think differently. for their future.

Child Weight Surveillance in Preschool in Hartford, Connecticut

Completed May, 2012 for the City of Hartford, Department of Families, Children, Youth and Recreation by the University of Connecticut's Center for Public Health and Health Policy

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Child Obesity: A Background

Children born in the United States at the beginning of the 21st century may be the first generation since U.S. Census data have been recorded to have a shorter life expectancy than their parents [1]. The decrease in life expectancy is entirely attributable to the prevalence of obesity in this generation [1]. The estimated direct costs of obesity, as calculated with the Gallup-Healthways Well-Being Index using 2009 data from 187 U.S. metropolitan areas, are approximately $50 million per 100,000 residents [2]. Children are entering into obesity early on, which translates into an often-unchangeable life course of chronic disease, with "adult" conditions such as type 2 diabetes and hypertension starting in childhood. Obesity has started to outpace cigarette smoking, another risk factor commonly beginning in adolescence, as the greatest risk factor for death and illness [3].

Besides decreasing life expectancy, being overweight or obese during childhood may severely affect a child's physical and psychological development. Hospital costs attributed to childhood overweight conditions have increased three-fold in the last 20 years [4, 5]. From 1979 to 1999, the occurrence of type 2 diabetes, previously called adult onset diabetes doubled in adolescents, particularly among minority children [6]. In the same time-period, diagnoses for sleep apnea and gall bladder disease, not usual pediatric problems, have tripled. A majority of overweight children (61%) have problems such as asthma, orthopedic problems resulting from excess weight, hypertension, dyslipidemia, and greater susceptibility to infectious disease [6]. These problems follow into adulthood where obesity is the direct antecedent to diabetes, heart disease, and many types of cancer, kidney failure, respiratory disease, and infertility. In many cultures, overweight stigmatizes the school age child [7]. This discrimination contributes to depression, low self-esteem, poor school performance, and interference with family functioning [8].

Unlike quitting smoking, achieving and maintaining a healthy weight and reversing the course of obesity often remains out of reach even for determined individuals. Adult weight loss treatments require long-term interventions. Most adults regain the lost weight, thus negating the time, financial and emotional investment, and health benefits. Sadly, there are no effective interventions for achieving the amount of sustained weight loss necessary for obese children to reach a healthy weight [9]. **To decrease the number of obese adults in the future, prevention strategies must focus on points in the life cycle when genes that program energy conservation are expressed, and appetite regulation, physical activity patterns, and food preferences are developed. That window of opportunity is almost entirely during pregnancy through pre-adolescence.**

two-thirds of adults
in are overweight or obese [10]

23%
of children in Hartford ages 2 to 5 are overweight or obese
[2001 kindergarten data]

[continued on page three]

Preschool Opportunity

Over time, center-based care (childcare centers, Head Start, preschools, nursery schools, pre-kindergarten and other early childhood programs) has become the primary type of childcare arrangement for young children. According to Census Bureau data from 2010, 43% of children ages 0 to 5 living with their mother reportedly attended center based care as their primary source of care, with variation by child age, income, race and ethnicity [17]. Children under age two were more likely to receive care from a parent or relative caregiver than a childcare center. On the other hand, children from households below the federal poverty level (FPL) or moderately above the FPL were less likely to receive center-based care compared to children from households at or above 200% of FPL [17].

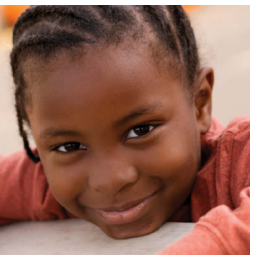
The National Center for Education Statistics data shows similar enrollment in center-based care for 3 to 5 year-old children, with lower rates among households with incomes below the federal poverty level (FPL) (47%) than households with incomes above FPL (60%) [18]. A greater percentage of Black (66%) and White (59%) 3 to 5 year-olds are enrolled in center-based care compared to Hispanic children (43%) [18]. One type of center-based program, the federally-funded Head Start program under which the majority of participants must meet low-income guidelines (45 CFR 1305.4), enrolled approximately 25% of Black children and 19% of Hispanic children about 4 years of age during 2005-2006 [19]. In Hartford, CT, approximately 73% of 3 to 5 year-old children are enrolled in center- or school-based care due to the significant expansion of the State's School Readiness Program *(J. Crowell, Assistant Director, personal communication)*.

