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Prevalence of Childhood Obesity: A Study on Bowling Green, KY Middle School Students

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PREVALENCE OF CHILDHOOD OBESITY: A STUDY ON BOWLING GREEN, KY MIDDLE SCHOOL STUDENTS

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By
Emily Jensen

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PREVALENCE OF CHILDHOOD OBESITY: A STUDY ON BOWLING GREEN, KY MIDDLE SCHOOL STUDENTS

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Abstract

OBJECTIVE: The purpose of this study was to determine if a relationship exists between childhood obesity rates with the amount of Physical Education (PE) and physical activity (PA) a child receives. This study also sought to compare the prevalence of obesity in Bowling Green, KY middle school students with the national average of overweight and obese children. STUDY DESIGN: Subjects (n = 507) included middle school (age range, 10-15 years) students in Bowling Green, KY. Subjects participating in the study completed a 7-question section of the Youth Behavioral Risk Survey (YBRS) to assess physical activity. Subjects' sex, age, weight, and height were recorded to measure body mass index (BMI). RESULTS: Demographic results of the study found that 13% of students were considered to be overweight and 12% were considered to be obese. Statistics did not show any significant correlation between PA variables and BMI. Although the relationship was weak, there was however, an inverse relationship between vigorous PA, PE access, and time spent participating in PE class to BMI. CONCLUSION: There is a higher prevalence of overweight and obesity in middle school students in Bowling Green, KY to the national average. However,

PA and PE availability may not be the main cause of this high frequency. Future studies should consider dietary intake of subjects, which is also a risk factor for obesity.

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CHAPTER I: INTRODUCTION

Obesity has become a worldwide health issue (Ildiko, V., et al., 2007) that is rapidly rising in children. In 2005, 25% of U.S. children were obese (Dehghan, M., et al., 2005). Kentucky (KY) ranks last among overall prevalence of childhood obesity (Childhood Obesity Action Network, 2007). Obesity is caused when energy intake exceeds energy expenditure resulting in excess body fat. Researchers have found that the possible cause of the increase in childhood obesity is a result of decrease in physical activity (PA) among children (Dehghan, M., et al., 2005). A nationwide study found that "Kentucky children are less likely than their counterparts nationwide to be physically active for at least 4 days per week (Childhood Obesity Action Network, 2007).

Physical activity can be defined as any activity that goes beyond your normal routine and "causes your body to work harder" (Vorvick, L., 2008). There are several ways that children can participate in PA, like playing sports or participating in physical education (PE) classes.

Children spend several hours in school. Researchers have found that schools are a setting where "decisions regarding physical activity, food choices, and attendance can be reasonably controlled and programmatically altered"(Carell, A., et al., 2005). Schools can be an environment that promotes physical activity and holds children accountable for their actions, which may help reduce the alarming increase in childhood obesity. A study on physical education (PE) in schools found that "[P]hysical education classes have the potential to

provide 97% of children in the United States with regular physical activity (Carell, A., et al., 2005).

Despite what researchers have found, schools are decreasing PA time in schools or completely cutting PE programs to focus on academic learning time (Carell, A., et al., 2005). The decrease in PE programs at schools may be contributing to the decrease in PA among children, and therefore, an increase in childhood obesity.

Childhood obesity is an indicator for several psychological and physical health related problems that were once only seen in adults. Such health problems include, type 2 diabetes mellitus (T2DM), hypertension, and hypercholesterolemia (Veuglers, P.J.; Fitzgerald, A.L., 2005). Researchers found that childhood obesity can affect future health problems as well because 70% of obese children become obese adults (Dehghan, M., et al., 2005). Other researchers have found that PA among children has beneficial effects on "body composition, fitness, and insulin levels" thus reducing these health related problems. However, it is unclear whether lack of PA is the primary cause of the rise in childhood obesity. Compared to adult studies, "the number of controlled studies focusing on childhood obesity, with a long follow-up is still limited" (Tanas, et al., 2007).

The primary purpose of this study was to compare obesity rates in Bowling Green, Kentucky middle school students, ages 10-15 years, to the national average of overweight and obese children of the same age range. The

secondary purpose of this study was to compare the body mass index (BMI) of the same subjects to the amount of PE and extracurricular PA each receives

Statement of Hypothesis

The null hypothesis of the study was that there would be no difference in obesity rates between Bowling Green, KY middle school students to the national average.

The second null hypothesis of the study was that there would be no difference in BMI between Bowling Green, KY middle school students and time spent participating in PA during PE classes and extracurricular activities..

The alternate hypothesis of the study was that Bowling Green, KY middle schools would have a higher percentage of overweight and obese students than the national average.

