Montana

2005 – 2006 Study of Oral Health Needs: 3rd Graders and Head Start Children

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Written By:

Rosina Everitte, MPH
Consultant

Introduction and Sampling Methodology

In 2005, Montana introduced several initiatives which were intended to contribute to improved oral health for school-age children. Cheri Seed, RDH, Oral Health Education Consultant, worked with various state, county, and other interested stakeholders to collect oral health data on a representative sample of Montana's children in order to assess statewide oral health needs and deficiencies in access to care. The study was funded through the State Oral Health Collaborative Systems (SOHCS) grant and used protocols developed by the Association of State and Territorial Dental Directors Association (ASTDD) for the "Make Your Smile Count" campaign. Using ASTDD's protocols allowed for the data collection process to be based on national guidelines and standards also being used in other states, so Montana's results can be compared with other locations.

The State of Montana contracted with three registered dental hygienists who traveled to pre-selected elementary schools and subsequent neighborhood Head Start programs. The hygienists were identified through a Request for Proposals process and then contracted with the Department of Public Health and Human Services to provide the dental screenings. The registered dental hygienists conducted oral health screenings between February and May of 2006. At their discretion, the hygienists visited schools and Head Start programs individually or in pairs.

Prior to the start of their work, the hygienists were trained in using the Oral Health Screening form, Montana's version of the ASTDD's Basic Screening Survey (BSS). (See Attachment 1) Data assessment and collection standards were taught through an ASTDD "Train-the-Trainer" video and other materials. The Oral Health Screening Form collected essentially the same data from both the third grade and Head Start students, with one exception. The Head Start screening form collected data on the presence of at least one Early Childhood Caries (ECC) and the third grade form collected data on the presence of sealant on at least one permanent molar tooth. Also, on occasion, school personnel requested screenings for additional students in other grades, but these data were excluded for this study.

Prior to the screening, the teacher collected the following demographic information for each child and included it on the Oral Health Screening Form: name, grade, age, race/ethnicity, and gender. On the day of the screening, the hygienists captured the following data on the form: screening date, school, town, county, screener's name, and basic training completion by hygienist. After the screening was completed, the hygienists also recorded for each third grade and Head Start child the following defined oral health events: number of untreated cavities, caries experience, and treatment urgency recommendations with applicable dental hygienist comments regarding each child's oral health condition. As mentioned above, only Head Start children were screened for the presence of at least one Early Childhood Caries (ECC) and only third grade children were screened for the presence of sealant on at least one permanent molar tooth.

Screenings were completed by direct observation only. Coding for the oral health events consisted of dichotomous answers, such as "yes" and "no", which were coded 1 and 2,

respectively. In instances when the hygienist was unable to assess for the presence or absence of a defined oral health event, it was coded as "99". Race and ethnicity were defined as Caucasian, African American, Hispanic, Asian, American Indian or Alaskan Native, Native Hawaiian or Pacific Islander, Multi-racial, or unknown. Treatment codes consisted of *No Treatment Needed, Early Treatment Needed, Urgent Treatment Needed,* and *Unknown.*

For both the third grade and Head Start samples, active parental consent was obtained before the screenings took place. Additionally, passive consent was obtained from each child before the hygienist actually began the screening. If a child felt uncomfortable or scared after due diligence was done to assure the child, no screening took place regardless of parental consent.

ASTDD's protocols and guidelines recommended randomly selecting elementary schools to participate in the sample. Oral health screenings were then conducted for all the third graders in the sampled schools. Prior to sampling, schools were stratified into two groups, using free or reduced lunch program data as a proxy for socioeconomic status (SES). Power analyses for two levels of stratification suggested over 1,000 students would need to be sampled for Montana's study to gain a 95% confidence and reliability in the oral health results.

Demographic data from the Montana Office of Public Instruction (OPI) were drawn from the 2003-2004 first grader database to acquire free or reduced lunch school designation for third graders during the 2005–2006 school year. The 237 public elementary schools in OPI's database were each designated as either a "Free or Reduced Lunch" school or "Not a Free or Reduced Lunch" school for the purposes of sampling. The dichotomous free or reduced lunch designation was defined by taking the mean participation percentage from all the free or reduced lunch eligible students across the state, as determined by the cutpoint, and profiling schools according to whether they fell above or below the cutpoint. The mean free or reduced lunch participation cutpoint was determined to be 39.57%. Schools averaging below the 39.57% mean participation cutpoint for all first graders were profiled as a "Not a Free/Reduced Lunch" school. Schools above the 39.57% mean participation cutpoint were profiled as a "Free/Reduced Lunch" school. No schools fell exactly on the cutpoint (average).

In order to include at least 1,000 third graders in the sample, 15 schools were needed from each strata, for a total of 30 schools. After stratifying each school by the mean participation cutpoint, 15 schools were randomly sampled from the free or reduced lunch group and 15 were randomly selected from the "not free or reduced lunch" group using a random seed call in SAS 9.1 (Table 1 and Map 1).

A total of 957 third grade students were screened within the 30 sampled schools, representing 9.36% of the total 2005-2006 Montana third grade public school population. The selected schools were located in 21 of Montana's 56 counties.

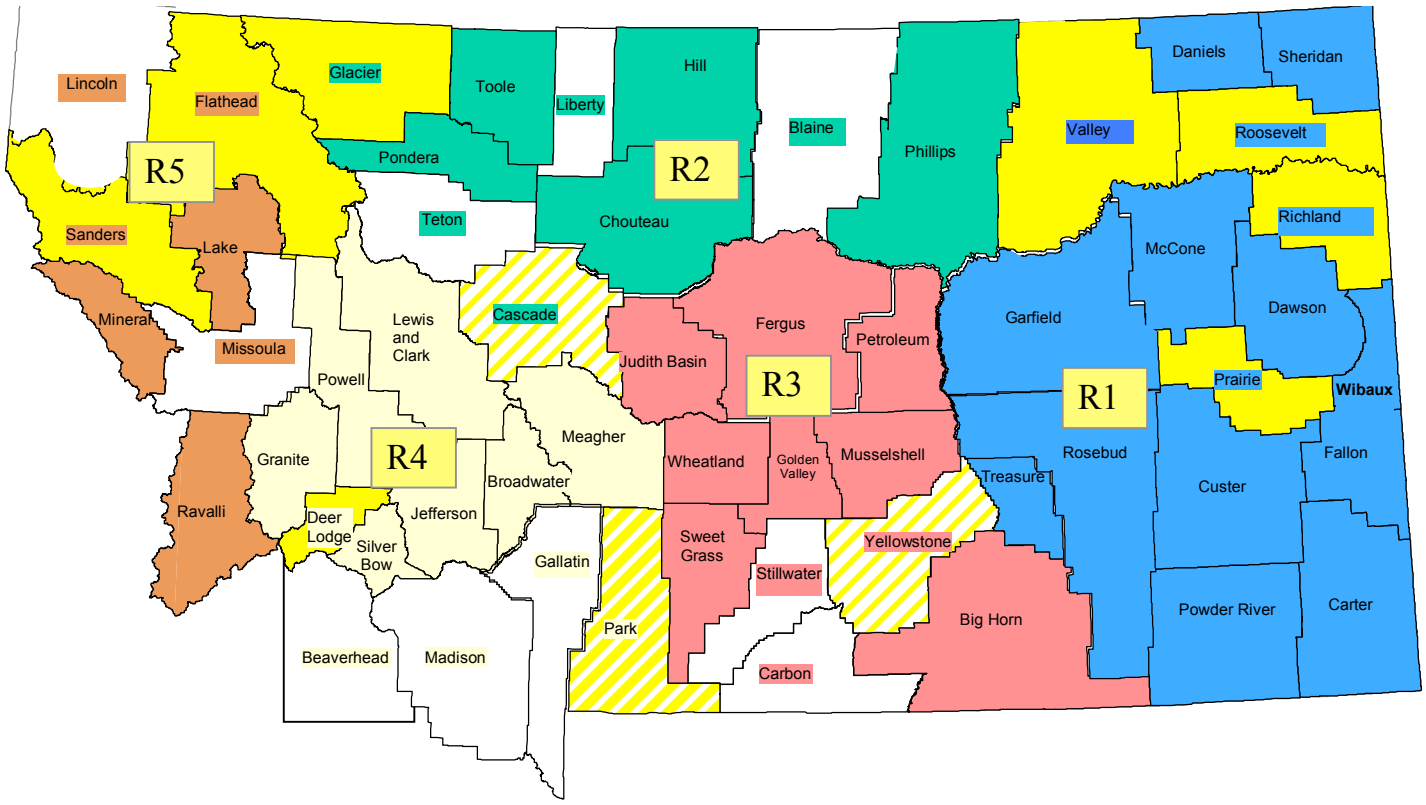
A total of 828 Head Start children from 14 counties were screened. The Head Start Agencies included in the survey were selected in proximity to the randomly selected elementary schools where third graders were screened.

