



New Hampshire 2008-09 Third Grade *Healthy Smiles – Healthy Growth* Survey

Oral Health and Body Mass Index Assessment of
New Hampshire 3rd Grade Students

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Background:

The New Hampshire *Third Grade Healthy Smiles – Healthy Growth Survey* was conducted between September 2008 and June 2009. The goal was to collect uniform information on the oral health and height/weight status of third grade students, to document the burden of disease, and to use this information for public health surveillance, intervention planning, and evaluation. Altogether, 81 randomly selected New Hampshire public schools and 3,151 students participated in the survey. Funding support for the survey was provided by the HNHfoundation, Northeast Delta Dental Foundation and the New Hampshire Department of Health and Human Services, Obesity Prevention Program and Rural Health and Primary Care Section. The Association of State and Territorial Dental Directors provided statistical support.

Introduction:

Oral health is an important part of general health that contributes to a person's ability to perform essential functions such as eating and speaking. Tooth decay is the most common chronic childhood disease, and is largely preventable through a combination of community, professional and individual strategies. Enough is known about dental disease prevention that any child can grow into adulthood with good oral health. New Hampshire has an established oral health surveillance system that includes oral health related data collected on 3rd grade students in public schools. The *Third Grade Oral Health Survey* was previously conducted in 2001 and 2004.

The problem of childhood obesity has increased significantly during recent years; however, limited work has been done to describe the burden of obesity among New Hampshire school-aged children, particularly those attending elementary and middle schools. Childhood obesity increases the risk for several chronic diseases including type 2 diabetes, high blood pressure, liver disease and depression during childhood as well as adulthood. Additionally, many nutrition and physical activity habits acquired at a young age predispose individuals to overweight and obesity as adults.

Methods:

Our sampling frame consisted of all New Hampshire public schools with 15 or more students enrolled in 3rd grade. Within this frame, we conducted a cross-sectional survey of oral health and height/weight status. We used a systematic sample and stratified by region and percentage of students participating in the free and reduced lunch program (FRL) in each school. The FRL participation was determined by data acquired from the New Hampshire Department of Education from the previous school year. Regions were defined as a county with a large enough population for sampling or two, less populated, socio-demographically similar counties combined. Coos County is socio-demographically different from the rest of our state and has less population; therefore, we screened every eligible, consenting student (census approach). Regions included Coos, Hillsborough, Strafford, Rockingham, Belknap/Merrimack, Carroll/Grafton, and Cheshire/Sullivan. Altogether, 81 schools were approached; among them four declined participation and were replaced with schools from the same sampling strata. Both active and passive consent forms were used depending on school preference; consent forms in Spanish were provided. The final study population consisted of all 3rd grade students who were enrolled in

selected schools, were present the day of the screenings and who had consented to participate in oral health screening, height/weight screening or both. Information on race and ethnicity was not collected.

One dentist and six dental hygienists were trained to provide dental screenings using the Association of State and Territorial Dental Directors Basic Screening Survey tool. They were also trained to collect height and weight measurements using a standardized protocol and equipment. Participating students underwent a brief visual examination to determine the presence of untreated tooth decay, previous decay experience, need for dental care (any care vs. urgent care) and dental sealants. Height was recorded to 1/8 of an inch and weight to 1/10 of a pound. Additional information collected to calculate body mass index (BMI) for-age percentiles included: gender, date of screening, and date of birth for each child.

Analysis:

We analyzed the data using SAS software and the Centers for Disease Control and Prevention's growth charts for BMI-for-age percentiles, with the following classification: Obese (BMI $\geq 95^{\text{th}}$ percentile), overweight (BMI $\geq 85^{\text{th}}$ – $< 95^{\text{th}}$ percentile), normal weight (BMI $\geq 5^{\text{th}}$ – $< 85^{\text{th}}$ percentile), and underweight (BMI $< 5^{\text{th}}$ percentile). We estimated the population proportion of obese and overweight students based on the above BMI classification. We also estimated the population proportion of students with active decay, decay history and sealants. Study population average estimates and secondary subgroup analyses were performed by region and gender. Additionally, 95% confidence intervals (indicate the reliability of the estimates), incorporating finite population correction, were calculated for each measure to determine statistical significance. All estimates were weighted (adjusted) according to selection probability and for non-response. Statewide estimates were also adjusted for the target population. Estimates for Coos County were based on a census; therefore, confidence intervals are not necessary.

