacted and invited to participate. If they declined to participate, the next program on the list was invited, repeating until a replacement was identified.

### ***Elementary Schools***

An electronic data file of all elementary schools in Washington was obtained from the Office of Superintendent of Public Instruction's (OSPI) website. The data file was for the 2013-2014 school year. The file included all 2,300 public schools in Washington State. All schools with at least 15 children each in kindergarten, second and third grade were included in the sampling frame (n=1,040 schools). The list of King County schools was drawn from this larger list, then sorted by the percent of children eligible for the National School Lunch Program (NSLP). A randomly selected school was the starting point for the sampling, then every 13<sup>th</sup> school was selected. The value 13 was determined by dividing the number of schools in the sampling frame (292) by the number of schools to be chosen (22). The resulting sample reflected the NSLP eligibility distribution of all King County elementary schools.

Schools were approached to participate. If an elementary school declined, the next school in the sample frame was contacted and invited to participate. The process was repeated until a willing school was identified. Since the elementary school data frame was sorted by percent of children in NSLP, the next school on the list was likely to have a very similar percent of its children receiving free or reduced priced lunch.

### ***Data Collection***

When a school decided to participate, a screener was identified to collect the data and a date was set for the screening to take place. The exams for the survey were conducted by oral health professionals. Each examiner underwent a calibration training in the fall before the commencement of data collection to ensure the different examiners were noting disease and other conditions in the same way. The actual examination was brief, lasting under one minute. It consisted of a visual examination of the child's mouth using only a penlight and dental mirror. Other dental instruments or diagnostic tools were not used during the exam. Children were provided a tooth brush and a small reward in the form of a sticker to take home with them, even if they did not participate in the screening process.

### ***Data Management and Analysis***

Data collection and entry used Epi Info Version 7.1.4. on MS Surface Pro or iPad tablets and/or paper forms, according to the preference of the screener. Epi Info is a public access software program developed and supported by the Centers for Disease Control and Prevention. Data presented in this report were analyzed using STATA version 13.1. Data analysis was conducted taking the clustering

effect of the sampling methodology into account, treating each school as an individual sampling unit as part of the weighting of the data. In addition, the data were adjusted for non-response within each school/program, also included as part of the data weighting. For the non-response sampling weight, the number of children enrolled in each school/program was divided by the number of children screened. Where possible, comparisons between the 2005, the 2010 and the 2015/16 surveys were made.

The 2015 elementary school sample for the King County survey included 22 schools with 4,017 children participating, with a response (screening) rate of 84%. The King County sample included schools from the State sample and 3 others selected from King County to make a sample representative of County schools on Free and Reduced Lunch eligibility.

School sites had the option of participating with positive consent or passive consent. Positive consent requires that parents sign their children up to participate, whereas passive consent allows children to be screened unless parents indicate otherwise. The same oral health measures and demographic information (race, language and FR/L participation) were collected regardless of the type of consent determined by the school.

Dental professionals conducted screenings on site, after DOH training to assure consistency in assessments. This type of dental screening underreports dental disease, because no x-ray or other diagnostic tools are used. The increased use of tooth colored filling materials, which are harder to see than amalgam filling material, also increases the difficulty of using visual techniques to report absence of fillings.

Student characteristics included age, gender, grade, race/ethnicity, language spoken at home, and, for elementary students, eligibility for free and/or reduced price lunch program (FRL) as a proxy for overall socioeconomic status. Information on grade status for 41 students was missing, and those children were not included in analyses by grade. Information on eligibility for free and/or reduced lunch programs was obtained through the school districts' Nutrition Services programs. Data on race/ethnicity and language spoken at home were provided by individual schools based on parent/guardian enrollment information. After the screening, all students were identified by an ID number and names were removed to ensure confidentiality.

Oral health indicators included

- **caries experience** (either untreated or treated decay)
- **untreated caries** (decay)
- **treated caries** (decay)
- **rampant caries** (treated or untreated decay on seven or more teeth)
- **dental sealants** on permanent molars (data only collected in grades 2 and 3)
- **treatment urgency**. Treatment urgency is not discussed in this report. It is a measure of the need for dental care for untreated decay or for dental abscesses. Dental abscesses were found in less than 1% of elementary children and in no child in Head Start. All children with untreated decay or dental abscesses were referred for dental care.

Data tables for King County survey data appear in the text and the Appendix to this report. Not all eligible children were screened in each grade and school, due to absences and other factors. To adjust for this nonresponse and to make the results reflect the total population of eligible children, survey weights were computed by dividing the number of children actually screened in any given grade and school by the number of children enrolled in that grade and school.

- All counts of sample size reported in the body of the report, including the data from Washington State results, are adjusted using these survey weights.
- Weighted data were compared using statistical tests. Tables in this report show data on all subjects and all comparisons. The text and figures describe only differences that were **statistically significant**, meaning that they were large enough that such differences would not be expected to occur by chance, due to random variation within or between samples.

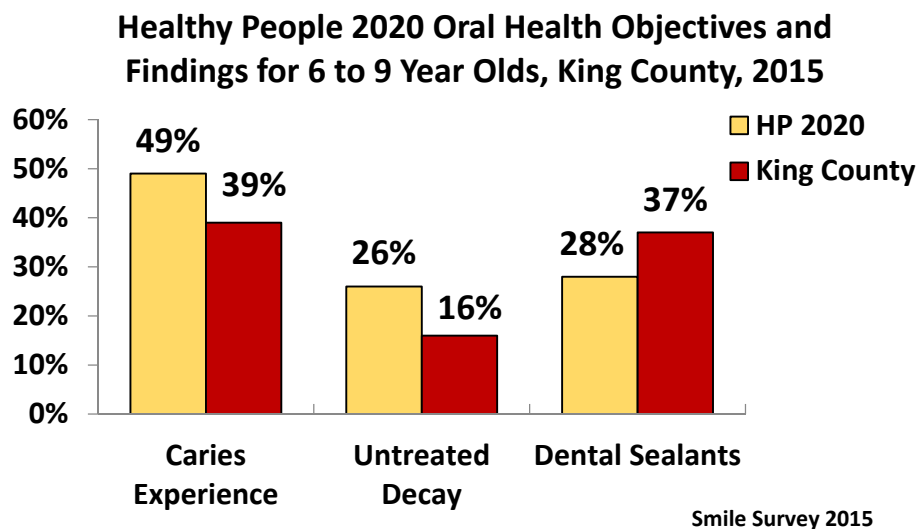
## 2015 Survey Findings for King County Elementary School Children (K,2,3)

### Comparison to National Objectives: Elementary School Children

The US Centers for Disease Control and Prevention have established national targets for children’s oral health. The objectives from the national Healthy People 2020 Oral Health Goals for children ages 6 to 9 are:

- Reducing the proportion of children who have dental caries experience to 49%
- Reducing the prevalence of untreated tooth decay to 26%
- Increasing the proportion of children who have dental sealants to 28%

In 2015, results for the 3,414 King County participants ages 6 to 9 **sed the HP 2020 objectives** in caries experience, untreated decay and dental sealants. The objective for parents, dental professionals and health care agencies in King County is to maintain these achievements for future 6 to 9 year old children.





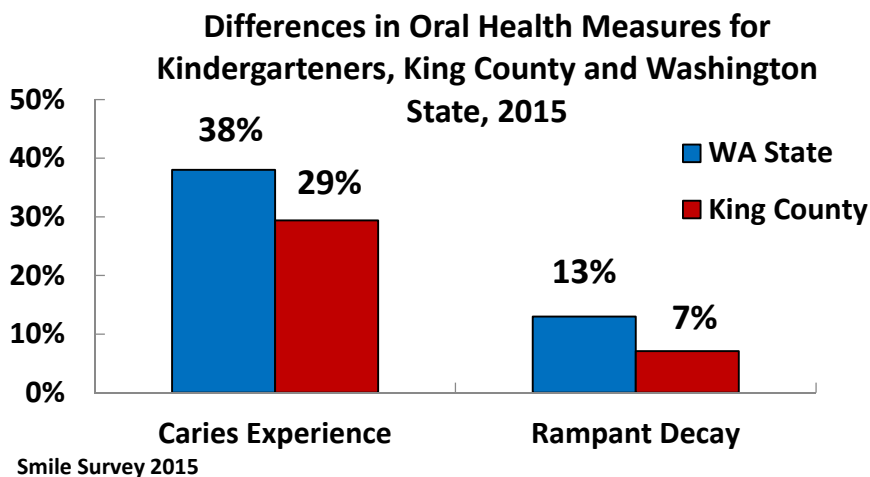
## Comparison to Washington State: Background and Methods

The 2015 Washington State Smile Survey elementary sample included 13,704 kindergarten, 2<sup>nd</sup> grade and 3<sup>rd</sup> grade children. Participating counties could choose to have a county level sample drawn. In King County, this sample totaled 4,017 children. In the following tables, the number of children is weighted to account for non-response, and reflects the number to whom the findings can be generalized.

Comparisons in the following tables are broken down by grade level, reflecting the substantial differences in oral health measurements among kindergarten, 2<sup>nd</sup> and 3<sup>rd</sup> graders sampled in the 2015 Smile Survey. Kindergarten students are unlikely to have many permanent teeth, especially permanent molars. Presence of dental sealants are only recorded for permanent molars, which is why that measurement is reported only for 2<sup>nd</sup> and 3<sup>rd</sup> graders. There can be age-related differences in decay experience as well as differences in accessing dental care.

## Comparison to Washington State: Kindergarten Children

Kindergarten students in King County were *more likely* to be caries free and had *less caries experience* than those in Washington State. They also had *less rampant decay* (treated or untreated decay on 7 or more teeth). Rates of untreated decay were not statistically different.



**Table 1: Oral Health Measures for Kindergarten Children, Washington State and King County, 2015**

Oral Health Measure	WA State (n=4,482) <sup>1</sup>	King County (n= 1,598) <sup>1</sup>
*Caries Free (no treated or untreated)	<b>62%</b> (58% - 65%)	<b>71%</b> (68% - 73%)
*Caries Experience	<b>38%</b> (35% - 42%)	<b>29%</b> (27% - 32%)
Untreated Decay	<b>13%</b> (12% - 15%)	<b>15%</b> (13% - 17%)
*Rampant Decay ( 7 or more teeth)	<b>13%</b> (11% - 16%)	<b>7%</b> (6% - 9%)

<sup>1</sup> In this and all other tables, numbers shown are weighted counts

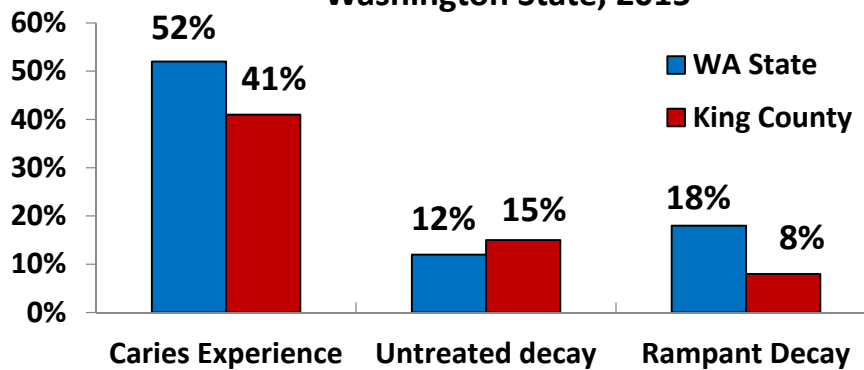
\*Significant difference between State and King County samples

Some of the difference in caries experience among kindergarteners may reflect differences among the children in the state and King County samples. Screened King County children were less likely to be eligible for Free/Reduced Lunch, less likely to be Hispanic and more likely to be Asian than their State counterparts. These characteristics were associated with lower caries experience in the King County sample and may partially explain why King County children had better oral health.

