Overweight and At-Risk for Overweight Among Hawai‘i Public School Students Entering Kindergarten, 2002-2003

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Abstract

Recent studies have pointed to an increasing problem of overweight and obesity in children in Hawai‘i, but all of these studies have been conducted in specific communities or special population groups. No broad population-based studies have been conducted to document the extent of overweight in the general population of children in Hawai‘i. To provide a population based estimate of overweight in Hawai‘i's children, this study examined Student Health Records for 10,199 children entering kindergarten in public schools during 2002-2003. Data on age, gender, height, and weight were used to calculate BMI (body mass index) scores. Because records for all students entering public school kindergarten were available for analysis, the data presented here represents the broadest estimates of overweight and at risk for overweight in Hawai‘i's children published to date. The results illustrate that almost one-third of the children aged 4-6 years old entering Hawai‘i public schools are either overweight or at risk for overweight. Rates are higher in rural school complexes than urban ones. Compared to a 1984 study that found 'no significant under or over nutrition' in Hawai‘i's school children, our results suggest that almost one-third of children aged 4-6 entering Hawai‘i public schools are either overweight or at risk for overweight. Physicians should be aware of this growing problem, and seek to implement practices to combat overweight among their pediatric patients and families.

Introduction

The number of overweight children in the United States has doubled in the past 20-30 years, with similar patterns occurring throughout the world.[1] Data from the 1999-2002 National Health and Nutrition Examination Survey (NHANES),[2] which uses actual height and weight measurements, indicated that an estimated 16% of children and adolescents ages 6-19 years were overweight. Studies have also shown that children in certain minority ethnic groups (American Indians, Hispanics, African-Americans) in the United States are particularly at risk for overweight and obesity.[3] The Centers for Disease Control and Prevention (CDC) 1999 Youth Risk Behavior Survey (YRBS)[4] found no difference between adolescents in Hawai‘i and nationally in terms of the proportions at risk for overweight (14.3%) or overweight (10%), illustrating that Hawai‘i is clearly following nationwide patterns for overweight and obesity.

The health problems that overweight or obese children and youth develop are similar to problems of overweight or obese adults. They are at increased risk for numerous health conditions, including type 2 diabetes,[5,6] hypertension, cardiovascular disease,[7] dyslipidemia (high triglyceride levels), some specific cancers, gallstones, osteoarthritis, rheumatoid arthritis, premature death, sleep apnea and respiratory problems, as well as poorer physical functioning status,[8] and lower life expectancy.[9]

Background

More than 20 years ago, researchers at the University of Hawai‘i conducted a study on the anthropometry of Hawai‘i school children, which provides an important background to current studies.[10] Lichton and his colleagues were able to measure the height, weight and measurements of the non-dominant arm (both upper arm circumference and triceps skin-fold thickness) of more than 14,000 children ages 5 to 15 years, attending both public and private schools in Hawai‘i. Their purpose was to establish growth standards for specific race and ethnic groups in Hawai‘i and to examine whether or not there was evidence of what they termed "significant under or over nutrition" within any groups of children. They compared their measurements with mainland children sampled for the National Center for Health Statistics (NCHS) growth curves in 1977, and found Hawai‘i children had heights and weights similar or greater, except for Samoan children who were consistently taller and heavier than the other school children. Comparisons of children of Asian ancestry were done based on studies conducted in several Asian countries (Philippines, Taiwan and South Korea), mainly because of the high rates of immigration from Asian countries to Hawai‘i. Comparing Asian ethnic school children with their counterparts in Asia found that Hawai‘i's Filipino, Chinese and Korean schoolchildren were taller and heavier than their counterparts in Asia. The

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authors suggested however, that Filipino children in Hawai'i stored less fat than other children. They did not find any evidence of over or under-nutrition among Hawai'i's school children. They further suggested that Samoan children may, for genetic reasons, be taller and heavier than other groups and their greater weight and storage of fat was not considered over-nutrition because this fit with their greater height. Numerous studies of Pacific populations have illustrated that the problems of dietary related chronic diseases, especially diabetes and obesity, are pervasive for Pacific Islanders (e.g. Native Hawaiians, Samoans and Micronesians).[11-13]

Recent research studies suggest that Hawai'i has a significant problem with childhood overweight. Most estimates are for infants and very young children and youths or adolescents; only a few studies include elementary school students. These studies have also found ethnic differences in the proportions of overweight or at risk.