The completed screenings were reviewed by the Oral Health Education Consultant or the Maternal and Child Health Epidemiological Statistician when they were received at the Department of Public Health and Human Services or as they were entered into the Oral Health Screening Database. To ensure the data were of good quality and as complete as possible, partial screening results were verified or deleted were necessary.

Table 1: Free or Reduced Lunch Stratification Breakout for 3rd Grade Schools

F/R lunch?	Health Planning Region	County Name	Elementary School Name	Total Participation Proportion
No	2	Teton	Fairfield School	0.296
No	2	Blaine	Meadowlark	0.381
No	2	Cascade	Sacajawea	0.239
No	2	Liberty	Chester - Joplin – Inverness	0.324
No	2	Teton	Power School	0.258
No	3	Carbon	Joliet School	0.284
No	3	Stillwater	Absarokee School	0.159
No	3	Yellowstone	West	0.240
No	3	Yellowstone	Highland	0.233
No	4	Madison	Sheridan Elementary	0.386
No	4	Gallatin	Anderson School	0.106
No	4	Beaverhead	Parkview	0.323
No	4	Park	Winans	0.328
No	4	Gallatin	Three Forks Elementary	0.252
No	5	Missoula	Chief Charlo	0.281
Yes	1	Richland	Fairview School	0.474
Yes	1	Roosevelt	Culbertson	0.431
Yes	1	Valley	Nashua School	0.675
Yes	1	Prairie	Terry School	0.471
Yes	2	Cascade	West Elementary	0.523
Yes	2	Cascade	Roosevelt School	0.427
Yes	3	Yellowstone	Broadwater	0.531
Yes	3	Yellowstone	Burlington	0.404
Yes	4	Park	East Side	0.441
Yes	4	Deer Lodge	WK Dwyer Primary	0.454
Yes	5	Flathead	Glacier Gateway Elementary	0.432
Yes	5	Sanders	Trout Creek	0.618
Yes	5	Lincoln	Asa Wood (Libby)	0.586
Yes	5	Flathead	West Glacier Elementary	0.655
Yes	5	Flathead	Marion Elementary	0.658

Map 1: 2005 MONTANA MAP OF SAMPLED 3RD GRADE SCHOOLS BY FREE AND REDUCED LUNCH PARTICIPATION AND HEALTH PLANNING REGION



Counties with Non-Free or Reduced Lunch school(s) included in sample

Counties with Free or Reduced Lunch school(s) included in sample

Counties with both Free or Reduced Lunch and Non-Free Lunch School(s) included in sample

4 Counties sampled in Region 1 – 4 free or reduced lunch counties

5 Counties sampled in Region 2 – 3 non-free or reduced lunch counties, 1 free or reduced lunch county, and 1 county with both strata sampled

3 Counties sampled in Region 3 – 2 non-free or reduced lunch counties and 1 county with both strata sampled

5 Counties sampled in Region 4 – 1 free or reduced lunch counties, 3 non-free or reduced lunch counties, and 1 county with both strata sampled

4 Counties sampled in Region 5 – 2 free or reduced lunch counties and 2 non-free or reduced lunch counties

Table 2: Head Start Schools by County and Health Planning Region

School	County	Region
Crow Head Start	Big Horn	3
Ft.Belknap Head Start	Blaine	2
Emerson Head Start	Cascade	2
Glendive Head Start	Dawson	1
Northwest Montana Head Start	Flathead	5
Bozeman Head Start	Gallatin	4
NMCDC Lincoln Ave Site	Hill	2
Rocky Boy Head Start	Hill	2
Flathead Early Childhood Services	Lake	5
Neighborhood Center	Lewis & Clark	4
Kootenai Valley Head Start	Lincoln	5
Ravalli Head Start	Ravalli	5
Fort Peck Head Start	Roosevelt	1
Head Start Lame Deer / Happy Times Center	Rosebud	1
Head Start Lame Deer / Cando Center	Rosebud	1
Head Start Lame Deer / Little Cheyenne	Rosebud	1
Head Start Lame Deer / Little Morning Stars	Rosebud	1
Head Start Lame Deer / Rainbow Center	Rosebud	1
Head Start Lame Deer / A.B.C. Center	Rosebud	1
Butte Head Start	Silver Bow	4

Weighting

The analysis of the third grade data incorporated weights to adjust for possible bias in the stratification used during the original sampling. Additional weights were incorporated, as needed, to include racial weights and regional weights. Racial weights for the third grade data were needed to adjust for the under-representation of Native Americans, as well as other races. Regional weights were needed to adjust for over-representation of particular counties within a region, such as Yellowstone County in Region 3, where population pockets may have biased the total student count. Head Start data were also weighted according to racial and regional imbalances.

