

**HOUSEHOLD SUPPORT AND PHYSICAL ACTIVITY IN ADOLESCENT FEMALES
FROM LOWER SOCIOECONOMIC STATUS HOUSEHOLDS**

by

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BACKGROUND: Parental support for physical activity has been demonstrated to be associated with physical activity levels of low socioeconomic status adolescent females. While research show that adult facilitation and encouragement of physical activity engagement is valued by this group, limited research has been done examining the associations between household support and physical activity levels in this population.

PURPOSE: The purpose of this study was to examine the association between the perception of household support and physical activity levels of low socioeconomic status adolescent girls.

METHODS: Thirty-six girls, between the ages of 13-17 years, were recruited from lower socioeconomic geographic areas. Recruitment strategies included boy low-touch (e.g., flyers, mailings) and high-touch (e.g., face to face) methods. During a study visit, participants completed two questionnaires as well as had their height and weight measured. The 3DPAR was used to assess participant physical activity and the household support questionnaire was used to collect demographic information as well as measure support for physical activity from the adult in the household the participant perceived themselves as being closest with and each additional adult in the household.

RESULTS: There were no significant associations between the perception of household support for physical activity and physical activity levels. There were negative significant associations between the BMI of low socioeconomic status adolescent girls and both the total household support ($p=0.001$) and the support provided by the closest adult to the participant in the household ($p<0.001$). The most frequently reported priorities were family and friends, school, and being the best version of oneself. The most frequently reported facilitators of physical activity were family/ friend support, types of physical activities, and school. The most frequently reported barriers to physical activity were school, transportation, and pain/injury.

CONCLUSIONS: These findings suggest that household support for physical activity is not associated with physical activity engagement in adolescent girls living in low socioeconomic geographic areas. Thus, other factors may be associated with physical activity participation in this population group, and this warrants further investigation.

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PREFACE

I would like to thank my committee members Dr. Jakicic, Dr. Ross, Dr. Gary-Webb, and Dr. Akiva for all of their help and support. I would especially like to thank my co-chairs Dr. Jakicic and Dr. Ross for all of their guidance and patience in preparing my dissertation. Thank you to all of those that helped me recruit and assess participants for this study including: Anna Peluso, Stephanie McCoy, and Andrea Stewart.

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1.0 INTRODUCTION

The current physical activity guidelines for children are to obtain at least 60 minutes of moderate-to-vigorous intensity physical activity daily.¹ As of 2007, only 42% of US children ages 6-11 years and 8% of adolescents met the recommended level of physical activity daily when physical activity was measured objectively.² In an analysis of NHANES self-reported physical activity, only 14.7% of adolescents ages 12-17 years met the 2008 physical activity guidelines for youth.³ Adherence of US adults to physical activity guidelines (30 minutes/ day, 5 days/ week) is between 5-10% in studies measuring physical activity objectively.^{2,4} Physical inactivity is highly prevalent across all ages, but physical activity significantly declines between childhood and adulthood.²

Engagement in physical activity, even in childhood, is associated with a more favorable cardio-metabolic risk profile and prevention of future cardiovascular disease.⁵⁻⁷ There is a significant graded negative association between cardio-metabolic risk factors such as blood pressure, insulin resistance, total cholesterol, and total triglyceride levels, and physical activity levels in children ages 9- 15 years.⁵ In a pooled analysis of studies examining time spent in moderate-to-vigorous physical activity and cardio-metabolic risk factors in children and adolescents by Ekelund et al., there was a significant association between the time spent in moderate-to-vigorous physical activity and all cardio-metabolic outcomes, independent of sex, age, sedentary time, and waist circumference.⁶ There is a significant and graded association

between physical activity and cardio-metabolic risk even in childhood, however the rates of children and adolescents obtaining the recommended levels of physical activity are low and remain low in adulthood.^{2,6}

1.1 PHYSICAL ACTIVITY IN YOUTH

As children age, physical activity levels decline steadily throughout adolescence.⁸⁻¹⁰ In studies looking at physical activity patterns over time, there is some disagreement as to when the decline in physical activity begins and the rate at which declines occur, but there is a consensus that there are significant declines in physical activity during adolescence.¹⁰⁻¹² The decline in physical activity throughout adolescence is more prominent in females compared to males, especially in African American females.^{13,14} One review of longitudinal studies looking at physical activity decline over a 10-year span, identified that physical activity decline among adolescent boys became smaller, but increased among adolescent females.¹⁰ However, higher levels of physical activity in childhood are consistently associated with an attenuated decline in physical activity throughout adolescence.^{8,15,16}

In addition to the decline of physical activity in adolescents, the timing of pubertal development is associated with physical activity levels in adolescents, especially in females.^{14,15,17} One study by Davison et al. found that more advanced pubertal development by age 11 significantly predicted fewer minutes of moderate-to-vigorous physical activity at age 13.¹⁷ Similarly, a longitudinal study by Hearst et al. found that early pubertal development was associated with lower levels of objectively measured physical activity two years later.¹⁵ In addition, advanced pubertal development in adolescent females has been associated with

significantly lower global self-worth, higher levels of depression, and increased maturity fears, which are all associated with lower reported enjoyment of physical activity.¹⁷ While not many studies have looked at the associations between pubertal development and physical activity in male children, one study by Duncan et al. found that early maturing boys had higher levels of physical activity at age 12, but experienced a greater rate of decline in physical activity over the next 5 years.¹⁸ Taken together, post-pubescent adolescent females have the greatest need to increase physical activity levels and are an important target for future physical activity interventions.

1.2 CORRELATES OF PHYSICAL ACTIVITY

There are many correlates of physical activity, some of which facilitate youth engagement in physical activity and others are barriers towards youth engagement in physical activity. These correlates stretch across the levels (individual, interpersonal, environment) of the Social Ecological Model and will be discussed in brief below.

1.2.1 Facilitators of youth physical activity

There are many correlates of youth physical activity that act to facilitate engagement in physical activity. There have been many psychosocial correlates of physical activity examined in the literature. The psychosocial correlate most consistently and positively associated with physical activity throughout childhood and adolescence in the literature is self-efficacy.^{15,19-21}

A qualitative study by Moore et al. of urban youth, found that both youth and parents cited the social aspects of physical activity and access to recreational facilities were facilitators of youth physical activity engagement.²² Additionally, adolescent girls living in an urban environment in comparison to girls living in a suburban environment perceived greater facilitation of neighborhood walkability due to crosswalks and pedestrian traffic signals.²³ A qualitative study of Non-Hispanic black and Black middle school girls by Taylor et al. identified three themes of facilitators including: (1) enjoyment of physical activity; (2) support for physical activity; and (3) body image and health.²⁴

School-based physical activity has been demonstrated to be a great facilitator of physical activity in youth.^{25,26} In a qualitative study of adolescents who were previously averse to physical education by Brooks and Magnusson, physical education and enjoyment increased when the program was switched to focus commitment and participation and reduced criticism of physical performance.²⁵ In a review of barriers and facilitators of physical activity by Rees et al. positive physical education experiences, enjoyment of physical activity, and respect of physical education instructors as facilitators of school-based physical activity.²⁶ Taken together, school can be a great and valued facilitator of youth physical activity, especially with the implementation of effective physical education classes focusing on enjoyment and engagement.

1.2.2 Barriers to youth physical activity

While age is predictive of decline in physical activity, there are a number of barriers youth face that can affect their engagement in physical activity.^{12,19,27,28} Depression is the most consistent psychosocial correlate negatively associated with physical activity in adolescence.¹² Body mass index (BMI) has been looked at extensively in the literature as a potential barrier to physical

activity engagement, however the results are mixed.^{9,11,12,20,29} In males, there are more consistent negative associations between BMI and physical activity seen throughout childhood and adolescents compared to females.^{30,31} However, higher BMI may negatively affect physical activity engagement secondarily through unique barriers including increased perceived and actual peer victimization, physical discomforts, negative body image, low motivation, and low self-efficacy.³²

Low socioeconomic status has been shown to be a barrier to engagement in physical activity, especially in adolescents. Low socioeconomic status adolescents are less physically active than their higher socioeconomic status counterparts and experience additional unique barriers to engagement in physical activity.³³⁻³⁶ Greater parental concern about perceived neighborhood and personal safety, living in a high crime area, and lack of access to affordable, proximal, and safe environments to engage in physical activity are additional barriers more commonly reported by low socioeconomic status adolescents.^{33,37,38} In a qualitative study by Humbert et al., low socioeconomic status adolescents reported family obligations as an additional barrier to physical activity, which was not reported by higher socioeconomic status adolescents.³³

In addition, there are many neighborhood and environmental factors that affect children and adolescent engagement in physical activity, which have strong ties to socioeconomic status^{37,39-43} Both school and neighborhood environment are associated with physical activity, especially parental perception of neighborhood safety.^{40,41} A study by Haug et al. examined the association between physical activity levels and greater access to outdoor school facilities in students and found that youth are at least 2.5 times more likely to be physically active in schools with greater access to outdoor facilities compared to students in schools with fewer outdoor

facilities.⁴⁰ Outside of school, parent perception of recreational opportunities and perception of neighborhood safety have been shown to be positively associated with physical activity.^{4,42,43} There is a significant positive association between parents' perceived risk of neighborhood safety and constrained behavior, which is more negatively associated with youth physical activity and this association is more pronounced in female youth.⁴³ Adult facilitation of physical activity is in greater demand in neighborhoods with lower perceived safety.^{33,42} The evidence suggests that in lower socioeconomic status populations in higher risk neighborhoods, parental engagement and facilitation of their child's physical activity may have a substantial impact and is an important consideration for future physical activity interventions in this population.

1.3 PARENT INFLUENCES ON YOUTH PHYSICAL ACTIVITY

In the literature there are two ways it has been hypothesized by which parents can influence their child's engagement in physical activity: (1) through parental modeling and (2) through parental support.⁴⁴⁻⁴⁶ In reviews of the literature, the relationship between parental modeling and youth physical activity levels is more inconsistent whereas parental support has a more consistent positive association with child and adolescent physical activity levels.^{12,19,46-48}

1.3.1 Relationship between parental modeling and adolescent physical activity

The relationship between parental engagement in physical activity and youth engagement in physical activity is not well defined.^{12,46-48} In studies measuring physical activity by self-report, the association between child physical activity and parental physical activity is weaker than in

studies measuring physical activity objectively.⁴⁷ Several studies support a positive association between child perception of higher parental physical activity levels in at least one parent and child engagement in physical activity as well as greater fitness levels.^{29,49-51} In a review of the literature by Edwardson and Gorely, there was greater support for the association of parental modeling and direct involvement in physical activity with younger children compared with adolescents.⁵²

Parental modeling may have differential associations depending on the gender of the parent and child. In general, paternal modeling has a more pronounced association with child physical activity than maternal modeling and this association is much stronger with male children.^{51,53} One study by Fuemmeler et al. found that father and sons' moderate-to-vigorous physical activity was positively correlated during the weekend and weekday afternoons, which are the time periods where parents are most likely to have the greatest affect on child physical activity levels.⁵¹ Some studies suggest mothers' engagement in physical activity does have weak to modest associations with physical activity in both genders, but more evidence supports the association between mothers and daughters' physical activity.^{11,47,53,54}

1.3.2 Relationship between parental support and adolescent physical activity.

There is consistent evidence in the literature to support a positive association between parental support and children's physical activity levels.^{9,44,55,56} Associations between parental support and youth physical activity are strongest in studies using self-report as a measure of physical activity, with more modest associations when physical activity is measured objectively.⁴⁸ The associations between parental support and child physical activity are stronger in adolescents compared to younger children.⁴⁶

Parental support is positively associated with child physical activity levels both directly and indirectly via increased self-efficacy.^{19,47,57} Different types of parental support are associated with increased engagement in youth physical activity; tangible support and intangible support. Tangible (logistical) support includes transportation of child to physical activity and financial support of physical activities.^{9,29,52} Tangible support from parents has a consistent positive association with child physical activity, with that relationship being stronger in adolescence, especially in those of lower socioeconomic status.^{33,52} Intangible support, including encouragement for physical activity and parental attitudes towards physical activity, has also been shown to be positively associated with adolescent physical activity.^{44,56} In a study by Sallis et al., objectively measured moderate-to-vigorous physical activity in young children was not associated with verbal encouragement from parents.³⁰ Taken together, the evidence suggests intangible support has a weaker association to child's physical activity, but that relationship is stronger as children move into adolescence.

There are differences between maternal and paternal support in the types of support each parent provides and the influences on the child. Children are more likely to perceive receiving more intangible support (i.e. emotional support) from their mother and more tangible support from their father.⁵⁸ There is evidence that mothers' support may have a more pronounced influence over their daughters' physical activity and fathers' support may have a more pronounced influence over their sons' physical activity levels.^{47,51}

Several studies that have reported that parental support has differential associations based on the gender of the child and that support provided differs based on the gender of the child.^{44,59} Parents view a greater perceived importance for physical activity for male children as well as provide higher levels of support for physical activity for their male children compared to female

children.^{44,47} Male children also receive higher levels of tangible support, potentially due to increased engagement in team sports, compared to their female counterparts.⁵⁹⁻⁶¹ However, one qualitative study by Tergerson et al. found that parental encouragement was more highly valued by adolescent females in comparison to males.²⁷

In the literature, it has also been shown that there are no significant differences in youth physical activity levels between those who receive high levels of support from one parent versus two parents. However, significant differences in youth physical activity levels between those who receive high levels of support from any parent versus those who do not receive any parental support.^{9,55,62,63} However, the primary aims of these studies were not to determine the differential associations between household status (one or more people who dwell in the same living space, and may consist of a single family or some other grouping of people). These secondary analyses suggest that as long as one parent provided encouragement for physical activity, their child is likely to have a greater level of engagement in physical activity.

1.4 HOUSEHOLD FACTORS AND YOUTH PHYSICAL ACTIVITY

It has been suggested that if a child perceives encouragement for physical activity or perceives one parent to be physically active, they themselves are more likely to be physically active.^{9,50,55,63} These studies however did not set out to examine differences based on household status. There have only been a few studies that have looked at the potential associations between household status and support on youth engagement in physical activity.⁶⁴⁻⁶⁸ One study by McNeal found that adolescents from single-parent households had significantly lower participation in extracurricular activities, including athletics.⁶⁴ Children of single parent families have been

found to spend significantly more time watching television compared to those in dual parent households.^{65,68} The evidence suggests that household status may influence youth engagement in physical activity, which may be an important factor to consider in the development of future physical activity interventions.

1.5 JUSTIFICATION

Although there have been many studies examining parental influences on physical activity in youth, few studies have examined potential associations with household status. Most of the studies that have looked at physical activity in youth by household status have done so in secondary analyses, but these studies have not been designed or powered to answer this question. It is important to understand the sources and types of support within the household that have the greatest associations with youth physical activity to help develop future physical activity interventions in this population.

This study was designed to examine the sources and types of support that have the greatest associations with youth physical activity levels from girls recruited from lower socioeconomic status neighborhoods. This information may be valuable for the development of future physical activity interventions in adolescent females. This information will help us determine if there is a need to develop interventions based on household status and what these differential needs are of these female adolescents.

1.6 SPECIFIC AIMS AND HYPOTHESES

This study will recruit adolescent females from lower socioeconomic status households to examine and test the following specific aims and hypotheses:

AIM 1: To examine the association between physical activity and perceived support for physical activity provided by the most influential adult in the household

HYPOTHESIS: Perceived support for physical activity provided by the adult in their household who the adolescent identifies as the most influential on them will be significantly associated with physical activity.

HYPOTHESIS: Perceived tangible support for physical activity provided by the adult in their household who the adolescent identifies as the most influential on them will be significantly associated with physical activity.

HYPOTHESIS: Perceived intangible support for physical activity provided by the adult in their household who the adolescent identifies as the most influential on them will be significantly associated with physical activity.

AIM 2: To examine the association between 2: physical activity and number of adults in the household who the adolescent perceives as providing support for physical activity.

HYPOTHESIS: The number of adults in the adolescent's household who they perceive provide support for their participation in physical activity will be significantly associated with physical activity.

HYPOTHESIS: The number of adults in the adolescent's household who they perceive provide *tangible support* for their participation in physical activity will be significantly associated with physical activity.

HYPOTHESIS: The number of adults in the adolescent's household who they perceive provide *intangible support* for their participation in physical activity will be significantly associated with physical activity.

AIM 3: To examine the association between physical activity and perceived magnitude of support for physical activity provided by adults in their household.

HYPOTHESIS: The adolescent's perceived magnitude of support for physical activity provided by all adults in their household will be significantly associated with physical activity.

HYPOTHESIS: The adolescent's perceived magnitude of *tangible support* for physical activity provided by all adults in their household will be significantly associated with physical activity.

HYPOTHESIS: The adolescent's perceived magnitude of *intangible support* for physical activity provided by all adults in their household will be significantly associated with their reported level of physical activity.

2.0 REVIEW OF THE LITERATURE

2.1 YOUTH PHYSICAL ACTIVITY

Current guidelines for youth physical activity is for children and adolescents ages 6-17 years old to engage in at least 60 minutes of moderate-to-vigorous physical activity per day, 7 days per week.⁶⁹ A study by Troiano et al., using objectively measured physical activity, found that only 42% children and 6-8% of adolescents adhere to the current guidelines.² When physical activity is measured by self-report, 80.3% of US adolescents (13-15 years) are not meeting current recommendations.⁷⁰ Belcher et al. analyzed objectively measured physical activity data from NHANES and found that 6-11year olds spend 88 minutes/day in moderate-to-vigorous physical activity compared to 33 minutes/ day in 12-15 year olds and 26 minutes/ day in 16-19 year olds.⁷¹ While measures of exactly how much physical activity youth are engaging in depends on the study and the measurement of physical activity, there is a general consensus that youth are not meeting recommendations and levels of physical activity decline in adolescence.^{2,70-72}

2.1.1 Gender differences in youth physical activity

The gender differences in youth physical activity are significant and can be seen in both unorganized and organized forms of physical activity. Male youth engage in significantly more physical activity and are more likely to meet recommendations compared to female youth.^{2,71,73}

An analysis of the 2011 Youth Risk Behavior Survey, which measured physical activity in youth by self-report, showed that high school boys were twice as likely as high school girls to meet the current physical activity guidelines (38% vs. 19%).⁷⁴ In an analysis of the National Longitudinal Survey of Children and Youth, Bengoechea et al. found that female adolescents participated significantly less frequently in unorganized (without a coach or instructor) physical activities (e.g., biking, skateboarding, etc.) compared to male adolescents.⁷⁵ In addition, several studies have found that male youth participate in significantly more organized sports than female youth.⁵⁹⁻⁶¹ Vilhjalmsson et al. found that the lower enrollment of female adolescents in organized sports fully accounted for the gender differences in the frequency of overall physical activity.⁶¹

Gender differences in physical activity levels are seen across all age groups; however, there is conflicting evidence as to whether the gender gap increases or decreases in adolescence.^{2,76} Troiano et al., in an analyses of objectively measured physical activity data collected as part of NHANES, found that even in late adolescence (ages 16-19 years), males averaged 32.7 minutes of moderate-to-vigorous physical activity, whereas females only averaged 19.6 minutes of moderate-to-vigorous physical activity daily.² This suggests that the gender gap is still seen even as adolescents transition into young adulthood.

2.1.2 Racial/ Ethnic differences in youth physical activity

Racial/ethnic differences that can be seen in youth physical activity levels, however, these differences vary by age and gender.^{12,51} In a review of correlates of physical activity in youth by Sallis et al., ethnicity was consistently related to physical activity levels in adolescents with non-Hispanic white youth being more active than other ethnic groups.¹² However there was little evidence to support racial/ ethnic differences in physical activity levels of children.¹²

Many of the gender differences seen in physical activity levels also differ by race/ethnicity.^{2,71,73} Sallis et al. found that Hispanic and non-Hispanic black male adolescents engaged in significantly greater levels of vigorous physical activity than non-Hispanic white male adolescents.³¹ One study by Belcher et al. found that non-Hispanic white males (ages 6-17 years) engaged in significantly fewer minutes of moderate-to-vigorous physical activity compared to non-Hispanic black and Mexican American males, but no such differences in females.⁷¹ Asian adolescents of both genders are less physically active than non-Hispanic black and non-Hispanic white adolescents.⁷⁷

There are mixed findings on if there are any racial/ethnic differences in females, especially in adolescence.^{2,13,77} A study by Kelly et al., which objectively measured physical activity levels in a diverse sample of 6th grade girls, found that there were no significant differences in physical activity levels between Hispanic, non-Hispanic black, and non-Hispanic white girls.⁷⁸ In a study of adolescent females by Neumark-Sztainer et al., race/ethnicity was significantly associated with the amount of time spent watching TV, but not associated with physical activity levels.²⁰

Basch however, did identify discrepancies in adolescent female physical activity levels by race/ethnicity based on an analysis of the 2007 National Youth Behavior Risk Survey.⁷⁹ Basch found that 42.1% of non-Hispanic black female high school students did not participate in 60 or more minutes of physical activity on at least 1 day per week, where this rate was 35.2% in Hispanic adolescents, and 16.7% in non-Hispanic white adolescents.⁷⁹ Similarly, Ornelas et al. found that non-Hispanic white female adolescents were significantly more likely and non-Hispanic black female adolescents were significantly less likely to achieve ≥ 5 bouts of moderate-to-vigorous physical activity per week than females of other racial/ethnic groups.⁴⁵ In a review

by Gordon-Larsen et al., time spent in moderate-to-vigorous physical activity was lower and inactivity was higher for non-Hispanic black and Hispanic adolescents and this trend was exaggerated in older female adolescents.⁸⁰ The evidence suggests that racial/ethnic differences in female youth are more prominent in older adolescents, however racial/ethnic minorities are consistently more physically inactive.

2.2 HEALTH CONSEQUENCES OF YOUTH PHYSICAL INACTIVITY

Physically active youth, especially when engagement in physical activity is consistent throughout childhood and adolescence, are more likely to remain physically active as adults.⁸¹ In a study by Yang et al. examining physical activity patterns over 21 years as part of the longitudinal Cardiovascular Risk in Young Finns study, found that those who were either decreasingly active or persistently inactive from youth to adulthood were more likely to be obese as adults compared to persistently active youth.⁸² In women, becoming decreasingly active from youth to adulthood was independently associated with the risk of being overweight and obese independent of childhood weight status.⁸² This highlights the importance of physical activity in adolescence, a pivotal time period in the lifespan predictive of weight status in adulthood, especially in females.

In addition to the reduced risk of becoming overweight or obese in adulthood, which is associated with many unfavorable cardiometabolic outcomes, engagement in physical activity throughout childhood and adolescence can reduce cardiometabolic risk even at a young age.^{6,7,83} In a study by Ekelund et al. time spent in moderate-to-vigorous physical activity was significantly associated with more favorable blood pressure, fasting insulin, fasting triglycerides, and HDL cholesterol independent of sex, age, sedentary time, and waist circumference in youth

ages 4-18 years.⁶ Another study by Andersen et al. assessing cardiometabolic risk and objectively measured physical activity in youth found that there was a graded-negative association between the clustering of cardiometabolic risk factors and moderate-to-vigorous physical activity.⁵ Janssen and LeBlanc, in a review of the literature on health benefits of physical activity in youth, found consistent support for the dose-dependent relationship between physical activity and greater health benefits.⁸⁴ However, in high-risk youth including those with obesity or hypertension, even modest increases in physical activity had health benefits.⁸⁴ Taken together, youth engagement in physical activity has positive implications in both current and future cardiometabolic risk status in adulthood.

In addition to the positive associations between cardiometabolic health and physical activity in youth, there is some evidence to support modest associations between physical and mental health, especially acutely.⁸⁵ One study by Kirkcaldy et al. found that adolescents who regularly engaged in endurance exercise had lower anxiety and depression scores as well as a more favorable self-image compared to their less active peers.⁸⁶ Benefits of physical activity on mental health have been seen in young children as well. A study by Hamer et al. in children ages 4-12 years found that increased screen time and low physical activity levels were associated with greater levels of psychological distress.⁸⁷ Engagement in physical activity has a wide range of health benefits even in youth, which makes the development of future interventions to increase physical activity levels of the utmost importance for current and future health status of youth.

2.3 PHYSICAL ACTIVITY DECLINE IN ADOLESCENCE

As indicated by the prevalence of children and adolescents achieving the recommended level of physical activity, there is a decline in physical activity from childhood to adolescence.^{2,72} A study by Kahn et al. examining patterns and determinants of physical activity in US adolescents found that age was the only factor that predicted change in physical activity over time.¹¹ In a review of the literature on physical activity decline by Dumith et al., physical activity levels decline on average 7.0% per year throughout the course of adolescence.¹⁰

There is some disagreement in the literature as to when physical activity declines begin and at what age physical activity peaks.^{11,76} A study by Trost et al. objectively measured physical activity in grades 1-3, 4-6, 7-9, and 10-12 and found significant declines in physical activity across each grade grouping.⁷⁶ Field et al. however, in a model of physical activity patterns over time, determined that physical activity increased until early adolescence and began declining in both genders after age 13.¹¹ While there are mixed findings about when declines in physical activity begin or what the degree of decline is in adolescence, overall levels of physical activity are low across all age groups and there is a need to increase physical activity levels especially among adolescents, who are not meeting guidelines.

2.3.1 Gender differences in physical activity decline

While physical activity declines significantly in both male and female adolescents, there are some gender differences.¹⁰ In a systematic review by Dumith et al., physical activity declines were greatest in males ages 9-12 years and in females ages 13-16 years.¹⁰ Another study by Kahn et al. had similar findings that 9-12 year old males had greater physical activity levels compared

to females, but female physical activity levels declined more slowly and by age 18 physical activity levels were similar between males and females.¹¹

Although there is some indication in earlier studies that gender differences in physical activity levels become non-significant by the time adolescents reach adulthood,¹¹ more recent studies report a greater decline in female adolescents.^{2,10,13} Dumith et al. found that while in earlier studies physical activity declines were greater in male adolescents, the decline in female adolescents has been increasing in more recent studies.¹⁰ Troiano et al. reported the decline in adherence to physical activity guidelines from ages 6-11 years to ages 12-15 years was 25% for males and 90% for females, with only 3% of adolescent females ages 12-15 years who met physical activity guidelines.² In a longitudinal prospective study by Kimm et al., which measured decline in physical activity in non-Hispanic black and non-Hispanic white females from the ages of 9- 10 years until the ages of 18-19 years, found that physical activity levels declined by 64% for non-Hispanic white females and 100% for non-Hispanic black females.¹³ This rapid decline in female physical activity levels in adolescence makes this developmental period a key target for future physical activity interventions to help attenuate this decline.

