



2015

Examining the Relationship Between Type and Extent of After-School Care Use and High BMI in Children Ages 5-17

Morgan E.B. Chojnacki
University of Kentucky, mebonn2@uky.edu

[Right click to open a feedback form in a new tab to let us know how this document benefits you.](#)

Recommended Citation

Chojnacki, Morgan E.B., "Examining the Relationship Between Type and Extent of After-School Care Use and High BMI in Children Ages 5-17" (2015). *DNP Projects*. 69.
https://uknowledge.uky.edu/dnp_etds/69

This Practice Inquiry Project is brought to you for free and open access by the College of Nursing at UKnowledge. It has been accepted for inclusion in DNP Projects by an authorized administrator of UKnowledge. For more information, please contact UKnowledge@lsv.uky.edu.

Final DNP Practice Improvement Project Report

Examining the Relationship Between Type and Extent of After-School Care Use and High BMI in Children

Age 5-17

Morgan E. B. Chojnacki

University of Kentucky

College of Nursing

December 1, 2015

Leslie Scott, PhD, PPCNP-BC, CDE, MLDE – Committee Chair

Chizimuzo Okoli PhD, MPH, MSN, RN – Committee Member

Aurelia Radulescu MD, FAAP – Committee Member/Clinical Mentor

Dedication

My final DNP Practice Improvement Project is dedicated to the future pediatric patients with high BMI that will be under my care. I pledge to continue to research and appropriately manage high BMI in children and to work to reverse the epidemic.

Acknowledgments

I'd like to acknowledge my advisor, Dr. Leslie Scott, for her guidance and direction throughout my journey from BSN to DNP. I'd like to thank my additional capstone committee members, Dr. Zim Okoli and Dr. Aurelia Radulescu, for your patience, mentorship, and for bestowing your knowledge of research and management of high BMI in children upon me. I'd like to acknowledge my husband Matt who has been my rock and foundation and supported me to be the best mom, wife, nurse, and student I could be throughout this program. I'd like to thank my sweet daughter Kennedy who has inspired me to change the world for the better and to dedicate my life to helping others. To my classmates, thank you for being in this with me and encouraging me throughout the last five years. I'd like to thank my friends and family who have supported me by providing childcare, meals, friendship, laughs, and love, all of which helped me remain a whole person while in graduate school. Lastly, I'd like to thank my Heavenly Father for granting me the perseverance, patience, and knowledge required to complete this program. Without all of you, I surely would not have been able to accomplish this goal. Thank you.

Table of Contents

| | |
|--|-----|
| Acknowledgements..... | iii |
| List of Tables..... | v |
| List of Figures..... | vi |
| Practice Improvement Project: Examining the relationship between type and extent of after-school care use and high BMI in children age 5-17..... | 1 |
| Appendix A: UK Millennium Cohort Study After-School Care Specific Items Survey..... | 13 |
| Practice Inquiry Project References..... | 17 |

List of Tables

| | |
|---|----|
| Table 1: Sample characteristics..... | 20 |
| Table 2: Frequencies of type of after-school care by BMI groups..... | 21 |
| Table 3: Hours of after-school care by type of care and BMI groups..... | 22 |

List of Figures

Figure 1: Frequencies of weekday type of after-school care by BMI groups.....21

Figure 2: Hours and type of weekend after-school care by BMI groups.....22

Abstract

Objectives: The purpose of this study was to examine the relationship between body mass index (BMI) and after-school care use in school age children and adolescents in Kentucky. The specific aims of this study were to examine differences in BMI groups (high versus normal/low) by: a) type and b) extent of after-school care use.

Methods: Parents of children age 5-17 years were administered a 21-item survey which assessed the amount of time their children spent in specific types of after-school care. BMI of the child/adolescent participants were obtained at the time of the survey. High BMI was defined as BMI \geq 85th percentile.

Results: During weekdays, participants with normal/low BMI more often participated in school clubs and care from grandparents while those with high BMI were more likely to receive care from older siblings and other relatives. Participants with high BMI had more hours of care by other relatives and older siblings on the weekdays and nonresident parents and older siblings on the weekends. The normal/low BMI group had more hours of care by school clubs, babysitters, and grandparents during weekdays and grandparents and other relatives during the weekend.

Conclusion: Providers should assess the type and extent of after-school care patients utilize as part of their well child visit and should recommend school clubs and recommend against care from older siblings and non-parent/grandparent relatives to maintain a healthy BMI. Further studies should evaluate the association between after-school care use and BMI in school age children and adolescents.

