

Parental Perception of Their Child's Weight Status and Associated Demographic Factors

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Abstract

The purpose of this cross-sectional descriptive study was to examine the accuracy of parental perception of their child's weight status and describe characteristics of those who accurately and inaccurately perceive their child's weight status. This study utilized data from the CARDIAC project which spanned from 2006-2009. Chi-square analysis was used to determine relationships between parental perception of their child's weight status and the child's actual weight status. Results indicate that parents have a higher level of accurate parental perception of their child's weight status than in previous studies.

Keywords: Childhood obesity, Parental perception, Appalachia

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The prevalence of obesity in children suggests that parents should recognize their child as obese. However, the continuing problem of childhood obesity has not significantly decelerated. The most recent data from the National Health and Nutrition Examination Survey (NHANES) showed no significant change in the prevalence of overweight children and adolescents between 1999-2000 and 2007-2008 data except for an increase in 6-19 year old males who were ≥ 97 th percentile of body mass index (BMI) for age and gender (Ogden, Carroll, Curtin, Lamb, & Flegal, 2010).

Previous studies suggest that parents do not accurately perceive their child as overweight or obese (Adams Quinn, & Prince, 2005; Cottrell et al., 2007; West et al., 2008; Wake, Salmon, Waters, Wright, & Hesketh, 2002; Etelson, Brand, Patrick, & Shirali, 2003; Myers & Vargas, 2000; Jain et al., 2001; Baughcum, Chamberlin, Deeks, Powers, & Whitaker, 2000; Baughcum, Burklow, Deeks, Powers, & Whitaker, 1998). Accurate or inaccurate perception has been studied in special populations related to race, ethnicity and culture with emphasis on overweight or obese children (Intagliata, Ip, Gesell, & Barkin, 2008). Significantly higher percentages of obese children live in rural areas. The obesity rate in rural areas is 16.5% compared to an urban rate of 14.8% (Liu et al., 2007). The clustered states of WV, KY, TN, NC, TX, SC, MS, and LA have the highest rate of obesity in the nation (Liu et al., 2007). The majority of these states are in the

Appalachian region (Appalachian Regional Commission, 2012). Mothers in WV, which is the only state entirely in the Appalachian area reported inaccurate perception of their child's weight status (Cottrell et al., 2007).

As studies have evaluated obese and overweight children (Adams et al., 2005; Cottrell et al., 2007; West et al., 2008; Wake et al., 2002; Etelson et al., 2003; Myers & Vargas, 2000; Jain et al., 2001; Baughcum et al., 2000; Baughcum et al., 1998), little emphasis has been placed on accurate or inaccurate perception of normal or underweight children. Demographic factors of parents who inaccurately perceived their overweight child's weight status have been studied, however, demographic factors of parents who are accurate in perceiving their child's weight status at any weight class has not been investigated in Appalachia.

Accurate perception of their child's weight status should guide the nutritional environment of families. Environmental factors that contribute to obesity, such as overeating and inactivity, are learned in childhood and may contribute to the development of obesity (Golan, 2006). Families harbor obesity. If one parent is obese, the child has a 50% chance of becoming obese. If both parents are obese, the child has an 80% chance of becoming obese. Obese children have a 70% chance of being overweight or obese as adults (U.S. Surgeon General, 2001). The eating patterns of the parent are modeled to the child (Birch & Fisher, 1998). Unless the parents perceive their child's weight status as a health risk, change will not occur (Murtagh, Dixey, & Rudolf, 2006).

Given the increased prevalence of obese children in rural areas and importance of parental involvement in their children's health status, the following aims were identified:

1. Evaluate accuracy of parental perception of their child's weight status as compared to their child's actual body status determined by Center for Disease Control and Prevention (National Center for Health Statistics, 2009) of BMI percentiles (age, gender, height, and weight) in a sample of Appalachia parents.
2. Evaluate the relationship of selected demographic variables (rural designation, education, age, gender, and socioeconomic status) among parents who are accurate and parents who are inaccurate in perceived weight status of their child.

Review of the Literature

Accuracy of Parental Perception of Their Child's Weight Status

Parental perception of their child's weight status involves body image perception projected to their child's body shape and habitus. Parental perceptions of their child's body image are reflected in multiple studies. The literature clearly reflects inaccurate parental perceptions when their child is designated as overweight (Adams et al., 2005; Cottrell et al., 2007; West et al., 2008; Wake et al., 2002; Etelson et al., 2003; Myers & Vargas, 2000; Jain et al., 2001; Baughcum et al., 2000; Baughcum et al., 1998).

In a study of 622 mothers of overweight children, 79% did not perceive their child as overweight (Baughcum et al., 2000). Of the group, 99 mothers had overweight or obese children. In a similar WIC population of Hispanic mothers (Olvera-Ezzell, Power, & Cousins, 1990), 38 mothers were assessed for accurate perception of their child's weight status. Sixty-one percent did not recognize their child as overweight. Parental perception was evaluated before and after a state-wide screening program in Arkansas (West et al., 2008). In this study, 60% of parents underestimated their child's weight at baseline. Parents of younger children were more likely to underestimate (65%) than parents of adolescents (51%). One year after measurement, accurate perception improved to 53% ($p < .0001$).

In a largely Hispanic population, Myers and Vargas (2000) questioned 200 parents of overweight children aged 2-5 years with open-ended questions about the size of their child. Using only direct visualization of their child's body, parents answered questions about weight and health concerns. Parents did acknowledge health risks, specifically cardiac risks (72%), however, 35% of parents did not perceive their child as obese. A similar study (Etelson et al., 2003) asked 83 parents to assess their 4-5 year old child's weight status by plotting their perception on a ruler with extremely underweight and extremely overweight at each end point of the scale after viewing standard growth cards (National Center for Health Statistics, 2000). Only 10.5% of the parents accurately identified their child as overweight in the overweight group of children. Not only was inaccurate perception noted in the obese population, but also only 41% of parents with normal weight children demonstrated accuracy in plotting their child's weight status.

Parental perception of their child's weight status has been studied in vulnerable populations including Native-Americans and Appalachians. Three tribes from Wisconsin were assessed for accurate perception of their child's weight status. Participants included 366 parent-child dyad participants from kindergarten through second grade. Twenty-six percent of children were overweight ($\geq 95^{\text{th}}$ percentile) and 19% were at risk for overweight ($\geq 85^{\text{th}}$ to $< 95^{\text{th}}$ percentile). Caregivers recognized only 15.1% of overweight children. Factors predictive of accurate perception included the child having a BMI $> 99^{\text{th}}$ percentile (Adams et al., 2005). In an additional study, body mass index (BMI) information was collected during the Coronary Artery Risk Detection In Appalachian Communities (CARDIAC) Project. Screening procedures revealed that 37 (33.6%), 14 (22.2%), and 23 (32.4%) of the kindergarten, fifth, and ninth grade students were at risk for being overweight or were already overweight. In the group, of at risk for being overweight or overweight, 62.2% of kindergarten parents, 57.1% of 5th grade parents, and 43.5% of 9th grade parents perceived their children to be of healthy weight (Cottrell et al., 2007).

