



Section of Chronic Disease
Prevention and Health Promotion

Chronicles

Volume 3, Issue 1

March 2011

CDPHP Chronicles is a web-based publication designed to provide our partners with updates on new data, program results, and other topics of importance as they relate to preventing chronic disease and promoting health in Alaska. To receive email announcements about newly-released issues, please email hss.cdphp@alaska.gov.

Prevalence of Overweight and Obesity among Matanuska-Susitna Borough School District Students, 2003-2010

Contributed by Mary Bell, RN, BSN, NCSN, Andrea M. Fenaughty, PhD., Karol Fink, MS, RD, and Charles J. Utermohle, PhD

Abstract

The Matanuska-Susitna Borough School District (MSBSD) and the Alaska Division of Public Health collaborated to assess the prevalence of overweight and obesity among MSBSD students. We analyzed routinely collected height and weight measurements for students in grades K, 1, 3, 5, and 7 from academic years 2003-2004 through 2009-2010. A total of 19,357 individuals' height and weight values were analyzed. We assessed and classified student weight status using BMI-for-age values and the categories defined by the National Center for Health Statistics. At the end of the 7-year time period in 2009-2010, 2% of students were underweight, 71% were at a healthy weight, 14% were overweight, and 12% were obese. Of students entering kindergarten or first grade in 2009-2010, 22% were overweight or obese. Trend data reveal an apparent decline in the prevalence of overweight and obesity combined since 2003-2004. The fact that a high percentage of students are overweight or obese when they enter school indicates that prevention efforts cannot wait until children enter the school system. Additionally, while no single practice, policy or program, in school or elsewhere, is likely to be sufficient to reverse the childhood obesity trend, schools clearly have a significant role in creating healthy school environments, in which the healthy choice is the easy and affordable choice.

Introduction

Obesity has become a major health problem for Alaskans and Americans. After changing relatively little during the 1960s and 1970s, obesity prevalence among US adults increased sharply over the ensuing decades, from 13.4% in 1980 to 34.3% in 2008.¹ Obesity is expensive. It is estimated medical complications of obesity cost Alaska's economy \$477 million per year in direct medical expenditures (E.A. Finkelstein, personal communication, July 2009).

The spread of the obesity epidemic has been equally, if not more, severe among children and adolescents. Since 1980, the national overweight and obesity rates have tripled for youth, with 34.7% of 6 to 19 year olds above a healthy weight (above the 85th percentile).² This is significant because of the negative impact overweight and obesity have on the physical, social, and emotional health of children, as well as academic performance.

Obese children are at increased risk of several chronic conditions including Type 2 diabetes, hypertension, high cholesterol, asthma, and certain forms of cancer.³ Seventy



State of Alaska, Sean Parnell, Governor
Department of Health and Social Services
William J. Streur, Commissioner

Division of Public Health
Ward Hurlburt, MPH, MD,
Chief Medical Officer and Director

Andrea Fenaughty, PhD
Chronicles Coordinator

percent of obese 5 to 17 year olds have one cardiovascular disease risk factor and 39% have two risk factors.⁴ Besides suffering from physical illnesses, obese children also may experience social stigmatization and discrimination, as well as psychological problems.³ Obese youth are less likely to report earning mostly A's and B's in high school than healthy weight youth.⁵

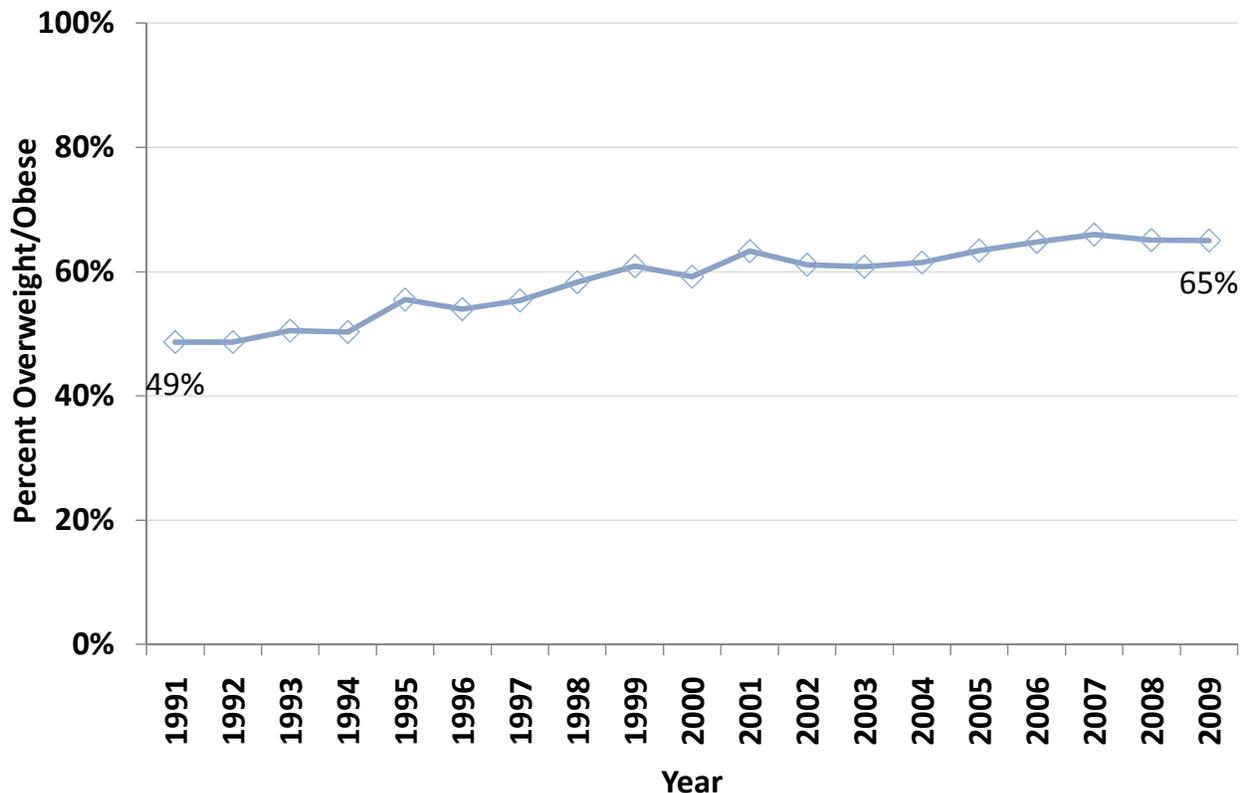
In addition, children and adolescents who are overweight and obese have an increased risk of being overweight or obese as adults.⁶ Approximately 80% of children who were overweight at 10–15 years were obese adults at age 25 years.⁷ Overweight and obese adults, in turn, have a higher risk of premature death than healthy weight adults. Obesity and overweight among adults are associated with an increased risk of coronary heart disease, Type 2 diabetes, musculoskeletal disorders, sleep apnea, asthma, and psychological disorders, as well as cancer of the endometrium, colon, kidney, gallbladder, and breast (postmenopausal).³ The impact of these numbers is reflected in the nation's concurrent epidemics of diabetes, heart disease, and other chronic diseases, and has even led to the projection that, due to obesity, today's children may be the first generation to have a shorter life expectancy than their parents' generation.⁸