Background

The proportion of obese children age 6–11 years in the United States increased from 7% in 1980 to nearly 20% in 2008 (CDC, 2011). Kentucky ranked second among US states in the prevalence of pediatric obesity in 2010 (CDC, 2010). This rise of childhood obesity has been linked with early childhood onset of type II diabetes mellitus (CDC, 2011), hypertension and hyperlipidemia (Freedman, Mei, Srinivasan, Berenson, & Dietz, 2007), and sleep apnea (Dietz, 2004). Overweight and obese children have more psychological and physical health problems than children of healthy weight. For example, such children are more likely to complain of musculoskeletal pain, depression, anxiety, and bullying than children of average weight (Bell et al., 2011). Childhood obesity is not only linked with increased morbidity and mortality at an earlier age, it is also associated with increased risk of premature adult death, diabetes, hypertension, ischemic heart disease, stroke, cancer, disability, asthma, and polycystic ovary syndrome (Reilly & Kelly, 2011). All of these obesity associated diseases cost millions of health care dollars annually, and they are contributing to the United States' increased morbidity and mortality at an earlier age.

According to the CDC (2011) societal factors including families, communities, schools, medical care providers, faith-based institutions, government agencies, the media, food and beverage industries, entertainment industries, and child care have influenced the increased incidence of childhood obesity. Among childcare influences, studies have implicated increased parental work hours (Morrissey, Dunifon, & Kalil, 2011) and use of certain types of daycare (Pearce et al., 2010) in the incidence of childhood obesity. More specifically, several studies from birth to three years have found that child care use is directly associated with an increase in childhood obesity (Benjamin et al., 2009; Gubbels et al., 2010; Hawkins, Cole, & Law, 2008; Pearce et al., 2010).

Children in extensive informal child care, defined as unregistered care from non-parental family members or friends for more than 30 hours per week, were more likely to be overweight. Interestingly, no increased risk of obesity was found with the use of formal childcare, defined as a nursery, childcare center, or registered nanny or babysitter, or limited child care use, defined as less than 30 hours per week (Pearce et al., 2010).

In one study, child care use was associated with body mass index (BMI) increasing from normal to overweight between age one and two; however, no significant difference in BMI between limited and extensive child care use was appreciated (Gubbels et al., 2010). Other studies have found extensive child care use has a negative effect on childhood BMI in comparison to limited use of child care (Benjamin et al., 2009). These investigators emphasized positive outcomes on BMI for formal child care use and negative outcomes on BMI for informal child care use. Furthermore, children of employed mothers who used informal child care were more likely to be overweight at age three as compared to those who used formal child care (Hawkins et al., 2008). Likewise, more hours spent in child care in someone else's home from birth to six months was associated with increased weight at one and three years old (Pearce et al., 2010). However, formal child care provided at a child care center and own-home child care were not associated with increased weight (Pearce et al., 2010). Furthermore, the number of hours a mother is employed is positively correlated with her children's BMI (Morrissey et al., 2011). Of particular interest, this association between children's weight and maternal work status tends to be much stronger at sixth grade compared to younger ages (Morrissey et al., 2011). The incidence of childhood obesity also becomes greater as children transition from elementary school to middle school to high school (CDC, 2011), so special attention must be paid to school age children and adolescents regarding their weight status.

The current literature focusing on the relationship of child care use and high BMI at younger ages has helped decrease the US incidence of obesity in children age 2 to 5 years from 13.9 percent in

2003 to 8.4 percent in 2011 (CDC, 2011). Few studies exist that examine this relationship amongst school age children and adolescents. Examining the link between after-school care use and high BMI in school age children and adolescents is necessary to help reverse the obesity trend. The purpose of this study was to examine the relationship between BMI and after-school care use in school age children and adolescents in Kentucky. The specific aims of this study were to examine differences in BMI groups (high versus normal/low) by: a) type and b) extent of after-school care use.

Methods

Study Permission

Permission for this study was granted from the University of Kentucky Institutional Review Board. Permission was obtained via email from Catherine Law, MD and Anna Pearce, PhD with the United Kingdom Millennium Cohort Study to utilize after-school care specific questions from their larger cohort study questionnaire. Written permission to recruit participants from the University of Kentucky Pediatric Clinics was obtained from Dr. Aurelia Radulescu, Dr. Rhya Strifling, and Dr. Carmel Wallace.

Study Demographics and Setting

Twenty-four dyads of pediatric patients and their parent/legal guardian were recruited via convenience sampling from the pediatric outpatient clinics at the University of Kentucky Clinic, located at 740 S. Limestone in Lexington, Kentucky. A majority of the participants were recruited from the Pediatric High BMI Diagnostic Clinic and the General Pediatrics Clinic. All pediatric patients and their parent/guardian who presented to the clinic for their previously scheduled appointments were given an informative flyer by the principal investigator (PI) after they checked in with the clerical staff. Patients/parents who were interested in the study contacted the PI. Parents and older children provided written informed consent and all children provided written or verbal assent prior to beginning the study. Participant dyads were recruited from October 1, 2015 to October 22, 2015.

