ABSTRACT

Investigating How the Household Influences Adult Physical Activity
in a Low-income Community

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We assessed the association between household structure and adult physical activity. Data were collected using Community Assessment for Public Health Emergency Response (CASPER) methodology to identify households (n=100) and administer a survey about household structure and health behaviors. Household structure was defined according to adults (>1 vs. 1) and children living in the household (>1 vs. 0). Physical activity was measured using the International Physical Activity Questionnaire-Short Form and converted to MET-minutes. In this study, adults from multi-adult households reported more MET-minutes of physical activity per week than adults from single adult households (p=0.049). Adults in multiple-adult households were twice as likely to meet recommendations compared to those from single-adult households (OR=2.41; 95% CI:1.05,5.52; p=0.04). Children in the household was not associated with adult physical activity. CASPER is a useful tool for identifying health behaviors in a local area. Future physical activity programs should focus on social support for adults.

Investigating How the Household Influences Adult Physical Activity
in a Low-income Community

by

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First, I would like to thank God for providing me the opportunity and means necessary to be a student in the MPH program at Baylor University and a resident in Waco, Texas. Throughout this time, I have learned I am extremely fortunate to constantly be surrounded by opportunities for learning as well as caring and passionate faculty and staff members who are dedicated to helping me become more of who He has created me. Second, I would like to thank my chair, Dr. Kelly Ylitalo. Thank you for leading me on this journey and ensuring we were always moving forward. To my thesis committee, thank you for partnering with me and guiding me through the research and writing process. Finally, I would like to thank my family and friends for their constant prayers, support, and encouragement throughout the MPH program as I continue to learn what is in store for me next.

CHAPTER ONE

Introduction

Purpose and Significance

Obesity rates in the United States have doubled among adults and tripled among children in the past thirty-five years (Centers for Disease Control and Prevention (CDC), 2015a; The State of Obesity, n.d.,). According to the CDC, the average American adult weighs twenty-four pounds more than the average American adult in 1960 and more than one-third of adults in the United States today are obese (2015a). High levels of obesity cost the United States an estimated $147 billion dollars in medical costs in 2008 and the average obese individual had $1,429 more medical expenses per year than individuals of normal weight (Ogden, Carroll, Kit, & Flegal, 2014). Some researchers (Ogden et al., 2014) have suggested childhood obesity rates have recently stabilized in the United States; nevertheless, Americans must find ways to better the health of the population and decrease the prevalence of obesity.

One of the primary ways to address the obesity epidemic and decrease the number of obese individuals is to promote healthy lifestyles by encouraging individuals to participate regularly in physical activity (Anokye, Trueman, Green, Pavey, & Taylor, 2012; Hamilton, Hamilton, & Zderic, 2007; S. C. Moore et al., 2012). Participating in physical activity provides numerous health benefits for children and adults (Burton & VanHeest, 2007; Milteer, Ginsburg, Council On Communications And Media, & Committee On Psychosocial Aspects Of Child And Family Health, 2012). The CDC

recommends children obtain at least 60 minutes of physical activity per day and adults obtain at least 150 minutes of moderate-intensity exercise per week, 75 minutes of vigorous-intensity exercise, or some combination of both (2015c). Despite the known benefits of physical activity and the CDC guidelines, 1 in 4 adults do not regularly participate in physical activity (Moore, Harris, Carlson, Kruger, & Fulton, 2012).

Health educators have an important responsibility of promoting the needs of individuals and communities. However, promoting physical activity behaviors in individuals proves difficult as complex influences can impede or promote the development and maintenance of healthy behaviors. The Social Ecological Model (SEM) accounts for the social and physical environments that influence individual behaviors, including interpersonal relationships, communities, and public policies. Using the multi-level approach proposed by the SEM, health educators can address outside influences in addition to educating individuals about the health benefits of regularly participating in physical activity.

This study examined the interpersonal influences of the SEM by investigating household structure and physical activity levels among adults. In previous studies, researchers (Cleland et al., 2014; Kegler, Swan, Alcantara, Feldman, & Glanz, 2014) have incorporated a social ecological approach to promoting physical activity behaviors in individuals and have examined how household structures can contribute to social support and behavior modeling for physical activity. However, the relationship between household structure and physical activity in low-income communities is less certain. The findings from this research may provide health educators with a greater understanding of

how household structures and interpersonal influences can contribute to individuals meeting physical activity recommendations.

Research Questions

The following questions were examined concerning the relationship between household structure and physical activity.

1. Does having more than one adult in the household increase the likelihood of adults meeting physical activity recommendations compared to single adult households?
2. Does having a child in the household increase the likelihood of adults meeting physical activity recommendations compared to a childless household?

Potential Limitations

1. One limitation of this study is that physical activity levels were measured through participant recall of participation in physical activity during the past seven days. Self-reported physical activity may be biased if participants over report physical activity levels for social desirability.
2. A second limitation of this study is the generalizability of results to the general population. Participants were selected from a single zip code in Waco, TX; and the relationship between household structure and physical activity in a southern, low-income community may not be generalizable to all household structures and household sizes in the United States.
3. A third limitation of this study is the possibility of selection bias in the method used to select the adult respondent to participate in the survey. Primary data

collection occurred on a Saturday morning and afternoon. A bias would have occurred if adults who were away from home at the time of data collection had different levels of physical activity than adults who were at home and participated in the survey.

Delimitations

1. This study was delimited to families residing in the 76704 zip code.
2. Upon receiving approval from the Institutional Review Board (IRB), trained interviewers were sent into the community for a single morning and afternoon session to complete surveys with residents.
3. Household members choosing to participate in the survey had to be at least 18 years old.

Public Health Benefits of Study

Health educators should consider the influence of household structure and how interpersonal influences affect an individual's likelihood of adopting and maintaining health behaviors. The results of this study will provide a social-ecological explanation of how social support through the family affects whether or not adults regularly participate in physical activity. Understanding how household structure positively or negatively affects physical activity behaviors will assist health educators as they develop and promote future interventions to increase physical activity. Increasing physical activity is an important public health goal to improve the overall health and quality of life among individuals and families, and potentially mitigate high rates of obesity in the United States.

CHAPTER TWO

Literature Review

Obesity Overview

According to the CDC, obesity rates have continued to rise in the United States since 1990 (2015b). In 2014, all 50 states reported at least 20% of the population as obese and many states reported more than 30% of the population as obese (2015b). During the past thirty years, childhood obesity rates have doubled and adolescent obesity rates have tripled. Twelve million children and adolescents are obese (Ogden, Carroll, Kit, & Flegal, 2012). Using a life course perspective, increasing rates of obesity in children and adolescents will lead to increased rates of obesity in adults, which will lead to additional health complications and medical expenses (Brisbois, Farmer, & McCargar, 2012; Kelsey, Zaepfel, Bjornstad, & Nadeau, 2014).

Obesity disproportionately affects certain population groups and race/ethnic minorities. Non-Hispanic blacks and Hispanics have higher prevalence rates of obesity (47.8% and 42.5%, respectively) compared to non-Hispanic whites (32.6%) (CDC, 2015a). Obesity mostly affects middle-age adults between 40-59 years old (CDC, 2015a). In addition, among whites, college graduates are less likely than high school graduates to be obese (A. K. Cohen, Rehkopf, Deardorff, & Abrams, 2013). It is estimated that if current trends continues, at least 50% of the United States population will be obese by 2030 (Dor, Ferguson, Langwith, & Tan, 2010).

Obesity carries with it additional health complications of heart disease (Kwagyan et al., 2015), stroke (Mitchell et al., 2015), type II diabetes (Gallagher & LeRoith, 2015), and cancer (P. J. Goodwin & Stambolic, 2015). Obesity also contributes to additional physical and psychological health complications such as poorer health-related quality of life, mental health, and school performance and missed school days in children (Cameron et al., 2012; Halfon, Larson, & Slusser, 2013). In addition, the associated economic costs of obesity are staggering (Malnick & Knobler, 2006). In 2008, it was estimated the annual medical cost of obesity in the United States was $147 billion. For obese individuals, their medical expenses were, on average, $1,429 higher compared to non-obese individuals (Ogden et al., 2014). While recent research (Ogden et al., 2014) has suggested the incidence rate of obesity has stabilized, there remains a high prevalence of obesity that must be addressed to improve health outcomes and quality of life of Americans.

Physical Activity Overview

Promoting physically active lifestyles may mitigate the rising prevalence of obesity in the United States (Eyler et al., 2014; Marques, Martins, Sarmento, Rocha, & Carreiro da Costa, 2015). Researchers have discovered numerous physical and psychological health benefits afforded to individuals who participate in physical activity. First, physical activity decreases risk factors for coronary heart disease and cardiovascular disease by improving insulin resistance, decreasing body weight, and increasing high-density lipoprotein cholesterol levels (Dickie, Micklesfield, Chantler, Lambert, & Goedecke, 2014; Wanner et al., 2014). Physical activity improves heart health by increasing VO_2 max and decreasing resting heart rate (Hamer, Ingle, Carroll, &

Stamatakis, 2012; Nauman, Aspenes, Nilsen, Vatten, & Wisløff, 2012). Additionally, recreational physical activity plays a primary preventative role in reducing the risk of hypertension (Huai et al., 2013). Also, individuals who engage in physical activity report higher levels of academic achievement (Kwak et al., 2009) as well as a decrease in clinical depression for individuals of all ages (Kremer et al., 2014; Loprinzi, 2013). Lastly, by participating in physical activity, individuals decrease their risk for all-cause mortality (Samitz, Egger, & Zwahlen, 2011; Woodcock, Franco, Orsini, & Roberts, 2011)

Despite all of these known benefits of participating in physical activity, one in four individuals do not regularly engage in physical activity or meet national guidelines and recommendations for physical activity (Moore et al., 2012). In fact, according to data from Healthy People 2010, only 48% of individuals reportedly met physical activity recommendations (Dishman, Rooks, Thom, Motl, & Nigg, 2010). Also, according to the United States Department of Health and Human Services, more than 80% of adults do not meet recommendations for aerobic and muscle-strengthening activities (HHS, Healthy People 2020, 2011). Non-Hispanic blacks and Hispanics are the least active population in the United States compared to non-Hispanic whites, lower education levels lead to lower amounts of physical activity in males and females, males overall are likely to be more physically active than females, and the American South is the least active area of the country compared to the West, Midwest, and northeast (CDC, 2014). As physical inactivity continues to increase in America, obesity rates will also increase, potentially contributing to a healthcare financing burden funding the treatment of obesity-linked diseases (Cecchini et al., 2010).