Overweight and Obesity in Alaska

Over the past several decades, overweight and obesity have become increasingly prevalent among Alaskans of all ages. The percentage of Alaskan adults who are overweight or obese has increased steadily from 49% in 1991 to 65% in 2009 (Figure 1). The majority of this increase has been in the obesity rate, which doubled between 1991 (13%) and 2009 (26%); rates of overweight have stayed relatively stable during this time, ranging between 35 to 40%.^{5,9} The net result of this set of trends is that an increasingly larger proportion of Alaskan adults who are above a healthy weight are in the higher risk obese category.

Statewide representative data on obesity prevalence for children younger than high school are not available in Alaska. Information on obesity rates among specific subpopulations of the youngest Alaskans is available from specific statewide programs and agencies that routinely measure and record height and weight. Records from the Alaska Women, Infants and Children (WIC) Program during 2001-2005 indicate that 19% of 2 to 4 year old WIC participants are overweight and an additional 21% are obese.¹⁰ Data collected during visits to

Figure 1: Prevalence of Adult Overweight/Obesity (BMI \geq 25.0) among All Alaska Adults, 1991-2009



Source: AK BRFSS

regional Alaska Native hospitals, community health centers, and village clinics throughout Alaska and entered into the Resource Patient Management System (RPMS) show similar results: 20% of 3 to 19 year olds are overweight and 20% are obese.¹⁰

The 2009 Alaska Youth Risk Behavior Survey (YRBS) indicated that approximately one-quarter of high school male (27%) and female (25%) students are above a healthy weight.¹¹ YRBS data on weight status are based on high school students' self-reports of height and weight; these data likely provide underestimates of overweight and obesity prevalence.¹²

School-Based Weight Status Measurement

One way to avoid underestimation due to self-report is to utilize directly measured student height and weight data routinely collected in schools. School-based measurement of student weight status is widely accepted for surveillance, the purpose of which is to identify prevalence, monitor trends and evaluate outcomes of interventions.¹³ Nationwide, 15 states require school districts to measure or assess students' height and weight.¹⁴

The State of Alaska does not require school districts to collect height and weight nor report on student weight status. However, according to the School Health Nurse Consultant for the Alaska Department of Health and Social Services, student height and weight are measured and recorded as part of routine health screenings in many of the 15 of 54 Alaskan school districts that employ school nurses (Mary Bell, RN, BSN, NCSN, oral communication, 4/15/2010).

The Alaska Department of Health and Social Services, Division of Public Health has worked with the Anchorage School District (ASD) since 2003 to analyze measured height and weight data from K-12th grade students. Results from this analysis revealed that from 1998-1999 to 2002-2003 the prevalence of overweight and obesity combined among students increased from 30% to 36%, but that since 2003-2004, overweight and obesity among ASD students has leveled off.^{15,16} Recent data indicate that 18% of ASD students are overweight and another 18% are obese.¹⁶ Though the ASD data are certainly valuable in terms of understanding the extent of childhood obesity in the largest urban area in Alaska, it is unclear to what extent these findings are generalizable to other school districts.

Another Alaska school district that measures and records student height and weight is the Matanuska-Susitna Borough School District (MSBSD). Existing self-reported data from this region indicate a burden of obesity and overweight similar to that seen statewide: currently 66% of adults in the region are overweight or obese (Charles Utermohle, PhD, email communication, 1/17/2011). Given the limitations of self-reporting as a basis for estimating the true burden of

overweight and obesity, the MSBSD and the Alaska Division of Public Health collaborated to analyze existing measurements of student height and weight for the 2003-2004 to 2009-2010 academic years.