Inclusion and Exclusion Criteria

In order to be included in the study, pediatric participants were between the ages of five and seventeen years, present for an appointment at the University of Kentucky pediatric outpatient clinics, and had low, regular, or high BMI. Pediatric participants were excluded from the study if they did not speak English. Parent/guardian participants were included if they were present with their child who had an appointment that day and if they were able to read, write, and speak English.

Instrument

The UK Millennium Cohort Study After-School Care Specific Items Survey is a 21-item survey which asks parents to self-report the amount of time their children spend in specific types of after-school care during a typical week. The survey was adapted from interview format to questionnaire format from a much larger survey of questions. All child care questions were included and remained unchanged except for a few British English translations (example: childminder to babysitter). The original UK Millennium Cohort study was performed using in-person interviews at two collection points 2.5 years apart and had 18,000 participants (Pearce et al., 2010). The validity of this instrument was not reported in the original UK Cohort Study, however, it was the best available instrument for self-reported use of after-school care due to unavailability of other valid tools.

Participant Recruitment

Participant dyads were recruited from the University of Kentucky Pediatric Outpatient Clinics waiting room from October 1, 2015 to October 22, 2015. Each dyad who presented to the clinic for their previously scheduled appointment received an informative flyer from the principal investigator (PI) and were told to contact the PI if they were interested in being part of the study. After contacting the PI, participant dyads gave informed consent and assent prior to beginning the study. Patient charts were

not accessed prior to obtaining consent. Parents were given a copy of the signed consent and assent forms.

Study Procedures

Parents were administered the 21-item UK Millennium Cohort Study After-School Care Specific Items Survey and a page of demographic items. Parents completed the ten minute survey in the exam room or in the waiting room while waiting to see their child's provider. Height, weight, calculated BMI, and BMI percentile for age and sex were measured as part of the regular care provided by clinic staff nurses during the child's appointment. BMI measurements and BMI percentiles were extracted from the pediatric participants' electronic medical record and were immediately de-identified to reduce risk of loss of confidentiality.

Data Analysis

Data from the surveys were compiled into an SPSS data spread sheet. Descriptive analysis including means with standard deviations and frequencies with percentages were used to describe participants' demographic variables. Demographic differences in BMI groups (high versus normal/low) were examined using Mann-Whitney U tests for continuous variables and Fishers exact tests for categorical variables. Frequencies were used to further describe differences in type of after-school care use by BMI groups. Mann-Whitney U tests were also used to examine differences in extent (number of hours) of after-school care use by BMI groups. Analyses were completed using IBM SPSS version 22 (SPSS, Inc., 2009, Chicago, IL, USA www.spss.com).

Results

Sample Characteristics

Participants were primarily male (56.5 %), white non-Hispanic (62.5%), from homes where parents were married and living with the spouse (45.8%), and on average 10 years of age. On average participants rated low perceived second hand smoke exposure. A greater proportion of participants with high BMI lived with persons who smoked in their homes as compared to those with low BMI (16.7% versus 0.0%). In addition, those participants with high BMI were significantly older than participants with normal/low BMI (see table 1). There were no other demographic differences between those with high versus normal/low BMI.

Type of After-School Care by BMI Groups

Children and adolescents in the study participated in six of eleven different types of after-school care during weekdays (see table 2, figure 1). Among these types, the most frequently used were grandparents, after-school club, and breakfast club. As compared to high BMI participants, a greater proportion of those with normal/low BMI participated in the breakfast club, after-school club, and grandparent care. As compared to normal/low BMI participants, those with the high BMI group were more likely to be cared for by older siblings and other relatives during weekdays.

On the weekends, children and adolescents in the study most often received care from four of nine types of caregivers (see table 2, figure 1). Among these caregivers, grandparents and older siblings were most frequently used. As compared to those in the high BMI group, those in the normal/low BMI group were more likely to be cared for by grandparents and other relatives.

Hours of After-School Care Use by Type of Care and BMI Groups

On average, the total hours of care provided during weekdays (4.0 hours) was greater than care provided during weekends (3.5 hours) (See table 3, figure 2). However, those in the high BMI group had a greater average hours of care on *weekends* as compared to those in the normal/low BMI group. During weekdays, the highest average number of hours of care was provided by grandparents (2.8 hours); while during weekends, the highest number of hours of care was provided by a non-resident parent (2.0 hours). As compared to the normal/low BMI group, the high BMI group had a greater average number of hours of care by other relatives and older siblings on weekdays and nonresident parents and older siblings on weekends. As compared to the high BMI group, the normal/low BMI group had a greater average number of hours of care by breakfast clubs, after-school clubs, babysitters, and grandparents during weekdays; and grandparents and other relatives during weekends.