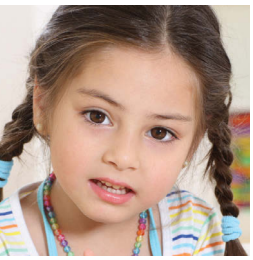
During this pivotal point in life for setting a path towards healthy behaviors and away from obesity, children spend a substantial amount of time in center-based care. The caregivers in these settings are positioned to play a role, whether they intend to or not, in the development of food habits and physical activity routines. Especially within low-income communities, childcare settings often have the added responsibility of preparing and supervising meal(s) and snack(s) under the federal Child and Adult Care Food Program (CACFP). Calls for action to promote health and prevent obesity are now geared towards childcare centers. First Lady Michelle Obama's Let's Move Child Care Initiative and the Institute of Medicine report, *Early Childhood Obesity Prevention Policies*, are among the calls to take action within the early care and education center setting to prevent and reverse the obesity trend. These calls encourage opportunities for physical activity throughout the day, reduction of sedentary activities, limits on-screen time, and adherence to appropriate food patterns emphasizing healthy foods and age appropriate portions.

Because almost three quarters of all preschool children in Hartford are enrolled in center-based care, they enjoy most of their recreational time and ingest much of their food intake at these centers. Thus, these centers play a critical role in the development of lifestyle choices for young children. Recognizing this importance, the Department of Families, Children, Youth, and Recreation asked the Center for Public Health and Health Policy at the University of Connecticut to provide baseline data on child weight status in city programs. This report describes the extent of childhood obesity in the preschool population and provides a statistically sound base from which to evaluate the effectiveness of planned programs.

[Child Obesity: A Background continued from page one]

Indicators show no decrease in the high rates (two thirds) of adults who are overweight or obese [10]. Among children ages 2-5, 23% are overweight or obese [11]. Rates of overweight for adults and children are even higher for low-income families and minorities. Compared to 21.3% of non-Hispanic White children ages 2-5, 27% of non-Hispanic Blacks, and 32.1% of Hispanic, mostly Mexican-American children are overweight or obese [11]. Of three-year old children participating in the Fragile Families and Child Wellbeing Survey from 1999-2003, 18% were obese with an additional 17% overweight [12] Black and Hispanic children were more likely to be overweight (17% and 24% respectively) than their White peers (14%) [12].





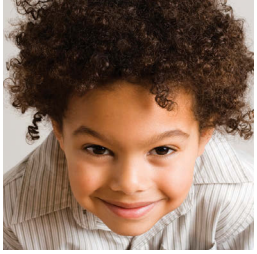
Children living in Hartford are at high risk for becoming obese. These children are predominantly Blacks and Latinos from low-resource families and they experience a high rate of excess weight and obesity related chronic diseases. Over one-third of children three years of age [13] and 23% of kindergarten children in Hartford are overweight [14]. The children in Hartford, especially pre-adolescent children, warrant additional attention beyond the general population. Interventions for newborns to age five have been found to be more effective than those for older children when it comes to promoting sustained moderate caloric intake and fostering weight loss or prevention of weight gain [15].

As a greater percentage of the preschool population becomes obese, both parents and teachers lose perspective on what is a healthy weight for a child. Earlier studies in Hartford [16] note that parents of preschool children do not see obesity as an issue, especially when they compare the weight of their children with playmates who also have unhealthy weights. These unhealthy weights are seen as "normal." Parents express great concern about their child's health but do not tie overweight in seemingly healthy young children with future chronic disease. Parental misunderstanding of what constitutes a healthy weight makes it more difficult for institutionally initiated programs, such as those in preschool settings, to be translated to practices at home.

The prevalence of overweight and obesity was **twice as high as the CDC guidelines** of children in Hartford for age and gender specific BMI.