This report presents a detailed analysis of the current extent of childhood overweight and obesity among MSBSD students, for grades K, 1, 3, 5, and 7, both overall and by demographic subgroup.

Methods

Sample

The sample was extracted from the health records of MSBSD students for the academic years 2003-2004 through 2009-2010. The MSBSD is the second largest district in the state, enrolling approximately 13% of Alaska's student population. School nursing staff routinely record height and weight measurements during school health screenings, the majority of which are conducted in grades K, 1, 3, 5, and 7. The current analysis is limited to these five grades. Health information, including height and weight measurements, is recorded in student files and is entered into an electronic database.

Height and weight measurements for students in grades K, 1, 3, 5, and 7 were extracted from the database with all personal identifiers removed, and students were assigned a unique identification number. Height was measured to the quarter of an inch and weight to the tenth of a pound.

Each data point included date and age of the student at time of measurement along with demographic variables of sex, grade, and race/ethnicity. Age was measured in days and expressed as a decimal age. Only a single race/ethnicity designation of American Indian or Alaska Native, Asian, Black or African American, Hispanic/Latino, Native Hawaiian or Pacific Islander, White, or Multi-ethnic was available for each student.

Height and weight values were screened for accuracy and biological plausibility. Of the total 20,630 assessments reported, a final sample of 19,357 (94%) comprised the first biologically plausible measurements per student within the academic year from the study period. The height and weight values represented 48% of total student enrollment in the represented grades over the 7-year time period, with increasingly higher percentages for students in all grades over time (Table 1). Annual sample sizes of students in grades K, 1, 3, 5, and 7 have increased from just over 1,000 students, representing 21% of district enrollments in 2003-2004 to over 4,623 students and 74% of enrollments in 2009-2010.

**Table 1. Percentage of Official Student Enrollment Sampled by Grade:
MSBSD Students, 2003-2010**

Academic Year	Grade Level					Total
	K	1	3	5	7	
2003-2004	13%	12%	16%	26%	33%	21%
2004-2005	25%	23%	19%	42%	49%	33%
2005-2006	26%	28%	23%	23%	47%	29%
2006-2007	41%	28%	31%	42%	65%	42%
2007-2008	50%	50%	54%	68%	72%	59%
2008-2009	72%	64%	65%	73%	75%	70%
2009-2010	75%	76%	80%	77%	62%	74%
Total	45%	42%	43%	51%	58%	48%

Source: MSBSD health records

Assessment of Overweight and Obesity

Body mass index (BMI) is used to estimate risk of weight-related health problems and is calculated using weight and height. Since children and adolescents, ages 2 to 18 years, are still growing and have differences in body composition, their BMI is compared to a reference population of youth. BMI percentiles for children and adolescents are determined by age on a sex-specific growth curve.¹⁷

BMI surveillance data are a reliable tool to describe trends in weight status over time among populations and subpopulations. BMI is the most widely used measure because it is easy, inexpensive, noninvasive, and quickly obtained. BMI is not a direct measure of body fat but has been shown to significantly correlate with body fat.¹⁸ It is important to note that BMI should not be used alone to diagnose an individual child as overweight or obese; rather, BMI should be used to identify children and adolescents who need to be examined further by a medical care provider to obtain an informed diagnosis.^{18,19}

Table 2: BMI Classification for Children 2-18 Years Old

BMI- For-Age Percentiles	Weight Classification ¹⁹
Less than 5 th	Underweight
5 th to less than 85 th	Healthy Weight
85 th to less than 95 th	Overweight
Equal to or greater than 95 th	Obese

Analysis

BMI-for-age and sex percentile values for age (to the month) at time of measurement were calculated for all students with valid height and weight data using SPSS statistical software programs. Reference percentiles came from the National Center for Health Statistics, Centers for Disease Control and Prevention.¹⁷

Height, weight, and BMI percentile values for seven academic years (2003-2004 to 2009-2010) were analyzed, along with demographic information on the age, sex, grade, and race/ethnicity of the students. SPSS was used to produce categorical measures of underweight, healthy weight, overweight, and obesity along with 95% confidence intervals in which the values of each student contributed equally. Unless stated otherwise, annual summaries of weight status were based upon all individuals with valid measurements within the academic year.