Demographic Factors Related to Accurate and Inaccurate Parental Perception

Educational status. Baughcum et al. (2000) identified lower educational status of the mother as an associated factor of inaccurate parental perception of their child's weight status. Forty-five percent of mothers who inaccurately perceived their child's weight status had lower education, noted in this study, as high school degree or less. Obesity (BMI $\geq 30\text{kg/m}^2$) was more common in the lower education group (30% vs. 14%) and children of parents with lower education were more overweight (weight-for height-percentiles $\geq 90^{\text{th}}$; 19% vs. 14%). A similar study conducted in Milan, Italy (Genovesi et al., 2005) described an inverse correlation between parental misperception of their child's weight status and maternal education. A group of 569 mother-child couples were evaluated by questionnaire and anthropometric measures. A significant association was noted between the mother's educational level and weight status based on BMI. Both mothers ($p = .002$) and children ($p = .02$) with a higher prevalence of overweight and obesity were in a lower educational class. Perception of their child's obesity ($p = .008$) was less in the lower educational class.

Poverty. Poverty is associated with poor parental perception of their child's weight status. Six of the previously reviewed studies (Etelson et al., 2003; Myers & Vargas, 2000; Jain et al., 2001; Baughcum et al., 2000; Baughcum et al., 1998; Hackie & Bowles, 2007) have documented inaccurate parental perception of their child's weight status using predominately Women, Infant, and Children (WIC) families. WIC is a federal program. The usual income eligibility requirements state that the recipients be between 100 percent of the Federal poverty guidelines, issued each year by the Department of Health and Human Services, but cannot be more than

185% of the Federal poverty income guidelines (United States Department of Agriculture, 2009). Comparable studies were not conducted in populations that were designated as predominately higher income brackets.

Race, ethnicity, and culture. Accurate or inaccurate perception has been studied in special populations related to race, ethnicity and culture. One-hundred and eleven African American families were screened during a diabetes prevention study (Intagliata et al., 2008). A substantial number of the children were obese (69%). However, only 44% of the care givers perceived the child's weight to be a health problem. Parental perception of their child's overweight status has been evaluated in populations that were predominately Latino (Intagliata et al., 2008) and Hispanic (Hackie & Bowles, 2007). Mother-child dyads (n=123) recruited from a Latino community were assessed by questionnaires and anthropometric measurements. Mothers in WV, which is the only state entirely in the Appalachian area, reported inaccurate perception of their child's weight status in the CARDIAC study. Parents, with children in three age groups, reported inaccurate perception of their child's weight status (Cottrell et al., 2007).

Age and gender of child. Parental inaccuracies have been associated with the age of the child. Baughcum et al. (2000), Myers and Vargus (2000), Etelson et al. (2003), Adams et al. (2005), Carnell, Edwards, Croker, Boniface, and Wardle (2005), and Hackie and Bowles (2007) studied populations of children under the age of 6 years. As previously cited, Baughcum et al. reported an inaccuracy rate of 79%, Myers and Vargus 89.5%, Etelson et al. 89.5%, Adams, et al. 84.9%, Carnell et al. 82.9%, and Hackie and Bowles 61%.

As children age, accurate perception by parents of the child's weight status improved. Eckstien et al. (2006) noted that parents of children age 6 and older had 56% accurate perception, versus 18% of children younger than six years of age, in overweight children. Maynard, Galuska, Blanck, & Serdula (2003) studied a large population of 5500 children ages 2-11. Significant improvement in accuracy was noted at 7.8 years of age for both boys and girls. In another study by Wald et al. (2007) accuracy rates of 17% for parents of children aged 3-5 years and 61.7% for children aged 6-12 were noted.

Studies of older children and teens demonstrate a better relationship between age and accurate perception. A study of 15,483 teens (Goodman, Hinden, & Khandelwal, 2000) demonstrated parental accuracy of 32% of their teen's weight status. West et al. (2008) noted parents of older children more prone to correctly estimate their weight status. Sixty-five percent of parents with children <13 years of age reported inaccurate weight status perception compared to 51% of parents with children \geq 13 years of age.

Gender has been studied as a modifying factor in parental perception. Studies by Wake et al. (2002), West et al. (2008) and Goodman et al. (2000) did not note a significant difference in parental perception related to gender. However, Wald et al. (2007) noted parental perception was more accurate for females at 63% compared to 46% for males. Crouch, O'Dea, & Battisti (2007) noted a near significant level ($p = .056$) of health concern for parents of females who were overweight. Maynard et al. 2003 noted parental perception to be more accurate for females at 29% compared to males at 14.0%.

Limitations of Existing Knowledge

Studies investigating parental perception overwhelmingly support that parents do not see their child as obese (Adams et al., 2005; Cottrell et al., 2007; West et al., 2008; Wake et al., 2002; Etelson et al., 2003; Myers & Vargas, 2000; Jain et al., 2001; Baughcum et al., 2000; Baughcum et al., 1998). Five of the studies (Etelson et al., 2003; Myers & Vargas, 2000; Jain et al., 2001; Baughcum et al., 2000; Baughcum et al., 1998) used predominately WIC families,

representing lower socio-economic status than the general population. Lower education as an influence is not consistently defined in the studies. Education, socio-economic status, race, ethnicity, and culture have strong associations with inaccurate parental perception of their child's weight status.

Studies considering age as a factor in accurate parental perception noted that accuracy is lower in children under six years of age (Adams et al., 2005; Baughcum et al., 2000; Etelson et al., 2003; Hackie & Bowles, 2007; Myers & Vargas, 2000) than children aged six and older (Eckstein et al., 2006; Maynard et al., 2003; Wald et al., 2007). Tanner staging also distorts perception, however, accuracy in teens was found to be more accurate than children less than six years of age (Goodman et al., 2000; West et al., 2008). Gender, as a factor in accurate parental perception, is not always noted (Goodman et al., 2000; Wake et al., 2002; West et al., 2008), although three studies noted that females were more often perceived as overweight by parents that accurately perceived their child as overweight (Crouch et al., 2007; Maynard et al., 2003; Wald et al., 2007).