Discussion

The purpose of this study was to examine the relationship between type and extent of after-school care use and high BMI in children and adolescents. Key findings were that children and adolescents with high BMI were older, more likely to receive after-school care from older siblings, nonresident parents, and relatives other than their parents and grandparents, and participated in a greater number of hours of weekend care by older siblings and non-parent/grandparent relatives than those with normal/low BMI. Children and adolescents with normal/low BMI were more likely to be cared for by school-associated clubs, babysitters, and grandparents, and less likely to be cared for by individuals other than parents during weekends than those with high BMI.

Older Children More Likely to Have High BMI

Children with high BMI were found to be older (10 years \pm 2.9 SD) in this study which is congruent with recent studies in the US and world-wide (Rivera et al., 2014; CDC, 2011; Fryar, Carrol, &

Ogden, 2012; Friend, Craig, & Turner, 2012). Although the rate of obesity is leveling off in younger children, the incidence of obesity among school age children and adolescents continues to increase at an alarming rate (CDC, 2011). Health care providers (HCPs) should be stringent on screening and treating elevated BMI in the school-age child and adolescent. Future studies may focus on the relationship of after-school care use and other obesity-contributing risks such as sedentary lifestyle, genetic predisposition to be overweight, excessive screen time, etc. as the development of obesity does not have a single causative factor (Dehgan, Akhtar-Danesh, & Merchant, 2005).

Children with High BMI are More Likely to Use Informal Care

Another key finding of this study was that children were more likely to be overweight or obese if they used informal care such as care from older siblings and relatives other than parents and grandparents. Other studies have found that receiving care from non-parental family members and friends is associated with high BMI (Hawkins et al., 2008, Pearce et al., 2010). However, contrary to the current study, studies have found own-home care is not associated with increased BMI (Pearce et al., 2010). Yet, Pearce et al.'s (2010) study was based on formal care given in-home to younger ages (nine months to three years) by registered nannies or babysitters, not family members. The UK Millennium Cohort Study After-School Care Specific Items survey used in the current study does not explicitly ask the location of the after-school care, but only who provided the care. In order to obtain conclusive results on the association between informal after-school care use and high BMI, more studies should be conducted on school age and adolescent children. Though the literature is rich with data regarding this relationship in young children, it is greatly lacking for older children. After more studies confirm this finding, HCPs should assess if parents are using older siblings and non-parent/grandparent relatives for after-school care and educate parents on patient centered options for better structured care.

In addition the current study supports findings from other studies which show formal childcare is associated with a healthy BMI. In studies by Pearce et al. (2010) and Hawkins et al. (2008), formal childcare defined as a nursery, childcare center, registered nanny or babysitter, or school clubs was also found to be protective against high BMI. Again, these two studies were conducted on younger children and comparative data with school age children and adolescents does not exist. Nonetheless, it is important for HCPs to assess the type of after-school care patients utilize as part of their routine well child visit and recommend formal after-school programs to maintain a healthy BMI.

Interestingly, care by grandparents was found to be more common amongst children with a healthy BMI in this study while other studies have found care from grandparents, especially if they have elevated BMI, to be associated with high BMI in their grandchildren (Davis, McGonagle, Schoeni, Stafford, 2008; Lin Lin, Leung, Hui, Lam, & Schooling, 2011; Maher, Li, Carter & Johnson, 2008). The finding of the current study may be as a result of a small sample size and should be interpreted with caution. The current study may be repeated with a larger group of participants and perhaps via interview to ensure accurate information is being reported by the parents. Though care by grandparents was often reported by this study's participants, the amount of hours spent under care from grandparents was relatively low and this may be the reason for this inconsistent finding.

Children with High BMI Participate in More Hours of After-School Care

Another key finding of this study is children with high BMI were more likely to participate in a greater number of hours of after-school care than children with normal/low BMI. Previous studies have also found this to be true (Pearce et al., 2010; Benjamin et al., 2009), though others found the amount of hours spent in care is not closely related with high BMI (Gubbels et al., 2010). In particular, children with high BMI were found to have more weekend hours under informal care than children with

normal/low BMI in the current study. Few if any studies exist which delineate differences in care on weekdays versus weekends.

Moreover, it may be that spending time with a nonresident parent is a contributing factor to high BMI since a greater number of high BMI participant weekend hours were spent in the care of a nonresident parent in the current study. This notion is supported by preliminary data which found nonresident parent sedentary activity was associated with adolescent sedentary activity and increasing adolescent BMI (Berge, Meyer, MacLehose, Eisenburg, & Nerumark-Sztainer, 2014). Future studies examining the relationship between weekend care, care from a nonresident parent, and high BMI should be explored. Such studies may provide important information whereby HCPs could educate their patients and families about making the best possible choices for after-school care, such as limiting the number of total hours children are in care with particular concern on the weekends. HCPs should not discourage after-school care in general, as it has been shown formal care is common in children with healthy BMI (Pearce et al., 2010), but HCPs should give families the information they need to choose the best care possible for their child.