Results:

The statewide sample consisted of 81 schools and 4,725 students. Participating schools were representative of the state in terms of eligibility for free and reduced lunch. Altogether 63 schools used active parental consent and 18 used passive parental consent. Participation rates among schools with active consent ranged from 21 to 93% (median 57%); and participation rates among schools with passive consent ranged from 80 to 100% (median 89%). Upon completion of the study, 3,086 consenting New Hampshire third grade students had data necessary to assess the height/weight status, however only those 7-10 years old (3,082) were included in the analyses. Children 6, 11 and 12 years old were considered outliers with regard of their age and were excluded from the height/weight status analyses. Altogether 3,015 students were analyzed for oral health status.

Oral health status of 3rd grade students in New Hampshire

Table 1 – Demographic description of children undergoing oral health screenings, 2008-2009

Variable	Number of Children	Percent
Gender (n=2,991)*		
Male	1,587	53.1%
Female	1,404	46.9%
Age (n=3,003)		
6 years	2	<0.1%
7 years	15	0.5%
8 years	1,889	62.9%
9 years	1,065	35.5%
10 years	30	1.0%
11 years	1	<0.1%
12 years	1	<0.1%

* Above totals differ from 3,015 due to missing demographic data points

Table 2 – Statewide prevalence of tooth decay experience, dental sealants and treatment urgency, 2008-2009

Variable	Number of Children	Percent of Children	95% Confidence Interval
Decay experience	1,427	43.6	39.7-47.4
Untreated decay	443	12.0	9.6-14.3
Dental sealants	1,644	60.4	56.8-64.1
Need treatment (early & urgent)	448	12.0	9.7-14.4
Need urgent treatment	39	1.0	0.5-1.5

Table 3 – Statewide prevalence of tooth decay experience, dental sealants and treatment urgency, stratified by gender, 2008-2009

Variable	Females		Males	
	Number of Children	Percent and 95% CI (n=1,404)	Number of Children	Percent and 95% CI (n=1,587)
Decay experience	630	40.8 (35.9-45.6)	788	46.3 (41.9-50.8)
Untreated decay	194	12.2 (9.5-15.0)	249	12.4 (9.7-15.0)
Dental sealants	787	61.2 (56.9-65.4)	841	59.4 (55.0-63.8)
Need treatment	193	12.2 (9.4-14.9)	255	12.6 (9.9-15.2)
Need urgent treatment	15	1.4 (0.3-2.5)	24	0.7 (0.3-1.2)

Table 4 – Statewide prevalence of tooth decay experience, dental sealants and treatment urgency, stratified by Free and Reduced Price Lunch (FRL) Status of School, 2008-2009

Variable	<25% FRL* 95% CI (n=1,615)	25-49% FRL* 95% CI (n=1,099)	≥ 50% FRL* 95% CI (n=301)
Decay experience	38.5 (34.8-42.2)	51.4 (44.6-58.2)	68.4 (63.5-73.4)
Untreated decay	9.7 (7.0-12.4)	15.6 (12.4-18.8)	22.3 (13.1-31.5)
Dental sealants	62.9 (58.1-67.7)	55.5 (51.5-59.6)	52.5 (50.8-54.1)
Need treatment (early & urgent)	9.8 (7.2-12.5)	15.5 (12.3-18.8)	22.5 (13.3-31.7)
Need urgent treatment	1.0 (0.3-1.7)	0.6 (0.2-1.1)	2.6 (0.8-4.9)

* Percent of children in the school that participate in the free/reduced price lunch program, 2007-2008.
Source: New Hampshire Department of Education.

Table 5 – Region specific prevalence estimates and 95% CI of tooth decay experience, dental sealants and treatment urgency, 2008-2009

Variable	Belknap Merrimack (n=376)	Carroll Grafton (n=393)	Cheshire Sullivan (n=300)	Coos* (n=217)	Hillsborough (n=1,021)	Rockingham (n=376)	Strafford (332)
Decay experience	50.2 (39.7-60.7)	46.7 (36.7-56.7)	51.6 (44.5-58.7)	64.0	43.9 (34.7-53.1)	38.9 (32.9-44.9)	44.2 (32.3-56.1)
Untreated decay	14.9 (7.2-22.5)	17.0 (9.2-24.7)	13.3 (8.4-18.3)	30.7	10.6 (6.8-14.4)	10.8 (5.9-15.8)	13.7 (6.0-21.3)
Dental sealants	59.8 (52.0-67.5)	39.8 (27.9-51.7)	61.7 (56.4-67.0)	23.7	60.3 (53.9-66.7)	63.8 (55.6-71.9)	56.3 (48.9-63.8)
Need treatment	14.9 (7.2-22.5)	16.7 (9.2-24.2)	13.7 (8.6-18.8)	31.1	10.7 (7.0-14.4)	10.8 (5.9-15.8)	14.6 (6.8-22.4)
Need urgent treatment	1.4 (0.0-3.1)	2.5 (0.9-4.2)	0.7 (0.0-1.7)	0.8	0.4 (0.0-0.9)	1.2 (0.0-2.5)	2.0 (0.2-3.7)