Table 3: Stratification and Non-Stratification Weights By Applicable Grade Level

Sample Stratification or Weighted Levels	***3rd Grade Weights***	***Head Start Weights***
Free or Reduced Lunch School Participation Rate		
• Above 39.57% (W1)	0.73	NA
• Below 39.57% (W2)	1.32	NA
Health Planning Regions		
• 1 (W3) (W6)	1.57	0.66
• 2	0.74	0.51
• 3	1.10	8.41
• 4	0.87	0.95
• 5	1.17	1.10
Race/Ethnicity		
• White (W4) (W5)	0.94	0.88
• Black	0.57	0.33
• Hispanic	0.76	2.29
• Asian	0.02	0.23
• American Indian or Native Alaskan	2.65	1.37
• Native Hawaiian or Pacific Islander	0.61	0.62
• Multi-racial	NA	0.92

The third grade and Head Start weights were calculated utilizing numerous data sources and several methods, which were contingent on the types of data readily available for population-based normalization procedures. The third grade weights for free or reduced lunch status were found by accessing 2005-2006 Office of Public Instruction (OPI) data on free/reduced lunch participation. Third grade weights for race and ethnicity were calculated using OPI enrollment numbers by race. The third grade and Head Start weights were calculated using the following method:

Free or Reduced Lunch
Weight1 (W1) =

$$\frac{\text{Total 3rd graders enrolled in F/R Lunch}}{\text{Total 3rd graders in state for 2005-2006}} \div \frac{\text{Total 3rd graders in "Above 39.57%" Strata}}{\text{Total 3rd graders sampled in study}}$$

OR

$$\textit{Weight1} = \frac{4046}{10226} \div \frac{518}{957} = 0.730974$$

For Weight1, the total number of free/reduced lunch children participation was inferred by taking the total number of children reported for the 2005-2006 school year (10,226)

and multiplying it by the mean state rate of free/reduced lunch participation (39.57%). Weight2, the total number not enrolled was calculated as (100%-39.57%) x 10,226.

Free or Reduced Lunch
Weight2 (W2) =

$$\frac{\text{Total 3rd graders not enrolled in F/R Lunch}}{\text{Total 3rd graders in state for 2005-2006}} \div \frac{\text{Total 3rd graders in "Below 39.57%" Strata}}{\text{Total 3rd graders sampled in study}}$$

OR

$$Weight2 = \frac{6180}{10226} \div \frac{439}{957} = 1.317438$$

For Weight2, the total number not enrolled was calculated as (100%-39.57%) x 10,226.

Regional Stratification Weight3 (W3)[c] =

$$\frac{\text{Total 3rd graders in Region 1}}{\text{Total 3rd graders in the state}} \div \frac{\text{Total 3rd graders sampled in Region 1}}{\text{Total 3rd graders sampled in study}}$$

OR

$$Weight3 = \frac{867}{10226} \div \frac{51}{957} = 1.5725367$$

Race Stratification for the 3rd grade subset
Weight4 (W4) [2] =

$$\frac{\text{Total Caucasian 3rd graders in state}}{\text{Total number of children in public school system}} \div \frac{\text{Total Caucasian 3rd graders in study}}{\text{Total number of children in study}}$$

OR

$$Weight4 = \frac{123548}{146788} \div \frac{855}{957} = 0.9420870$$

[1] All regions were calculated in the same manner enabling one weight demonstration.

[2] All 3rd grade race stratifications were calculated in the same manner enabling one weight demonstration. However, OPI data did not collect information on multi-racial children, therefore a multi-racial weight was not applied.

*Race Stratification for the Head Start subset***
Weight5 (W5) [1] =

$$\frac{\text{Total Caucasian HS children in state}}{\text{Total number of HS children in state}} \div \frac{\text{Total Caucasian HS children in study}}{\text{Total number of HS children in study}}$$ [3]

OR

$$\textit{Weight5} = \frac{2399}{4675} \div \frac{478}{817} = 0.877188$$

Regional Stratification
Weight6 (W6) [1] =

$$\frac{\text{Total children ages 2-6 in Region 1}}{\text{Total children ages 2-6 in the state}} \div \frac{\text{Total children 2-6 sampled in Region 1}}{\text{Total children sampled in study}}$$

OR

$$\textit{Weight3} = \frac{3305}{42497} \div \frac{97}{828} = 0.663853$$

An overall weight was calculated for each child sampled by multiplying all applicable race, Health Planning Region, and free/reduced lunch weights together before application of the overall weight to the measurement in question.

Third grade variable-level weights ranged from 0.02 for Asian children to 2.65 for American Indian/Alaskan Native children suggesting an almost 3-fold difference in the sample weights. This three-fold difference implies Asian children were highly over-sampled and American Indian/Alaskan Native children were moderately under-sampled compared to the statewide third grade population proportions for race.

For Head Start, overall weight differentials were even more extreme, with over an 8-fold differential between race and regional weights (0.33 vs 8.41). However, the majority of the weights, as represented in Table 3, were more moderate. The future third grade population sample may need to include racial stratification from the beginning, so as to incorporate schools with higher levels of Native American students so that the sample is more representative. The future Head Start sample may need to stratify by region and race, as the Head Start population for this study tended to be biased toward minorities and particular disadvantaged regions of the state.

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1 All Head Start race stratifications and regional stratification weights were calculated in the same manner enabling one weight demonstration.

2 Total state enrollment numbers for Head Start were not available at the time of this analysis. Census estimates for 2005-2006 for Montana children ages 2 to 6 were used for this weight.

3 Eleven children sampled did not have a reported race and were not included in the calculation

Clinical Methodology

To maintain quality data collection and promote the uniformity of collection procedures, standardized clinical definitions were used to identify untreated cavities, caries experience, sealants on at least one permanent molar tooth, one Early Childhood Caries (ECC), and treatment urgency recommendations. According to the ASTDD Manual, new decay (untreated caries) was defined by two visual criterions: a loss of at least ½ mm of tooth structure at the enamel surface (hole) and brown to dark-brown coloration of the walls of the cavity. Teeth having met both criterions were considered "decay", even if a filling or crown was also in place. Fissure, pit cavities, and smooth tooth surfaces were all included in the definition of decay. Missing teeth or teeth with fillings, crowns, or fractures did not constitute untreated or new decay unless they met the two criterions stated above. Screeners were advised by ASTDD to be conservative when in doubt.

Past decay or caries experience were defined as old decay with fillings, crowns, or missing teeth, as well as all new decay. If a student presented new decay at the screening, they were automatically labeled as having past decay or a caries experience. One or more missing six-year or twelve-year molars may have categorized a child as having had a caries experience, as well.

The presence of sealant on at least one permanent molar tooth was collected on the entire third sample and recorded on the data collection tool. Dental sealants could have been either transparent or opaque, and may have included even partially-retained sealants, as long as they covered a permanent molar. Screeners were advised that observing sealants could be difficult, and that utilizing a toothpick or explorer may be necessary to identify if a surface had a sealant.

Early Childhood Caries or ECC (collected only on Head Start children) were defined as the presence of a caries (filled, untreated, or missing due to decay) on his/her six upper front teeth (maxillary anterior teeth) were considered. Screeners were asked to try and identify the root cause of missing front teeth from the children or their parents (if applicable).