Physical Activity and Minority Populations

Eliminating health disparities and improving the health of all people is one of four overarching goals of Healthy People 2020 in the United States (United States Department of Health and Human Services [HHS], Healthy People 2020, 2011). African Americans have higher overall rates of chronic diseases compared to whites (Harley, Buckworth, et al., 2009). For example, African-American men and women over twenty years of age have a 46.0% and 48.3% rate, respectively, of cardiovascular disease. In addition, the 2011 death rate from cardiovascular disease for all populations was 229.6. However, the death rates for non-Hispanic black males was 352.4 and 248.6 for females (Mozaffarian et. al, 2015). Lower socioeconomic status and race/ethnic minority populations are least likely to meet physical activity recommendations, which likely contribute to poorer health status. This is supported by estimates indicating that 50% of African American men report no leisure-time physical activity (Ball, Jeffery, Abbott, McNaughton, & Crawford, 2010). While chronic disease risk factors increase with age suggesting a need for elderly populations to be physical active, African-American men decrease their participation in physical activity level as they age (Ahmed et al., 2005). In conjunction with African-American men, African-American women are one of the least physically active populations in the United States where only 36% of African-American women meet the 150 minutes per week of moderate-to-vigorous intensity physical activity each week (CDC, 2014). African-American women are known to have increased rates of colon and breast cancer, overweight/obesity, and other chronic diseases compared to white and Hispanic population groups (U.S. Cancer Statistics Working Group, 2015). These data

highlight the importance of increasing physical activity among race/ethnic minority groups.

Social Ecological Model

The SEM illustrates the multiple influences affecting an individual and how those influences relate to one another (McLeroy, Bibeau, Steckler, & Glanz, 1988). The SEM considers how social and physical environments influence individual behavior and public policies. This multi-level approach allows health educators to consider more complex explanations for an individual's behavior rather than focusing on the individual in isolation (Glanz, Rimer, & Viswanath, 2008).

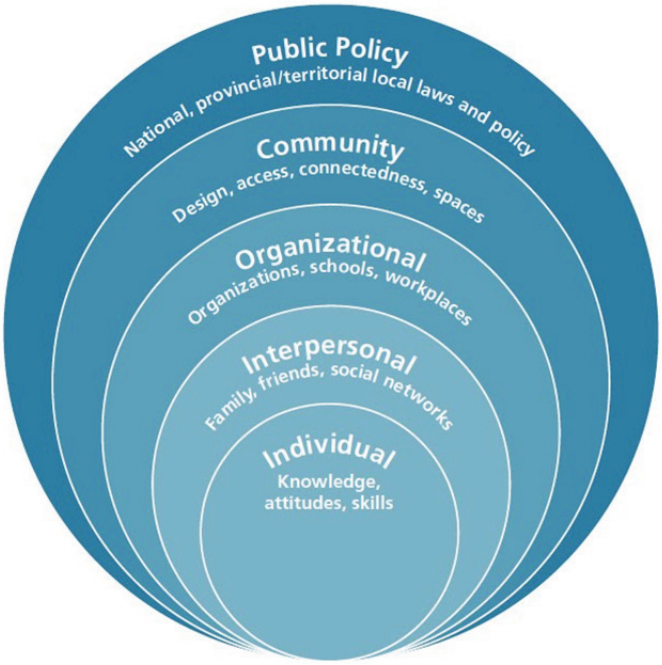

Figure 2.1. The SEM applied to Physical Activity. Each level of influence of the SEM is provided ("Social-Ecological Model - Active Canada 20/20," n.d.).

In the SEM as shown in Figure 2.1, the individual is at the center and is influenced by each subsequent layer. Each additional level of influence builds on the previous level and can affect each preceding level. The first level of the SEM consists of intrapersonal factors such as the individual's knowledge, skill set, and genetics. The second level consists of interpersonal influences and how the individual interacts with other people, and subsequently how interactions with others influence individual decision-making. The third level of the SEM consists of organizational or institutional influences such as rules in the workplace or community and access to needed resources in the community. The fourth level broadens the second level by considering the community's influence such as social networks outside of proximal interpersonal influences of family and peers. The final level of the SEM consists of public policies at the local, state, and federal levels that regulate or support community values and can affect available resources, which affect support groups and, ultimately, the individual.

Ecological models like the SEM expand intervention and education efforts from an individual approach to include the physical and social environmental factors associated with health behavior changes. The complex relationship between individuals and their environments as shown by the SEM suggests that motivating individuals to participate in healthy behavior choices may include developing new policies and creating environments promoting convenience (Glanz et al., 2008; Kegler et al., 2014).

Social Ecological Model and Physical Activity

Applied to physical activity, social ecological approaches provide a framework for understanding why individuals may or may not participate in physical activity (Cleland et al., 2014; Giles-Corti & Donovan, 2002). For example, at the individual level,

one's knowledge about the benefits and types of physical activity as well as individual motivation and ability to participate in physical activity will influence one's amount of time spent being physically active (Dishman, McIver, Dowda, Saunders, & Pate, 2015; Lawman, Wilson, Van Horn, Resnicow, & Kitzman-Ulrich, 2011). Next, interpersonal factors through social support from family and friends may negatively or positively increase physical activity participation (McAuley, Jerome, Elavsky, Marquez, & Ramsey, 2003). The workplace may or may not require certain amounts of physical activity to complete daily responsibilities (Michaels & Greene, 2013).

In addition, communities must be conducive to participating in physical activity (A. A. Eyler, Brownson, Bacak, & Housemann, 2003; Griffin, Wilson, Wilcox, Buck, & Ainsworth, 2008). This includes physical design, available parks and facilities, connectedness using bike lanes and sidewalks, and social connectedness through churches, fitness clubs and recreational groups such as cycling or walking clubs (Baruth et al., 2013; Kaczynski & Glover, 2012).

Lastly, public policies are of critical importance because they can impede or promote physical activity. For example, the California-based Safe Routes to School policy provided funds for sidewalks, traffic lights, pedestrian crossings, and cycling paths (Boarnet, Anderson, Day, McMillan, & Alfonzo, 2005). Also, Complete Streets, a policy set from Smart Growth America, provides communities with resources to propose a plan to design and maintain streets for all mediums of transportation (Geraghty et al., 2009). Within the SEM, these examples highlight the need for future policies that enhance social support, facility access, and safety (Booth, Owen, Bauman, Clavisi, & Leslie, 2000). The

influence of the physical and social environment on the individual demonstrates the complexity of designing health interventions.

Interpersonal Influences – Household Structure

The United States Census Bureau provides an important term related to family structure, "household." Households consist of all persons living in a housing unit where housing units include houses, apartments, mobile homes, groups of rooms, or single rooms occupied as separate living quarters. Family households have at least two individuals related by birth, marriage, or adoption and may or may not have children. Additional types of household occupants range from single families, single persons living alone, two or more families living together, or any other group of related or unrelated individuals who share living spaces (U.S. Census Bureau, 2015). Households may or may not include family members as primary residents leading to various types of family structures within a household. As family structures vary, the household and housing unit provide a consistent and primary place where families and individuals interact, provide social support, and model important physical activity behaviors.

In the United States, families and family structures are dynamic entities subject to change. For example, economic influences such as the recession of 2007-2009 where many Americans faced financial hardship, led to the restructuring of families, changes in the labor market, and workforce migration leading to households downsizing and merging (Street, NW, Washington, & Inquiries, n.d.). Economic changes have also contributed to shifting gender roles between men and women where men no longer serve as the primary provider for the family outside the home. As women continue to receive higher levels of education and enter the workforce, families continue to shift (Fraad,

2011). Lastly, as time proceeds for every family, family structures shift as some adults may previously have had children living in the house, but now live in childless households because adult children have moved away.

Social Support and Health

Family structure has important implications for health research because families provide an environment for individuals to extend and receive social support. Social support includes several dimensions of instrumental, emotional, appraisal, and informational and consists of the types of commitment and advice individuals give and receive in relationships (House, 1981). Social support contributes to better health. Social support has contributed to improved mood in women (Janisse, Nedd, Escamilla, & Nies, 2004), increased levels of physical activity in men and women, (da Silva, Azevedo, & Gonçalves, 2013), and served as a primary determinant for improved health in adolescents (Viner et al., 2012). The health benefits of social support have been linked to less cognitive decline while aging, greater resistance to infectious diseases, increased maintenance of physical activity behaviors, and better prognoses when facing life-threatening illnesses (Barber, 2013; S. Cohen & Janicki-Deverts, 2009; Kouvonen et al., 2012). In addition, social support has been linked with cardiovascular health benefits of decreased blood pressure levels in adults. Adults transitioning from work to the home environment where high levels of social support were present had greater differences in blood pressure compared to adults who returned to home environments with less social support (Steptoe, Lundwall, & Cropley, 2000). Furthermore, researchers found social support exchanged between married couples and their children contributed to better self-

reported health and increased life expectancy than single-adult or divorced families and their children (Koball, Moiduddin, Henderson, Goesling, & Besculides, 2010).

Previously, in a review examining the impact of the family on health, four primary factors were attributed to familial well-being: marriage, parenthood, mother's employment, and socioeconomic status. (Ross, Mirowsky, & Goldsteen, 1990). Overall, married families reported higher incomes and increased social support leading to decreased stress and rates of disease and sickness than non-married families. In families with children, children negatively affected health of adults or did not affect health at all due to increased financial strains and less adult social support as parents focused time and energy on children. Social support was a strong indication of health in families, particularly for married families (Gerstel, Riessman, & Rosenfield, 1985).