A 1997-1998 cross-sectional study of more than 20,000 children aged 1-4 years participating in the United States Department of Agriculture (USDA) Women, Infants and Children (WIC) food program in Hawai'i found that the prevalence of overweight in all ethnic groups was above the expected 15%.[14] The data also demonstrated significant differences across ethnic groups. Among 2-4 year olds, Samoan children were the tallest (16.9%) and the heaviest (27% were overweight), while Filipino children were the shortest (19.0% were short) and the lightest (11.8% were underweight) (based upon the CDC percentile cut-off points). Hawaiians (13.6%), Asians (12.2%), and Others (10.1%) also had high percentages of short children. The prevalence of overweight was lowest among 1-year-olds, but it increased at age 2 and remained high until age 4.

A longitudinal study examining body size and overweight, which took anthropometric measurements of more than 1,400 public school students ages 6-17 years on Moloka'i, suggested a childhood obesity problem in Hawai'i, disproportionately affecting those of Hawaiian ancestry.[15] Obesity rates in that study were twice as high as national rates.

Data from the 2003 Hawai'i Youth Risk Behavior Survey (YRBS) show that 27.1% of the middle school students surveyed considered themselves to be slightly or very overweight. Other survey data collected between 2000-2004 from the Nutrition Education Needs Assessment Survey (NENAS) conducted in the Hawai'i public schools every 10 years, also showed an overweight problem among youth and teenagers. More than one-third of the 4th graders and high school students surveyed for the NENAS were either overweight or at risk for overweight.

While the studies mentioned above support a significant problem of overweight among young children and youths and adolescents in Hawai'i, the lack of sufficient and current data on elementary school age children was one driving force behind this study. Another reason for this study was to assess the utility of the Student Health Records as a source of surveillance data for childhood weight measurement.

Methods

Student Health Records are required for students entering public schools by Hawai'i Administrative Rules.[16] Under an agreement with the Superintendent's Office of the Department of Education and the Department of Health, this study was conducted to examine childhood overweight among public school students, and to assess the feasibility of using the Student Health Records as a means of surveillance of childhood overweight. The study protocol was reviewed and approved by the Department of Health's Institutional Review Board and the Superintendent's Office of the Department of Education.

The Student Health Record document contains the student's required immunizations history and must be stamped or signed by a medical practitioner, medical personnel, or a clinic. It also contains the student's information on the forms, including the age and gender of the child along with information regarding existing chronic conditions, such as asthma. Height and weight are measured and recorded by the medical personnel completing the form.

Of the 12,682 children who entered the Hawai'i public school system in 2002-2003, there were 12,452 Student Health Records available from the DOH Immunization Branch. 2,253 records were excluded from the study: records which were not complete for age, sex, weight ,and height or had implausible anthropometric values, and children who did not meet the age criteria of the study (e.g. older students transferring into a school). The study population was limited to those students from ages 4 to 6 years (48 to 71 months), resulting in a total of 10,199 students; the mean age was 57 months old. EpiInfo 2000 NutStat was used to calculate percentiles for BMI (body mass index), height for age and weight for height based on the 2000 CDC reference population.