* Coos County estimates based on a census

Approximately 43.6% of New Hampshire 3rd grade students experienced tooth decay and 12.0% of students had untreated tooth decay at the time of the survey. Only 1.0% of 3rd grade students required urgent treatment due to pain or swelling. There were no differences in prevalence of oral health indicators by gender. Based on the free and reduced lunch program participation; students in schools with ≥ 50% of students participating in the free and reduced lunch program experienced more tooth decay and were less likely to have dental sealants than students in schools where less than 25% of students were participating in the free and reduced lunch program. According to the analysis by regions, Coos County had the highest prevalence of decay experience and untreated decay and the lowest prevalence of dental sealants. This prevalence was statistically significantly higher when compared to all other regions. Third grade students in the Carroll/Grafton region had statistically significantly fewer sealants than students in some other regions.

Weight status of third grade students in New Hampshire

Table 1 – Demographic description of children undergoing height and weight measurements, 2008-2009

Variable	Number of Children	Percent
Gender (n=3,086)		
Male	1,643	53.2%
Female	1,443	46.8%
Age (n=3,086)		
6 years	2	0.1%
7 years	15	0.5%
8 years	1,968	63.8%
9 years	1,069	34.6%
10 years	30	1.0%
11 years	1	<0.1%
12 years	1	<0.1%

Table 2 – Statewide prevalence* of overweight and obesity, 2008-2009

Variable	Number of Children	Percent of Children	95% Confidence Interval
Obese	556	18.0	16.1-19.9
Overweight	481	15.4	14.1-16.7
Normal weight	1,994	64.9	62.9-66.8
Underweight	51	1.7	1.0-2.4

* Only children 7-10 years (3,082) included

Table 3 – Statewide prevalence* of overweight and obesity, stratified by gender, 2008-2009

Variable	Females		Males	
	Number of Children	Percent and 95% CI (n=1,441)	Number of Children	Percent and 95% CI (n=1,641)
Obesity	236	14.6 (11.9-17.3)	320	20.8 (17.2-24.5)
Overweight	221	15.5 (13.1-17.8)	260	15.3 (13.2-17.5)
Normal weight	958	67.5 (64.0-71.0)	1,036	62.7 (59.2-66.2)
Underweight	26	2.4 (1.0-3.8)	25	1.1 (0.6-1.6)

* Only children 7-10 years (3,082) included

Table 4 – Statewide prevalence* of overweight and obesity, stratified by age, 2008-2009

Variable	7&8 Year Olds		9&10 Year Olds	
	Number of Children	Percent and 95% CI (n=1,983)	Number of Children	Percent and 95% CI (n=1,099)
Obesity	345	16.9 (14.7-19.1)	211	19.7 (17.0-22.3)
Overweight	310	15.6 (14.2-17.1)	171	15.1 (12.8-17.4)
Normal weight	1,294	66.0 (63.8-68.2)	700	63.2 (59.6-66.7)
Underweight	34	1.4 (0.8-2.1)	17	2.1 (0.7-3.4)

* Only children 7-10 years (3,082) included

Table 5 – Statewide prevalence* of overweight and obesity, stratified by Free and Reduced Price Lunch (FRL) Status of School, 2008-2009

Variable	<25% FRL* 95% CI (n=1,665)	25-49% FRL* 95% CI (n=1,111)	≥ 50% FRL* 95% CI (n=306)
Obesity	16.3 (14.2-18.4)	20.1 (16.8-23.4)	27.3 (22.2-32.3)
Overweight	15.2 (13.5-16.9)	16.6 (14.7-18.6)	13.4 (11.7-15.1)
Normal weight	66.5 (64.1-68.9)	62.1 (59.1-65.1)	58.1 (53.9-62.3)
Underweight	2.0 (1.1-2.9)	1.1 (0.3-1.8)	1.2 (0.0-2.6)

* Percent of children in the school that participate in the free/reduced price lunch program, 2007-2008.
Source: New Hampshire Department of Education.