The existing literature provides numerous studies related to accurate or inaccurate parental perception of their child's weight status. Most of the studies were performed in preschool-aged children; few studies used larger populations of school aged children. When compared to urban areas, rural populations have a higher rate of obesity (Liu et al., 2007). Accurate or inaccurate parental perception of their child's weight status has not been studied specifically in these populations using normal weight children. Within Appalachia, demographic factors have not been used in comparing parents who are accurate verses inaccurate in perceiving in their child's weight status.

Methodology

Sample

The study used existing data from the Coronary Artery Risk Detection In Appalachian Communities (CARDIAC) study collected during the years of 2005-2009 from eight counties. CARDIAC is a cardiovascular screening project for West Virginia children in kindergarten (CARDIAC-Kinder), second (CARDIAC-Too), and fifth grade (CARDIAC-Kid). All 5th graders in West Virginia were eligible to participate in the screening program. All kindergarten and second grade students in select counties were also eligible to participate. Each screening was conducted within the school setting and was free for all participants. The program continues to be supported by the Claude Worthington Benedum Foundation and the West Virginia (WV) Department of Health and Human Services.

Parents or legal guardians of all children who participated in the CARDIAC health screening in eight counties between 2006 and 2009 were eligible to complete a questionnaire related to health behaviors and attitudes titled "Environmental Determinants of Physical Activity in Children". Data from this questionnaire were used for this study. All procedures for the original study were approved by the Institutional Review Board (IRB) for the Protection of Human Subjects at West Virginia University. The request for approval of this secondary analysis was added to the original IRB application as an addendum and approved.

Treatment of Data

CARDIAC data sets were received from the CARDIAC project in three age groups: (1) kindergarten, (2) second grade, and (3) fifth grade. Data sets for the CARDIAC project from the 2006 to 2009 time period were used for this study. Eight counties in WV were represented in the data.

The data sets contained two components of the CARDIAC project: 1) anthropometric and demographic data measured and recorded by CARDIAC team members from the CARDIAC screening that the child participated in, and 2) the questionnaire “Environmental Determinants of Physical Activity in Children” containing self-reported data completed by parents of children participating in the project during eligible years and from participating counties. Specific data from each component were selected and placed in data sets for three cohorts: kindergarten, second grade, and fifth grade. Anthropometric measurements used in this study included the child’s BMI percentile. Further recoding was necessary to categorize the BMI into categories of underweight, normal weight, overweight, and obese. Cardiac team members linked the anthropometric and demographic data for the student and the questionnaire reported by the parent for that child. Data sets were received in an SPSS file and were cleaned, prepped, and de-identified by CARDIAC team members.

CARDIAC Data Extraction

Anthropometric measures. The method for measuring children in the CARDIAC study has been used for the duration of the project. A child’s weight status was reported as BMI percentiles obtained from measurements taken by CARDIAC project staff members. Height (cm) and weight (kg) were obtained by measuring to the tenth digit using the SECA Road Rod stadiometer (78”/200cm) and the SECA 840 Personal Digital Scale. Both SECA stadiometer and digital scales have been incorporated in national and international measurement studies of children’s obesity for over 5 years (*Seca - seca sensa 804.*). Standard calculation for each child’s BMI was based on the recommended equation from the CDC (weight (kg)/height (cm)² X 10,000) (Hammer, Kraemer, Wilson, Ritter, & Dornbusch, 1991; Pietrobelli et al., 1998). Weight percentile categories were based on age-and gender-specific growth charts recommended by the CDC. Children’s BMI percentiles are categorized into 4 groups (Hammer et al., 1991; Pietrobelli et al., 1998): underweight (<5th percentile), normal weight (from the 5th to the 84.9th percentile), overweight (between the 85th and 94.9th percentiles) and obese (95th% and above). For this data, the CARDIAC Project recruited West Virginia Rural Health Education Partnership (WVRHEP) students to assist with measurements. The WVRHEP students were health science students from schools of medicine, nursing, dentistry, pharmacy, as well as students of physical therapy. CARDIAC staff and local school nurses train WVRHEP students to conduct anthropometrical testing.

Parent Questionnaire. The questionnaire, “Environmental Determinants of Physical Activity in Children” was also completed by a sub sample of CARDIAC participants. One parent or legal guardian of each participating child answered a series of questions exploring their child’s cardiovascular risk. Validated questions developed from a previous study (Cottrell et al., 2007) assessed parent health knowledge, and parent health attitudes.

Variables

Parental Perception

Parental perception of their child’s weight status was evaluated by comparison of the parent’s response to the question, “Compared to other children the same age and gender, how would you describe your child’s weight (fill in only one): very underweight, slightly underweight, about the right weight, slightly overweight, and very overweight.” Accurate perception was defined as: very underweight or slightly underweight as associated with BMI’s less than the 5th percentile, about the right weight associated with BMI’s at or above the 5th

percentile to less than the 85th percentile, slightly overweight associated with BMI's at or above the 85th percentile to less than the 95th percentile, and very overweight associated with BMI's equal to or greater than the 95th percentile (U.S. Department of Health and Human Services, 2006).

Demographic Factors

Educational status was assessed using the demographic tool completed by parents. The categories were: 8th grade education or less, some high school, high school graduate or GED, some college or technical training, college graduate, and completed graduate school. The response is given by filling in the corresponding circle next to the given responses. Parents complete the demographic sheet and the tool reflected whether the mother or father is completing the form.

The socioeconomic status of the population was determined using the Census Bureau equation of family size and composition. For this study, the socioeconomic status of the participants and families was described using a proxy measure of poverty level in the county of residence. This was determined by the ZIP Codes taken from the CARDIAC data which was categorized into counties. The socioeconomic status of the participants was then determined by the ZIP code of the participant, compared to the county designation of percent of poverty of that county for children ages 0-17 living in poverty as determined by the Census Bureau (U.S. Census Bureau, 2012). Three categories were designed to describe level of poverty for the county in which the child and family reside: Level 1, poverty level 10%-15% of population designated as living in poverty, Level 2, 16%-25% of population designated as living in poverty, and Level 3, 26% and above of population designated as living in poverty (United States Department of Agriculture, 2010).

Race/ethnicity was determined based on the self-report of parents from the CARDIAC questionnaire completed by the parent. Categories on this questionnaire included: Black, Hispanic, White, Asian, Bi-racial, and Other. Since the state of West Virginia is entirely in the Appalachian area, all participants were assumed to be members of the Appalachian culture due to their West Virginia residence.