The second alternate hypothesis of the study was that students participating in more PE and extracurricular PA are less likely to be overweight and obese.

Limitations

An important limitation to the results of this study was its inability to generalize findings outside the study. Demographic variables were limited to sex, age, height, and weight. Family history and social class could affect the results of this study, however, they were not variables.

This study also had a lack of random sampling. All subjects were limited to one public middle school in Bowling Green, KY. The convenience sampling of this study could have caused a bias in the results. The subjects measured may

not have accurately represented the pool of subjects it was compared to. In future studies, a wider range of subjects should be measured.

Another important limitation of this study was the unreliability of self-report data. The questions in the survey were specific allowing results not to be fully reliable. Results suggest this finding in questions five and six of they survey. In question 5, 280 subjects reported having no access to PE compared to the only 228 subjects who did not have access to PE in question six. In future studies, a more general survey should be administered.

Diet of the subjects also has an influence on the results of this study. Diet was not taken into consideration in this study. An individual's diet can greatly affect that individual's BMI.

CHAPTER II: REVIEW OF LITERATURE

Obesity has become a "worldwide epidemic" (Ildkio, V., et al., 2007). Obesity is caused when energy intake exceeds energy outtake, which causes excess body fat. Therefore, "[I]insufficient physical activity and poor nutrition are widely acknowledged as the primary mechanisms underlying the rise in excess body weight" (Veugelers, P.J., Fitzgerald, A.L.; 2005). Unfortunately, obesity, once a problem for mainly adults, is rapidly rising in children. According to the Mayo Clinic, "[I]n just two decades, the prevalence of overweight doubled for U.S. children ages 6-11 – and tripled for American teenagers" (The Medical Foundation for Medical Education and Research, 2006). Specifically, The American Obesity Association has found, "15.5 percent of adolescents (ages 12-19) and 15.3 percent of children (ages 6 to 11) are obese" (The American Obesity Association, 2007). Another study in 2005, showed that 25% of U.S. children are obese (Dehghan, M., et al., 2005) and these numbers are steadily increasing. A study in 2004 found that in Kentucky alone, over 20% of middle school body and 12% of middle school girls were seriously overweight. In 2003, Kentucky was the third highest in overweight high school students.

Obesity in children and adolescents is clinically measured by the body mass index (BMI). The Centers for Disease Control (CDC) defines overweight children or at risk of being obese children having a BMI in the 85th percentile and obese children as having a BMI in the 95th percentile (The American Obesity Association, 2007).

Several psychological and physical health problems are associated with childhood obesity. For example, "[C]hildhood overweight affects self-esteem, and has negative consequences on cognitive and social development"(Veugelers, P.J., Fitzgerald, A.L.; 2005). And unfortunately, health problems once seen in only adults are now affecting children due to childhood obesity such as, type 2 diabetes mellitus, hypertension, and hypercholesterolemia (Veugelers, P.J., Fitzgerald, A.L.; 2005). Childhood obesity can affect future health problems as well because 70% of obese children become obese adults (Dehghan, M., et al., 2005). "In children and adolescent, percentage of body fat and visceral adipose tissue are also positively correlated with insulin resistance, which in an independent predictor of the development of stroke, cancer, coronary artery disease, hypercholesterolemia, and T2DM in adulthood" (Carrel, A., et al., 2005). "As a whole, the obesity epidemic constitutes a substantial decrease in quality of life and life expectancy and accounts for billions of dollars in health care spending" (Veugelers, P.J., Fitzgerald, A.L; 2005).

Today, children spend more time watching television and playing video games and are less likely to participate in sports and physical education (Carrel, A., et al., 2005). It has been hypothesized and confirmed by several studies that a decline in physical activity among children has caused a steady increase in obesity rates around the world (Dehghan, M., et al., 2005). Many studies have also shown that school is an important environment where children can be physically active, learn healthy habits, and be held accountable for their actions (Carrel, A., et al., 2005). According to Carrel, A., et al. "childhood has been identified as a

critical period for nurturing lifetime activity behavior, and school physical education is a key opportunity to promote active lifestyles" (Carrel, A., et al., 2005). "Children spend many hours in school, making physical education (PE) programs in schools a potentially important channel through which physical activity and fitness may be promoted among young adults" (Datar, A., Sturm, R., 2004).