The CDC reference population is based on national health surveys from 1963 to 1994 along with supplemental sources, including NHES II &II, NHANES I, II & III and others.[17] It is important to note that the CDC reference population is actually an "idealized population". The CDC reference population can be described as a normal distribution with cut off points using z-scores (standard deviation units) or percentiles. In this study we are using the percentile cut-off points. The CDC uses the following definitions as cut-off points for percentiles: overweight is defined as BMI $\geq$ 95th percentile and at-risk for overweight was defined as being between $\geq$ 85th and < 95th percentiles. In an idealized population, 10% of children would be

at-risk for overweight and 5% would be overweight, with a total of 15% combined at-risk for overweight and overweight.

One limitation of this study is that kindergarten is not required in Hawai'i; therefore, this study population is not representative of children aged 4-6 throughout the state of Hawai'i in 2002-2003, so we do not know the total number of children who could have entered kindergarten during 2002-2003. We estimate therefore, that this group of kindergartners (n=10,199) accounts for at least one-third of the population of children aged 4 to 6 in the state of Hawai'i in 2002-2003 (e.g. there were more than 30,000 children aged 4 to 6 in the state of Hawai'i in 2002-2003). Furthermore, this group of children is only comprised of public schools students and does not provide any estimates of the proportions of children entering kindergarten who are overweight or at-risk for overweight children in private schools.

Results

Table 1 lists the percentages of children overweight and at risk for overweight for each of the school complexes in Hawai'i. The maps show these percentages for each island. School complexes in Hawai'i are grouped geographically and comprise those elementary and middle schools that feed into a particular high school, similar to a school district. Although information on individual schools was available for the study, and was provided to the Department of Education, to ensure privacy, results of individual schools were suppressed under an agreement between the Department of Health and the Department of Education.

Overall, the state totals (Table 1) reveal high proportions of 4 & 5-year-olds entering Hawai'i public schools overweight and at-risk for overweight (28.5%). Variation between complexes range from a low of 17.6% at the Kaiser complex on O'ahu, to a high of 47.1% at the Hana complex on Maui. In general, this study suggests that rural communities on O'ahu and O'ahu's Neighbor island communities are more likely to have kindergarteners entering schools overweight or at risk for overweight.

Discussion

Since these data represent the status of children entering kindergarten, overweight and obesity is clearly a problem which exists before children begin school in many communities throughout Hawai'i. There are some notable differences between school complexes, as different school complexes reflect the ethnic and other social characteristics of the communities of which they are a part. For examples of the diverse ethnic, social, economic, and other characteristics of Hawai'i's school complexes, refer to the University of Hawai'i's Center on the Family Data Center interactive website.[18] Further research is currently being conducted to determine some of the school and community factors that may be associ-

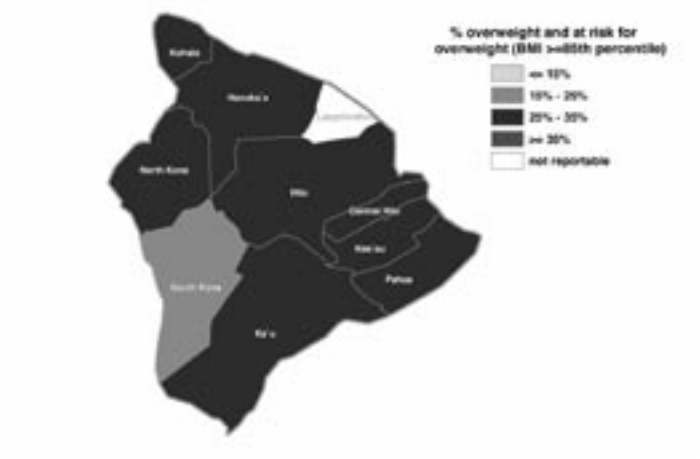
Table 1: Hawaii 4 & 5 year olds entering public schools in 2002-2003 by complex area and percentage overweight or obese.

