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Average Beverage Intake and Average BMI in 2-5 Year Old WIC Children

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By

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ABSTRACT

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in 2-5 Year Old WIC Children

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Average Body Mass Index (BMI) and beverage intake were examined to determine if children who drank excessive amounts of beverages had a higher BMI than children who drank average amounts of beverages. Ninety-six WIC charts were reviewed. Average total fluid intake was 32.5 oz/day. For juice and total milk, the average intakes were 11.9 oz/day and 15.6 oz/day, respectively. The average intake of other drinks was 2.4 oz/day. Average BMI of children who drank excessive amounts and average amounts of total fluids was 16.143$\pm$1.60 and 16.457$\pm$1.90, respectively. No statistically significant differences were found between BMI and the consumption of total fluids, juice, milk, or other drinks. This study indicates excessive beverage intake is not related to obesity in children. WIC nutritionists and dietitians should continue encouraging juice and milk intake into a child's daily food plan, by using *The Food Guide Pyramid for Young Children Ages 2-6 Years Old*.

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CHAPTER I

Introduction

Since 1977, pediatricians, nurses, and parents have used pediatric growth charts to track the physical growth of infants, children, and adolescents in the United States. The original charts were developed by the National Center for Health Statistics (NCHS), as a clinical tool for health professionals to determine if the physical growth of a child is adequate or inadequate (National Center for Health Statistics [NCHS], 2000). The charts consist of a series of curves called "percentiles" that illustrate the distribution of children across the country according to selected body measurements (NCHS, 2000). Growth plots give one of the best overall indicators that things are going well for a child medically, nutritionally, emotionally, and in terms of the feeding relationship (Satter, 2000, p. 36).

Once the original charts were developed, the NCHS recommended for them to be revised periodically. As the charts became universally accepted and implemented into pediatrics, some concerns arose surrounding the data methods used to construct the 1977 charts. The charts were revised in 2000 (NCHS, 2000). The revised set of growth charts consists of 16 charts (8 for boys and 8 for girls). These charts represent revisions to the 14 existing charts as well as the introduction of two new charts, Body Mass Index (BMI)-for-age charts for boys and girls ages 2-20 years old (NCHS, 2000).

BMI is used to judge whether an individual's weight is appropriate for their height. BMI is the most commonly used approach to determine if adults are overweight or obese and is also the recommended measure to determine if children are overweight (NCHS, 2000). For many people, overweight begins in childhood and tracks into adulthood (Center for Disease

Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion [CDC NCCDPHP], 2001). Once a person becomes overweight, reduction and maintenance are extremely difficult to achieve, so prevention is by far the most effective solution to the problem. The new BMI charts allow healthcare providers to detect, at early ages, children who are showing signs of being at risk for obesity (NCHS, 2000).

The BMI charts can be used clinically at age 2 years, when accurate stature can be obtained (NCHS, 2000). The BMI charts were created for use in place of the 1977 weight-for-stature charts, as they are considered to be a more accurate tool for screening for obesity (CDC NCCDPHP, 2001). CDC NCCDPHP (2001) defines childhood obesity for children 2-20 years old as a BMI for age and gender $\geq 95^{th}$ percentile. Children with a BMI above this cut off point are more likely to be obese, at risk for remaining obese, and are more likely to have future adverse outcomes, than those classified as overweight by lower percentile cutoffs (CDC NCCDPHP, 2001). Children with a BMI between the 85^{th} and 95^{th} percentile are considered to be at risk for becoming overweight (NCHS, 2000; CDC NCCDPHP, 2001). Children at greatest risk for developing obesity are children of obese parents, children from low-income families, and children of Hispanic origin (Christoffel & Ariza, 1998). In addition, childhood obesity has been linked with decreased physical activity and specific dietary factors.

A child's growth during the preschool years is characterized by a continued, steady increase in body size. The body's rate of growth slows from its high rate in infancy and stabilizes at a roughly constant rate by about 5 years of age (Queen & Lang, 1992, p. 4). Body proportions change significantly after the 1^{st} year with little head and trunk growth

(Lucas, 1996, p. 258). Children's limbs begin to lengthen, which gives a more mature body proportion (Lucas, 1996, p. 258). Between the ages of 1 and 2 years old, an average child grows about 12 cm in stature and gains about 3 kg (6.5 lbs.) in weight (Lucas, 1996, p. 258; Queen & Lang, 1992, p. 4). By the age of 4 years, the average annual increase in stature is down to about 6 to 8 cm (2.5-3.5 inches) per year (Lucas, 1996, p. 258; Queen & Lang, 1992, p. 4). Sex differences in stature and weight during early childhood are slight, but the pattern of more adipose tissue in girls than boys appears in the value of mean skin fold measurements after the age of 2 years (Queen & Lang, 1992, p. 4). Fat generally decreases during the early childhood years, reaching a minimum at approximately age 6 (Lucas, 1996, p. 258). After that, body fat increases ("the adiposity rebound") in preparation for the pubertal growth spurt (Lucas, 1996, p. 258).

One successful supplemental food program, the WIC (Women, Infants, and Children) program, monitors growth in eligible children ages 1-5 years old at nutritional risk and provides specific supplemental food packages, which include eggs, cereal, cheese, milk, juice, and beans or peanut butter. The Pediatric Nutrition Surveillance System (PedNSS) (1999), which collects and analyzes growth parameters in WIC children across the United States, found in 1999 that for the past 6-8 years the Cabell County WIC program had more than the average number of obese children in West Virginia. With these facts, Cabell County WIC Program is a prime site for assessing BMI as a measurement for obesity in relation to dietary factors.

The population that will be studied is Cabell WIC children ages 2-5 years old. Charts will be reviewed with a focus on areas of the current 24-hour dietary recall, height, weight, and risk codes.

Value of the Study

Since the 1999 PedNSS data has reported that Cabell County WIC has had an above average number of obese children for several years, it is important to determine factors that may play a role in the weight and height of children. In addition, it will determine if specific beverages and amounts have an effect on BMI. This is important because WIC provides juice and milk in adequate amounts for children 1-5 years old. The results of this study may provide insight on dietary factors that are related to the high number of obese children in the Cabell County WIC Program. In addition, it can be used as a pilot study for the state.

Statement of the Problem

Do urban WIC children ages 2-5 years old who drink more beverages have a greater BMI than urban WIC children ages 2-5 years old who drink fewer beverages?

Hypotheses

The following hypotheses were developed:

1. There will be no significant differences in BMI between children who drink excessive amounts (>36 fluid ounces/day) of total fluids and children who drink average amounts (≤36 fluid ounces/day) of total fluids.
2. There will be no significant differences in BMI between children who drink excessive amounts (≥12 fluid ounces/day) of 100% juice and children who drink average amounts (<12 fluid ounces/day) of 100% juice.

3. There will be no significant differences in BMI between children who drink ≥16 fluid ounces of milk and children who drink <16 fluid ounces of milk daily.
4. There will be no significant differences in BMI between children who drink excessive amounts (≥12 fluid ounces/day) of other drinks (Kool-Aid, soda pop, and fruit drinks) and children who drink average amounts (<12 fluid ounces/day) of other drinks

Limitations

The sample population was made up of WIC clients' ages 2-5 years old in an urban setting. Chart reviews were done to collect data for this study. The following limitations were considered when interpreting the results for this study:

1. Charts were not selected randomly. Charts were reviewed on days the researcher was available.
2. Accuracy of the current 24-hour dietary recall was the payee's/proxy's responsibility. The payees and proxies received no additional education on how to fill out the 24-hour dietary recall sheet prior to this study.
3. The number of subjects was limited.
4. Accuracy of the readability of BMI percentiles.