However, many PE programs in the U.S. have decreased physical activity time or have been cut completely due to a focus on academic only learning time (Carell, A., et al., 2005). Kentucky required that all children participate in PE, however, time requirements are not mandated (National Association for Sport and Physical Education, 2008). Datar and Sturm, 2004, found, [A]lthough guidelines recommend that students have daily classes, receive a substantial percentage of their weekly amount of in-school physical activity in PE classes, and be physically active for at least half of the PE class time, only a small minority of children have daily classes, and active class time is far below 50% (Datar, A., Sturm, R., 2004). The SPARK (Sports, Play, and Active Recreation for Kids) program found that PE programs in schools only supplied "18 of the recommended 150 minutes per week at school" (Carrel, A., et al., 2005). The decrease in PE programs at schools contributes to the decrease in physical activity among children.

Childhood obesity has become a worldwide health issue and an early predictor of adulthood obesity and the cause of several psychological and physical health related problems. Research has proven that school based PE programs are

not supplying children with the needed amount of physical activity needed to prevent childhood obesity. Many studies have shown that "even small changes in the amount of physical activity showed beneficial effects on body compositions, fitness, and insulin levels in children" (Carell, A., et al., 2005). This study also found that PE intervention programs had significant benefits on students' BMI, insulin sensitivity, and cardiovascular fitness (Carell, A., et al., 2005).

Intervention Programs

Several studies created PA intervention programs to evaluate body fat, BMI, and/or cardiovascular endurance changes in children and adolescents. Scheffler, et al., examined whether PE modifies body composition in preschool children. The subjects underwent a 24-month exercise program. Upon the completion of this program, Scheffler, et al., found that PE interventions did improve body composition among preschool children.

Fifty-three children with a BMI above the 95th percentile for age were subjects in Carell, et al.'s study. This study measured the effect of PA intervention programs on insulin levels, body composition, and cardiovascular endurance. Subjects were then randomized into fitness classes. The intervention class consisted of 14 students who focused on lifestyle activities such as walking, cycling, and snowshoeing. Typical movement time was 42 minutes in a 45-minute class. The control group consisted of 35 to 40 students who averaged a movement time of 25 minutes in a 45-minute class. Skill development drills were the focus of the control group class. "These issues tended to result in less movement and tendency for students to hold back and not enter to play (Carell, et

al., 2005). Researchers found that children who participated in small fitness-oriented classes showed a significant improvement in body composition, cardiovascular fitness, and fasting insulin levels.

Similarly, Vajda, et al. studied the effects of a 3-hour per week PA intervention program on body fat and cardiovascular endurance in 10-year old obese boys. Subjects were split into two groups that participated in a PE program for 5 months. The intervention group participated in two curricular PE classes a week and three one-hour extracurricular aerobic PA sessions in the afternoon, on Mondays (swimming and water games), Wednesdays (folk dance), and Fridays (soccer). The control group only had to participate in the two PE classes per week. Results found that peak ventilation, aerobic power, oxygen pulse, and running distance improved in the intervention group and not on the control group. BMI did not increase in either group.

Salmon, et al.'s study examined the effectiveness of PA interventions in various locations on male and female children aged 4-12 years and adolescents aged 13-19 years. Researchers found that PA intervention programs were most successful in the school setting.

Surveys and Questionnaires

Similar to this study on the prevalence of childhood obesity rates in Bowling Green, KY middle schools, several studies also used surveys and questionnaires to observe causes in childhood obesity. Ortega, et al. surveyed subjects on PA participation. Subjects were also measured for BMI, waist circumference, and skinfold measurement. PA level was then compared to body

composition for assessment. The study found that low levels of PA, especially vigorous PA, may play an important role in the development of overweight and excess of central adiposity in children and adolescents.

Veugelers and Fitzgerald's study surveyed fifth grade students, their principals, and parents. Height, weight, and dietary habits, physical activity, and parental-school risk factors were measured to evaluate the significance of these risk factors to childhood overweight and obesity. The study found that parents and schools were an important factor in reducing childhood obesity.

Datar and Sturm(2004) examined PE in elementary schools and compared results to subjects' BMI. The purpose of the study was to find if there was a difference in BMI depending on PE instruction time. Researchers found that one additional hour of PE in first graders reduced BMI in girls who were overweight or at risk of becoming overweight in kindergarten. They concluded that "[E]xpanding physical education programs in schools, in the form in which they currently exist, may be an effective intervention for combating obesity" (Datar, A., Sturm, R., 2004).

Holstein, et al. examined trends in vigorous PA verses physical inactivity among 11-15 year olds from 1988 to 2002. The sample population was the Health Behavior in School-aged Children (HBSC) in 11, 13, and 15-year-old students in 1988, 1991, 1994, 1998, and 2002. Researchers found that a large proportion of children and adolescents do not comply with the national recommendations that children should be physically active at least 60 minutes per day.