Limitations

Limitations of this study include small sample size (n=24), limited study data collection duration (one month), and cross-sectional survey design. First, the sample size limited the full use of inferential statistics to better determine associations between the variables of interest. The small sample size is also predominantly white which is not consistent with findings in the literature regarding incidence of obesity (NHANES, 2009), so this sample may not be representative of this vulnerable population and findings may not be generalizable to a diverse set of patients. In addition, limited data collection duration contributed to the small sample size and the issues discussed previously. Lastly, the cross-sectional design of this study limits the ability to ascribe causality (i.e., it cannot be determined whether

high obesity contributes to type of after-school care or vice versa) and the survey design may have limited the accuracy of data collection. An interview style for data collection may have ensured more accurate data from parents regarding questions about type and extent of after-school care use; however, an interview style would likely have decreased the number of participants in this study.

Conclusion

This cross-sectional descriptive study examined the relationship between type and extent of after-school care use and high BMI in school age and adolescent children by using parent reported survey data about the type of care children receive after school and measuring children's BMI. Main findings were children with high BMI were older, more likely to use informal after-school care from older siblings and non-parent/grandparent relatives, and more likely to spend more total hours in after-school care than children with normal/low BMI. Children with normal/low BMI were more likely to spend time in structured after-school care such as school sanctioned clubs and babysitters, and spent less time overall in care than children with high BMI. Many of these findings are original in this age range and based on findings from this small sample study. However, HCPs should continue to watch these trends and recommend types and amounts of after-school care which will foster healthy BMIs for their pediatric patients. Researchers should continue to focus on examining the link between school-age and adolescent children's BMIs and where they spend time after school so HCPs can make after-school care recommendations based on large scale, generalizable study findings.

After-School Care Use

In this section, we are interested in knowing about how often and what type of after-school care your child uses.

B1: Thinking about a typical week including weekends, does your husband, wife, or partner regularly look after your child when you are not there?

- 1 No
- 2 Yes

B2: IF your husband, wife, or partner regularly looks after your child about how many hours per week is your child looked after by your husband, wife or partner?

How Many? none

B3: Thinking about a typical week, does your child go to an out-of-school or breakfast club before school?

- 1 No
- 2 Yes

B4: IF your child attends breakfast club, is childcare the main reason he or she goes to this out-of-school or breakfast club before school?

- 1 No
- 2 Yes

B5: On how many days per week does your child go to an out-of-school or breakfast club before school?

How many? none

B6: How many hours per day does your child spend at an out-of-school or breakfast club before school?

How many? none

B7: Is this an out-of-school or breakfast club on their school premises?

- 1 No
- 2 Yes

B8: Thinking about a typical week, does your child go to an out-of-school or homework club after school?

- 1 No
- 2 Yes

B9: IF your child attends after school club, is childcare the main reason he or she goes to this out-of-school or homework club?

- 1 No
- 2 Yes

B10: On how many days per week does your child go to this out-of-school or homework club after school?

How many? none

B11: How many hours per day does your child go to this out-of-school or homework club after school?

How many? none

B12: Is this out-of-school or homework club on their school premises?

- 1 No
- 2 Yes

B13: Apart from anything you've already told me about, thinking about a typical week, is your child looked after on weekdays by any of these?

Check All that apply & Indicate number of hours per week for each type of care

- Day care How Many Hours?
- Baby sitter How Many Hours?
- Nanny How Many Hours?
- Au pair How Many Hours?
- Grandparent(s) How Many Hours?
- Non-resident parent/
absent father/mother How Many Hours?
- Older brother/ sister How Many Hours?
- Other relatives How Many Hours?
- Friends/neighbors How Many Hours?
- None of these
- Other

B14: If you checked other, please specify

B15: Thinking about a typical week, is your child looked after on the weekend by any of these?

Check all that apply & Indicate number of hours per week for each type of care

- Day care How Many Hours?
- Baby sitter How Many Hours?
- Nanny How Many Hours?
- Au pair How Many Hours?
- Grandparent(s) How Many Hours?
- Non-resident parent/
absent father/mother How Many Hours?
- Older brother/ sister How Many Hours?
- Other relatives How Many Hours?
- Friends/neighbors How Many Hours?
- None of these
- Other

B16: If you checked other, please specify

B17: About how many hours in a typical week is your child looked after by the childcare mentioned above in answer B13 on weekdays?

How Many Hours? none

B18: About how many hours in a typical week is your child looked after by the childcare mentioned above in answer B15 on weekends?