Assumptions

The researcher assumed that the WIC payee or proxy filled out the 24-hour dietary recall sheet accurately and all information reported was truthful. Another assumption is that weight and height were measured properly and accurately. The next assumption is that the WIC participants in this study will be representative of the total population of Cabell County WIC participants. The final assumption is that any differences in demographic characteristics

compared to other urban WIC Programs in West Virginia will be minimal and not have an effect on the results of this study.

Definitions of Terms

Body Mass Index (BMI)- Weight in kilograms divided by the square of height in meters. Used to provide a guideline based on height and weight to determine underweight and overweight (CDC NCCDPHP, 2000).

Center for Disease Control and Prevention (CDC)- Recognized as the lead federal agency for protecting the health and safety of people- at home and abroad, providing credible information to enhance health decisions, and promoting health through strong partnerships (CDC, 2002).

Childhood Obesity- Defined as body mass index for age and sex $\geq 95^{th}$ percentile (CDC NCCDPHP, 2000).

*Children- Persons who have had their first birthday but have not yet attained their fifth birthday.

*Clinic- A facility where applicants are certified.

C-tad- A computer printout with a collection of data that was entered by WIC staff for that participant and visit. The C-tad contains the WIC participant's DOB, ethnicity, current nutritional risk codes, current height, weight, and growth chart percentiles, and the nutrition education that was provided to that client.

*Food Instrument- Means a voucher, check, electronic benefits transfer card, coupon or other document, which is used by a participant to obtain supplemental foods.

Growth Chart- Consist of a series of curves called "percentiles" that illustrate the distribution of children across the country (United States), according to selected body measurements (NCHS, 2000).

National Center for Chronic Disease Prevention and Health Promotion (NCCDPHP)- A CDC organization that focuses on preventing premature death and disability from chronic diseases, and promotes healthy personal behavior (CDC, 2002).

National Center for Health Statistics (NCHS)- A CDC organization that provides statistical information that will guide actions and policies to improve the health of the American people (CDC, 2002).

*Nutritional Risk- Means: (a) detrimental or abnormal nutritional conditions detectable by biochemical or anthropometrical measurements; (b) other documented nutritionally related medical conditions; (c) dietary deficiencies that impair or endanger health; (d) conditions that directly affect the nutritional health of a person, including alcoholism or drug abuse; or (e) conditions that predispose persons to inadequate nutritional patterns or nutritionally related medical conditions, including but not limited to, homelessness and migrancy.

*Participant- Means pregnant women, breastfeeding women, postpartum women, infants and children who are receiving supplemental foods or food instruments under the program, and the breastfed infants of participant breastfeeding women.

Payee- The person who signs the WIC participant agreement, which lists the rights of the participant and the rules of the program.

Preschooler- Between the ages 2 and 6 years old (USDA, 1999).

*Proxy- Any person designated by a woman participant, or by a parent or caretaker of an infant or child participant, to obtain and transact food instruments or to obtain supplemental foods on behalf of a participant.

The Special Supplemental Nutrition Program for Women, Infants and Children (WIC Program)- Designed to improve the health of low-income, nutritionally at-risk infants, children, and pregnant, postpartum, and breastfeeding women by providing supplemental food, nutrition education, and health care referrals (Oliveira & Gundersen, 2000).

24-Hour Dietary Recall- A record of foods eaten by a person for one 24-hour period. (Whitney & Rolfes, 2002, p. E-3).

*Federal Register Definitions

CHAPTER II

Literature Review

Body Mass Index

In March of 1997, the Maternal and Child Health Bureau, Health Resources and Services Administration and the Department of Health and Human Services convened a conference in Washington DC to develop guidance for physicians, nurse practitioners, dietitians/nutritionists, and others who care for overweight children. The expert committee members were chosen for their clinical and research experience in the field of pediatric obesity. The expert committee reported, a clinically useful assessment of obesity must reflect excess body fat and still be simple to use (Barlow & Dietz, 1998).

Body mass index (BMI), expressed as body weight in kilograms divided by the square of height in meters (kg/m2), is a weight-for-height index that meets these criteria (Barlow & Dietz, 1998). The body mass index formula and table for calculated body mass index values for selected heights and weights for ages 2-20 years are available through the CDC NCCDPHP website (CDC NCCDPHP, 2000). BMI can be used to judge whether an individual's weight is appropriate for their height (NCHS, 2000). BMI is the standard obesity assessment in adults and its use in children provides a consistent measure across age groups (Barlow & Dietz, 1998). The International Task Force on Obesity (ITFO) met in June of 1997 in Dublin for a workshop on childhood obesity and they also agreed that BMI provides a reasonable index of adiposity in children (Dietz & Bellizzi, 1999).

Since 1977, pediatric growth charts have been the gold standard is assessing and monitoring growth in U.S. children 0 to 20 years old (NCHS, 2000). These growth charts

consist of a series of curves called "percentiles" that illustrate the distribution of children across the country according to selected body measurements (NCHS, 2000). In 2000, the NCHS released revised reference growth curves, which included two new charts. These charts were body mass index for age for boys and girls ages 2-20 years old (CDC NCCDPHP, 2001).

Appropriate cut off values to diagnosing obesity should minimize false-positive results, that is, only a few children who are not obese will be above the cutoff (Barlow & Dietz, 1998). Although this approach misclassifies some obese children who fall below the cutoff, it avoids the potential psychological and physical harm of misclassifying and treating children who are not obese (Barlow & Dietz, 1998). The NCHS took the recommendations from the U.S. expert committee, who came to the consensus that children with a BMI $\geq 95^{th}$ percentile for age and gender should undergo in-depth medical assessment (Barlow & Dietz, 1998). In 2000, the NCHS developed guidelines to interpret BMI for age in children and adolescents (CDC NCCDPHP, 2001). CDC NCCDPHP (2001) defined childhood obesity as a BMI-for-age and gender $\geq 95^{th}$ percentile, children at risk for obesity is a BMI-for-age and gender $\geq 85^{th}$ percentile, and children who are underweight is defined as a BMI-for-age and gender $\leq 5^{th}$ percentile.

Advantages

One advantage of using BMI in children and adolescents is that it compares well to laboratory measures of body fat. Lazarus, Baur, Webb, and Blyth (1996) compared Dual-energy X-ray Absorptiometry (DXA), a relatively recent laboratory method for studying body composition, including adiposity, to BMI. Lazarus et al. (1996) found that there were no

significant differences between the two screening methods in the 85th and 95th percentile cutoff points. This study demonstrated that the cutoff points that have been recommended appear to offer a reasonable compromise between true and false-positive points (Lazarus et al., 1996).

According to the NCHS (2000), another advantage of using BMI in children is it relates to health risk. Larger body mass index values (BMI in kg/m2) are associated with increased morbidity and mortality in adulthood and there are significant correlations between BMI values in childhood and in adulthood. Guo, Roche, Chumlea, Gardner, and Siervogel (1994) examined the predictive value of childhood BMI for overweight at 35 $\pm$ 5 years, defined as BMI >28 for men and >26 for women. Analyses of data for 555 white children indicated that overweight at 35 years old could be predicted from BMI at younger ages. Guo et al. found the prediction is excellent at age 18, good at age 13, but only moderate at ages younger than 13 years old. For 18-year-olds with a BMI value exceeding the 60th percentile, the odds of overweight at 35 years old were 34% for men and 37% for women (Guo et al., 1994).

Childhood Obesity

The prevalence of childhood obesity has been steadily increasing over the past several decades and has become an increasing public health concern in developed countries. It is the most common nutritional problem among children in the United States and is now considered a disease of epidemic proportions. The general rise in obesity (both in children and adults) is associated with long lasting physical and mental health consequences and a cost of approximately $100 billion a year in the United States. Researchers have found that childhood obesity is associated with a variety of physiological and psychological problems

such as diabetes, hypertension, respiratory diseases, adult obesity, low self-esteem, and eating disorders (Mackenzie, 2000).