Surveillance Protocol

In April, 2012, the Department of Families, Children, Youth, and Recreation contracted with the Center for Public Health and Health Policy (CPHHP) to measure a statistically representative sample of preschool children enrolled in center-based care in Hartford, CT. A prevalence estimate for overweight and obesity with 95% certainty ± 3% required that 35 of the 66 listed preschools with a minimum of 1,379 Hartford children under the age of six participate in the surveillance project. (See Appendix B for the table of power calculations). To obtain the 35 required centers, CPHHP staff randomly drew 35 identical slips of paper from a "hat" with the names of the 66 center-based programs in Hartford. Following data collections, power was re-calculated using actual numbers of children sampled at each site. The expected precision of the estimates did not change. Appendix A lists the 35 sites selected for surveillance.



Mayor Segarra sent a letter to all sites stating his support of the study. The Department of Families, Children, Youth, and Recreation then notified each selected site. Catalina Quesada, a CPHHP staff member, visited each site to discuss scheduling and logistics. Teams of two to four undergraduate students supervised by a CPHHP staff member conducted the surveillance in May of 2012. All students in attendance that day were measured for height and weight. Data was not included for children who were not in the age range or were non-Hartford residents.

Data Collected

Survey staff measured *height* using a stadiometer (Shorrboard portable measuring board, model 420, Shorr Products, Olney, MD) using standard protocols [20]. All children were in stocking feet and care was taken to assure that hair ornaments, hats, or hair did not artificially increase the measurement. Child *weights* were obtained using an electronic self-calibrating digital scale (Physicians Remote Read Digital Scale 349KL, Healthometer, Bridgeview, IL) without shoes or bulky clothing. Weight data were reported as raw numbers and adjusted for average weight of clothing. All measures were repeated three times and were taken in a private area. Children who were non-cooperative or anxious about being measured were excluded from the survey.

Staff recorded data on a survey sheet that remained in the child's file in the childcare center. This sheet contained the center name, classroom, child's name, date of birth, ethnicity, and city of residence taken from school records as well as the individual measurements. CPHHP staff, in cooperation with individual center staff, prepared the survey sheets before the day of survey. After the survey staff completed all measurements, essential information from these sheets was entered into a Microsoft Access® file that contained the center, classroom, decimal age[1], ethnicity, whether the child resided in Hartford, along with the height and weight measurements. An individual summary report was prepared for each participating center. All identifying information remained in each center.

The University of Connecticut, Office of Research Compliance, on 4/12/2012, deemed this protocol as exempt from human subject research with a HIPAA waiver. Body mass index (BMI), a measure of the relationship of body weight to height, was used as a measure of weight classification. The reference standards are adjusted for age and gender. Because children are both attaining height and gaining weight, a static BMI cut-off used with adults is not used for children. The age- and gender-specific Centers for Disease Control and Prevention (CDC) Reference Standards classifies children as underweight (BMI<5th), normal weight (BMI >5th but <85th), at risk for overweight (BMI >85th but <95th), and overweight (>95th) (See Figure 1).

This report presents weight classification data for all centers with comparisons made on gender, child age, and ethnicity. All data within each center was aggregated for analysis.

[...interventions for newborns to age 5 have been found to be more effective than those for older children.]

[1] *The Microsoft Access® program calculated decimal age on the day of measurement from date of birth. Once the calculation was completed, no record remained on the electronic file of date of birth.*

Results

Sample description. All centers fully cooperated with the surveillance project. The tables below provide a summary of enrollment (Table 2) and demographics (Table 3) for the participants from 35 sites and 85 classrooms. Overall preschooler attendance on the measurement day was 82%. One hundred seventy of the 1,586 children measured did not reside in Hartford, three were over the cut-off age of six, and only nine children were uncooperative, resulting in a usable study sample of 1,120 Hartford preschoolers. The ethnicity of children in the centers closely paralleled that of the demographics in the city with 54% reported as African-American/black, and 37% as Latino.