How Many? none

B19: During a typical summer, on about how many days in total was your child looked after by you or your husband, wife, or partner on weekdays at times when he or she would usually be at school?

How many? none

B20: During a typical summer, apart from you or your husband, wife, or partner, who looked after your child on weekdays at times when he or she would usually be at school?

Check all that apply & Indicate number of hours per week for each type of care

- Day care How Many Hours?
- Baby sitter How Many Hours?
- Nanny How Many Hours?
- Au pair How Many Hours?
- Grandparent(s) How Many Hours?
- Non-resident parent/
absent father/mother How Many Hours?
- Older brother/ sister How Many Hours?
- Other relatives How Many Hours?
- Friends/neighbors How Many Hours?
- None of these
- Other

B21: During a typical summer, about how many days in total was your child looked after on weekdays, by the childcare mentioned above in answer B20?

How Many? none

References

- Bell, L. M., Curran, J. A., Byrne, S., Roby, H., Suriano, K., Jones, T. W., & Davis, E. A. (2011). High incidence of obesity co-morbidities in young children: A cross-sectional study. *Journal of Paediatrics & Child Health, 47*(12), 911-917. doi: 10.1111/j.1440-1754.2011.02102.x
- Benjamin, S. E., Rifas-Shiman, S. L., Taveras, E. M., Haines, J., Finkelstein, J., Kleinman, K., & Gillman, M. W. (2009). Early Child Care and Adiposity at Ages 1 and 3 Years. *Pediatrics, 124*(2), 555-562. doi: 10.1542/peds.2008-2857
- Berge, J., Meyer, C., MacLehose, R., Eisenburg, M., & Nerumark-Sztainer, D. (2014). Nonresident parental influence on adolescent weight and weight-related behaviors: similar or different from resident parental influence?. *International Journal of Behavioral Nutrition and Physical Activity, 11*, 131.
- CDC (2010). U.S. obesity trends. Retrieved from <http://www.cdc.gov/obesity/data/trends.html>
- CDC (2011). Childhood obesity facts. Retrieved from <http://www.cdc.gov/obesity/data/childhood.html>
- Davis, M., McGonagle, K., Schoeni, R., & Stafford, F. (2012). Grandparental and parental obesity influences on childhood overweight: implications for primary care practice. *Journal of the American Board of Family Medicine, 21*(6), 549-554.
- Dehgan, M., Akhtar-Danesh, N., & Merchant, A. (2005). Childhood obesity, prevalence, and prevention. *Nutrition Journal, 4*(24).
- Dietz, W.H. (2004). Overweight in childhood and adolescence. *New England Journal of*

Freedman, D. S., Mei, Z., Srinivasan, S. R., Berenson, G. S., & Dietz, W. H. (2007). Cardiovascular risk

factors and excess adiposity among overweight children and adolescents: the Bogalusa Heart Study. *The Journal Of Pediatrics*, 150(1), 12-17.e12.

Friend, A., Craig, L., & Turner, S. (2012). The prevalence of metabolic syndrome in children: A systematic

review of the literature. *Metabolic Syndrome and Related Disorders* 11(2), 71-80.

Fryar, C., Carroll, M., & Ogden, C. (2012). Prevalence of obesity among children and adolescents: United

States, trends 1963-1965 through 2009-2010. *CDC: Division of Health and Nutrition Examination Surveys 2009-2010*.

Gubbels, J. S., Kremers, S. P. J., Stafleu, A., Dagnelie, P. C., de Vries, N. K., van Buuren, S., & Thijs, C.

(2010). Child-care use and the association with body mass index and overweight in children from 7 months to 2 years of age. *International Journal of Obesity*, 34(10), 1480-1486. doi: 10.1038/ijo.2010.100

Hawkins, S. S., Cole, T. J., & Law, C. (2008). Maternal employment and early childhood overweight:

findings from the UK Millennium Cohort Study. *International Journal of Obesity*, 32(1), 30-38. doi: 10.1038/sj.ijo.0803682

Lin Lin, S., Leung, G., Hui, L., Lam, T., & Schooling, C. (2011). Is informal childcare associated with

childhood obesity? Evidence from Hong Kong's 'Children of 1997' birth cohort. *International Journal of Epidemiology* 40(5), 1238-1246.