Counties of residence were classified using Rural-Urban Commuting Area Codes (RUCA) to distinguish rurality (United States Department of Agriculture, 2009). Based on definitions of rural, (*ERS/USDA data - rural definitions: Data documentation and methods*) The Economic Research Service of the United States Department of Agriculture (USDA) defines nine methods of operationalizing rural. RUCA codes define rural areas based on the same theoretical principles and information used by the Office of Management and Budget (OMB). RUCA codes allow rural definitions based on metropolitan, micropolitan, and small town commuting areas. RUCA primary codes 4-10 are designated as rural (<http://www.ers.usda.gov/data/ruraldefinitions>). This designation of rural was used in this study. RUCA codes from the three cohorts were categorized as "rural" (RUCA codes 4-10) and non-rural (RUCA codes 1-3). Comparison of responses by parents related to the child's gender was determined based on answers from the CARDIAC screening, either male or female.

Analysis

Data Analysis

Data were analyzed using the Statistical Package for Social Science (SPSS) Graduate Pack for Windows (2004) computer software program. After data cleaning, and removal of any

subjects with impossible values or greater than 10% of the necessary data elements missing, descriptive statistics were used to describe the sample. Each group of students from kindergarten, second grade, and fifth grade was evaluated. The BMI of every child in the sample was calculated using their correct weight and height; then compared to the appropriate CDC guidelines for BMI percentiles in children by age. Parametric testing was used after meeting all assumptions. All analyses used a level of $p < .05$ to designate statistical significance. Because this study uses previously collected data, a post hoc power analysis was completed, considering the actual number of useable cases available from a larger data set.

To analyze parental perception of their child's weight status and the actual weight status, chi-squares were used to determine whether there was a relationship between a child's weight status and his or her parent's perception of that weight status. Differences in selected demographics between parents who accurately perceive their child's weight status and parents who inaccurately perceive their child's weight status was evaluated by subdividing children into groups where parents accurately and inaccurately perceived their weight status. Chi-square analysis was used to compare demographic variables between the groups.

Results

Sample Description

Demographics of children and families. Race was originally reported in five categories, however, few responses were given in categories of Black, Asian, Hispanic, Bi-Racial, and other (kindergarten total $n = 919$; Black, Asian, Hispanic, Bi-Racial, and other $n = 53$; second grade total $n = 703$ Black, Asian, Hispanic, Bi-Racial, and other $n = 133$; fifth grade total $n = 297$, Black, Asian, Hispanic, Bi-Racial, and other $n = 16$). Therefore, two groups were created: a) Caucasian and b) all other races (Black, Asian, Hispanic, Bi-Racial, or other). This met the assumptions for chi-square.

Due to the small numbers of responses for level of education below high school for the mothers in all cohorts (kindergarten $n = 32$; second grade $n = 20$; fifth grade $n = 7$), these categories were collapsed for chi square analysis to reflect high school (HS) or less as one category, while other educational categories from the original data set were kept intact. Socio-economic status was described using county designation of the participant and economic status of that county as given by the U.S. Census Department and the United States Department of Agriculture in three levels: Level 1, 10%-15% of population designated as living in poverty; Level 2, 16%-25% of population designated as living in poverty; and Level 3, 26% and above of population designated as living in poverty.

Demographics of kindergarten cohort. The kindergarten cohort was the largest sample. Multiple characteristics of that sample were explored. There were 957 participants in this group. In this cohort, 71.7 % of the children were under or normal weight and gender was almost equally distributed (48.6%; 51.4%). The majority of kindergarten children were Caucasian (94.3%). Slightly less than one-half (47%) of that population lived in counties with 10%-15% of the populations living in poverty. The majority of their families lived in counties designated non-rural (63.1%). Most mothers had post-high school education (57.6%). A detailed description of sample demographics appears in Table 1.

Table 1

Kindergarten Cohort: Demographics and Child's BMI Category

	Characteristic	Frequency	Percent
Child's Gender	Female	444	48.6
	Male	486	51.4
Child's Race	White	866	94.3
	All other races	53	5.7
Poverty Level (Designated at living in poverty)	Level 1, 10%-15%	440	47.0
	Level 2, 16%-25%	350	37.4
	Level 3, 26% and above	146	15.6
RUCA	Non-Rural (RUCA codes 1-3)	591	63.1
	Rural (RUCA codes 4-10)	345	36.9
Mother's Education	HS or less	105	24.8
	Some Post HS college or tech	117	27.5
	Undergraduate degree	128	30.1
	Graduate school	75	17.6
Child's BMI Category	Underweight	35	4.0
	Normal weight	590	67.6
	Overweight	120	13.8
	Obese	127	14.6
Person Completing Form	Mother	855	93.9
	Father	39	4.2
	Other	17	1.9

Second grade cohort. The demographic characteristics of the second grade cohort were obtained from 608 participants with 54.2% females and 45.8% males. More than one-half of the second-grade children were under or normal weight (66.4%). Caucasian was the predominant race in this cohort. The majority of the mothers reported post high school education. Most of the participants (47.3%) lived in counties that contained 10%-15% of the population living in poverty. The majority of the families of the second grade children lived in areas designated as non-rural (72.2%). See Table 2 for detailed demographic data.

Fifth grade cohort. The demographic patterns of the fifth grade cohort were described with 304 participants; 54.8% females and 45.2 % males. In fifth grade children, more than one-half of the participants were under or normal weight (56.6%). Again, the predominant race was Caucasian (94.6%). No information was given as to who completed the demographic form in this cohort.

The economic composition of the fifth grade cohort was varied. For this group, the percentage living in poverty level 1 (10%-15% of the population designated as living in poverty, 41%), and poverty level 2, (16%-25% of population designated as living in poverty, 42.9%) were nearly equal. The majority of the families lived in areas designated as rural (60.9%). The majority of the mothers reported post high school education. Further detailed data are found in Table 3.