2.3.2 Puberty and physical activity decline

Early maturation in female adolescents has been shown to be associated with lower levels of physical activity.^{14,15,17,88} One study by Drenowatz et al. found that early maturing girls had significantly lower physical activity levels compared to average or late maturers; however, this difference was not independent of body mass.⁸⁸ Two longitudinal studies measuring moderate-to-vigorous physical activity objectively in female adolescents found that more advanced pubertal status was associated with lower physical activity levels two years later.^{15,17}

In addition, early pubertal development by age 11 is associated with lower psychological well-being by age 13.¹⁷ This predicted lower physical activity enjoyment and may be an indirect mechanism through which pubertal status affects physical activity levels.¹⁷ While not many studies have looked at the implication of pubertal status on male adolescents' physical activity levels, one study by Duncan et al. found that males who were more physically mature by age 12 had higher physical activity levels, but experienced greater declines in physical activity from ages 12-17.¹⁸ This suggests maturation status may be an important consideration in the development of future physical activity interventions in adolescents, especially in female adolescents.

2.4 THEORETICAL FRAMEWORK

The current study operated within the theoretical framework of Social Cognitive Theory and the Social Ecological Model. Social Cognitive Theory is one of the most commonly used psychological theories in health promotion interventions to elicit change in a health behavior on an individual level.^{89,90} The Social Ecological Model describes three constructs: (1) individual factors; (2) social environmental factors; and (3) physical environment factors, which all contribute to engagement in a specific behavior such as physical activity.⁹¹⁻⁹³ Both Social Cognitive Theory and the Social Ecological Model can be used to understand the factors that may contribute to the engagement in physical activity in youth.

2.4.1 Social Cognitive Theory

Social Cognitive Theory in the context of health promotion is described as “the belief in one’s efficacy to exercise control as a common pathway through which psychosocial influences affect health functioning”.⁹⁰ Social Cognitive Theory proposes that behavior is influenced by social and psychological determinants and is useful in the development of interventions to elicit positive behavior changes, such as the increase in physical activity.⁹⁴ The framework of Social Cognitive Theory suggest that behavior is influenced directly and indirectly on multiple social, cultural, and environmental levels.⁹⁵

Several studies have examined the use of Social Cognitive Theory to explain physical activity behaviors in youth.^{94,96} One study by Ramirez et al. found that little variance in physical activity behavior in children was explained by Social Cognitive Theory; however, the constructs of Social Cognitive Theory were important in understanding physical activity behavior in children.⁹⁶ In a meta-analysis of Social Cognitive Theory and physical activity in adolescents, Plotnikoff et al. found that Social Cognitive Theory explained 33% of the variance for physical activity.⁹⁴

While Social Cognitive Theory explains some of the variance in youth physical activity, especially in adolescents, constructs of Social Cognitive Theory have been consistently tied to youth physical activity including self-efficacy, environmental factors, and social influences.^{97,98} Gregory Welk proposed a conceptual model of youth physical activity (Figure 1) based on foundations of Social Cognitive Theory.⁹⁹ This model illustrates the complex nature of physical activity as a behavior in youth, but also highlights several avenues through which youth physical activity could be targeted in an effort to increase physical activity levels.

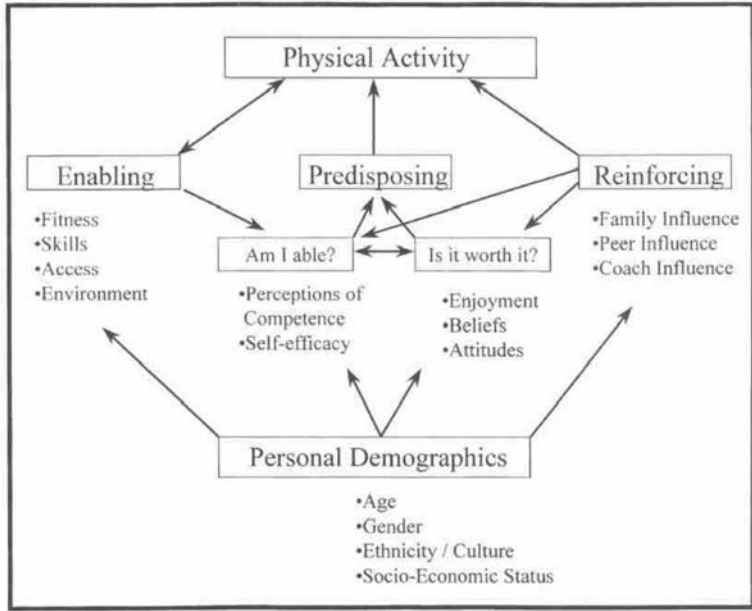


Figure 1: Conceptual model of youth physical activity

2.4.2 Social Ecological Model

The Social Ecological Model focuses on the individual, social environmental, and physical environmental levels in which an individual's behavior is influenced.⁹¹ Individual level factors would include psychological and demographic factors such as self-efficacy, gender, race/ethnicity, and BMI.⁹³ The social environmental factors, or interpersonal factors, affecting engagement in a particular behavior would include factors such as social norms, social support, and familial influences.^{91,93} Physical environmental factors would include factors such as perceived neighborhood safety, natural and built environment of the neighborhood, and transportation.^{91,92}

The Social Ecological Model is very easily applied in the context of youth physical activity engagement. There is an interplay between neighborhood and environmental level

factors, interpersonal factors, and individual factors that influence youth engagement in physical activity.⁹³ In Figure 2, Duncan et al. illustrate how these three constructs of the Social Ecological Model influence one another and ultimately influence youth engagement in physical activity.⁹³ It is important to consider all of the factors that influence youth engagement in physical activity and evaluate these factors to help identify potentially modifiable factors for future intervention targets to help increase physical activity in youth.

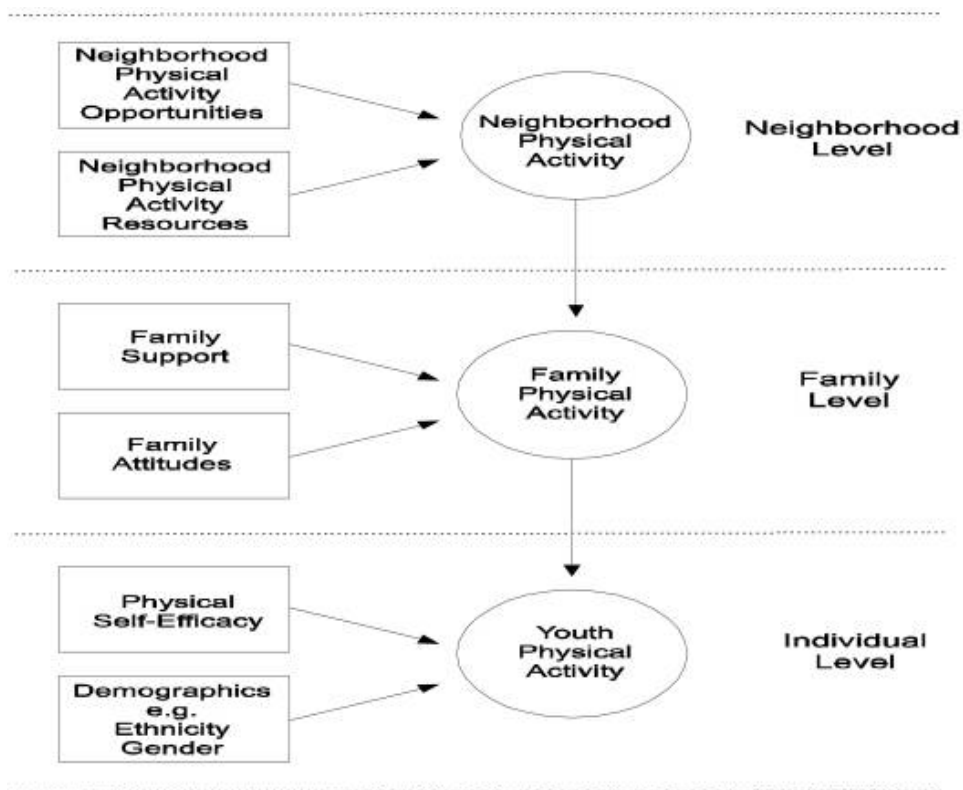


Figure 2 Multilevel model to examine youth physical activity

2.5 INDIVIDUAL FACTORS AND YOUTH PHYSICAL ACTIVITY

In order to develop effective physical activity interventions in the future, it is important to understand the barriers that youth face to engagement in physical activity, especially in

adolescence. Psychosocial factors, BMI status, socioeconomic status, neighborhood, and environmental factors have all been associated with physical activity levels in youth.^{39,41,100} Physical activity is a complex behavior and understanding the factors that can promote youth to engage in physical activity or act as a barrier to physical activity is important, especially in adolescence where physical activity declines independent of these associated factors.¹⁰

2.5.1 Psychosocial factors and youth physical activity

Many psychosocial correlates of physical activity that have been demonstrated to be associated with physical activity in youth, both positively and negatively.^{12,21} Self-efficacy is one of the psychosocial correlates most consistently and positively associated with physical activity levels in youth.^{19,20,59} Many cross-sectional studies have identified other factors such as self-worth, athletic and social self-esteem, personal attitudes about body shape and fitness, and perceived competence, which are positively associated with physical activity levels in adolescents.^{11,12} A review of correlates of physical activity in youth by Sallis et al. identified depression as the most consistent psychosocial variable negatively correlated with physical activity levels in adolescents.¹²

Most studies examining psychosocial correlates of physical activity in youth are cross-sectional in nature and are unable to determine the directionality of these relationships. One longitudinal study by Schmalz et al. examining the relationship and directionality between self-esteem and physical activity in adolescent females found a significant lagged effect of physical activity on self-esteem, but not in the other direction.¹⁶ A longitudinal study by Hearst et al. looking at correlates of physical activity over time in adolescents found that greater self-efficacy predicted higher levels of moderate-to-vigorous physical activity two years later, which may help

attenuate physical activity decline in adolescence.¹⁵ Taken together, it does appear that greater physical activity self-efficacy leads to greater engagement in physical activity, which in turn has positive effects on adolescent self-esteem.

2.5.2 BMI and youth physical activity

The relationship between BMI and physical activity levels in youth is complex and inconsistent, especially in females.¹² In younger male children, there is a consistent negative association between increased BMI and moderate-to-vigorous physical activity.^{30,31,101} One study by Trost et al., which measured the association between BMI and objectively measured physical activity levels in preschoolers, found that overweight preschool boys exhibit significantly lower levels of physical activity compared to normal weight boys; however, there was no difference in preschool girls by weight status.¹⁰¹ A study by Kahn et al. found that physical activity levels were lower in adolescents with high and low BMIs, suggesting the relationship between physical activity and BMI is more complex than a simple inverse relationship.¹¹ Another study by Neumark-Sztainer et al. found that BMI was not related to physical activity levels in adolescent females, but BMI was positively associated with sedentary time.²⁰

While the relationship between BMI and physical activity is inconsistent, especially in adolescence, increased BMI has been shown to be associated with physical activity indirectly.^{32,102} In a review of qualitative studies by Stankov et al., overweight and obese adolescents commonly reported peer victimization, social exclusion, uncomfortable environment at school, negative body image, lack of motivation, physical discomfort, low self-efficacy, and lack of peer support as barriers to engagement in physical activity.³² Storch et al. examined the relationship between peer victimization and physical activity levels in overweight and obese

adolescents and found a significant negative association between peer victimization and physical activity; this relationship was mediated by depressive symptoms and loneliness.¹⁰² Whether there are direct or indirect influences of increased BMI status on physical activity levels in adolescents, weight status is an important consideration in future physical activity interventions in adolescents.

2.5.3 Socioeconomic status and youth physical activity

Physical activity is influenced by socioeconomic status in adolescents, with adolescents from a higher socioeconomic status engaging in more physical activity than adolescents from a lower socioeconomic status.^{33,34} In a study by Raudsepp and Vira, physical activity of adolescents was significantly correlated to family income.⁶⁰ In a review of socioeconomic status and its relationship with physical activity in adolescents by Stalsberg et al., there was an overall significant association between socioeconomic status and physical activity levels; however, this relationship varied by the measure of physical activity and socioeconomic status employed.³⁴ Studies that measured physical activity duration rather than frequency saw a stronger correlation between socioeconomic status and physical activity.³⁴ Given that physical activity guidelines are a high volume of 60 minutes per day, 7 days per week,⁶⁹ the association with socioeconomic status is particularly relevant.

Lower socioeconomic status adolescents experience additional and unique barriers compared to higher socioeconomic status adolescents. In a qualitative study by Humbert et al., which assessed the factors that influence physical activity participation among high and low socioeconomic status adolescents, found that low socioeconomic status adolescents describe additional barriers including: family obligation, adult involvement, and proximity, cost, safety,

and facilities.³³ In low socioeconomic status overweight adolescents, lack of family support was identified as a barrier to physical activity engagement.³² Results from a study by Zakarian et al. suggest that vigorous physical activity levels decline in low socioeconomic status adolescents with age when they are no longer required to participate in physical education classes.³⁶ Taken together, facilitation of physical activity appears to be an important component to physical activity engagement among low socioeconomic status adolescents.

2.6 INTERPERSONAL FACTORS AND YOUTH PHYSICAL ACTIVITY

2.6.1 Peer influences on youth physical activity

Youth face many barriers to physical activity, however there are many people in their lives that have the potential to influence their engagement as well as their thoughts and attitudes about physical activity. One of those potential sources of influence are their peers, who have been shown to have both positive and negative associations with youth physical activity.^{18,33,38,55,103,104} Peers can affect youth physical activity engagement in many ways including through gender and social norms, co-participation in physical activity, and through peer victimization.¹⁰³

2.6.1.1 Gender and social norms

Peers influences on youth physical activity levels are largely determined by social norms.^{11,38,55} Peer gender norms predict boys' and girls' attitudes towards physical activity and contribute to peer influences on youth engagement in physical activity.^{11,103} In boys, gender norms have more positive associations with engagement in physical activity. Specifically, physically active boys

are perceived more favorably among their peers than physically inactive boys.²⁸ Furthermore,, the importance of male peers that their fellow peers be fit and muscular was positively associated with physical activity.¹¹

In females, physically active girls are viewed more positively by female peers and more negatively by male peers.²⁸ However, both genders have unfavorable opinions of inactive girls.²⁸ In a qualitative study by Tergerson and King, common benefits to exercise reported by adolescent females were to “stay in shape” and “lose weight”.²⁷ Similarly, Kahn et al. found that in female peers who feel their fellow peers should be thin was positively correlated with physical activity levels.¹¹ Dwyer et al. found that adolescent girls placed more importance on spending time with friends and significant others rather than engaging in physical activity.³⁸ Differential gender norms drive participation in physical activity as well as create additional barriers for physical activity, especially in female adolescents.

2.6.1.2 Influence of physically active social networks

In adolescents, having a friend to exercise with was commonly reported as a positive cue to engage in physical activity.²⁷ In a study by Raudsepp and Viira, weekly vigorous physical activity was positively associated with the adolescent’s best friend’s vigorous physical activity.⁶⁰ In adolescents, having more physically active friends as well as greater peer support was associated with an attenuated decline in physical activity from ages 12-17 years.¹⁸ In a review of peer influences by Fitzgerald et al., peer support was the only significant correlate of objectively measured physical activity in older male adolescents.¹⁰³ In both high and low socioeconomic status adolescents, friends were reported as an important factor for the enjoyment of physical activity.³³

Co-participation in physical activity is one of the strongest positive peer correlates of physical activity in youth.¹⁰⁴⁻¹⁰⁸ Friendship quality, acceptance, and crowd affiliation (peer associations) predicted physical activity in a sample of adolescents.¹⁰³ In a study by Macdonald-Wallis et al., which examined objectively measured moderate-to-vigorous physical activity and friendship networks, there was a significant association between the physical activity levels of the child and their first and second-degree friends.¹⁰⁵ Adolescents who perceive their friends to be physically active are also more likely to report being physically active themselves.^{55,104} There is evidence to support the positive association between physical activity in children and their peers through co-participation in physical activity and belonging to a physically active social network.^{27,104,105}

2.6.1.3 Peer victimization

In addition to the positive influence peers can have on youth physical activity, peers can also have a negative influence.^{103,104} For example, peers can negatively influence youth physical activity through peer victimization. Weight criticism during physical activity is one of the more common forms of peer victimization negatively influencing physical activity in girls and overweight adolescents.^{103,104} Salvy et al. hypothesized that overweight youth are less likely to engage in physical activity in comparison to normal weight youth by removing themselves from physical activity settings to avoid potential scrutinization.¹⁰⁴

Peer victimization is not limited to overweight and obese youth. Negative peer influences are more common in adolescent females, who reported significantly lower levels of emotional support from peers and higher levels of peer victimization compared to males.^{103,104,109} In a qualitative study by Humbert et al., the detrimental impacts of getting cut from sports teams, being made fun of, getting picked last, and not being included, had negative associations with

physical activity levels.³³ In a study by Barkley et al., which stimulated ostracism of youth during physical activity through an interactive video game, found that those who that were in the ostracized condition accumulated 22% fewer accelerometer counts and 27% more sedentary time in a real-life subsequent free-time play.¹¹⁰ While it has been suggested by Fitzgerald et al. that the power of peer support may be the greatest for at-risk/overweight adolescents than low-risk youths,¹⁰³ modification of youth-peer networks may be more challenging than other avenues such as parental support.

2.6.2 Familial modeling and youth physical activity

Parents and family members can also influence youth physical activity levels. It has been hypothesized that one potential mechanism through which parents and family can influence youth engagement in physical activity is through modeling of physical activity.^{29,49-51} There are mixed findings in review articles as to whether parent physical activity and child physical activity are significantly associated.^{12,46-48} However, even a mix of null to positive associations with youth physical activity suggested that parental and familial modeling of physical activity is a potential avenue through which youth physical activity engagement can be influenced.

2.6.2.1 Age of child and parental modeling

Most of the positive associations demonstrated between physical activity levels of children and their parents is seen in younger children (>12 years).^{29,49-51} In a study of 4th and 5th grade children by Fuemmeler et al., which objectively measured physical activity in both parents and their child, parental moderate-to-vigorous physical activity was significantly positively correlated to child moderate-to-vigorous physical activity.⁵¹ In addition, having two parents with high levels

of moderate-to-vigorous physical activity was associated with higher levels of moderate-to-vigorous physical activity in children.⁵¹ A review by Edwardson et al. found that parents played an important role in their child's physical activity through direct involvement and role modeling, whereas parental attitudes towards physical activity and encouragement were more important in adolescents.⁵² Similarly, Cleland et al. found that parental co-participation in physical activity was more frequent in younger children compared with older children, whereas direct support for physical activity was more frequently provided to older children.¹¹¹

The documented relationship between parental modeling and adolescent engagement in physical activity is not as strong. Adolescents who perceived at least one parent to be physically active engaged in significantly greater number of sports than those who perceived neither parent to be active.⁵⁰ In addition, adolescents who perceived both parents to be physically active performed significantly better on a 1.6 km fitness test than those who did not perceive either parent as active.⁵⁰ However, other studies have not demonstrated a significant relationship between parental physical activity levels and adolescent physical activity levels.^{55,56} In a review of parental influences on physical activity by Trost et al., in children ages 6-12 years 41% of parent/ child physical activity associations were positive and significant in papers examining associations between physical activity and parental physical activity.⁴⁶ However, in adolescents ages 13-18 years only 30% of associations were positive and significant between parent/ child physical activity levels.⁴⁶ Given the current literature, the relationship between parental physical activity modeling and physical activity engagement in youth appears to be strongest in younger children, to a lesser extent in adolescence.

2.6.2.2 Gender and parental modeling

It has also been hypothesized that the gender of the parent and child may play a role in the influence of parental modeling of physical activity.^{51,53,54} In 9-15 year olds, fathers physical activity was significantly correlated with physical activity levels in boys across all age groups, but only at age 9 in girls.⁵³ Similarly, a study by Fuemmeler et al. found that fathers' and sons' moderate-to-vigorous physical activity was significantly positively correlated during the weekend and weekday afternoons, times where fathers' could have the greatest potential influence on their sons' moderate-to-vigorous physical activity.⁵¹ However, no significant association was found between fathers' and daughters' moderate-to-vigorous physical activity.⁵¹ In a review of the literature by Yao and Rhodes, father-son physical activity modeling was significantly higher than mother-son physical activity modeling.⁴⁸

Maternal physical activity has been shown to be associated with self-reported physical activity levels in adolescents.¹¹ Cleland et al. found that maternal modeling was significantly associated with reduced decline in moderate-to-vigorous physical activity over time in boys and co-participation in physical activity with girls was significantly associated with reduced decline in moderate-to-vigorous physical activity.¹¹¹ In a review of parental influences by Trost and Loprinzi, 47% of studies that correlated maternal physical activity levels to children's physical activity levels reported significant positive associations.⁴⁶ Fuemmeler et al. found robust correlations between mothers' and daughters' moderate-to-vigorous physical activity in 4th and 5th grade girls.⁵¹ Evidence suggests that paternal physical activity modeling may have a more pronounced influence over their sons' physical activity levels, whereas maternal modeling appears to influence both genders with a stronger relationship with daughters' physical activity levels.

2.6.2.3 Siblings and youth physical activity

In addition to parental physical activity modeling, sibling physical activity modeling and co-participation in physical activity is another avenue through which youth physical activity can be influenced. A review of physical activity correlates by Sallis et al. found that sibling physical activity was consistently related to youth physical activity.¹² Duncan et al. found that children who reported their siblings frequently watched them engage in physical activity had higher levels of physical activity.¹¹²

One study by Cleland et al. found a direct association between physical activity young girls (5-6 years old) and sibling co-participation in physical activity.¹¹¹ Timperio et al. found that sibling engagement in physical activity at least three times per week was associated with greater decreases in BMI-z score over three years in girls ages 10-12 years.¹¹³ However, a study by Jose et al. examining predictors of leisure time physical activity in the transition from adolescence to adulthood found that in females, having younger siblings was significantly inversely associated with being persistently active.¹¹⁴ Therefore, while sibling physical activity and co-participation in physical activity is another avenue through which youth physical activity can be influenced it likely varies by age of the siblings, especially in adolescent females.

2.7 NEIGHBORHOOD AND ENVIRONMENTAL FACTORS AND YOUTH PHYSICAL ACTIVITY

Many neighborhood and environmental factors that influence physical activity engagement in adolescents. In low socioeconomic status adolescents, proximity, cost, safety, and availability of facilities to engage in physical activity are commonly reported barriers.³³ A qualitative study by

Holt et al. identified three themes that influenced physical activity including neighborhood characteristics, family involvement, and adult-supervised programs.⁴²

2.7.1 The physical environment and youth physical activity

The physical environment, including neighborhood walkability, community design, access to recreational facilities, and other aspects of the built environment (e.g., number of parks, residential density, intersection density) have been shown to be associated with youth physical activity.^{115,116} A study by Norman et al. found that the number of nearby recreation facilities and number of nearby parks was positively correlated with adolescent girls' objectively measured physical activity levels.¹¹⁷ A study by Romero found that physical activity was significantly and positively correlated with hours spent in after-school programs and perception of higher quality of local facilities.¹¹⁸ Additionally, de Bruijn et al. found that adolescents who lived in more attractive neighborhoods had a more positive attitude towards being physically active.¹¹⁹ This suggests that youth physical activity levels and attitudes about physical activity are associated with the number of accessible and high quality recreational and school facilities.

Several studies have highlighted the availability of recreational facilities and neighborhood walkability and the association with neighborhood demographics and socioeconomic status.^{115,116,120} Gordon-Larsen et al., in an analysis of the National Longitudinal Study of Adolescent Health examining the association between community level socioeconomic status and the availability of physical activity related facilities, found that higher socioeconomic status communities had significantly greater relative odds of having one or more physical activity facilities.¹²⁰ Similarly, Powell et al. found that commercial physical activity-related facilities were less likely to be present in lower-income neighborhoods and neighborhoods with a

higher proportion of residents of racial/ ethnic minority backgrounds.¹¹⁶ Given the positive association between physical activity and neighborhood walkability, and access to recreation facilities and parks,¹¹⁵ the inequality of access to these facilities in lower socioeconomic status neighborhoods may contribute to the lower physical activity levels of lower socioeconomic status youth.

2.7.2 Neighborhood safety and youth physical activity

In addition to the physical environment, youth and parent perception of neighborhood safety has been demonstrated to be associated with youth engagement in physical activity.¹²¹⁻¹²³ Nichol et al. found that adolescent girls with the highest perception of safety were 1.45 times more likely to be physically active than those with the lowest perceptions of safety.¹²³ A study by Gómez et al., using an objective measurement of neighborhood safety, found that density of violent crime within a .5 mile of their home was significantly and inversely associated with adolescent girls' outdoor physical activity.¹²¹ In addition to the association between physical activity and perception of neighborhood safety, Romero et al. found that perception of safe adults at local facilities accounted for more of the variance than perception of neighborhood safety in youth physical activity levels.¹¹⁸

In addition, parent perception of neighborhood safety is associated with parental constraint (prohibiting engagement in physical activity without adult supervision).³⁷ A study by Carver et al. found that parental constraint was inversely associated with increased perceived risk of neighborhood safety, which was negatively associated with moderate-to-vigorous physical activity during evening hours and active transport in adolescent females.³⁷ Gordon-Larsen et al., concluded that physical activity in adolescence is most heavily influenced by environmental

factors, whereas inactivity is more heavily influenced by socio-demographic factors.^{80,122,123} This suggests that neighborhood and environmental factors must be strongly considered when evaluating barriers that adolescents face to engaging in physical activity.