### Comparison to Washington State: 2<sup>nd</sup> and 3<sup>rd</sup> Grade Children

A comparison of 2<sup>nd</sup> and 3<sup>rd</sup> grade students showed a similar pattern with one exception. In King County, 2<sup>nd</sup> and 3<sup>rd</sup> grade students were *less likely* to have *caries experience or rampant decay* than were 2<sup>nd</sup> and 3<sup>rd</sup> grade students from other areas of Washington State. However, rates of *untreated decay* were higher for King County students. Use of dental sealants for 2<sup>nd</sup> and 3<sup>rd</sup> graders were not statistically different between King County and Washington State children.

**Differences in Oral Health Measures for 2<sup>nd</sup> & 3<sup>rd</sup> Grade Students, King County and Washington State, 2015**



Smile Survey 2015

**Table 2: Oral Health Measures for 2<sup>nd</sup> & 3<sup>rd</sup> Graders, Washington State and King County, 2015**

Oral Health Measure	WA State (n=9,222)	King County (n=3,405)
*Caries Experience	<b>52%</b> (48%-56%)	<b>41%</b> (39% -43%)
*Untreated Decay	<b>12%</b> (11%-14%)	<b>15%</b> (14% - 16%)
*Rampant Decay	<b>18%</b> (15%-22%)	<b>9%</b> (8%-10%)
Dental Sealants	<b>50%</b> (44%-55%)	<b>46%</b> (44%-48%)

\*Significant difference between State and King County samples

As in kindergarteners, part of the difference in caries experience among 2<sup>nd</sup> and 3<sup>rd</sup> graders may be due to differences between the children in the state and King County samples. Screened King County children were less likely to be eligible for Free/Reduced Lunch, less likely to be Hispanic and more likely to be Asian than their State counterparts. These characteristics were associated with lower caries experience in the King County 2<sup>nd</sup> and 3<sup>rd</sup> grade sample, and may partially explain why King County children had better oral health.

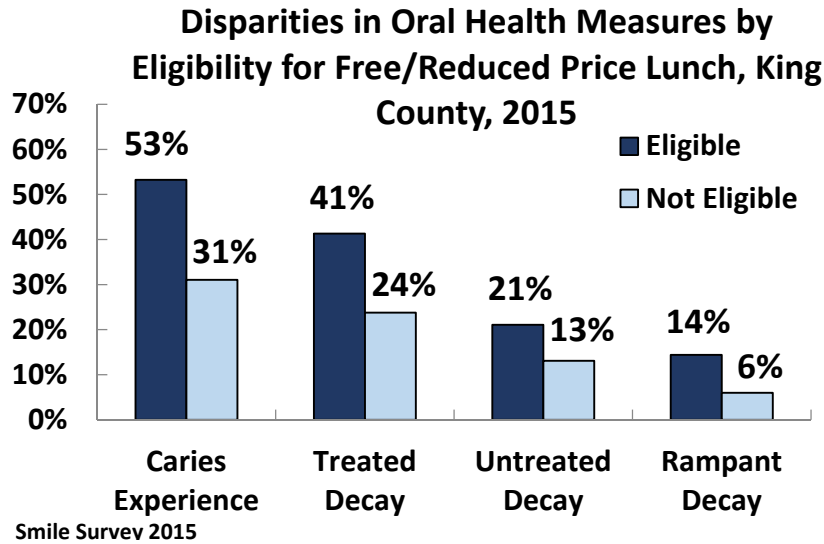
## Disparities in Oral Health for Elementary School Children

Findings from the Smile Survey show that screened kindergarten, 2<sup>nd</sup> and 3<sup>rd</sup> grade students from low income families, minority children, and those in immigrant/refugee families (those who spoke a language other than English at home) were significantly **more likely** to suffer from dental disease than were children from middle or higher income families, white non-Hispanic children and children who spoke English at home. A multivariate analysis showed that although race and language were related to caries experience, **low income** (Free/Reduced Lunch eligibility) was the **strongest predictor of oral disease** among elementary children.

### Disparities Associated with Low Income

Participation in the Free and/or Reduced Lunch program (FRL) is often used as a proxy for low income, as the program eligibility income standards correspond to 130% and 185% of the Federal Poverty Level. Using this measure, the Survey found that King County elementary school children from **low-income families had higher rates of dental disease**.

Students eligible for FRL programs in King County were **more likely** to have experienced **dental decay**, to have **treated** and **untreated decay**; and were **more than twice as likely** to have **rampant decay**, compared to students not eligible for FRL programs.



**Table 3: Oral Health Measures for Elementary School Students (K,2,3), by Eligibility for Free/Reduced Price Lunch, King County, 2015**

Oral Health Measure	All children (n=4,017)	Not FRL Eligible (n=2,523)	FRL Eligible (n=1,558)
*Caries Experience	37% (36%-39%)	31% (29%-33%)	53% (50%-56%)
*Treated Decay	29% (27%-30%)	24% (22%-26%)	41% (39%-44%)
*Untreated Decay	15% (14%-16%)	13% (12%-15%)	21% (19%-23%)
*Rampant Decay	8% (7%-9%)	6% (5%-7%)	14% (13%-16%)

\*Significant difference between FRL eligible and not eligible groups

### Disparities Associated with Race/Ethnicity

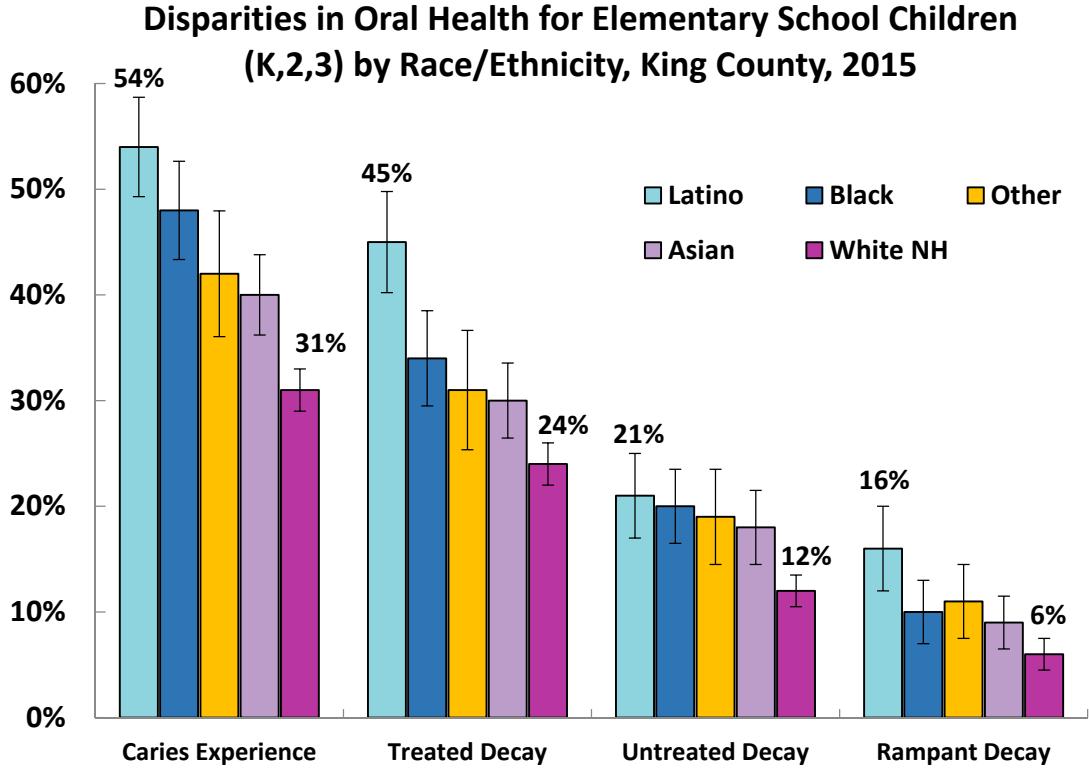
Dental disease affects minority children (Hispanic/Latino, African-American, American Indian/Alaska Native, Asian and Pacific Islander and multiracial) at a higher rate than white non-Hispanic children.

- White non-Hispanic (NH) children had the lowest rates of all four oral disease measures. As a group, minority children had **one and a half times the rate of dental disease** (caries experience and treated and untreated decay) and **more than twice the rate of rampant decay** of white non-Hispanic children.

- For caries experience, Latino children had a significantly higher rate than all race groups except Blacks.
- For treated decay, Latino children’s rate was higher than those of all other groups
- For untreated decay, the only race-based difference was a lower rate among white non-Hispanic children.
- For rampant decay, Latino children had a higher rate than Asian and white non-Hispanic children.

To illustrate the statistically significant and non-significant differences among race groups, the following figure displays confidence intervals, depicted as brackets around the rate. If the confidence intervals for two rates overlap, the two rates were not significantly different.

Using this information it is easier to see that, for example, Latino and Black children’s rate of caries experience were not significantly different, but their rates of treated decay are. The confidence intervals also clarify that there were no significant differences in any measure among Black, Asian and children of other races (American Indian, Pacific Islander and multiple races, grouped due to small numbers).



Smile Survey 2015

**Table 4: Oral Health Measures for Elementary School Students (K,2,3) by Race/Ethnicity, King County, 2015**

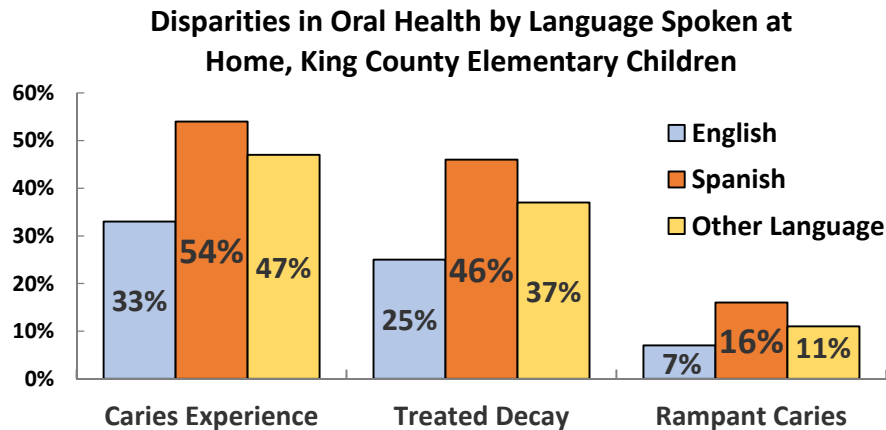
Oral Health Measure	Hispanic/Latino (n=557)	African American (n=637)	Asian (n=874)	Other Races (n=464)	White NH (n=2,729)
*Caries Experience	54% (49%-59%)	48% (43%-52%)	40% (36%-44%)	42% (36%-48%)	31% (29%-33%)
*Treated Decay	45% (40%-50%)	34% (30%-39%)	30% (26%-33%)	31% (26%-37%)	24% (22%-26%)
*Untreated Decay	21% (17%-25%)	20% (17%-24%)	18% (15%-22%)	19% (15%-24%)	12% (10%-13%)
*Rampant Decay	16% (12%-20%)	10% (7%-13%)	9% (7%-12%)	11% (8%-15%)	6% (5%-8%)

\*Significant differences among race/ethnic groups

### Disparities Associated with Language Spoken at Home

There was a difference in oral health measures between students with English as a primary language and those whose families spoke another language at home. Schools reported the home language that parents/guardians designated when the student was registered. Students who spoke both English and another language at home were grouped with those who spoke another language. This measure combined students newly arrived in the United States with those whose families have been living in the country for a longer period but maintain cultural ties.