Table 6 – Region specific prevalence* estimates and 95% CI of overweight and obesity, 2008-2009

Variable	Belknap Merrimack (n=389)	Carroll Grafton (n=402)	Cheshire Sullivan (n=298)	Coos** (n=220)	Hillsborough (n=1,021)	Rockingham (n=405)	Strafford (347)
Obese	23.9 (19.2-28.6)	17.7 (12.7-22.7)	18.7 (13.7-23.6)	22.2	16.2 (13.0-19.5)	18.1 (13.9-22.3)	13.6 (8.0-19.3)
Overweight	17.8 (13.9-21.6)	16.9 (12.6-21.2)	13.6 (9.9-17.3)	19.3	14.5 (12.1-17.0)	15.3 (12.8-17.9)	13.6 (10.0-17.2)
Normal weight	57.1 (53.6-60.6)	64.2 (59.4-68.9)	66.5 (60.9-72.2)	55.9	67.4 (63.9-71.0)	64.7 (60.7-68.6)	69.7 (62.7-76.7)
Underweight	1.2 (0.0-2.5)	1.2 (0.0-2.8)	1.2 (0.0-2.8)	2.6	1.8 (0.6-3.6)	1.9 (0.2-3.5)	3.1 (0.8-5.4)

* Only children 7-10 years (3,082) included

** Coos County estimates based on a census

Table 7 – Region specific estimates* of overweight and obesity, by gender, 2008-2009

Variable	Belknap Merrimack (n=389)	Carroll Grafton (n=402)	Cheshire Sullivan (n=298)	Coos** (n=220)	Hillsborough (n=1,021)	Rockingham (n=405)	Strafford (347)
Obese & Overweight Males	40.4 (33.0-47.8)	37.4 (30.9-43.9)	35.7 (28.7-43.7)	45.9	33.1 (28.8-37.5)	37.5 (28.1-46.9)	27.8 (20.6-35.0)
Obese & Overweight Females	43.1 (38.7-47.5)	31.7 (24.8-38.6)	28.9 (21.1-36.7)	37.0	28.0 (23.3-32.7)	27.9 (17.7-38.2)	26.5 (14.5-38.6)

* Only children 7-10 years (3,082) included

** Coos County estimates based on a census

We found that approximately 18.0% of New Hampshire 3rd grade students were obese and 15.4% were overweight at the time of the survey. According to the Centers for Disease Control and Prevention Growth charts, these percentages are expected to be 5% and 10% respectively. Only 1.7% of third grade students were underweight. There was not a significant difference in prevalence of obesity by gender at elected significance level. According to the analysis by participation in the free and reduced lunch program in each school there was a significantly higher percentage of obese third grade students in schools where $\geq 50\%$ of students were participating in the free and reduced lunch program as compared to schools where $<25\%$ of students were participating. According to the analysis by region, the Belknap/Merrimack region and Coos County had the highest prevalence of obesity. These prevalence estimates were statistically significantly higher when compared to the regions of Hillsborough and Strafford counties. When the categories of overweight and obese were combined, 35.5% (95%CI: 32.6-38.3) of male and 30.7% (27.7-33.7) of female New Hampshire 3rd grade students were overweight or obese. Regionally, 45.9% of 3rd grade male students in Coos County were overweight or obese; and 43.1% of female students in the Belknap/Merrimack region were overweight or obese.

Conclusion:

Regional disparities in oral health were detected. Students in Coos County were more likely to have experienced decay, have untreated decay, and to be in need of treatment; and they were least likely to have dental sealants. Statewide, children attending schools with a higher proportion ($\geq 50\%$) of students participating in the free and reduced lunch program were more likely to have experienced decay, have untreated decay, and to be in need of treatment; and they were less likely to have dental sealants than students in schools with $< 25\%$ of participation in the program.

With regard to obesity, a larger proportion of males were obese than females, though the gender difference was not statistically significant. Those living in the Belknap/Merrimack region and Coos County had the highest prevalence of obesity among New Hampshire 3rd grade students. Close to half of 3rd grade male students in Coos County were overweight or obese. Statewide, children attending schools with a higher proportion ($\geq 50\%$) of students who participate in the free and reduced lunch program experienced an increased burden of obesity compared to students in schools with less than 25% of students participating.

Findings regarding schools with higher participation in the free and reduced lunch program should not be interpreted to mean that individual children participating in the program are more likely or less likely to be overweight or obese or have unfavorable oral health status. In this survey participation in the free and reduced lunch program approximates school-level socioeconomic status.

Detected inequities should be addressed by targeted prevention and intervention activities with progress measured by similar surveys done at three to five year intervals. Preventive measures and intervention activities may differ depending on the type of disparity being addressed (e.g., regional vs. gender differences).

Data were collected only on students attending New Hampshire public schools and cannot be generalized to those attending private schools or those who are homeschooled. Additionally, only students consenting were assessed by this survey; it is not known whether students who did not consent to participation experience a smaller or larger burden of dental disease or obesity.

Acknowledgement:

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