	Complex Area	% overweight (BMI >=95)	% at risk for overweight (BMI >= 85 and < 95)	Total
State total (N=10,199)		14.4	14.1	28.5
(Oahu N=7,234)		13.9	13.8	27.7
	Aiea (N=247)	8.1	17.8	25.9
	Campbell (N=440)	16.4	13.0	29.4
	Castle (N=370)	15.4	13.5	28.9
	Farrington(N=483)	15.5	17.2	32.7
	Kahuku (N=188)	19.7	16.0	35.7
	Kailua (N=204)	15.2	13.7	28.9
	Kaimuki (N=343)	15.5	13.7	29.2
	Kaiser (N=119)	7.6	10.1	17.6
	Kalaheo (N=305)	9.5	12.8	22.3
	Kalani (N=249)	7.6	12.9	20.5
	Kapolei (N=334)	13.2	10.5	23.7
	Leilehua (N=553)	13.4	15.9	29.3
	McKinley (N=373)	14.5	13.4	27.9
	Mililani (N=315)	10.8	13.7	24.5
	Moanalua (N=241)	12.5	12.0	24.5
	Nanakuli (N=148)	17.6	10.8	28.4
	Pearl City (N=446)	13.2	12.8	26.0
	Radford (N=588)	12.2	15.1	27.3
	Roosevelt (N=407)	11.1	11.8	22.9
	Waialua (N=59)	22.0	17.0	39.0
	Waianae (N=302)	15.9	14.2	30.1
	Waipahu (N=483)	19.9	12.6	32.5
Hawaii (N=1,310)		15.1	15.2	30.3
	Central Hilo (N=215)	16.3	14.0	30.3
	Hilo (N=241)	17.0	14.5	31.5
	Honokaa (N=200)	16.5	18.0	34.5
	Kau (N=41)	14.6	17.1	31.7
	Keeau (N=152)	15.1	17.1	32.2
	Kohala (N=34)	11.8	20.6	32.4
	North Kona (N=221)	15.4	13.1	28.5
	Pahoa (N=86)	14.0	14.0	28.0
	South Kona (N=120)	8.3	14.2	22.5
Kauai (N=488)		12.5	16.4	28.9
	Central Kauai(N=233)	9.0	14.2	23.2
	East Kauai (N=150)	16.0	14.7	30.7
	West Kauai (N=141)	14.9	22.0	36.9
Maui (N=1,167)		17.9	13.8	31.7
	Baldwin (N=203)	17.2	17.7	34.9
	Hana (N=17)	35.3	11.8	47.1
	Kekaulike (N=275)	15.6	12.7	28.3
	Lahainaluna (N=124)	27.4	17.7	45.1
	Lanai (N=30)	20.0	26.7	46.7
	Maui (N=452)	15.9	11.1	27.0
	Molokai (N=67)	17.9	13.4	31.3

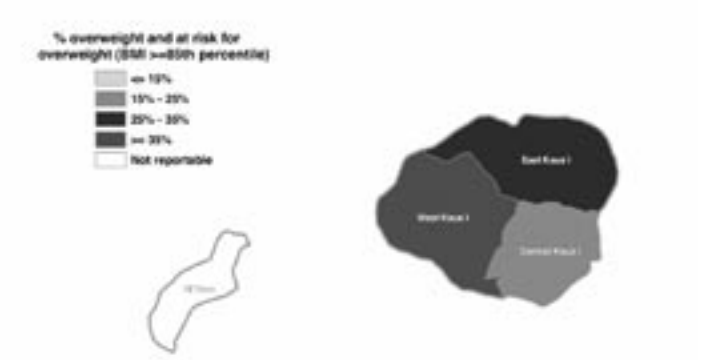
Source: Department of Health, Community Health Division.

Note: Laupahoehoe and Niihau are not reportable due to small numbers.