Results

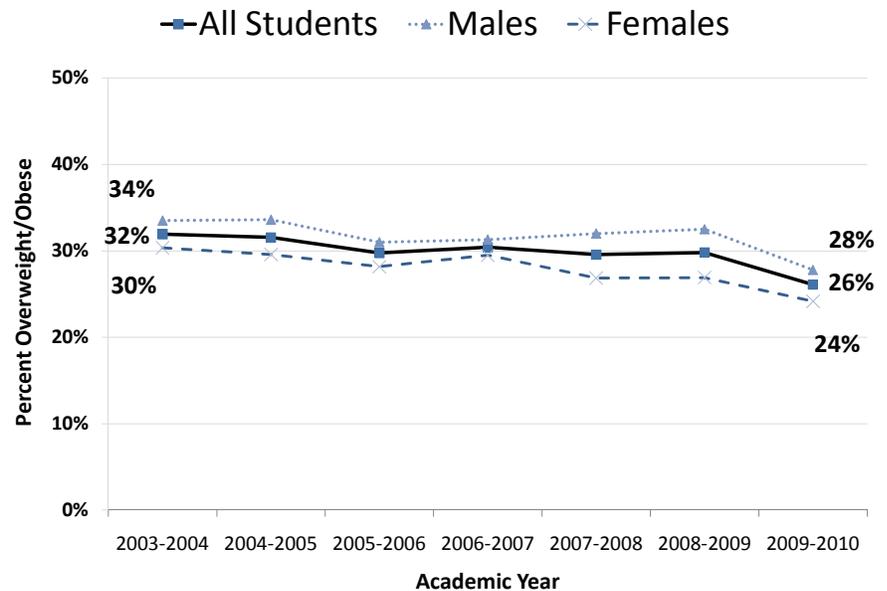
Trends in Weight Status

The trend in weight status among MSBSD students over the past 7 years is depicted in Figure 2. Over that time period, the percentage of students who were above a healthy weight (BMI $\geq 85^{\text{th}}$ percentile) decreased from 32% in 2003-2004 to 26% in 2009-2010, representing a 19% decline in the percent of students above a healthy weight.

During this period, boys were consistently more likely than girls to be above a healthy weight, but the apparent decline in the prevalence of overweight and obesity combined was seen among both girls and boys.

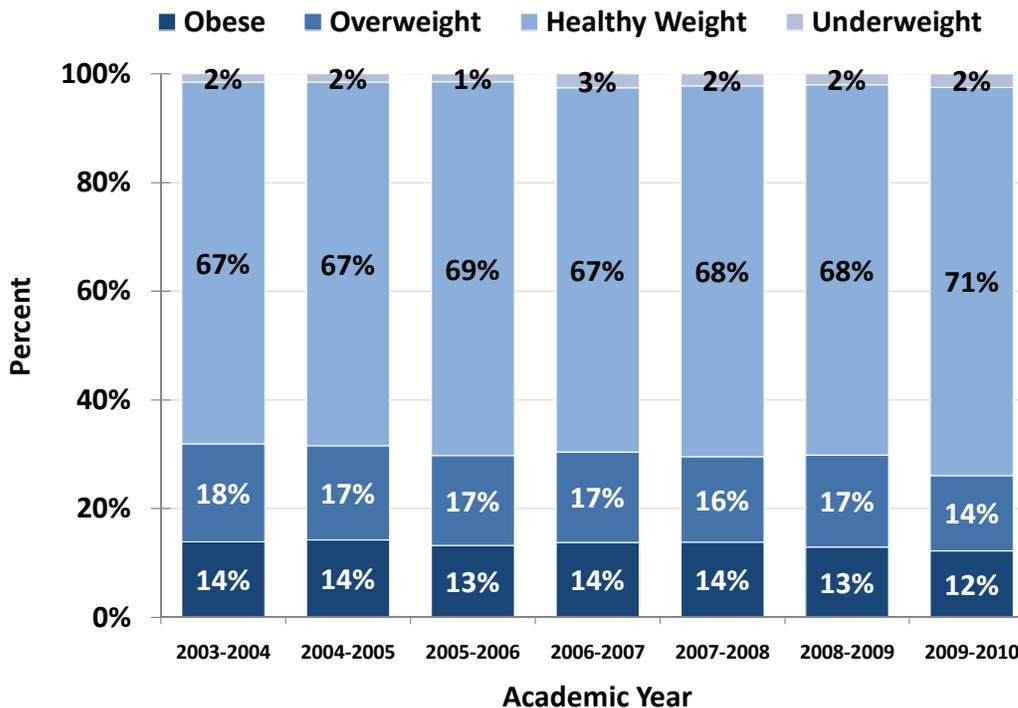
The reduction in the percentage of students above a healthy weight was seen in both obesity (from 14% to 12%) and overweight (from 18% to 14%) over the 7-year period (Figure 3).

Figure 2: Trend in Prevalence of Overweight/Obesity (BMI $\geq 85^{\text{th}}$ percentile) by Sex, MSBSD Students in Grade K, 1, 3, 5, & 7 (2003-2004 through 2009-2010)



Source: MSBSD health records

Figure 3: Weight Status, by Academic Year MSBSD Students in Grades K, 1, 3, 5, & 7 (2003-2004 to 2009-2010)



Source: MSBSD health records
Percentages may not sum to 100% due to rounding

Current Weight Status

Considering just the most recent year of data, the prevalence of overweight and obesity combined among MSBSD students in grades K, 1, 3, 5, and 7 was 26%; only 2% were underweight (Figure 4).

The prevalence of overweight and obesity combined increased along with grade level (Figure 5). Whereas nearly one-third (32%) of 7th grade students were above a healthy weight in the 2009-2010 academic year, 22% of kindergarteners were either overweight or obese.

Of children entering kindergarten and 1st grade in 2009-2010, 14% were overweight and 8% were obese; 77% were at a healthy weight (Figure 6).