Table 2

Second Grade Cohort: Demographics and Child's BMI Category

	Characteristic	Frequency	Percent
Child's Gender	Female	329	54.2
	Male	278	45.8
Child's Race	White	570	94.5
	All other race	133	5.5
Poverty Level (Designated at living in poverty)	Level 1, poverty level 10%-15%	287	47.3
	Level 2, 16%-25%	212	34.9
	Level 3, 26% and above	108	17.8
RUCA	Non-Rural (RUCA codes 1-3)	411	72.2
	Rural (RUCA codes 4-10)	158	27.8
Mother's Education	HS or less	117	23.9
	Some Post HS college or tech	135	27.6
	Undergrad degree	153	31.3
	Grad school	84	17.2
Child's BMI Category	Underweight	17	2.8
	Normal weight	386	64.2
	Overweight	90	15.0
	Obese	108	18.0
Person Completing Form	Mother	534	92.4
	Other Adult Female	12	2.1
	Father	29	5.1
	Other Adult Male	2	.4

Parental Responses

Recoding responses. Accurate and inaccurate parental perception of their child's weight status as related to BMI percentiles was evaluated. To calculate parental perception of their child's weight status, data were recoded for two categories of perception responses. Too few responses were given in perceived categories of underweight and obese to meet chi-square assumptions. Therefore, responses that were perceived as "underweight" were combined with perceived "normal weight" and responses perceived as "obese" were combined with perceived "overweight". To be consistent with the combined categories of perceived weight status, the child's actual weight status or BMI category was also recoded. Thus, the BMI categories for the child's actual weight were collapsed to reflect under/normal weight as one category and overweight/obese as the second category in the BMI variable.

Results of Analysis

Kindergarten cohort. In the kindergarten cohort, a significant relationship between accurate parental perceptions of their child's weight status and the child's actual weight status ($p < .001$) was found. Among groups of the kindergarten children perceived by their parents to be about the right weight or less, 78.2% of kindergarten children were actually under or normal weight. Of the kindergarten children perceived by their parents to be about the right weight or less, 21.8% of the children were actually overweight and obese. Of the kindergarten children perceived by their parents to be slightly overweight and overweight, 7.5% of those children were actually underweight or normal weight and 92.5% were overweight/obese (Table 4).

Table 3

Fifth Grade Cohort: Demographics Variables and Child's BMI Category

	Characteristic	Frequency	Percent
Child's Gender	Female	165	54.8
	Male	136	45.2
Child's Race	White	281	94.6
	All other races	16	5.4
Poverty Level (Designated at living in poverty)	Level 1, 10%-15%	116	41.1
	Level 2, 16%-25%	121	42.9
	Level 3, 26% and above	45	16.0
RUCA	Metro counties (RUCA codes 1-3)	119	39.1
	Non-metro counties (RUCA codes 4-7)	185	60.9
Mother's Education	HS or less	53	39.6
	Some Post HS college or tech	29	21.6
	Undergrad degree	36	26.9
	Grad school	16	11.9
Child's BMI Category	Underweight	4	1.3
	Normal	163	54.9
	Overweight	54	18.2
	Obese	76	25.6

Cohort second grade. In the second grade cohort, a significant relationship was noted between parental perception of the child's weight status and the child's actual weight status ($p < .001$). Of the second grade children perceived by their parents to be about the right weight or less, 80.6% were under/normal weight. However, 19.4% of the children perceived as under/normal weight were actually overweight/obese. Of the second grade children perceived to be slightly overweight and overweight, 9.3% were under or normal weight children and 90.7% were overweight/obese (Table 4).

Fifth grade cohort. Parents of children in the fifth grade cohort also demonstrated a significant relationship between perception of their child's weight status and their actual weight status ($p = .002$). In the fifth grade cohort, 44.1% of children perceived by their parents to be about the right weight or less were under/normal weight. In the same group, 55.9% were actually overweight/obese. Of the fifth grade group perceived to be slightly overweight and overweight, 24.1% were under/normal weight and 75.9% were overweight/obese (Table 4).

Demographics

To determine the possible impact of demographics between parents who accurately and inaccurately perceive their child's weight status, chi-square analyses were performed. Demographic variables consisted of: gender, race, poverty level, child's BMI category, rurality, and mother's education. This question did not require recoding of child's BMI category.

Table 4

Parental Perception and Actual BMI Status

Cohort	Perception	Under/Normal BMI	Overweight/Obese BMI	χ^2	<i>p</i>
Kindergarten	About right/under	(n = 615) 78.2%*	(n = 244) 21.8%	178.202	< .001
	Slightly Overweight/ Overweight	7.5%	92.5%*		
Second Grade	About right/under	(n = 624) 80.6%*	(n = 239) 19.4%	204.738	< .001
	Slightly Overweight/ Overweight	9.3%	90.7%*		
Fifth Grade	About right/under	(n = 111) 44.1%*	(n = 179) 55.9%	9.926	.002
	Slightly Overweight/ Overweight	24.1%	75.9%*		

Kindergarten cohort. For the parents of children in kindergarten, there was a statistically significant relationship between whether or not the parent was accurate in the perception of the child's weight status and the child's gender ($p < .001$). In parents with daughters, 45.7% were inaccurate and 54.3% were accurate in their perception of the child's weight status. Of the parents with sons, 49.1% were inaccurate while 50.9% were accurate in weight perception of their child. There was also a statistically significant relationship between whether or not the parent was accurate in the perception of the child's weight status and the child's BMI category ($p < .001$). In groups of parents of children with BMIs categorized as underweight, 68.6% were inaccurate and 31.4% were accurate in perceiving their child's weight status. In parents of normal weight BMIs children, 22.0% were inaccurate and 78.0% were accurate. Parents with children having BMIs in the overweight category were 95.8 % inaccurate and 4.2% accurate. In parents with children in BMI groups considered obese, 92.9% were inaccurate and 7.1% were accurate in weight perception (Table 5). No relationship was found between race, poverty level, rural status, or mother's education and accurate parental perception of their child's weight status.

Second grade cohort. No relationship was found between gender, poverty level, rural designation, or mother's education and accurate parental perception of their child's weight status. A significant relationship between whether or not the parent was accurate or inaccurate in the perception of their child's weight status as related to race ($p = .002$). Parents of Caucasian children demonstrated 52.3% inaccuracy and 47.7% accuracy in weight status perception. Parents of children categorized as "all other races" had inaccurate perception of 24.2% and accurate perception of 75.8% of their child's weight status (Table 6). A statistically significant relationship was noted in the child's BMI category ($p < .001$).

Table 5

Kindergarten Cohort: Gender and BMI Category as Related to Parental Accuracy

(n)	Females (441)	Males (468)	χ^2	P	Under weight (35)	Normal weight (590)	Over weight (120)	Obese (127)	χ^2	P
Parental Perception			5.84	<.001					377.54	<.001
Accurate	54.3%	50.9%			31.4%	78.0%	21.8%	7.1%		
Inaccurate	45.7%	49.1%			68.6%	22.0%	95.8%	92.9%		

In groups of parents whose child's BMI was categorized as underweight, 35.3% were inaccurate and 64.7% were accurate in perceiving their child's weight status. In parents of children with BMIs categorized as normal, 33.2% were inaccurate and 66.8% were accurate. Parents with children having BMIs in the overweight category were 77.8 % inaccurate and 22.2% accurate. Parents with children in BMI groups considered obese were 89.8% inaccurate and 10.2% accurate in weight perception. In parents whose BMI category was designated as underweight, 56.0% were not accurate and 44.0% were accurate in perceiving their child's weight.