Social Support and Physical Activity

Pubmed and Google Scholar were the primary search engines utilized to locate relevant research studies. Initial search engine restrictions included the use of human subjects, English as the language, and a publication date after 2000. A publication date after 2000 was selected based on an expert panel's (Kesaniemi et al., 2001) discussion about issues concerning physical activity and health that informed the most recent guidelines for physical activity (Haskell et al., 2007). Primary search terms included "adult," "social support," "physical activity," and "family structure" which yielded 27 results. Additional studies were found using reference lists and systematic reviews.

Research has demonstrated the importance of increasing social support and adherence to being physically active through tailored interventions and community programs. This is especially important for older adults and minority populations who

have stressed the need for programs that enhance social support (Belza et al., 2004; King, 2001). In particular, African-American adult men and women have expressed the need for social support to maintain regular participation in physical activity (Kirchhoff, Elliott, Schlichting, & Chin, 2008; Wilcox, Oberrecht, Bopp, Kammermann, & McElmurray, 2005). Social support can originate from physician counseling, a trainer, and even a regular exercise partner and friend (Harley, Odoms-Young, Beard, Katz, & Heaney, 2009; Young, Gittelsohn, Charleston, Felix-Aaron, & Appel, 2001). Social support can also be provided through group exercise programs in the community or a local church (Bopp et al., 2007; Lavizzo-Mourey et al., 2001; Parham & Scarinci, 2007).

Age-specific barriers and motivators are important to consider in older adults as physical and social needs differ compared to young and middle-aged adults (Schutzer & Graves, 2004). Previous findings have shown adults of all ages stress the need for social support to be physically active (Belza et al., 2004; Bopp, Wilcox, Oberrecht, Kammermann, & McElmurray, 2004; I. C. Goodwin, 2007). Because older adults may experience additional issues of social isolation and limited ability to participate in vigorous physical activities, many older adults focus on walking and need higher levels of social support and reinforcement to maintain walking activities (McAuley et al., 2003; Resnick, Orwig, Magaziner, & Wynne, 2002). The availability and easy access to safe parks, community centers, and recreation areas provide a primary medium where older adults can participate in physical activity together and extend and receive the desired benefits of social support (Kirchhoff et al., 2008; Wilcox et al., 2005; Young, He, Harris, & Mabry, 2002).

Households may provide primary environments for individuals to extend and receive social support and behavior modeling where individuals are encouraged to be physically active (Kral & Rauh, 2010; Nomaguchi & Bianchi, 2004). Among adults, married adults spend more time together eating meals and watching television than single adults. However, physical activity among married adults may also be inhibited by work conflicts or one spouse who does not exercise because of long hours of employment (Nomaguchi & Bianchi, 2004; Roos, Sarlio-Lähteenkorva, Lallukka, & Lahelma, 2007). In older adults whose primary mode of physical activity includes walking, a survey highlighted how proximity and walking distance to a park influenced whether or not adults would be active and use the park with each other (Mowen, Orsega-Smith, Payne, Ainsworth, & Godbey, 2007). Adult behavior modeling can directly benefit family members and members of the community. Encapsulated within the direct benefit of adult behavior modeling lies the indirect benefit of achieving and maintaining health gains for the adults desiring to model positive health behaviors. By actively modeling physical activity behaviors for others, the adults may receive the numerous health benefits physical activity provides.

Adults and Children's Physical Activity

Adults also have an important opportunity for behavior modeling to children (Kral & Rauh, 2010). African-American women have identified themselves as role models to the family for physical activity (Harley, Buckworth, et al., 2009; Wilbur, Chandler, Dancy, Choi, & Plonczynski, 2002). Parental support for physical activity among families is very important and parents can recognize their role in behavior modeling by prioritizing play time with their children, transporting them to parks and

recreation areas, as well as participating in their own types of physical activity (Loprinzi & Trost, 2010).

Overall, research has demonstrated a negative relationship between parenthood and adult physical activity due to barriers of time (Bellows-Riecken & Rhodes, 2008). Fathers showed a decrease in time spent participating in sports and utilizing workout centers compared to adult men without children (Nielsen et al., 2006). Similarly, mothers showed decreases in leisure-time physical activity due to increases in household responsibility compared to adult women without children (Grace, Williams, Stewart, & Franche, 2006; Scharff, Homan, Kreuter, & Brennan, 1999). Parents' physical activity levels before and after having children are met by further barriers including unaffordable facilities, unavailable childcare, and high crime rates leading to safety concerns for outdoor activities (Seefeldt, Malina, & Clark, 2012). Barriers for mothers who value physical activity attribute decreases in leisure-time physical activity to time constraints from societal pressures to care for children and additional family and community members (Janisse et al., 2004; Tavares & Plotnikoff, 2008). Still, other researchers (Adamo, Langlois, Brett, & Colley, 2012; Adamo et al., 2012; Laroche et al., 2013) report mothers and fathers engage in less physical activity compared to non-parents as well as have increased BMI. However, some parents have reported higher household activity levels and no effect on other types of activity (i.e., leisure, transport, or occupational) (Candelaria et al., 2012).

As children age, parents may learn to balance requiring children to participate in physical activity and consider the child's interests to promote a natural desire to be physically active. Considering the shaping influence of adults on children, families

should seek to instill healthy habits in children that the children will continue through adolescence and into adulthood (Quarmby, 2013). The maintenance of healthy behaviors from adolescence into adulthood proves challenging. For example, adolescents who achieved five or more sessions per week of moderate-to-vigorous physical activity and less than fourteen hours per week of screen time were unlikely to carry these levels of physical activity and low levels of screen-time behavior into adulthood, reinforcing a need for social support and consistent modeling from adults (Gordon-Larsen, Nelson, & Popkin, 2004). Furthermore, maternal modeling, paternal reinforcement, and maternal and sibling co-participation all had positive associations with boys' and girls' physical activity levels (V. Cleland et al., 2011). Children without siblings spend more time watching TV compared to those with siblings (Bagley, Salmon, & Crawford, 2006). Similarly, researchers found children living in single-parent biological homes, had increased rates of television viewing time as well as increased rates of the children having their own television in their room (Sisson, Broyles, Newton, Baker, & Chernausek, 2011). While it has been found 70% of children meet physical activity recommendations and 54% meet screen-time viewing recommendations, low levels of screen-time may not necessarily predict higher levels of physical activity (Fakhouri, Hughes, Brody, Kit, & Ogden, 2013). Screen time in children may compete with time spent in physical activity. The American Academy of Pediatrics recommends screen-time in children and adolescents be limited to one to two hours and should be avoided for children under the age of two (Media and Children, 2015). These findings suggest future interventions should be developed to decrease screen-viewing time in children and increase activities

that emphasize the role of the family in health and well-being (Turtiainen, Karvonen, & Rahkonen, 2007).

African-American Social Support and Physical Activity

Previously, researchers have determined social support as a primary component for improving the health of African-American families. A key systematic review of qualitative studies provides an extensive compilation of important research on this topic (Siddiqi, Tiro, & Shuval, 2011). This review examined primary barriers and enablers to physical activity in African-American adults and older adults.

Barriers to physical activity in adults and older adults included lack of time (Bopp et al., 2007), lack of motivation (James, Hudson, & Campbell, 2003), and lack of knowledge (Wilbur et al., 2002). Additionally, social and environmental barriers included lack of childcare (Richter, Wilcox, Greaney, Henderson, & Ainsworth, 2002), family responsibilities (Williams, Bezner, Chesbro, & Leavitt, 2006), working long hours (Bopp et al., 2004), lack of space and facilities (Belza et al., 2004), neighborhood safety (Young et al., 2002), and costs of fitness membership or exercise equipment (Belza et al., 2004). Researchers focusing on barriers in older adults suggested physical health concerns of disease (Bragg, Tucker, Kaye, & Desmond, 2009) and fatigue (Bopp et al., 2004) as primary barriers. Additionally, older adults expressed a need for facilities with exercises for older adults who do not feel comfortable exercising with young adults and adolescents (Belza et al., 2004). Additionally, older adults reported weather conditions and traffic as additional barriers (Richter et al., 2002).

Considering these multitudes of barriers in African-American adults and older adults, researchers have found key enabling factors for physical activity in these

populations. Individual level enabling factors included positive physical health and mental health benefits (Harley, Buckworth, et al., 2009), including disease-risk reduction (Williams et al., 2006), and personal enjoyment (Harley, Katz, et al., 2009) were noted. Social enabling factors included the importance of social support to initiate and maintain physical activity. Researchers have found the benefits of having social support through a physically active partner/friend (Harley, Odoms-Young, et al., 2009), structured or group exercise (Harley, Katz, et al., 2009), and the presence of children (Richter et al., 2002), all contribute to increased likelihood of being physically active.

Family-based collectivism is a common cultural norm for many African Americans, where the interests and needs of the family are prioritized over the individual (Hays & Mindel, 1973). This family-based collectivism leads to mutual respect and trust through shared life experiences (Wilson et al., 1995). Through shared life experiences, African-American families oftentimes serve as references for respecting and continuing cultural traditions (Hatchett & Jackson, 1993). African-Americans have been shown to exhibit strength in the bonds between immediate and extended family (Nobles, 2007). Family closeness has been found as an important factor for decreasing major depressive disorder and depressive symptoms in African-Americans (Taylor, Chae, Lincoln, & Chatters, 2015). Considering this, African-American families play a significant influential role in contributing to physically active lifestyles.

Summary

The previous supporting evidence connecting social support and the cultural importance of the African American's family further underscores the importance of social support for physical activity and health. Household structures provide varying

levels of social support to promote physical activity. Social support, especially in minority populations and older adults, has been identified as a primary factor for beginning and maintaining physical activity behaviors. Despite the evidence about the benefits of participating in physical activity, many adults may struggle to begin and maintain healthy habits due to dynamic household structures and levels of social support. Considering the SEM, interpersonal networks serve a primary responsibility of providing social support and behavior modeling to improve healthy habits. Thus, future interventions to increase physical activity in adults should incorporate methods of enhancing social support among individuals, especially in underserved and minority populations (Florindo, Salvador, & Reis, 2013; Russell, Rufus, Fogarty, Fiscella, & Carroll, 2013). This project will investigate the influence of household structure on adult physical activity in a low-income, predominantly African-American, population in central Texas and provide information for health educators to better understand the relationship between household structure and physical activity.