Treatment urgency was collected to identify the current treatment needs for each child. Children with no obvious problems were recommended to have a routine dental care visit. Children having caries without accompanying signs or symptoms, spontaneous bleeding of the gums, suspicious white or red soft tissue, or an ill-fitting denture were recommended to visit the dentist within a few weeks. Children who had signs or symptoms that included pain, infection, swelling, or soft tissue ulceration for more than two weeks duration, as determined by questioning, were recommended to visit the dentist as soon as possible. These recommendations were annotated on a form and were sent home to the parents separate from the screening forms, so that every child's parents could be aware of any current dental needs.

User Information

For Tables 4 through 11, codes associated with the various responses are located in the coding section following the tables. This numerical coding process quantifies an otherwise categorical variable and allows for interpretation of means and medians for the overall distribution of the population for the variable. Additionally, all demographic data and tabulated results were left unweighted for true representation of the sample distributions.

Demographic Analysis

Table 4: Demographics Characteristics by Grade

Demographic Characteristics	**3rd Grade**		**Head Start**	
Health Planning Region	N = 957 Mean = 3.43 Median = 4		N = 828 Mean = 3.23 Median = 4	
	n	%	n	%
• 1	51	5.33	97	11.71
• 2	220	22.99	275	33.21
• 3	189	19.75	21	2.54
• 4	258	26.96	211	25.48
• 5	239	24.97	224	27.05
Age In Years 3rd Grade	N = 957 Mean = 8.67 Median = 9			
• 7	2	0.21		
• 8	348	36.36		
• 9	574	59.98		
• 10	32	3.34		
• 11	1	0.10		
Age In Years Head Start			N = 828 Mean = 4.08 Median = 4	
• 2			3	0.36
• 3			158	19.08
• 4			437	52.78
• 5			226	27.29
• 6			4	0.48
Gender	N = 957 Mean = 1.48 Median = 1		N = 826 Mean = 1.45 Median = 1	
• Male	499	52.14	451	54.60
• Female	458	47.86	375	45.40
Race	N = 956 Mean = 1.33 Median = 1		N = 817 Mean = 2.68 Median = 1	
• Caucasian	855	89.44	478	58.51
• African American	15	1.57	15	1.84
• Hispanic	30	3.14	22	2.69
• Asian	4	0.42	6	0.73
• American Indian/ Alaskan Native	41	4.29	239	29.25
• Native Hawaiian/ Pacific Islander	3	0.31	2	0.24
• Multi-racial	8	0.84	55	6.73
• Unknown	1	NA	11	NA

Table 5: 3RD Grader Demographics Characteristics by Free or Reduced Lunch Classification

Demographic Characteristics	**Children in F/R Lunch Strata**		**Children NOT in F/R Lunch Strata**	
Health Planning Region	N = 518 Mean = 3.47 Median = 4		N = 828 Mean = 3.23 Median = 4	
	n	%	N	%
• 1	51	9.85	0	0.00
• 2	109	21.04	111	25.28
• 3	83	16.02	106	24.15
• 4	95	18.34	163	37.13
• 5	180	34.75	59	13.44
Age In Years 3rd Grade	N = 518 Mean = 8.67 Median = 9		N = 439 Mean = 8.66 Median = 9	
• 7	2	0.39	0	0.00
• 8	183	35.33	165	37.59
• 9	315	60.81	259	59.00
• 10	18	3.47	14	3.19
• 11	0	0.00	1	0.23
Gender	N = 518 Mean = 1.47 Median = 1		N = 439 Mean = 1.49 Median = 1	
• Male	274	52.90	225	51.25
• Female	244	47.10	214	48.75
Race	N = 518 Mean = 1.35 Median = 1		N = 438 Mean = 1.31 Median = 1	
• Caucasian	457	88.22	398	90.87
• African American	8	1.54	7	1.60
• Hispanic	19	3.67	11	2.51
• Asian	3	0.58	1	0.23
• American Indian/ Alaskan Native	29	5.60	12	2.74
• Native Hawaiian/ Pacific Islander	2	0.39	1	0.23
• Multi-racial	0	0.00	8	1.83
• Unknown	0	NA	1	NA

Table 6: 3RD Grader and Head Start Oral Health Prevalence Rates, Weighted and Unweighted Results

Oral Health Measures	**3rd Graders**			**Head Start**		
Untreated Cavities	N = 955 Mean = 1.71 Median = 2			N = 828 Mean = 1.61 Median = 2		
	n	Unweighted %	Weighted % (95% CI)	n	Unweighted %	Weighted % (95% CI)
• Yes	276	28.90	27.90 (25.06 – 30.74)	322	38.89	44.52 (41.13 – 47.91)
• No	679	71.10	72.10 (69.26 – 74.94)	506	61.11	55.48 (52.09 – 58.87)
Caries Experience	N = 957 Mean = 1.35 Median = 1			N = 828 Mean = 1.42 Median = 1		
• Yes	619	64.68	64.26 (61.22 – 67.30)	483	58.33	68.28 (65.11 – 71.45)
• No	338	35.32	35.74 (32.70 – 38.78)	345	41.67	31.72 (28.55 – 34.89)
Sealants (Permanent Molar)	N = 956 Mean = 1.54 Median = 2			Not Applicable		
• Yes	442	46.23	45.96 (42.80 – 49.12)	NA	NA	
• No	514	53.77	54.04 (50.88 – 57.20)	NA	NA	
Treatment Needs	N = 956 Mean = 2.36 Median = 2			N = 825 Mean = 2.54 Median = 2		
• Routine Scheduled Txt	680	71.13	72.15 (69.31 – 74.99)	500	60.85	52.40 (48.99 – 55.81)
• Early Txt Needed	204	21.34	20.40 (17.85 – 22.95)	200	24.24	26.55 (23.54 – 29.56)
• Urgent Txt Needed	72	7.53	7.45 (5.79 – 9.11)	123	14.91	21.05 (18.27 – 23.83)
Early Childhood Caries	Not Applicable			N = 828 Mean = 1.69 Median = 2		
• Yes	NA	NA	NA	255	30.80	34.94 (31.69 – 38.19)
• No	NA	NA	NA	573	69.20	65.06 (61.81 – 68.31)

Table 7: 3RD Grader Oral Health Prevalence Rates by Region, Weighted Results

Oral Health Measures	Region 1		Region 2		Region 3	
	(n=51)		(n=220)		(n=187)	
Untreated Cavities	Mean = 1.76 Median = 2		Mean = 1.80 Median = 2		Mean = 1.79 Median = 2	
	N	Weighted %	N	Weighted %	N	Weighted %
• Yes	12	21.08	43	18.42	40	19.68
• No	39	78.92	177	81.58	147	80.32
Caries Experience	Mean = 1.39 Median = 1		Mean = 1.42 Median = 1		Mean = 1.39 Median = 1	
• Yes	31	66.71	127	57.01	115	59.66
• No	20	33.29	93	42.99	74	40.34
Sealants (Permanent Molar)	Mean = 1.76 Median = 2		Mean = 1.51 Median = 2		Mean = 1.53 Median = 2	
• Yes	12	21.08	107	47.65	88	46.19
• No	39	78.92	113	52.35	100	53.81
Treatment Needs	Mean = 2.37 Median = 2		Mean = 2.26 Median = 2		Mean = 2.31 Median = 2	
• Routine Scheduled Txt	39	78.92	176	81.43	148	80.17
• Early Txt Needed	5	7.63	29	12.66	23	11.05
• Urgent Txt Needed	7	13.45	14	5.92	18	8.78

Yellow shading indicates significant differences between the proportions in yellow and the other non-yellow proportions within the stratifying level (region) to within a 95% confidence boundary.