- Students whose home language was English had significantly **lower** rates of caries experience, treated decay and rampant decay.
- Children who spoke Spanish at home had a **higher** rate of treated decay than children speaking English or other languages at home.



Smile Survey 2015

**Table 5: Oral Health Measures for Elementary School Children (K,2,3) by Language Spoken at Home, King County, 2015**

Oral Health Measure	English (n=3,772)	Spanish (n=419)	Other Language (n=1,072)
*Caries Experience	<b>33%</b> (31% - 35%)	<b>54%</b> (48% - 60%)	<b>47%</b> (44% - 51%)
*Treated Decay**	<b>25%</b> (23% - 27%)	<b>46%</b> (40%-51%)	<b>37%</b> (34% - 41%)
*Untreated Decay	<b>14%</b> (12% - 15%)	<b>19%</b> (15%-24%)	<b>21%</b> (18% - 24%)
*Rampant Caries	<b>7%</b> (6% - 8%)	<b>16%</b> (12%-20%)	<b>11%</b> (9% - 14%)

\*Significant difference between English and Spanish or Other groups

\*\*Significant difference between Spanish and Other Language groups

### Summary of Disparities Findings (K,2,3)

Race/ethnicity, home language and family income were strongly related to each other in this sample of elementary students. White non-Hispanic children were much more likely than minority children to speak English at home (90% vs 51%, respectively). Minority children and those speaking other languages at home were more than twice as likely to be eligible for FRL (55% of each group, compared to 21% of white non-Hispanic children).

Statistical analysis allows an estimate of how strongly each demographic characteristic is related to oral disease, holding constant the effects of all other characteristics. This approach showed that **low income** (eligibility for FRL) had the **strongest** independent relationship to caries experience. Language spoken at home and minority race/ethnicity were independently associated with higher caries, but their effects were smaller than that of income.

### No Disparities in Protective Measures - Dental Sealants (2<sup>nd</sup> and 3<sup>rd</sup> graders)

Dental sealants are an evidence-based strategy to prevent dental decay. Dental sealants are protective coatings applied to the grooves and pits of permanent molars, which are the tooth areas shown to be most vulnerable to decay. Among the 2,719 King County 2<sup>nd</sup> and 3<sup>rd</sup> graders who participated in Smile Survey 2015, there were **no economic, race/ethnic or language** differences in application of dental sealants. This was the only oral health measure that did **not** show any disparities.

**Table 6: Dental Sealants for 2<sup>nd</sup> & 3<sup>rd</sup> Graders  
by Demographics, King County, 2015**

<b>Demographics</b>	<b>Number</b>	<b>% with Sealants</b>	<b>95% Confidence Interval</b>
<b>Eligible for FRL</b>	1,112	<b>47%</b>	(43%-50%)
<b>Not eligible for FRL</b>	1,699	<b>45%</b>	(42%-47%)
<b>White non-Hispanic</b>	1,792	<b>47%</b>	(45%-50%)
<b>Other Races/Ethnicities</b>	1,761	<b>44%</b>	(41%-47%)
<b>Speak English at home</b>	2,509	<b>46%</b>	(44%-48%)
<b>Other language at home</b>	1,118	<b>45%</b>	(42%-49%)



## Change over Time: Methods for Comparing the 2015 Smile Survey to Past Results

Comparisons between the 2005, 2010 and 2015 Smile Surveys are made cautiously, as the subjects and sampling strategies differed. In 2005, the sample included 2<sup>nd</sup> and 3<sup>rd</sup> graders; in 2010, the sample included kindergarten and 3<sup>rd</sup> graders; and in 2015 the Survey measured kindergarten, 2<sup>nd</sup> and 3<sup>rd</sup> graders. Disease patterns and use of dental sealants vary among students of different ages, so cross-grade comparisons may introduce error. To allow consistent comparisons across years, the following comparisons use data for

- (1) **kindergarteners** for 2010 vs 2015 and
- (2) **3<sup>rd</sup> graders** for 2005, 2010 and 2015.

The sampling method for the state and county Smile Surveys did not change over time, but there have been changes in the way that numbers of students are weighted to adjust for non-response. In order to make accurate comparisons across years, data from earlier surveys have been re-weighted to match the weighting method used in 2015. Therefore some of the values in this report may not exactly match weighted data in published reports from the 2005 and 2010 Surveys.

## Change over Time for Kindergarteners: Comparing the 2010 and 2015 Surveys

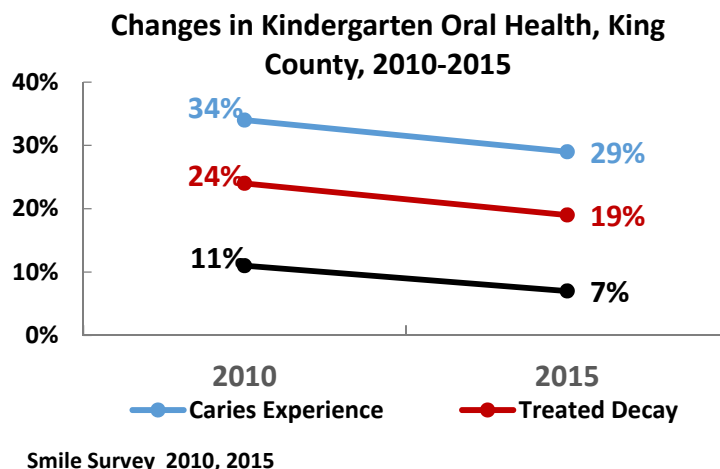
### Sample Characteristics

Kindergarteners were surveyed in 2010 and 2015. The 2010 and 2015 samples did not differ in their proportions of children eligible for FRL (38% and 37%, respectively). However, compared to 2010, the 2015 sample had

- significantly fewer Hispanics and American Indians
- more multiracial children
- approximately equal proportions of white non-Hispanic and minority children
- fewer home speakers of Spanish and more speakers of English and of other languages.

### Oral Health Changes

Kindergarteners in 2015 had significantly **less caries experience, treated decay and rampant decay** than those surveyed in 2010. There was **no difference** in untreated decay in the two Surveys.



**Table 7: Changes in Oral Health Measures for Kindergarteners, King County**

Oral Health Measure	2010 (n=2,499)	2015 (n=1,598)
*Caries Experience	34% (32% -36 %)	29% (27% - 32%)
*Treated Decay	24% (22%-26%)	19% (17% - 21%)
Untreated Decay	15% (13%-17%)	15% (13% - 17%)
*Rampant Decay	11% (10%-13%)	7% (6% - 8%)

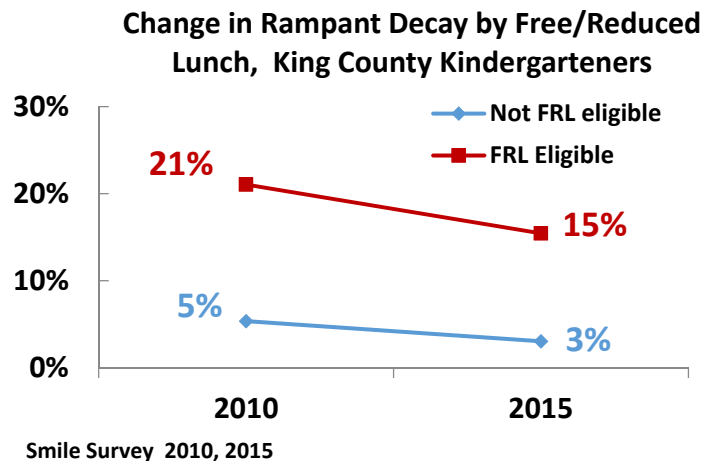
\*Significant difference between 2010 and 2015

**Disparities in Oral Health over Time for Kindergarteners**

Gains in oral health measures 2010 -2015 were driven by improvements among disadvantaged groups: FRL-eligible, minorities and kindergarteners who did not speak English at home. Despite these improvements, most disparities in oral health persisted between the 2010 and 2015 surveys.

**Trends in Disparities by Income**

Kindergarteners eligible for Free and Reduced Lunch (FRL) had **double the rates of caries experience, treated decay, untreated decay and rampant caries** of those not eligible, in both 2010 and 2015. These disparities **persisted** in all four oral health measures between 2010 and 2015, although rampant decay declined significantly in both groups between surveys.



**Table 8: Changes in Oral Health Measures for Kindergarteners by Free/Reduced Lunch Eligibility, King County**

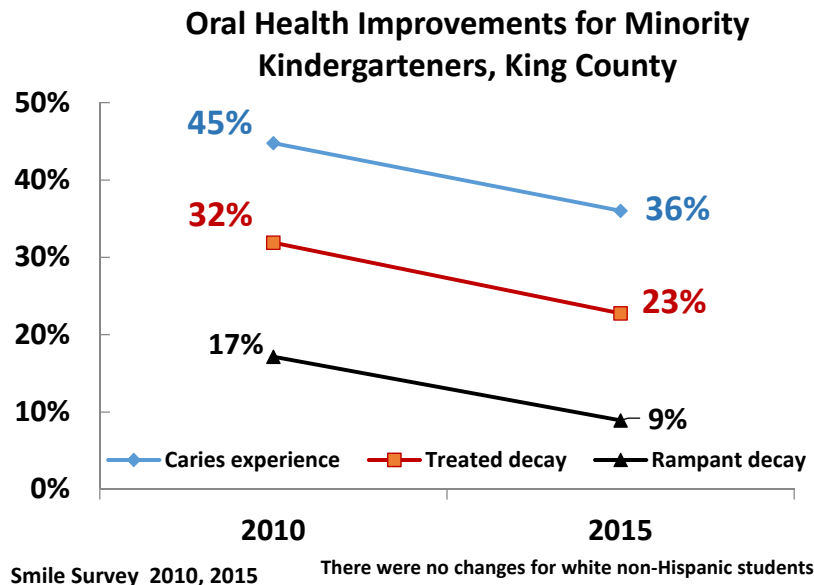
Oral Health Measure	Not FRL Eligible		FRL Eligible	
	2010 (n= 1,549)	2015 (n=802)	2010 (n=946)	2015 (n= 480)
<b>Caries Experience</b>	<b>24%</b> (22%-26%)	<b>23%</b> (19%-26%)	<b>50%</b> (47%-54%)	<b>44%</b> (39%-50%)
<b>*Treated Decay</b>	<b>17%</b> (15% - 19%)	<b>15%</b> (12% -18%)	<b>35%</b> (32% - 39%)	<b>28%</b> (23%-33%)
<b>Untreated Decay</b>	<b>9%</b> (8% - 11%)	<b>12%</b> (9%-14%)	<b>24%</b> (20% - 27%)	<b>23%</b> (18%-27%)
<b>**Rampant Decay</b>	<b>5%</b> (4% - 7%)	<b>3%</b> (2%-4%)	<b>21%</b> (18% - 24%)	<b>15%</b> (11%-19%)

\*Significant decline 2010-2015 in FRL eligible group

\*\*Significant decline 2010-2015 in both FRL groups

**Trends in Disparities by Race/Ethnicity**

Minority kindergarteners (Hispanic or non-white) had **higher rates** of all four oral health measures than did white non-Hispanic children, in both surveys. Minority children’s rates of caries experience, treated decay and rampant caries **declined significantly** between surveys, but race-based disparities in all 4 measures persisted. White non-Hispanic children did not experience a change in any measure between 2010 and 2015.