Prevalence of Overweight. Thirty-seven percent of the children were classified as overweight or obese, with 17% classified as overweight and 20% as obese. This is compared to the CDC normal distribution of weight classification targets that would classify 10% as overweight and 5% as obese (Figure 1). The prevalence of overweight and obesity was twice as high as the CDC guidelines for age and gender specific BMI.

Boys were just as likely to be overweight or obese as girls (Figure 2). Latino children were significantly more likely to be overweight or obese than African-American children (Figure 3). Four- to five-year-old children were more likely to be overweight or obese than younger enrollees (Figure 4). At all centers except one, over 30% of the children were overweight or obese (Table 4).

TABLE 2

Total Enrollment	**1,589**
Absent	284
> 5 years old	3
Not Hartford Residents	170
Child Uncooperative	9
Total Usable Measurements	**1,120***

**Post-hoc analysis confirmed adequacy of sample size to predict overweight and obesity with 95% confidence.*

TABLE 3

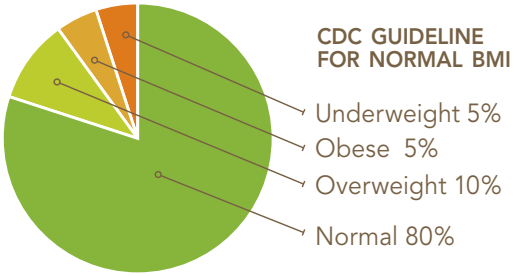
Gender, Age, and Ethnicity	
Gender, Female	51%
Ethnicity	
African American/Black	54%
Latino	37%
Other	7%
White	2%
Asian	1%
Age	
3-4 years old	27%
4-5 years old	73%

TABLE 4

Quintile Distributions of BMI classifications among centers (n=35)

Quintile	Percent range of children classified as overweight or obese
0-20%	13-31
21-40%	31-33
41-60%	33-37
61-80%	39-47
81-100%	48-59

FIGURE 1: BMI classification for total



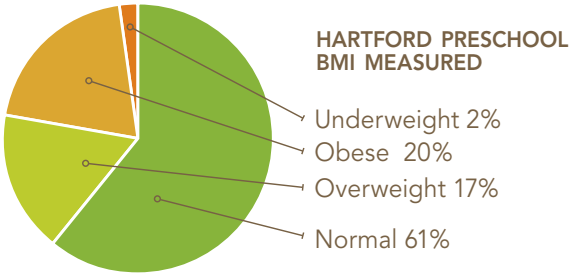
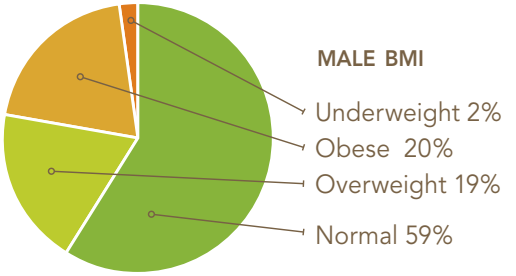