CHAPTER III: METHODOLOGY

Subjects

507 middle school student volunteers (Male n=237, Female n=270) between the ages of 10 and 15 years of age (average age male=12.55±1.03 years; female=12.41±1.06 years) participated in the study. The subjects' average height was 66.08±3.66 inches and the average weight was 120.24±33.29 pounds. This study was approved by the Human Subjects Review Board at Western Kentucky University. All subjects provided informed consent, and subjects' guardians also received an opt-out form that was approved by the Human Subjects Review Board. Subjects were chosen from Bowling Green Junior High School.

Protocol

On the day of data collection, in their homeroom class, subjects answered the PA portion of the Youth Risk Behavior Survey (Appendix A). This survey assessed the students' time spent participating in PA and PE class. All surveys remained anonymous.

In a separate room, subjects individually were weighed in pounds on the Sunbeam SAB700DQ-01 A191NT Dial Scale and measured for height in inches with 2 wooden meter sticks. Measurements along with the subjects' sex and age were recorded on the back of the survey to obtain BMI. Names of subjects were not included on surveys, responses, and measurements to maintain anonymity.

BMI means of subjects were calculated to find the prevalence of obesity in Bowling Green, KY. BMI is calculated by weight divided by height squared

(kg/m^2). Overweight and obesity by BMI was obtained by using the charts developed by the National Center for Health Statistics, 2000. (Appendix B). BMI distribution was determined by using the 1 Sample K-S test. Spearman's rho was used to determine any relationship between BMI, age, and sex to the PA variables. Spearman's rho describes the relationship between two variables without making any assumptions about the relationship between the variables.

CHAPTER IV: RESULTS

Population Demographics

Participants' physical characteristics and demographic data are presented in Appendix C. Study participants had an average BMI of 19.39 (SD = 4.30) for females and 18.98 (SD = 4.47) for males. BMI statistic shows a normal distribution determined by using the 1 Sample K-S test, which shows the Gaussian population.

65 participants (13%) were considered to be overweight and 60 participants (12%) were considered to be obese. The results of this study showed that 25% of students at Bowling Green Junior High School are overweight or obese. 17% of those ages 6 – 11 and 26% of those 12-19 were considered to be obese.

Appendix D shows the percentage of subjects by age and sex that were considered to be overweight and obese.

Aerobic/Anaerobic Activity

Utilizing Spearman's rho, there were no statistically significant correlations between BMI and days spent participating in vigorous ($r = -0.075$, $p = 0.09$), and moderate ($r = 0.044$, $p = 0.32$) aerobic activity as well as anaerobic ($r = 0.015$, $p = 0.73$) activity. When exploring gender's relationship to aerobic and anaerobic variables, relationships remained weak between the variables. The most significant relationship was between gender and vigorous aerobic activity. When comparing gender, 71% of females reported exercising in vigorous aerobic activity 1 day per week, while 29% of males reported exercising 1 day per week.

In comparison to 32.7% of females who reported exercising in vigorous aerobic activity 7 days per week, while 67.3% of males reported exercising 7 days per week. Appendix E indicates the correlation between gender and days spent participating in vigorous aerobic activity.

Leisure Activities

Similar findings were found when exploring BMI to leisure activities. No significant relationship was observed. Over 57% of 12 year olds reported watching television, playing video games, and playing on the computer 1-2 hours a day compared to 45% of 11year olds and 53% of 13 year olds.

PE

Data suggest a weak relationship between BMI and days spent participating in PE class ($r = -0.023$, $p = 0.60$). Over half ($n = 280$ or 56%) of students participating in the survey reported not taking PE. Of those 280 students, 71% (116) of 13 year olds did not take PE. Also, data suggest as student age increases, the access to PE decreases. Appendix F shows the correlation between age and no days participating in PE.

Time in PE

Also noteworthy is the amount of time Bowling Green Junior High School students are engaged in PE. Of the 280 subjects reporting no access to PE, only 228 reported no access to PE. Data remained consistent with previous analysis, indicating a weak relationship between BMI and actual time spent exercising in PE. For those students reporting that they did participate in PE, although the

relationship was weak, there was an inverse relationship between age and time spent exercising in PE.

Sports

Regarding participation in sports, response categories ranged from 0 teams to 3 or more teams. Finding showed an equal distribution among all response categories. Students not participating on any sports teams were the highest at 30.5% (n = 123) of sample compared to 22.9% (n = 115) participating on 1 team, 24.5% (n = 123) participating on 2 teams, and 22.1% (n = 111) participating on 3 or more teams. Spearman's correlation continued to show weak relationships between variables in conjunction with an adverse. When comparing gender to number of sports teams, 37% of females reported playing on no teams compared to only 25% of males. In comparison to only 16% of females participating in 3 or more teams, while 28% of males participated in 3 or more sports teams. Overall statistics showed a weak relationship between the variables.