**Table 9: Changes in Oral Health Measures for Kindergarteners by Race/Ethnicity, King County**

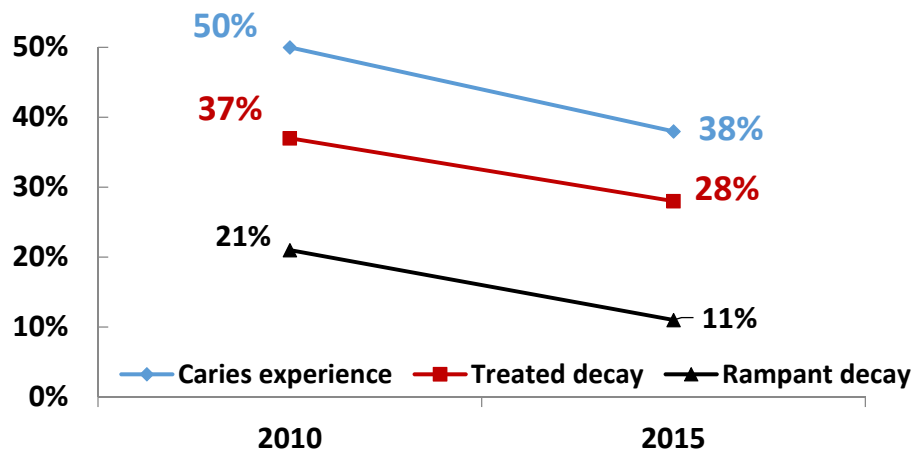
Oral Health Measure	White non-Hispanic		Minority	
	2010 (n=1,245)	2015 (n=844)	2010 (n= 1,254)	2015 (n=748)
*Caries Experience	23% (20%-26%)	23% (20%-26%)	45% (42%-48%)	36% (32%-40%)
*Treated Decay	16% (14% - 18%)	15% (12% -18%)	32% (29% - 35%)	23% (19%-26%)
Untreated Decay	10% (8% - 12%)	11% (9%-14%)	20% (17% - 23%)	19% (16%-22%)
*Rampant Decay	5% (1 - 4%)	5% (1%-4%)	17% (15% - 19%)	9% (6%-11%)

\*Significant decline 2010-2015 in minority group

**Trends in Disparities by Language Spoken at Home**

Children speaking a language other than English at home had **significantly higher** rates of all four oral health measures in 2010, and in 2015 were equivalent only in rate of untreated decay. From 2010 to 2015, non-English speakers **improved significantly** in caries experience, treated decay and rampant decay but did not eliminate the disparity in any of these measures. English speakers did not improve on any of the four measures between 2010 and 2015.

**Oral Health Improvements for Kindergarteners Speaking a Language Other than English at Home, King County**



Smile Survey 2010, 2015

There were no changes for English-speaking students

**Table 10: Changes in Oral Health Measures for Kindergarteners by Language Spoken at Home, King County**

Oral Health Measure	English		Other language	
	2010 (n= 1,708)	2015 (n=1,159)	2010 (n=791)	2015 (n= 435)
<b>*Caries Experience</b>	<b>27%</b> (24%-29%)	<b>26%</b> (23%-29%)	<b>50%</b> (46%-54%)	<b>38%</b> (36%-43%)
<b>*Treated Decay</b>	<b>18%</b> (16% - 20%)	<b>15%</b> (13% -18%)	<b>37%</b> (33%-41%)	<b>28%</b> (23%-33%)
<b>Untreated Decay</b>	<b>12%</b> (11% - 14%)	<b>14%</b> (11%-16%)	<b>20%</b> (17% - 23%)	<b>18%</b> (14%-23%)
<b>*Rampant Decay</b>	<b>7%</b> (6% - 8%)	<b>5%</b> (4%-7%)	<b>21%</b> (18% - 24%)	<b>11%</b> (8%-15%)

\*Significant decline 2010-2015 in ‘Other language’ group

**Summary of Changes over Time among Kindergarteners**

Overall, the oral health of kindergarteners has improved over time, but disparities still remain. Income still has the greatest impact on oral health with children eligible for Free/Reduced Lunch program showing higher rates of dental disease. Disparities by race/ethnicity and language spoken at home still persist but may be driven by income.

**Changes over Time for 3<sup>rd</sup> Graders: Comparing the 2005, 2010, and 2015 Surveys**

**Sample Characteristics**

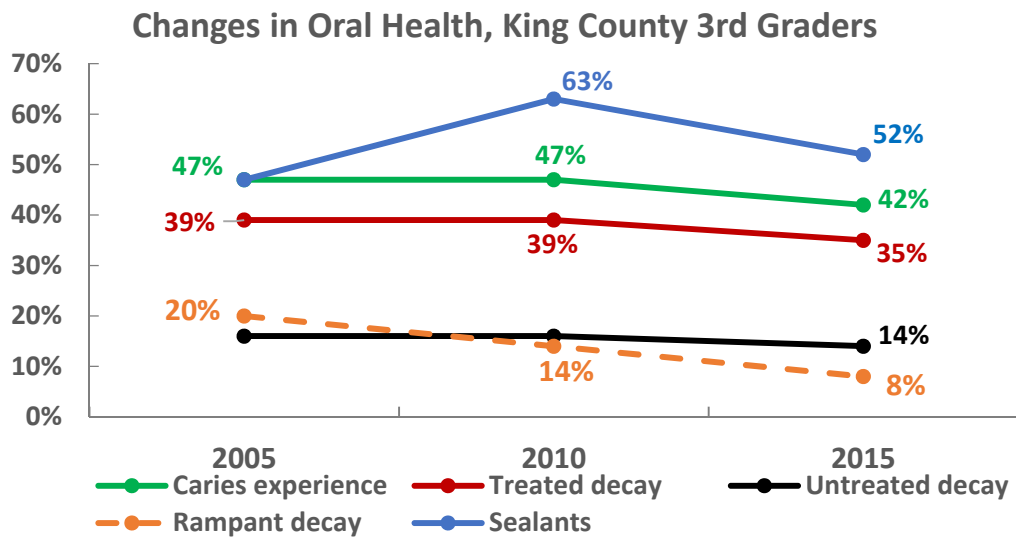
Third graders were surveyed in 2005, 2010 and 2015. The demographic composition of the sample changed between 2005 and 2010 and maintained its greater diversity in 2015.

- The proportion of students eligible for FRL increased significantly between 2005 and 2010 (35% to 42%), and remained at 42% in 2015. The change from 2005 and 2015 was significant. This increase may reflect an increase in poverty among King County young children, from 6% in 2005 to 16% in 2010, with poverty rates continuing about 10% thereafter.
- The percent of ‘minority’ children increased significantly from 2005 (42%) to 2010 (50%), and did not change significantly in 2015 (48%). The overall change from 2005 and 2015 was significant.
- The percentage of students speaking a non-English language doubled between 2005 and 2010 (16% to 35%). It decreased non-significantly 2010-2015 but there was an overall 2005-2015 significant increase.

## Oral Health Changes

From 2005 to 2015, there was a statistically significant **decrease** in the King County rate of **caries experience** and **rampant decay** among 3<sup>rd</sup> graders.

- The rate of rampant decay decreased in each of the 3 surveys.
- Treated decay declined between 2010 and 2015, but due to smaller samples in 2005 and 2015, there was no significant overall decline detected between 2005 and 2015.
- The percentage of children with dental sealants increased between 2005 and 2010, but dropped back to slightly above its 2005 level in the 2015 data.



Smile Survey 2005, 2010, 2015

**Table 11: Changes in Oral Health Measures for 3rd Graders, King County, 2005-2015**

Oral Health Measure	2005 (n= 1,179)	2010 (n=2,439)	2015 (n=1,623)	Significant Change
<b>Caries Experience</b>	<b>47%</b> (44%-50%)	<b>47%</b> (45%-49%)	<b>43%</b> (40% - 45%)	decrease 2010 to 2015 decrease 2005 to 2015
<b>Treated Decay</b>	<b>39%</b> (36% - 42%)	<b>39%</b> (37% - 42%)	<b>35%</b> (32% - 37%)	decrease 2010 to 2015
<b>Untreated Decay</b>	<b>16%</b> (14% - 19%)	<b>16%</b> (15% - 19%)	<b>14%</b> (13% - 16%)	no significant changes
<b>Rampant Decay</b>	<b>20%</b> (18% - 22%)	<b>14%</b> (12% - 16%)	<b>8%</b> (7% - 10%)	decrease 2005 to 2010 decrease 2010 to 2015 decrease 2005 to 2015
<b>Dental Sealants</b>	<b>47%</b> (44% - 51%)	<b>63%</b> (60% - 65%)	<b>52%</b> (49% - 54%)	increase 2005 to 2010 decrease 2010 to 2015

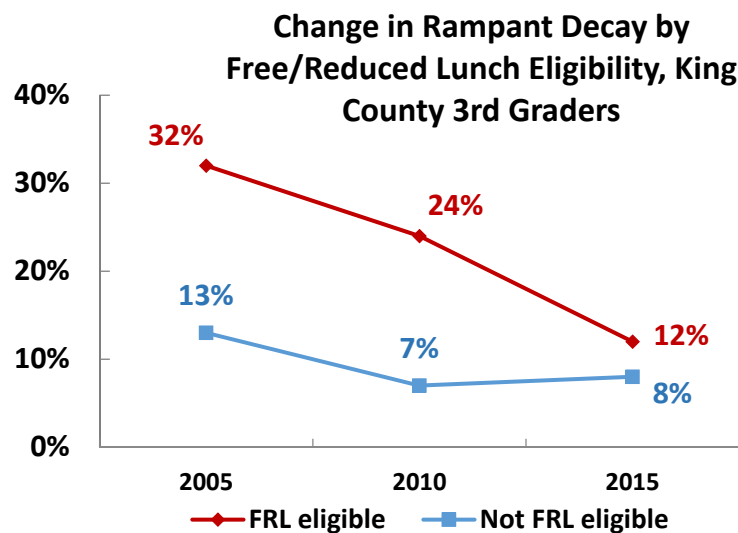
## Disparities in Oral Health over Time in 3<sup>rd</sup> Graders

While some oral health outcomes (rampant decay, treated decay and dental sealants 2005-2010) improved, disparities persisted. The 2005, 2010 and 2015 Smile Survey data showed continuing **disproportionate disease levels in children by income, race/ethnicity and language spoken at home**. The only oral health measure that showed no difference among groups was dental sealants. This finding may reflect the location of school-based sealant programs in schools with lower-income children, and efforts among providers to target these children for preventive treatment.

### Trends in Disparities by Income

Between the 2005 and 2015 surveys, there were **no significant changes** in rate of **caries experience, treated or untreated decay** between 3<sup>rd</sup> graders eligible for free/reduced lunch and those not eligible. The income-related disparities in these outcomes remained unchanged.

In contrast, rampant decay **declined significantly** in both income groups between 2005 and 2010, and continued to drop among those with lower income 2010-2015. This 2010/2015 decline eliminated any statistically significant difference in income-related rampant decay among 3<sup>rd</sup> graders.