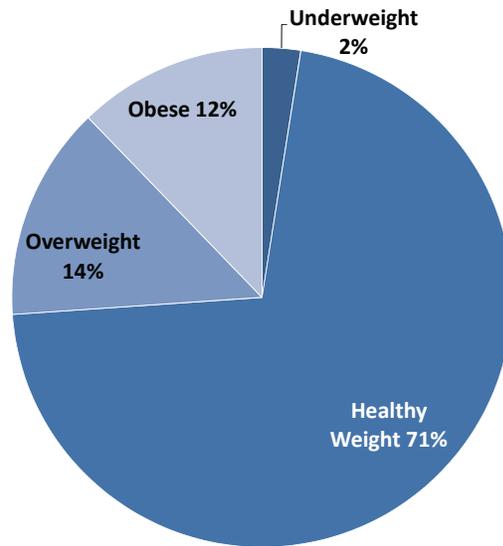
Racial and ethnic minorities make up a relatively small proportion of the sample (Table 3); however, these proportions mirror the overall racial and ethnic composition of the MSBSD.²⁰ As such, even with 3 years of data combined, only one racial/ethnic difference in the prevalence of overweight and obesity reached statistical significance: Asian students (19%) were significantly less likely to be above a healthy weight than were American Indian/Alaska Native students (34%; Figure 7). Results for racial/ethnic groups with less than 100 students are not reported.

Table 3: Racial and Ethnic Distribution of Sample, MSBSD, 2007-2008 to 2009-2010

	Percent of Sample	Number in Sample
American Indian/Alaska Native	11%	1,421
Asian	1%	151
Black or African American	1%	159
Hispanic/Latino	2%	270
Native Hawaiian or Pacific Islander	1%	62
White	80%	9,881
Multi-Ethnic	3%	419
Total	100%	12,363

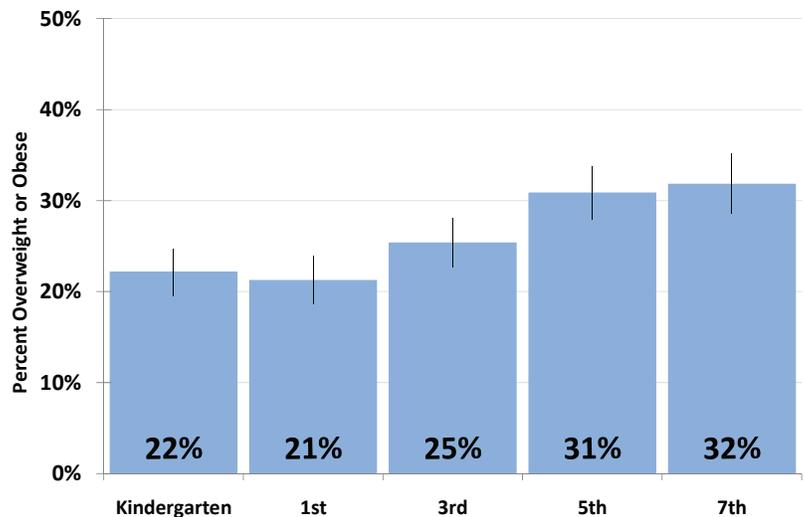
Source: MSBSD health records

Figure 4: Weight Status, MSBSD Students in Grades K, 1, 3, 5 & 7 (2009-2010)



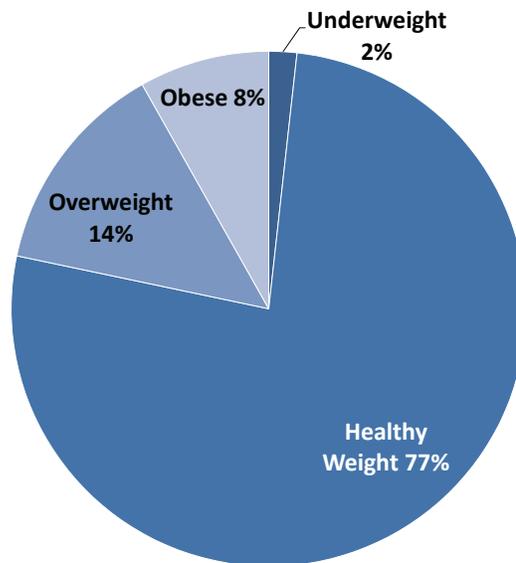
Source: MSBSD health records
Percentages may not sum to the 100% due to rounding

Figure 5: Percentage of Overweight/Obesity by Grade Level, MSBSD (2009-2010)