CHAPTER V: DISCUSSION

Data indicated that 25% of children ages 6 - 19 years in Bowling Green, KY are overweight or obese. The national average of overweight and obese children 6 -11 years of age is 15.3% compared with 17% of students in Bowling Green, KY. Even more surprising is the number of adolescents (2-19 years of age) categorized as overweight and obese. The national average of obese adolescents is 15.5% and in Bowling Green, KY that statistics is 25%. Students at Bowling Green Junior High in Bowling Green, KY are very much over the average statistics of overweight and obesity. This is consistent with the researchers hypothesis.

Although data showed weak relationships between all variables, there was a slight inverse relationship in moderate aerobic activity and BMI ($r=-0.075$, $p=0.09$). The same results showed for BMI as it related to PE availability ($r=-0.023$, $p=0.60$) and time spent participating in PE, which shows that PA may have an impact on childhood obesity, however, may not be the primary factor.

Also, noteworthy is the amount of PE to which children at Bowling Green Junior High school have access to. Data suggest that over half (n=260 or 56%) of students do not have access to PE. It is recommended that students receive 150 minutes of weekly physical activity at school (Carrel, A., et al., 2005) and it is obvious these students are not getting that time. Data also suggest that PE availability decreased with a students' age. According to results of the survey,

34% of 11 year-olds did not take PE, 45% of 12 year-olds did not take PE, 72% of 13 year-olds did not take PE, and 72% of 14 year-olds did not take PE.

Data results showed similarity with other studies on childhood obesity and PA. Harris, et al., 2009, reviewed PA intervention programs in schools for children ages 5 to 18 years of age. The researchers meta-analysis indicated that school-based PA programs did not have an effect on BMI. Also, Cleland, et al., 2008, compared frequency and duration of PE availability to students' BMI in 109 schools. Data results showed no significant correlations.

However, this study on childhood obesity prevalence in Bowling Green, KY middle schools along with the previous studies mentioned, did not take into account dietary behaviors or family income of subjects. These factors may have a higher impact on childhood obesity than PE availability and PA.

Over 50% of 12 and 13 year olds reported spending 1-2 hours of watching television or playing video or computer games. Studies show that hours spent watching television and playing video or computer games verses participating in PA has caused an increase in obesity rates among children (Carrel, et al., 2005). However, the actual cause of this increase may be a result of dietary consumption during these leisure activities. Matheson, et al., 2004, compared the amount and types of food consumed among children while watching television verses any other time of the day. Researchers found that "children consume a substantial proportion of their daily energy while watching television"(Matheson, et al., 2004). These researchers also examined the associations between BMI and

dietary intake during television viewing. Results showed that television viewing was associated with a higher BMI in some children.

Dietary intake along with socioeconomic status was also a limitation of this study. Fast food, which is generally high in calories and fat content, is easily available and inexpensive. Chaloupka, et al., 2009, studied price and availability of healthy and fast food on BMI in children and adolescents. Researchers found that lower fast food prices were associated with more fast food consumption among children and adolescents, which was also associated with a higher BMI.

Data of subjects showed that the prevalence of overweight and obesity in Bowling Green, KY middle school students was above that national average of overweight and obese children in the nation. However, data statistics showed a weak correlation between PA and PE availability and BMI. Although, PA and PE availability may have a small impact on childhood obesity rates in Bowling Green, KY middle school students, it may not be the main cause. Future study should take into account subjects' dietary behaviors and socioeconomic status, which, as other studies show, may have a higher impact on obesity rates among children.

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Appendix A

Check the Box that applies to you.

1. On how many of the past 7 days did you exercise or participate in physical activity (PA) for at least 20 minutes that made you sweat and breathe hard, such as basketball, soccer, running, swimming laps, fast bicycling, fast dancing, or similar aerobic activities?
☐ 0 days ☐ 1 day ☐ 2 days ☐ 3 days ☐ 4 days ☐ 5 days ☐ 6 days ☐ 7 days

2. On how many of the past 7 days did you participate in PA for at least 30 minutes that did not make you sweat or breathe hard, such as fast walking, slow bicycling, skating, pushing a lawn mower, or mopping floors?
☐ 0 days ☐ 1 day ☐ 2 days ☐ 3 days ☐ 4 days ☐ 5 days ☐ 6 days ☐ 7 days

3. On how many of the past 7 days did you exercise to strengthen or tone your muscles, such as push-ups, sit-ups, or weight lifting?
☐ 0 days ☐ 1 day ☐ 2 days ☐ 3 days ☐ 4 days ☐ 5 days ☐ 6 days ☐ 7 days