FIGURE 2: BMI classification by gender



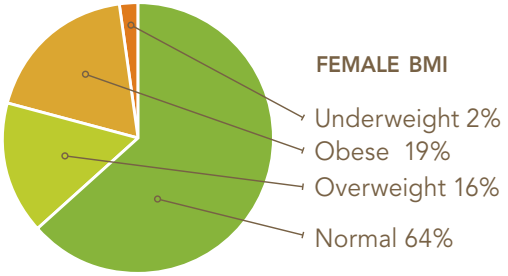


FIGURE 3: BMI classification by ethnicity

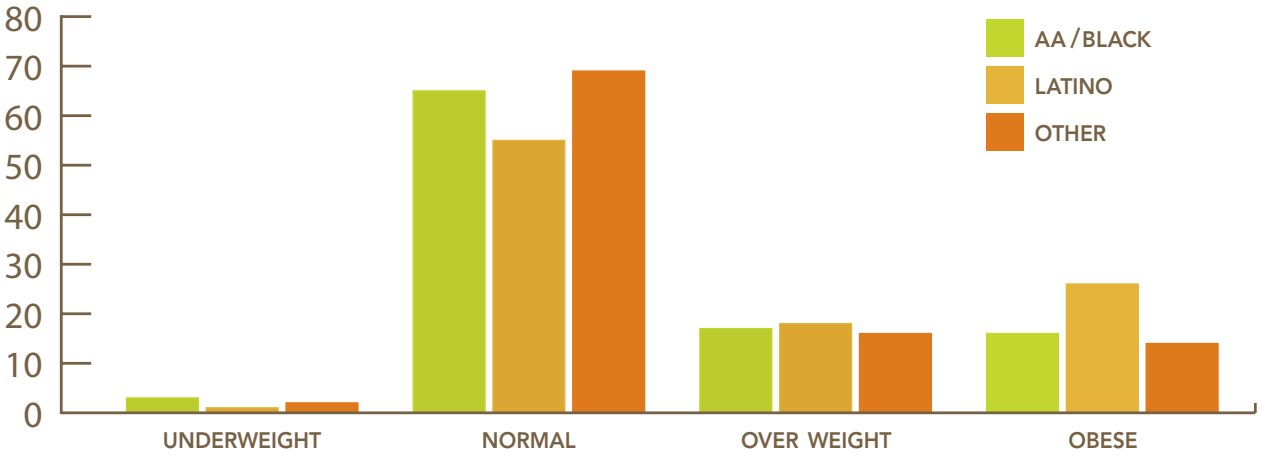
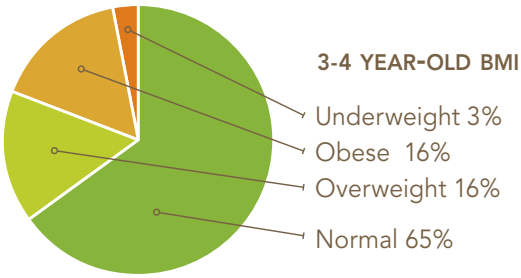
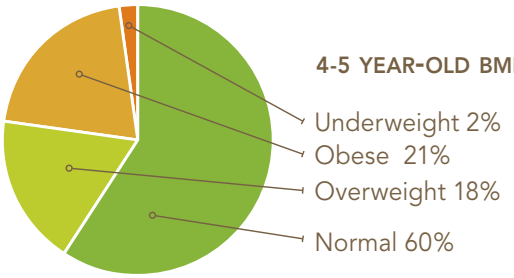


FIGURE 4: BMI classification by age





Citywide Implications

Almost all U.S. cities share the same burden of preschool obesity as Hartford. The percentage of children in Hartford enrolled in center-based preschool programs (73%) (J. Crowell, Assistant Director, personal communication) is significantly above the national average of 43% [18]; this offers Hartford a unique opportunity to develop system-wide inventions that could significantly reduce the prevalence of obesity in its children. This report purposefully does not make a list of recommendations. Its intent is to provide baseline statistics for discussions and planning across city departments, preschool directors, staff, parents, and collaborating agencies.

The current study documented greater obesity rates for Hartford's preschoolers than both the CDC-expected and actual U.S. prevalence. Although Latino preschoolers had the highest rates of obesity in Hartford, African American/Black and preschoolers of other races/ethnicity exceeded the expected and actual U.S. prevalence. These results indicate a need to design obesity prevention approaches that recognize culturally specific beliefs and practices.

This study also identified cross-sectional trend for greater obesity in older children in the centers, with four- to five-year-old children having more obese individuals than in the three- to four-year age group. Many children enter preschool programs already programmed for obesity. Children should not grow fatter in this age group. This is especially the case because during this stage of growth and development when incremental changes in height are greater than those of weight, resulting in longer legs and arms and increased trunk length, obesity prevalence should decrease. The data shows the opposite occurring among preschoolers in Hartford.

Although the problem seems insurmountable, the solutions are feasible. For preschool children, the average change needed from current energy intake may be less than 35 Kcal/day [4]. Greater Kcal adjustments will likely be needed among already overweight and obese children, whereas normal weight children may require lesser adjustments to Kcal to achieve a 5% prevalance of obesity [5], the Healthy People 2010 goal [21]. The approximately 35 Kcal/day equates to the reduction of about 2 oz. of apple juice or an increase of less than 15 minutes of activity. Creating these changes falls within the purview of a center-based program.