It is imperative for public health workers to develop culturally-appropriate, lasting interventions for communities. Considering the high prevalence of obesity in the United States and the additional increased risk factor of physical inactivity in minority populations, experts should consider these separate, but related issues using the SEM. Because minority populations experience sociocultural stressors and tend to live with increased health problems, the SEM can help researchers address primary levels of influence while also understanding how all of the layers work together. Researchers have illustrated significant health disparities and discrepancies facing minority populations in

the United States and should consider how addressing the interpersonal level of influence for physical activity can contribute to positive and lasting health outcome for individuals.

CHAPTER THREE

Methods

Data Collection

Data were collected using the Community Assessment for Public Health Emergency Response (CASPER). This protocol was developed in 2009 by the Centers for Disease Control and Prevention, National Center for Environmental Health, Division of Environmental Hazards and Health Effects, Health Studies Branch. CASPER methodology has been described by previous researchers (Bayleyegn et al., 2015; Horney, Davis, Davis, & Fleischauer, 2013; Nyaku et al., 2014) and allows health officials to gather data about household-based public health information in a quick, inexpensive, and accurate manner (Bayleyegn et al., 2012).

CASPER is based on four primary objectives: (1) determine the critical health needs and assess the impact of the disaster, (2) characterize the population residing in the area, (3) produce household-based information and estimates for decision-makers, and (4) evaluate the effectiveness of relief efforts through conducting a follow-up CASPER. To best meet these objectives, responders must construct a time-efficient response using a designed assessment for a specific geographic area. This methodology is commonly used to determine public health needs following natural disaster, but can also be utilized in non-emergency settings when public health needs of a community are unknown by assessing health perceptions, health status, and estimating community needs. CASPER

can be implemented quickly, but a successful CASPER requires time establishing the purpose, setting, and availability of resources.

For this project, data were collected as part of the Texas Healthy Communities Project in a partnership between the Waco-McLennan County Public Health Department and the Master of Public Health Program at Baylor University. Experts from the Waco-McLennan County Public Health District selected the zip code 76704 in Waco, TX, as the sampling frame because high obesity levels in 76704 were detected. Based on the leadership capacity of stakeholders and gatekeepers living in 76704 wanting to meet the needs of their community, district leaders applied funding from the Texas Department of State Health Services to assess physical activity and healthy nutrition and develop and pilot an intervention in the neighborhoods of 76704.

Sampling was led by the health professionals from the Texas Department of State Health Services. A two-stage sampling method was conducted in accordance with CASPER recommendations. In the first stage, the research team divided 76704 into pre-defined census blocks according to the United States Census bureau website. Thirty blocks were selected with their probability proportional to the estimated number of housing units in each cluster. Housing units were defined as a house, apartment, mobile home, group of rooms, or single room that is intended to be occupied as separate living quarters. The second stage involved the selection of seven housing units in each census block with the intent to conduct 7 interviews from each census block for a total of 210 household surveys.

Interview teams consisted of Baylor University faculty, Baylor University public health students, Waco-McLennan County Public Health District staff, Texas Department

of State Health and Services employees, and community volunteers. Team roles included a knocker, tracker, and interviewer. In smaller groups, the knocker and tracker roles were combined. The knocker was responsible for knocking on the door and obtaining informed consent to begin the survey. The tracker was responsible for completing the tracking form throughout each cluster to track survey responses. The interviewer was responsible for administering the survey and recording verbal answers on either the paper survey or iPad.

All team members reported to the Waco-McLennan County Public Health District office on Saturday, March 21, 2015, for a one-hour training session before dividing into team roles and entering the community. Interviews were primarily conducted in a morning session and afternoon session, with a lunch break in between and a brief follow-up meeting at the end of the day. Training, lunch, and the follow-up meeting all occurred at the Waco-McLennan County Public Health District office. To obtain additional surveys, interviews were also conducted throughout the subsequent week using the same household selection and interview protocol.

Teams were prepped with supplies and tools to complete household surveys. Interview teams were supplied with the following materials: rain poncho, dog treats, survey incentive for participants, complementary gift bags of information for participants, cluster tracking form, survey, and interviewer identifiers. Ponchos were provided due to inclement weather forecasts that day. Dog treats were issued for teams to present to as a potential distraction for stray dogs in the community as well as any household dogs where surveys were completed. Adults who participated in the survey were offered a ten-dollar gift card to a local grocery store and a bag containing information and items related to upcoming community events and the services provided by the Waco McLennan

County Public Health District. The cluster tracking form was provided per CASPER implementation guidelines to assist in response rate calculation and provide information about each housing unit selected for interviewing. The surveys were conducted orally and responses were recorded either on paper to be later uploaded into a computer or an iPad for automatic submission and upload to the computer. Lastly, interviewer identifiers were placed in the windshield of cars and interviewers wore matching vests to identify themselves in the neighborhoods.

Housing units were selected on site by the interview team using a printed detailed map of the census block from GoogleEarth. Teams randomly selected a starting housing unit in the cluster and traveled through the census block in a serpentine method such that teams will pass along one side of the street before turning down the other side of the street to ensure that every house in the census block is passed. If there was no answer at the selected housing unit, the team marked accordingly on the cluster tracking form to revisit that home later in the day, and then moved on to the next home. Teams revisited the housing unit up to three times to obtain a completed survey, at which time if there was still no answer, teams would move on to another home until seven interviews were complete for that cluster. Once seven interviews were completed, teams returned to the main office to receive materials for another interview cluster. The tracking form was kept separate from the surveys to ensure confidentiality and anonymity.

Informed consent was obtained using the following CASPER protocol.

1. An introduction of the interview team and agency responsible for CASPER
2. Explanation of the purpose of CASPER and benefits to the community
3. Description of the interview and the amount of time required to complete

4. Description of any anticipated discomfort or inconvenience for the participant
5. Explanation that the survey is anonymous and not linked to any personally identifying information
6. Statement that participation is voluntary, can be stopped at any time, and there will be no penalty or loss of benefit for not completing the survey
7. Contact information of the person(s) a participant may contact if there questions about the CASPER or to verify the interview team
8. Clear participation request or invitation that requires an explicit answer.

Confidentiality and anonymity were included in the consent agreement.

Study Participants

CASPER methodology indicates any adult present in the house can report information about himself or herself and his or her household. For this study, any household member who was at least 18 years old, regardless of gender or ethnicity, was eligible to participate in the survey after completing the verbal informed consent. Surveys were completed in 100 (49.0%) of the 204 homes that were approached on March 21, 2015, and during the subsequent week. Residents in the remaining 104 homes declined to participate in this study. In total, there were 274 individuals living in the 100 surveyed homes in which an adult was surveyed.

Measures

For this study, the primary variables of interest were household structure and physical activity. Household structure variables included household size, number of adults (single-adult versus multiple-adult households), number of children (zero children

versus at least one child in the household) living in the home, and receipt of welfare. Household size was calculated by counting all individuals reportedly living in a household. Each household was categorized by number of adults and number of children. Adults were defined as any individuals 18 years or older and children were defined as any individuals 17 years old or younger. Households reporting SNAP, WIC, or free and reduced lunch benefits were categorized as receiving welfare and households not reporting SNAP, WIC or free and reduced lunch benefits were categorized as not receiving welfare.

Physical activity was measured for the adult survey respondent using the International Physical Activity Questionnaire-Short Form (IPAQ-SF) (Craig et al., 2003). The IPAQ was developed as a tool to use in global surveillance to assess physical activity and sedentary behaviors. It has been used worldwide and translated into an estimated 20 languages. The IPAQ provides respondents with a variety of physical activity categories of intensity making this instrument easily self-administered or used in an interview (Ainsworth & Macera, 2012).

The validity and reliability of the IPAQ-SF has been tested with test-reliability scores of 0.34 to 0.93 (Craig et al., 2003; Hagströmer, Oja, & Sjöström, 2006). The validity of the IPAQ-SF has been assessed fair ($r = 0.26$ for 10-minute bouts of exercise and $r = 0.36$ for 1-minute bouts of exercise) compared to objective-based, accelerometer data in African-American populations (Wolin, Heil, Askew, Matthews, & Bennett, 2008). Researchers (Craig et al., 2003) have affirmed the validity ($r = 0.3$) and reliability ($r = 0.8$) of the IPAQ in adult populations, leading others to also implement the IPAQ in low-

income populations (Leach, Mama, Soltero, & Lee, 2014; Lee, Mama, Medina, et al., 2011; Lee, Mama, McAlexander, Adamus, & Medina, 2011).

Participants were asked to report time spent in vigorous activities and moderate activities as defined by the IPAQ-SF. Vigorous activities were defined as activities that take hard physical effort and make the individual breathe much harder than normal. Moderate activities were defined as activities that take moderate effort and make the individual breathe somewhat harder than normal. All activities were measured according to the number of days in the past week and average time spent each day in those activities.

To assess physical activity, time spent in vigorous and moderate activities was converted to MET-minutes per week. One metabolic equivalent (MET) is the amount of energy the body uses at rest (Fletcher, Froelicher, Hartley, Haskell, & Pollock, 1990). A 3-MET activity requires the body to use 3 times the normal amount required at rest. For example, if an individual engages in a 3-MET activity for twenty minutes, he or she has obtained 60 MET-minutes. Additionally, an individual engaging in a 6 MET activity for ten minutes has also obtained 60 MET-minutes of activity (Mealing, Bowles, Merom, & Bauman, 2011) . In this study, moderate physical activity will be defined as 4 METs and vigorous physical activity will be defined as 8 METs according to IPAQ data analysis instructions for physical activity conversions and from previous work of researchers (Ainsworth et al., 2011; Craig et al., 2003). The CDC recommends adults obtain at least 150 minutes of moderate-intensity exercise each week, 75 minutes of vigorous-intensity exercise each week, or some combination of both (CDC, 2015c).