Table 6

Second Grade Cohort: Race and BMI Weight Category as Related to Parental Accuracy

Race (n)	Caucasian (570)	Non- Caucasian (33)	χ^2	p	Under weight (17)	Normal weight (386)	Over weight (90)	Obese (108)	χ^2	p
Parental Perception			9.81	.002					141.51	<.001
Accurate	47.7%	75.8%			64.7%	66.8%	22.2%	10.2%		
Inaccurate	52.3	24.2%			35.3%	33.2%	77.8%	89.8%		

Fifth grade cohort. In the 5th grade cohort there was a significant relationship between whether or not the parent was accurate in the perception of the child's weight status ($p < .001$) and the child's gender ($p < .001$). In parents with daughters, 38.2% were inaccurate and 61.8% were accurate in their perception of the child's weight status. Of the parents with sons, 61.0% were inaccurate while 39.0% were accurate in their weight perception of their child (Table 7).

In cases where the child's BMI was categorized as underweight, 100.0% were accurate in perceiving their child's weight status. In parents whose children had BMIs in the normal weight category, 26.4% were inaccurate and 73.6% were accurate. Parents with children having BMIs in the overweight category were 61.1 % inaccurate and 38.9% accurate. In parents with children in BMI groups considered obese, 86.8% were inaccurate and 13.2% were accurate in weight perception (see Tables 7). No relationship was found between race, poverty level, rural designation, or mother's education and accurate parental perception of their child's weight status.

Table 7

Fifth Grade Cohort: Gender as Related to Parental Accuracy

Gender (n)	Females (165)	Males (136)	χ^2	<i>p</i>	Under weight (17)	Normal weight (386)	Over weight (90)	Obese (108)	χ^2	<i>p</i>
Parental Perception			15.58	<.001					83.90	<.001
Accurate	65.8%	34.2%			100.0%	73.6%	38.9%	13.2%		
Inaccurate	43.2%	56.8%			00.0%	26.4%	61.1%	86.8%		

Discussion

Limitations of Secondary Data

While secondary data are a valuable resource, use of such data presents certain limitations. The data were collected for defined purposes, not specifically for the aims of this study. Therefore, data analysis required redefining variables and re-categorizing of data elements to meet the objectives of this study. These changes resulted in decreased variability of the data potentially impacting the results. Re-categorizing the data was performed with vigilance to preserve the original definition of the variables while balancing the need to have adequate responses in each category.

Parental perception of their child's weight status was assessed using questions from the study that asked parents to evaluate their child's appearance to other children of the same age and gender. Considering the rate of obesity in the general population of children in WV (Neal et al., 2006), this method of questioning and comparison could be limiting. In this study, it could not be determined if the parent was comparing their child to another child in the normal weight category. If comparison of the child's weight status was to children who were overweight or obese, parental accuracy would naturally be distorted.

The secondary data used in this study did not adequately represent the population of West Virginia as related to educational status. A higher level of education was noted in the respondents than in the general population of West Virginia (*West Virginia Quick Facts from the US Census Bureau*). Another limitation of this study was the need to use a proxy measure of socioeconomic status of respondents for analyses. This method is not reflective of the individual family. Limitations were noted with respect to geographic location in this study. RUCA codes were used to classify rural or urban dwelling of the family. Lack of representation of every county in the state in the original data set allowed only certain RUCA codes to be represented. The location of the data collection sites in the Appalachian area suggests a prevalence of Appalachian culture in the respondents. However, this study does not account for residents living in the area who would not self-identify as a member of the Appalachian cultures by virtue of in-migration or other factors.

Parental Perception of Child's Weight Status and Associated Demographic Factors

Parental perception of their child's weight status was often accurate as compared to the child's actual BMI category in this sample. Accurate parental perception of their child's weight status was highest among kindergarten children and declined to its lowest rate in parents of fifth grade children. This is in direct contrast to other studies of parental recognition of their child's weight status. The perceptions of the parents in this study, as compared to other studies, were

more accurate than those of parents reported in the literature (Baughcum et al., 2000; Myers & Vargas 2000; National Center for Health Statistics, 2000; Hackie & Bowles, 2007; West et al., 2008; Cottrell et al., 2007). The contrast in results could be explained by the larger sample of children in this study than noted in previous studies, as well as the similarity of ages in each of the cohorts in this study. Higher educational level of the parents may have influenced perception of the parents regarding their child's weight status in this study. Also, the time lapse since the previous studies were completed could account for the difference, since education on children's obesity has been initiated in the media (Baughcum et al., 2000; Myers & Vargas 2000; National Center for Health Statistics, 2000; Hackie & Bowles, 2007; Jeffery, Voss, Metcalf, Alba, & Wilkin, 2005; West et al., 2008; Cottrell et al., 2007).

Parental perception of their child's weight status was related to the child's BMI category. To further investigate aspects of accurate and inaccurate parental perception of their child's weight status, BMI categories were re-expanded into the four original categories: a) underweight, b) normal weight, c) overweight, and d) obese and then compared only to established accurate and inaccurate parental perception. When accurate parental perception of their child's weight status was compared to BMI categories, differences in parental accuracy of their child's weight status at each BMI category were identified. There was a major decrease in parental accuracy at the obese category in all cohorts. The major decrease in parental accuracy in the obese category is difficult to explain. Perhaps the line between overweight and obesity is not clear to parents. One previous study did evaluate parental perception of their child's weight status and included categories other than overweight and obese. West et al. (2008) noted less than one-half of parents with children having BMIs in the underweight category were accurate in weight perception. Other studies were conducted primarily with overweight children without a distinction between overweight and obese, and BMI categories were not always used for comparison to parental perception of their child's weight (Baughcum et al., 2000; Myers & Vargas 2000; National Center for Health Statistics, 2000; Hackie & Bowles, 2007).

Differences in accurate parental perception related to the age of the child in this study varied from the literature. Accurate parental perception of their child's weight status appeared to decline as the child got older in this study. Other studies in the literature demonstrated lower accuracy in children younger than 6 years of age (West et al., 2008) and higher accuracy in children older than 6 years of age (Eckstein et al., 2006; Maynard et al., 2003; Wald et al. 2007).