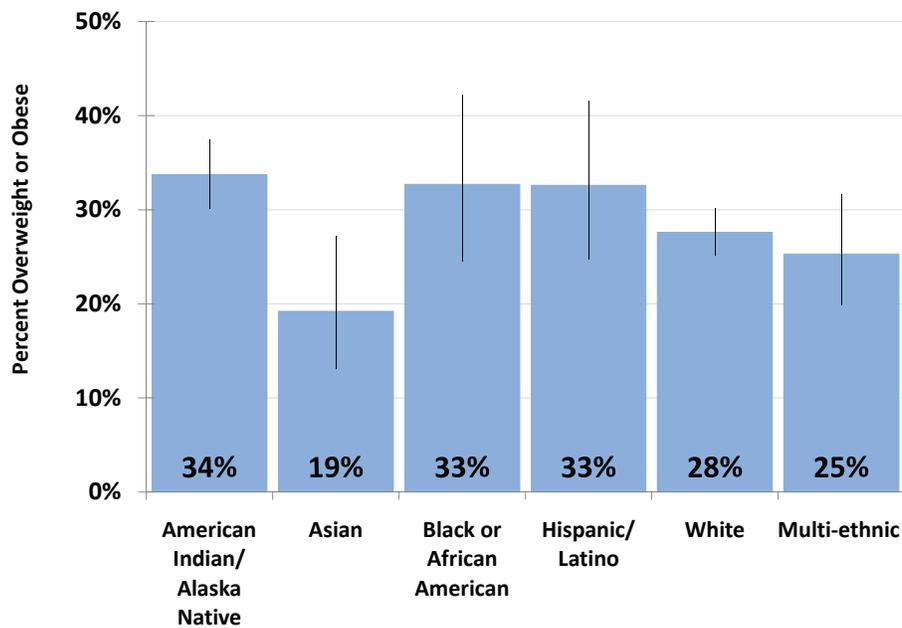
Source: MSBSD health records

Figure 6: Weight Status of MSBSD Students in Grades K & 1 (2009-2010)



Source: MSBSD health records
 Percentages may not sum to the 100% due to rounding

Figure 7: Percentage Overweight/Obesity, by Race/Ethnicity, MSBSD Students in Grades K, 1, 3, 5, & 7 (2007-2008 through 2009-2010)



Source: MSBSD health records

Discussion

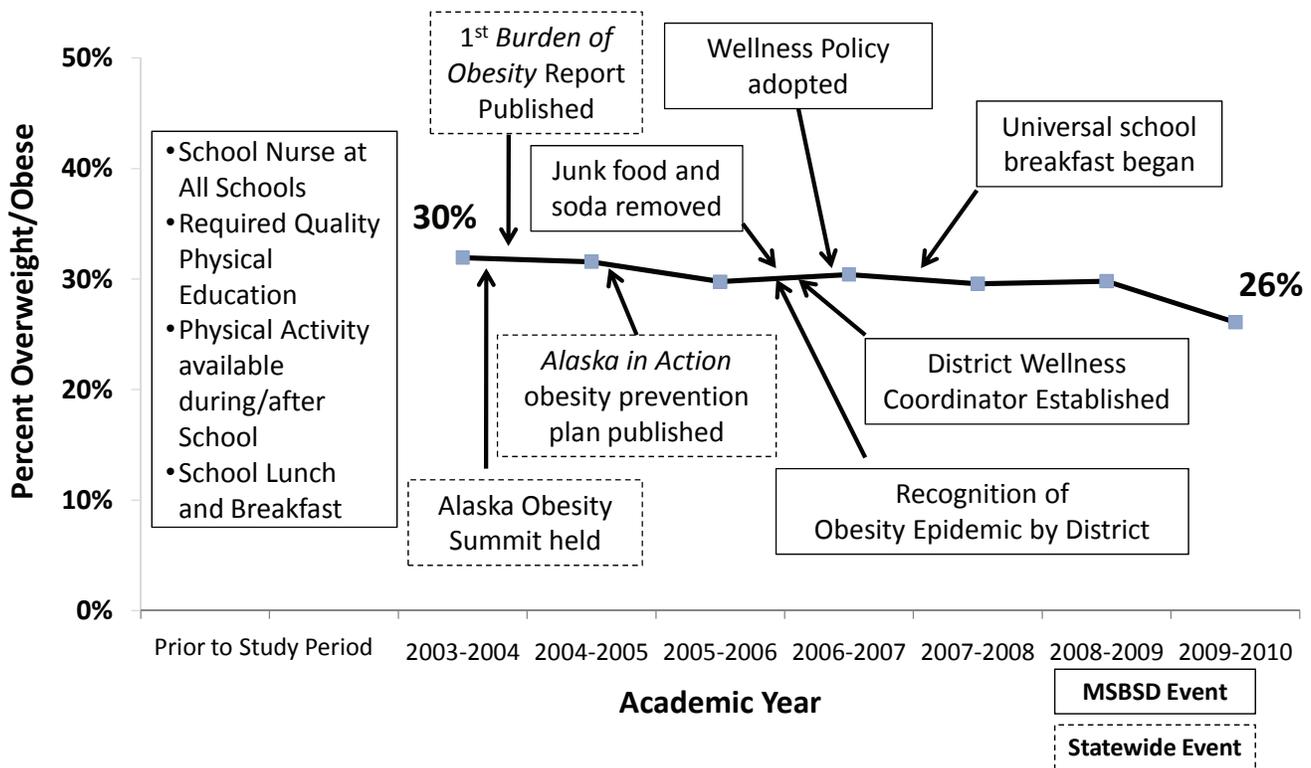
Childhood overweight and obesity are significant problems in the MSBSD. As of the 2009-2010 academic year, more than one in four students in the represented grades was above a healthy weight. Although no demographic groups were immune to this important health issue, certain population subgroups appear to be at increased risk. Boys had higher rates of overweight and obesity combined compared to girls. Students in higher grades were more likely to be above a healthy weight than were the students in the earliest grade; however, more than one-fifth of students in grades K and 1 were overweight or obese. This indicates that weight status is already a concern for many students upon entering school; clearly, the solution to reduce childhood obesity cannot rest solely with the school district.