In this sample, time each respondent reported engaging in physical activity will be converted to MET-minutes and compared to CDC recommendations. Following CDC recommendations (2015c) and IPAQ data analysis instructions, 150 minutes of moderate physical activity times 4 METs equals 600 MET-minutes per week or 75 minutes of vigorous physical activity times 8 METs equals 600 MET-minutes per week. Individuals will be categorized according to whether physical activity recommendations were met or not. Adults who report at least 600 MET-minutes per week have met recommendations and adults who report less than 600 MET-minutes per week have not met recommendations (IPAQ, 2008).

Statistical Analysis

All survey data from paper sources and iPads were merged into a single Microsoft Excel file for data management and statistical analyses in Excel and SAS v.9.4.

First, descriptive statistics, including frequencies, proportions, and means were used to describe individual-level and household-level variables. These variables included age, gender, race, household structure, meeting physical activity recommendations or not, and receipt of welfare.

Physical activity was measured by converting time spent in moderate-to-vigorous physical activity to MET-minutes and then categorized as meeting or not meeting physical activity recommendations as outlined by the CDC (2015c). MET-minutes were evaluated for outliers and winsorizing was used to top-code values considered to be out of range. For example, one adult respondent reported twenty-four hours of vigorous physical activity and twenty-four hours of moderate physical activity on a typical day. Another adult respondent reported vigorous physical activity during ten days of the

previous week. To correct these errors and outliers in the data, MET-minutes were winsorized. The practice of winsorizing is consistent with other investigations (Bui et al., 2015; Burzynska et al., 2014). For this project, the top 10% of self-reported MET-minutes were top-coded with the 90th percentile of MET-minutes. Therefore, for this study, the largest value for MET-minutes per week is 13,200 MET-minutes. Before winsorizing, the mean MET-minutes was 5245.5 per week. After winsorizing, the mean MET-minutes were reduced to 3408.2 per week. Median MET-minutes of physical activity were not affected by winsorizing. We reported the winsorized mean and median MET-minutes of physical activity per week, and used these corrected data to determine the proportion of adults who met physical activity recommendations. MET-minutes and proportion meeting recommendations was reported for the total sample population and by household structure.

Second, student t-tests and chi-square tests were used to evaluate the differences in physical activity by household structure. Student t-tests were used to assess household structure differences in mean MET-minutes of physical per week. The Wilcoxon-Mann-Whitney test was used to test differences in median MET-minutes of physical activity per week. Chi-square tests were used to evaluate the relationship between household structure and the proportion of adults meeting physical activity recommendations.

Third, potential covariates that may confound the relationship between household structure and meeting physical activity recommendations were considered. These variables included average age of adults living in the home and receipt of welfare. Logistic regression was used to model the log-odds of meeting vs. not meeting physical activity recommendations. Bivariate logistic regression was used to determine the

relationship between each household structure and potential covariate and meeting vs. not meeting recommendations. Multivariate logistic regression was used to determine the relationship between household structure and meeting vs. not meeting recommendations, adjusting for covariates. Results are presented as odds ratios (ORs) and corresponding 95% confidence intervals (CIs). Statistical significance was defined *a priori* at the α =0.05 level.

CHAPTER FOUR

Investigating How the Household Influences Adult Physical Activity in a Low-income Community

Abstract

Objective. This study assessed the association between household structure and adult physical activity.

Methods. Data were collected using Community Assessment for Public Health Emergency Response (CASPER) methodology to identify households (n=100) and administer a survey about household structure and health behaviors. Household structure was defined according to adults (≥1 vs. 1) and children living in the household (>1 vs. 0). Physical activity was measured using the International Physical Activity Questionnaire-Short Form and converted to MET-minutes.

Results. In this study, adults from multi-adult households reported more MET-minutes of physical activity per week than adults from single adult households (p=0.049). Adults in multiple-adult households were twice as likely to meet recommendations compared to those from single-adult households (OR=2.41; 95%CI:1.05,5.52; p=0.04). Children in the household was not associated with adult physical activity.

Conclusions and Implications. CASPER is a useful tool to identify health behaviors in a local area. Future physical activity programs should focus on social support for adults.

Introduction

Obesity rates in the United States have doubled among adults and tripled among children in the past thirty-five years (Centers for Disease Control and Prevention (CDC), 2015a; The State of Obesity, n.d.). The average American adult today weighs twenty-four pounds more than the average American adult in 1960 (The State of Obesity, n.d.) and more than one-third of adults in the United States today are obese (2015a). High levels of obesity cost the United States an estimated $147 billion dollars in medical costs in 2008 and the average obese individual had $1,429 more medical expenses per year than individuals of normal weight (Ogden et al., 2014). Some researchers (Ogden et al., 2014) have suggested childhood obesity rates have recently stabilized in the United States; nevertheless, Americans must find ways to better the health of the population and decrease the prevalence of obesity.

Physical activity affords numerous health benefits for individuals (Burton & VanHeest, 2007; Milteer et al., 2012) and is one of the primary ways to decrease obesity (Anokye et al., 2012; Hamilton et al., 2007; S. C. Moore et al., 2012). The CDC recommends adults obtain at least 150 minutes of moderate-intensity exercise per week, 75 minutes of vigorous-intensity exercise, or some combination of both (2015c). Additional physical activity recommendations for older adults include emphasizing participation in moderate-intensity, muscle-strengthening, and flexibility activities, while also reducing sedentary behavior and improving risk management.

Despite the known benefits of physical activity, nearly one in four (23.7%) of adults in the United States reported no participation in leisure-time physical activity (Nutrition, Physical Activity and Obesity Data, Trends and Maps web site, 2015). Also,

an estimated 59.0% of African-American high school students did not obtain at least sixty minutes of physical activity per day on five or more days and an estimated 21.5% of African-American high school students did not obtain at least sixty minutes of physical activity on one day (CDC, 2015b). Furthermore, an estimated 35-44% of adults 75 years or older are physically active and 28-34% of adults ages 65-74 are physically active (CDC, 2016). Physical inactivity increases with age from 26.1% to 33.4%, 40.0%, and 52.4% among adults 18 to 44, 45 to 64, 65 to 74, and ≥75 years of age, respectively (Go, et al., 2013). The combination of low rates of physical activity in these populations present health education specialists a challenge to improving overall quality of life.

Promoting physical activity behaviors in individuals proves difficult as complex influences may impede or promote the development and maintenance of healthy behaviors. The Social Ecological Model (SEM) illustrates how social and physical environments may influence individual behaviors. The interpersonal level includes close relationships individuals have such with others including family members, roommates, and friends. These relationships may contribute positively or negatively to an individual's likelihood of engaging in healthy behaviors, such as being physically active. For example, a negative influence may come from a roommate who prefers to watch television while a positive influence may come from another friend who participates regularly in a running or cycling club. Using the multi-level approach proposed by the SEM, health educators can address outside influences in addition to addressing individual-level factors related with regular participation in physical activity.

Previous studies have incorporated a social ecological approach to promoting physical activity behaviors in individuals (Cleland et al., 2014; Kegler, Swan, Alcantara,

Feldman, & Glanz, 2014). Within the household, marriage, parenthood, mother's employment, and socioeconomic status have been attributed to well-being. (Ross et al., 1990). Compared to non-married families, married families reported increased social support leading to decreased stress, rates of disease, and sickness. In families with children, children negatively affected health of adults or did not affect health at all due to increased financial strains and less adult social support as parents focused time and energy on children. Mother's employment and socioeconomic status were attributed to a sense of control and ability to mobilize resources needed to be healthy. In addition, African-American populations may experience social and cultural isolation and have highlighted a need for physical activity programs that enhance social support (Belza et al., 2004; King, 2001). African-American adult men and women have expressed a need for social support to regularly participate in physical activity (Kirchhoff et al., 2008; Wilcox et al., 2005). As adults age, the likelihood of being physically active decreases (Schutzer & Graves, 2004). By increasing older adults' self-efficacy and social support for physical activity, long-term maintenance of physical activity may be improved (McAuley et al., 2003). This emphasis on how household relationships and socioeconomic status contribute to positive health and older adults and African-American populations expressing a need for support to be physically active suggests household structure may play a significant role in increasing physical activity behaviors.

This study examined the interpersonal influences of the SEM by investigating household structure and physical activity levels among adults in a low-income community. However, the relationship between various household structures and sizes and physical activity in low-income communities is less certain. The findings from this

research may provide health educators with a greater understanding of how household structures and interpersonal influences can contribute to individuals meeting physical activity recommendations.

Methods

This study occurred as part of the Texas Healthy Communities Project in a partnership between the Waco-McLennan County Public Health District and the Master of Public Health program at Baylor University. Households were selected using the Center for Disease Control and Prevention's (CDC) Community Assessment for Public Health Emergency Response (CASPER) methodology. CASPER methodology has been described previously (Bayleyegn et al., 2015; Horney, Davis, Davis, & Fleischauer, 2013; Nyaku et al., 2014) and allows health officials to gather data about household-based public health information in a quick, inexpensive, and accurate manner (Bayleyegn et al., 2012). A two-stage sampling method was conducted, according to CASPER recommendations. The first stage divided 76704 into pre-defined census blocks according to the United States Census bureau website. The second stage involved the selection of seven housing units in each census block with the intent to conduct 7 interviews from each census block for a total of 210 household surveys. All interviewers reported to the McLennan County Public Health District office on Saturday, March 21, 2015, for a one-hour training session before dividing into team roles and entering the community.

CASPER methodology indicates any adult present in the house can report information about the household. For this study, any household member who was at least 18 years old, regardless of gender or ethnicity, was eligible to participate in the survey after completing the verbal informed consent. Paper and iPad surveys were completed in

100 (49.0%) of the 204 homes that were approached on March 21, 2015, and during the subsequent week. Residents in the remaining 104 homes declined to participate in this study. In total, there were 274 individuals reportedly living in the 100 surveyed homes.