Table 7: 3RD Grader Oral Health Prevalence Rates by Region, Weighted Results (continued)

Oral Health Measures	Region 4 (n=258)		Region 5 (n=239)	
Untreated Cavities	Mean = 1.71 Median = 2		Mean = 1.56 Median = 2	
	N	Weighted %	N	Weighted %
• Yes	75	29.09	106	43.08
• No	183	70.91	133	56.92
Caries Experience	Mean = 1.29 Median = 1		Mean = 1.32 Median = 1	
• Yes	183	70.53	163	66.93
• No	75	29.47	76	33.07
Sealants (Permanent Molar)	Mean = 1.63 Median = 2		Mean = 1.42 Median = 1	
• Yes	96	39.56	139	58.12
• No	162	60.44	100	41.88
Treatment Needs	Mean = 2.35 Median = 2		Mean = 2.51 Median =2	
• Routine Scheduled Txt	183	70.70	134	57.53
• Early Txt Needed	60	24.21	87	34.58
• Urgent Txt Needed	15	5.09	18	7.89

Yellow shading indicates significant differences between the proportions in yellow and the other non-yellow proportions within the stratifying level (region) to within a 95% confidence boundary.

Table 8: 3RD Grader Oral Health Prevalence Rates by Free/Reduced Lunch Strata, Weighted Results

Oral Health Measures	Regular Price Lunch Strata		Free/Reduced Lunch Strata	
	N=438		N=517	
Untreated Cavities	Mean = 1.76 Median = 2		Mean = 1.67 Median = 2	
	N	Weighted %	N	Weighted %
• Yes	107	24.22	169	32.65
• No	331	75.78	348	67.35
Caries Experience	Mean = 1.40 Median = 1		Mean = 1.31 Median = 1	
• Yes	262	60.26	357	69.43
• No	177	39.74	161	30.57
Sealants (Permanent Molar)	Mean = 1.51 Median = 2		Mean = 1.56 Median = 2	
• Yes	213	48.93	229	42.11
• No	226	51.07	288	57.89
Treatment Needs	Mean = 2.30 Median = 2		Mean = 2.42 Median =2	
• Routine Scheduled Txt	332	75.92	348	67.25
• Early Txt Needed	84	18.69	120	22.63
• Urgent Txt Needed	23	5.39	49	10.12

Yellow oral health outcome shading indicates significant differences between the proportions reported for the two stratified levels of Free/Reduced Lunch to within a 95% confidence boundary.

Table 9: 3RD Grader Oral Health Prevalence Rates by Gender, Weighted Results

Oral Health Measures	**Female**		**Male**	
	N=456		**N=499**	
Untreated Cavities	Mean = 1.73 Median = 2		Mean = 1.69 Median = 2	
	N	Weighted %	N	Weighted %
• Yes	122	25.67	154	30.04
• No	334	74.33	345	69.96
Caries Experience	Mean = 1.38 Median = 1		Mean = 1.32 Median = 1	
• Yes	282	62.37	337	66.08
• No	176	37.63	162	33.92
Sealants (Permanent Molar)	Mean = 1.56 Median = 2		Mean = 1.52 Median = 2	
• Yes	201	43.56	241	48.28
• No	256	56.44	258	51.72
Treatment Needs	Mean = 2.33 Median = 2		Mean = 2.40 Median =2	
• Routine Scheduled Txt	339	75.13	341	69.26
• Early Txt Needed	89	18.12	115	22.62
• Urgent Txt Needed	30	6.76	42	8.12

Table 10: 3RD Grader Oral Health Prevalence Rates by Race/Ethnicity, Weighted Results

Oral Health Measures	**Caucasian (1)**		**African American (2)**		**Hispanic (3)**		**Asian (4)**	
	(N=853)		**(N=15)**		**(N=30)**		**(N=4)**	
Untreated Cavities	Mean = 1.71 Median = 2		Mean = 1.80 Median = 2		Mean = 1.57 Median = 2		Mean = 1.75 Median = 2	
	N	Weighted %	N	Weighted %	N	Weighted %	N	Weighted %
• Yes	247	28.36	3	15.73	13	42.78	1	18.50
• No	606	71.64	12	84.27	17	57.22	3	81.50
Caries Experience	Mean = 1.36 Median = 1		Mean = 1.53 Median = 2		Mean = 1.27 Median = 1		Mean = 1.25 Median = 1	
• Yes	549	62.84	7	39.48	22	71.17	3	66.62
• No	306	37.16	8	60.52	8	28.83	1	33.38
Sealants (Permanent Molar)	Mean = 1.52 Median = 2		Mean = 1.67 Median = 2		Mean = 1.70 Median = 2		Mean = 1.25 Median = 1	
• Yes	406	48.24	5	34.25	9	29.93	3	81.50
• No	448	51.76	10	65.75	21	70.07	1	18.50
Treatment Needs	Mean = 2.36 Median = 2		Mean = 2.20 Median = 2		Mean = 2.67 Median = 2		Mean = 2.25 Median =2	
• Routine Scheduled Txt	608	71.74	12	84.27	17	57.22	3	81.50
• Early Txt Needed	188	21.77	3	15.73	6	19.82	1	18.50
• Urgent Txt Needed	59	6.49	0	0.00	7	22.97	0	0.00

Table 10: 3RD Grader Oral Health Prevalence Rates by Race/Ethnicity, Weighted Results

Oral Health Measures	**American Indian/ Alaskan Native (5)**		**Native Hawaiian/ Pacific Islander (6)**		**Multi-racial (7)**	
	(N=41)		**(N=3)**		**(N=8)**	
Untreated Cavities	Mean = 1.80 Median = 2		Mean = 1.67 Median = 2		Mean = 1.75 Median = 2	
	N	Weighted %	N	Weighted %	N	Weighted %
• Yes	8	21.50	1	30.34	2	24.29
• No	33	78.50	2	69.66	6	75.71
Caries Experience	Mean = 1.29 Median = 1		Mean = 1.67 Median = 2		Mean = 1.13 Median = 1	
• Yes	29	73.76	1	30.34	7	89.65
• No	12	26.24	2	69.66	1	10.35
Sealants (Permanent Molar)	Mean = 1.68 Median = 2		Mean = 2.00 Median =2		Mean = 1.25 Median = 1	
• Yes	13	30.67	0	0.00	6	77.50
• No	28	69.33	3	100.00	2	22.50
Treatment Needs	Mean = 2.30 Median = 2		Mean = 2.67 Median = 2		Mean = 2.38 Median = 2	
• Routine Scheduled Txt	33	78.18	2	69.66	6	75.71
• Early Txt Needed	4	10.16	0	0.00	1	12.14
• Urgent Txt Needed	4	11.66	1	30.34	1	12.14