Mei, Scanlon, Grummer-Strawn, Freedman, Yip, and Trowbridge (1998) examined the prevalence of obesity in 15,029,147 low-income children 0 to 59 months through the Center for Disease Control Pediatric Nutrition Surveillance Data sets from 1983-1995. Mei et al. (1998) found the prevalence of overweight for the children 0 to 59 months old in the period increased from 18.6% in 1983 to 21.6% in 1995, based on the weight-for-height 85th percentile cutoff point. This indicates that obesity is not only on the rise for older children, adolescents, and adults, but also our youngest population children <5 years old (Mei et al., 1998).

Modifiable Factors

Obesity has been linked to interaction between environmental and genetic factors. It has been found that children who have 1 obese parent have approximately a 40% chance of becoming obese and children with 2 obese parents have an approximately 80% chance of becoming obese (Mackenzie, 2000). There are a variety of factors both non-modifiable and modifiable that are associated with the risk of obesity. Two modifiable factors, which can play a role in a child's risk for obesity, are physical activity and diet.

Physical Activity

In today's society, children are becoming less active and spending more time engaged in sedentary activities. Many of the current guidelines for energy intake are based on estimates of energy expenditure, but more recently, however, actual measurements of daily energy expenditure in children have been conducted. These studies suggest that current

recommendations for energy intake, especially in young children are too high and actual total energy expenditure (TEE) is lower than previous estimates, by as much as 20% in children 0 to 3 years old and 25% in children less than 10 years old (Goran, Poehlman, & Johnson, 1995).

In addition, parental obesity and low levels of physical activity are correlated with decreased physical activity in children (Strauss, 1999). The opposite is also true; children of active parents are six times more likely to be active than when neither parent is active (Mackenzie, 2000). Increased television viewing is associated with higher rates of childhood obesity (Crespo, Smit, Troiano, & Bartlett, 2001).

Gortmaker, Must, Sobol, Peterson, Colditz, and Dietz (1996) reported a dose response relationship between the number of hours of television viewing and the incidence of obesity with the odds of becoming overweight 8.3 times greater for those watching more than 5 hours of television a day. In this same study, they found about 33% of youth view 5 or more hours of television daily. This is well above the daily viewing time of 2 hours or less that is recommended by the American Academy of Pediatrics (Mackenzie, 2000). Strauss (1999) reports watching television decreases the time available for exercise and activity, while encouraging the snacking and consumption of energy dense foods. Moreover, more than 90% of foods advertised on television are high in fat, salt, sugar, and consuming them further contributes to obesity (Strauss, 1999).

Diet

A variety of nutrients and foods have been studied to determine if they increase or decrease the risk of obesity in children, but most of these studies involve older children and

very few studies involve preschool age. Two areas that appear to be most studied for preschool age children is fat and beverage intake.

Fat Consumption. Nutritional surveys in children indicate that the prevalence and degree of obesity are related to the amount of fat consumed (Strauss, 1999). Although, in the past 20 years, since the National Health and Nutrition Examination Survey II (NHANES II) (1976-1980), the percentage of calories from total fat has decreased slightly for 3 to 5 year old preschool children (from 34 to 33%), the percentage of children and adolescents who meet the dietary goals for total fat and saturated fat are low (Alaimo, McDowell, & Briefel, 1994). Data from the CSFII (1995) found that 31 to 37% of children 3 to 19 years old met the total fat goal, and 23 to 38% met the goal for saturated fat. These estimates, however, have improved since Phase I, NHANES III (1988-1991), when only 15-23% of those aged 2-19 years met the total fat goal and 7 to 9% met the saturated fat goal (Alaimo, et al., 1994). It is estimated that children consume 1/3 of meals outside of the home, often at fast food restaurants where foods typically have 45% to 55% of their calories from fat (Mackenzie, 2000).

A study done by Klesges, Klesges, Eck, and Shelton (1995) evaluated the determinants of accelerated weight gain over 3 years in a cohort of 146 preschool children. Higher levels of percent of calories from fat were associated with greater increases in BMI, as were recent increases in percent of calories from fat. Total caloric intake did relate to weight gain, however, when fat calories were entered into the regression equation, it explained more of the variance in weight gain than total energy intake. This suggests that for preschool children, the percent of calories from total fat is an important contributor to accelerated weight gain. In

addition, this study found that modifiable diet/activity variables together accounted for 33% more of the variance in BMI changes than the combined set of non-modifiable variables such as parental obesity (Klesges et al., 1995).

Beverage Consumption. During 1992 and 1993, a cross sectional study by Dennison, Rockwell, and Baker (1997) evaluated juice consumption and its effects on growth parameters in 168 children from middle to low socioeconomic status in rural upstate New York. A seven-day consecutive dietary record was collected for each child. Dietary data was entered into computer software. Each child's daily consumption of beverages-milk (all types), fruit juice (100% juice, all varieties), soda pop, and other drinks (including fruit drinks, fruit punches, Kool-Aid, ect,) but excluding water was determined. Each child's height and weight was collected. For the purpose of these analyses short stature was defined as $<20^{th}$ percentile for height for age and BMI cutoffs for obesity were defined as $>75^{th}$ percentile for age and sex. The children were divided into two groups: 2 and 5 year olds (Dennison et al., 1997).

The two age groups of children consumed a similar amount of milk (9.8 and 11.0 fl. oz/day for 2 and 5 year olds, respectively) and fruit juice (5.9 and 5.0 fl oz/day for 2 and 5 year olds, respectively). The older children consumed more soda pop and other beverages. In this study, the majority (39%) of the fruit juice consumed was mixed fruit juice. The children's consumption of milk and juice did not differ by primary caretaker education or income status (as reflected by participating in the food stamp program and/or WIC program), however, soda pop was higher in 2-year old children whose parents received food assistance compared with those who did not and was inversely related to primary caretaker's education (Dennison, Rockwell, & Baker, 1997).

Among 2 year olds those who consumed excess fruit juice were 3 times as likely to be short, as children who consumed less fruit juice. There was no evidence that children who were drinking excess fruit juice were substituting fruit juice for milk. In conclusion, this study found that the consumption of >12 fluid ounces /day of fruit juice by young children was associated with short stature and with obesity (Dennison, Rockwell, & Baker, 1997)

A study by Skinner and Carruth (2001) found contradictive results. This longitudinal study examined beverage intakes of 72 white children (from middle to upper socioeconomic status families residing in the vicinity of a Southern U.S. city). Beverage intake was examined by reviewing seven in home interviews per child by one of two registered dietitians when each child was between 24 and 72 months of age. Seven sets of 3-day dietary information (a 24 hour recall and 2 food records including 1 weekend day) were collected from the mothers of the children. The collected dietary data was analyzed for beverage intake, categorized as juice (100% juice), milk, carbonated beverages, and other drinks (lemonade, tea, and juice drinks). In addition, the following growth parameters were also taken for each child at 72 months: height, weight, body mass index (measured as kg/m2), and ponderal index (measured as kg/m3) (Skinner & Carruth, 2001).

The children's mean longitudinal juice intake was 5.4 $\pm$ 3.8 oz/day and did not differ by gender. Juice intake decreased by 46% from 27 to 72 months. In addition, milk intake remained stable at 11 to 12 oz/day. Intakes of carbonated beverages and other drinks more than doubled. Also, it was found that the children <10^{th} percentile for height had less juice per day compared to taller children >10^{th} percentile. Similarly, the children who exceeded the 85^{th} percentile had less juice per day than the children for the group with BMI <85^{th}

percentile. There were no statically significant associations between juice intake and children's height, weight, or body mass index, as tested. As a result, this study found that juice intake was neither associated with short stature or overweight. Furthermore, as juice consumption decreased, intakes of less nutritious beverages increased (Skinner & Carruth, 2000).