- Maher, E., Li, G., Carter, L., & Johnson, D. (2008). Preschool child care participation and obesity at the start of kindergarten. *Pediatrics* 122(2), 322-330.
- McLaren, L., Zarrabi, M., Dutton, D., Auld, M., & Emery J. (2012). Childcare: Implications for overweight/obesity in Canadian children? *Chronic disease and injuries in Canada* 33(1), 1-11.
- Morrissey, T. W., Dunifon, R. E., & Kalil, A. (2011). Maternal Employment, Work Schedules, and Children's Body Mass Index. *Child Development*, 82(1), 66-81. doi: 10.1111/j.1467-8624.2010.01541.x
- National Center for Health Statistics (). National Health and Nutrition Examination Survey. Retrieved from <http://www.cdc.gov/nchs/nhanes.htm>
- Pearce, A., Li, L., Abbas, J., Ferguson, B., Graham, H., & Law, C. (2010). Is childcare associated with the risk of overweight and obesity in the early years? Findings from the UK Millennium Cohort Study. *International Journal Of Obesity* (2005), 34(7), 1160-1168. doi: 10.1038/ijo.2010.15
- Reilly, J. J., & Kelly, J. (2011). Long-term impact of overweight and obesity in childhood and adolescence on morbidity and premature mortality in adulthood: systematic review. *International Journal of Obesity*, 35(7), 891-898. doi: 10.1038/ijo.2010.222
- Rivera, J., de Cossío, T., Pedraza, L., Aburto, T., Sánchez, T., & Martorell, R. (2014). Childhood and adolescent overweight and obesity in Latin America: a systematic review. *The Lancet Diabetes and Endocrinology* 2(4), 1415-1421.

Table 1. Sample Characteristics

| | | Total (N = 24) | High (n = 13) | Normal/Low (n = 11) | Difference* | |
|-----------------------------------|-------------------------------|-------------------|------------------|------------------------|-----------------|------------------|
| | | N (%) | n (%) | n (%) | Chi-square (DF) | P-value |
| Gender | Female | 10 (43.5) | 6 (60.0) | 4 (40.0) | 0.4 (1) | .680 |
| | Male | 13 (56.5) | 6 (46.2) | 7 (53.8) | | |
| Ethnicity | White, non-Hispanic | 15 (62.5) | 10 (76.9) | 5 (45.5) | 6.6 (4) | .094 |
| | Black, non-Hispanic | 4 (16.7) | 1 (7.7) | 3 (27.3) | | |
| | Hispanic | 1 (4.2) | 0 (0.0) | 1 (9.1) | | |
| | Asian/Pacific Islander | 2 (8.3) | 0 (0.0) | 2 (18.2) | | |
| | Other | 2 (8.3) | 2 (15.4) | 0 (0.0) | | |
| Marital status | Married living with spouse | 11 (45.8) | 7 (53.8) | 4 (36.4) | 2.0 (3) | .639 |
| | Member of an unmarried couple | 2 (8.3) | 1 (7.7) | 1 (9.1) | | |
| | Divorced/separated | 7 (29.2) | 4 (30.8) | 3 (27.3) | | |
| | Single, never married | 4 (16.7) | 1 (7.7) | 3 (27.3) | | |
| Household smokers | None | 20 (83.3) | 9 (69.2) | 11 (100.0) | 3.6 (2) | .149 |
| | One | 3 (12.5) | 3 (23.1) | 0 (0.0) | | |
| | Two | 1 (4.2) | 1 (7.7) | 0 (0.0) | | |
| | Three or more | 0 (0.0) | 0 (0.0) | 0 (0.0) | | |
| Age of participant (years) | | Mean (SD) | Mean (SD) | Mean (SD) | Mann-Whitney U | P-value |
| | | 10.4 (2.9) | 11.6 (2.7) | 9.2 (2.7) | | |
| BMI (kg/m²) | | 26.0 (9.5) | 33.5 (6.4) | 17.2 (1.7) | .00 | <.0001 |
| Perceived SHS exposure | | 1.7 (2.8) | 2.2 (3.2) | 1.1 (2.2) | 57.5 | .351 |

SD = Standard Deviation, DF = Degrees of freedom

*all differences between high and normal/low BMI groups calculated using Fishers exact tests for categorical variables and Mann-Whitney U tests for continuous variables.

Table 2. Frequencies of type of after-school care by BMI groups

| | Weekday | | | Weekend | | |
|--------------------------|-----------|-----------|------------|-----------|-----------|------------|
| | Total | High | Normal/low | Total | High | Normal/low |
| Breakfast club | 4 (16.7) | 1 (25.0) | 3 (75.0) | | | |
| After-school club | 6 (25.0) | 2 (33.3) | 4 (66.7) | | | |
| Daycare | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) |
| Babysitter | 1 (4.2) | 0 (0.0) | 1 (100.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) |
| Nanny | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) |
| Au Pair | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) |
| Grandparents | 12 (50.0) | 5 (41.7) | 7 (58.3) | 4 (16.7) | 1 (25.0) | 3 (75.0) |
| Nonresident Parent | 0 (0.0) | 0 (0.0) | 0 (0.0) | 1 (4.2) | 1 (100.0) | 0 (0.0) |
| Older sibling | 3 (12.5) | 2 (66.7) | 1 (33.3) | 2 (8.3) | 2 (100.0) | 0 (0.0) |
| Other relatives | 3 (12.5) | 3 (100.0) | 0 (0.0) | 1 (4.2) | 0 (0.0) | 1 (100.0) |
| Friend/neighbor | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) |
| None of these | 9 (37.5) | 6 (66.7) | 3 (33.3) | 16 (66.7) | 9 (56.3) | 7 (43.8) |