Preschool programs can make effective changes associated with a decrease in overweight and obesity [22] and institute curriculum and program changes designed to prevent a further increase in obesity [23]; however, these programs support children during one critical, but limited, phase in the children's lives. To have long lasting impact, supportive programming for home, health care, early childcare, and other school, faith, and community environments that provide opportunities for healthful living must bookmark their work.

[This report does not make a list of recommendations. Its intent is to provide baseline statistics for citywide discussions and planning.]

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Appendix A [randomly selected sites in Hartford]

SITE:	ADDRESS:
Annie Fisher Montessori	280 Plainfield Street Hartford, CT 06112
Breakthrough II School	395 Lyme Street Hartford, CT 06112
Breakthrough Magnet School	290 Brookfield Street Hartford, CT 06106
Capitol Prep Magnet School	1304 Main Street Hartford, CT 06013
Catholic Charities-BEACON ELC	571 Farmington Avenue Hartford, CT 06105
Catholic Charities-El Paraiso Infantil	45 Wadsworth Street Hartford, CT 06106
Catholic Charities-S.S. Cyril & Methodius	45 Groton Street Hartford, CT 06109
Catholic Charities-Southside Family Center	15 Newfield Avenue Hartford, CT 06106
CREC River Street Early Learning Center	34 Sequassen Street Hartford, CT 06106
CRT Bloomfield	1051 Blue Hills Avenue Hartford, CT 06002
CRT Clark Center	75 Clark Street Hartford, CT
CRT Grace	37 Grace Street Hartford, CT 06106
CRT Heritage	175 Enfield Street Hartford, CT
CRT Job Corps	100 William Shorty Way Hartford, CT
CRT Jumoke	250 Blue Hills Avenue Hartford, CT
CRT Laurel	211 Laurel Street Hartford, CT 06105
CRT Sheldon Oaks	79 Van Block Avenue Hartford, CT
Dwight Pre-K	585 Wethersfield Avenue Hartford, CT 06114
Elkey's Learning Experience	599 Broadview Terrace Hartford, CT 06106
Hartford Neighborhood Centers Inc.	38 Lawrence Street Hartford, CT 06106
Kennelly Pre-K	180 White Street Hartford, CT 06114
Metzner ELC	680 Franklin Avenue Hartford, CT 06114
Mount Olive Central Baptist	457 Main Street Hartford, CT 06103
Moylan Montessori	101 Catherine Street Hartford, CT 06106
Moylan Pre-K	101 Catherine Street Hartford, CT 06106
Naylor Pre-K	639 Franklin Avenue Hartford, CT 06114
Salvation Army-North End	100 Nelson Street Hartford, CT 06120
Salvation Army-The Right Place	123 Sigourney Street Hartford, CT 06105
Simpson Waverly Pre-K	55 Waverly Street Hartford, CT 06120
The Village for Families and Children	1680 Albany Avenue Hartford, CT 06105
Trinity College Community Child Center	300 Summit Street Hartford, CT 06106
Waverly ELC 55	55 Waverly Street Hartford, CT 06120
Wish Pre-K 350	350 Barbour Street Hartford, CT 06120
Women's League	1695 Main Street Hartford, CT 06120
YWCA-The Growing Tree	195-205 Garden Street Hartford, CT 06105

Appendix B [sample estimates and power calculations]

To determine the number of preschools to sample, power calculations were performed using the formula:

$n = (z_{\alpha}^{2}[p(1-p)/\delta^{2}]$ [24] adjusted for clustered sampling where: $z_{\alpha} = 1.96$, p is the prevalence, p(1 – p) = variance of the prevalence, δ = the fraction of the sample mean by which the true mean will differ from the sample mean by a probability of no more than .05. Two sets of prevalence data were used in power calculations.