An adult respondent for participating households provided information on household demographics, healthy eating, and moderate-to-vigorous physical activity as part of a larger study (Ylitalo KR, Stone K, Umstattd Meyer MR, Doyle EI, Curtis R., in press). For this study, the primary variables of interest are household structure and moderate-to-vigorous physical activity. Household structure variables included household size, number of adults (single-adult versus multiple-adult households), and number of children (zero children versus at least one child in the household) living in the home. Household size was calculated by counting all individuals reportedly living in a household. Each household was categorized by number of adults and number of children. Adults were defined as any individuals 18 years or older and children were defined as any individuals 17 years old or younger. Receipt of welfare was a dichotomous variable determined by a question about receiving SNAP, WIC, or free and reduced lunch benefits. Households receiving SNAP, WIC, or free and reduced lunch benefits were classified as receiving welfare and households not receiving SNAP, WIC, or free and reduced lunch benefits were classified as not receiving welfare.

To assess moderate-to-vigorous physical activity, time spent in vigorous and moderate physical activities was converted to MET-minutes per week. One metabolic equivalent (MET) is the amount of energy the body uses at rest (Fletcher et al., 1990). In this sample, time each respondent reported engaging in moderate-to-vigorous physical activity was converted to MET-minutes and compared to CDC recommendations.

Following CDC recommendations (2015c) and IPAQ data analysis instructions, 150 minutes of moderate physical activity times 4 METs equals 600 MET-minutes per week, or 75 minutes of vigorous physical activity times 8 METs equals 600 MET-minutes per week. Individuals will be categorized according to whether physical activity recommendations were met or not. Adults who report at least 600 MET-minutes per week meet recommendations and adults who report less than 600 MET-minutes per week do not meet recommendations (IPAQ, 2008).

All survey data from paper and iPads were merged into a single Microsoft Excel file for data management and statistical analyses in Excel and SAS v.9.4.

First, descriptive statistics, including frequencies, proportions, and means were used to describe individual-level and household-level variables. These variables included age, gender, race, household structure, meeting physical activity recommendations or not, and receipt of welfare.

Physical activity MET-minutes were evaluated for outliers. To correct these errors and outliers in the data, MET-minutes were winsorized. The practice of winsorizing is consistent with other investigations (Bui et al., 2015; Burzynska et al., 2014). For this study, the top 10% of self-reported MET-minutes were top-coded with the 90^{th} percentile of MET-minutes. For example, one adult respondent reported twenty-four hours of vigorous physical activity and twenty-four hours of moderate physical activity on a typical day. Another adult respondent reported vigorous physical activity during ten days of the previous week. Therefore, for this study, the largest value for MET-minutes per week is 13,200 MET-minutes. Before winsorizing, the mean MET-minutes were 5245.5 per week. After winsorizing, the mean MET-minutes were reduced to 3408.2 per week.

Median MET-minutes of moderate-to-vigorous physical activity were not affected by winsorizing. We reported the winsorized mean and median MET-minutes of moderate-to-vigorous physical activity per week, and used these corrected data to determine the proportion of adults who met physical activity recommendations. MET-minutes and proportion of adults meeting recommendations were reported for the total sample population and by household structure.

Second, student t-tests and chi-square tests were used to evaluate the differences in moderate-to-vigorous physical activity by household structure. Student t-tests were used to assess household structure differences in mean MET-minutes of moderate-to-vigorous physical activity per week. The Wilcoxon-Mann-Whitney test was used to test differences in median MET-minutes of moderate-to-vigorous physical activity per week. Chi-square tests were used to evaluate the relationship between household structure and the proportion of adults meeting physical activity recommendations.

Third, potential covariates that may confound the relationship between household structure and meeting physical activity recommendations were considered. These variables included average age of adults living in the home and receipt of welfare. Logistic regression was used to model the log-odds of meeting vs. not meeting physical activity recommendations. Bivariate logistic regression was used to determine the relationship between each household structure and potential covariate and meeting vs. not meeting recommendations. Multivariate logistic regression was used to determine the relationship between household structure and meeting vs. not meeting recommendations, adjusting for covariates. Results are presented as odds ratios (ORs) and corresponding

95% confidence intervals (CIs). Statistical significance was defined *a priori* at the α =0.05 level.

Results

Descriptive Results

The sociodemographic characteristics describing the 274 individuals residing in the sample households appear in Table 1. Regarding age, 31.7% of individuals were <18 years, 31.3% were 18-44 years, 20.4% were 45-64 years, and 16.5% were 65 years and older. The majority of the sample was female (58.0%). Considering race, 82.8% identified as black, 0.4% as white, 13.9% as Hispanic, 1.5% as other, and 1.5% did not provide information on race/ethnicity.

The 2010-2014 American Community Survey 5-Year Estimates were used to determine characteristics of the 8,044 individuals residing in zip code 76704. In 76704, 30.4% of residents are <18 years, 32.0% are 18-44 years, 21.7% are 45-64 years, and 16.0% are ≥65 years; 52.9% are female and 47.1% are male; and 76.6% identified as black, 7.3% as white, 12.2% as Hispanic, and 4% as other.

The sociodemographic characteristics describing the 100 sample households in the CASPER sample appear in Table 2. The mean household age of adults ≥18 years was 49.5 ± 17.2 and the mean household age of children <18 was 7.9 ± 5.0. There were forty-two households with only one adult resident and fifty-eight households with two or more adult residents. There were sixty households with no children and forty households with at least one child resident. The mean household size was 2.72 ± 1.54. Fifty households

were classified not receiving welfare and fifty households were classified receiving welfare.

Table 4.1 Sociodemographic characteristics of residents in sample households (n=274) in study and zip code, CASPER, 2015.

Characteristic	Study and zip code		U.S. Census
	n	%	%
Age			
<18	90	31.7	30.4
18-44	89	31.3	32.0
45-64	58	20.4	21.7
65+	47	16.5	16.0
Missing	0	0.0	-
Sex			
Male	112	40.9	47.1
Female	159	58.0	52.9
Missing	3	1.1	-
Race			
Black	227	82.8	76.6
White	1	0.4	7.3
Hispanic	38	13.9	12.2
Other	4	1.5	4
Missing	4	1.5	-

Notes. U.S. Census Bureau, 2010-2014 5-Year American Community Survey estimates from zip code 76704.

The physical activity characteristics of households in the study population appear in Table 3. The mean physical activity per week for the adult household respondent was 3408.2 MET-minutes (±4485.3) and the median physical activity was 1460.0 MET-minutes (IQR 4040.0). Adults who lived in multi-adult households reported significantly more MET-minutes per week compared to adults who lived in single-adult households (p=0.049). Median MET-minutes per week was significantly higher for adult respondents from multi-adult households compared to single-adult households (p=0.04). Overall,

sixty-two percent of adult respondents met physical activity recommendations. A greater proportion adult respondents from multiple-adult households met physical activity recommendations compared adult respondents from single adult households (p=0.04).

Mean MET-minutes of physical activity per week were not significantly different between households with at least one child and households with zero children (p=0.89). The proportion of adult respondents from households with at least one child who met recommendations was not significantly different from the proportion of adult respondents from households with no children who met recommendations (p=0.61).

Table 4.2. Sociodemographic characteristics of households (n=100) in study and zip code, CASPER, 2015.

Characteristic	Study and zip code	
	%	Avg (sd)
Average Age (years)		
Adults (18+)		49.5 (17.2)
Children (<18)		7.9 (5.0)
Household Structure		
Adults in House		
1 Adult	42.0	
>1 Adult	58.0	
Children in House		
0 Children	60.0	
≥1 Child	40.0	
Household Size		2.72 (1.54)
One	28.0	
Two	19.0	
Three	24.0	
Four or more	29.0	
Receipt of Welfare		
Yes	50.0	
No	50.0	

Table 4.3. Physical activity of households (n=100) in study and zip code, CASPER 2015.

Characteristic	Total	Adults in Household			Children in Household		
		>1 Adult	1 Adult	p	≥ 1 Child	0 Children	p
Average MET-minutes per Week (minutes (standard deviation))	3408.2 (4485.3)	4158.3 (4845.8)	2372.4 (3746.6)	0.049	3335.0 (4775.9)	3457.0 (4321.3)	0.89
Median MET-minutes per Week (minutes (interquartile range))	1460.0 (4040.0)	1680.0 (6960.0)	700.0 (3600.0)	0.04	1020.0 (3640.0)	1680.0 (4840.0)	0.62
Meeting Recommendations (%)							
Yes	62.0	70.7	50.0	0.04	65.0	60.0	0.61
No	38.0	29.3	50.0		35.0	40.0	

Notes. Student t-tests were used to generate p-values between average MET-minutes per week. The Wilcoxon-Mann-Whitney test was used to generate p-values between median MET-minutes per week. Chi-square tests were used to generate p-values between households meeting and not meeting recommendations.

Bivariate and Multivariate Results

The odds ratios (OR) and 95% confidence intervals (CI) for meeting physical activity recommendations vs. not meeting recommendations appear in Table 4. Bivariate (unadjusted) logistic regression analyses of each independent variable (≥1 adult household structure, >1 child household structure, average adult household age, and receipt of welfare) and the log-odds of meeting vs. not meeting physical activity recommendations appear in the first column. Adult respondents from multiple-adult households were more than twice as likely to meet recommendations than adult respondents from single-adult households (OR=2.41; 95% CI:1.05,5.52; p=0.04). Adult respondents from households with at least one child appeared more likely to meet recommendations compared to adult respondents from households with no children (OR=1.24, 95% CI: 0.54, 2.84; p=0.61), but results were not significant at the α=0.05 level. Average adult household age was significantly associated with meeting recommendations. Every one-year increase in average adult household age decreased the odds of meeting recommendations by approximately 4% (OR=0.96; 95% CI: 0.94, 0.99; p=0.004). Adult respondents from households classified as receiving welfare were less likely to meet recommendations compared to adult respondents from households not receiving welfare (OR=0.84; 95% CI: 0.38, 1.89; p=0.68), but results were not significant at the α=0.05 level.

Models 1 and 2 consist of adjusted odds ratios and corresponding 95% confidence intervals from multivariate logistic regression analyses. Adult respondents from multiple-adult households are more likely to meet recommendations than adult respondents in single-adult households, but results were not significant at the α=0.05 level after

adjusting for average household age of adults and receipt of welfare (OR=1.71; 95% CI: 0.70, 4.2; p=0.25). Likewise, after adjusting for average household age of adults and receipt of welfare, child household structure was not associated with meeting physical activity recommendations at the α=0.05 level (OR=0.55; 95% CI: 0.18, 1.68; p=0.30). Average household age of adults was significantly associated with meeting physical activity recommendations in both multivariate models. An increase in average household age of adults was inversely associated with meeting recommendations.