Smile Survey 2005, 2010, 2015

**Table 12: Oral Health Measures for 3<sup>rd</sup> Graders by Free/Reduced Lunch Eligibility, King County**

Oral Health Measure	Not FRL Eligible			FRL Eligible		
	2005 (n=763)	2010 (n=1,412)	2015 (n=781)	2005 (n=410)	2010 (n=1,008)	2015 (n=568)
<b>Caries Experience</b>	<b>36%</b> (32%-40%)	<b>36%</b> (33%-39%)	<b>36%</b> (32%-39%)	<b>67%</b> (62%-73%)	<b>62%</b> (59%-66%)	<b>58%</b> (54%-63%)
<b>Treated Decay</b>	<b>31%</b> (27% - 35%)	<b>30%</b> (28% - 33%)	<b>29%</b> (25% -32%)	<b>54%</b> (49% - 60%)	<b>53%</b> (49% - 56.2%)	<b>49%</b> (44%-54%)
<b>Untreated Decay</b>	<b>9%</b> (7% - 12%)	<b>12%</b> (10% - 14%)	<b>14%</b> (11%-16%)	<b>29%</b> (24% - 34%)	<b>23%</b> (20% - 26%)	<b>21%</b> (17%-25%)
<b>*Rampant Decay</b>	<b>13%</b> (11% - 16%)	<b>7%</b> (5% - 8%)	<b>8%</b> (6%-10%)	<b>32%</b> (27% - 37%)	<b>24%</b> (21% - 27%)	<b>12%</b> (9%-15%)

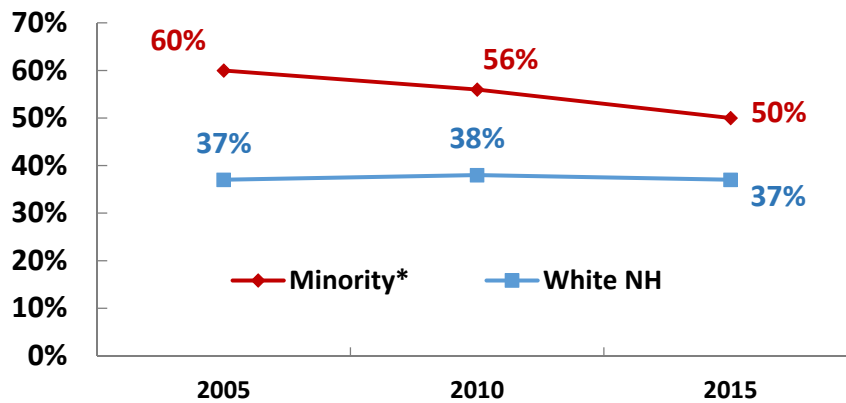
\*Significant decline 2005-2015 in both FRL groups

**Trends in Disparities by Race/Ethnicity**

White non-Hispanic 3<sup>rd</sup> graders had *less disease* (caries experience) and greater access to care (*less untreated decay*) than did minority children in each Smile Survey year. Over the three surveys, these disparities *did not decrease* significantly although minority students' rates decreased.

In contrast, *rampant decay declined* significantly over time in both minority and white non-Hispanic groups. The strong drop in the minority group eliminated the statistical disparity seen in the 2005 and 2010 surveys.

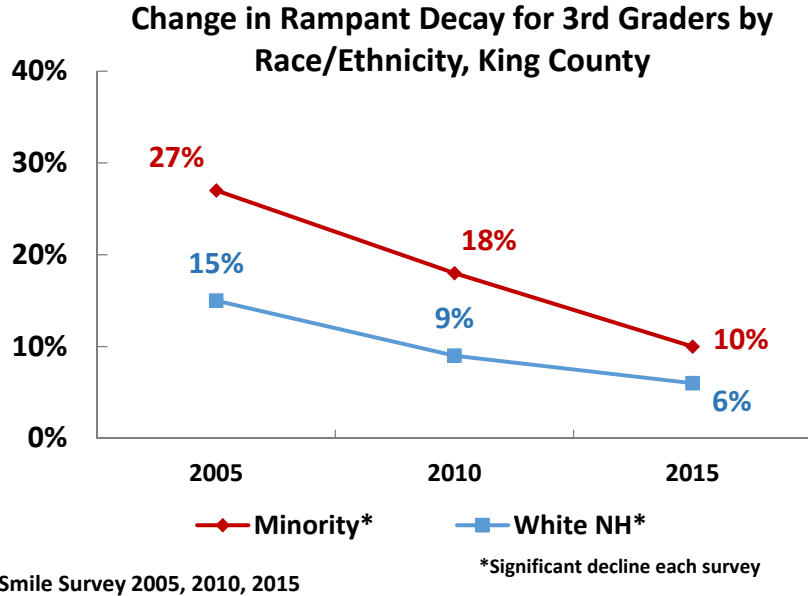
**Change in Caries Experience for 3<sup>rd</sup> Graders by Race/Ethnicity, King County**



Smile Survey 2005, 2010, 2015

\*Significant decline 2010-2015 & 2005-2015





**Table 13: Oral Health Measures for 3<sup>rd</sup> Graders by Race/Ethnicity, King County**

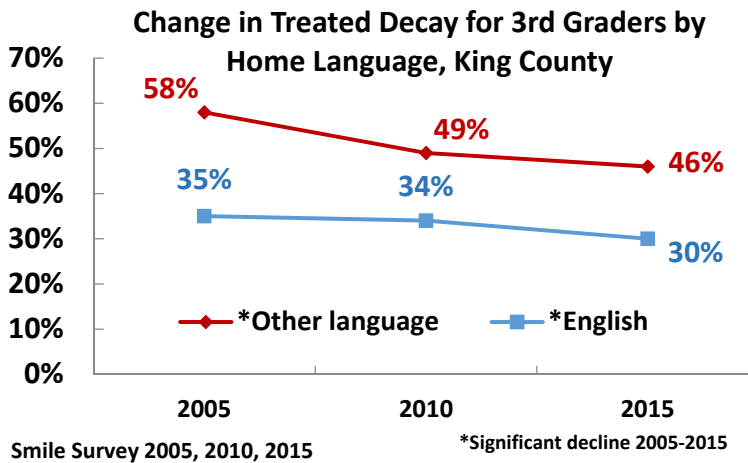
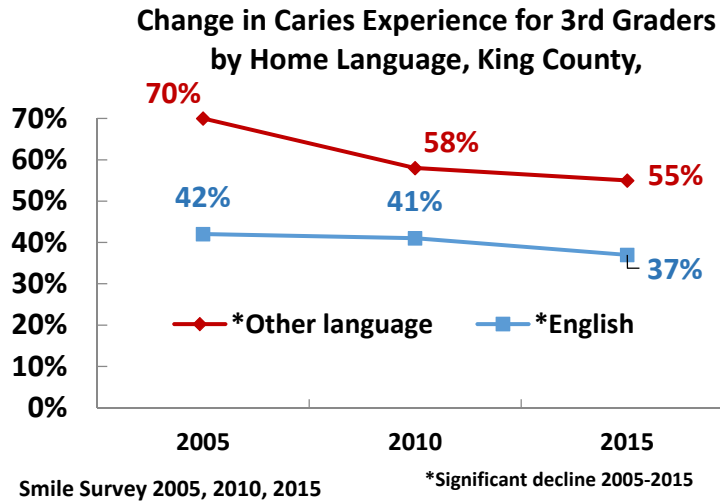
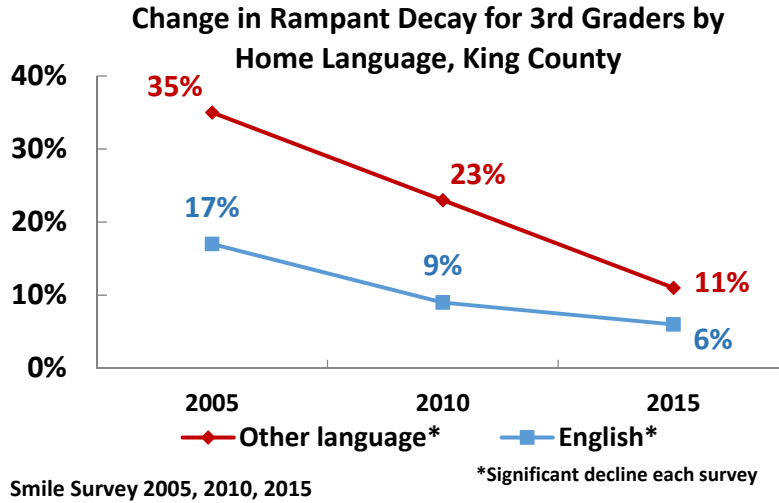
Oral Health Measure	White non-Hispanic			Minority		
	2005 (n=688)	2010 (n=1,205)	2015 (n=793)	2005 (n=491)	2010 (n=1,225)	2015 (n=743)
<b>*Caries Experience</b>	<b>37%</b> (34%-41%)	<b>38%</b> (35%-42%)	<b>37%</b> (33%-40%)	<b>60%</b> (55%-65%)	<b>56%</b> (53%-59%)	<b>50%</b> (46%-54%)
<b>Treated Decay</b>	<b>32%</b> (28% - 36%)	<b>32%</b> (29% - 35%)	<b>31%</b> (27%-34)	<b>49%</b> (44% - 54%)	<b>46%</b> (44% - 50%)	<b>40%</b> (37%-45%)
<b>Untreated Decay</b>	<b>11%</b> (7% - 17%)	<b>12%</b> (9% - 16%)	<b>12%</b> (10%-15%)	<b>24%</b> (19% - 28%)	<b>21%</b> (18% - 24%)	<b>18%</b> (14%-21%)
<b>**Rampant Decay</b>	<b>15%</b> (12% - 18%)	<b>9%</b> (8% - 12%)	<b>6%</b> (4%-8%)	<b>26%</b> (22% - 31%)	<b>19%</b> (16% - 21%)	<b>10%</b> (8%-13%)

\*Significant decline between 2010 and 2015, and overall 2005- 2015, in minority children

\*\* Significant declines between 2005 and 2015 in both race/ethnic groups

***Trends in Disparities by Language Spoken at Home:*** Despite Improvements, Disparities Persisted

Between the 2005 and 2015 Smile Surveys there were significant **reductions in caries experience, treated decay and rampant decay** among children whose primary home language was English and among those who spoke another language at home. Despite this progress, language-related disparities persisted in rates of **caries experience, treated decay, untreated decay and rampant decay**.



**Table 14: Oral Health Measures for 3<sup>rd</sup> Graders by Language Spoken at Home, King County**

Oral Health Measure	English Spoken at Home			Other Language Spoken at Home		
	2005 (n=990)	2010 (n=1,582)	2015 (n=1,107)	2005 (n=189)	2010 (n=848)	2015 (n=516)
<b>*Caries Experience</b>	<b>42%</b> (39%-46%)	<b>41%</b> (38%-44%)	<b>37%</b> (34% - 40%)	<b>70%</b> (63%-78%)	<b>58%</b> (54%-62%)	<b>55%</b> (50% - 60%)
<b>*Treated Decay</b>	<b>35%</b> (32% - 39%)	<b>34%</b> (32% - 37%)	<b>30%</b> (27% - 33%)	<b>58%</b> (50% - 66%)	<b>49%</b> (45% - 53%)	<b>46%</b> (41% - 50%)
<b>Untreated Decay</b>	<b>14%</b> (11% - 16%)	<b>13%</b> (11% - 15%)	<b>13%</b> (11% - 15%)	<b>29%</b> (22% - 37%)	<b>23%</b> (19% - 26%)	<b>20%</b> (17% - 24%)
<b>*Rampant Decay</b>	<b>17%</b> (15% - 20%)	<b>9%</b> (8% - 11%)	<b>7%</b> (5% - 8%)	<b>34%</b> (27% - 42%)	<b>22%</b> (19% - 26%)	<b>11%</b> (8% - 14%)

\* Significant decline between 2005 and 2015 in both groups

### Summary of Disparities over Time among 3<sup>rd</sup> Graders

With many variables, sample changes and three surveys, it is complicated to detect overall changes in oral health and disease. Multiple logistic regression combining survey year and student characteristics is a statistical way to isolate the effects of different characteristics on caries experience. The Odds Ratio for a characteristic expresses its impact on caries experience, holding constant the effects of time and other influences, including changes in composition of the samples.