Table 11: 3rd Grader Oral Health Prevalence Rates by Early/Urgent Treatment Needs, Weighted and Unweighted Results

Demographic Characteristics	3rd Grade		Head Start	
	N = 276		N = 323	
Health Planning Region	Mean = 3.79 Median = 4		Mean = 3.10 Median = 2	
	n	%	n	%
• 1	12	4.35	50	15.48
• 2	43	15.58	112	34.67
• 3	41	14.86	13	4.02
• 4	75	27.17	53	16.41
• 5	105	38.04	95	29.41
Age In Years *Head Start*			Mean = 4.04 Median = 4	
• 2			1	0.31
• 3			72	22.29
• 4			163	50.46
• 5			87	26.93
• 6			0	0.00
3rd Grade	Mean = 8.66 Median = 9			
• 7	1	0.36		
• 8	107	38.77		
• 9	155	56.16		
• 10	12	4.35		
• 11	1	0.36		
Gender	Mean = 1.43 Median = 1		Mean = 1.44 Median = 1	
• Male	157	56.88	179	55.59
• Female	119	43.12	143	44.41
Race	Mean = 1.29 Median = 1		Mean = 3.15 Median = 3	
• Caucasian	247	89.82	150	46.73
• African American	3	1.09	3	0.93
• Hispanic	13	4.73	8	2.49
• Asian	1	0.36	2	0.62
• American Indian/ Alaskan Native	8	2.91	141	43.93
• Native Hawaiian/ Pacific Islander	1	0.36	1	0.31
• Multi-racial	2	0.73	16	4.98

Oral Health Measures	3rd Grade		Head Start	
	(N=275)		(N=323)	
Untreated Cavities	Mean = 1.02 Median = 1		Mean = 1.01 Median = 1	
	N	Weighted %	N	Weighted %
• Yes	269	97.66	319	97.87
• No	6	2.34	4	2.13
Caries Experience	Mean = 1.0 Median = 1		Mean = 1.00 Median = 1	
• Yes	275	100.00	322	99.93
• No	0	0.00	1	0.07
Sealants Or ECC	Mean = 1.62 Median = 2		Mean = 1.44 Median = 1	
• Yes	104	37.82	180	51.87
• No	172	62.18	143	48.13
Treatment Needs	Mean = 3.26 Median = 3		Mean = 3.38 Median = 3	
• Early Txt Needed	204	73.25	200	74.51
• Urgent Txt Needed	72	26.75	123	25.49
Free or Reduced Lunch School				
• Yes	169	61.23		
• No	107	38.77		

Table 12: Proportional Allocation of Early/Urgent Treatment Needs On Various Demographics for 3rd Grade Children

Demographic Characteristics	**3rd Grade**	**Head Start**
	N = 276	**N=323**
Health Planning Region		
	Proportional Allocation[4]	Proportional Allocation[4]
• 1	23.53%	51.55%
• 2	19.54%	40.72%
• 3	21.69%	61.90%
• 4	29.07%	25.11%
• 5	43.93%	42.41%
Gender		
• Male	31.46%	39.69%
• Female	25.98%	38.13%
Race		
• Caucasian	28.88%	31.38%
• African American	20.00%	20.00%
• Hispanic	43.33%	36.36%
• Asian	25.00%	33.33%
• American Indian/ Alaskan Native	19.51%	59.00%
• Native Hawaiian/ Pacific Islander	33.33%	50.00%
• Multi-racial	25.00%	29.09%

[4] Proportional Allocation = the total number of children identified as needing early or urgent treatment a grade and a demographic characteristic ÷ the total number of children in that grade and demographic characteristic (i.e. the subset of children who were identified as needing early or urgent treatment in Region 1 (n=12) divided by the total 3rd graders in that region (n=51)

Table 13: Head Start Oral Health Prevalence Rates by Region, Weighted Results

Oral Health Measures	**Region 1**		**Region 2**		**Region 3**	
	(N=97)		**(n=275)**		**(n=21)**	
Untreated Cavities	Mean=1.49 Median=1		Mean = 1.59 Median = 2		Mean = 1.43 Median = 1	
	N	Weighted %	N	Weighted %	N	Weighted %
• Yes	50	53.54	112	44.47	12	57.14
• No	47	46.46	163	55.53	9	42.86
Caries Experience	Mean = 1.30 Median = 1		Mean = 1.43 Median = 1		Mean = 1.10 Median = 1	
• Yes	68	73.42	158	62.54	19	90.48
• No	29	26.58	117	37.46	2	9.52
ECC	Mean = 1.57 Median = 2		Mean = 1.65 Median = 2		Mean = 1.57 Median = 2	
• Yes	42	46.93	95	39.47	9	42.86
• No	55	53.07	180	60.53	12	57.14
Treatment Needs	Mean = 2.86 Median = 3		Mean = 2.64 Median = 2		Mean = 3.17 Median = 3	
• Routine Txt Needs	47	46.46	163	55.53	5	27.78
• Early Txt Needed	17	17.56	47	18.09	5	27.78
• Urgent Txt Needed	33	35.97	65	26.37	8	44.44

Table 13: Head Start Oral Health Prevalence Rates by Region, Weighted Results (continued)

Oral Health Measures	**Region 4**		**Region 5**	
	(N=211)		**(n=224)**	
Untreated Cavities	Mean=1.76 Median=2		Mean = 1.57 Median = 2	
	N	Weighted %	N	Weighted %
• Yes	51	25.36	97	44.03
• No	160	74.64	127	55.97
Caries Experience	Mean = 1.47 Median = 1		Mean = 1.44 Median = 1	
• Yes	112	55.18	126	57.96
• No	99	44.82	98	42.04
ECC	Mean = 1.77 Median = 2		Mean = 1.73 Median = 2	
• Yes	48	23.32	61	29.11
• No	163	76.68	163	70.89
Treatment Needs	Mean = 2.28 Median = 2		Mean = 2.47 Median =2	
• Routine Txt Needs	158	73.77	129	56.80
• Early Txt Needed	46	22.45	85	37.50
• Urgent Txt Needed	7	3.78	10	5.70

Table 14: Database Variable Coding List

Gender
Male=1
Female=2
Race
Caucasian=1
African American=2
Hispanic=3
Asian=4
American Indian/Alaskan Native=5
Native Hawaiian/Pacific Islander=6
Multi-racial=7
Unknown=8
Untreated Cavities
Yes=1
No=2
Caries Experience
Yes=1
No=2
Sealants
Yes=1
No=2
ECCs
Yes=1
No=2
Treatment Needs
No Treatment Needed=2
Early Treatment Needed=3
Urgent Treatment Needed=4
Free or Reduced Lunch School
Yes=1
No=2

Discussion

Demographic characteristics represented in Tables 4 and 5 give the proportional representations of the samples drawn from the state's third grade and Head Start populations. Comparing these two tables provides much information regarding the distribution and mal-distribution of the samples. As stated previously, over-representation and under-representation of particular subgroups was an issue, but weights were applied to adjust for representation issues.