Discussion and Conclusions

The purpose of this study was to assess the association between household structure and adult physical activity in a predominantly African-American community. Findings from our study indicate that adult respondents in multiple-adult households reported more MET-minutes of physical activity compared to adult respondents in single-adult households. More MET-minutes translated to higher proportions of adults meeting CDC physical activity recommendations. Thus, adult respondents in multiple-adult households were more likely to meet physical activity recommendations compared to adult respondents in single-adult households. One possible mechanism by which household structure may influence physical activity is that individuals living in a household may have increased opportunity to extend and receive positive social support to engage in healthy behaviors.

Our work is consistent with previously published studies based on African-American men and women who emphasized the need for physical activity programs that enhance social support (Joseph, Ainsworth, Keller, & Dodgson, 2015). Our study posits that household structures with multiple adults may experience increased social support

for physical activity. In African-American populations, primary barriers to physical activity include lack of motivation (James et al., 2003), knowledge (Wilbur et al., 2002), and social support (Belza et al., 2004), but enabling factors such as positive physical and mental health (Harley, Buckworth, et al., 2009) and social support through a physically active partner or friend (Harley, Odoms-Young, et al., 2009) have been previously identified. Researchers (Kirchhoff et al., 2008; Wilcox et al., 2005) have not only identified social support of paramount importance in African-Americans for regularly participating in physical activity, but also when making and maintaining health behavior changes at any level (Russell et al., 2013). The link between household structures with multiple adults that may provide increased social support for increasing levels of physical activity is relevant for future program implementation in African-American, adult populations. Understanding that individuals may receive positive health benefits of social interactions with others in and outside the house, it is not surprising to consider how social interactions may lead to increased physical activity behaviors in settings such as group exercise classes, home-based programs, or walking, running, and cycling clubs. Our work re-emphasizes the importance of how various household structures and relationships within may increase opportunities of social support for increased physical activity behaviors in adults.

In our study, adult physical activity was not associated with children in the household as there were no significant differences in adult MET-minutes of physical activity per week in households with at least one child compared to households with zero children. In addition, adult respondents in households with at least one child were not

Table 4.4. Odds ratios (95% CI) for meeting physical activity recommendations, CASPER 2015.

	Bivariate			Model 1			Model 2		
	OR	95% CI	p	OR	95% CI	p	OR	95% CI	p
Household Structure									
Mult Adult (>1 vs. 1 adult)	2.41	(1.05, 5.52)	0.04	1.71	(0.70, 4.2)	0.25			
Any child (≥1 vs. 0 children)	1.24	(0.54, 2.84)	0.61				0.55	(0.18, 1.68)	0.30
Average Adult Age (yrs)	0.96	(0.94, 0.99)	0.004	0.97	(0.94, 0.99)	0.01	0.95	(0.92, 0.98)	0.002
Receipt of Welfare (yes vs. no)	0.84	(0.38, 1.89)	0.68	0.76	(0.31, 1.86)	0.54	0.79	(0.31, 1.98)	0.61

Notes. Model 1 & 2 are multivariate (adjusted) ORs for meeting vs. not meeting recommendations.

more likely to meet physical activity recommendations compared to adult respondents in households with zero children. Our results are inconsistent with previously published studies where adults with children reported less physical activity compared to adults without children (Grace et al., 2006; Nielsen et al., 2006). The day-to-day responsibilities and barriers of time associated with having children in the house may lead to a decreased time spent in physical activity for adults (Bellows-Riecken & Rhodes, 2008; Seefeldt et al., 2012).

While parental support for physical activity is important (Loprinzi & Trost, 2010), researchers have determined that a lack of childcare opportunities for African-American adults (Richter et al., 2002), family responsibilities (Williams et al., 2006), and social pressures to care for the family (Janisse et al., 2004) present additional barriers to physical activity. These same barriers may challenge our study population and prevent adults from being physically active. However, it is important to consider that African-American women have identified themselves as role models for physical activity in the family (Wilbur et al., 2002). Our findings along with findings from previously published studies are counterintuitive because of the increased opportunities adults in the house have with children to provide social support and role-modeling healthy behaviors for children. Thus, future research is needed, particularly among African-Americans to determine how various household structures may contribute to increased social support and behavior modeling for children, and in return, increases adult physical activity.

Average adult age was a significant predictor of whether or not adults would meet physical activity recommendations. As average adult age increased, the likelihood of meeting physical activity recommendations decreased. Furthermore, average adult

household age mitigated the effect of household structure. Our findings are consistent with previously published research where older adults are less physically active compared to younger adults in urban neighborhoods (Hillier, Tappe, Cannuscio, Karpyn, & Glanz, 2014). One potential reason that lower levels of physical activity have ben observed among older adults is that older adults may experience fear of falls or injury with physical activity (Ambrose, Paul, & Hausdorff, 2013; Schutzer & Graves, 2004). This is an important consideration in our study population where the average age of adults was 49.5 years old and many adult respondents reported households that depicted mixed generations living in the same home.

Increasing physical activity among older adults presents unique challenges for public health professionals. The presence of mixed-generation and older-adult households may present a challenge to developing appropriate physical activity programs that increase social support across a wider age range. Previously published studies indicate web-based physical activity programs may be effective for increasing physical activity in underserved populations (Massoudi et al., 2010; Parks, Housemann, & Brownson, 2003). Thus, developing home-based physical activity programs (Fanning et al., 2015) and programs that incorporate additional non-face-to-face physical activity interventions such as phone calls, letters in the mail (Müller & Khoo, 2014), and text messaging (Müller, Khoo, & Morris, 2016) should be considered when working with older adults. Also, because walking is safer and preferred in older adults (McAuley et al., 2003), health educators should seek to improve the built environment and increase availability, affordability, and safety of churches (Bopp et al., 2007), parks (Mowen et al., 2007), and recreation centers. Lastly, it has been suggested that physicians in contact regularly with

their older adult patients may play an important role in helping older adults begin and maintain physical activity behaviors (Schutzer & Graves, 2004).

Our study findings suggest that household structure may influence physical activity levels, particularly in older adults. We considered the SEM framework for this study because it provides an explanation of additional factors in the social and physical environment that influence an individual's behaviors. Interpersonal influences provide areas and relationship opportunities for individuals to increase social support. One possible explanation for our findings is that larger household sizes have more residents that may extend and receive more social support compared to households of smaller size. Another possible explanation is that larger household sizes may have higher incomes, thus increasing opportunities to be physically active. Our work stresses the need to consider the possible influences of various household structures for physical activity programs that increase social support in older adults. In addition, our work highlights the usefulness the SEM framework provides health educators to develop intervention and education efforts that include interpersonal physical and social environmental factors associated with intrapersonal health behavior change.

Limitations

There are four primary limitations to this study. First, physical activity levels were measured through participant recall. Self-reported physical activity may be biased if participants over report physical activity levels for social desirability. Although this study used the IPAQ-SF, a previously validated self-report measure of physical activity (Craig et al., 2003), over-reporting of physical activity is likely. This may have over-inflated the percentage of households with adult respondents who met physical activity

recommendations. Future research should incorporate objective measures of physical activity through accelerometers or other fitness trackers to compare to subjective, recall, and self-report measures of physical activity.

A second limitation of this study is the generalizability of results to other populations. Because participants were selected from a single zip code in Waco, TX, the relationship between household structure and physical activity in a southern, low-income community may not be generalizable to all household structures and populations in the United States. Environmental, societal, and cultural influences in other regions of the United States may influence physical activity behaviors differently than in our community. Future research should include diverse low-income sample sizes in other regions of the United States to investigate influences on adult physical activity behaviors.

A third limitation of this study is the possibility of selection bias in the method used to select the adult respondent to participate in the survey. Because the bulk of primary data collection occurred on a Saturday morning and afternoon, a bias would have occurred if adults away from home at the time of the survey had different levels of physical activity than adults at home. Future research could increase participation rates by collecting physical activity data for all of the adults in the household, or during multiple times and days.

A fourth limitation of this study is that we measured household structure and physical activity in adults, but the mechanism by which household structure may influence adult physical activity is unmeasured. We hypothesized that households with more adults and children would produce higher levels of positive social support and would lead to increased physical activity behaviors; however, the number of individuals

living in a household may not always contribute to increased positive social support. Our sample included predominantly older adults and mixed-generation households. These types of household structures may not necessarily produce higher levels of social support for physical activity behaviors. In addition, our households may have experienced additional barriers to healthy living. For example, some individuals may have jobs that require longer work hours or have other conflicting responsibilities contributing to decreased time spent in the house. Future research may wish to include measures of perceived social support between household residents to elucidate possible mechanisms between household structure and physical activity among adults.

Nevertheless, our study has notable strengths. Our study utilized the CDC's CASPER methodology. This methodology provides a quick, accurate, and cost-efficient plan for collecting public health data about a local community (T. Bayleyegn et al., 2012). In addition, our survey incorporated a previously validated scale for physical activity using the IPAQ-SF (Craig et al., 2003). Thus, our research design was strengthened by utilizing CASPER methodology and the IPAQ-SF.

Second, this study is unique because it provides the first data about healthy living behaviors in the 76704 zip code. This is important because of the strong leadership, commitment, and interest of gatekeepers and stakeholders in this community seeking to improve the quality of life of their residents. While the sample size for this study was relatively small (n=100), the sociodemographic characteristics of residents of the sample households compared similarly to the United States census data for 76704 in terms of age, gender, and race/ethnicity distribution.

Third, this study has reinforced the relevance of the interpersonal level of the SEM. Household structure and relationships may contribute to increased social support and thus increased physical activity among adults. Because positive health behavior changes prove complex at the individual level, the SEM can guide public health professionals because it provides an illustration about various levels of influence that affect decision-making of individuals. Because our study had a higher proportion of older adults, our findings have emphasized the increased need of increasing social support in older adults to improve physical activity levels.