The only statistically significant racial/ethnic differences seen in weight status were between Asian students and American Indian or Alaska Native students, the latter group having a prevalence of overweight and obesity combined at 34%. It is worth noting that the current classification system for defining youth weight status is based upon a primarily White standard population. Many factors contribute to youth height and weight, and there

are undoubtedly cultural differences in the distribution of those factors. Nonetheless, because there currently are no clinically significant differences in the relationship between BMI and body composition in different racial or ethnic groups, it is recommended that the same BMI standards be applied to all racial and ethnic subpopulations.^{19,21}

The good news from this 7-year analysis of student weight status is that the prevalence of overweight and obesity combined within the MSBSD appears to be on the decline. This pattern appears to hold across both sexes. Although the lack of a reasonable control group prohibits a rigorous evaluation of the causes of this “bend in the trend,” several statewide and MSBSD-specific initiatives could plausibly have contributed to this outcome either through raising awareness of the issue of childhood obesity, changing practices and policy that help prevent obesity, or more directly through providing programming and staff resources to address the issue. These initiatives and events have been superimposed on the prevalence of overweight and obesity in Figure 8 and are described in greater detail on the following pages.

Figure 8. Obesity-Related Initiatives and Events in Alaska and MSBSD (2003 to Present)



Evidence-Based School Strategies to Prevent Childhood Obesity

Over the past decade, various programs within Alaska, both within and outside of state government, have attempted to address childhood obesity. While there have been notable successes from these efforts,¹⁶ the prevalence of childhood overweight and obesity in Alaska is currently nearly double the *Healthy Alaskans 2010* targets.²²

An incredibly complex array of factors are likely responsible for the alarming trends seen in obesity rates over the recent decades. Although body weight is the result of genes, metabolism, behavior, culture, and socioeconomic status, behavior and environment play a large role and these are the optimal targets for prevention and treatment actions.²³ The recommended approach to obesity prevention and control is to shape environments, such as the school environment, through practices, policies and programming to better support healthy choices.²⁴⁻²⁶

The Centers for Disease Control and Prevention recommends evidence-based obesity prevention and control practices, policies and programs and has identified 10 key school-based strategies.²⁴ While one single intervention may improve one element of student physical activity and/or nutrition, an approach involving multiple strategies is required to achieve greater, sustainable impact.

The MSBSD has implemented many of the recommended obesity prevention and control best-practices. According to the MSBSD Director of Education (LeBron McPhail, oral communication, 12/17/2010), throughout and even *prior* to the study period of 2003-2004 to 2009-2010 the district:

- employed school nurses;
- provided a high quality course of study in physical education;
- provided opportunities for physical activity during and after school; and
- served free and reduced school lunch and breakfast at almost all schools.

These practices, policies and programs may be part of the reason overweight and obesity prevalence rates in the MSBSD at the start of the study period are lower than other Alaskan school districts.

While many obesity prevention and control best practices were in place prior to the study period, additional interventions were added during the study period making the prevention approach more comprehensive. The MSBSD School Board formally recognized the seriousness of the obesity epidemic and revised *Board Policy 3554 Other Food Sales* on June 15, 2005,²⁷ which set nutrition standards for any snack or beverage sold outside the federal meal program. This policy revision essentially eliminated access to high fat, high calorie, high sugar foods and sugar-sweetened beverages (with an exception for sport drinks) on school campus. The policy was

implemented district wide by modifying the centralized vending and beverage contracts.

Furthermore, the MSBSD in 2005-2006 designated a district wellness coordinator, to maintain an ongoing active school wellness council that involves students, parents, food service personnel, school boards, school administrators, health professionals and community members. Maintaining a school wellness council is an effective way to achieve an enduring focus on promoting physical activity and healthy eating.²⁸

In December 2005, the district Wellness Policy, *Board Policy 5040* and associated Administrative Regulations, were adopted.²⁹ This policy provided further guidance on implementation of *BP 3554* and set additional requirements. The policy discouraged the use of food as a reward and limited marketing of foods and beverages to those that meet the nutrition standards set forth in *BP 3554*. The district also addressed physical activity by preventing physical education from being withheld for disciplinary purposes and stating that restricting recess for disciplinary purposes should be a consequence of last resort. The combination of these best practices and policies may have helped normalize healthy food choices and physical activity in the district.

In 2007-2008 the district implemented a universal school breakfast policy at all elementary, middle and high schools that had a meal program. The Supervisor of Nutrition Services reported that since school breakfast became available at no cost to all students, there has been an incremental annual increase in participation in the breakfast program from about 20% of students in 35 schools in 2007-2008 to 25% during the 2009-2010 academic year. In addition, the majority of elementary schools students eat breakfast and lunch in the classroom, which reduces transition time and allows students more time to eat a nutritious meal (Chris Johnson, personal communication, 11/1/2010). Students eating in the classroom may receive additional supervision during meal times as teachers are able to encourage consumption of healthy foods.

The recognition of the childhood obesity epidemic and the implementation of the evidenced based practices, policies and programs discussed above may have contributed to the apparent decline in childhood overweight and obesity during the study period. While adoption of school policies and environmental approaches with concurrent evaluation is warranted, it is outside the scope of this report. Therefore, the extent to which any of these interventions may have contributed to the apparent decline of overweight and obesity rates remains a matter of speculation.