2.8 PARENTAL SUPPORT AND YOUTH PHYSICAL ACTIVITY

While there are many factors that have been demonstrated to be associated with youth physical activity, the present study will focus on the associations between parental support and youth physical activity. Parental support is more strongly associated with youth physical activity than parental engagement or modeling in physical activity, especially in adolescents.^{9,19,44,55,56} Parental support has been consistently, significantly, and positively associated with youth physical activity in reviews of the literature.^{46,47} In a review by Yao et al., the specific parental support behaviors that had the greatest effect size on youth physical activity was the relationship between parental encouragement and youth physical activity.⁴⁸

The most important forms of parental support are encouragement, involvement, and facilitation of physical activity in youth.⁴⁷ Two different types of support are commonly examined along with youth physical activity levels- tangible and intangible support. Tangible support (i.e., instrumental or logistic support) is the direct facilitation and involvement of physical activity in youth.⁴⁶ This includes transportation to places where youth can engage in physical activity, supervision of physical activity, and financial support through enrollment in physical activity programs and purchasing equipment for physical activity.¹²⁴

Intangible support generally involves forms of support including encouragement and parental praise. Intangible support has been associated with youth physical activity levels both

directly and indirectly via self-efficacy.⁴⁷ Youth perception of parental encouragement has been shown to be positively correlated with the amount of time spent in physical activity.⁵⁶ Youth who perceive encouragement from at least one parent engage in significantly more moderate-to-vigorous physical activity than those who perceive no parental encouragement.^{9,55,62} All forms of parental support have been associated with increased engagement in physical activity; however, it is evident that the type of support and influence on subsequent physical activity can vary by age, gender, and socioeconomic status.

2.8.1 Age of child and parental support

In a review of parental support and youth physical activity by Trost and Loprinzi, 63% of reported associations between parental support and child physical activity were positive and significant for children aged 6-12 years.⁴⁶ However, this association was even stronger in adolescents aged 13-18 years, where 73% of reported associations between parental support and physical activity were significant and positive.⁴⁶ In adolescents, parental attitudes towards physical activity, transportation to physical activity, and encouragement for physical activity are all important correlates of physical activity.⁵² In a study by Verloigne et al. higher parental praise was related to higher self-efficacy as well as perception of fewer barriers in adolescents.¹²⁵ Additionally, lack of transportation to physical activity was inversely associated with physical activity in adolescents.¹¹

In children, direct involvement in physical activity plays a more important role in physical activity engagement.⁵² A study by Sallis et al. found that in 10 year old children, verbal encouragement from parents was not associated with objectively measured physical activity and suggested that more concrete means of support may be necessary in this age group.³⁰ A study by

Bradley et al. found that parental transportation to physical activity was associated with greater levels of moderate-to-vigorous physical activity in children.⁹ There is more support for the influence of parental tangible and intangible support on adolescent physical activity; however, parental tangible support is a key facilitator in child engagement in physical activity as well.

2.8.2 Gender of child and parental support

There are gender differences in the amount and type of parental support provided to their child. Boys tend to receive more parental support for physical activity in comparison to girls.^{30,47,58} One study by Sallis et al. found that 9 year old boys received significantly more encouragement for physical activity and were more frequently transported for physical activity or sports compared to girls of the same age.³⁰ In children and early adolescents, parental support tended to explain more of the variance in boys' physical activity than in girls'.⁴⁷ In a qualitative studies, female adolescents are more likely than males to feel encouragement from parents is a positive cue to exercise and name family to be the most influential factors on their decisions to be physically active.^{27,28} The literature suggests that female youth are less likely to receive parental encouragement, but place a greater value on parental encouragement than their male counterparts. Future interventions should focus on increasing parental tangible and intangible support as an avenue to increase physical activity among female youth.

There are differences in associations between parent and youth physical activity based on the gender of the parent and the types and amount of support for child physical activity. One study by Gustafson and Rhodes suggested that mothers may have a more pronounced influence on their daughters compared to their sons.⁴⁷ Brunet et al. found that children aged 9 years perceive more maternal intangible support than tangible support.⁵⁸ In children of the same age,

mothers report providing significantly higher levels of logistical support for daughters compared to fathers.²⁹ Boys also perceive more paternal tangible support compared with girls of the same age.⁵⁸ There is a lack of studies examining gender and parental support in older adolescents, but even at a young age gender differences can already be quantified.

2.8.3 Socioeconomic status and parental support

Adult facilitation of youth physical activity is even more important to youth of lower socioeconomic status.³³ A study by Siceloff et al. in underserved young adolescents found that higher levels of family instrumental support were associated with higher levels of moderate-to-vigorous physical activity.¹⁰⁹ Additionally, increases in family instrumental support, but not emotional support, predicted increases in moderate-to-vigorous physical activity in adolescents over 19 weeks. One qualitative study by Alm et al. identified lack of family support as a barrier to physical activity in overweight adolescents of low socioeconomic status.¹²⁶

Greater parental concern about child safety has been associated with increased levels of parental constraint, which is inversely associated with youth physical activity levels.^{9,37} A study by Gordon-Larsen et al. found that living in a high crime area is associated with a decreased likelihood of falling into the highest category of moderate-to-vigorous physical activity.⁸⁰ In a qualitative study of inner city adolescent girls, parental perceived neighborhood safety was one of the most commonly reported barriers to engagement in physical activity.³⁸

Education level of parents has also been shown to have a positive association with child engagement in physical activity.^{19,53,80} A study by Belanger-Gravel et al. found that in parent-tween dyads there was a significant moderating effect of education of the parent on physical activity levels of the tween.⁵⁷ In addition, lower educated parents are significantly less likely to

have a positive perception of facilitating factors towards child engagement in physical activity.⁵⁷ Motl et al. observed a significant positive relationship between parental education with perceived neighborhood safety, equipment accessibility, and social support in female adolescents.³⁹ A longitudinal study of physical activity decline in female adolescents by Kimm et al. found that lower levels of parental education was associated with greater declines in physical activity levels in both non-Hispanic white and non-Hispanic black adolescent females.¹³ Youth from a low socioeconomic status background are at particularly high risk of being physically inactive, but the need for adult facilitation of physical activity suggests this is a group where interventions to increase parental support could be particularly effective.

2.8.4 Parent versus peer support

Family and friend support are both positively associated with physical activity levels in adolescents.^{19,20} Encouragement from both parents and peers have been demonstrated to be positively associated with physical activity in adolescents.^{63,127} Hohepa et al. found that while encouragement from parents and peers were both positively correlated with after school physical activity levels in high school students, those with low levels of parental support were less likely to be physically active after school.⁶³ In a review by Sallis et al., parental support and direct help from parents were consistently associated with adolescent physical activity levels; however, peer modeling of physical activity was unrelated and there was an indeterminate relationship between perceived support from peers and adolescent physical activity.¹² Evidence suggests that in adolescence parents provide a more essential role than peers in physical activity support, whereas peers provide an additional level of support for physical activity in physically active social networks.

Parents may also play a crucial role in the development of adolescents' perceptions of physical activity. A study by King et al. found that adolescents' perceptions of physical activity differed significantly based on whether or not they received parental encouragement to exercise.⁵⁵ In addition, they were more likely to report negative barriers to exercise if they did not have at least one encouraging parent, but no significant difference was observed whether or not they had a friend that exercised.⁵⁵ However, peer co-engagement in physical activity is one of the most important cues for adolescents to engage in physical activity.²⁷ One study by Duncan et al. found that having more physically active friends as well as greater peer support was associated with less of a decline in adolescents' physical activity levels from ages 12-17 years.¹⁸ However, peer victimization is a barrier to engagement in physical activity for many adolescents,¹⁰³⁻¹⁰⁵ suggesting peer co-participation may just be the resultant of physically active peers clustering together.

2.9 HOUSEHOLD STATUS AND YOUTH PHYSICAL ACTIVITY

Evidence suggests that if at least one parent provided encouragement to their child related to physical activity, they are significantly more physically active than those not receiving any encouragement.^{9,55} One study by Hohepa et al. found that there was no difference between adolescents receiving high support from two parents compared to those receiving high support from one parent.⁶³ Similarly, if youth perceive at least one parent to be active, they themselves are significantly more likely to be fit and engage in a greater number of sports than those who perceive neither parent to be active.^{49,50} While these studies did not examine household status,

they suggest that if at least one parent in the home encourages and/or model's physical activity for their child, the child will be more likely to be physically active.

There are mixed findings on the associations between household status and youth physical activity. Several studies report no significant differences in physical activity levels of youth between two parent, step-parent, or single parent families.^{8,19,45} One study by Ornelas et al. found that there was no significant difference in physical activity levels of youth from dual parent, step-parent, or single parent families. However, those in the "other" category, which were mostly foster children, were significantly less likely to achieve the recommended levels of physical activity compared to children in other household make-ups.⁴⁵ A longitudinal study by Kimm et al. found that single parent household status was associated with a greater decline in physical activity in older non-Hispanic white adolescent females, but there was no difference in older non-Hispanic black adolescent females.¹³

One study by McNeal found that high school students from single-parent households have significantly lower participation rates in extracurricular activities including athletics; however, this finding was no longer significant after controlling for socioeconomic status.⁶⁴ A qualitative study by Thompson et al. described that parents in two-parent households commonly paired off with one or more children due to complex schedules.⁶⁷ In one study, children living in single parent families had lower levels of physical activity, spent more time in low-intensity activity than their peers, and spent a greater amount of time watching TV compared with their peers; these differences were stronger in older children.⁶⁸ While many of these studies have examined household status in their secondary analyses, no study to our knowledge has set out to examine the levels and impact of household status and support on physical activity levels of adolescent females from lower socioeconomic status households. This knowledge could help us

to understand additional factors contributing to physical inactivity in this population and help us to identify new strategies to incorporate into physical activity interventions in this population.

2.10 CONCLUSION

Given the low levels of physical activity and stark decline throughout adolescence, there is a clear need for more research in order to understand the correlates of physical activity, particularly those related to the home or family, in adolescent girls from low socioeconomic status households. Several studies that have examined barriers to physical activity in this population have described the need for adult supervision, safe environments, and familial support as a mechanism to increase physical activity levels in adolescent females. However, the relationship between household status and parental support for physical activity and the physical activity levels of adolescent females of low socioeconomic status households is not well understood. The present study will help us to determine the relationship between the amount (i.e., number of adults providing support and level of support) and type (e.g., tangible and intangible support) of household support for physical activity and the physical activity levels of adolescent females recruited from lower socioeconomic status neighborhoods. This information will help us to better understand how to support physical activity in female adolescents from lower socioeconomic status neighborhoods and may be used to develop more effective physical activity interventions in this population.

3.0 METHODS

3.1 STUDY DESIGN

This study was a cross-sectional, exploratory study designed to evaluate associations between physical activity levels in adolescent females recruited from lower socioeconomic status neighborhoods and their perception of household support. Physical activity levels and perception of household support were assessed via questionnaire administered to adolescent participants during an in-person study visit at the Physical Activity and Weight Management Research Center at the University of Pittsburgh or at community-based sites.

3.2 PARTICIPANTS

We aimed to recruit 50 adolescent females, as determined by a power analysis presented in section 3.5, between the ages of 13-17 years old, without any psychological or physiological condition that may hinder participation in physical activity. Our recruitment strategies targeted participants from lower socioeconomic status households by recruiting from low socioeconomic status neighborhoods (based on zip code and census tract poverty data) in the Greater Pittsburgh area. We targeted neighborhoods with greater than 50% of residents living below the poverty line for recruitment. From these targeted neighborhoods, we were able to identify potential

community sites to recruit from as well as employ other low touch methods of recruitment (details provided in section 3.3).

3.3 RECRUITMENT AND SCREENING PROCEDURES

3.3.1 Participant Recruitment

Recruitment efforts targeted lower socioeconomic status neighborhoods using a combination of both low-touch (i.e., flyers, Craigslist, CTSI registry, mailings) and high-touch (i.e., face-to-face) recruitment strategies. The following low-touch strategies were utilized, including: parent informational letters (Appendix A), the University of Pittsburgh's Clinical Translational Science Institute (CTSI) registry, Craigslist postings (Appendix B), and distribution of flyers throughout the targeted neighborhoods. Participants were also recruited via letters (Appendix A) sent to households that have previously signed up for a guest pass to access the gym as part of the Community Leisure Learn Program at the University of Pittsburgh. Flyers (Appendix C) were posted at local businesses, bus stops, community centers, and local bulletin boards throughout the targeted neighborhoods.

In addition to the low-touch recruitment strategies utilized, several high-touch recruitment strategies were utilized in an attempt to maximize recruitment efforts. These efforts included in-person recruitment at community events (e.g., health fairs, community socials) and making presentations at community-based organizations that cater to underserved adolescents. The efforts made to recruit at community events and partner with community-based organizations to facilitate recruitment efforts are described in section 3.3.2.

3.3.2 Community relationship building

Prior to participant recruitment, the Principal Investigator presented the study and recruitment protocol to members of the Community Research Advisory Board (CRAB) through the Center for Health Equity at the University of Pittsburgh. The CRAB was established in 2002 to provide guidance to investigators on study design and recruitment of underserved populations with the goal of making research responsive to community needs and culturally relevant. The CRAB provided valuable feedback (Appendix D) on potential recruitment strategies for the target population of this study and this feedback was utilized in community-based recruitment efforts.

Community relationships were formed by reaching out to pre-existing contacts of co-investigators and CRAB members as well as reaching out via phone or e-mail to additional organizations that served the target population. Co-Investigators and CRAB members provided contact information and in some cases made more formal introductions connecting the Principal Investigator with community leaders. Through these efforts, five community partnerships were formed and facilitated participant recruitment; three community organizations provided site-agreements to allow for on-site assessments (Appendix D), and two community health fair events allowed for on-site recruitment.

A partnership was formed with the Youth Outreach Coordinator at the Wadsworth Hall Community Center in the Oak Hill community. Together, we held three youth ice cream socials to increase community engagement with Wadsworth Hall and also to recruit potential participants on-site at the social. In order to prepare for the ice cream socials, the Youth Outreach Coordinator and Principal Investigator walked through the community and passed out flyers (Appendix C) to spread the word about the youth ice cream socials.

Partnerships were also formed with the Jeron X. Grayson Community Center, the Braddock Youth Project, and Gwen's Girls. The Jeron X. Grayson Community Center is a community center for middle school and high school students to provide them with a safe place to be after school as well as during the summer months. The Braddock Youth Project is a youth work skills training program designed to aid youth in advancing towards positive life outcomes. Gwen's Girls provides programming designed to empower girls and young women to have productive lives through holistic and gender-specific programs, education, and experiences. Each site allowed for the Principal Investigator to come for at least two visits (one for recruitment and one for on-site assessment). Each site provided a site agreement (Appendix E), which was an agreement between the research team and the site that we were allowed to assess participants at their site and that they would provide a private space for height and weight measurements to be collected.

Additionally, the Principal Investigator was given a table as a vendor for two community health fairs, which occurred in two different targeted neighborhoods. As a vendor, this allowed for the on-site recruitment and screening of potential participants. This strategy also provided a more personal face-to-face interaction, which allowed the Principal Investigator to build rapport with potential participants.

3.3.3 Participant screening

The initial eligibility screening procedure was dependent on the method through which interested participants were recruited. If interested participants were recruited by flyer, parent letter, or Craigslist posting, they were instructed to call the number listed on the flyer. When an interested participant called the number listed, a member of the research staff provided a detailed

description of the study, answered any questions they had, and with permission from the caller screened individuals still interested in participating. If interested participants were recruited through the CTSI registry, they were instructed to call registry personal, who did a short pre-screen (Appendix F) with the individual. If the potential participant was determined to be initially eligible from the pre-screen, interested participant's contact information was forwarded to the Principal Investigator. Interested participants were then contacted and screened by study staff in the method described above. Interested participants recruited through community-based events or community organizations were screened on-site and in-person by study staff.

Regardless of how potential participants were recruited or screened, the screening form was the same (Appendix F). The screening form was used to screen potential participants themselves, or the parent or guardian of the potential participant as a proxy. The screening form contained a description of the general purpose of the study, information about participant compensation, and allowed individuals to ask questions about the study. The study staff screened the potential participant then asked them for permission to ask a series of questions to determine their initial eligibility to participate in the study.

Once participants were deemed eligible (inclusion and exclusion criteria for this study are displayed in Table 1), the Principal Investigator or study staff and participant scheduled a date and time for the study visit. Participant contact information (name, address, phone number) was collected and recorded onto a Subject Address List document. If participants were screened over the phone, a letter confirming the date and time of the study visit (Appendix G), a map with directions to the Physical Activity and Weight Management Research Center (Appendix H), and a copy of the Informed Consent form (Appendix I) were mailed in advance of the participants' study visit. If a participant was screened at a health fair, this information was given to them in-

person. Participants were contacted by the study staff to confirm the study visit date and time, the day prior to the study visit and to confirm payment after the completion of the study visit.

Table 1. Inclusion and exclusion criteria of participants.

<p><u>Inclusion Criteria:</u></p> <ul style="list-style-type: none">• Female• 13-17 years of age• Ability to provide assent
<p><u>Exclusion Criteria:</u></p> <ul style="list-style-type: none">• Male• Presence of any psychological or physiological condition that may hinder participation in physical activity• Is currently pregnant• Is a parent themselves• Participation in any other research study that may impact the outcome of the current study in the previous 12 months

3.4 STUDY VISIT

When the study visit took place at the Physical Activity and Weight Management Research Center, the Principal Investigator or qualified research staff escorted the participant to a private room to verify signed consent forms from their parent or guardian. The Principal Investigator or qualified research staff then reviewed the study procedures with them and answered any remaining questions the participant had and obtained written participant assent before beginning study procedures. Height and weight measurements were collected and questionnaires were administered in a private room. If a large group of participants were assessed at the same time,

the questionnaires were administered by trained research staff in a communal room, but height and weight measurements were collected in a private location.

When the assessment was conducted on-site at a community-based organization, the assessment procedures remained the same as when conducted at the Physical Activity and Weight Management Research Center. Parental consent forms were obtained from participants and then written participant assent was collected before any other study procedures were administered. Participant assent and questionnaire administration occurred in a communal room to allow multiple participants to be assessed simultaneously. Height and weight measurements were collected in a private room by qualified research staff.

3.4.1 Height and Weight

Height: Participants were asked to remove their shoes, jackets, and any other heavy clothing or accessories (i.e. jewelry, phone, purse, hat, etc.). The Principal Investigator or qualified research staff measured the participants' height with a wall-mounted stadiometer at the Physical Activity and Weight Management Research Center or a portable stadiometer (Seca213) for on-site assessments. Participants were instructed to stand upright with the backs of their heels against the stadiometer and to look straight ahead. Height was measured twice to the nearest 0.1cm and recorded on the data recording form and the average of the two measurements was calculated (Appendix K).

Weight: Participants weight was measured using a calibrated Tanita WB-110A scale for assessments conducted at the Physical Activity and Weight Management Research Center. For assessments conducted at community sites, a portable electronic scale (Seca869) was used to measure weight. The subject was instructed to stand upright and still with both feet on the scale.

Subjects were instructed to remain on the scale until the scale was stabilized. Weight was measured twice to the nearest 0.1kg and the average of the two measurements was calculated (Appendix K).

Body Mass Index (BMI): BMI was calculated using the standard equation measured height (m²) divided by weight (kg) of each participant. BMI percentile score was computed using the 2000 CDC growth charts for girls aged 2-20 years.¹²⁸

3.4.2 Questionnaires

3-Day Physical Activity Recall (3DPAR): The 3DPAR (Appendix L) has been demonstrated to be a valid and reliable measure of physical activity in adolescents.^{129,130} The 3DPAR asked participants to recall the previous 3 days and asks them to break down their day into 30 minute time blocks from 7am-12am. It asked participants to record the activity they were doing for each 30 minute time block and the intensity at which they performed that activity. The 3DPAR is appropriate to be administered either in an individual or group setting. The Principal Investigator or qualified research staff read from the administrator script originally designed to be administered to 13-16 year olds (Appendix L.1.1).¹²⁹ The verbal administration of the 3DPAR helped to guide participants through the questionnaire and standardized the explanation of questionnaire items including types of activities performed and activity intensities. The Principal Investigator or qualified member of the research staff scored the 3DPAR instrument according to the standard protocol (Appendix L.1.2) and calculated minutes moderate-to-vigorous physical activity per day.

Household Physical Activity Support: This questionnaire has been developed for the purpose of the present study and (Appendix M) has four main sections to assess (a) demographic

characteristics, (b) household make-up, (c) household support for physical activity, and (d) physical activity context. The demographics section asked participants about their date of birth, race/ethnicity, neighborhood of residence, whether or not they care for/watch other children in the household, and whether they attended an after school program or worked outside of the home. The household make-up section asked how many adults (18 years or older) and children (17 years or younger) lived with them in their household. It also asked them to think about the adult in the household they are closest to and answer questions about that person including whether they work outside of the home, and whether they are typically home when they get home from school and on the weekends.

The household support for physical activity section has been adapted from the parent support scale originally developed for the Amherst Health and Activity Study^{18,31,58,112,127} The household support scale used in the present study was a 5-item, 5-point Likert-type scale that asked, “In a typical week how often does the specified adult...”: (1) “...do sports or physical activity with you?”; (2) “...watch you participate in physical activity or sports?”; (3) “...take you to a place where you can play sports or participate in physical activity?”; (4) “...tell you physical activity is good for you?”; and (5) “...encourage you to be physically active/play sports?” Participants were asked to circle one of the following responses status for each question: *never*, *once*, *sometimes*, *almost daily*, or *daily*.

The household support for physical activity questionnaire prompted the participant to complete the 5-item sub-scale for the adult they perceive as having the most influence over them as well as the other adults living in the household. For each additional adult, the participant was asked to report the adult’s gender, age, and relationship to the participant.

This household support scale was used to assess two parental support constructs: tangible and intangible support. Three of the questions (i.e., "...do sports or physical activity with you?"; "...watch you participate in physical activity or sports?"; and "...take you to a place where you can play sports or participate in physical activity?") were designed to measure tangible support. The two remaining questions ("...tells you physical activity is good for you?"; and "...encourages you to be physically active/play sports?") measured intangible support. This subscale was utilized to address the sub-aims, which examined the associations between physical activity and measures of perceived tangible and intangible household (parental/adult) support for physical activity.

The last part of the questionnaire asked the participant to complete three open-ended questions to collect more information about the adolescents' context for physical activity (i.e., priorities, facilitators, barriers). The three questions asked were: (1) "What do you consider the top 3 priorities in your life?"; (2) "What prevents you from being physically active?"; (3) "What would help you the most in becoming more physically active?"

3.5 STATISTICAL ANALYSIS

This was a cross-sectional, observational study exploring associations between self-reported physical activity levels in adolescent females from lower socioeconomic status households and their perception of household support for physical activity. An a-priori power analysis was conducted to estimate the sample size for this study. Power was set at 0.75 and statistical significance set at $p < 0.05$ for a two-tailed test. In order to detect a moderate effect size, an $f^2 = 0.15$ was assumed for this power analysis. Based upon these assumptions, a sample size of 50

participants was determined to be necessary. However, as described in the results section of this document, only 36 individuals were consented and participated in this study. Given that the magnitude of the correlations observed was approximately $r=0.150$, post-hoc power calculations determined a sample of 304 would have been needed to detect a significant correlation at an $r=0.150$. All data was analyzed using SPSS version 24 (Chicago, Illinois).

Data were checked for normality. The following variables were normally distributed: moderate-to-vigorous physical activity, age, and household support measures. Non-normal data included: BMI, BMI percentile, and vigorous physical activity. To account for non-normal data, descriptive characteristics were presented as median (25th, 75th percentile). For the linear regressions analysis, non-normal data was transformed using the natural log to correct for normality and the transformed variable was used in the models.

Descriptive characteristics were analyzed for the total sample. Study sample characteristics included age, BMI, BMI percentile, grade in school, number of children in the household, number of adults in the household, and moderate-to-vigorous physical activity. Continuous data were computed as median (25th, 75th percentile) and categorical variables including race/ethnicity, neighborhood, and whether the participant watches other children after school or attends an after school program were computed as frequencies. Open-ended questions were coded using a modified constant comparison method, a qualitative data coding technique.¹³¹ In brief, the Principal Investigator read through the open-ended responses several times to identify patterns in the data and divided them into categories. From there, categories were given a name that best represented the responses that made up the category. If a response was not able to be categorized into one of preexisting categories, subsequent categories were named to fit the responses, or the response was moved into the “other” category (Appendix N).

To address the primary aims of this study, bivariate correlation was used to determine significant associations between variables. Specifically, linear regression controlling for BMI, race, and age, was used to evaluate the association between low socioeconomic status female adolescents' physical activity and:

1. Perceived support for physical activity provided by the adult they feel closest to in their household (**Specific Aim 1**)
2. Number of adults in the household who the adolescent perceives to provide support for physical activity (**Specific Aim 2**)
3. Perceived magnitude of support for physical activity provided by adults in their household (**Specific Aim 3**)

Exploratory analyses were conducted examining associations between BMI and the same household support measures specified in the specific aims. Bivariate correlation was used to determine significant associations between variables. Specifically, linear regression controlling for race and age was used to evaluate the associations between BMI and household support measures.

4.0 RESULTS

Fifty-six individuals were screened for eligibility. Of these individuals, 55 were deemed eligible, and 1 did not complete the screening procedure due to perceived low financial incentive coupled with travel demands to participate in this study. The final number of potential participants screened and assessed by recruitment method is presented in **Table 2**. Low-touch methods (i.e., flyers, Craigslist, CTSI registry, mailings) of recruitment resulted in 22 potential participants screened and 13 participants assessed. High-touch methods (i.e., face-to-face) of recruitment resulted in 34 potential participants screened and 23 participants assessed. Overall, the final analysis sample for this study was $n=36$.