#### For caries experience:

- There was a small but statistically significant **decrease in caries experience** between 2005 and 2015, taking into account the differences in the sample composition.
- **Low income** (FRL eligibility) was the strongest predictor of oral disease. A child eligible for FRL had more than double the chance of caries experience of a child not eligible.
- **Children speaking a language other than English** at home and **minority children** had a statistically significant risk of caries experience in these surveys, independent of their eligibility for FRL. With FRL eligibility and other factors held constant, a child speaking another language at home had 1.5 times the caries experience of a child in an English-speaking home. A minority child had 1.3 times the caries experience rate of a white non-Hispanic child.

#### For treated and untreated decay (which together make up caries experience):

Multiple logistic regression showed that the improvement in caries experience 2005-2015 was a result of a significant **decrease in treated decay** when demographic characteristics were statistically controlled. There was **no change** in rate of **untreated decay** across surveys.

- **Low income** (FRL eligibility) had a significant independent impact on treated and untreated decay, and this disparity persisted across surveys. In this period a child eligible for FRL had twice the odds of **treated or untreated decay** compared to a child not eligible.

- **Children speaking a language other than English** were significantly more likely to have treated and untreated decay, independent of FRL status and other factors.
- Across the three surveys a **minority** child had 1.2 times the treated decay rate of a white non-Hispanic child, with other factors held constant. There was **no disparity** in untreated decay by race/ethnicity across the surveys.

**For rampant decay:**

Rampant decay also **declined** significantly between 2005 and 2015, controlling for student and sample characteristics.

- As with other types of decay, **FRL eligibility** had the strongest independent association with higher rampant decay rates. An eligible child had 2.6 times the rate of a child with higher income.
- There was no disparity by race/ethnicity, but children **speaking a language other than English at home** were significantly more likely to have rampant decay in this time period when other differences were controlled.

**Table 15: Significant Independent Predictors of Oral Health Measures for 3<sup>rd</sup> Graders, King County, 2005-2015**

<b>Caries Experience</b>	Odds Ratio	95% CI
FRL eligible	2.45	2.11-2.84
Nonwhite or Latino	1.28	1.10-1.50
Language other than English	1.49	1.26-1.76
<b>Treated Decay</b>	Odds Ratio	95% CI
FRL eligible	2.12	1.82-2.46
Minority	1.21	1.03-1.42
Language other than English	1.47	1.24-1.74
<b>Untreated Decay</b>	Odds Ratio	95% CI
FRL eligible	1.96	1.59-2.42
Language other than English	1.44	1.16-1.80
<b>Rampant Decay</b>	Odds Ratio	95% CI
FRL eligible	2.59	2.06-3.27
Language other than English	1.78	1.41-2.24

In the period 2005-2015, the King County economy contracted, and has recovered slowly. The later Smile Survey samples mirrored this economic downturn with a higher proportion of low-income children. The later samples also contained relatively more minority children and those speaking a language other than English at home. Given the strong links between poorer oral health and these characteristics, we would have expected an increase in caries experience. In contrast, the 2015 Survey showed heartening **improvements** in oral health among 3<sup>rd</sup> graders. However, disparities in oral health measures by income, race/ethnicity and language have persisted during this time.

## Disparities over Time in Preventive Care: Trends in Dental Sealants

In direct comparison of sample results from 2005, 2010 and 2015, use of dental sealants was observed to change over time, but there were no differences in sealant use across groups defined by income, race/ethnicity or home language. In each group, sealants increased significantly 2005-2010 and declined significantly 2010-2015, resulting in no overall change in use, and no demographic disparities.

Analysis using multiple logistic regression produced a different result. With statistical adjustment for the effects of changing sample characteristics and number of sealant programs,

- Sealants among 3<sup>rd</sup> graders **increased** slightly but significantly during the 2005-2015 period.
- Although there were **no disparities** in sealant use by FRL eligibility and language spoken at home, **minority children** were significantly **less likely** to have sealants than white non-Hispanic children.
- The strongest predictor of having sealants was attending a school that had a **school-based dental sealant program**, in which sealants were applied to students' permanent molars. Attending a school with a sealant program **more than doubled** the likelihood that a student would have sealants, when all other factors were held constant. Sealant programs targeted low income schools, in which 50% or more of students were eligible for Free/Reduced Lunch.

**Table 16: Significant Independent Predictors of Dental Sealants for 3<sup>rd</sup> Graders, King County, 2005-2015**

Dental Sealants	Odds Ratio	95% CI
Minority	0.71	0.61-0.84
Sealant program	2.67	2.22-3.22

Private dental practices, community clinics and dental schools have joined school based programs in implementing the CDC recommendation for dental sealants on children's permanent molars. In King County, private and other providers now offer school based sealant programs. In view of this increase in sealant programs, it was surprising to see such a small increase in sealant use over the 10 year period.

Two factors may explain the small size of the increase in sealant use.

- The effect of non-Public Health school based sealant programs was not well captured in Smile Survey data, as many of the schools with these programs chose not to participate in the Survey.
- The school samples, stratified to represent the distribution of students eligible for Free/Reduced Lunch, did not accurately reflect sealant program status among all schools.

Attending a school with a school-based dental sealant program was the strongest Smile Survey predictor of sealant use. The sampling variability in 2015 suggests why the Survey may have detected such a small growth in sealant use.

## 2015 Survey Findings for Preschool Children – Head Start/ECEAP

The preschool portion of the 2015 Smile Survey included 25 Head Start/ECEAP sites in King County with 492 children participating, with a response (screening) rate of 65%. When data were weighted to adjust for non-response (due to absence or lack of parental permission), 684 children were represented. Preschool sites were selected using the state survey method. Parental consent was obtained. All screenings were conducted by dental professionals who had attended a DOH survey training session to assure consistency in measures.

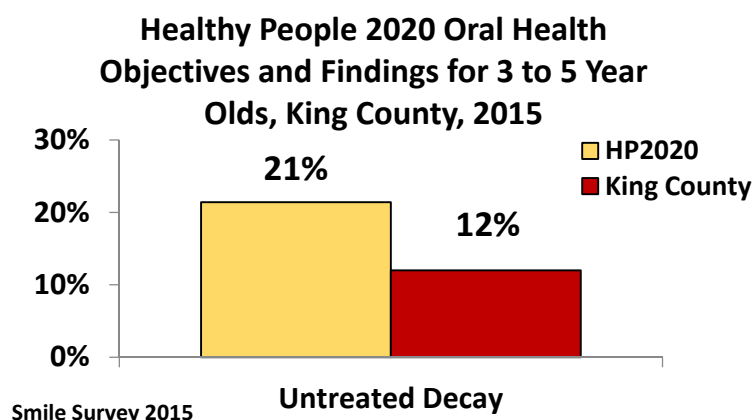
Oral health measures included caries experience (evidence of treated or untreated decay), treated decay, untreated decay, rampant decay (treated or untreated decay on seven or more teeth), early childhood caries (ECC) and white spot lesions. Early childhood caries (ECC) is characterized by dental decay on maxillary front teeth. It is associated with a virulent form of decay-causing bacteria and has been linked to particular infant feeding practices, especially bottle feeding during sleep time. White spot lesions are the initial breakdown of tooth enamel near the gum line. Not all lesions progress to decay.

### Comparison to National Objectives: Preschool Children

The US Centers for Disease Control and Prevention have established national targets for children’s oral health. The objectives from the national Healthy People 2020 Oral Health Goals for children ages 3 to 5 are:

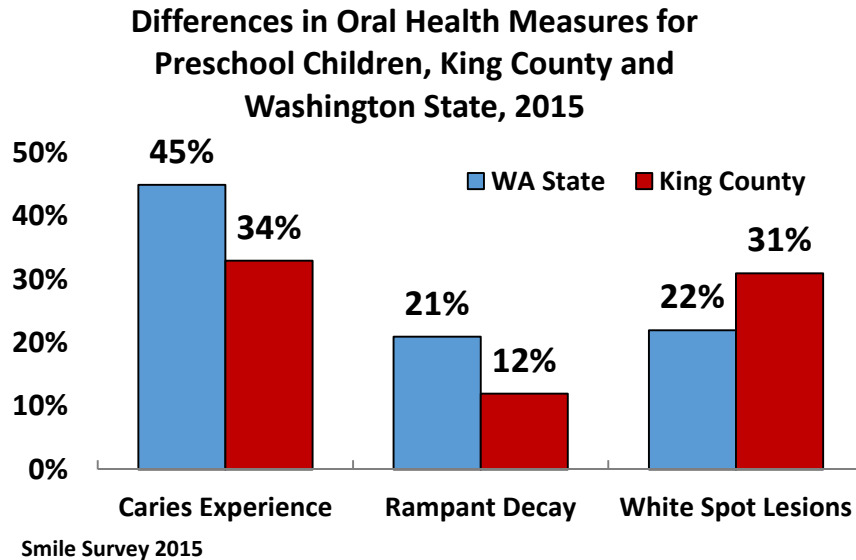
- Reducing the proportion of children who have dental caries experience to 30%
- Reducing the prevalence of untreated tooth decay to 21%

The Healthy People 2020 oral health objectives apply to all children ages 3 to 5 years old, regardless of family income. The Washington State and King County Smile Surveys specifically targeted Head Start/ECEAP children from low-income families, who might be expected to have poorer oral health. Despite this difference in target populations, King County preschool children’s rate of untreated decay (12%) met the HP2020 objective for rate of untreated decay (21.4%). King County’s rate of caries experience (34%) was not significantly different from the national objective (30%).



## Comparison to Washington State: Preschool Children

King County children in preschool programs had significantly *less caries experience* and *less rampant decay* than children in programs in other areas of the State. There were significant differences between rates of *white spot lesions*: King County preschool children were 1.4 times more likely to have white spot lesions. The reason for this difference is not known.