4. On an average school day, how many hours do you watch TV, play video games, or play on computer?
☐ 0 ☐ Less than 1 hour per day ☐ 1 hour per day ☐ 2 hours per day ☐ 3 hours per day
☐ 4 hours per day ☐ 5 or more hours per day

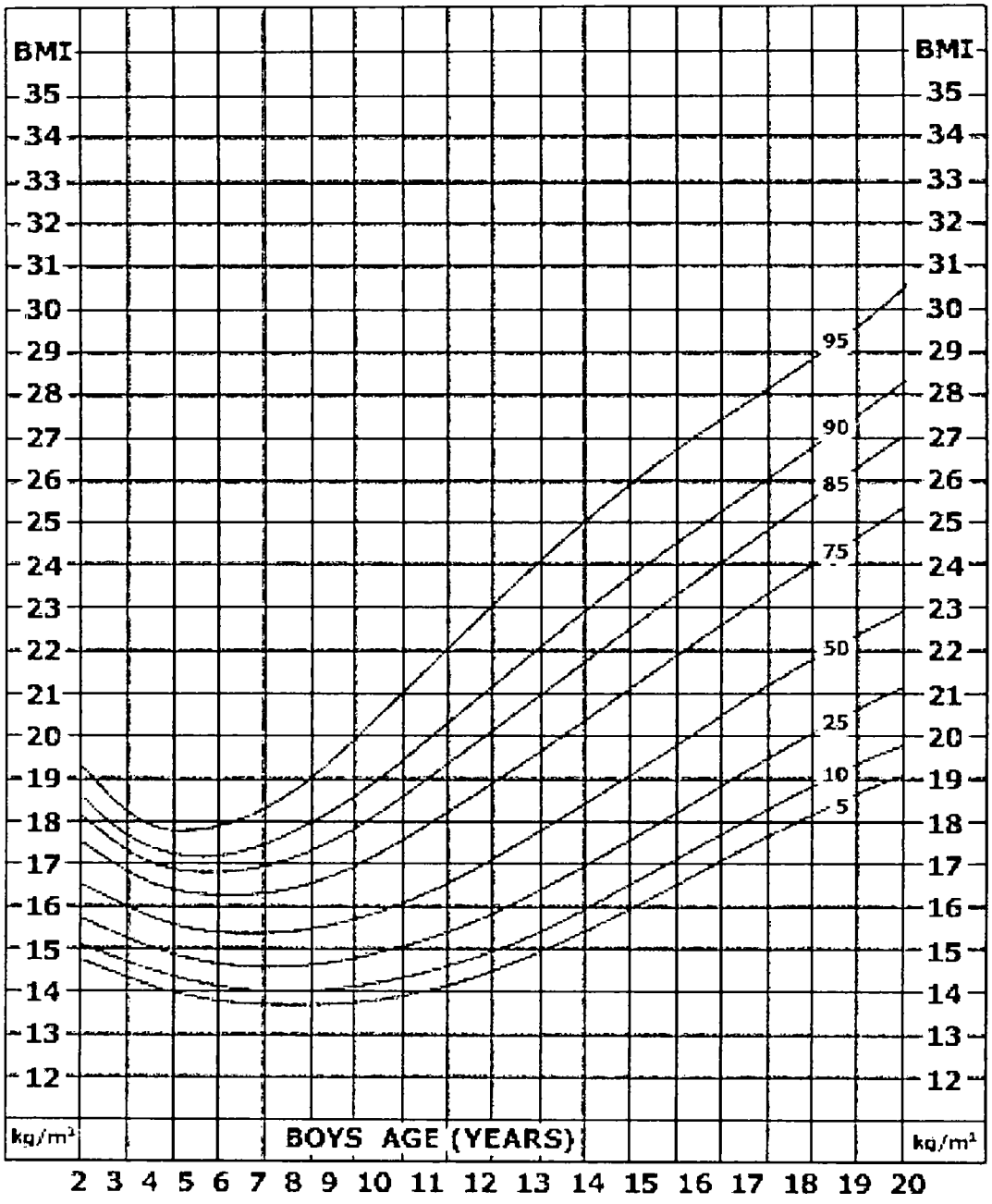
5. In an average week when are you in school, on how many days do you go to physical education (PE) classes?
☐ 0 days ☐ 1 day ☐ 2 days ☐ 3 days ☐ 4 days ☐ 5 days