Table 2. Participant screening and recruitment summary

Recruitment Method	Number Screened	Number Assessed
<i>Low-Touch</i>		
<i>Postings (e.g., Craigslist, flyer)</i>	14	9
<i>CTSI Registry</i>	6	2
<i>Participant Referrals</i>	2	2
<i>High-Touch</i>		
<i>Health Fairs</i>	3	1
<i>Ice cream Socials</i>	6	4
<i>Youth Summer Programs</i>	25	18
TOTAL	56	36

4.1 PARTICIPANT DEMOGRAPHICS

Participants had a median age of 14.9[25th, 75th percentile: 13.8,15.9] years, a median BMI of 26.5 [20.8, 30.8] kg/m², and a median BMI percentile of 90.5 [58.5, 97.0]% (**Table 3**) (Appendix O; **Table 10**). Participants were 60.0% black, 20.0% mixed (black/Hispanic, white/black, black/Native American), and 17.1% white race and primarily from the Braddock or Hill District neighborhoods (54.3%) in the Greater Pittsburgh area. Additional neighborhood level data is presented in Appendix P (**Table 11**). Participants reported engaging in a median of 160.3[92.5,

205.0] minutes of moderate-to-vigorous physical activity per day and a median of 0.0 [0.0, 10.0] minutes of vigorous physical activity (**Table 3**) (Appendix Q; **Table 12**). Further examination of vigorous physical activity showed that 72.2% (n=26) of participants engaged in zero minutes of vigorous physical activity per day

Table 3. Demographics of participants

Characteristics (N=36)	Medians and Frequencies
Age (yrs)	14.9 [13.8, 15.9]
BMI (kg/m²)	26.5 [20.8, 30.8]
BMI Percentile	90.5 [58.5, 97.0]
Grade in School	9.0 [7.0, 10.0]
Race/Ethnicity (%):	
White	6 (17.1)
Black	21 (60.0)
American Indian	1 (2.9)
Other/ Mixed Race	7 (20.0)
Physical Activity (mins/day) :	
Moderate-to-Vigorous Physical Activity	160.3 [92.5, 205.0]
Moderate Physical Activity	135.0 [80.0, 190.0]
Vigorous Physical Activity	0.0 [0.0, 10.0]
Neighborhood:	
Hill District	11 (31.4)
Braddock	8 (22.9)
Arlington	3 (8.6)
Penn Hills	2 (5.7)
Rankin	1 (2.9)
Cherry Springs	1 (2.9)
Ross Township	1 (2.9)
Highland Park	1 (2.9)
Bradford Woods	1 (2.9)
Carrick	1 (2.9)
Perrysville	1 (2.9)
Squirrel Hill	1 (2.9)

NOTE: Data are presented as median [25th percentile, 75th percentile], or N(%)

Household characteristics are presented in **Table 4**. The majority of participants (69.4%; n=25) had at least two adults living in their household. Approximately 36.1% (n=13) had three or four adults living in their household and 30.6% (n=11) had only one adult living in their household. Nearly 67% (n=24) of participants had one or more children living with them in their household, with up to 7 other children living in their house. The majority of participants (72.2%; n=26) named their mother as the person they perceived themselves to be closest with. Only 5.6% (n=2) named their father and 11.2% (n=4) named an older sibling as the adult in their household that they are closest with. All participants (n=36) reported receiving intangible support for physical activity from at least one adult in their household at least one time per week (**Table 5**). However, almost 1 in 5 participants (19.4%; n=7) reported receiving no tangible support for physical activity from any adult in their household. Measures of support by race/ethnicity, age, and BMI percentile are presented in Appendix R (**Tables 13, 14, and 15**).

Table 4. Household characteristics of n=36 participants

Characteristic	N	%
Number of Adults (≥ 18 years) in the Household:		
One	11	30.6
Two	12	33.3
Three	7	19.4
Four	6	16.7
Number of Additional Children (< 18 years) in the Household:		
zero	12	33.3
one	10	27.8
two	5	13.9
three	6	16.7
four	1	2.8
five	1	2.8
six	1	2.8
seven	1	2.8
Closest Adult:		
Mother	26	72.2
Father	2	5.6
Mom's Partner	1	2.8
Dad's Partner	2	5.6
Grandma	1	2.8
Brother	2	5.6
Sister	2	5.6

NOTE: 'Closest adult' refers to participant response to the question, "Think about the adult (18 or older) that you are closest to in your household. Please circle their gender and list their relationship to you."

Table 5. Household support characteristics of n=36 participants

Household Support	Medians and Frequencies
Closest Adult Providing Support:	
Total support	11.0 [7.6, 14.5]
Tangible Support	5.0 [1.3, 7.0]
Intangible Support	6.0 [4.3, 7.0]
Number of Adults (≥ 18 years) in the Household Providing Support:	
<i>Total support:</i>	
Zero	0 (0.0)
One	11 (30.6)
Two	14 (38.9)
Three	6 (16.7)
Four	5 (13.9)
<i>Tangible Support:</i>	
Zero	7 (19.4)
One	6 (16.7)
Two	12 (33.3)
Three	7 (19.4)
Four	4 (11.1)
<i>Intangible Support:</i>	
Zero	0 (0.0)
One	11 (30.6)
Two	16 (44.4)
Three	5 (13.9)
Four	4 (11.1)
Total Magnitude of Support:	
Total support	23.0 [9.3, 31.0]
Tangible Support	10.5 [2.0, 14.8]
Intangible Support	11.5 [8.0, 15.8]

NOTE: Data are presented as median [25th percentile, 75th percentile], or N(%). Total support is the sum of reported tangible and intangible support. For closest adult, max total support score is 20; max tangible support score is 12; max intangible support score is 8.

4.2 PERCEIVED SUPPORT FOR PHYSICAL ACTIVITY FROM CLOSEST ADULT IN THE HOUSEHOLD

Linear regression models were fit to examine the correlations between moderate-to-vigorous physical activity and perceived support from the adult they reported as being the closest with them. Pearson correlations were non-significant between moderate-to-vigorous physical activity and total support ($r=0.129$; $p=0.459$), tangible support ($r=0.055$; $p=0.754$), and intangible support ($r=0.197$; $p=0.257$) for physical activity. Partial correlations, adjusted for age, BMI, and race/ethnicity, of total support ($r=0.221$; $p=0.224$), tangible support ($r=0.126$; $p=0.492$), and intangible support ($r=0.197$; $p=0.174$) for physical activity were also not significantly correlated to moderate-to-vigorous physical activity (**Table 6**).

Table 6. Association between support from the closest adult in the household and moderate-to-vigorous physical activity

Moderate-to-vigorous Physical Activity (mins/day)	Closest Adult in the Household		
	<i>Total support</i>	<i>Tangible Support</i>	<i>Intangible Support</i>
Pearson Correlation (unadjusted)	0.129	0.055	0.197
p-value	0.459	0.754	0.257
Partial Correlation (adjusted)	0.221	0.126	0.247
p-value	0.224	0.492	0.174

NOTE: Partial correlations adjusted for age, BMI, and race/ethnicity; total support is the sum of reported tangible and intangible support.

4.3 PERCEIVED SUPPORT FOR PHYSICAL ACTIVITY AND THE NUMBER OF ADULTS PROVIDING SUPPORT IN THE HOUSEHOLD

Linear regression models were fit to examine the correlations between moderate-to-vigorous physical activity and the number of adults in the household perceived as providing support for physical activity. Pearson correlations were non-significant between moderate-to-vigorous physical activity and the number of adults providing total support ($r=-0.058$; $p=0.739$), tangible support ($r=-0.026$; $p=0.884$) for physical activity, and intangible support ($r=-0.196$; $p=0.260$). Adjusted partial correlations between moderate-to-vigorous physical activity and the perceived number of adults providing total support ($r=-0.028$; $p=0.880$), tangible support ($r=0.003$; $p=0.985$), and intangible support ($r=-0.171$; $p=0.34$) were non-significant (**Table 7**).

Table 7. The association between the number of adults in the household providing support and moderate-to-vigorous physical activity

Moderate-to-vigorous Physical Activity (mins/day)	Number of Adults in the Household Providing Support		
	Total support	Tangible Support	Intangible Support
Pearson Correlation (unadjusted)	-0.058	-0.026	-0.196
p-value	0.739	0.884	0.260
Partial Correlation (adjusted)	-0.028	0.003	-0.171
p-value	0.880	0.985	0.349

NOTE: Partial correlations adjusted for age, BMI, and race/ethnicity; total support is the sum of reported tangible and intangible support.

4.4 PERCEIVED SUPPORT FOR PHYSICAL ACTIVITY AND THE TOTAL MAGNITUDE OF SUPPORT FROM ADULTS IN THE HOUSEHOLD

Regression models were fit to examine the correlations between moderate-to-vigorous physical activity and the total perceived magnitude of support from the adults in their household, while controlling for covariates. Unadjusted Pearson correlations were negative between moderate-to-vigorous physical activity and the total magnitude of total support ($r=-0.099$; $p=0.571$), tangible support ($r=-0.090$; $p=0.608$), and intangible support ($r=-0.094$; $p=0.592$). Partial correlations of the total magnitude of total support ($r=-0.056$; $p=0.763$), tangible support ($r=-0.054$; $p=0.771$), and intangible support ($r=-0.049$; $p=0.791$) were not significantly correlated to moderate-to-vigorous physical activity (**Table 8**).

Table 8. Association between the total magnitude of household support and moderate-to-vigorous physical activity

Moderate-to-vigorous Physical Activity (mins/day)	Total Magnitude of Support from the Household		
	Total support	Tangible Support	Intangible Support
Pearson Correlation	-0.099	-0.090	-0.094
Significance	0.571	0.608	0.592
Partial Correlation	-0.056	-0.054	-0.049
Significance	0.763	0.771	0.791

NOTE: Partial correlations adjusted for age, BMI, and race/ethnicity; total support is the sum of reported tangible and intangible support.

4.5 EXPLORATORY ANALYSIS

Exploratory analyses were performed to examine associations between BMI and the household support measures and moderate-to-vigorous physical activity (**Table 9**). There were significant negative unadjusted and adjusted correlations found between BMI and: (1) support from the

closest adult in the household: unadjusted ($r=-0.553$; $p=0.001$) adjusted ($r=-0.515$; $p=0.002$); (2) tangible support from the closest adult in the household: unadjusted ($r=-0.549$; $p=0.001$) adjusted ($r=-0.515$; $p=0.001$); (3) the total magnitude of support from the adults in the household: unadjusted ($r=-0.514$; $p=0.002$) adjusted ($r=-0.495$; $p=0.003$); (4) the total magnitude of tangible support from the adults in the household: unadjusted ($r=-0.523$; $p=0.001$) adjusted ($r=-0.494$; $p=0.003$); and (5) the total magnitude of intangible support from the adults in the household: unadjusted ($r=-0.418$; $p=0.012$) adjusted ($r=-0.433$; $p=0.012$). There were no significant associations between BMI and moderate-to-vigorous physical activity.

Table 9. Correlations between BMI and household support measures and physical activity

		Pearson Correlation	p-value	Partial Correlation	p-value
HOUSEHOLD SUPPORT FOR PHYSICAL ACTIVITY					
Closest Adult in the Household	<i>Total support</i>	-0.553	0.001	-0.515	0.002
	<i>Tangible Support</i>	-0.549	0.001	-0.515	0.001
	<i>Intangible Support</i>	-0.279	0.104	-0.257	0.150
Number of Adults in the Household Providing Support	<i>Total support</i>	-0.308	0.071	-0.310	0.079
	<i>Tangible Support</i>	-0.317	0.064	-0.297	0.093
	<i>Intangible Support</i>	-0.314	0.066	-0.332	0.059
Total Magnitude of Support from the Household	<i>Total support</i>	-0.514	0.002	-0.495	0.003
	<i>Tangible Support</i>	-0.523	0.001	-0.494	0.003
	<i>Intangible Support</i>	-0.418	0.012	-0.433	0.012
PHYSICAL ACTIVITY					
<i>Moderate-to-vigorous (min/day)</i>		0.098	0.575	0.097	0.592

NOTE: Partial correlations adjusted for age and race/ethnicity; total support is the sum of reported tangible and intangible support.

4.5.1 Participant reported priorities, facilitator, and barriers

Participants were asked open-ended questions about their top 3 priorities in life, barriers towards engaging in physical activity, and facilitators towards engaging in physical activity. Responses were recoded to examine the most commonly reported priorities, barriers, and facilitators of physical activity (Appendix N). The most frequently reported life priorities by participants were family and friends, best version of oneself (e.g., “*making the best of myself*”; “*being successful*”), and school (Figure 3). Other frequently reported top priorities included health and well-being (e.g., “*being healthy*”; “*happiness*”), sports and hobbies (e.g., “*fashion*”; “*dancing*”; “*music*”), and essential needs (e.g., “*food*”; “*making money*”).

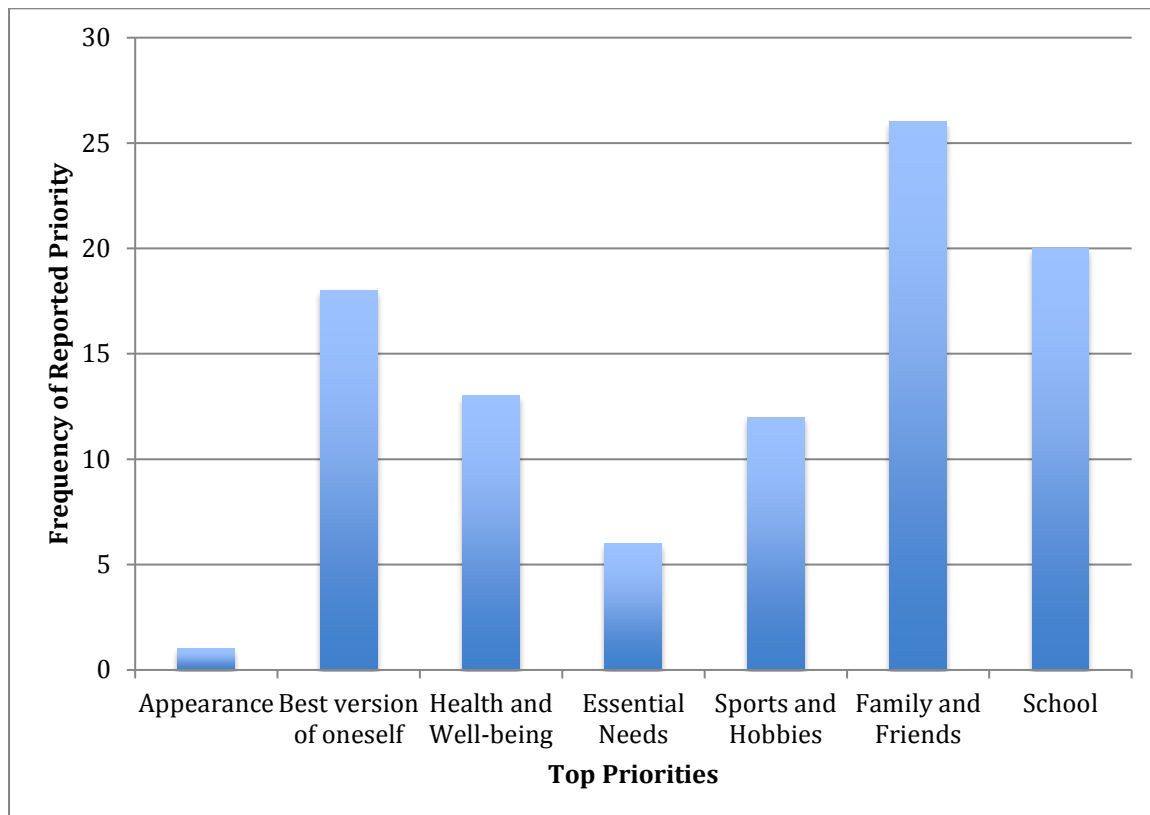


Figure 3. Top priorities in life as reported by n=36 participants

The most commonly reported facilitators towards engagement in physical activity were family/friend support, school, and types of physical activities (e.g., “workout circuit”; “walking”; “dancing”; or “going outside”) (Figure 4). The most frequently reported facilitator of physical activity was family/friend support. These responses included: “mom driving me;” “my family taking me to the YMCA;” “driving adults;” “walking around with my friends;” “people encourage me to do them;” and “my mom and dad encourage me to do it.” Of the school-based facilitators, participants reported that gym class was a facilitator of physical activity as well as being on a high-school sports team. Motivation (“having motivation” and “by having motivation that I could do this”) and time (“less work”; “less time from school”; and “more time”) were also reported as facilitators of physical activity.

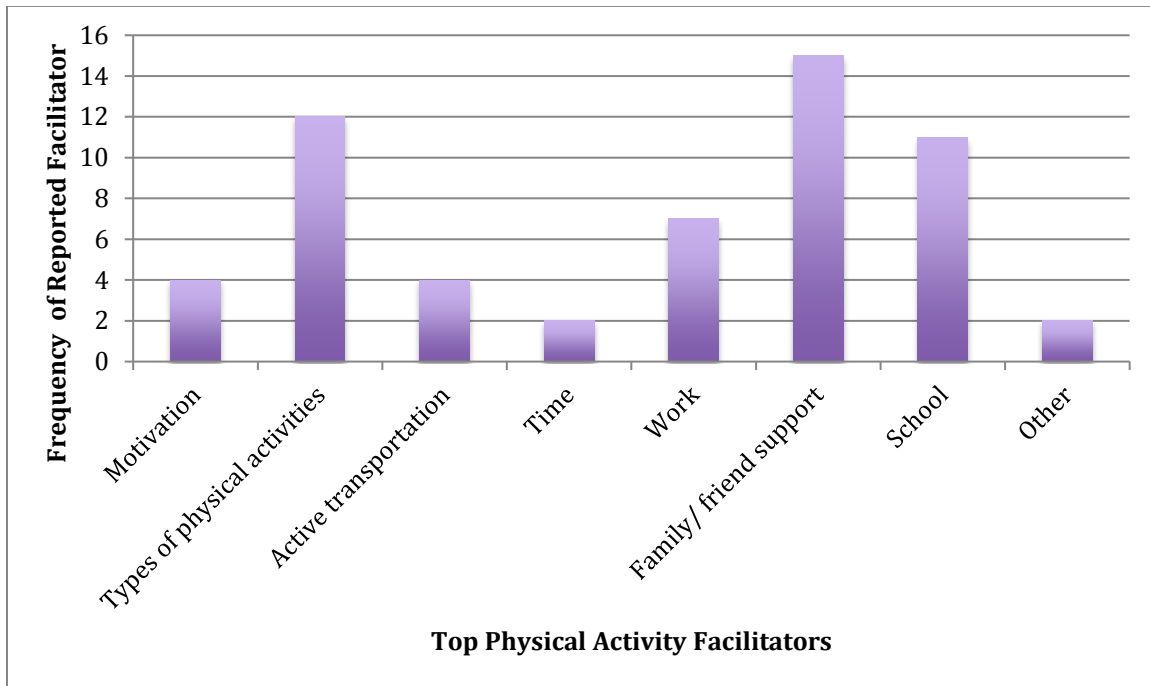


Figure 4. Reported facilitators for engaging in physical activity as reported by n=36 participants

The most commonly reported barriers towards engagement in physical activity by participants are displayed in Figure 5. School, pain or injury, and transportation barriers were

the most commonly reported barriers towards physical activity engagement. While some participants reported lack of motivation as a barrier towards engagement in physical activity, most barriers reported were school-related barriers. School-related barriers reported included: “homework;” “school- not having enough time to spend working out because of studying, homework, or extra-curricular activities;” and “work and homework prevents me from getting more physically active because right after school I go to work and when I get home I’m tired.” Transportation-related barriers reported included: “don’t live near activities I want to attend;” “I’m unable to drive places;” and “not having the transportation to get places.” Pain or injury barriers reported included: “being sore;” “weight;” “sometimes leg starts to hurt;” and “I don’t want to get hurt.”

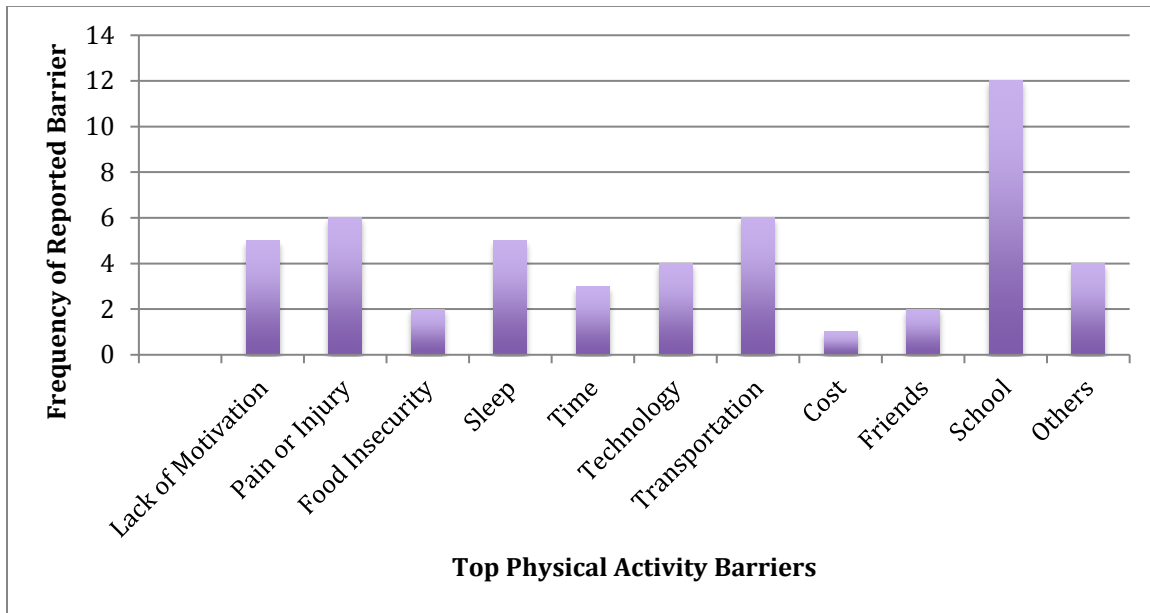


Figure 5. The most commonly reported barriers towards engaging in physical activity as reported by n=36 participants

5.0 DISCUSSION

5.1 INTRODUCTION

The primary aims of this study sought to explore the association between household support for physical activity and level of physical activity of adolescent girls recruited from lower socioeconomic status neighborhoods. Specifically, we sought to determine the relationship between adolescent girls' physical activity and three specific measures of household support: (1) perceived support for physical activity from the adolescent's perceived closest adult in the household; (2) the number of adults providing support for physical activity in the household; and (3) the overall magnitude of support for physical activity in the household. Further, we sought to differentiate between total support, tangible support, and intangible support. Contrary to our initial hypotheses, there were no significant associations between any of the specified measures of household support and physical activity levels of adolescent girls recruited from lower socioeconomic status neighborhoods (**Tables 5, 6, and 7**).

While there were no significant association between physical activity levels and any of the support measures, family/friend support was the most commonly reported facilitator of engagement in physical activity as reported by participants in an open-ended response (**Figure 4**). Exploratory analyses found a significant inverse association between both the total magnitude of household support for physical activity and total support (both tangible and intangible) for

physical activity and BMI (**Table 9**). This suggests that the higher an adolescent's BMI, the less likely they are to perceive support for physical activity from adults in the household. The following sections will describe the interpretations of these findings, as well as the strengths and limitations of this study and future directions.

5.2 HOUSEHOLD SUPPORT FOR PHYSICAL ACTIVITY

5.2.1 Physical activity

The median physical activity levels reported by participants was 160.3 [92.5, 205.0] minutes/day of moderate-to-vigorous physical activity. These levels are above the 60 minutes of moderate-to-vigorous physical activity per day recommended by the 2008 Physical Activity.¹ Additionally, these levels are also higher than in previous studies measuring physical activity in adolescent girls.^{2,70} Hallal et al. found that 80.3% of US adolescents 13-15yrs old were not meeting the US guideline of 60 minutes of moderate-to-vigorous physical activity per day.⁷⁰ It has also been demonstrated that lower socioeconomic status adolescents engage in significantly less physical activity.¹³² This study found that more than 75% of the study population was meeting the US guidelines of 60 minutes of moderate-to-vigorous physical activity per day, which is not in agreement with past literature measuring physical activity both objectively and subjectively.^{2,70-72} One potential factor that could have contributed to the timing of the assessments, in which 75% (n=27) of assessments occurred during the summer and only 25% (n=9) occurred during the school year. Additionally, 50% (n=18) of the total sample was recruited from structured summer programs, which may have skewed our physical activity measurement.

There are several additional factors to consider when interpreting the high levels of physical activity in this study. While the 3DPAR has been shown to be a valid and reliable instrument to measure physical activity levels in an adolescent population,^{129,130} it may not have been the appropriate for use with our study sample. While administering the 3DPAR to participants, the Principal Investigator noticed that it was challenging for many participants to recall what activities they engaged in over the past three days. The participants also had difficulty understanding the definitions of light, moderate, hard, and very hard in the context of physical difficulty of the activity they recalled. A study by Bauer et al. used the 3DPAR to measure moderate-to-vigorous physical activity in a lower socioeconomic status population and was able to detect a significant association between familial support for physical activity and physical activity levels of adolescent girls.¹³³ However, this study did not provide the quantification of moderate-to-vigorous physical activity calculated from the 3DPAR, so it is difficult to assess whether their measurement of physical activity from the 3DPAR was higher or on par with what is expected in this population.

Other studies have utilized the 3DPAR to provide information about the context of physical activity, but have relied on a concurrent objective measurement to quantify physical activity. For the TAAG study, Vorhees et al. used the 3DPAR to understand the context of physical activity, but measured physical activity concurrently using accelerometry to measure minutes/day of moderate-to-vigorous physical activity.¹³⁴ Similarly, Dulin-Keita et al. used accelerometry to measure moderate-to-vigorous physical activity and the 3DPAR to get at the context of physical activity in a population of Non-Hispanic black adolescent girls.¹³⁵ It may be that the 3DPAR is a more valid tool to assess context of physical activity (e.g., types of physical activity, where they are engaging in physical activity, and perception of difficulty of physical

activity), but may not be appropriate to accurately quantify moderate-to-vigorous physical activity in a population of adolescent females recruited from lower socioeconomic status neighborhoods.