Tables 4 and 5 were excellent sources of information on the allocation of children in the free or reduced lunch strata by way of school designation. Though not tabulated, Regions 1 and 5 proportionally contributed more free or reduced lunch children than the other regions, with Region 4 contributing the least number of children.

Tables 4 and 5 also reflected that children of an Asian, American Indian, Native Hawaiian, and Hispanic descent (in descending order, respectively) were proportionally

more represented by the free or reduced lunch stratification than other races, including the multi-racial designation.

The overall oral health results for Montana's third grade population are outlined in Table 6, which provides a picture of their oral health needs. Prior convenience sampling of third graders within the community has been done for several years, but little has been known about the population to compare the convenience results for overall validity and accuracy. The results in Table 6 suggest random sampling within a cumulative-year convenience sample may be a viable alternative to controlled sampling, in lieu of adequate funds to support rigorous study designs.

Of the five oral health measurements reported in the convenience and controlled samples, three were within confidence limits of each other, meaning there were no significant differences between untreated cavities, early treatment needs, and urgent treatment needs. The two remaining measurements that were significantly different, sealant prevalence rates and caries experience were higher in the controlled random sample than the convenience sample. These differences may have been due to several factors; among them, the inherent difficulty associated with identifying sealants. For an untrained and/or ill-equipped screener, which is more likely the case for convenience sample data collection, the sealants measurement can be difficult to obtain due to identification problems inherent to sealants (as stated in the clinical methodology). Therefore, these results suggest that if a convenience oral health sample is completed in lieu of a controlled sample, adequate training and adequate equipment are necessary in order to ascertain valid estimates for sealants.

The caries experience differentials may be due to reporting inadequacies. Reporting protocols suggest that a child has a caries experience if a child was observed as having an untreated cavity. It is unclear if this protocol was adhered to uniformly, as set protocols have not traditionally been part of the convenience sample process. In lieu of convenience sample protocols, reporting on caries experience can be handled at the analysis of the data, as conditional programming can take care of any reporting inaccuracies. Overall, randomly sampling within a cumulative-year convenience sample may prove to be a viable alternative to controlled sampling initiatives, when appropriate weights are administered for relevance back to the population.

According to Table 7, which segregated the oral health results by region for the third grade population, there appear to be significant differences within most of the variable categories at the 95% confidence level (5% error).

- For untreated cavities, Region 2 had a significantly lower prevalence rate than Region 4, and Region 5 was significantly higher than Regions 1, 2, 3, or 4.
- For caries experience or past caries, Region 2 had a significantly lower prevalence rate than Region 4, accounting for the only significant difference for this category.
- For sealants, Region 1 had a significantly lower prevalence rate for sealant placement than Regions 2, 3, 4, or 5, and Region 5 was significantly higher for sealant placement than Region 4.
- For routine treatment needs with no treatment urgency, Region 5 had a significantly lower prevalence rate than Regions 1, 2, or 3.
- For early treatment needs, Regions 4 and 5 had no significant difference between themselves, but had a significantly higher prevalence rate than Regions 1, 2, or 3.
- For urgent treatment needs, there were no significant differences between the regions, but Region 1 had a more elevated rate than the other regions. However,

due to the low sample size, large confidence intervals made small to medium differences between the categories impossible to ascertain.

Table 8 suggests that with additional delineation by free or reduced lunch strata, significant access to dental care issues may be present for Montana's underprivileged children. When 95% confidence intervals were calculated, children in schools classified as a free or reduced lunch school had significantly higher rates of untreated cavities, caries experience, and urgent treatment needs. These children were also significantly less likely to be assessed by the visiting hygienist as cases who receive routinely scheduled care. The sealant placement prevalence rate for children in schools classified as a free or reduced lunch school, was not statistically significant from the children in the non-free or reduced lunch schools, although the rate was slightly lower among free or reduced lunch school children.

Table 9 represents third grade oral health prevalence rates by gender. Although none of the weighted results by gender were significantly different, there was an overall trend for males to have higher prevalence rates for caries formation, past and present, as well as early/urgent treatment needs. However, when compared to females, they were also more likely to have had at least one sealant placement. Notably, the results had a mixed message.

Prevalence rates by race or ethnicity in Table 10 suggest that although there appears to be significant differences between the racial categories, significance at the 95% confidence level could not be ascertained due to small sample numbers for the majority of the categories. Therefore, information derived from Table 10 can only be used superficially to address higher and lower rates per category.

According to the Table 10:

- The prevalence rate of untreated cavities was highest for third grade children of Hispanic-descent, followed by Native Hawaiians. African Americans had the lowest weighted prevalence of untreated cavities.
- The prevalence rate of caries experience was highest for third grade children identified as multi-racial, followed closely by American Indian and Hispanic children.
- Third grade children identified as Native Hawaiians in the sample had the lowest rate of caries experience.
- Asian children had the highest prevalence rate for sealant placement, followed closely by multi-racial children. Native Hawaiians had the lowest prevalence rate of sealants.
- Caucasian children had the highest prevalence rate of early treatment needs, followed closely by Hispanic and Asian children. Native Hawaiians had the lowest prevalence rate for early treatment needs.
- Native Hawaiians had the highest prevalence of urgent treatment needs, while Asian children had the lowest prevalence from the sample.

As previously stated, these results can only to be used superficially, as sample sizes ranged from moderately high to very small (853 vs. 3).

Children with early or urgent treatment needs, represented in Table 11, have different demographic characteristics and outcome rates than other children in the sample with no

treatment needs or treat needs that are not urgent. Third grade children with early or urgent treatment needs were statistically more likely to come from Regions 4 and 5, and less statistically likely to come from Region 1. Head Start children with early or urgent treatment needs were statistically more likely to come from Regions 2 and 5, and less statistically likely to come from Region 3. Additionally, both samples demonstrated a significant difference between the genders, with males more likely to have treatment needs than females.

The oral health picture represented by Table 11 is a predictable one. In both samples, over 97% of children in this subgroup presented with a current, untreated cavity. Over 99% had a prior or current caries experience, meaning at most, 7% of one sample had other oral health issues needing treatment (such as chipped teeth, etc.). Over 61% of the third grade sample who had early or urgent treatment needs attended a school designated as a free or reduced lunch school, suggesting oral health disparities exist within schools with lower SES. However, in both samples, over 73% of children who were identified as needing early or urgent treatment in fact only needed to see a dentist for early treatment.

Table 12 represents the proportional allocation of early or urgent treatment needs by various demographic characteristics for third grade and Head Start children. This subset analysis can be useful for understanding what subset of the population was most in need of early or urgent intervention at the time of the screenings, so that programs can be used accordingly and target those subpopulations for future initiatives.