According to the USDA's 1994 Continuing Survey of Food Intakes by Individuals (CSFII), children drinking more fruit juice were actually slightly taller with slightly lower BMI's. There were 441 children age 2-3 years old and 389 children 4 to 5 years old. In addition, this study found that children who consume higher levels of fruit juice tend to consume higher amounts of milk and lower levels of fruit drinks and soft drinks. This study agrees with Skinner and Carruth (2001) that fruit juice appears to be a substitute for beverages such as, soft drinks and fruit drinks, but not for milk in the diets of children (Nutrition Insights, 1997).

A study done on 548 older children (age 11.7 years, SD 0.8) from public schools in four Massachusetts communities who were followed for 19 months, examined the association between baseline and change in consumption of sugar-sweetened drinks, and difference in measures of obesity. Linear and logistic regression analyses adjusted for potentially confounding variables and clustering of results within schools. The results of this study suggested, that for each additional serving of sugar-sweetened drink consumed, both body mass index and frequency of obesity increased (Ludwig, Peterson, & Gortmaker, 2001).

WIC Program

Federal

The Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) is designed to improve the health of low-income, nutritionally at risk infants, children, and pregnant, postpartum, and breastfeeding women by providing supplemental food, nutrition education, and healthcare referrals. The WIC program, administered by the United States Department of Agriculture's Food and Nutrition Service, was established as a pilot program in 1972 and made permanent in 1974. The program is based on two premises: (1) that the inadequate nutritional patterns and health behavior of low-income women and children make them especially vulnerable to adverse health outcomes, and (2) that food intervention programs during critical times of growth and development can help prevent future medical and developmental problems (Oliveira & Gundersen, 2001).

Eligibility for the WIC program is limited to pregnant women, women up to six months postpartum who are not breastfeeding, breastfeeding up to 12 months postpartum, infants up to 1 year of age, and children up to their 5th birthday (West Virginia Department of Health and Human Resources [WVDHHR], 2001). To be eligible, family income must fall below 185% of poverty guidelines (Oliveira & Gundersen, 2001; WVDHHR, 2001). Income guidelines are based on family size (WVDHHR, 2001). WIC recipients must also be individually determined to be at "nutritional risk" by a health professional. Four major types of nutritional risk are recognized for WIC eligibility: (1) detrimental or abnormal nutritional conditions detectable by biochemical or anthropometrical measurements, such as anemia, low maternal weight gain, or inadequate growth in children; (2) nutritionally related medical conditions,

such as nutrient deficiency diseases, some specific obstetrical risks, or gestational diabetes; (3) dietary deficiencies that impair or endanger health, such as highly restrictive diets, inadequate diet, or inappropriate infant feeding; and (4) conditions, such as homelessness and migrancy, that predispose persons to inadequate nutritional patterns or nutritionally related medical conditions (Oliveira & Gundersen, 2001).

As a requirement of the WIC Program, the participant must be at nutritional risk. Since Congress limits WIC funding and these funds have not been sufficient to serve all eligible persons, the program directs the benefits to persons who need it most. When funds are insufficient to serve all eligible applicants, local WIC agencies fill vacancies based on a priority system (Oliveira & Gundersen, 2001). Priority is given to persons demonstrating medically based nutritional risks over dietary-based nutritional risks, and to pregnant and breastfeeding women and infants over children (Oliveira & Gundersen, 2001).

Most WIC participants receive checks or vouchers each month that allow them to purchase a monthly food package designed to supplement their diets at authorized food stores (Oliveira & Gundersen, 2001). A few locations use alternative food delivery systems. Food packages for children 1 to 5 years old consist of milk or cheese, iron-fortified cereal, 100% fruit and/or vegetable juice, eggs, and peanut butter or dry beans/peas (Oliveira & Gundersen, 2001). This food package is expected to reduce the prevalence of iron-deficiency anemia, improve diets, and improve physical and mental growth and development (Oliveira & Gundersen, 2001). Foods provided by WIC are high in five-target nutrients- protein, calcium, iron, and vitamins A and C, which are frequently lacking in the diets of the programs target population, and which may result in adverse health consequences (Oliveira & Gundersen, 2001). In

addition to these nutrients, the WIC food packages also provide vitamin D, folate, and vitamin B-6 (pyridoxine) (Oliveira & Gundersen, 2001). The WIC food package is not intended to meet the total nutritional needs of the participants, and participants are educated on ways to obtain the balance or necessary nutrients from other food sources.

State

There are a variety of food packages available for West Virginia WIC children ages 2-5 years old (West Virginia Department of Health and Human Resources [WVDHHR], 2000). There are also a variety of risk codes for West Virginia WIC participants (United States Department of Agriculture [USDA], 2000). One specific risk code, 512 for West Virginia and 425 for the national code, is "Inappropriate Feeding Practices for Children" which is in the "children" participant category and a priority level of V (USDA, 2000). Below are the definitions and cut-off values for this risk code.

Routine consumption or feeding of the following:

- 12 or more ounces of any fruit juice per day
- Non-fat or reduced fat milks as primary milk source between 12 and 24 months of age;
- Foods low in essential nutrients and high in calories that replace age-appropriate nutrient dense foods needed for growth and development between 12 and 24 months of age
- Foods of inappropriate consistency, size, or shape that put children less than 4 years of age at risk for choking.

Routine use of any of the following inappropriate feeding practices:

- Forcing a child to eat a certain type and/or amount of food

- Ignoring a child's request for appropriate foods
- Restricting a child's ability to consume nutritious meals at an appropriate frequency per day
- Not supporting a child's need for growing independence with self-feeding
- Feeding or offering a child primarily pureed or liquid foods when the child is ready and capable of eating foods of an appropriate texture.

The WIC Program's justifies why each specific area puts a child at risk, the justification for juice consumption of 12 or more ounces of fruit juice per day by young children being a risk is that juice may displace other more nutritious foods (USDA, 2000). The USDA's National WIC Nutritional Risk Criteria book (2000) also notes excessive juice intake has been linked with "failure to thrive" and gastrointestinal disturbances. In addition, it is noted some young children who consume excessive amounts of sorbitol-containing fruit juices can develop chronic non-specific diarrhea (USDA, 2000).

As mentioned earlier, juice is provided to participants monthly. Children ages 2-5 years on the Cabell County WIC Program receive the food package "57" which provides 6- 48oz containers of 100% juice or 6- 12 oz cans of the juice concentrate (WVDHHR, 2000). A variety of 100% fruit juices that are available to WIC participants. In addition, food package "57" provides children ages 2-4 years old 4 ½ gallons of milk (whole, 2%, skim, or chocolate) monthly (WVDHHR, 2000). This averages out for these children to receive daily approximately 9.2 oz and 19.2 oz of juice and milk, respectively. Unlike juice, WIC has no risk code or cut-off point for excessive milk intake.

Childhood Food Preferences and Patterns

Children's food acceptance patterns are developed by early learning and experiences with food (Birch, 1996). Some of these patterns may explain individual differences in children's adiposity and eating disorders (Birch, 1996). Food acceptance patterns are unique to each child and are influenced by a variety of factors, some unlearned and some learned (Birch, 1996). Innate unlearned responses to sweet, sour, and bitter tastes of food influence children's food-acceptance patterns (Mackenzie, 2000). Although at birth, children show a preference for a sweet taste and dislike for sour and bitter tastes, there is no evidence that children have an innate, unlearned preference for high fat or calorie-dense foods (Mackenzie, 2000).

Klesges, Stien, Eck, Isbell, and Klesges (1991) suggested that childhood food preferences and eating patterns are formed by parental food beliefs and eating habits. Parents tend to have foods that they like and eat in their homes, and with repeated opportunities to eat these foods, young children will include many of them in their diet. Gable and Lutz (2000) found similar results when they interviewed 65 parent-child pairs and found that children will eat high sugar, high fat, and junk foods if available in the home. In addition, a significant association was found between family meals and food availability, parents who reported eating more family meals on a weekly basis also reported more fruits and vegetables available in the home. A positive relationship between parent endorsement of authoritarian beliefs and the availability of sweets in the home and a negative relationship was found between inappropriate expectations of child nutrition and dairy products in the home (Gable & Lutz,

2000). Strauss (1999) reported if parents tend to enjoy high fat foods, their children would develop similar eating patterns.