**Table 17: Oral Health Measures in Preschool Children, King County and Washington State, 2015**

Oral Health Measure	WA State (n=1,479)	King County (n=630)
*Caries Experience	<b>45%</b> (41% - 49%)	<b>34%</b> (30% - 38%)
Untreated Decay	<b>17%</b> (13% - 21%)	<b>12%</b> (9% - 15%)
Treated Decay	Not available	<b>25%</b> (21%-29%)
*Rampant Decay	<b>21%</b> (17% - 25%)	<b>12%</b> (9% - 15%)
*White Spot Lesions	<b>22%</b> (17% - 27%)	<b>31%</b> (28% - 35%)

\* Significant difference between groups

## Disparities in Oral Health for Preschool Children

### No Disparities Associated with Race/Ethnicity:

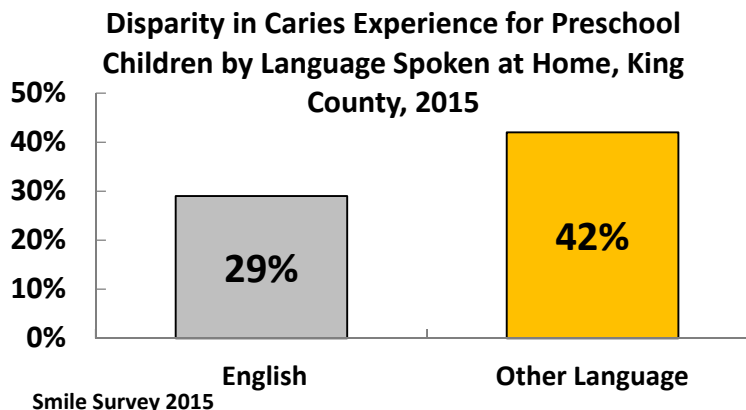
The 2015 Smile Survey found no statistically significant differences in dental disease between white non-Hispanic preschoolers and minority children.

**Table 18: Oral Health Measures for Preschool Children by Race/Ethnicity, King County, 2015**

Oral Health Measure	White non-Hispanic (n=143)	Minority (n=530)
Caries Experience	<b>34%</b> (26%-44%)	<b>34%</b> (29%-39%)
Treated Decay	<b>24%</b> (17%-34%)	<b>25%</b> (21%-30%)
Untreated Decay	<b>17%</b> (11%-26%)	<b>11%</b> (8%-14%)
Rampant Decay	<b>11%</b> (6%-19%)	<b>12%</b> (9%-16%)
White Spot Lesions	<b>36%</b> (27%-46%)	<b>30%</b> (26%-35%)

Head Start/ECEAP programs serve low-income children, and dental disease is strongly related to poverty. In the broader population there is a disproportionate burden of oral disease in young minority children. These Smile Survey data, comparing children who differ not on poverty but only on race, find no difference in dental disease. This suggests that race/ethnicity is a correlate but not a 'cause' of poorer oral health among these low-income children.

**Disparities Associated with Language Spoken at Home:** In contrast, preschool children in families speaking English at home had significantly lower rates of *caries experience* and *treated decay* than children whose families did not speak English at home. There were no differences in untreated decay, rampant decay or white spot lesions by language spoken at home.





**Table 19: Disparities in Oral Health Measures for Preschool Children by Language Spoken at Home, King County, 2015**

Oral Health Measure	English (n=414)	Other Language (n=268)
*Caries Experience	<b>29%</b> (24% - 35%)	<b>42%</b> (35% - 49%)
Treated Decay	<b>22%</b> (17% - 27%)	<b>31%</b> (25% - 38%)
Untreated Decay	<b>11%</b> (8% - 15%)	<b>14%</b> (10% - 20%)
Rampant Decay	<b>12%</b> (9% - 16%)	<b>12%</b> (8% - 17%)
White Spot Lesions	<b>31%</b> (26% - 37%)	<b>31%</b> (25% - 38%)

\* Significant difference between language groups

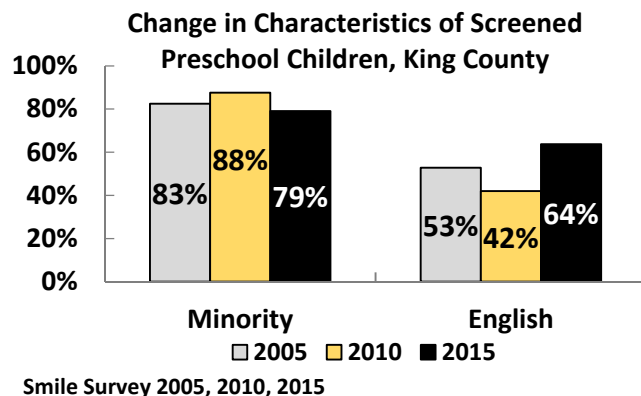
## Change over Time for Preschoolers: Comparing the 2005, 2010, and 2015 Surveys

### Sample Characteristics

Smile Survey samples in 2005, 2010 and 2015 were created using similar methods and therefore can be examined for oral health and demographic changes over time. As all children in these programs came from low-income families, there was no variation in income over time.

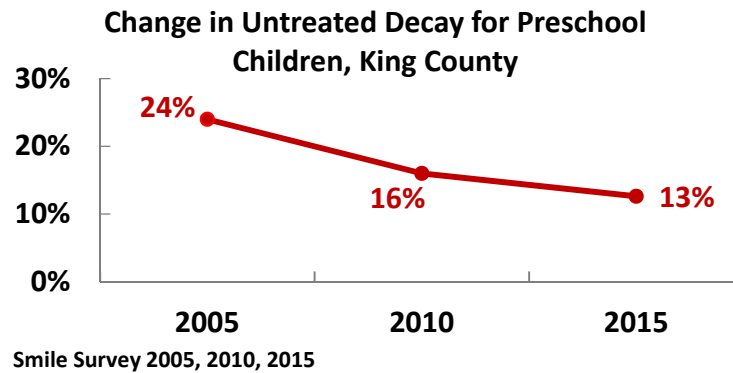
Nonwhite and Hispanic children predominated in all three surveys, making up 77% to 88% of children screened. The proportion of minority children increased slightly 2005-2010 and declined slightly 2010-2015, for no overall change 2005-2015.

The proportion of children speaking English dropped significantly between 2005 and 2010, then rose significantly 2010-2015 for an overall significant increase 2005-2015. There were more home speakers of English in 2015 than in 2005 or 2010.



### Oral Health Changes

The preschool rate of **untreated decay decreased** significantly between 2010 and 2015, resulting in an overall decline between 2005 and 2015. Rates of caries experience, treated decay and rampant caries were stable across all surveys.



**Table 20: Oral Health Measures for Preschool Children, King County, King County**

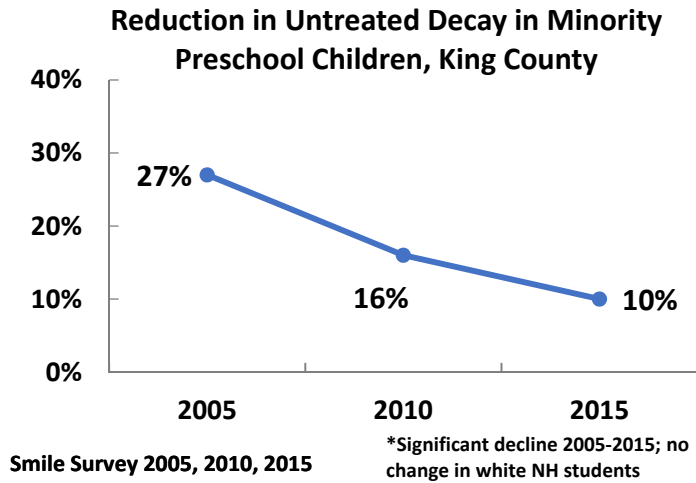
Oral Health Measure	2005 (n=397)	2010 (n=528)	2015 (n=684)
Caries Experience	39% (34% - 45%)	36% (32% - 42%)	34% (30% - 38%)
Treated Decay	22% (17% - 27%)	26% (22% - 31%)	25% (21% - 29%)
*Untreated Decay	24% (20% - 29%)	16% (13% - 20%)	12% (9% - 15%)
Rampant Decay	12% (9% - 16%)	11% (9% - 15%)	12% (9% - 15%)
White Spot Lesions	Not Available	42% (38% - 47%)	31% (28% - 35%)

\*Significant change between 2010 and 2015 and overall 2005-2015

### Disparities in Oral Health over Time

#### *Trends in Disparities by Race/Ethnicity*

Untreated decay—a proxy for access to dental care—declined among minority preschool children between 2005 and 2010, and remained below the 2005 level in the 2015 Survey. The rate of untreated decay among white non-Hispanics did not change during this interval.



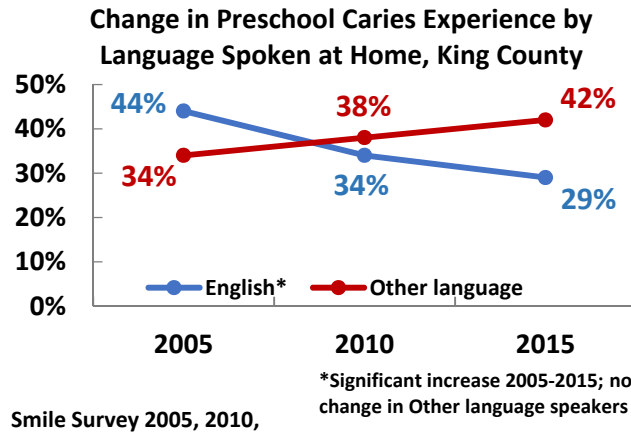
**Table 21: Oral Health Measures in Preschool Children  
by Race/Ethnicity, King County, 2005-2015**

Oral Health Measure	White non-Hispanic			Minority		
	2005 (n=69)	2010 (n=65)	2015 (n=177)	2005 (n=324)	2010 (n=463)	2015 (n=582)
<b>Caries Experience</b>	<b>25%</b> (14%-37%)	<b>41%</b> (27%-56%)	<b>34%</b> (22%-44%)	<b>42%</b> (36%-49%)	<b>36%</b> (31%-41%)	<b>34%</b> (29%-38%)
<b>Treated Decay</b>	<b>16%</b> (6% - 25%)	<b>29%</b> (16% - 42%)	<b>24%</b> (16%-33%)	<b>23%</b> (18% - 28%)	<b>26%</b> (21% - 31%)	<b>25%</b> (21%-30%)
<b>*Untreated Decay</b>	<b>13%</b> (5% - 22%)	<b>21%</b> (9% - 32%)	<b>17%</b> (10%-25%)	<b>27%</b> (21% - 33%)	<b>16%</b> (12% - 20%)	<b>11%</b> (7%-14%)
<b>Rampant Decay</b>	<b>5%</b> (0% - 10%)	<b>18%</b> (7% - 29%)	<b>11%</b> (5%-17%)	<b>13%</b> (9% - 17%)	<b>11%</b> (7% - 14%)	<b>12%</b> (6%-16%)

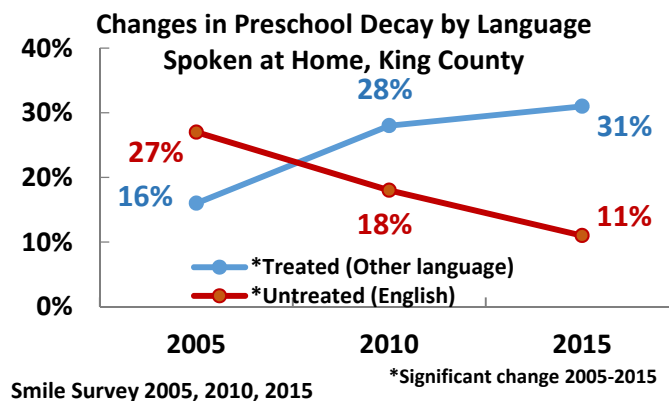
\*Significant decline between 2005-2010 and 2005-2015 in minority group

***Trends in Disparities by Language Spoken at Home***

Preschool children speaking English at home had a decrease in caries experience between the 2005 and 2015 surveys. Over the same time period, caries experience increased non-significantly among children speaking other languages, enough to produce a significant language-related disparity in 2015.



A 60% decrease in *untreated decay* in children speaking English drove their drop in caries experience. During the same period, children speaking other languages had a significant increase in *treated decay*. These changes did not produce or ameliorate disparities in 2015.