The influence of Appalachian culture and beliefs may be responsible for the discrepancy in agreement of parental perception of their child's weight status. Appalachian culture holds the belief that heavier children are stronger and better equipped for sports. As the child ages, parents may perceive that the size of the child demonstrates sustenance and hardiness. Thin, or even normal weight children are often seen as disadvantaged with less ability to withstand illness and other adverse situations. Parent's beliefs that they have performed well in nurturing their child by feeding them adequately are reinforced through having a child who is heavier (Cochran, 2005; Cochran, 2008; Trombini et al., 2003). However, lack of knowledge as to whether the sample would self-identify as an Appalachian remains a limitation.

In this study, gender of the child was related to accurate parental perception of their child's weight status in parents of kindergarten and fifth grade children. Parents of younger children were more accurate in perceiving their daughter's weight status than their son's. This finding is consistent with previous studies that found parental accuracy in perception of their child's weight status more consistently in daughters than sons (Crouch et al., 2007; Maynard et al., 2003; Wald

et al., 2007). Society's generalized acceptance of larger males, while females are expected to be smaller, may explain these findings (Cafri & Thompson, 2004; McCreary, 2002).

Other contributing factors for accurate parental perception varied among the cohorts. Modifying factors of race, education, and poverty had limited impact on accurate parental perception of their child's weight in all cohorts in this study. Previous studies found high levels of inaccurate perception in WIC populations which included homogeneous respondents from lower socioeconomic status and lower educational levels groups (Etelson et al., 2003; Myers & Vargas, 2000; Jain et al., 2001; Baughcum et al., 2000; Baughcum et al., 1998). Baughcum et al. (2000) identified lower educational status of the mother as an associated factor of inaccurate parental perception of their child's weight status. These studies, however, were conducted primarily with lower income families (income at or below 185% of the U.S. Poverty Income Guidelines), making the impact of income versus education is difficult to ascertain.

Implications for practice. As the growth and development of the child progresses, various age related interventions should be considered. In infancy, nurses can assist parents in perceiving normal weight status for their infant and reinforce that an overweight baby does not imply a "healthy" baby. The infant's nutritional self-regulation and hunger cues can be taught and reinforced to parents. For children with a BMI status that is overweight or obese, nurses must understand that the literature describes parental perception of their child as personal and subjective. The high prevalence of obesity in second and fifth grade in this sample demonstrates a need for nursing interventions early, preferably prior to second grade. Interventions should be targeted in these age groups, especially for parents of male children. Programs that emphasize athletes with normal BMIs could serve as cues to action in promoting likelihood of change for parents of overweight or obese children. Noting that parents recognized their child as overweight when their child was in the obese category promotes targeting this group of parents for intervention, since recognition of the problem has occurred and change may follow.

Since obesity in children is not a "billable" diagnosis in primary care, repeat visits for this diagnosis may not occur. Nurses can lobby to create changes in billing practices to include the diagnosis of obesity for children as well as the associated diagnosis of hypertension and metabolic syndrome, thereby facilitating closer primary care follow-up of these problems for children.

Opportunities for further study. Replication of this study in geographic areas that contain a larger population of racially diverse families should be considered. Other age groups of children should be included in the study to evaluate the impact of physical development on parental perception of their child's weight status. Perception of weight status and associated health risks should be expanded and studied in children as well.

Conclusion

It is necessary for a parent to accurately perceive their child's weight in order for them to take action related to food provision and consumption patterns. Some groups may be at a greater risk for inaccurate perception. Association of obesity and health risks must be evaluated to determine the meaning of accurate parental perception of their child's weight status. Future research should support the development of childhood obesity tools, parental and family intervention strategies and methods of evaluating change in food provision and consumption patterns in children.

References

- Adams, A. K., Quinn, R. A., & Prince, R. J. (2005). Low recognition of childhood overweight and disease risk among native-American caregivers. *Obesity Research, 13*, 146-152. [MEDLINE]
- Appalachian Regional Commission. (2012). ARC: *Maps*. Retrieved from http://www.arc.gov/appalachian_region/MapofAppalachia.asp
- Baughcum, A. E., Burklow, K. A., Deeks, C. M., Powers, S. W., & Whitaker, R. C. (1998). Maternal feeding practices and childhood obesity: A focus group study of low-income mothers. *Archives Pediatric Adolescent Medicine, 152*, 1010-1014. [MEDLINE]
- Baughcum, A. E., Chamberlin, L. A., Deeks, C. M., Powers, S. W., & Whitaker, R. C. (2000). Maternal perceptions of overweight preschool children. *Pediatrics, 106*, 1380-1386. [MEDLINE]
- Birch, L. L., & Fisher, J. O. (1998). Development of eating behaviors among children and adolescents. *Pediatrics, 101*, 539-549. [MEDLINE]
- Cafri, G., & Thompson, J. K. (2004). Measuring male body image: A review of the current methodology. *Psychology of Men & Masculinity, 5*(1), 18-29.
- Carnell, S., Edwards, C., Croker, H., Boniface, D., & Wardle, J. (2005). Parental perceptions of overweight in 3-5 y olds. *International Journal of Obesity, 29*(4), 353-355. [MEDLINE]
- Cochran, J. (2008). Empowerment in adolescent obesity: State of the science. *Online Journal of Rural Nursing & Health Care, 8*(1), 63-73.
- Cochran, J. (2005). *Appalachian culture: Bringin' it home: Appalachian culture*. Paper presented at the *In Rural Culture: West Virginia's Legacy*. West Virginia Geriatric Association.
- Cottrell, L. A., Minor, V., Murphy, E., Ward, A., Elliott, E., Tillis, G., . . . Neal, W. A. (2007). Comparisons of parent cardiovascular knowledge, attitudes, and behaviors based on screening and perceived child risks. *Journal of Community Health Nursing, 24*(2), 87-99. [MEDLINE]
- Crouch, P., O'Dea, J. A., & Battisti, R. (2007). Child feeding practices and perceptions of childhood overweight and childhood obesity risk among mothers of preschool children. *Nutrition & Dietetics, 64*, 151-158.
- Eckstein, K. C., Mikhail, L. M., Ariza, A. J., Thomson, J. S., Millard, S. C., & Binns, H. J. (2006). Parents' perceptions of their child's weight and health. *Pediatrics, 117*, 681-690. [MEDLINE]
- Etelson, D., Brand, D. A., Patrick, P. A., & Shirali, A. (2003). Childhood obesity: Do parents recognize this health risk? *Obesity Research, 11*, 1362-1368. [MEDLINE]
- Genovesi, S., Giussani, M., Faini, A., Vigorita, F., Pieruzzi, F., Strepparava, M. G., & Valsecchi, M. G. (2005). Maternal perception of excess weight in children: A survey conducted by paediatricians in the province of Milan. *Acta Paediatrica, 94*, 747-752. [MEDLINE]
- Golan, M. (2006). Parents as agents of change in childhood obesity - from research to practice. *International Journal of Pediatric Obesity, 1*(2), 66-76.
- Goodman, E., Hinden, B. R., & Khandelwal, S. (2000). Accuracy of teen and parental reports of obesity and body mass index. *Pediatrics, 106*(0031-4005; 1), 52-58. [MEDLINE]
- Hackie, M., & Bowles, C. L. (2007). Maternal perception of their overweight children. *Public Health Nursing, 24*(6), 538-546. [MEDLINE]
- Hammer, L. D., Kraemer, H. C., Wilson, D. M., Ritter, P. L., & Dornbusch, S. M. (1991). Standardized percentile curves of body-mass index for children and adolescents. *American Journal of Diseases of Children, 145*(3), 259-263. [MEDLINE]