The first set of prevalence data of overweight, obese, and severely obese for children aged two to five was from [25]; these were defined by the percentage of multi-ethnic children in a large sample from southern California who exceeded the CDC growth chart percentile cutoffs:

Overweight .....27.1% above the 85th percentile (≥25 kg/m2),
Obese.....13.1% above the 95th percentile (≥30 kg/m2),
Extremely Obese .....2.5% above 1.2 x 95th percentile (≥35 kg/m2).

The second set was from A. Ferris' data [13]:

Overweight *(above 85th percentile)* ... 34%
Obese *(above 95th percentile)* ... 16%
Very Obese *(above 99th percentile)* ... 7%
Delta (δ) was set to 0.005, 0.01, 0.02, 0.03, and 0.04

The adjustment for clustered sampling involved multiplying the standard deviation in the NIST formula by $[1 + ICC*(m - 1)]^{½}$ [26] where m = the average number of children per preschool, and ICC = the intracorrelation coefficient, i.e., the correlation of overweight prevalence among children within the same preschool. ICC values calculated for BMI measured in students sampled in schools in the National Longitudinal Study of Adolescent Health were calculated to be 0.035 for males and 0.045 for females [27]; thus, 0.04 was used as an estimate of the ICC value for the correlation of overweight prevalence among children in the same preschool. The value of m was set as 40 for Centers, i.e., (2,812/66).

The table below provides sample sizes necessary to obtain sample prevalence data within 0.5% and 4% of the population prevalence with 95% certainty for an ICC of .04 for the three weight classes.

Data	Severity	m	ICC	δ	p	Num_site	Num_kid
Ferris	Overweight	40	0.04	0.04	0.34	34.48	1,379.29
Ferris	Obese	40	0.04	0.04	0.162	0.65	826.1
Ferris	Severe Obese	40	0.04	0.04	0.07	10	400.14
Ferris	Overweight	40	0.04	0.03	0.34	61.3	2,452.07
Ferris	Obese	40	0.04	0.03	0.16	36.72	1,468.62
Ferris	Severe Obese	40	0.04	0.03	0.07	17.78	711.36
Ferris	Overweight	40	0.04	0.02	0.34	137.93	5,517.15
Ferris	Obese	40	0.04	0.02	0.16	82.61	3,304.39
Ferris	Severe Obese	40	0.04	0.02	0.07	40.01	1,600.56
Ferris	Overweight	40	0.04	0.01	0.34	551.72	22,068.61
Ferris	Obese	40	0.04	0.01	0.16	330.44	13,217.56
Ferris	Severe Obese	40	0.04	0.01	0.07	160.06	6,402.26
Ferris	Overweight	40	0.04	0.005	0.34	2,206.86	88,274.44
Ferris	Obese	40	0.04	0.005	0.16	1,321.76	52,870.25
Ferris	Severe Obese	40	0.04	0.005	0.07	640.23	25,609.03
Koebnick	Overweight	40	0.04	0.04	0.27	30.36	1,214.31
Koebnick	Obese	40	0.04	0.04	0.13	17.49	699.72
Koebnick	Severe Obese	40	0.04	0.04	0.03	3.75	149.82
Koebnick	Overweight	40	0.04	0.03	0.27	53.97	2,158.77
Koebnick	Obese	40	0.04	0.03	0.13	31.1	1,243.94
Koebnick	Severe Obese	40	0.04	0.03	0.03	6.66	266.35
Koebnick	Overweight	40	0.04	0.02	0.27	121.43	4,857.23
Koebnick	Obese	40	0.04	0.02	0.13	69.97	2,798.87
Koebnick	Severe Obese	40	0.04	0.02	0.03	14.98	599.29
Koebnick	Overweight	40	0.04	0.01	0.27	485.72	19,428.93
Koebnick	Obese	40	0.04	0.01	0.13	279.89	11,195.49
Koebnick	Severe Obese	40	0.04	0.01	0.03	59.93	2,397.16
Koebnick	Overweight	40	0.04	0.005	0.27	1,942.89	77,715.73
Koebnick	Severe Obese	40	0.04	0.005	0.13	1,119.55	44,781.97
Koebnick	Severe	40	0.04	0.005	0.03	239.72	9,588.63

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