5.2.2 Association between household support and physical activity

This study was novel in its examination of non-traditional measures of household support for physical activity in a sample of adolescent girls recruited from lower socioeconomic status neighborhoods. Household support measures were normally distributed, which indicated that there was a wide range of household support for physical activity among participants. Contrary to our initial hypotheses, our study found no significant association between girls' physical activity levels and any measure of household support. This is in contrast to prior studies in adolescents have indicated that if at least one parent provided encouragement to their child related to physical activity, they were significantly more physically active than those who did not receive any encouragement.^{9,55}

In a longitudinal study of family support and physical activity from 8th to 12th grade in a racially/ethnically diverse group of girls, Dowda et al. found maintenance of high familial support over time reduces the decline in the physical activity levels of adolescent girls.¹³⁶ It is possible that consistent familial support for physical activity in girls from low SES households attenuates the decline in physical activity; however, because our study was cross-sectional, we were not able to examine this association.

It is possible that household support was attenuated by other physical activity barriers unique to this population. In a qualitative study by Humbert et al., which assessed the factors that influence physical activity among high and low socioeconomic status adolescents, low

socioeconomic status adolescents described barriers to physical activity including: family obligations, proximity to recreational opportunities, cost, safety, and facilities.³³ Our study also found that cost and proximity were important key barriers to the girls' physical activity. It is possible that in our study, household support for physical activity was not enough to increase girls' physical activity given other environmental barriers.

While we were unable to detect significant associations between measures of household support for physical activity and physical activity levels, we did detect small positive correlations between the support provided by the closest adult and girls' physical activity levels. The correlation between tangible support from the closest adult and physical activity was $r=0.160$, which is small in magnitude, but indicates a positive association between household support and physical activity. In a study of emotional social support and physical activity in an underserved adolescent population, Siceloff et al., in found a significant (cross-sectional) association between MVPA and family tangible support ($r=0.12$).¹⁰⁹ The magnitude and direction of our correlation between tangible support from the closest adult in the household and physical activity is similar to that of Siceloff et al., however we found a stronger correlation between intangible support and physical activity of $r=0.247$, whereas Siceloff et al. found no significant correlation. The sample of adolescents in the Siceloff et al., study was slightly younger which may explain why we saw a stronger association with intangible support in the current study, since it has been demonstrated that intangible support is more consistently associated with physical activity in older adolescents.⁴⁶

In addition, while non-significant, we did detect a small negative association ($r=-0.171$) between the number of adults perceived to be providing intangible support and physical activity levels of adolescent girls recruited from lower socioeconomic status neighborhoods. To our

knowledge, no other study has specifically examined the association between the number of adults providing support for physical activity and physical activity levels of adolescent females, specifically those recruited from lower socioeconomic status neighborhoods. In a diverse sample of adolescent females, McGuire et al. found a significant positive correlation of $r=0.15$ between parental support and physical activity.⁵⁶ In the present study, it is possible that the girls' perception of the intangible support was not viewed as encouragement but rather nagging, which may explain the negative direction of the association. That is, the household support questionnaire was worded in such a way that it was unclear whether the parent was telling participants to be physically active in a positive or negative manner. In focus groups done as part of a qualitative study of weight-related behaviors in non-Hispanic black female adolescents, participants stated that judgments made by their family members about their health habits were not perceived to be helpful.¹³⁷ It may be that the wording of the intangible support subscale was unable to distinguish between positive or negative encouragement, which is an important consideration when using this tool in the future.

5.3 FACILITATORS AND BARRIERS TOWARDS ENGAGEMENT IN PHYSICAL ACTIVITY

Participants were asked open-ended questions about the barriers they experience to engaging in physical activity and what factors or facilitators are helpful in engaging in physical activity. Their response patterns highlighted both common barriers and facilitators of youth physical activity, particularly those living in low socioeconomic status households. These barriers and

facilitators should be considered when developing future physical activity interventions in this population of adolescent girls recruited from lower socioeconomic status neighborhoods.

5.3.1 Physical activity barriers

The most frequently reported participant barriers to physical activity were school (e.g., homework, class) and tangible (e.g., transportation to activities, need for food) barriers (Figure 5). School barriers such as “*work and homework prevents me from getting more physically active because right after school I go to work and when I get home I’m tired*” and “*school- not having enough time to spend working out because of studying homework or extra-curricular activities*” are similar to what has been previously reported in other qualitative studies looking at barriers to physical activity in an adolescent female population, regardless of socioeconomic status.^{55,63} School-related barriers to physical activity are not unique to a lower socioeconomic status population; however, opportunity to be physically active in the school environment is tied to socioeconomic status. Lower socioeconomic status adolescents may have less access to physical activity opportunities within the school context due to fewer programs offered, less equipment, etc.^{118,138} Schools may present common barriers across socioeconomic status in an adolescent population; however, students from lower socioeconomic status neighborhoods may have reduced opportunities for school to facilitate physical activity as well.

The tangible barriers reported by participants of this study are characteristic barriers to a lower socioeconomic status population. Barriers reported included: “*don’t live near activities I want to attend;*” “*having to pay for things;*” “*a good meal in front of me;*” and “*not having the transportation to get to the places.*” These barriers are similar barriers facing a low socioeconomic status population to those reported by Dagkas and Stathi in a qualitative study

examining differences in physical activity engagement in higher and lower socioeconomic status schools.¹³⁸ Additionally, they found that these financial barriers influenced students' abilities to be active outside of school as well as less parental support and encouragement to participate in physical activity.¹³⁸ While we did not compare household support measured in this study to a higher socioeconomic status population, household support was normally distributed, indicating a wide range of support for physical activity in our sample, and there was no significant association with physical activity levels.

5.3.2 Physical activity facilitators

There were a number of physical activity facilitators reported in open-ended questions that should be considered when developing future interventions with low socioeconomic status adolescent girls (Figure 4). The top three reported facilitators were: (1) Family/ friend support; (2) enjoyment of a particular type of physical activity; and (3) school, which suggests a multilevel approach would be appropriate to target factors across levels of the Social Ecological Model. While we did not find any significant associations between household support for physical activity and physical activity levels, it was clear from open-ended responses that household involvement and encouragement for physical activity was an important facilitator towards engagement in physical activity. This is similar to previous studies, which have cited the need for adult involvement and facilitation of physical activity in a lower socioeconomic status population.³³ Given that household encouragement and support was the most commonly reported facilitator of physical activity as reported by participants in an open-ended question, it may be that limitations of this study including inaccurate measurement of physical activity and small sample size, prevented the detection of a significant association between household support and

physical activity levels in adolescent females recruited from lower socioeconomic status neighborhoods.

The second most commonly reported facilitator of physical activity was engagement in specific types of physical activities that the participants enjoyed. Responses included: “volleyball;” “workout circuit;” “walking;” “going outside;” and “dance.” The wide range of responses highlights the diversity of physical activities girls enjoy engaging in. Previous studies have found an association between the enjoyment of physical activity and physical activity levels in adolescents.^{12,139} The diversity of physical activity interests reported in our study, highlight the importance of the consideration of enjoyment of physical activity in the development of future physical activity interventions.

School-related facilitators were also mentioned frequently in response to the open-ended question about what helps to facilitate physical activity engagement. “Gym class” and “playing on a high school team” were commonly reported facilitators of physical activity, which highlights the importance of school-based programming in adolescent physical activity levels. A study by Zakarian et al. suggested that vigorous physical activity levels decline in low socioeconomic status adolescents with age when they are no longer required to participate in physical education classes.³⁶ Similarly, Gordon-Larsen et al. found that participation in physical education programs was lower among non-Hispanic black and Hispanic adolescents.⁸⁰ Taken together, school is a facilitator as well as a barrier towards engagement in physical activity in lower socioeconomic adolescent girls. Given that lower socioeconomic status schools have fewer resources, financially supporting these schools to increase opportunities to facilitate engagement in physical activity is essential. The National Physical Activity Plan set several goals to increase school-based physical activity including: high-quality physical education programs; provide

afterschool, holiday, and vacation programs to ensure physical activity; and professional development programs that prepare educators to deliver effective physical activity programs.¹⁴⁰ School-based physical activity should be considered as a target for future interventions to increase physical activity in that setting.

5.4 BMI AND HOUSEHOLD SUPPORT FOR PHYSICAL ACTIVITY

This study found a significant inverse association between the total magnitude of household support, as well as support from the closest adult in the household with participant BMI. Our findings confirm and extend findings of previous studies examining associations between BMI and support for physical activity.^{32,141} One qualitative study by Alm et al. identified lack of family support as a barrier to physical activity in overweight adolescents of low socioeconomic status.³² Our findings confirm and extend the findings by Alm et al. by measuring both support for physical activity and physical activity levels of lower socioeconomic status adolescent girls.

In contrast to our findings, Zabinski et al. found no significant difference in adult support for physical activity between overweight and normal weight girls (8-16yrs).¹⁴¹ While we did not dichotomize participants into overweight and normal weight, our findings suggest there is a significant inverse association between household support for physical activity and BMI. Our study was also recruited from lower socioeconomic status neighborhoods, which was different than the study population of Zabinski et al. It may be that particularly in lower socioeconomic status neighborhoods, household support for physical activity is lower in overweight/obese adolescent girls. This finding should be replicated in future studies designed and powered to examine the associations between BMI, household support, and physical activity levels. These

findings should also be considered when designing physical activity and weight loss interventions to focus on increasing household support for overweight/obese adolescent girls from lower socioeconomic status neighborhoods.

We also found no significant association between physical activity levels and BMI, similar to previous studies examining associations between BMI and physical activity.^{11,20} However, it is possible that we were not able to detect a potential association due to the self-report measure of physical activity used, which resulted in a potentially skewed physical activity measurement. This potential association warrants further investigation in studies measuring physical activity objectively. Although physical activity levels do not appear to be associated with BMI as shown by this study and others, it is an important health-promoting behavior that should be targeted in this high-risk population.

5.5 STRENGTHS, LIMITATIONS, AND FUTURE DIRECTIONS

This study had a number of strengths that included: 1) underserved sample of adolescent girls recruited from lower socioeconomic status neighborhoods, 2) examination of three different measures of household support for physical activity (support from closest adult, number of adults providing support, and total magnitude) and physical activity levels of adolescent girls, and 3) overall makeup of the household (parents, grandparents, siblings, etc.). However, this study also had a number of limitations that may have influenced the findings of this study as well as the generalizability of this study. These limitations are described below as well as future directions to address these study limitations.

5.5.1 Limitations and Future Directions

The current study was limited by several factors including: 1) generalizability to greater population of lower socioeconomic status adolescent females; 2) measurement of physical activity using the 3DPAR questionnaire; 3) timing of data collection; 4) household support questionnaire designed to be answered during the school year; and 5) participant total below targeted recruitment goal.

1) **Generalizability to greater population of lower socioeconomic status adolescent**

females: This study aimed to recruit lower socioeconomic status adolescent girls; however, we did not directly measure socioeconomic status (e.g., parent education, household income). Additionally, the recruitment approach may have biased the generalizability of the results of this study. While many recruitment strategies were employed in this study, the majority of participants were recruited through community programs targeting underserved adolescent girls. Specifically, the girls that were recruited through the Jeron X. Grayson Community Center, Gwen's Girls, or the Braddock Youth Project were all taking part in structured summer programs. While these programs were not physical activity-based, they may have incorporated physical activity as part of their programs, which would have affected participant physical activity engagement. Additionally, it may be that girls that voluntarily enroll and participate in a summer program are not representative of the general population of lower socioeconomic status adolescent girls. These factors need to be considered when applying the results of this study to the general population.

Future Directions: Based on this limitation, future studies should target recruitment of these girls to allow for generalizability to the wider population. For example, recruitment

from schools may be a more appropriate way to recruit girls of different physical activity levels. Recruitment through schools could also provide additional information about free/reduced price lunch or school socioeconomic status as a proxy for participant socioeconomic status.

- 2) **Measurement of physical activity using the 3DPAR questionnaire:** This study measured physical activity using the 3DPAR questionnaire, which may not have accurately assessed average minutes of moderate-to-vigorous physical activity per day. Though the 3DPAR is a valid and reliable instrument, there are inherent flaws and biases in self-report tools.¹⁴² The 3DPAR asked participants to recollect their daily activities and their perception of the intensity of each specific activity. From this information, the researcher then assigns each activity a MET level based on the activity and intensity reported. It may be particularly difficult for younger children to recall activities they did every 30 minutes 3 days ago. The Principal Investigator noticed that many participants had difficulty recalling what they did for the past 3 days and had difficulty rating activities as “light,” “moderate,” “hard,” or “very hard” in the context of physical intensity. This inherently biases the accuracy of the 3DPAR to each individual participant’s perception. This suggests that a researcher-administered tool may be more appropriate over a self-administered tool in a lower socioeconomic status population.

Future Directions: To more accurately assess physical activity, future studies should incorporate an objective measure of physical activity. Objective measurement of physical activity would also help to more concretely detect the associations between household support and moderate intensity physical activity. Ideally, it would be best to measure

physical activity both objectively and with the 3DPAR to test for validity of the 3DPAR in lower socioeconomic status adolescent populations.

- 3) **Timing of data collection:** The timing of data collection for this study may have affected the results of this study as well. Data collection began while school was still in session and continued into the summer. While it was recorded whether the participant was currently in school or it was summer at the time of the assessment, timing of data collection must be considered when interpreting the results. The majority of the participants were assessed during the summer time, which may have limited our ability to detect average physical activity and barriers to physical activity that are unique to the school year.

Future Directions: Future studies should take into consideration the timing of data collection and design studies to measure physical activity either during the school year, over the summer, or a large enough sample size to look at the differences between the two time periods. It is important that future studies work to examine physical activity and support for physical activity during the school year and over the summer as they are different time periods each with its own unique set of barriers towards engagement in physical activity.

- 4) **Household support questionnaire designed to be answered during the school year:** Similarly related to the timing of data collection in the present study, several questions in the household support for physical activity questionnaire were asked as if the participant was still in school. These questions included: (1) “Do you currently attend school?”; (2) “What grade are you in?”; (3) “Do you typically attend an after-school program during the week?”; and (4) “Is he/she typically home when you get home from school?”. While

participants were prompted to fill in the grade they had just completed and answer the questions pertaining to the school year in a more generalizable fashion, this may have influenced how participants answered these questions and needs to be considered when interpreting results pertaining to these questions.

Future Directions: The household support for physical activity questionnaire should be modified for use in future studies to collect demographic information relevant to the time in which the data is being collected. Future studies should modify the questionnaire if data is collected in the summer, to gauge participation in summer programs or work to provide more context to the questionnaire findings and reported physical activity levels.

- 5) **Participant total below targeted recruitment goal:** Another issue that limits the interpretation of our results is the total number of participants was below our initial goal of 50. Recruitment of participants from this population was challenging (discussed in following section) and resulted in a reduced total number of participants and reduced statistical power, which may have reduced our ability to detect significant associations.

Future Direction: Future studies should consider a comprehensive recruitment approach, including adequate time for building community trust and rapport, and involvement of community members in the research process to help reach participant recruitment goals to ensure that these important studies are adequately powered.

5.6 FUTURE CONSIDERATIONS FOR COMMUNITY-BASED RESEARCH

There are several future considerations for conducting studies in a lower socioeconomic status population, especially a pediatric population, that have come to light through recruitment and

data collection of the present study. Specific recruitment and assessment considerations that should be taken into account when designing futures studies in low socioeconomic status adolescent female populations with the overall goal of reducing participant burden and increasing participant/community benefits.¹⁴³

5.6.1 Recruitment

Recruitment was a significant barrier to obtaining the desired number of participants as well as the most time consuming portion of this study. Multiple recruitment strategies were utilized to maximize participant reach, which is in line with recommendations from studies examining recruitment efforts in underserved populations.¹⁴⁴ These included both low-touch strategies (e.g., flyers, Craigslist, CTSI registry, mailings) and high-touch strategies (e.g., health fairs, on-site recruitment presentations). There were several strategies utilized in this study that were essential in recruiting the targeted population of participants including: utilization of a community research advisory board, recruitment through local community organizations, community events, and participant referrals. However, there were several strategies that we found were not as successful (Table 2) to recruit the target population; furthermore, it is possible that successful strategies could be improved upon in future studies to maximize recruitment and build greater trust and rapport within the communities.

5.6.1.1 Social Marketing Recruitment

We implemented several low-touch recruitment strategies in specific lower income communities in order to maximize recruitment efforts including: posting flyers in targeted areas, Craigslist postings, and the CTSI registry. In a review of recruitment of minority and underserved

populations in the US, this self-referral by potential participants was utilized in 58.8% of studies, and the majority of studies combined this approach with other high touch, community-based methods.¹⁴³ In the present study, 10 participants were recruited through these efforts; while these efforts were targeted towards lower socioeconomic status communities, participants recruited through this method were less likely to be from the targeted demographic as noted from self-reported neighborhood the participants indicated on the questionnaire.

In another review of recruitment strategies in vulnerable populations by UyBico et al., social marketing strategies, health system, and referral recruitment were found to be the most successful recruitment strategy in 35-45% of studies.¹⁴⁴ We did not experience as much recruitment success using marketing strategies such as flyers or utilizing participant registry. This could potentially be due to a number of factors, including: (1) different target population of the current study; (2) flyers placed in low traffic areas of our target population; (3) lack of participant interest; (4) language may not have been effective at attracting the target audience; (5) lack of follow-up/ face-time with potential participants; (6) targeted zip codes of registry members may have inadvertently included higher socioeconomic status neighborhoods; and (7) lack of utilization of social marketing strategies, which may be particularly more successful in an adolescent female population. In an examination of their theory-informed recruitment of children in an African American population, Beech et al. describe the importance of adopting a specific marketing plan, informing community organizations about research in order to engage the community, tailoring recruitment messages to the target population, and mechanisms for dissemination of information.¹⁴⁵ Going forward, community input and involvement from a community research advisory board will help ensure that the study is relevant, based on the needs of the community, and that study materials are appropriate. This would help with

distribution and dissemination of information about the study and may help to recruit more participants more effectively.

5.6.1.2 Community Outreach and Recruitment

Community outreach and partnerships formed with community-based organization was the most fruitful recruitment strategy used in this study. Several important components of this recruitment strategy included: (1) advisement from the University of Pittsburgh's Community Research Advisory Board (CRAB); (2) building on pre-existing community relationships through the CRAB or co-investigators; and (3) engaging in higher-touch forms of communication with community partners.

The use of a community-based advisory board to provide valuable feedback on recruitment strategies as well as to partner and build-upon community relationships with more well-respected community researchers has been well-document as an essential strategy in community-based research.^{143,146-148} In our study, feedback from the CRAB was an essential component for successful researcher-community partnerships and providing community connections that allowed us to recruit from community health fairs. Feedback and suggestions on recruitment strategies provided by the CRAB employed in this study included increased face-face time with community members and finding a way to give back to partnering community organizations.

One of the greatest challenges researchers conducting community-based studies face is building trust and rapport with community members and leaders of community organizations.^{149,150} We found this to be the most time-consuming part of recruiting this population, but also the most important in helping to successfully recruit the target population of lower socioeconomic status adolescent girls. It was also very important to consider the interests

of the communities and community partners we collaborated with. Wallerstein and Duran describe the importance of being sure that community organization's interest are kept in mind and accommodated as much as possible by the research/ researcher.¹⁵¹ In order to increase the benefit to community partners for this cross-sectional study with limited resources, the principal investigator gave back to many community partners by doing a health promotion-focused demonstration at community-site events. It is important that the community is invested in the research topic and understand the positive impacts that the research could have on the community. Future community-based participatory research studies need to take into consideration the needs of partnering community-organizations and work to incorporate those needs into interventions or provide materials/time that will help benefit the organization and participant beyond involvement in the study.

5.6.1.3 Future Community-based Participatory Research approaches

There were many community-based participatory research (CBPR) strategies that were successful in recruiting participants for the present study; however, there are other strategies that could be utilized to maximize recruitment and engagement with the community. To build trust within the communities we were recruiting in, having a community liaison, a trusted member of the target community, help with recruitment and communication efforts would have been extremely helpful.^{147,148} We did not have a community liaison or representative on our research staff and that may have limited our approachability at community events and in building relationships with community sites. Future community-based studies should focus on partnering with a trusted member of the community to help communicate the research message more effectively to potential participants and to help ease concerns about research participation.

Other strategies to employ in future research with an underserved adolescent population are school- and church-based recruitment, which were not utilized in the present study. Recruiting from churches and schools serving low socioeconomic status populations may have also helped to reduce bias in our study, where the majority of our participants were currently enrolled in a summer-camp program. Elder et al. describe the success of recruitment through the school system for the TAAG study by adapting their strategies to the age of the girls they were recruiting and to the specific school sites at which they were recruiting.¹⁵² The TAAG study was faced with many recruitment challenges as well, but adopting a more intensive and focused efforts in each school such as small group presentations, teacher liaisons, and focus groups with lower participating schools to assess perception of the study helped increase recruitment.¹⁵² The school system and churches are great ways to access a wider population within the community and building relationships and trust with the leaders at these institutions may be helpful in participant recruitment.

Future studies should focus on developing meaningful community relationships to help build trust and rapport between researchers and the community. The more avenues through which recruitment is approached and the flexibility of the recruitment approach has been shown in this study and others as the key to successful recruitment in CBPR. The recruitment challenges faced while conducting this study have stressed the importance of establishing strong community relationships/ partnerships, remaining flexible with recruitment methods, and most importantly gaining trust and building rapport within the community.

5.6.2 Participant Burden and Incentives

A barrier towards obtaining the goal number of participants was the lack of balance between participant burden and participant compensation. This study was also cross-sectional, so there was no direct benefit to participating, which may have warranted an increased financial incentive to participate. Of the 56 participants screened and deemed eligible, only 36 completed the one-time assessment. When examining at the ratio of assessed to screened by recruitment and assessment type, a clear pattern emerged. Of the 31 potential participants screened at either health fairs, community events, or via phone only 18 came to the Physical Activity and Weight Management and completed their assessment. There was a high rate of cancellation, no shows, and reschedules among these participants. The primary reasons given by potential participants for non-attendance included: (1) lack of reliable transportation; and (2) low financial incentive. These barriers were similar to the literature examining participant burden and incentives in underserved and minority populations.^{143,150,152,153} Wallace and Bartlett describe the challenge of balancing the amount of financial incentive against time and effort, but without crossing into coercion.¹⁵⁰ This is an important consideration for future studies as the lack of transportation and low financial incentive may have reduced the rate of completion of the study assessment for those interested and eligible potential participants.

We had greater success with on-site, community based recruitment and assessment completion when looking at the ratio of assessed to screened. Of the 25 potential participants screened at site-agreement community organizations, 18 completed the on-site assessment, which followed within the week of the initial screening visit. Eliminating the burden of transportation to the assessment site may have increased the ratio of assessed to those screened eligible. A challenge with on-site recruitment and assessment was obtaining signed informed

parental consent and the time between the initial introductory visit and participant assessment. Elder et al. reported that at least one school with low return rates on informed consents for the TAAG study offered a \$10 incentive to parents to return consent forms regardless of their decision, which improved recruitment rates.¹⁵² Future studies should take as many steps as possible to reduce the burden to participants and incentivize participants when able to help balance the burden to incentive ratio as much as possible.

5.7 CONCLUSIONS

This study showed no significant associations between household support for physical activity and physical activity levels of adolescent girls recruited from lower socioeconomic status neighborhoods. This could be because barriers lower socioeconomic girls face towards engaging in physical activity are not easily overcome by household support for physical activity. Limitations related to the measurement of physical activity and sample size may have also contributed to the lack of significant findings.

Exploratory analyses revealed a significant inverse association between BMI and household support for physical activity in adolescent girls recruited from lower socioeconomic status neighborhoods. Low socioeconomic status overweight/obese adolescents are a particularly vulnerable population, who are in great need of effective behavioral interventions to reduce weight status and increase physical activity. While this study did not show a significant relationship between household support for physical activity and physical activity levels of adolescent girls recruited from lower socioeconomic status neighborhoods, it is important to consider that family/friend support was the most frequently reported facilitator of physical

activity reported as part of this study. Future studies should examine the potential association between household support and physical activity levels of adolescent girls recruited from lower socioeconomic status neighborhoods using an objective measurement of physical activity and an adequately powered sample. Further examination is warranted into the significant inverse association between BMI and household support for physical activity in order to develop more effective future interventions in this population.

APPENDIX A

LETTER TO PARENTS

Title: Understanding Physical Activity in Adolescent Females
Principal Investigator: Kristie Rupp, MS

Dear Parents,

We are inviting your daughter between the ages of 13-17 years to participate in a new research study being conducted by the Department of Health and Physical Activity at the University of Pittsburgh. The purpose of this study is to learn more about physical activity in adolescent females. This study will help us understand how to get girls of this age more physically active.

Your daughter will be asked to come in for one visit to the Physical Activity and Weight Management Research Center that will take approximately 30-45 minutes. During her visit we will take her height and weight when she arrives and then ask her to complete two separate questionnaires about her physical activity, home, neighborhood, and other basic demographic information. She will receive a \$15 WePay debit card upon the completion of her visit.

Information about your child will be kept confidential and only Ms. Rupp and her supervisors, Dr. Sharon Ross and Dr. John Jakicic, will have access to the information collected throughout this study. All data will be kept in a locked filing cabinet in a locked office at the University of Pittsburgh. Your daughter's name will be replaced by an ID number, so that her identity will not be revealed. The information linking the ID number to your child's name will be kept in a separate safe location from this information. Your daughter's research records will be destroyed according to University policy (7 years following study completion).