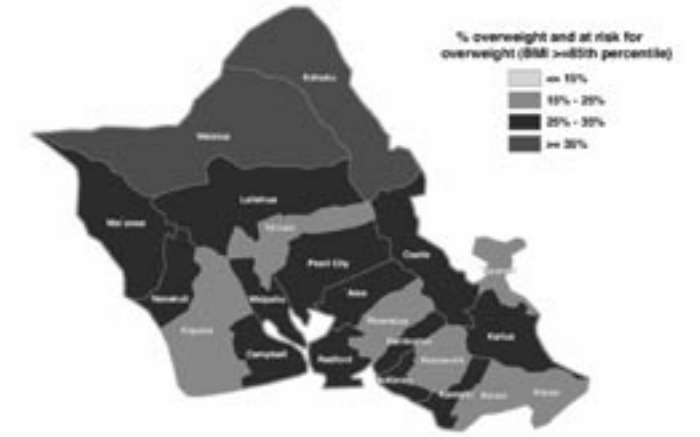
Percent Overweight And At Risk for Overweight, Public School Students Entering Kindergarten By School Complex, Hawai`i County, 2002 - 2003



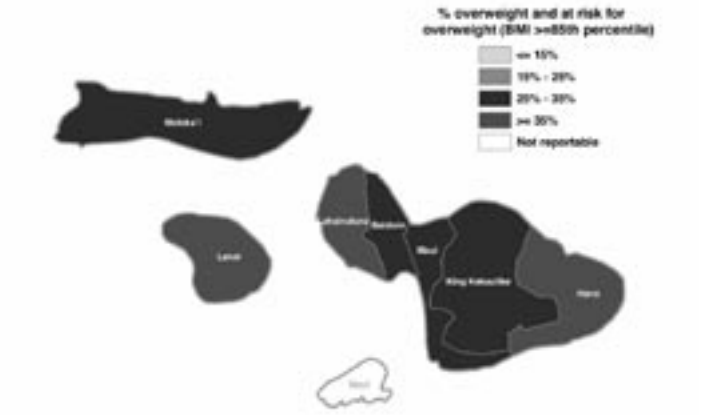
Percent Overweight And At Risk for Overweight, Public School Students Entering Kindergarten By School Complex, Kaua`i County, 2002 - 2003



Percent Overweight And At Risk for Overweight, Public School Students Entering Kindergarten By School Complex, Honolulu County, 2002 - 2003



Percent Overweight And At Risk for Overweight, Public School Students Entering Kindergarten By School Complex, County of Maui, 2002 - 2003



ated with the observed differences between the school complexes. School level indicators for which data are available include ethnicity, the proportions of children receiving subsidized school lunches, the proportion of families receiving TANF (Temporary Assistance for Needy Families) and proportions of children for whom English is a Second Language (ESL). Community level indicators for which data are available include ethnicity, income, and occupation.

This study supports the findings of other recent studies, illustrating that childhood obesity is a serious problem in Hawai'i, for both the individuals involved and communities that will experience an increased burden of providing care for individuals with chronic diseases. It is important that a comprehensive system of prevention, early detection and treatment be developed. Trends in reported physical activity levels on the YRBS also indicate that the percentage of Hawai'i middle school students who attended physical education classes daily has decreased by 50% from 1993 to 1999. The overall proportion of these students participating in daily physical activity was much lower compared to the United States.[19]

Surveillance is an essential element of a coordinated public health response, developing and implementing a system for monitoring childhood obesity is an essential foundation of obesity prevention. It is evident from this study that it is feasible to use Student Health Records (Form 14) data as a basis for developing a system of on-going childhood obesity surveillance. Such a surveillance system needs to include Student Health Records from private schools as well in order to be state-based. Private schools also require students to have completed Student Health records for immunizations, therefore the potential for a state-wide surveillance system for children entering schools is feasible.

The findings from this study suggest that there is a significant and growing problem of overweight among Hawai'i's children. Physicians need to be aware of this growing problem, and should seek to implement strategies within their practices to combat overweight among their pediatric patients and families. Guidance on the role of physicians in the prevention of pediatric overweight obesity is available through the American Academy of Pediatrics.[20]

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