The regional breakout indicated that:

- Region 5 had the highest contributing proportion of third grade children with early or urgent oral health needs, and Region 2 had the lowest contributing proportion (43.93% vs. 19.54% respectively).
- Head Start children in Region 3 had the highest contributing proportion of children with early or urgent oral health needs, and Region 4 had the lowest contributing proportion (61.90% vs. 25.11%).
- For both the third grade sample and the Head Start sample, male children contributed more numbers proportionally than females for early or urgent oral health needs.
- For race, however, there were some mixed messages within the data. For the third graders, Hispanic children had the highest contributing proportion for early or urgent oral health needs, with American Indians contributing the lowest proportion (43.33% vs 19.51% respectively).
- Asian Head Start children contributed the most children proportionally, while African Americans contributed the least proportionally (59.00% vs. 20.00% respectively).

Again, racial results should be taken superficially as a measure of rate elevation, not of statistical significance, as many categories had sample sizes too small for population representation.

Head Start children were tabulated by region in Table 13 after applying the appropriate weights to the data. However, due to extreme weighting fluctuations and the non-representativeness of the sample to the overall preschool population, no confidence intervals were calculated for significant differences in oral health measures/outcomes. Therefore, prevalence rates should be used superficially to illustrate elevations in

measurements, noting extreme differences may be due to extremely high sampling weights.

Table 13 demonstrates prevalence rates for untreated cavities, ECCs, caries experience, and treatment need for each region.

- For untreated cavities, Region 3 had the highest prevalence rate, followed closely by Region 1. Region 4 had the lowest prevalence rate at 25.36%, suggesting only 25% of the HS population may have untreated cavities in this region.
- For ECCs, Region 1 had the highest prevalence rate at 46.93%, followed closely by Region 3. Region 4 had the lowest prevalence rate at 23.32%, suggesting only 23% of the HS population may have had at least one ECC in this region.
- Region 3 had the highest prevalence rate of caries experience at 90.48%; however, this dramatically high rate may be due to the extremely high weight associated with Region 3 (8.41). Region 4 had the lowest prevalence rate at 55.18%, suggesting over 55% of the Head Start population may have had at least one caries experience in this region.
- Region 5 demonstrated the highest prevalence rate for early treatment needs in the Head Start sample (37.50%).
- Region 3 represented the highest prevalence rate for urgent treatment needs (44.44%).

All of these findings suggest there remains a very high need for oral health education and intervention in the Head Start community, with all the rates demonstrating high need for dental intervention and with few regions modeling good oral health profiles.

Complex Analyses – Third Grade

Complex analyses are critical to understanding the full degree of the problems within a particular population or study. They are designed to filter through the various levels of each demographic category to understand how each one affects the outcomes in question, such as untreated cavities, caries experience, sealants, and treatment need. It is a way of quantifying the social aspects of life as general predictors of negative or unwanted outcomes.

In this study, the collected demographics included:

- Health Planning Region
- Age in years
- Gender
- Free or reduced lunch, or non-free or reduced lunch
- Race or ethnicity

Though characteristics like age in years only tend to show how the sample is distributed like a bell-shaped curve, other variables such as region, gender, and race/ethnicity can describe so much more of a population or sample, including how big of a health disparity exists within each level of these characteristics.

When complex analyses were applied to race and free/reduced lunch to the outcome of untreated cavities in third grade children, interesting health disparities were exposed. For example, Caucasian children enrolled in Free or Reduced Lunch (FRL) schools were 62% more likely to have an untreated cavity than Caucasian children enrolled in a Non-Free or Reduced Lunch (NFRL) school. Additionally, Caucasian children enrolled in a free or reduced lunch school were 50% more likely to have had at least one caries experience (past or present decay) than Caucasian children enrolled in a Non-Free or Reduced Lunch school. Furthermore, the students of free or reduced lunch schools were 133% more likely to be identified as an "urgent treatment needed" dental case when compared to Caucasian children enrolled in a NFRL school. All other races were either not statistically different or had too small a sample size to accurately calculate significance.

When Health Planning Regions were integrated into the complex analyses, regional health disparities were exposed. For example, third grade children in Region 5 enrolled in FRL schools were 142% more likely to have an untreated cavity than Region 5 children enrolled in a RPL school. These children were also 121% more likely to have had at least one caries experience (past or present decay) than Region 5 children enrolled in a NFRL school. However, Region 4 children enrolled in FRL schools were 96% less likely to have had sealant on at least one permanent molar tooth in place at the time of the screening than Region 4 children enrolled in a NFRL school. Children in Region 5 enrolled in FRL schools were 218% more likely to be identified as an “urgent treatment needed” dental case when compared to other Region 5 children in NFRL schools. All other regions were not statistically different.

These results, as well as the previous tabular results, should assist program managers, county and state professionals, and legislation to make adequate decisions on oral health education and interventions within the public school system and statewide. They should also enable state and national comparisons on key oral health measures, as well as assist with the Maternal and Child Health Block Grant reporting requirements.

Limitations

As with any study, there were several limitations to this oral health assessment. Sampling limitations included non-response bias; non-randomness of Head Start sample; no stratification by region or race; subjectivity of demographic information; and sampling of public schools only. Non-response bias suggests there may be some bias in the results when less than 100% of the sample participated, because the children who did participate may be different from those who did not. For this study, not all third grade or Head Start children sampled were screened, therefore making it essential to account for the children who did not participate when calculating non-response weights. Additionally, knowledge about how many children populated a given classroom was not uniformly assessed making classroom counts difficult to ascertain. Therefore, non-response was not accounted for in the study.

Head Start data were collected in a quasi-convenience way, mostly due to lack of funding for collecting non-third grade data. Future efforts should focus on receiving funding for Head Start data collection, as well as accurately collecting state Head Start enrollment numbers for a given school year.

Additionally, the lack of regional or racial stratifications in the original study design resulted in certain regions and races being underrepresented. Weighting corrected some of this bias, but normalization weights that exceed 2.0 can cause statistical problems. Regional and racial comparisons were limited, and 95% confidence intervals were either calculated but were extremely broad (regional CIs) or not calculated at all due to negative numbers within the limits (racial CIs). Subsequently, both confidence interval situations create limitations on result interpretation.

Another limitation that may have introduced bias into the sample was the standard protocol of requesting teachers to fill out the student's demographic information before the hygienists' visits. If standard collection guidelines were not administered to the teachers before the visits, demographic uniformity and validity could not be expected in the sample. Furthermore, many teachers, especially Head Start teachers, failed to complete the forms, leaving many racial designations blank.

Sampling for this study only included public schools in the state. No private schools, home-schools, or Hutterite schools were placed in the population pool for possible sampling. This limitation introduced bias by only sampling mainstream Montana children without sampling alternative education population pools. Estimates for 2006 suggest 4.00% of Montana children ages 6 to 14 were home-schooled or in private schools.

Clinical limitations included changes to the ASTDD protocol in the diagnosis of Early Childhood Caries (ECC) after the 2005-2006 school year. These changes in the ASTDD instruction manual reflect identified loose interpretation of age parameters for ECC identification in children. Subsequently, for the 2005-2006 Montana Head Start screenings, children of all ages who presented with a maxillary anterior caries were considered positive of an ECC. Current guidelines have established an age limit of three on ECC identification for future studies. Ultimately, the possible loose interpretation of the guidelines may have elevated the actual rate of ECCs in the sample, thus elevating the rate for the state report.