Your daughter may choose to stop participating in the study at any time. Participation in this study is completely voluntary. You/your daughter's decision to withdraw your/their consent for participation in this research study will have no effect on your current or future relationship with the University of Pittsburgh.

If you are interested in finding out whether your daughter is eligible to participate in this study please contact Ms. Kristie Rupp by phone at (412) 383-4037.

Thank you,

Kristie Rupp, MS
Graduate Research Assistant
Physical Activity and Weight Management Research Center
Department of Health and Physical Activity School of Education
University of Pittsburgh
(412) 383-4037

APPENDIX B

CRAIGSLIST AD

☆ Girls ages 13-17 needed for Physical Activity Research Study (University of Pittsburgh)

PITTSBURGH GIRLS ON THE MOVE!

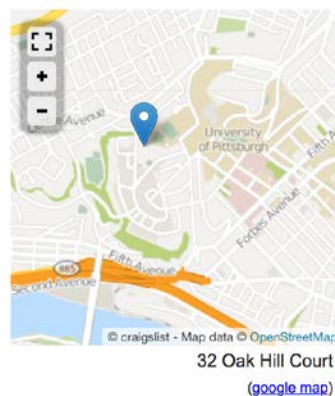
*Do you have a daughter between the
ages of 13-17 years old?*

We Want to Learn About Physical Activity from
HER!



This is a research study conducted by the University of Pittsburgh
Participation in this study will take approximately 1 hour of your time
Compensation will be provided for her time

Please CALL (412-383-4037) to PARTICIPATE.



32 Oak Hill Court
[\(google map\)](#)

Do you have a daughter between the ages of 13-17?
We want to learn about physical activity from her!

The Pittsburgh Girls on the Move! Study is a research study conducted by the University of Pittsburgh.
Participation in this study will take approximately 1 hour of her time.
Compensation will be provided for her time.

Please call Kristie at 412-383-4037 if interested in participating.

◦ do NOT contact me with unsolicited services or offers

Figure 6. Craigslist Ad

APPENDIX C

FLYERS

PITTSBURGH GIRLS ON THE MOVE!

*Are You a Female Between the Ages of
13-17 years old?*

We Want to Learn About Physical Activity from
YOU!



This is a research study conducted by the University of Pittsburgh
Participation in this study will take approximately 1 hour of your time

Please CALL (412-383-4037) to PARTICIPATE.

Move! Pittsburgh Girls PA Study (412) 383-4037
Move! Pittsburgh Girls PA Study (412) 383-4037
Move! Pittsburgh Girls PA Study (412) 383-4037
Move! Pittsburgh Girls PA Study (412) 383-4037
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Move! Pittsburgh Girls PA Study (412) 383-4037
Move! Pittsburgh Girls PA Study (412) 383-4037
Move! Pittsburgh Girls PA Study (412) 383-4037

Figure 7: Community Flyer

PITTSBURGH GIRLS ON THE MOVE!

*Do you have a daughter between the
ages of 13-17 years old?*

We Want to Learn About Physical Activity from
HER!



This is a research study conducted by the University of Pittsburgh
Participation in this study will take approximately 1 hour of your time
Compensation will be provided for her time

Please CALL (412-383-4037) to PARTICIPATE.

Move! Pittsburgh Girls PA Study (412) 383-4037
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Move! Pittsburgh Girls PA Study (412) 383-4037
Move! Pittsburgh Girls PA Study (412) 383-4037

Figure 8. Parent Flyer

Youth Ice Cream Social!!

*Come Celebrate the Pre-End of
the School Year*

Wednesday, May 18th, 2016

2:45-3:30pm between 200-300 Burrows St

Friday, May 20th, 2016

2:45pm-3:30pm @ 480 Oak Hill Drive



All Teen Girls ages 13-17 are encouraged to stop by and learn about how they can participate in a research study conducted by the University of Pittsburgh.

For more information please contact:

Jeanine Baxter, HOU Youth Outreach Specialist at 412-621-0438

Figure 9. Ice cream social flyer

APPENDIX D

CRAB FEEDBACK FORM

**Center for Health Equity (CHE)
Community Research Advisory Board (CRAB)**

Investigator Feedback Form

Instructions to CRAB Members: Please feel free to ask the investigator (s) any questions you have during the presentation to aid you in completing this feedback form. A summary of all comments (not associated with any CRAB member's name) will be provided to the investigator within 30 days of their CRAB presentation. Please write clearly so that your comments are accurately reflected in the summary.

Place your completed feedback form in the blue folder and *return the folder* to Ms. Lora Ann Bray. All Investigators will be invited to return and give us an update on how they use this information.