6. During an average PE class, how many minutes do you spend actually exercising or playing sports?
☐ I do not take PE ☐ Less than 10 minutes ☐ 10-20 minutes ☐ 21-30 minutes ☐ 31-40 minutes
☐ 41-50 minutes ☐ 51-60 minutes ☐ more than 60 minutes

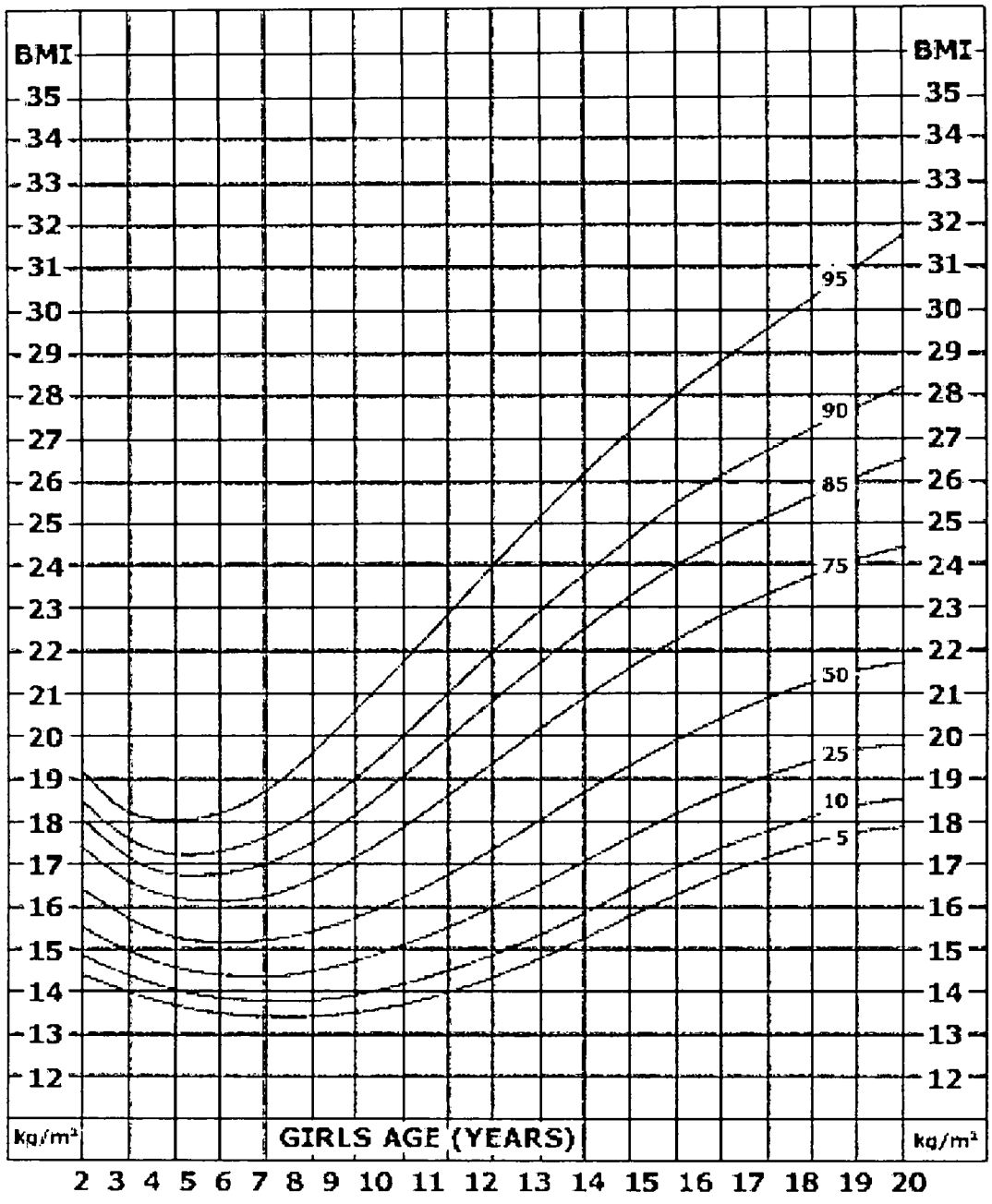
7. During the past 12 months, on how many sports teams did you play?
☐ 0 Teams ☐ 1 team ☐ 2 teams ☐ 3 or more teams

Appendix B:

Body Mass Index-for-Age Percentiles: Boys Aged 2 to 20 Years (National Center for Health Statistics, 2000).



Body Mass Index-for-Age Percentiles: Girls Aged 2 to 20 Years (National Center for Health Statistics, 2000).