- Intagliata, V., Ip, E. H., Gesell, S. B., & Barkin, S. L. (2008). Accuracy of self- and parental perception of overweight among Latino preadolescents. *North Carolina Medical Journal*, 69(2), 88-91. [MEDLINE]
- Jain, A., Sherman, S. N., Chamberlin, L. A., Carter, Y., Powers, S. W., & Whitaker, R. C. (2001). Why don't low-income mothers worry about their preschoolers being overweight? *Pediatrics*, 107, 1138-1146. [MEDLINE]
- Jeffery, A. N., Voss, L. D., Metcalf, B. S., Alba, S., & Wilkin, T. J. (2005). Parents' awareness of overweight in themselves and their children: Cross sectional study within a cohort (EarlyBird 21). *British Medical Journal (Clinical Research Edition)*, 330(7481), 23-24. [MEDLINE]
- Liu, J., Bennett, K., Harun, N., Zheng, X., Probst, J., & Pate, R. (2007). Overweight and physical inactivity among rural children aged 10-17: A national and state portrait 11. Columbia, SC: South Carolina Rural Health Research Center. Retrieved from <http://rhr.sph.sc.edu> .
- Maynard, L. M., Galuska, D. A., Blanck, H. M., & Serdula, M. K. (2003). Maternal perceptions of weight status of children. *Pediatrics*, 111, 1226-1231. [MEDLINE]
- McCreary, D. R. (2002). Gender and age differences in the relationship between body mass index and perceived weight: Exploring the paradox. *International Journal of Men's Health*, 1(1), 31-42.
- Murtagh, J., Dixey, R., & Rudolf, M. (2006). A qualitative investigation into the levers and barriers to weight loss in children: Opinions of obese children. *Archives of Diseases in Children*, 91, 920-923. [MEDLINE]
- Myers, S., & Vargas, Z. (2000). Parental perceptions of the preschool obese child. *Pediatric Nursing*, 26, 23-30. [MEDLINE]
- National Center for Health Statistics. (2000). *Center for disease control growth charts: United States*. Retrieved from http://www.cdc.gov/growthcharts/cdc_charts.htm
- Neal, W., Minor, V., Elliott, E., Cotterell, L., Tillis, G., Nicololoso, P. & Murphy, S. (2006). *CARDIAC project*. Retrieved from <http://www.cardiacwv.org/>
- Ogden, C. L., Carroll, M. D., Curtin, L. R., Lamb, M. M., & Flegal, K. M. (2010). Prevalence of high body mass index in US children and adolescents, 2007-2008. *JAMA: Journal of the American Medical Association*, 303(3), 242-249. [MEDLINE]
- Olvera-Ezzell, N., Power, T. G., & Cousins, J. H. (1990). Maternal socialization of children's eating habits: Strategies used by obese Mexican-American mothers. *Child Development*, 61, 395-400. [MEDLINE]
- Pietrobelli, A., Faith, M. S., Allison, D. B., Gallagher, D., Chiumello, G., & Heymsfield, S. B. (1998). Body mass index as a measure of adiposity among children and adolescents: A validation study. *Journal of Pediatrics*, 132, 204-210.
- Seca -seca sensa 804*. Retrieved from <http://www.seca.com/english/uk/home>
- Trombini, E., Baldaro, B., Bertaccini, R., Mattei, C., Montebanocci, O., & Rossi, N. (2003). Maternal attitudes and attachment styles in mothers of obese children. *Perceptual & Motor Skills*, 97(0031-5125; 2), 613-620. [MEDLINE]
- U.S. Surgeon General. (2001). *The Surgeon General's call to action to prevent and decrease overweight and obesity*. U.S. Department Of Health and Human Services. Retrieved from <http://www.surgeongeneral.gov/topics/obesity/calltoaction/CalltoAction.pdf>
- U.S. Census Bureau. (2007). *How the Census Bureau Measures Poverty*. Retrieved from <http://www.census.gov/hhes/www/poverty/about/overview/measure.html>

- U.S. Department of Health and Human Services. (2007). *Tools for calculating body mass index (BMI)*. Retrieved from http://www.cdc.gov/nccdphp/dnpa/growthcharts/bmi_tools.htm
- United States Department of Agriculture. *Women, infants, and children: Income eligibility guidelines*. Retrieved from <http://www.fns.usda.gov/wic/howtoapply/incomeguidelines.htm>
- United States Department of Agriculture (2010). *County level data sets- percent of total population living in poverty* [Date file]. Retrieved from <http://www.ers.usda.gov/data-products/county-level-data-sets/poverty.aspx>
- United States Department of Agriculture (2012). *Economic Research Services rural definitions: Data documentation and methods* [Date file]. Retrieved from <http://www.ers.usda.gov/data/ruraldefinitions/documentation.htm>
- Wake, M., Salmon, L., Waters, E., Wright, M., & Hesketh, K. (2002). Parent-reported health status of overweight and obese Australian primary school children: A cross-sectional population survey. *Internal Journal of Obesity Related Metabolic Disorders*, 26, 717-724. [[MEDLINE](#)]
- Wald, E. R., Ewing, L. J., Cluss, P., Goldstrohm, S., Cipriani, L., Colborn, D. K., & Weissfeld, L. (2007). Parental perception of children's weight in a paediatric primary care setting. *Child: Care, Health & Development*, 33, 738-743. [[MEDLINE](#)]
- West Virginia Quick Facts from the US census bureau*. Retrieved from <http://quickfacts.census.gov/qfd/states/54000.html>
- West, D., Raczynski, M., Phillips, M., Bursac, Z., Gauss, C., & Montgomery, B. (2008). Parental recognition of overweight in school-age children. *Obesity*, 16, 630-636. [[MEDLINE](#)]