Figure 1: Frequencies of weekday type of after-school care by BMI groups

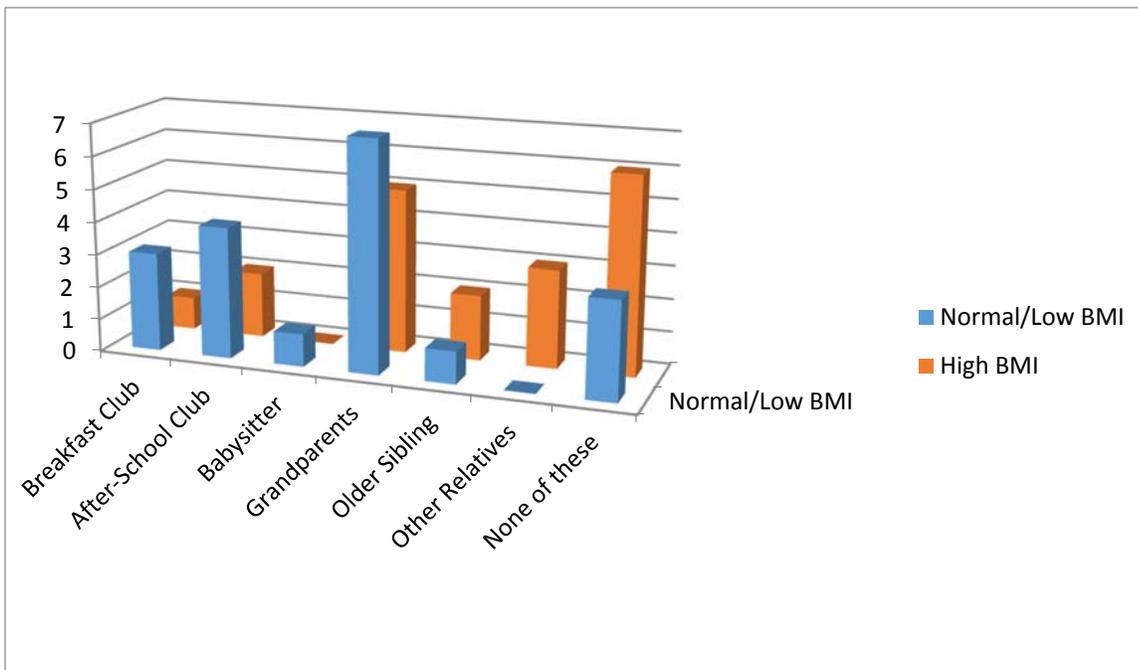


Table 3: Hours of after-school care by type of care and BMI groups

| | Weekday | | | Weekend | | |
|--------------------------|------------------|------------------|------------------|------------------|-------------------|------------------|
| | Total | High | Normal/low | Total | High | Normal/low |
| Breakfast club | 0.5 (1.6) | 0.1 (0.3) | 0.9 (2.4) | | | |
| After-school club | 0.6 (1.2) | 0.4 (1.0) | 0.9 (1.4) | | | |
| Daycare | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) |
| Babysitter | 0.3 (1.4) | 0 (0.0) | 0.6 (2.1) | 0 (0.0) | 0 (0.0) | 0 (0.0) |
| Nanny | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) |
| Au Pair | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) |
| Grandparents | 2.8 (4.8) | 2.3 (3.8) | 3.5 (5.6) | 1.2 (3.0) | 0.9 (3.3) | 1.5 (2.6) |
| Nonresident Parent | 0 (0.0) | 0 (0.0) | 0 (0.0) | 2.0 (9.8) | 3.7 (13.3) | 0 (0.0) |
| Older sibling | 0.3 (1.2) | 0.6 (1.5) | 0 (0.0) | 0.2 (0.6) | 0.3 (0.8) | 0 (0.0) |
| Other relatives | 0.5 (1.7) | 1.0 (2.3) | 0 (0.0) | 0.3 (1.2) | 0 (0.0) | 0.5 (1.8) |
| Friend/neighbor | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) |
| Total hours | 4.0 (5.1) | 3.9 (4.6) | 4.0 (5.8) | 3.5 (9.9) | 4.9 (13.4) | 1.9 (2.7) |

Figure 2: Hours and type of weekend after-school care by BMI groups