Appendix C

Demographic Characteristics

Variable	Height	Weight	BMI	BMI SD
Male				
11 n = 66	63.47	102.2	17.66	3.40
12 n = 75	64.9	118.28	19.50	5.58
13 n = 83	68.31	126.67	19.01	3.64
14 n = 42	69.32	137.36	19.96	3.92
15 n = 4	70.37	145.3	20.51	2.66
Female				
10 n = 1	62.87	92	16.36	0
11 n = 42	63.49	110.3	18.95	4.81
12 n = 66	65.04	112.1	18.51	4.36
13 n = 81	67.18	129.5	20.11	4.63
14 n = 45	66.5	124	19.67	3.76
15 n = 2	64.87	144	24.13	6.67

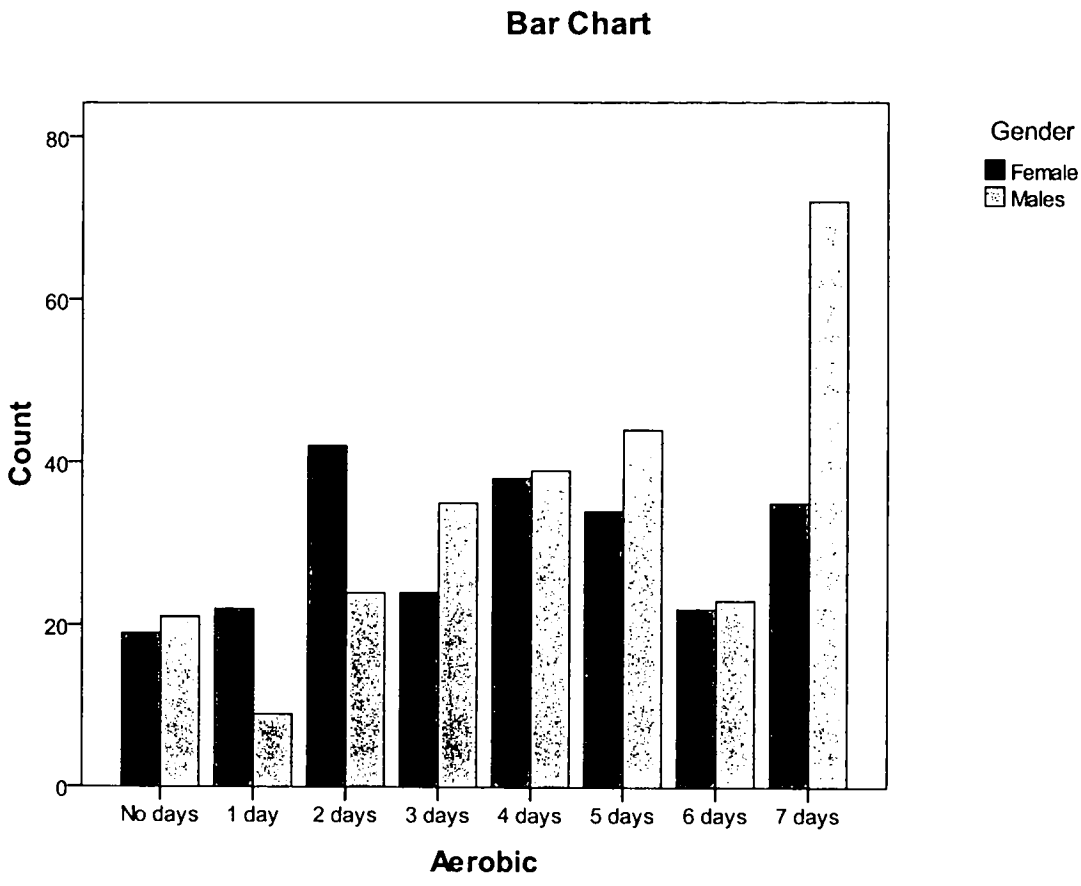
Appendix D

Demographic Information (Overweight and Obese Females)

Variable	Overweight	Obese
Male		
10	0% (n = 0)	0% (n = 0)
11	18% (n = 12)	8% (n = 5)
12	13% (n = 10)	19% (n = 14)
13	13% (n = 11)	10% (n = 8)
14	12% (n = 5)	14% (n = 60
15	25% (n = 4)	0% (n = 0)
Female		
10	0% (n = 0)	0% n = 0
11	18% (n = 12)	17% (n = 7)
12	13% (n = 10)	11% (n = 7)
13	13% (n = 11)	11% (n = 9)
14	12% (n = 5)	9% (n = 4)
15	0% (n = 0)	50% (n = 1)

Appendix E

Days spent participating in vigorous aerobic activity between genders by percentages.



Appendix F

Survey results between age and percentage of subjccts reporting having no access to PE.