Finally, recent national data suggest that the apparent decline seen in the district student overweight and obesity rates may at least in part reflect national trends. Analysis of directly measured youth height and weight data from the National Health and Nutrition Examination Survey (NHANES) found no significant increase in obesity between the periods 1999-2000 and 2007-2008.¹

Limitations

The following limitations must be considered when interpreting these findings. Height and weight measurements were not collected through a statistically valid sampling procedure but were obtained as part of the routine school health screening process. The available measurements for the 7-year time period represented 48% of students enrolled in grades K, 1, 3, 5, and 7 with recorded data for 74% of students in these grades during the 2009-2010 academic year. Because efforts were made to screen all students in these grades, it is unlikely that the prevalence of overweight and obesity is due to a selection bias that resulted in the disproportionate selection of students from groups at high risk for being overweight or obese.

Although the school nurses conduct most of the height and weight measurements, variations from this protocol may have occurred. Currently, schools use a variety of measurement equipment, and multiple staff members may be involved in the measurement process. The district does not have a weighing and measuring protocol nor does the district conduct regular calibration of equipment. While the variations in procedure and equipment likely resulted in some degree of random error, it is unlikely that they could be responsible for systematic under- or over-estimation of weight status.

Conclusion

In spite of the study limitations, the results of this analysis indicate both cause for concern and reason for hope with regard to the weight status of children in the MSBSD. While further study of the impact and effectiveness of changes to policy, practices, and programming in the MSBSD is needed, the apparent decline of overweight and obesity prevalence demonstrate that success is possible and that now is the time to make a concerted effort to accelerate this apparent declining trend in childhood obesity.

Schools are second only to families in terms of social institutions with potential for influence on the lives of young people. Implementation of a Coordinated School Health Program (CSHP)³⁰ is an excellent framework for the planning and coordination of school health policies, practices, and programs for preventing obesity.

The CSHP framework centers around eight critical, interrelated components: health education; physical education; health services; mental health and social services; nutrition services; healthy and safe environment; family and community involvement; and staff wellness. Individually, each of these components can contribute to students' health and well-being. However, when all of the individual components work together, students' health and learning are improved.

Use of the CSHP framework results in a planned, organized, and comprehensive set of courses, services, practices, policies, and programs that meet the health and safety needs of all students from kindergarten through grade 12. The CSHP can be

facilitated by a school wellness council and strengthened by conducting school health self-assessments and making a coordinated plan.

The encouraging findings presented in this report would not have been apparent had the MSBSD not examined the weight status of their student body. The expansion of the BMI surveillance program to other districts in Alaska would: (a) help monitor student health and identify disparate populations; (b) provide a mechanism to evaluate the effectiveness of school wellness policies and efforts to improve school health; (c) strengthen school district grant applications by clearly identifying need and target populations; (d) enable the Department of Health and Social Services to provide better technical assistance to school districts and agencies in identifying health risks, developing interventions, and determining how to target limited financial resources; and (e) potentially catalyze improvements in local physical activity and nutrition policies.

No single practice, policy or program, in school or elsewhere, is likely to be sufficient to reverse the childhood obesity trend. The fact that a high percentage of students are overweight or obese when they enter school indicates that prevention efforts cannot wait until children enter the school system.

Nonetheless, schools clearly have a significant role in creating healthy school environments, in which the healthy choice is the easy and affordable choice. To decrease childhood obesity statewide, Alaska schools will need to work with students, families, communities, schools, childcare centers, worksites, health care, media, and government to implement a coordinated set of comprehensive evidenced-based prevention strategies. Only the synergistic work of all these stakeholders will ensure that Alaska's children have a strong and healthy future.

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Section of Chronic Disease Prevention and Health Promotion

Chronicles

Volume 3, Issue 1

March 2011

- Volume 3, Issue 1. March 2011. Prevalence of Overweight and Obesity among Matanuska-Susitna Borough School District Students, 2003-2010. *Contributed by:* Mary Bell, RN, BSN, NCSN, Andrea Fenaughty, PhD, Karol Fink, MS, RD, and Charles J. Utermohle, PhD.
- Volume 2, Issue 1. February 2009. Prevalence of Overweight and Obesity among Anchorage School District Students, 1998-2008. *Contributed by:* Andrea Fenaughty, PhD, Karol Fink, MS, RD, , Diane Peck, MPH, RD, and Charles J. Utermohle, PhD.
- Volume 1, Issue 4. July 2008. Food Insecurity in Alaska. *Contributed by:* Charles J. Utermohle, PhD, Rebecca S. Wells, MS, Andrea Fenaughty, PhD.
- Volume 1, Issue 3. April 2008. Medicaid Disease Management. *Contributed by:* Nancy Cornwell, Division of Health Care Services, and Charles J. Utermohle, PhD, Section of Chronic Disease Prevention and Health Promotion, Division of Public Health.
- Volume 1, Issue 2. February 2008. Alaska Worksite Health Collaborative. *Contributed by:* Barbara Stillwater PhD, RN and Lisa Aquino MHS.
- Volume 1, Issue 1. September 2007. Living Well Alaska. *Contributed by:* Barbara Stillwater PhD, RN.

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Suggested Citation: Bell, M, Fenaughty AM, Fink K, Utermohle CJ. Prevalence of Overweight and Obesity among Matanuska Susitna Borough School District Students, 2003-2010. Alaska Department of Health and Social Services, Division of Public Health, Section of Chronic Disease Prevention and Health Promotion, *Chronicles*, Volume 3, Issue 1, March 2011.