**Table 22: Oral Health Measures for Preschool Children by Home Language, King County**

Oral Health Measure	Speak English			Speak Other Language		
	2005 (n=210)	2010 (n=222)	2015 (n=486)	2005 (n=187)	2010 (n=306)	2015 (n=236)
<b>*Caries Experience</b>	44% (37%-52%)	34% (27%-41%)	29% (24%-34%)	34% (26%-41%)	38% (32%-45%)	42% (34%-49%)
<b>**Treated Decay</b>	27% (20%-34%)	24% (18%-31%)	22% (17%-26%)	16% (10%-22%)	28% (22%-34%)	31% (24%-38%)
<b>*Untreated Decay</b>	27% (20%-34%)	18% (12%-24%)	11% (7%-15%)	21% (14%-27%)	15% (11%-20%)	13% (8%-18%)
<b>Rampant Decay</b>	14% (9%-20%)	9% (7%-14%)	12% (8%-16%)	9% (4%-13%)	13% (9%-17%)	11% (7%-16%)

\*Significant decrease 2005-2015 in English speakers; \*\*Significant increase 2005-2015 among non-English speakers

## Summary of Disparities over Time among Preschool Children

Because sample sizes were small, rates of oral disease varied more rapidly in the preschool surveys than in those of elementary children. Most changes were not large enough to be statistically significant. Multiple logistic regression, which examined survey year and student characteristics, determined that

- There was a very small but statistically significant **decrease in caries experience** between 2005 and 2015, taking into account the differences in the sample composition (Odds Ratio 0.97, confidence interval 0.96-0.99). The change was the result of a significant decrease in **untreated decay**, which is part of caries experience (O.R. =0.91).
- In this low-income preschool population, **minority race/ethnicity** and **language spoken at home** had no relationship to oral health measures when other factors were controlled.

## Report Conclusions

The findings of the 2015 King County Smile Survey indicate that children continue to be affected by dental disease, and suggest ways to prevent disease and improve children’s dental health.

### Key findings from the 2015 King County Smile Survey of preschool and elementary children include:

1. King County children enjoy relatively good oral health.
  - King County **children age 6 to 9** exceeded the Healthy People 2020 child oral health objectives in caries experience, untreated decay and use of dental sealants.
  - HeadStart/ECEAP (**preschool**) children surpassed the Healthy People 2020 oral health objective in untreated decay for 3 to 5 year olds, and met the standard for caries experience.
  - **Kindergarten** children in the King County sample had lower rates of caries experience and rampant decay than did those in the Washington State sample. There was no difference in rate of untreated decay in the two groups.
  - **Second and third graders** in the King County sample also had less caries experience and rampant decay than those in the Washington State sample. King County children had a higher rate of untreated decay—an indicator of poor access to care-- than did Washington children.
2. Children’s oral health shows modest but significant improvement.
  - In the time since the 2005 and 2010 Smile Surveys, three of the four oral health measures (caries experience, treated decay and rampant caries) have **modestly improved**. There has been no change in untreated decay.
  - Most gains have occurred among children at higher risk for poor oral health: those from low income families, minority children, and those whose families speak a language other than English at home.

3. Despite gains over time, disparities in oral disease persist for elementary children.
- Children in low income families (those who were eligible for Free/Reduced Lunch) had nearly double the rate of oral disease compared to higher income children. Poverty is the strongest predictor of poor oral health in the Smile Survey.

Untreated decay is a measure reflecting access to care. The King County region has a range of dental programs and services offered to low-income families, including private dental offices, community dental clinics, Public Health dental clinics, the University of Washington Dental School and other dental programs. Despite these opportunities for care, the 2000, 2005, 2010 and 2015 Smile Surveys all show that children from low-income families continue to have elevated rates of untreated dental disease compared to the general population. This suggests that barriers to child dental care extend beyond finding a provider.

Minority children (those who are nonwhite or Latino) also have higher rates of oral disease. Most of this disparity is a result of their relatively higher poverty rather than race/ethnicity itself. Dental disease is primarily a disease of poverty, and families of color, immigrants and refugees in King County are much more likely than non-Hispanic white families to be poor. The racial and ethnic disparities in childhood dental disease continue to be a significant problem. The 2005 and 2010 King County surveys revealed the problem, and the 2015 survey data showed little change in the pattern. Among minority groups, Latino children were likely to have more caries experience and more severe disease than multi-racial or Asian children. Much has been done to reach and educate the Hispanic community, but the results of the 2015 survey suggest that more still needs to be done to reduce dental disease in Latino children.

- Children who speak a language other than English at home also have a disadvantage in oral health relative to those who speak English. Language is a less powerful predictor than poverty or race/ethnicity, but retains its relation to poorer oral health. Children speaking Spanish at home are particularly at risk, mirroring the higher vulnerability of Latinos.

4. There are no disparities in the prevention measure included in the Survey.

- Dental sealants are applied to permanent molars.
- In 2015 there were no differences in sealants among children by income, race/ethnicity or language spoken at home, reflecting a significant effort to target services to those at greatest risk.
- Dental sealants are now routinely applied to permanent molars by all types of dental providers, seeking to maintain the high level of dental sealants found in children in King County.

From a Public Health perspective it is important to continue the emphasis on prevention and preventive services. Dental sealants and community water fluoridation continue as the most effective ways to prevent dental decay. These preventive measures have helped to drive the observed decline in dental disease in King County children. To sustain this progress, we need to focus on helping families achieve oral health behavior changes (home care and diet) to address childhood oral disease. This focus is especially important in working with low-income families as well as families of color and immigrant/refugee families.

## Appendix Data Tables

**Table 1.1**  
**Elementary School Participation in Smile Survey 2015**

	Number of Schools	Number Enrolled	Number Screened	Response Rate
Participating Schools	22	4,782	4,017	84%

**Table 1.2**  
**Student Race/Ethnicity and Free/Reduced Price Lunch Program Participation for King County Elementary Schools, Participating Schools, and Smile Survey participants, 2015-2016**

	School Enrollment	Percent on FRL	Percent White	Percent Hispanic	Percent African-American	Percent Asian	Percent Other Race
King County Elementary Schools (n=317)	145,963	36%	45%	18%	8%	17%	12%
Participating Schools (n=22)	10,959	34%	46%	16%	10%	18%	11%
Children Screened (n=5,035)		38%	51%	11%	13%	17%	8%

- King County elementary schools are those in the 2015-2016 enrollment data from the Washington State Office of the Superintendent of Public Instruction that had kindergarten, 2<sup>nd</sup> or 3<sup>rd</sup> grade students. Race/ethnicity and FRL data reflect all students in the school, not just those in kindergarten, 2<sup>nd</sup> and 3<sup>rd</sup> grades.
- Race/ethnic and FRL data for participating schools come from the same OSPI source and also reflect all students, not only those in screened classrooms.
- Data for screened children are weighted to account for children who were absent on screening day.

**Table 1.3**  
**Demographics of Screened Children, 2015**

Variable	Kindergarten (n=1,598)		2nd Grade (n=1,785)		3 <sup>rd</sup> Grade (n=1,634)		All Grades (n=4,989)	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
<b>Age</b>								
4 years	1	0.1%					1	
5 years	729	47%					729	15%
6 years	821	53%					821	17%
7 years	5	0.3%	720	40%	5	0.3%	730	15%
8 years			1046	59%	706	43%	1752	35%
9 years			17	1%	894	55%	911	18%
10 years					29	2%	29	0%
Missing	1	1%	1	0.7%			2	<1%
<b>Gender</b>								
Male	805	52%	966	54%	813	50%	2584	52%
Female	751	48%	817	46%	821	50%	2389	48%
Missing/Unknown	1	0.8%	2	0.1%			3	<1%
<b>Free/Reduced Lunch Eligibility</b>								
Not eligible	802	51%	943	53%	785	48%	2530	51%
Eligible	480	31%	538	30%	551	34%	1569	30%
Missing/Unknown	276	18%	303	17%	298	18%	877	19%
<b>Language at Home</b>								
English	1,125	72%	1245	70%	1,120	69%	3490	71%
Spanish	92	6%	142	8%	174	11%	408	8%
Other/English & Other	335	22%	382	20%	272	20%	989	19%
Missing/Unknown	2	0.2%	15	0.8%	58	0.6%	75	0.4%
<b>Race/Ethnicity</b>								
White non-Hispanic	818	53%	895	59%	819	50%	2532	52%
African American	198	13%	232	13%	208	13%	638	12%
Hispanic/Latino	141	9%	199	11%	204	12%	544	11%
Asian	283	18%	287	16%	272	17%	842	16%
Amer. Indian/AK Native	6	0.4%	9	0.5%	21	1%	36	0.7%
Pacific Islander	19	1%	25	1%	19	1%	63	1%
Multiracial	87	6%	118	7%	82	5%	287	6%
Unknown	5	0.3%	20	1%	9	0.5%	34	<1%



**Table 1.4**

**Oral Health Status of Screened Kindergarten, 2<sup>nd</sup> & 3<sup>rd</sup> Grade Children Stratified by Grade**

Total n=4,000	Kindergarten (n= 1,557)			2nd & 3 <sup>rd</sup> Grades (n=3,406 )		
	Number Screened	Percent	Confidence Interval	Number Screened	Percent	Confidence Interval
Caries free	1,110	71%	69% - 74%	2,020	59%	57% - 61%
Caries experience	447	29%	26% -31%	1386	41%	39% - 43%
Treated decay	291	19%	17% - 21%	1123	33%	31% - 35%
Untreated decay	224	14%	13% - 17%	505	15%	14% - 16%
Rampant caries	106	7%	5% - 8%	293	9%	8% - 10%
Dental sealants	94	6%	5% - 8%	1,576	46%	44% - 48%
<b>Treatment Need</b>						
No obvious problem	1,768	86%	83% - 87%	2,907	85%	84% - 87%
Early dental care needed	208	13%	12% - 15%	457	13%	12% - 15%
Urgent dental care needed	14	0.8%	0.3% - 1%	37	1%	0.8% - 2%

**Table 2.1**  
**Head Start and ECEAP Participation in Smile Survey 2015**

	Number of Sites	Enrollment	Number Screened	Response Rate
Participating Sites	25	757	492	65%

**Table 2.2**  
**Age, Gender, Language Spoken at Home and Race/Ethnicity of Screened Head Start/ECEAP Children**

Variable	Screened Children	
	Number	Percent
Age		
3 years	76	11%
4 years	350	51%
5 years	258	38%
Gender		
Male	358	52%
Female	325	48%
Language Spoken at Home		
English	414	61%
Spanish	137	20%
Other/English & Other	131	19%
Missing/Unknown	2	0%
Race/Ethnicity		
Amer. Indian/AK Native	1	0%
Asian	93	14%
Black/African American	196	29%
Hispanic/Latino	174	25%
Multiracial	57	8%
Pac. Islander	12	2%
White non-Hispanic	143	21%
Other	7	1%
Missing/Unknown	1	0%

**Table 2.3**  
**Oral Health Status of Screened Head Start and ECEAP Children**

Screened Children (n=630)		
	Percent	Confidence Interval
Caries free	66%	(62%-79%)
Treated decay	34%	(30% - 38%)
Untreated decay	25%	(21%-29%)
Rampant decay	12%	(9% - 15%)
White spot lesions	31%	(28% - 35%)
 Treatment Need		
None needed	88%	(84%-90%)
Treatment needed	12%	(10% - 16%)
Urgent treatment needed	<1%	

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