Johnson and Birch (1994) demonstrated that children, whose parents had a tendency to eat uncontrollably even when not hungry, also had lower ability to regulate their energy intake. Quan, Salomon, Nitze, and Reicks (2000) found low-income mothers with young children, who have been successful in consuming high levels of fruits and vegetables, are those who practice specific behaviors, such as, starting the day with juice or fruit or eating a vegetable at dinner. Dennison, Rockwell, and Baker (1997) reported preschool-aged children's food preferences are best explained by sweet taste and exposure.

Normal Nutrition For 2-5 Years Old

Children's appetites begin to diminish around 1 year of age, and this is consistent with slowing growth. Children spontaneously vary their food intakes to coincide with their growth patterns; they demand more food during periods of rapid growth than during slow growth. Sometimes they seem insatiable, other times they seem to live on air and water (Whitney & Rolfes, 2002, p. 545).

The responsibility of the primary care provider is the what, when, and where of feeding. This includes controlling what food comes into the house, making and presenting meals, insisting that children show up for meals, making mealtime pleasant, teaching children to behave at the table, and regulating timing and content of snacks. It is the child's responsibility for how much he/she eats and whether he/she eats (Satter, 2000, p. 33).

Gable and Lutz (2000) found parental control of child eating showed a negative association with children's participation in extracurricular activities and a positive association with the

amount of television children watched. Research by Birch and Fisher (1995), indicates that as parents' control increases during mealtimes, children's ability to regulate their energy intake declines.

The U.S. Dietary Guidelines were meant to be achievable healthful goals for all Americans over the age of 2 years (Johnson & Nicklas, 1999; United States Department of Health and Human Services, 2001). The best tool for helping the U.S. public meet these guidelines is the Food Guide Pyramid (Johnson & Nicklas, 1999). Recently, The United States Department of Agriculture's Center for Nutrition Policy and Promotion (1999) developed a food guide pyramid aimed at young children ages 2-6.

To provide all the needed nutrients, children's meals should include a variety of foods from each food group in amounts suited to their appetites and needs. *Tips for Using the Food Guide Pyramid for Young Children*, provides guidelines for the number of servings and serving sizes from each food group, and list specific foods that fall into each food group (United States Department of Agriculture Center for Nutrition Policy and Promotion [USDA CNPP], 1999). Children ages four to six years old need 6 servings of grains, 3 servings of vegetables, 2 servings of fruit, 2 servings of the milk group, and 2 servings of meat (USDA CNPP, 1999). Two to three year old children need serving sizes that are smaller, about two-thirds the portion for a child over four years old (USDA CNPP, 1999). Children whose diets follow the Food Guide Pyramid pattern meet their nutrient needs (Whitney & Rolfes, 2002, p. 545).

CHAPTER III

Procedure

The current gold standard in the measurement of childhood obesity is BMI for age and gender. There are two modifiable factors that play a role in childhood obesity, physical activity and diet. Recent studies have found contradictive results in determining if beverage intake has an effect on the height and weight of children. The WIC Program provides two beverages in the child food package, milk and juice. In addition, the program requires that a child WIC participant visits the clinic at least two times per year in which the child is weighed, measured, and the payee or proxy receives individual nutritional counseling by a nutritionist for that child. Upon each clinic visit, a nutritionist is responsible and required to review the child's 24-hour dietary recall with the proxy or payee.

This study was designed to answer the following question "Do urban WIC children ages 2-5 years old who drink more beverages have a greater BMI, than urban WIC children ages 2-5 years old who drink fewer beverages?"

The following null hypotheses were developed and tested:

1. There will be no significant differences in BMI between children who drink excessive amounts (>36 Fl. oz./day) of total beverages and children who drink average amounts ($\leq$36 Fl. oz./day) of total beverages.
2. There will be no significant differences in BMI between children who drink excessive amounts ($\geq$12 Fl. oz./day) of 100% juice and children who drink average amounts (<12 Fl. oz./day) of 100% juice.

3. There will be no significant differences in BMI between children who drink ≥16 fluid ounces of milk and children who drink <16 fluid ounces of milk daily.
4. There will be no significant differences in BMI between children who drink excessive amounts (≥12 Fl. oz./day) of other drinks and children who drink average amounts (<12 Fl. oz./day) of other drinks.

Subjects

Data was collected from the current WIC charts of participants' ages 24-60 months old, during April and May 2002. The subjects were participants of Valley Health Systems Inc. Cabell County WIC Program, located in Huntington, West Virginia. Ninety-six out of 105 subjects (47 males and 49 females) were included in analysis. Risk codes were used to determine high-risk subjects. High risk follow-up visits (n=3) and low hemoglobin (n=6) subjects were not included in the final analysis.

Methods

Permission was obtained through Valley Health Systems and the West Virginia State WIC Office to review charts at the Cabell County WIC Program site. Charts were reviewed on the days the researcher was available. Each participant went through the normal clinic routine including getting weighed, measured, nutritional counseling, and vouchers.

It was assumed that the medical assistant weighed and measured each child 2 years and over according to the following procedures:

Weight Measurement:

1. The child's shoes were removed.
2. The scale was placed in the "zero" position before the child stepped on the scale.

3. The child stood still with both feet in the center of the platform.
4. The measurement was read to the nearest ¼ pound.

Height Measurement:

1. The child's shoes, hats, and bulky clothing such as coats and sweaters were removed. In addition, hairstyles were adjusted or undone so they would not interfere with measurement.
2. The child stood erect, with shoulders level, hands at sides, knees or thighs together and his/her weight evenly distributed on both feet. The child's feet were flat on the floor or foot piece, with both heels comfortably together and touching the base of the vertical board. When possible all four contact points (the head, back, buttocks, and heels were touching the vertical surface while maintaining a natural stance.
3. The child's head was positioned by placing a hand on the chin to move the head into the Frankfort Plane. The Frankfort Plane is an imaginary line from the lower margin of the eye socket to the notch above the tragus of the ear. When aligned correctly, the Frankfort Plane is parallel to the horizontal headpiece and perpendicular to the vertical back piece of the stadiometer.
4. The headpiece was lowered until it firmly touched the crown of the head and was at a right angle with the measurement surface. Stature measurement was read to the nearest $1/8^{th}$ inch.

The nutritionists were previously educated about what the researcher was looking for on the 24- dietary recalls, with specific focus on types of beverages and serving sizes. Nutritionists were encouraged to probe and ask questions to the clients to help provide a more

reliable 24-hour dietary recall. Once vouchers were printed the researcher reviewed the 24-dietary recall sheet, C-tad, and growth chart.

Information collected from the chart was placed on the Data Collecting Sheets. BMI was calculated by entering each subject's height and weight into the BMI NCHS Web Calculator. To ensure accuracy of the BMI NCHS Web Calculator, height and weight were also compared to the CDC (2000) BMI table. After BMI was calculated, each subject was plotted individually on a BMI for age and gender growth chart, to determine the BMI percentile for each child.

Statistical Analysis

The researcher entered all data using the Statistical Package for the Social Sciences (SPSS) computer software. A faculty member from Marshall University assisted with the statistical analyses. T-tests were performed to tests the hypotheses and to determine if there were significant differences in BMI and beverage intake in WIC children ages 2-5 years old. In addition, descriptive statistics were used to determine the average intake of total fluids, 100% juice, milk, and other drinks. Each child was plotted on a BMI for age and gender growth chart, so BMI percentiles could be determined. Finally, descriptive statistics were used to present ethnicity, age, and bottle vs. cup use among the participants.