Thank you for taking the time to provide this valuable feedback!

~~~~~

**Date:** \_\_\_\_\_ January 20, 2016 \_\_\_\_\_

**Last Name of Investigator:** \_\_\_\_\_ Rupp \_\_\_\_\_

**Focus of Research:** \_\_\_\_\_ Physical Activity \_\_\_\_\_

(For example: cancer, heart, depression, mental health, emergency medicine)

**Target Community:** \_\_\_\_\_ Female Adolescents \_\_\_\_\_

**1. Was this study explained to you in a clear manner?**

\_6\_ Yes                      \_0\_ No                      \_4\_ Somewhat

Additional Written Comment from Respondent:

- Needed more clarity on sample design and definitions i.e. SES, income vs. geographic area

**2. Do you believe this research addresses a problem in the target community?**

\_8\_ Yes                      \_0\_ No                      \_2\_ Somewhat

Additional Written Comment from Respondent:

- Not certain that this is a problem exclusive to “your SES” and/or 1 to 2 parent household

**3. What are the most positive aspects of this research? (explain 1-3 aspects)**

- Seeking to investigate adolescent female activity levels to inform future interventions
- To increase “Health” in “Teens” and exercise
- To engage in more socialization skills
- Focuses on an important public health problem
- Looking at physical activity in a logical way
- Addressing physical activity in an inactive population
- Novel in thinking about household status
- Female adolescents are the focus
- Exercise/Physical activity is being examined
- Novel research area
- Teens are likely to exercise when motivated by peer groups/ seeking out press with community organizations is a good idea especially through food banks, family activity at colleges (for all colleges have athletic facilities), pools at gyms that are attractive and accessible
- Physical activity and positive aspects of behavioral health go hand in hand
- Targets population that is overlooked for multiple reasons (age and SES groups)

**4. What recommendations do you have to improve this research in regards to:**

**a. Study team:**

- Increase facetime with/recruitment
- Can you pay people to help you recruit that are minorities? Perhaps other students doing the work for credit?
- Reconsider asking every question vs. having participants fill out a survey on their own

**b. Recruitment:**

- Honors College First Year Experience Students
- Bus Ads
- Check out “Family Fun Night” events at Community Centers
- Organization “Education Teens about HIV/AIDS” will have a conference this spring. Email me and I will introduce you to the contact person ([lab47@pitt.edu](mailto:lab47@pitt.edu))
- Add a monetary incentive for recruitment of teens (iTunes gift card)
- Non-activity-based centers
- Family-based events
- Also look at churches
- May need to consider some random sample recruitment methods to obtain a more likely cross-sample, since your sample size is so small



- Mentoring organizations i.e. Boys and Girls Club, Big Brothers/Big Sisters
- At mentoring programs at the Urban League and church groups
- Possibly provide bus tickets to attend facilities for exercise
- Be certain to recruit from activities other than those already physical activity-based
- Identify specific criteria for analysis and stick to them
- Need to identify and link incentives with specific recruitment locations

**c. Dissemination:**

- Paper copies
- Determine a dissemination plan at outset of study as a goal to strive to accomplish
- Community organizations want handouts or information
- Write a plan to at least distribute the results through the organization that helps you recruit
- Find a way to report back and share information with participant community. Will help with future research and community engagement
- Bus ads for recruitment and community meeting to share your results

**d. Community Engagement:**

- Provide Handbook/ Binder for exercises
- Valuable incentive
- Spend time developing a relationship with the places where you plan to recruit
- Reach out to multiple community stakeholder organizations and anchor institutions prior to recruitment, seeking their partnership
- More visibility and reasons why this study will give benefits to the participants
- Kingsley Association, Hosanna House, Hill House- all serve robust communities

**5. Please add any additional comments (e.g., on data analysis), suggestions, or questions that you still have for the investigator concerning this research study.**

- Qualitative and Quantitative analysis
- You may need to consider dyadic analysis, since you'll have family member and individual variables
- Consider doing a few qualitative interviews with a group of those who engage in physical activity and those who don't
- How will siblings influence this research project?
- "Amachi" is a mentoring group for children of incarcerated parents
- Too many analysis groups will lower your power

## APPENDIX E

### COMMUNITY SITE AGREEMENTS

#### Letter of Agreement

*June 28, 2016*

To the University of Pittsburgh Institutional Review Board (IRB):

I am familiar with **Kristie Rupp**'s research study entitled *Household Support and Physical Activity in Adolescent Females from Lower Socioeconomic Status Households*. I understand that *Jerom X. Grayson Community Center* involvement to be *the recruitment and assessment of participants to be on site and a private location will be provided for the conduction of these assessments.*

As the research team conducts this research project I understand and agree that:

- This research will be carried out following sound ethical principles and that it has been approved by the IRB at the University of Pittsburgh.
- I have read and understand the protocol and agree to allow the conduction of recruitment and assessments on-site at the *Jerom X. Grayson Community Center*.
- To the extent confidentiality may be protected under State or Federal law, the data collected will remain confidential, as described in the protocol. The name of our agency or institution will *not be* reported in the results of the study.

Therefore, as a representative of *Jerom X. Grayson Community Center*, I agree that *Kristie Rupp*'s research study may be conducted at our agency/institution.

Sincerely,

  
Kim El, Program Manager

## Letter of Agreement

June 27, 2016

To the University of Pittsburgh Institutional Review Board (IRB):

I am familiar with Kristie Rupp's research study entitled *Household Support and Physical Activity in Adolescent Females from Lower Socioeconomic Status Households*. I understand that *Gwen's Girls* involvement to be *the recruitment and assessment of participants to be on site and a private location will be provided for the conduction of these assessments*.

As the research team conducts this research project I understand and agree that:

- This research will be carried out following sound ethical principles and that it has been approved by the IRB at the University of Pittsburgh.
- I have read and understand the protocol and agree to allow the conduction of recruitment and assessments on-site at the *Gwen's Girls*.
- To the extent confidentiality may be protected under State or Federal law, the data collected will remain confidential, as described in the protocol. The name of our agency or institution will *not be* reported in the results of the study.

Therefore, as a representative of *Gwen's Girls*, I agree that *Kristie Rupp's* research study may be conducted at our agency/institution.

Sincerely,



*Kathi Elliott, DNP, MSW, CRNP*  
Executive Director *Gwen's Girls*

### Letter of Agreement

June 27, 2016

To the University of Pittsburgh Institutional Review Board (IRB):

I am familiar with **Kristie Rupp's** research study entitled *Household Support and Physical Activity in Adolescent Females from Lower Socioeconomic Status Households*. I understand that *Braddock Youth Project* involvement to be *the recruitment and assessment of participants to be on site and a private location will be provided for the conduction of these assessments*.

As the research team conducts this research project I understand and agree that:

- This research will be carried out following sound ethical principles and that it has been approved by the IRB at the University of Pittsburgh.
- I have read and understand the protocol and agree to allow the conduction of recruitment and assessments on-site at the *Braddock Youth Project*.
- To the extent confidentiality may be protected under State or Federal law, the data collected will remain confidential, as described in the protocol. The name of our agency or institution will *not be* reported in the results of the study.

Therefore, as a representative of *Braddock Youth Project*, I agree that *Kristie Rupp's* research study may be conducted at our agency/institution.

Sincerely,



*Jessica Gumbert*  
Program Coordinator  
Braddock Youth Project

**Figure 10. Community Site Agreements**

## APPENDIX F

### CONTACT TRACKING FORM

#### RECRUITMENT FORM:

1. *“Thank you for calling to find out more about our research study. My name is \_\_\_\_\_ and I would like to briefly tell you about this research study.”*
2. **Procedure for Describing the Study and Obtaining Verbal Consent to Conduct the Phone Screen:** A description of the study will be read to participants, and this description includes important components of the informed consent process (see script below). Individuals who express an interest in participating in this study will be told the following to obtain verbal consent:
  - **Investigators Component of Informed Consent:** *“This study is being conducted by myself, Kristie Rupp, and Dr. John Jakicic from the University of Pittsburgh.”*
  - **Description Component of Informed Consent:** *“The purpose of this research study is to understand physical activity in adolescent girls. Specifically, we are interested the relationship between support for physical activity and physical activity behaviors. We are trying to recruit 75 adolescent girls ranging from 13-17 years old. As part of our study, we will be asking you/ your daughter to complete two questionnaires about physical activity and other things related with physical activity, as well as taking height and weight. This study asks you to come for one visit to the University of Pittsburgh Physical Activity and Weight Management Research Center that should last no longer than 60 minutes and there will be a \$15 compensation for participating. All of the information we collect will be coded with an ID number and any identifying information will be kept in a separate locked location away from the collected study data.”*

*“Before beginning this study, we need to see if you/ your daughter are eligible to participate. So, now I will ask you a few questions about your demographic background and questions about you/ your daughter’s physical health and medical history to see if you are eligible to participate in this study. These questions should take no more than 5 minutes. If you are eligible, I will ask you for your name,*

*address, e-mail address or telephone number so that we can contact you to schedule your study visit to the University of Pittsburgh.”*

- **Confidentiality Component of Informed Consent:** *“If your answer to a particular question tells me clearly that you will not be eligible for this study, I will stop the interview, and not ask you any more personal questions.*
- **Right to Participate or Withdraw from Participation Component of Informed Consent:** *“Your responses to these questions are confidential, and the information related to you/your daughter’s health history that you are about to give me will be destroyed after this interview even if you/your daughter? are found to be eligible.*  
*“Do you have any questions related to any of the information I have provided to you?”*

Staff member will answer any questions or will defer these questions to the Principal Investigator or Co-Investigator when appropriate prior to proceeding. If the individual would like to think about their participation prior to proceeding with the phone screen, they will be provided with the telephone number that they can call if they decide to participate in the future.

- **Voluntary Consent Component of Informed Consent:** *“Does this all sound ok to you? May I proceed to ask you questions to determine if you/ your daughter may be eligible to participate in this study?”*

If the caller response is a “YES,” indicate the participant’s agreement with this statement on the top of the next page, sign your name and date the form, and then complete the phone screen.

If the caller response is “NO,” thank the individual for calling and DO NOT complete the phone screen.

**PHONE SCREENING CONSENT:**

The caller gives verbal permission to conduct the Phone Screening:  
\_\_\_\_\_YES \_\_\_\_\_NO

Verbal Assent was given to:

\_\_\_\_\_  
Staff Member Signature

\_\_\_\_\_  
Date Verbal Assent was given

1. “What is your/your child’s gender?”  Male  Female  
(Must be female)
  
2. “How old are you/ your daughter?” \_\_\_\_\_  
(Must be between 13-17 years old)
  
3. “What is your/ your daughter’s date of birth?”: \_\_\_\_\_/\_\_\_\_\_/\_\_\_\_\_
  
4. “Do you/your daughter have any conditions that may prevent participation in physical activity?”  
 Yes  No  
(Ineligible)
  
5. “Are you/ your daughter currently pregnant?”  
 Yes  No  
(Ineligible)
  
6. “Do you/ your daughter have any children?”  
 Yes  No  
(Ineligible)
  
7. “Are you/ your daughter currently participating or have participated in any other research study in the past 12 months?”  
 Yes  No Specify: \_\_\_\_\_  
(Ineligible if study would affect physical activity patterns)

If the caller/their daughter is deemed ELIGIBLE, continue to collect contact information and schedule appointment date/ time.

*“Okay, based on your answers to these questions it looks like you’re / your daughter is eligible to participate in the study. Now I would like to get a little more information from you and schedule your visit with us..”*

Appointment date: \_\_\_\_\_/\_\_\_\_\_/\_\_\_\_\_

Appointment time: \_\_\_\_\_

*“We will send you a packet containing the appointment confirmation, directions to our facility, and informed consent document that must be signed by your parent or guardian and brought with you to your appointment.”*

#### CONTACT INFORMATION

First Name: \_\_\_\_\_

Phone Number: \_\_\_\_\_

Address: \_\_\_\_\_

City: \_\_\_\_\_ State: \_\_\_\_\_ Zip: \_\_\_\_\_

Email: \_\_\_\_\_



## APPENDIX G

### APPOINTMENT CONFIRMATION LETTER

Dear \_\_\_\_\_,

You have scheduled your visit with us for the *Pittsburgh Girls on the Move!* Research Study on \_\_\_\_\_ at \_\_\_\_\_.

This visit will take place at the:

Physical Activity and Weight Management Research Center

32 Oak Hill Court

Pittsburgh, PA 15261

On the day of your appointment, please bring with you the informed consent document found in this mailing **signed** by your parent or bring your parent with you on the day of your appointment to sign the informed consent in-person.

You will be paid for participating in this study by a debit card that you can use to withdraw your payment. In order to load the card for the full \$15, your social security number will be asked for and **ONLY** used for tax purposes. Once your card is loaded, your social security number will be

blacked out and whited out. If you choose not to provide your social security number an automatic tax fee of 28% will be deducted from your payment. This would reduce payment to \$10.80. If you have any further questions do not hesitate to contact Kristie at (412) 383-4037.

Thank you and we look forward to seeing you!

Sincerely,

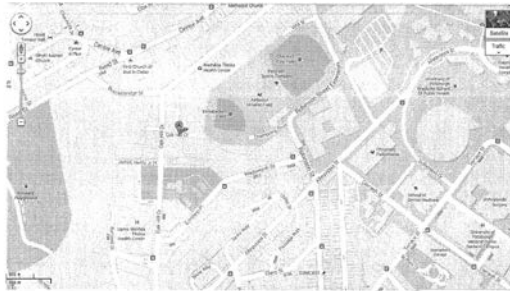
Kristie

## APPENDIX H

### MAP TO RESEARCH FACILITY

Directions to the Physical Activity and Weight Management Research Center  
Oak Hill Commons  
32 Oak Hill Court  
Pittsburgh, PA 15213 (mailing zip code 15261)  
412-383-4020

*NOTE: Because this is a new building this address may not show up when using your GPS.  
Thus, we recommend that you use the directions and map below.*



#### **From the North**

- Take 279 South
- Take exit 2A to merge onto I-579 S/Veterans Bridge toward Veterans Bridge
- Continue to follow I-579 S
- Take the exit toward Parkway East (376)/Oakland/Monroeville
- Merge onto Boulevard of the Allies
- Exit onto Forbes Avenue
- Turn left onto Craft Avenue
- Turn left onto Fifth Avenue
- Take the first right onto Robinson Street
- Go past the 2<sup>nd</sup> stop sign at the top of the hill and turn left onto Wadsworth Street
- At the first stop sign, Oak Hill Drive, make a right
- Go to the 1<sup>st</sup> Stop Sign.
- Our building is just past this stop sign on the right, and the entrance to the parking lot is approximately 100 ft past the stop sign on the right.

**Figure 11. Map to Physical Activity and Weight Management Research Center**

## APPENDIX I

### INFORMED CONSENT



University of Pittsburgh

*School of Education*  
*Physical Activity and Weight Management Research Center*

Oak Hill Commons  
32 Oak Hill Court  
Pittsburgh, PA 15213  
412-383-4020  
Fax: 412-383-4045

### INFORMED CONSENT TO PARTICIPATE IN A RESEARCH STUDY

**TITLE:** Understanding Physical Activity in Adolescent Females

**PRINCIPAL INVESTIGATOR:** Kristie Rupp, MS  
Physical Activity and Weight Management Research Center  
Department of Health and Physical Activity  
University of Pittsburgh  
32 Oak Hill Court  
Pittsburgh, PA 15261  
Telephone: 412-383-4037

**CO-INVESTIGATORS:**

John M. Jakicic, Ph.D.  
Chair and Professor  
Department of Health and Physical Activity  
University of Pittsburgh

Tiffany Gary-Webb, Ph.D., MHS  
Associate Professor  
Departments of Behavioral and Community  
Health Sciences and Epidemiology  
Graduate School of Public Health  
University of Pittsburgh

Sharon Taverno Ross, Ph.D.  
Assistant Professor  
Department of Health and Physical Activity  
University of Pittsburgh

Thomas Akiva, Ph.D.  
Assistant Professor  
Applied Developmental Psychology  
Department of Psychology in Education  
University of Pittsburgh

***Why is this research being done?***

The purpose of this study is to understand physical activity behaviors and context in adolescent females ages 13-17. If your daughter agrees to participate with your consent, your child will be asked to answer a questionnaire about physical activity, her home, and neighborhood environment. Questions will be asked about the number of adults in the household, the age of adults in the household, gender, and the relationship of adults in the household to your daughter. However, no names for these persons will be requested. The only other measure we will be taking is height and weight.

***Who is being asked to participate in this study?***

Your daughter is being invited to take part in this research study because she is between the ages of 13-17 years old.

***What procedures will be performed for research purposes?***

If your daughter agrees to participate with your consent to take part in this research study, she will undergo the following procedures in the Department of Health and Physical Activity at the University of Pittsburgh.

Questionnaires (25-55 minutes):

Your daughter will be asked to complete questionnaires about her physical activity, home, and neighborhood as well as other basic demographic information. These questionnaires will take approximately 25-55 minutes to complete.

Body Weight and Height (5 minutes)

We will measure your daughter's body height and weight using a medical scale and wall-mounted stadiometer (similar to a ruler mounted against a wall used to measure height). For this procedure, she will remove her shoes and be in light clothing. This is similar to what she has done at the doctor's office or at school.

***What are the possible risks, side effects, and discomforts of this research study?***

There is **little risk** involved in this study for your daughter. No invasive procedures or medications are involved for your child. **The major potential risk is a breach of confidentiality**, but we will do everything possible to protect your child's privacy. To reduce the likelihood of a breach of confidentiality, all researchers have been thoroughly trained to maintain your privacy. It is also possible that your daughter will experience embarrassment from answering one or more questions on the surveys, or from measurements of height and weight. However, she will be told she can skip any of the questions that make her uncomfortable and height and weight will be collected in private. Other non-physical risks for your child include boredom, frustration, stress, and time constraints when completing the questionnaires.

***What are the possible costs from taking part in this study?*** There is no cost to you for participating in this research study.

***What are the possible benefits from taking part in this study?*** Your child will likely receive no direct benefit from taking part in this study.

***Will I be paid if I take part in this study?***

For completing the study, your daughter will be compensated for her time with a \$15 WePay Debit Card. This will be a paid on a debit card provided to you. If your daughter is found ineligible during the data collection or the data is incomplete, she may not receive compensation.

***Confidentiality:***

**All records** pertaining to your child's involvement in this study are kept **strictly confidential** and any data that includes your child's identity will be stored in locked files, and will be retained by us for a minimum of seven years after the final reporting or publication of a project. The database will be kept on a server that is password protected. Your child's identity will not be revealed in any description or publications of this research that may result. It is possible that authorized representatives from the University of Pittsburgh Research Conduct and Compliance Office (including the University of Pittsburgh Institutional Review Board) may review your data for the purpose of monitoring the conduct of this study.

In unusual cases, the investigators may be required to release identifiable information related to your child's participation in this research study in response to an order from a court of law. If the investigators learn that your child, or someone with whom you are involved is in serious danger or potential harm, they will need to inform, as required by Pennsylvania law, the appropriate agencies.

Only the researchers listed on the first page of this form and their staff will have access to your child's research records. However, other scientists may request data obtained by this study. We will allow data to be released to qualified researchers only after ensuring that your child's name and other identifying information is not given to these researchers. Your child will not be identified by name in any publication of research.

**Participation in this study is completely voluntary.** You may stop your child's participation at any time, even after signing this form, or your child may refuse to take part in the study. To formally withdraw you and your child's consent for participation in this research study you, as the parent, should provide the notice of this decision to the principal investigator listed on the first page of this form in one of the following ways: 1) provide a written and dated notice of this decision, or 2) send an email of this decision, or 3) contact the investigator by telephone to inform her of this decision. This written letter, email, or record of this telephone notice to withdraw you and your child's consent from the study will be retained by the investigator. Should you or your child decide to withdraw from the study, any data that has been collected will be retained for a minimum seven years as per University of Pittsburgh policy and will continue to be used by the researchers.

---

**VOLUNTARY CONSENT/ PARENTAL CERTIFICATION**

The above information has been explained to me and my child, and all of my current questions have been answered. I understand that I am encouraged to ask questions about any aspect of this research study during the course of this study, and that such future questions will be answered by a qualified individual or by the investigator(s) listed on the first page of this consent document at the telephone number(s) given. I understand that I may always request that my questions, concerns, or complaints be addressed by a listed investigator.

I understand that I may contact the Human Subjects Protection Advocate of the IRB Office, University of Pittsburgh (1-866-212-2668) to discuss problems, concerns, and questions; obtain information; offer input; or discuss situations in the event that the research team is unavailable. **By signing this form, I agree for my child to participate in this research study. A copy of this consent form will be given to me/my child.**

\_\_\_\_\_ Printed Name of Child-Participant

“I understand that, as a minor (age less than 18 years), the above-named child is not permitted to participate in this research study without my consent. Therefore, by signing this form, I give my consent for her participation in this research study.”

\_\_\_\_\_ Parent's or Legal Guardian's Name (Print)

\_\_\_\_\_ Relationship to Child-Participant

\_\_\_\_\_ Parent or Legal Guardian's Signature

\_\_\_\_\_ Date

**CERTIFICATION OF INFORMED CONSENT**

I certify that I have explained the nature and purpose of this research study to the above-named individual(s), and I have discussed the potential benefits and possible risks of study participation. Any questions the individual(s) have about this study have been answered, and we will always be available to address future questions as they arise. I further certify that no research component of this protocol was begun until after this consent form was signed.

\_\_\_\_\_  
Printed Name of Person Obtaining Consent

\_\_\_\_\_  
Role in Research Study

\_\_\_\_\_  
Signature of Person Obtaining Consent

\_\_\_\_\_  
Date



## APPENDIX J

### ADOLESCENT ASSENT



University of Pittsburgh

*School of Education*  
*Physical Activity and Weight Management Research Center*

Oak Hill Commons  
32 Oak Hill Court  
Pittsburgh, PA 15213  
412-383-4020  
Fax: 412-383-4045

### ADOLESCENT ASSENT TO PARTICIPATE IN A RESEARCH STUDY

TITLE: Understanding Physical Activity in Adolescent Females

#### PRINCIPAL INVESTIGATOR:

Kristie Rupp, MS  
Physical Activity and Weight  
Management Research Center  
Department of Health and Physical Activity  
University of Pittsburgh  
32 Oak Hill Court  
Pittsburgh, PA 15261  
Telephone: 412-383-4037

#### CO-INVESTIGATORS:

John M. Jakicic, Ph.D.  
Chair and Professor  
Department of Health and Physical Activity  
University of Pittsburgh

Sharon Taverno Ross, Ph.D.  
Assistant Professor  
Department of Health and Physical Activity  
University of Pittsburgh

Tiffany Gary-Webb, Ph.D., MHS  
Associate Professor  
Departments of Behavioral and Community  
Health Sciences and Epidemiology  
Graduate School of Public Health  
University of Pittsburgh

Thomas Akiva, Ph.D.  
Assistant Professor  
Applied Developmental Psychology  
Department of Psychology in Education  
University of Pittsburgh

You are being asked to participate in a research study that is looking at physical activity in 13-17 year old girls. We are going to tell you more about what you will do if you agree to participate in the study. Please stop me and ask any questions that you may have before you agree to participate in the study.

The purpose of this study is to learn more about the factors associated with participation in physical activity in girls your age. If you agree to participate in this study, you will be asked to come in for one visit to the Physical Activity and Weight Management Research Center that will take approximately 30-60 minutes. During your visit we will take your height and weight when you arrive and then ask you to complete two questionnaires that ask you about your physical activity. You will receive a \$15 WePay Debit Card at the end of your visit.

You may experience embarrassment from answering some of questions on the surveys, or from measurements of height and weight. You are allowed to skip over questions you do not want to answer or stop participating at any time during your visit.

There is no direct benefit to you for being in this study. However, results from this study will help us understand more about physical activity in girls your age, which will help us to develop future programs to increase physical activity.

The records of this study will be kept strictly confidential. Research records will be kept in a locked file, and all electronic information will be given a special code and kept in a password protected file. We will not include any information in any report we may publish that would make it possible to identify you.

Although your parent provided permission, the decision to participate in this study is entirely up to you. You may refuse to take part in the study *at any time* without affecting your relationship with the investigators of this study or the University of Pittsburgh.

You have the right to ask questions about this research study and to have those questions answered by me before, during, or after the study. If you have any more questions about the study, you can contact me, Kristie Rupp, at KLR70@pitt.edu or by telephone at 412-383-4037. If you have any other concerns about your rights as a research participant that have not been answered by me today, you can call the Human Subject Protection Advocate of the IRB Office, University of Pittsburgh (866-212-2668).

**CHILD ASSENT**

This research has been explained to me, and I agree to participate.

\_\_\_\_\_  
Signature of Child-Subject

\_\_\_\_\_  
Date

\_\_\_\_\_  
Printed Name of Child-Subject

I have explained this research to the adolescent subject in appropriate language and I believe she understands what this research involves.

\_\_\_\_\_  
Signature of Person Explaining the Research

\_\_\_\_\_  
Date

## APPENDIX K

### DATA RECORDING FORM

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**Girls on the Move! Study****Physical Assessment Form**

Participant ID: \_\_\_\_\_

Date of Evaluation: \_\_\_\_/\_\_\_\_/\_\_\_\_

---

**PARTICIPANT VISIT CHECKLIST**

The participant needs to provide the following information/documentation prior to beginning their assessment session today.

- |                                                 |                |
|-------------------------------------------------|----------------|
| <input type="checkbox"/> Informed Consent       | Initial: _____ |
| <input type="checkbox"/> Contact Screening Form | Initial: _____ |

The assessments must be completed in the following order. Under no circumstances is this protocol to be altered unless approved by the Principal Investigator for this participant.

- |                                                              |                |
|--------------------------------------------------------------|----------------|
| <input type="checkbox"/> Greet Participant                   | Initial: _____ |
| <input type="checkbox"/> Participant Assent                  | Initial: _____ |
| <input type="checkbox"/> Height                              | Initial: _____ |
| <input type="checkbox"/> Weight                              | Initial: _____ |
| <input type="checkbox"/> Questionnaires                      |                |
| <input type="checkbox"/> 3DPAR                               | Initial: _____ |
| <input type="checkbox"/> Household Physical Activity Support | Initial: _____ |
| <input type="checkbox"/> Questionnaire Checks:               |                |
| <input type="checkbox"/> First Check at Assessment Visit     | Initial: _____ |
| <input type="checkbox"/> Second Check after Assessment Visit | Initial: _____ |

---

**Girls on the Move! Study**

Physical Assessment Form

Participant ID: \_\_\_\_\_

Date of Evaluation: \_\_\_\_ / \_\_\_\_ / \_\_\_\_

---

**SECTION I: HEIGHT ASSESSMENT**

Body Height: measured to the nearest 0.1 cm

| 1 <sup>st</sup> Measurement | 2 <sup>nd</sup> Measurement | 3 <sup>rd</sup> Measurement |
|-----------------------------|-----------------------------|-----------------------------|
|                             |                             |                             |

\*If the 1<sup>st</sup> and 2<sup>nd</sup> measurements differ by > 0.5 cm, then a 3<sup>rd</sup> measurement is to be taken.

**SECTION II: WEIGHT ASSESSMENT**

Body Weight: measured to the nearest 0.1 kg

| 1 <sup>st</sup> Measurement | 2 <sup>nd</sup> Measurement | 3 <sup>rd</sup> Measurement |
|-----------------------------|-----------------------------|-----------------------------|
|                             |                             |                             |

\*If the 1<sup>st</sup> and 2<sup>nd</sup> measurements differ by .0.2 kg, then a 3<sup>rd</sup> measurement is to be taken.

**SECTION III: BMI Percentile**

|           |  |
|-----------|--|
| Birthdate |  |
| Age       |  |

BMI: calculated as  $\text{kg}/\text{m}^2$

|                                |  |
|--------------------------------|--|
| BMI ( $\text{kg}/\text{m}^2$ ) |  |
| BMI Percentile                 |  |

\*BMI calculated as the mean of weight measurements divided by the mean of height measurements squared.

**Figure 12. Girls on the Move! Assessment Form**

## APPENDIX L

### 3 DAY PHYSICAL ACTIVITY RECALL

#### Activities Scale

This purpose of this questionnaire is to estimate the amount of physical activity that you perform. The name of each day (Tuesday, Monday, and Sunday) that you will describe is located in the top right hand corner of each time sheet.

1. For each time period, write in the activity number that corresponds to the main activity you actually performed during that particular time period.
2. Then rate how physically hard each activity was. Place a "✓" in the timetable to indicate one of the following intensity levels for each activity.

• **Light** - Slow breathing, little or no movement.



• **Moderate** - Normal breathing and some movement.



• **Hard** - Increased breathing and moderate movement.



• **Very Hard** - Hard breathing and quick movement.



## Activity Numbers

### **Eating**

- 1.) Eating a meal
- 2.) Snacking

### **Work**

- 3.) Working (e.g., part-time job, child care)  
(list)
- 4.) Doing house chores (e.g., vacuuming, dusting, washing dishes, animal care, etc.)
- 5.) Yard Work (e.g., mowing, raking)

### **After School/Spare Time/ Hobbies**

- 6.) Church
- 7.) Hanging around
- 8.) Homework
- 9.) Listening to music
- 10.) Marching band/flag line/drill team
- 11.) Music lesson/playing instrument
- 12.) Playing video games/surfing Internet
- 13.) Reading
- 14.) Shopping
- 15.) Talking on phone
- 16.) Watching TV or movie

### **Transportation**

- 17.) Riding in a car/bus
- 18.) Travel by walking
- 19.) Travel by bicycling

### **Sleep/Bathing**

- 20.) Getting dressed
- 21.) Getting ready (hair, make-up, etc.)
- 22.) Showering/bathing
- 23.) Sleeping

### **School**

- 24.) Club, student activity
- 25.) Lunch/free time/study hall
- 26.) P. E. Class
- 27.) ROTC
- 28.) Sitting in class

### **Physical Activities and Sports**

- 29.) Aerobics/aerobic dancing
- 30.) Basketball
- 31.) Bicycling
- 32.) Bowling
- 33.) Calisthenics(i.e., jumping jacks, sit-ups)
- 34.) Cheerleading
- 35.) Dancing (social, recreational)
- 36.) Dancing (ballet, jazz, modern, tap)
- 37.) Field hockey
- 38.) Frisbee
- 39.) Golf
- 40.) Horseback riding
- 41.) Ice/roller skating
- 42.) Jogging/running
- 43.) Karate/judo/martial arts/ self-defense
- 44.) Rollerblading
- 45.) Skateboarding
- 46.) Soccer
- 47.) Softball/baseball
- 48.) Stationary exercise machines (e.g., cycle, ski machine, stair climber, treadmill)
- 49.) Street hockey
- 50.) Swimming, water exercise
- 51.) Tennis
- 52.) Volleyball
- 53.) Walking (briskly)
- 54.) Weight/circuit training
- 55.) Gymnastics/tumbling
- 56.) Kickboxing/Tae Bo
- 57.) Track and field
- 58.) Trampoline
- 59.) Other \_\_\_\_\_

### **Sample activity time sheet:**

The table below shows the correct way to fill out the activity time sheets.  
Note that only **one** intensity level is checked for each activity.


|                    | <b>Activity Number</b> | <b>Light</b> | <b>Moderate</b> | <b>Hard</b> | <b>Very Hard</b> |
|--------------------|------------------------|--------------|-----------------|-------------|------------------|
| <b>7:00-7:30</b>   | 22                     | ✓            |                 |             |                  |
| <b>7:30-8:00</b>   | 21                     | ✓            |                 |             |                  |
| <b>8:00-8:30</b>   | 18                     |              | ✓               |             |                  |
| <b>8:30-9:00</b>   | 28                     | ✓            |                 |             |                  |
| <b>9:00-9:30</b>   | 28                     | ✓            |                 |             |                  |
| <b>9:30-10:00</b>  | 26                     |              |                 | ✓           |                  |
| <b>10:00-10:30</b> | 26                     |              |                 | ✓           |                  |

**Activity Numbers**

**YESTERDAY**

Put a "1" to rate the intensity of each activity.

Write activity numbers in this column.



|               | Activity Number | Light | Moderate | Hard | Very Hard |
|---------------|-----------------|-------|----------|------|-----------|
| before school | 7:00-7:30       |       |          |      |           |
|               | 7:30-8:00       |       |          |      |           |
| during school | 8:00-8:30       |       |          |      |           |
|               | 8:30-9:00       |       |          |      |           |
|               | 9:00-9:30       |       |          |      |           |
|               | 9:30-10:00      |       |          |      |           |
|               | 10:00-10:30     |       |          |      |           |
|               | 10:30-11:00     |       |          |      |           |
| lunch time    | 11:00-11:30     |       |          |      |           |
|               | 11:30-12:00     |       |          |      |           |
|               | 12:00-12:30     |       |          |      |           |
|               | 12:30-1:00      |       |          |      |           |
|               | 1:00-1:30       |       |          |      |           |
|               | 1:30-2:00       |       |          |      |           |
| after school  | 2:00-2:30       |       |          |      |           |
|               | 2:30-3:00       |       |          |      |           |
|               | 3:00-3:30       |       |          |      |           |
|               | 3:30-4:00       |       |          |      |           |
|               | 4:00-4:30       |       |          |      |           |
|               | 4:30-5:00       |       |          |      |           |
| supper time   | 5:00-5:30       |       |          |      |           |
|               | 5:30-6:00       |       |          |      |           |
|               | 6:00-6:30       |       |          |      |           |
|               | 6:30-7:00       |       |          |      |           |
|               | 7:00-7:30       |       |          |      |           |
|               | 7:30-8:00       |       |          |      |           |
|               | 8:00-8:30       |       |          |      |           |
|               | 8:30-9:00       |       |          |      |           |
| 9:00-9:30     |                 |       |          |      |           |
| 9:30-10:00    |                 |       |          |      |           |
| 10:00-10:30   |                 |       |          |      |           |
| 10:30-11:00   |                 |       |          |      |           |
| 11:00-11:30   |                 |       |          |      |           |

Figure 13. 3DPAR

Administrator Script for 3-Day Physical Activity Recall



Hi, I'm \_\_\_\_\_ . We would like to give you this questionnaire that will tell us about the activity you've done for the past three days.

**[Hand out surveys and make sure every student has survey and pen/pencil.]**

On the first page you'll see several pictures of commonly performed activities categorized by intensity level:

**Light Activities**- require little or no movement with slow breathing **Moderate Activities**- require some movement and normal breathing **Hard activities**- require a moderate amount of movement and increased breathing

**Very Hard Activities**- require quick movements and hard breathing.

If you turn the page, you'll see a bunch of activities listed, each with it's own number. You're going to use these numbers to identify the activities that you did. So, if you ate a meal, you're going to use the number "one" to identify that activity. Before we get started, I want to point out a few things. Please notice that walking is listed twice <sup>28</sup> and <sup>#53</sup> because it can be done for different reasons; transportation or exercise. Also note that if you performed a physical activity or sport that is not listed, you may choose #55 (Other) and write in the activity that you did. Remember, we're only talking about PHYSICAL activity. Some people say they "slept hard last night" or they had "hard homework". While you may be thinking hard while doing your homework, it would not be considered hard *physical* activity because you're not moving and breathing harder.

At the bottom of this page there's a small example of how we would like you to use this list of activities. Each row represents a 1/2 hour, starting from 7 a.m. and going all the way to midnight. In the first column, labeled 'Activity Number' you're going to write down the number of the main activity you did for that 1/2 hour block of time. Only **one** activity number can be entered into each block. Once you've written down that number, put an 'x' in **only one** intensity box that **best** describes the intensity of this activity. Remember the definitions of light, moderate, hard, and very hard. If you need to, check the first page or ask if you're not sure how the activity should be rated.