CHAPTER IV

Results and Discussion

A study was designed to determine if urban WIC children ages 2-5 years old who drink more beverages have a greater BMI than urban WIC children ages 2-5 years old who drink fewer beverages. Charts were reviewed to test four hypotheses developed by the researcher and to answer the following questions:

1. Is there a significant difference in BMI in children who drink excessive amounts (>36 Fl. oz./day) of total fluids than children who drink average amounts (≤36 Fl oz./day) of total fluids?
2. Is there a significant difference in BMI in children who drink excessive amounts (≥12 Fl. oz./day) of 100% juice compared to children who drink average amounts (<12 Fl. oz./day) of 100% juice?
3. Is there a significant difference in BMI in children who drink ≥16 fluid ounces of milk compared to children who drink <16 fluid ounces of milk daily?
4. Is there a significant difference in BMI in children who drink excessive amounts (≥12 Fl. oz./day) of other drinks (soda pop, fruit drinks, and Kool-Aid) compared to children who drink average amounts (<12 Fl. oz./day) of other drinks (soda pop, fruit drinks, and Kool-Aid)?

To complete this study 105 charts were reviewed and 96 of these charts were used in the analysis. Nine charts were not used because those children were at high nutritional risk due to a low hemoglobin or medical condition. Forty-nine female and 47 male charts were used to tests the hypotheses that were developed. Information used to test the hypotheses was

collected from the children's' 24-hour dietary recall and growth chart which are both currently in use by the Cabell County WIC Program. The 24-hour dietary recall listed the beverages and the amounts consumed over a 24-hour time period. The growth charts contained the current height and weight of the child, which was used to calculate Body Mass Index (BMI).

Statistical Analyses of Hypotheses

Table 1, shows the average total fluid intake of WIC children by gender and age. The average total fluid intake for children ages 24-60 months old (2-5 years old) was 32.5 oz/day. This is considered a normal average intake for children this age. The lowest average total fluid intake was 28.1 oz/day, which occurred in boys, ages 49-60 months old. The highest average total fluid intake was 35.7 oz/day, which also occurred in boys, but in a younger age category, 37-48 months old.

Table 1.

Average Total Fluid Intake (oz/day) of WIC Children by Age and Gender (n=96)

	Age			
Gender	24-36 Months	37-48 Months	49-60 Months	24-60 Months
Male	33.1	35.7	28.1	32.3
Female	32.7	30.8	34.5	32.7
Average	32.9	33.3	31.3	32.5

Hypothesis one was tested using a T-test and is illustrated in *Table 2*. Sixty-three (65.6%) children drank $\leq$36 and 33 (34.3%) children drank >36 fluid ounces of total fluids daily. The average BMI of children who drank $\leq$36 and >36 fluid ounces of total fluids daily, were 16.457 $\pm$ 1.9 and 16.143 $\pm$ 1.6, respectively. These results indicate that children who drank an

average amount of total fluids (≤36 oz/day) had a higher average BMI (16.457 ± 1.9), than those children who drank an excessive amount of total fluids (>36 oz/day). Although BMI was greater in children who drank average amounts of total fluids daily, there were no significant differences found in BMI and total fluid intake. With these results, hypothesis number 1 was not rejected.

Table 2.

Independent Samples T-Test: Total Fluid Intake (n=96)

Total Fluid Intake	**Number of Children**	**Mean BMI**	**Std. Deviation**	**Std. Error Mean**	**t-value**	**df**	**Sig. (2-tailed)**	**Mean Difference**
>36 Fl. oz.	n=33	16.143	1.597	.278				
					-.809	94	.421	-.314
≤36 Fl. oz.	n=63	16.457	1.906	.240				

*significant at the .05 level

Next, juice intake was assessed. The average juice consumption of children ages 24-60 months old was 11.9 oz/day, which is slightly under what is considered excess juice intake at ≥12 oz/day (Table 3). Boys and girls drank an average of 11.2 and 12.6 oz/day of juice, respectively (Table 3). Skinner and Carruth (2001) found the average intake of juice consumption in children ages 27-72 months old to be less at 5.4 oz/day and there was no difference in gender. Another study found 2 and 5 year olds average juice consumption to be 5.5 oz/day (Dennison, Rockwell, & Baker, 1997). The current study done found a higher

average juice consumption overall (11.9 oz/day) and girls drank an average of 1.4 oz/day more than boys.

Table 3, indicates that the highest average juice intake (13.3 oz/day) was consumed by females' ages 24-36 months old. Boys' ages 49-60 months old had the lowest average juice consumption at 8 oz/day. In addition, when dividing children into three age categories (24-36, 37-48, and 49-60 months old), on average all groups consumed ≥12 oz/day of juice, except those boys falling into the 49-60 month age category. Finally, the average juice intake of WIC children decreased as the children got older. At 24-36, 37-48, and 49-60 month's average intake was 13.0, 12.7, and 10.1 (oz/day), respectively. Skinner and Carruth (2001) found similar results in children 27-72 months. In their study, juice intake decreased from 6.8 oz/day to 3.6 oz/day over time.

Table 3.

Average Juice Intake (oz/day) of WIC Children by Age and Gender (n=96)

	Age			
Gender	24-36 Months	37-48 Months	49-60 Months	24-60 Months
Male	12.6	12.9	8.0	11.2
Female	13.3	12.5	12.1	12.6
Average	13.0	12.7	10.1	11.9

Hypothesis number 2 was tested and the results are illustrated in *Table 4*. Forty-six children (47.9%) drank ≥12 and 50 (52.1%) drank <12 fluid ounces of juice daily. The average BMI was 16.679 ± 2.123 and 16.045 ± 1.404, for children who drank ≥12 and <12 oz/day of juice, respectively. Children who drank ≥12 oz/day of juice had a slightly higher BMI than children who drank <12 oz/day. Dennison, Rockwell, and Baker (1997), found a

much lower percent (11%) of children ages two and five drinking excessive amounts of juice (≥12 oz/day), compared to the current study in which close to half of the subjects (47.9%) were drinking excessive amounts of juice.

Dennison, Rockwell, and Baker (1997) found that obesity was more likely in children who drank excessive amounts of juice. In this study, even though a higher average BMI was found in children who drink ≥12 oz/day of juice, there were no significant differences found in BMI and juice intake. Skinner and Carruth (2001) found juice intake was not significantly related

Table 4.

Independent Samples T-Test: Juice Intake (n=96)

Juice Intake	**Number of Children**	**Mean BMI**	**Std. Deviation**	**Std. Error Mean**	**t-value**	**df**	**Sig. (2-tailed)**	**Mean Difference**
≥12 Fl. oz.	n=46	16.679	2.123	.313				
					1.739	94	.085	.634
<12 Fl. oz.	n=50	16.045	1.404	.199				

*significant at the .05 level

to children's height, weight, or BMI. Skinner and Carruth (2001) also examined juice intake of children in percentile groups divided by height, weight, and BMI using the 2000 growth percentiles and did not find any trend toward overweight children. Results of the current study support Skinner and Carruth (2001), and disagree with Dennison, Rockwell, and Baker (1997). Hypothesis number 2 was not rejected.

Table 5 and Table 6 compares total milk intake for boys and girls. The average total milk

Table 5.

Average Milk Intake (oz/day) of WIC Boys by Age (n=47)

	Age			
Type of Milk	24-36 Months n=17	37-48 Months n=15	49-60 Months n=15	24-60 Months n=47
Skim	0	0	1.1	.36
1%	0	0	0	0
2%	3.9	5.3	6.9	5.3
Whole	8.9	12	4.2	8.4
Chocolate	2.6	.6	1.1	1.4
Total	15.4	17.9	13.3	15.5

Table 6.

Average Milk Intake (oz/day) of WIC Girls by Age (n=49)

	Age			
Type of Milk	24-36 Months n=17	37-48 Months n=17	49-60 Months n=15	24-60 Months n=49
Skim	0	0	0	0
1%	0	1.4	0	.47
2%	2.8	6.1	7.9	5.6
Whole	10.7	8.2	7.3	8.7
Chocolate	0	1.7	.9	.87
Total	13.5	17.4	16.1	15.7

consumption for children ages 24-60 months old was 15.6 oz/day and only differed for males (Table 5) and females (Table 6) by .2 oz/day at 15.7 and 15.5 oz/day for girls and boys, respectively. Skinner and Carruth (2001) found a stable intake of milk of 11-12 oz/day for children 27-72 months old.

Both girls and boys ages 37-48 months old had the highest average intake of milk at 17.4 and 17.9 oz/day respectively, compared to boys and girls of the other two age categories of 24-36 and 49-60 months old. For girls, the lowest average total milk intake was 13.5 oz/day, which occurred at 24-36 months old, while in boys the lowest average total milk intake was 13.3 oz/day, which occurred at 49-60 months old. The average intakes of chocolate, skim, and 1 % milks, were very low. The majority of milk consumption for these children came from whole and 2% milk. These results coincide with WIC recommendations to provide whole milk to children 2 and under.

Hypothesis number three was also tested using T-test and results are illustrated in *Table 7*.

Table 7.

Independent Samples T-Test: Total Milk Intake (n=96)

Milk Intake	**Number of Children**	**Mean BMI**	**Std. Deviation**	**Std. Error Mean**	**t-value**	**df**	**Sig. (2-tailed)**	**Mean Difference**
≥16 Fl. oz.	n=55	16.125	1.558	.210				
					-1.417	94	.160	-.525
<16 Fl. oz.	n=41	16.649	2.071	.323				

*significant at the .05 level

Forty-one (43%) of children ages 2-5 years old drank <16 oz/day. Fifty-five (57%) children drank ≥16 oz/day of milk. Children who drank <16 and ≥16 oz/day of milk had an average BMI of 16.649 ± 2.071 and 16.125 ± 1.558, respectively. Children who drank <16 fluid ounces of milk daily had a greater average BMI (16.649 ± 2.071) than children who drank more milk (BMI= 16.125 ± 1.558). Although BMI was slightly higher in children who drank less milk, there were no significant differences found in BMI and milk intake of ≥16 or <16 oz/day per day. Hypothesis number 3 was not rejected.

Next, other drinks were assessed. *Table 8,* shows children ages 24-60 months old consumed an average total of 2.4 oz/day of other drinks with little difference based on gender. Both girls and boys in all age categories fell well below the ≥12 oz/day, which is considered excessive. Boys 49-60 months old consumed the highest average other beverage intake (4.7 oz/day) and girls 37-48 months old consumed the lowest average other beverage intake (.4 oz/day), than all other categories. Older children (49-60 months old) had higher average

Table 8.

Average Other Drinks Intake (oz/day) of WIC Children by Age and Gender (n=96)

	Age			
Gender	24-36 Months	37-48 Months	49-60 Months	24-60 Months
Male	.9	1.5	4.7	2.4
Female	2.8	.4	3.7	2.3
Average	1.9	1.0	4.2	2.4

intakes (4.2 oz/day) than younger children (24-36 & 37-48 months old, 1.9 & 1.0, respectively). Skinner and Carruth (2001) also found older children drank more other

beverages than younger children.

The final hypothesis, hypothesis number 4, was tested and results are illustrated in *Table 9*. Fourteen (14.6%) children drank ≥12 and 82 (85.4%) children drank <12 fluid ounces of other drinks (Kool-Aid, fruit drink, and soda pop) daily. The average BMI was 16.312 ± 1.620 and 16.355 ± 1.842 for children who drank ≥12 and <12 oz/day of other drinks, respectively.

Table 9.

Independent Samples T-Test: Other Drinks Intake (n=96)

Other Drinks Intake	**Number of Children**	**Mean BMI**	**Std. Deviation**	**Std. Error Mean**	**t-value**	**df**	**Sig. (2-tailed)**	**Mean Difference**
≥12 Fl. oz.	n=14	16.312	1.620	.433				
					-.083	94	.934	-.044
<12 Fl. oz.	n=82	16.355	1.842	.203				

*significant at the .05 level

Average BMI was similar in children who drank ≥12 and <12 oz/day of other drinks. Again, there were no significant differences in the intake of other drinks and BMI. Hypothesis number 4 was not rejected.

In addition to testing the hypotheses, the researcher decided to determine the number of children who fell into the following percentile groups: obese, at risk for becoming obese, normal weight, and underweight for age and gender. *Table 10,* shows 12 (12.5%) children plotted at or above the 95th percentile for BMI for age and gender. These children would be

considered obese as defined by NCHS (2000). In addition, there were 9 children (9.38%) who were considered to be at risk for obesity, as they plotted between the 85th – 95th percentiles. This indicates that 21 (12 males, 9 females) (21.90%) children were considered

Table 10.

Number and Percent of WIC Children in BMI Percentiles by Gender (n=96)

	BMI Percentiles							
Gender	≥95th		85th-95th		≤5th		>5th and <85th	
	n	%	n	%	n	%	n	%
Male	6	6.25	6	6.25	3	3.13	32	33.30
Female	6	6.25	3	3.13	4	4.17	36	37.50
Total	12	12.50	9	9.38	7	7.30	68	70.80

obese or at risk for becoming obese in this sample. Sixty-eight (70.8%) children had a BMI between >5th and <85th percentile, which fell within the normal range for BMI for age and gender. There were 7 (7.30%) children ranking in the underweight category (≤5th percentile).

In addition, the researcher examined BMI percentiles and total fluid intake of ≤36 and >36 oz/day by age and gender (Table 11). *Table 11*, shows 66.7 % (8/12) of overweight children (plotted >95th percentile) consumed average amounts (≤36 oz/day) of total fluids, while 33% (4/12) consumed excessive amounts of total fluids (>36 oz/day). In addition, children between the ages of 24-36 months had the least number of obese children (n=2), while the 37-48 (n=5) and 49-60 (n=5) month categories each had more.

Eight out of nine children (88.9 %) who plotted between the 85th-95th percentiles consumed average amounts of total fluid, while only 1 child (11.1%) consumed excessive amounts (>36 oz/day) of total fluids. This indicates that 76.2% (16/21) of children who were

either overweight or at risk for becoming overweight did not drink excessive amounts of total fluids. All age categories 24-36 (n=3), 37-48 (n=3), and 49-60 (n=3) months had an equal number of children who were at risk for becoming obese.

There were seven children who plotted $\leq 5^{th}$ percentile. Four children (57.1%) consumed average amounts of total fluids. Three children (42.9%) consumed excessive amounts of total

Table 11.

Total Fluid Intake and Number of WIC Children in BMI Percentiles by Age and Gender (n=96)

		Age							
Average Total Fluid Intake	BMI Percentiles	24-36 Months Male n=17	24-36 Months Female n=17	37-48 Months Male n=15	37-48 Months Female n=17	49-60 Months Male n=15	49-60 Months Female n=15	24-60 Months Male n=47	24-60 Months Female n=49
Average ≤36 oz/day	$\geq 95^{th}$	2	0	0	2	2	2	4	4
	$85^{th} – 95^{th}$	2	1	1	1	2	1	5	3
	$\leq 5^{th}$	0	1	2	0	0	1	2	2
	$>5^{th}$ and $<85^{th}$	7	9	8	8	9	5	24	22
Excessive >36 oz/day	$\geq 95^{th}$	0	0	2	1	0	1	2	2
	$85^{th} – 95^{th}$	0	0	1	0	0	0	1	0
	$\leq 5^{th}$	0	1	1	1	0	0	1	2
	$>5^{th}$ and $<85^{th}$	6	5	0	4	2	5	8	14

fluids. The number of females and males in this group ($\leq 5^{th}$ percentile) was almost evenly distributed with 4 and 3, respectively. Four of the seven children who plotted $\leq 5^{th}$ percentile were between 37-48 months old.