So, going through this example at the bottom, we see that this person took a shower from 7:00 'til 7:30 so they wrote #22 in the first time block. They classified this activity as light by putting a check in the 'light' column. From 7:30 to 8:00, this person did activity #21 which is getting ready (combing hair, doing make-up). They indicated that this activity was done at a light intensity. Does anyone have a question about filling out the time blocks?

O.K. think about your activities starting with yesterday. Think about what you were doing between 7:00 and 7:30 that morning. Were you still sleeping, getting ready for school or doing something else? Find the number in the list that corresponds to that activity and put that number in the first box. Now, mark the box that applies to the intensity level of that activity. Now think about what you did for the next half-hour, from 7:30-8:00. Write down the activity number and check the appropriate intensity box. Please be as **honest** and **accurate** as you can. If you have

**any** questions, please **do not hesitate to ask**. Fill out the rest of the sheet for yesterday and then do the same thing for the day before yesterday and the day before that.

**[Walk around the room to see how the students are doing and provide cues.] [Wait about 10 minutes]**

If you're done with yesterday, turn the page and do the same thing for the day before. Now think about what you did (day before yesterday) morning from 7:00-7:30. Fill out this sheet for (day before yesterday) the same way you did for yesterday.

**[Walk around the room to see how the students are doing and provide cues.] [Wait about 10 minutes]**

O.K., once you're done with (day before yesterday), you're going to do the same thing for (three days ago). Think about what you did (three days ago) morning from 7:00-7:30. Go ahead and fill out the rest of this sheet for (three days ago) and then put your pencil down and wait once you are done.

**[Walk around the room to see how the students are doing and provide cues.]**

All right, you're all done! Thank you for your cooperation and effort filling out this questionnaire!

**[Check each 3DPAR as they are turned in]**

### 3DPAR Methodology and Scoring

The 3-Day Physical Activity Recall (3DPAR) is a self-report instrument, based on the Previous Day Physical Activity Recall (PDPAR),<sup>1</sup> that is designed to capture the habitual physical activity of adolescents. The instrument uses a time-based recall approach over a three-day period and can be completed during a single 30- to 45-minute session, making it ideal for school-based data collection. The 3DPAR has been validated against accelerometry.<sup>2</sup>

The 3DPAR asks participants to recall their physical activity behavior on each of the previous 3 days, beginning with the most recent day. Each day is divided into 34 blocks of time (30 minutes per block) between 7:00 AM and midnight, which are grouped into broader time periods (e.g., before school, during school, evening). Participants record their predominant activity (chosen from a list of activities) and the intensity of that activity for each 30-minute block. (The version of the 3DPAR that was used in the Lifestyle Education for Activity (LEAP)<sup>3</sup> study, which included 59 activities, can be downloaded from the Children's Physical Activity Research Group (CPARG) website.)

Beginning with the most recent day, a participant enters the main activity in which he/she participated during each 30-minute block. The main activity is defined as the activity that occupied the majority of the 30-minute period. Participants also rate the relative intensity of the activity as light, moderate, hard, or very hard. To help them select the correct intensity level, the instrument provides pictorial representations of the four intensity levels. For example, light activity is depicted by a person sitting down, while very hard is depicted by a person running. In the LEAP study, participants always completed the 3DPAR on a Wednesday, recalling activities from the preceding Tuesday, Monday, and Sunday. This schedule ensured that both weekday and weekend activities were included. However, other studies have administered the 3DPAR on other days of the week. An example of a section of the participant form is shown in Table 1.

After participants complete the instrument, staff members assign a metabolic equivalent (MET) value to each 30-minute block, based on the activity and intensity level. The MET levels<sup>4</sup> used in the Trial of Activity for Adolescent Girls (TAAG) study are shown in Table 2.<sup>5</sup>

Data from the 3DPAR can be analyzed in a number of ways:

- Daily number of 30-minute blocks in which the main activity was rated at 3 METs or greater, a measure of moderate-to-vigorous physical activity (MVPA), averaged over the 3 days.
- Daily number of 30-minute blocks in which the main activity was rated as 6 METs or greater, a measure of vigorous physical activity (VPA), averaged over the 3 days.
- Total METs per day, calculated by adding the MET values for each 30-minute time block and averaging them over the three days.

Children may meet a physical activity standard if they report a daily average of 2 or more 30-minute blocks of MVPA (consistent with the 60-minute per day recommendation)<sup>7,8</sup> and/or 1 or more 30-minute blocks of VPA (consistent with the *Healthy People 2010* goal of 22.720).

The 3DPAR has been adapted for use in other studies. For example, activities often reported by boys were added in one study.<sup>6</sup> TAAG administered the 3DPAR on any weekday and added activities that are commonly done in the northern states.

**Table 1**Example of a portion of one day of the TAAG 3DPAR instrument<sup>5</sup>:

|             | Activity Number | Light | Moderate | Hard | Very Hard |
|-------------|-----------------|-------|----------|------|-----------|
| 7:00-7:30   | 15              | ☐     |          |      |           |
| 7:30-8:00   | 14              | ☐     |          |      |           |
| 8:00-8:30   | 23              |       | ☐        |      |           |
| 8:30-9:00   | 18              | ☐     |          |      |           |
| 9:00-9:30   | 18              | ☐     |          |      |           |
| 9:30-10:00  | 21              |       |          | ☐    |           |
| 10:00-10:30 | 21              |       |          | ☐    |           |

#15 is Showering/bathing , and was checked as a light activity. It was assigned a MET value of 2.5 (Table 2).

#14 is Getting ready (hair, make-up, etc) and was checked as a light activity. It was assigned a MET value of 2.5.

#23 is Travel by walking and was checked as a moderate activity. It was assigned a MET value of 4.0.

#18 is Sitting in class and was checked as a light activity. It was assigned a MET value of 1.5.

#21 is P.E. class and was checked as a hard activity. It was assigned a MET value of 7.5.

In the time period shown, between 7:00 am and 10:30 am:

3 30-minute blocks would be classified as moderate-to-vigorous physical activity

2 30-minute blocks would be classified as vigorous physical activity.

To calculate the total MET score value, add the MET value for each 30-minute block. For the time period between 7:00 am and 10:30 the total MET score would be: 2.5 + 2.5 + 4.0 + 1.5 + 1.5 + 7.5 + 7.5 = 27.0.

**Table 2**MET values used in TAAG<sup>6</sup>

| Activity                           | Intensity weighted MET levels |          |      |           |
|------------------------------------|-------------------------------|----------|------|-----------|
|                                    | Light                         | Moderate | Hard | Very Hard |
| 1. Eating a meal                   | 1.5                           | 1.5      | 1.5  | 1.5       |
| 2. Snacking                        | 1.5                           | 1.5      | 1.5  | 1.5       |
| 3. Church                          | 1.5                           | 3.0      | 3.0  | 3.0       |
| 4. Hanging around                  | 1.5                           | 1.5      | 1.5  | 1.5       |
| 5. Homework                        | 1.5                           | 1.5      | 1.5  | 1.5       |
| 6. Listening to music              | 1.5                           | 1.5      | 1.5  | 1.5       |
| 7. Music lesson/playing instrument | 2.5                           | 2.5      | 2.5  | 2.5       |
| 8. Video games/surfing internet    | 1.5                           | 1.5      | 1.5  | 1.5       |
| 9. Reading                         | 1.5                           | 1.5      | 1.5  | 1.5       |
| 10. Shopping                       | 2.5                           | 3.0      | 3.0  | 3.0       |
| 11. Talking on phone               | 1.5                           | 1.5      | 1.5  | 1.5       |
| 12. Watching TV or movie           | 1.5                           | 1.5      | 1.5  | 1.5       |
| 13. Getting dressed                | 2.5                           | 2.5      | 2.5  | 2.5       |
| 14. Getting ready (hair, make-up)  | 2.5                           | 2.5      | 2.5  | 2.5       |

### 3DPAR Methodology and Scoring

The 3-Day Physical Activity Recall (3DPAR) is a self-report instrument, based on the Previous Day Physical Activity Recall (PDPAR),<sup>1</sup> that is designed to capture the habitual physical activity of adolescents. The instrument uses a time-based recall approach over a three-day period and can be completed during a single 30- to 45-minute session, making it ideal for school-based data collection. The 3DPAR has been validated against accelerometry.<sup>2</sup>

The 3DPAR asks participants to recall their physical activity behavior on each of the previous 3 days, beginning with the most recent day. Each day is divided into 34 blocks of time (30 minutes per block) between 7:00 AM and midnight, which are grouped into broader time periods (e.g., before school, during school, evening). Participants record their predominant activity (chosen from a list of activities) and the intensity of that activity for each 30-minute block. (The version of the 3DPAR that was used in the Lifestyle Education for Activity (LEAP)<sup>3</sup> study, which included 59 activities, can be downloaded from the Children's Physical Activity Research Group (CPARG) website.)

Beginning with the most recent day, a participant enters the main activity in which he/she participated during each 30-minute block. The main activity is defined as the activity that occupied the majority of the 30-minute period. Participants also rate the relative intensity of the activity as light, moderate, hard, or very hard. To help them select the correct intensity level, the instrument provides pictorial representations of the four intensity levels. For example, light activity is depicted by a person sitting down, while very hard is depicted by a person running. In the LEAP study, participants always completed the 3DPAR on a Wednesday, recalling activities from the preceding Tuesday, Monday, and Sunday. This schedule ensured that both weekday and weekend activities were included. However, other studies have administered the 3DPAR on other days of the week. An example of a section of the participant form is shown in Table 1.

After participants complete the instrument, staff members assign a metabolic equivalent (MET) value to each 30-minute block, based on the activity and intensity level. The MET levels<sup>4</sup> used in the Trial of Activity for Adolescent Girls (TAAG) study are shown in Table 2.<sup>5</sup>

Data from the 3DPAR can be analyzed in a number of ways:

- Daily number of 30-minute blocks in which the main activity was rated at 3 METs or greater, a measure of moderate-to-vigorous physical activity (MVPA), averaged over the 3 days.
- Daily number of 30-minute blocks in which the main activity was rated as 6 METs or greater, a measure of vigorous physical activity (VPA), averaged over the 3 days.
- Total METs per day, calculated by adding the MET values for each 30-minute time block and averaging them over the three days.

Children may meet a physical activity standard if they report a daily average of 2 or more 30-minute blocks of MVPA (consistent with the 60-minute per day recommendation)<sup>7,8</sup> and/or 1 or more 30-minute blocks of VPA (consistent with the *Healthy People 2010* goal of 22.720).

The 3DPAR has been adapted for use in other studies. For example, activities often reported by boys were added in one study.<sup>6</sup> TAAG administered the 3DPAR on any weekday and added activities that are commonly done in the northern states.

| Activity                                       | Intensity weighted MET levels |          |      |           |
|------------------------------------------------|-------------------------------|----------|------|-----------|
|                                                | Light                         | Moderate | Hard | Very Hard |
| 61. Swimming (laps)                            | 4.0                           | 4.0      | 8.0  | 10.0      |
| 62. Swimming (play, pool games)                | 4.0                           | 4.0      | 6.0  | 6.0       |
| 63. Tennis, racquetball, badminton, paddleball | 6.0                           | 6.0      | 7.0  | 8.0       |
| 64. Trampolining                               | 4.0                           | 4.0      | 5.0  | 5.0       |
| 65. Track & field                              | 4.0                           | 4.0      | 6.0  | 10.0      |
| 66. Volleyball                                 | 3.5                           | 5.0      | 6.0  | 8.0       |
| 67. Walking for exercise                       | 3.0                           | 4.0      | 5.0  | 5.0       |
| 68. Weightlifting                              | 3.0                           | 3.0      | 6.0  | 7.0       |
| 69. Wrestling                                  | 6.0                           | 6.0      | 6.0  | 6.0       |
| 70. Yoga, stretching                           | 2.5                           | 2.5      | 2.5  | 2.5       |

**APPENDIX M**

**HOUSEHOLD SUPPORT FOR PHYSICAL ACTIVITY QUESTIONNAIRE**

ID #: \_\_\_\_\_

Date: \_\_\_\_\_

**Questions about YOU:**

1. Date of birth: \_\_\_\_\_/\_\_\_\_\_/\_\_\_\_\_

2. Which race best describes you? (*Check all that apply*)

- White or Caucasian
- Black or African American
- American Indian/ Native American
- Native Hawaiian or other Pacific Islander
- Asian
- Other: \_\_\_\_\_

3. Are you of Hispanic or Latino origin?

- Yes
- No

4. What neighborhood do you live in? \_\_\_\_\_

5. Do you currently attend school?

- Yes
- No

6. If you answered yes to #5, what grade are you in? \_\_\_\_\_

**Please skip this question if the answer to #5 is no.**

7. Do you typically watch your siblings or other children in your home on a regular basis?

- Yes
- No
- Don't Know



8. If you answered yes to #7, approximately how many days and for how long do you watch your siblings or other children in the household? **Please skip this question if the answer to #5 is no.**

Days per week (0-7)\_\_\_\_\_

Hours per day (0-24)\_\_\_\_\_

9. Do you typically attend an after-school program during the week?

- Yes  
 No  
 Don't Know

10. If you answered yes to #9, approximately how many days per week and for how long do you attend the program?

**Please skip this question if the answer to #9 is no.**

Days per week (0-7)\_\_\_\_\_

Hours per day (0-24)\_\_\_\_\_

***Questions about YOUR HOME:***

1. How many adults (18 years or older) live with you in your home? \_\_\_\_\_

2. How many children (17 years or younger) live with you in your home?

\_\_\_\_\_

3. Think about the adult (18 or older) that you are closest to in your household. Please circle their gender and list their relationship to you:

Gender: Male      Female      Relationship: \_\_\_\_\_

Age: \_\_\_\_\_

4. Does he/she work outside of the home?

Yes       No       Don't Know

5. If you answered yes to #4, does he/she work full time or part-time?  
**Please skip this question if the answer to #4 is no.**

Full-time       Part-time       Don't Know

6. Is he/she typically home when you get home from school?

Yes       No       Don't Know

7. Is he/she typically home on the weekends?

Yes       No       Don't Know

**Questions about YOUR PHYSICAL ACTIVITY:**

**Note: Physical activity is any activity that you do for at least 10 minutes at a time that gets you breathing harder, sweating or your heart pumping faster.**

16. Please answer the following 5 questions about the **adult you are closest with**. Please circle your answers:

**During a typical week, how often...**

|                                                                                       | <u>Never</u> | <u>Once</u> | <u>Sometimes</u> | <u>Almost Daily</u> | <u>Daily</u> |
|---------------------------------------------------------------------------------------|--------------|-------------|------------------|---------------------|--------------|
| 1) Does he/she play sports or do physical activity with you?                          | 1            | 2           | 3                | 4                   | 5            |
| 2) Does he/she watch you participate in physical activity or play sports?             | 1            | 2           | 3                | 4                   | 5            |
| 3) Does he/she take you to a place where you can do physical activity or play sports? | 1            | 2           | 3                | 4                   | 5            |
| 4) Does he/she tell you that physical activity and sports are good for you?           | 1            | 2           | 3                | 4                   | 5            |
| 5) Does he/she encourage you to be physically active or play sports?                  | 1            | 2           | 3                | 4                   | 5            |

17. Think about **the other adults in your household**. Please fill out one sheet per additional adult in your household. Please circle their gender and list their relationship to you and answer the following questions below:

Gender:      Male          Female      Relationship: \_\_\_\_\_

Age: \_\_\_\_\_

**During a typical week, how often...**

|                                                                                       | Never | Once | Sometimes | Almost Daily | Daily |
|---------------------------------------------------------------------------------------|-------|------|-----------|--------------|-------|
| 1) Does he/she play sports or do physical activity with you?                          | 1     | 2    | 3         | 4            | 5     |
| 2) Does he/she watch you participate in physical activity or play sports?             | 1     | 2    | 3         | 4            | 5     |
| 3) Does he/she take you to a place where you can do physical activity or play sports? | 1     | 2    | 3         | 4            | 5     |
| 4) Does he/she tell you that physical activity and sports are good for you?           | 1     | 2    | 3         | 4            | 5     |
| 5) Does he/she encourage you to be physically active or play sports?                  | 1     | 2    | 3         | 4            | 5     |

Think about **the other adults in your household**. Please fill out one sheet per additional adult in your household. Please circle their gender and list their relationship to you and answer the following questions below:

Gender:    Male            Female    Relationship: \_\_\_\_\_

Age: \_\_\_\_\_

**During a typical week, how often...**

|                                                                                       | Never | Once | Sometimes | Almost Daily | Daily |
|---------------------------------------------------------------------------------------|-------|------|-----------|--------------|-------|
| 1) Does he/she play sports or do physical activity with you?                          | 1     | 2    | 3         | 4            | 5     |
| 2) Does he/she watch you participate in physical activity or play sports?             | 1     | 2    | 3         | 4            | 5     |
| 3) Does he/she take you to a place where you can do physical activity or play sports? | 1     | 2    | 3         | 4            | 5     |
| 4) Does he/she tell you that physical activity and sports are good for you?           | 1     | 2    | 3         | 4            | 5     |
| 5) Does he/she encourage you to be physically active or play sports?                  | 1     | 2    | 3         | 4            | 5     |

Think about **the other adults in your household**. Please fill out one sheet per additional adult in your household. Please circle their gender and list their relationship to you and answer the following questions below:

Gender:    Male            Female    Relationship: \_\_\_\_\_

Age: \_\_\_\_\_

**During a typical week, how often...**

|                                                                                       | <u>Never</u> | <u>Once</u> | <u>Sometimes</u> | <u>Almost Daily</u> | <u>Daily</u> |
|---------------------------------------------------------------------------------------|--------------|-------------|------------------|---------------------|--------------|
| 1) Does he/she play sports or do physical activity with you?                          | 1            | 2           | 3                | 4                   | 5            |
| 2) Does he/she watch you participate in physical activity or play sports?             | 1            | 2           | 3                | 4                   | 5            |
| 3) Does he/she take you to a place where you can do physical activity or play sports? | 1            | 2           | 3                | 4                   | 5            |
| 4) Does he/she tell you that physical activity and sports are good for you?           | 1            | 2           | 3                | 4                   | 5            |
| 5) Does he/she encourage you to be physically active or play sports?                  | 1            | 2           | 3                | 4                   | 5            |

**Finally, please answer these questions YOUR LIFE:**

18. What do you consider the top 3 priorities in your life?

1.

2.

3.

19. What things in your life prevent you from getting more physical activity?

20. What things in your life help you get more physical activity?

**THANK YOU FOR COMPLETING OUR SURVEY!!**

## APPENDIX N

### QUALITATIVE DATA CODING

#### Top 3 Priorities in Life:

- 1) **Family and Friends** (coded for the following responses): family, my sister, being with my nana, friends, my mom, my sister, my dad, friendship and family, family/ close friends
- 2) **Health and Wellbeing** (coded for the following responses): becoming healthy, my health, happiness, being happy, exercise, sleep, stay healthy, having good health, to live life to the fullest, being healthy
- 3) **Bettering oneself** (coded for the following responses): trying my best at everything, having a good job, making the best of myself, get a good career, goals, becoming a better me, work, completing everything I put my mind to, good career, have a nice job, do good in life, being successful, what I do, to succeed, make goals, helping others
- 4) **School** (coded for the following responses): education, school, my grades, keeping my grades up, graduating, go to college, finish school, get me an education, college,
- 5) **Sports or Physical Activity** (coded for the following responses): dancing, dance, sports, karate
- 6) **Essential Needs** (coded for the following responses): money, food, make money
- 7) **Hobbies** (coded for the following responses): my phone, fashion, music, free time, having the most fun I possibly can
- 8) **Appearance** (coded for the following responses): staying cute

#### What prevents you from being physically active?

- 1) **Lack of Motivation** (coded for the following responses): lack of motivation, my behavior, my attitude, laying around, hanging out, I prevent myself, laziness
- 2) **School**(coded for the following responses): homework, sometimes I don't have time to do activities or sports because I'm busy after school, work and homework prevents me from getting more physically active because right after school I go to work and when I get home I'm tired, schoolwork, school- not having enough time to spend working out



because of studying homework or extra-curricular activities, school, gwen's girls, coming to camp

- 3) **Pain or Injury** (coded for the following responses): being sore, weight, sometimes leg starts to hurt, injury, migraines, back pain, cold/fever, asthma, I don't want to get hurt
- 4) **Transportation** (coded for the following responses): don't live near activities I want to attend, I'm unable to drive places, transportation, not having the transportation to get to the places
- 5) **Cost** (coded for the following responses): having to pay for things
- 6) **Food Insecurity** (coded for the following responses): a good meal in front of me, food
- 7) **Sleep** (coded for the following responses): sleep, sleep/sometimes, sleep calls my name, nothing except sleeping,
- 8) **Time** (coded for the following responses): house chores, not enough time, didn't have time work a lot
- 9) **Friends** (coded for the following responses): my social network, hanging out,
- 10) **Technology** (coded for the following responses): my phone, I'm easily distracted by my phone, tv/phone, the distractions (internet, video games, etc)
- 11) **Other:** weather, mom says no, nothing

### **What things in life help you be more active?**

- 1) **Family/ friend support** (coded for the following responses): going to schenley park with my mom, mom driving me, my family taking me to the YMCA, my family playing volleyball with me, family, driving adults, carpooling, family, people encourage me to do them, support, walking around with my friends, friends, playing outside with my friends encouragement, my mom and dad encourage me to do it
- 2) **School** (coded for the following responses): gym, school, gym class, playing on a high school team, running track, clubs
- 3) **Active transportation** (coded for the following responses): having to walk places, walking to the bus stop to go to work, when I am hungry I have to walk to the store
- 4) **Physical activity** (coded for the following responses): summer camp, volleyball, workout circuit, gwen's girls, girl scouts, walking, dancing, dance, doing things at home on my own, going outside, outside
- 5) **Work** (coded for the following responses): work somehow, because I work with energetic kids, work, doing chores, going to work, work always walking around or something
- 6) **Motivation** (coded for the following responses): more motivation, eating and wanting to work it off/ better body, motivation, by having motivation that I can do this
- 7) **Time** (coded for the following responses): less work, less time from school
- 8) **Other** (coded for the following responses): vegetables and fruit, lack of body pain

**APPENDIX O**

**Table 10. Extended demographics**

| <b>Participant Demographics<br/>(N=36)</b> | <b>Medians [25th, 75th percentile]</b> | <b>Mean (<math>\pm</math>SD)</b> | <b>Range</b>  | <b>Skewness</b> | <b>Kurtosis</b> |
|--------------------------------------------|----------------------------------------|----------------------------------|---------------|-----------------|-----------------|
| <b>Age (yrs)</b>                           | 14.9 [13.8, 15.9]                      | 15.0 ( $\pm$ 1.4)                | (13.0, 17.6)  | 0.367           | -0.815          |
| <b>BMI (kg/m<sup>2</sup>)</b>              | 26.5 [20.8, 30.8]                      | 27.2 ( $\pm$ 8.7)                | (15.4, 52.6)  | 1.328           | 1.806           |
| <b>BMI Percentile</b>                      | 90.5 [58.5, 97.0]                      | 76.4 ( $\pm$ 26.5)               | (3.0, 99.0)   | -1.236          | 0.855           |
| <b>Grade in School</b>                     | 9.0 [7.0, 10.0]                        | 8.6 ( $\pm$ 1.6)                 | (6.0, 11.0)   | -0.026          | -1.07           |
| <b>Physical Activity (mins/week) :</b>     |                                        |                                  |               |                 |                 |
| Moderate to Vigorous Physical Activity     | 165.0 [92.5, 205.0]                    | 160.3 ( $\pm$ 79.3)              | (30.0, 320.0) | 0.455           | -0.38           |
| Moderate Physical Activity                 | 135.0 [80.0, 190.0]                    | 143.1 ( $\pm$ 71.6)              | (30.0, 310.0) | 0.504           | -0.435          |
| Vigorous Physical Activity                 | 0.0 [0.0, 10.0]                        | 17.2 ( $\pm$ 42.1)               | (0.0, 200.0)  | 3.126           | 10.449          |

**APPENDIX P**

**Table 11. Neighborhood characteristics of n=36 participants**

| <b>Neighborhood:</b> | <b>Zip Code</b> | <b>Percent Below Poverty</b> | <b>Frequency of participant reported neighborhood</b> |
|----------------------|-----------------|------------------------------|-------------------------------------------------------|
| Hill District        | 15219           | 39.6                         | 11[31.4]                                              |
| Braddock             | 15104           | 31.7                         | 8 [22.9]                                              |
| Rankin               | 15104           | 31.7                         | 1 [2.9]                                               |
| Arlington            | 15210           | 27.5                         | 3 [8.6]                                               |
| Carrick              | 15210           | 27.5                         | 1 [2.9]                                               |
| Southside            | 15203           | 24.2                         | 1 [2.9]                                               |
| Ross Township        | 15214           | 23.4                         | 1 [2.9]                                               |
| Northview Heights    | 15212           | 22.4                         | 1 [2.9]                                               |
| Brighton             | 15212           | 22.4                         | 1 [2.9]                                               |
| Highland Park        | 15206           | 20.4                         | 1 [2.9]                                               |
| Squirrel Hill        | 15217           | 14.3                         | 1 [2.9]                                               |
| Perrysville          | 15218           | 13.7                         | 1 [2.9]                                               |
| Penn Hills           | 15235           | 10.9                         | 2 [5.7]                                               |
| Bradford Woods       | 15015           | 3.8                          | 1 [2.9]                                               |
| Cherry Springs       | -               | -                            | 1 [2.9]                                               |

Note: Frequency of participant reported neighborhood presented as n[%]

**APPENDIX Q**

**Table 12. Physical activity (min/day) by age, BMI, race/ethnicity**

|                         | <b>Frequency</b><br>N=36 | <b>MVPA (min/day)</b>                  |
|-------------------------|--------------------------|----------------------------------------|
| <b>Age:</b>             |                          |                                        |
| 13                      | 10                       | 185.0 (115.0, 252.5)<br>[60.0, 320.0]  |
| 14                      | 9                        | 90.0 (60.0, 220.0)<br>[30.0, 320.0]    |
| 15                      | 8                        | 140.0 (102.5, 170.0)<br>[90.0, 220.0]  |
| 16                      | 5                        | 160.0 (65.0, 260.0)<br>[60.0, 300.0]   |
| 17                      | 4                        | 185.0 (157.5, 190.0)<br>[150.0, 190.0] |
| <b>BMI Percentile:</b>  |                          |                                        |
| <85th                   | 16                       | 140.0 (70.0, 217.5)<br>[50.0, 320.0]   |
| 85th<95th               | 7                        | 170.0 (120.0, 180.0)<br>[60.0, 230.0]  |
| ≥95th                   | 13                       | 180.0 (105.0, 205.0)<br>[30.0, 320.0]  |
| <b>Race/ Ethnicity:</b> |                          |                                        |
| White                   | 6                        | 175.0 (137.5, 240.0)<br>[70.0, 300.0]  |
| Black                   | 21                       | 170.0 (90.0, 190.0)<br>[60.0, 320.0]   |
| American Indian         | 1                        | -                                      |
| Other/ Mixed Race       | 7                        | 12.0 (50.0, 220.0)<br>[30.0, 320.0]    |

NOTE: Data presented as median (25<sup>th</sup>, 75<sup>th</sup> percentile) [range]

**APPENDIX R**

**Table 13. Support from closest adult by age, BMI, and race/ethnicity**

|                         | Frequency<br>N=36 | Closest Adult in the Household    |                               |                              |
|-------------------------|-------------------|-----------------------------------|-------------------------------|------------------------------|
|                         |                   | <i>Total Support</i>              | <i>Tangible Support</i>       | <i>Intangible Support</i>    |
| <b>Age:</b>             |                   |                                   |                               |                              |
| 13                      | 10                | 11.5 (7.5, 15.0)<br>[4.0, 16.0]   | 5.0 (0.8, 7.3)<br>[0.0, 9.0]  | 7.0 (4.8, 7.3)<br>[4.0, 8.0] |
| 14                      | 9                 | 12.0 (6.5, 15.0)<br>[5.0, 18.0]   | 6.0 (0.0, 9.0)<br>[0.0, 10.0] | 6.0 (5.0, 8.0)<br>[4.0, 8.0] |
| 15                      | 8                 | 10.5 (10.0, 14.3)<br>[6.0, 16.0]  | 6.0 (4.3, 7.8)<br>[2.0, 9.0]  | 5.5 (4.0, 7.0)<br>[4.0, 8.0] |
| 16                      | 5                 | 11.0 (8.0, 14.5)<br>[6.0, 16.0]   | 5.0 (3.0, 7.0)<br>[2.0, 8.0]  | 7.0 (4.5, 7.5)<br>[4.0, 8.0] |
| 17                      | 4                 | 6.5 (2.5, 11.3)<br>[2.0, 12.0]    | 0.5 (0.0, 4.8)<br>[0.0, 6.0]  | 5.0 (2.5, 7.5)<br>[2.0, 8.0] |
| <b>BMI Percentile:</b>  |                   |                                   |                               |                              |
| <85th                   | 16                | 12.5 (11.3, 15.8)<br>[5.0, 18.0]  | 7.0 (6.0, 8.8)<br>[0.0, 10.0] | 6.0 (5.0, 7.0)<br>[4.0, 8.0] |
| 85th<95th               | 7                 | 10.0 (8.0, 15.0)<br>[6.0, 15.0]   | 5.0 (2.0, 7.0)<br>[0.0, 8.0]  | 7.0 (5.0, 8.0)<br>[4.0, 8.0] |
| ≥95th                   | 13                | 8.0 (5.0, 10.5)<br>[2.0, 13.0]    | 2.0 (0.0, 4.5)<br>[0.0, 6.0]  | 5.0 (4.0, 7.0)<br>[2.0, 8.0] |
| <b>Race/ Ethnicity:</b> |                   |                                   |                               |                              |
| White                   | 6                 | 12.5 (11.5, 16.0)<br>[10.0, 16.0] | 6.5 (5.8, 8.3)<br>[5.0, 9.0]  | 6.5 (5.0, 7.3)<br>[5.0, 8.0] |
| Black                   | 21                | 10.0 (6.0, 12.0)<br>[2.0, 18.0]   | 4.0 (0.5, 6.5)<br>[0.0, 10.0] | 6.0 (4.0, 8.0)<br>[2.0, 8.0] |
| American Indian         | 1                 | -                                 | -                             | -                            |
| Other/ Mixed Race       | 7                 | 11.0 (6.0, 15.0)<br>[5.0, 16.0]   | 4.0 (0.0, 8.0)<br>[0.0, 9.0]  | 7.0 (5.0, 7.0)<br>[5.0, 8.0] |

NOTE: Data presented as median (25<sup>th</sup>, 75<sup>th</sup> percentile) [range]

**Table 14. Number of adults providing support by age, BMI, and race/ethnicity**

|                         | Frequency<br>N=36 | Number of Adults in the Household Providing Support |                              |                              |
|-------------------------|-------------------|-----------------------------------------------------|------------------------------|------------------------------|
|                         |                   | <i>Total Support</i>                                | <i>Tangible Support</i>      | <i>Intangible Support</i>    |
| <b>Age:</b>             |                   |                                                     |                              |                              |
| 13                      | 10                | 2.0 (1.8, 3.3)<br>[1.0, 4.0]                        | 2.0 (1.5, 3.0)<br>[0.0, 4.0] | 2.0 (1.8, 3.3)<br>[1.0, 4.0] |
| 14                      | 9                 | 2.0 (1.0, 2.0)<br>[1.0, 2.0]                        | 2.0 (2.0, 2.0)<br>[0.0, 2.0] | 2.0 (1.0, 2.0)<br>[1.0, 2.0] |
| 15                      | 8                 | 2.5 (1.0, 3.8)<br>[1.0, 4.0]                        | 2.5 (1.0, 3.8)<br>[1.0, 4.0] | 2.0 (1.0, 3.0)<br>[1.0, 4.0] |
| 16                      | 5                 | 3.0 (1.5, 3.5)<br>[1.0, 4.0]                        | 3.0 (1.5, 3.5)<br>[1.0, 4.0] | 3.0 (1.5, 3.5)<br>[1.0, 4.0] |
| 17                      | 4                 | 1.5 (1.0, 2.0)<br>[1.0, 2.0]                        | 0.5 (0.0, 1.8)<br>[0.0, 2.0] | 1.5 (1.0, 2.0)<br>[1.0, 2.0] |
| <b>BMI Percentile:</b>  |                   |                                                     |                              |                              |
| <85th                   | 16                | 2.0 (2.0, 3.0)<br>[1.0, 4.0]                        | 2.0 (2.0, 3.0)<br>[0.0, 4.0] | 2.0 (2.0, 2.8)<br>[1.0, 4.0] |
| 85th<95th               | 7                 | 2.0 (1.0, 3.0)<br>[1.0, 4.0]                        | 2.0 (1.0, 3.0)<br>[0.0, 4.0] | 2.0 (1.0, 3.0)<br>[1.0, 4.0] |
| ≥95th                   | 13                | 1.0 (1.0, 2.5)<br>[1.0, 4.0]                        | 1.0 (0.0, 2.5)<br>[0.0, 3.0] | 1.0 (1.0, 2.0)<br>[1.0, 4.0] |
| <b>Race/ Ethnicity:</b> |                   |                                                     |                              |                              |
| White                   | 6                 | 3.0 (1.8, 4.0)<br>[1.0, 4.0]                        | 3.0 (1.8, 4.0)<br>[1.0, 4.0] | 2.5 (1.8, 3.3)<br>[1.0, 4.0] |
| Black                   | 21                | 2.0 (1.0, 2.0)<br>[1.0, 4.0]                        | 2.0 (0.5, 2.0)<br>[0.0, 4.0] | 2.0 (1.0, 2.0)<br>[1.0, 4.0] |
| American Indian         | 1                 | -                                                   | -                            | -                            |
| Other/ Mixed Race       | 7                 | 2.0 (1.0, 3.0)<br>[1.0, 4.0]                        | 2.0 (0.0, 3.0)<br>[0.0, 3.0] | 2.0 (1.0, 3.0)<br>[1.0, 4.0] |

NOTE: Data presented as median (25<sup>th</sup>, 75<sup>th</sup> percentile) [range]

**Table 15. Total magnitude of support by age, BMI, and race/ethnicity**

|                         | Frequency<br>N=36 | Total Magnitude of Support from the Household |                                  |                                  |
|-------------------------|-------------------|-----------------------------------------------|----------------------------------|----------------------------------|
|                         |                   | <i>Total Support</i>                          | <i>Tangible Support</i>          | <i>Intangible Support</i>        |
| <b>Age:</b>             |                   |                                               |                                  |                                  |
| 13                      | 10                | 25.0 (14.8, 31.2)<br>[4.0, 48.0]              | 11.0 (3.8, 16.0)<br>[0.0, 20.0]  | 13.5 (7.8, 18.5)<br>[4.0, 28.0]  |
| 14                      | 9                 | 21.0 (7.5, 25.5)<br>[5.0, 33.0]               | 10.0 (0.0, 14.0)<br>[0.0, 20.0]  | 11.0 (6.5, 12.5)<br>[5.0, 14.0]  |
| 15                      | 8                 | 28.0 (10.0, 35.5)<br>[6.0, 47.0]              | 13.0 (4.5, 19.5)<br>[2.0, 27.0]  | 12.0 (5.0, 19.0)<br>[2.0, 22.0]  |
| 16                      | 5                 | 30.0 (16.0, 37.0)<br>[16.0, 39.0]             | 14.0 (8.0, 17.5)<br>[8.0, 21.0]  | 16.0 (8.0, 19.5)<br>[8.0, 21.0]  |
| 17                      | 4                 | 7.5 (4.5, 20.3)<br>[4.0, 24.0]                | 0.50 (0.0, 9.3)<br>[0.0, 12.0]   | 7.0 (4.5, 11.0)<br>[4.0, 12.0]   |
| <b>BMI Percentile:</b>  |                   |                                               |                                  |                                  |
| <85th                   | 16                | 26.5 (21.5, 32.5)<br>[5.0, 48.0]              | 14.0 (10.3, 20.0)<br>[0.0, 27.0] | 12.5 (10.3, 15.8)<br>[5.0, 28.0] |
| 85th<95th               | 7                 | 27.0 (10.0, 34.0)<br>[8.0, 37.0]              | 12.0 (2.0, 15.0)<br>[0.0, 16.0]  | 15.0 (8.0, 18.0)<br>[8.0, 22.0]  |
| ≥95th                   | 13                | 9.0 (6.0, 22.0)<br>[4.0, 35.0]                | 4.0 (0.0, 9.5)<br>[0.0, 14.0]    | 7.0 (4.0, 11.5)<br>[2.0, 21.0]   |
| <b>Race/ Ethnicity:</b> |                   |                                               |                                  |                                  |
| White                   | 6                 | 30.4 (22.0, 41.0)<br>[16.0, 47.0]             | 17.5 (11.0, 22.5)<br>[8.0, 27.0] | 14.0 (9.5, 18.5)<br>[8.0, 20.0]  |
| Black                   | 21                | 16.0 (7.5, 27.5)<br>[4.0, 48.0]               | 8.0 (0.5, 14.0)<br>[0.0, 20.0]   | 8.0 (5.5, 14.5)<br>[2.0, 28.0]   |
| American Indian         | 1                 | -<br>-                                        | -<br>-                           | -<br>-                           |
| Other/ Mixed Race       | 7                 | 25.0 (8.0, 35.0)<br>[5.0, 37.0]               | 12.0 (0.0, 14.0)<br>[0.0, 15.0]  | 12.0 (8.0, 21.0)<br>[5.0, 22.0]  |

NOTE: Data presented as median (25<sup>th</sup>, 75<sup>th</sup> percentile) [range]

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