When examining total fluid intake and children who plotted within the normal range on the BMI growth charts ($>5^{th}$ and $<85^{th}$), there were 46 (67.6%) children who drank average

amounts of total fluids and 22 children (32.4%) who drank excessive amounts of total fluids. It appears that the majority of children, who plotted in the normal range on the growth, also had an average amount of total fluid intake.

In addition to types of beverages consumed by WIC Children ages 2-5 years old, cup and bottle use was also assessed (Table 12). Ninety-one (95%) children drank strictly from a cup and only 1 (1.0%) child strictly drank from a bottle. There were 4 (4%) children who used both a bottle and cup. All children (n=30) between 49-60 months old used a cup only. There were 3 children who used both a bottle and a cup and 1 child who used strictly a bottle in the 24-36 months age category.

Table 12.

Number of WIC Children Ages 2-5 Years Drinking From Bottle, Cup, or Both (n=96)

	Age			
Drink From	24-36 Months	37-48 Months	49-60 Months	24-60 Months
Cup	30	31	30	91
Bottle	1	0	0	1
Both	3	1	0	4

Demographics

There were ninety-six participants' ages 2-5 years old from the Cabell County WIC site. *Table 13,* shows the division of boy and girl subjects by age. There were a total of 34 (35.4%), 32 (33.3%), and 30 (31.3%) children, ages 24-36, 37-48, and 49-60 months old, respectively. There were a total of 47 (49%) boy and 49 (51%) girl subjects.

Table 13.

Age of WIC Subjects by Gender and Age (n=96)

	Age							
	24-36 Months		37-48 Months		49-60 Months		Total	
Gender	n	percent	n	percent	n	percent	n	percent
Male	17	17.7 %	15	15.6 %	15	15.6 %	47	49.0 %
Female	17	17.7 %	17	17.7 %	15	15.6%	49	51.0 %
Total	34	35.4 %	32	33.3 %	30	31.3 %	96	100 %

The majority (94.8%) of subjects were Caucasian, with the remaining percents being African American (4.2%) and Asian (1%) (Table 14). There were 45 (46.9%) and 46 (47.9%) Caucasian boys and girls, respectively. In addition, there were a total of 4 African American children and 1 Asian child.

Table 14.

Ethnicity of WIC Subjects by Gender (n=96)

	Ethnicity							
	Caucasian		African American		Asian		Total	
Gender	n	percent	n	percent	n	percent	n	percent
Male	45	46.9 %	2	2.1 %	0	0.0 %	47	49.0 %
Female	46	47.9 %	2	2.1 %	1	1.0 %	49	51.0 %
Total	91	94.8 %	4	4.2 %	1	1.0 %	96	100 %

CHAPTER V

Summary and Conclusion

Childhood obesity is on the rise in the United States and is affecting our youngest population. The WIC Program provides supplemental food packages to children ages 1-5 years old that qualify financially and are at nutritional risk. Anthropometrical, dietary recall, and demographic information were used to determine if WIC children ages 2-5 years who drank more beverages had a greater BMI than children who drank fewer beverages. Four null hypotheses were developed and tested.

1. There will be no significant differences in BMI between children who drink excessive amounts (>36 Fl. oz./day) of total fluids and children who drink average amounts (≤36 Fl. oz./day) of total fluids.
2. There will be no significant differences in BMI between children who drink excessive amounts (≥12 Fl. oz./day) of 100% juice and children who drink average amounts (<12 Fl. oz./day) of 100% juice.
3. There will be no significant differences in BMI between children who drink ≥16 fluid ounces of milk and children who drink <16 fluid ounces of milk daily.
4. There will be no significant differences in BMI between children who drink excessive amounts (≥12 Fl. oz./day) of other drinks (Kool-Aid, soda pop, and fruit drinks) and children who drink average amounts (<12 Fl. oz./day) of other drinks.

Descriptive statistics and T-tests were used to determine the average intake of fluids and to determine if hypotheses would be rejected or accepted. There were no significant differences in BMI of children who drank excessive or average amounts of total fluids. The average total

fluid intake for WIC children ages 2-5 years old was 32.5 oz/day. The average 100% juice intake for WIC children 2-5 years old was 11.9 oz/day, and no significant differences were found in BMI in children who drank excessive or average amounts of 100% juice. In addition, there were no significant differences in total milk intake and BMI in WIC children ages 2-5 and the average total milk intake was 15.6 oz/day. Finally, there were no significant differences in BMI and children who drank excessive or average amounts of other drinks (Kool-Aid, soda pop, and fruit drinks). The average intake of other drinks was 2.4 oz/day. These results indicate that beverage intake does not have an effect on BMI.

A high percentage (21.9%) of children ranked at or above the 85th percentile for BMI for age and gender. The 1999 PedNSS found 10.2% of Cabell County WIC Children were overweight. The results of the current study found 12.5% of WIC children were overweight which supports the PedNSS results, that there are a higher average number of obese children at the Cabell County WIC site, compared to other counties in West Virginia, however, this study did not link obesity to total fluid intake, because the majority of children who plotted on the NCHS BMI growth charts for at risk of becoming obese or currently were obese did not drink excessive amounts (>36 oz/day) of total fluids.

The demographic data found that the majority of subjects were Caucasian and there was little difference between males and females. There were two other ethnicities involved in this study, 3 African American children and 1 Asian child. When age categories and gender were analyzed the number of children in each category was evenly distributed and little difference occurred between males and females.

Finally, bottle and cup use was assessed among participants. The majority of children drank strictly from a cup. There was one child who still drank strictly from a bottle and 4 children who used both a bottle and a cup.

Recommendations for Further Research

The current study found no significant differences in BMI and beverage intake. These findings suggest that the following investigations would be appropriate to gain additional information on the causes of childhood obesity to determine why the Cabell County WIC site has a higher average number of obese children compared to other West Virginia WIC sites.

1. Repeat the study and use a larger sample size at Cabell or combined sites to provide more accurate data on average beverage intake and BMI.
2. A longitudinal study to determine if average beverage intake and BMI follow similar patterns as each child ages.
3. A study that compares accurate BMI percentiles to fluid intake, rather than the actual BMI number, to better verify for age and gender: obese, at risk for obesity, normal weight, and underweight children.
4. A study where children could be observed for a 24-hour period by a researcher so more accurate 24-hour dietary recalls could be used and determine if diets of children affect BMI.
5. A study that assesses fat intake and BMI in WIC children to determine if fat intake has an effect on BMI

6. A study that assesses physical activity and BMI in Cabell County WIC children to determine if children who attend the Cabell County WIC site are less active than children of other West Virginia WIC sites.

Conclusion

This study could easily be repeated at different WIC sites or again at the Cabell County WIC site. Additional data could be collected on physical activity or from the 24-hour dietary recall. It could be redesigned to allow more focus on BMI percentiles if a more accurate way of determining BMI percentiles is available.

The value of this study is that it provides a basis that beverage intake does not necessarily cause a higher BMI or increases the risk of obesity in children. It encourages WIC to continue providing adequate amounts of juice and milk to children. In addition, these finding indicate that there is a high percentage of obese children at the Cabell County WIC site, but it appears that beverage intake is not a cause of this, therefore, other factors such as, physical activity, food intake, and genetics should be studied.

Nutritionists and dietitians at WIC should continue to encourage nutritious beverages such as, water, milk, and juice over other drinks such as, soda pop, Kool-Aid, and fruit drinks. In addition, clients should be counseled on how beverages fit into the *Food Guide Pyramid for Young Children Ages 2-6 Years Old*. Finally, it is important that studies are continually done to try to determine the causes of childhood obesity, so WIC nutritionists and dietitians are able to better counsel parents and caregivers of overweight children.

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