Implications for Future Research and Practice

The results of this study emphasized the importance of considering household structure as a focal point for health educators to increase physical activity among adults. Our study indicated that as adults increase in age, the likelihood of meeting physical activity recommendations decreases. As a result, future interventions should focus on older adults and further investigate the role various household structures influence the exchange of social support among household members. Even more, there is a need for culturally-appropriate and age-appropriate physical activity behavior interventions. Social support is known to improve physical activity behaviors in adults (Belza et al., 2004; Bopp et al., 2004). Also, behavior modeling, remains important in African-American populations (Tavares & Plotnikoff, 2008; Wilbur et al., 2002). Although our findings were inconsistent with previously published studies on adult physical activity and children, parents should seek to increase physical activity with their children by emphasizing play time and spending time at parks (Loprinzi & Trost, 2010) as well as instilling healthy habits their children will sustain as adults (Quarmby, 2013).

Regularly participating in physical activity is a primary way to mitigate the rising rates of obesity and associated health care expenditures in the United States. Individuals living with obesity may experience other chronic conditions including: type II diabetes (Gallagher & LeRoith, 2015), cancer (P. J. Goodwin & Stambolic, 2015), and poorer health-related quality of life (Cameron et al., 2012). Particularly in minority populations that may experience higher rates of chronic diseases compared to other populations, the health benefits and chronic disease risk reduction afforded by participating regularly in physical activity are numerous (Dickie et al., 2014) including: reduced risk of hypertension (Huai et al., 2013), decreased risk for all-cause mortality (Samitz et al., 2011), and decreased clinical depression (Loprinzi, 2013). By seeking to eliminate health disparities and improve the health of all people as outlined in Healthy People 2020, public health professionals can utilize a multi-level approach that incorporates intrapersonal and interpersonal factors when developing physical activity interventions in their communities.

BIBLIOGRAPHY

Adamo, K. B., Langlois, K. A., Brett, K. E., & Colley, R. C. (2012). Young children and parental physical activity levels: findings from the Canadian health measures survey. *American Journal of Preventive Medicine*, *43*(2), 168–175. http://doi.org/10.1016/j.amepre.2012.02.032

Ahmed, N. U., Smith, G. L., Flores, A. M., Pamies, R. J., Mason, H. R. C., Woods, K. F., & Stain, S. C. (2005). Racial/ethnic disparity and predictors of leisure-time physical activity among U.S. men. *Ethnicity & Disease*, *15*(1), 40–52.

Ainsworth, B. E., Haskell, W. L., Herrmann, S. D., Meckes, N., Bassett Jr., D. R., Tudor-Locke, C., … Leon, A. S. (2011). 2011 Compendium of Physical Activities: A Second Update of Codes and MET Values. *Medicine & Science in Sports & Exercise*, *43*(8), 1575–1581. http://doi.org/10.1249/MSS.0b013e31821ece12

Ainsworth, B. E., & Macera, C. A. (2012). *Physical activity and public health practice*. Retrieved from http://public.eblib.com/choice/publicfullrecord.aspx?p=870701

Ambrose, A. F., Paul, G., & Hausdorff, J. M. (2013). Risk factors for falls among older adults: A review of the literature. *Maturitas*, *75*(1), 51–61. http://doi.org/10.1016/j.maturitas.2013.02.009

Anokye, N. K., Trueman, P., Green, C., Pavey, T. G., & Taylor, R. S. (2012). Physical activity and health related quality of life. *BMC Public Health*, *12*(1), 624. http://doi.org/10.1186/1471-2458-12-624

Bagley, S., Salmon, J., & Crawford, D. (2006). Family Structure and Children's Television Viewing and Physical Activity: *Medicine & Science in Sports & Exercise*, *38*(5), 910–918. http://doi.org/10.1249/01.mss.0000218132.68268.f4

Ball, K., Jeffery, R. W., Abbott, G., McNaughton, S. A., & Crawford, D. (2010). Is healthy behavior contagious: associations of social norms with physical activity and healthy eating. *The International Journal of Behavioral Nutrition and Physical Activity*, *7*, 86. http://doi.org/10.1186/1479-5868-7-86

Barber, F. D. (2013). Effects of social support on physical activity, self-efficacy, and quality of life in adult cancer survivors and their caregivers. *Oncology Nursing Forum*, *40*(5), 481–489. http://doi.org/10.1188/13.ONF.481-489

Baruth, M., Wilcox, S., Saunders, R. P., Hooker, S. P., Hussey, J. R., & Blair, S. N. (2013). Perceived environmental church support and physical activity among Black church members. *Health Education & Behavior: The Official Publication of the Society for Public Health Education*, *40*(6), 712–720. http://doi.org/10.1177/1090198113477110

Bayleyegn, T. M., Schnall, A. H., Ballou, S. G., Zane, D. F., Burrer, S. L., Noe, R. S., & Wolkin, A. F. (2015). Use of Community Assessments for Public Health Emergency Response (CASPERs) to Rapidly Assess Public Health Issues — United States, 2003-2012. *Prehospital and Disaster Medicine*, *FirstView*, 1–8. http://doi.org/10.1017/S1049023X15004938

Bayleyegn, T., Vagi, S., Schnall, A., Podgornik, M., Noe, R., & Wolkin, A. (2012). Community Assessment for Public Health Emergency Response (CASPER) Toolkit. Centers for Disease Control and Prevention Division of Environmental Hazards and Health Effects Health Studies Branch. Retrieved from http://emergency.cdc.gov/disasters/surveillance/pdf/CASPER_Toolkit_Version_2_0_508_Compliant.pdf

Bellows-Riecken, K. H., & Rhodes, R. E. (2008). A birth of inactivity? A review of physical activity and parenthood. *Preventive Medicine*, *46*(2), 99–110. http://doi.org/10.1016/j.ypmed.2007.08.003

Belza, B., Walwick, J., Shiu-Thornton, S., Schwartz, S., Taylor, M., & LoGerfo, J. (2004). Older adult perspectives on physical activity and exercise: voices from multiple cultures. *Preventing Chronic Disease*, *1*(4), A09.

Boarnet, M. G., Anderson, C. L., Day, K., McMillan, T., & Alfonzo, M. (2005). Evaluation of the California Safe Routes to School legislation. *American Journal of Preventive Medicine*, *28*(2), 134–140. http://doi.org/10.1016/j.amepre.2004.10.026

Booth, M. L., Owen, N., Bauman, A., Clavisi, O., & Leslie, E. (2000). Social-cognitive and perceived environment influences associated with physical activity in older Australians. *Preventive Medicine*, *31*(1), 15–22. http://doi.org/10.1006/pmed.2000.0661

Bopp, M., Lattimore, D., Wilcox, S., Laken, M., McClorin, L., Swinton, R., … Bryant, D. (2007). Understanding physical activity participation in members of an African American church: a qualitative study. *Health Education Research*, *22*(6), 815–826.

Bopp, M., Wilcox, S., Oberrecht, L., Kammermann, S., & McElmurray, C. T. (2004). Correlates of strength training in older rural African American and Caucasian women. *Women & Health*, *40*(1), 1–20.

Bragg, M. A., Tucker, C. M., Kaye, L. B., & Desmond, F. (2009). Motivators of and Barriers to Engaging in Physical Activity: Perspectives of Low-Income Culturally Diverse Adolescents and Adults. *American Journal of Health Education*, *40*(3), 146–154.

Brisbois, T. D., Farmer, A. P., & McCargar, L. J. (2012). Early markers of adult obesity: a review. *Obesity Reviews: An Official Journal of the International Association for the Study of Obesity*, *13*(4), 347–367. http://doi.org/10.1111/j.1467-789X.2011.00965.x

Bui, T. V., Blizzard, C. L., Luong, K. N., Truong, N. L. V., Tran, B. Q., Otahal, P., … Gall, S. (2015). Physical Activity in Vietnam: Estimates and Measurement Issues. *PLoS ONE*, *10*(10), e0140941. http://doi.org/10.1371/journal.pone.0140941

Burton, L. J., & VanHeest, J. L. (2007). The Importance of Physical Activity in Closing the Achievement Gap. *Quest*, *59*(2), 212–218. http://doi.org/10.1080/00336297.2007.10483549

Burzynska, A. Z., Chaddock-Heyman, L., Voss, M. W., Wong, C. N., Gothe, N. P., Olson, E. A., … Kramer, A. F. (2014). Physical Activity and Cardiorespiratory Fitness Are Beneficial for White Matter in Low-Fit Older Adults. *PLoS ONE*, *9*(9). http://doi.org/10.1371/journal.pone.0107413

Cameron, A. J., Magliano, D. J., Dunstan, D. W., Zimmet, P. Z., Hesketh, K., Peeters, A., & Shaw, J. E. (2012). A bi-directional relationship between obesity and health-related quality of life: evidence from the longitudinal AusDiab study. *International Journal of Obesity (2005)*, *36*(2), 295–303. http://doi.org/10.1038/ijo.2011.103

Candelaria, J. I., Sallis, J. F., Conway, T. L., Saelens, B. E., Frank, L. D., & Slymen, D. J. (2012). Differences in physical activity among adults in households with and without children. *Journal of Physical Activity & Health*, *9*(7), 985–995.

Cecchini, M., Sassi, F., Lauer, J. A., Lee, Y. Y., Guajardo-Barron, V., & Chisholm, D. (2010). Tackling of unhealthy diets, physical inactivity, and obesity: health effects and cost-effectiveness. *The Lancet*, *376*(9754), 1775–1784. http://doi.org/10.1016/S0140-6736(10)61514-0

Centers for Disease Control and Prevention (2015a, June 16). *Adult Obesity Facts.* Retrieved August 30, 2015, from http://www.cdc.gov/obesity/data/adult.html

Centers for Disease Control and Prevention (2015b, September 1). *Adolescent and School Health.* Retrieved February 27, 2016, from http://www.cdc.gov/healthyyouth/data/topics/index.htm

Centers for Disease Control and Prevention (2014, May 23). *Facts about Physical Activity.* Retrieved October 8, 2015, from http://www.cdc.gov/physicalactivity/data/facts.htm

Centers for Disease Control and Prevention (2015c, September 11). *Data, Trends, and Maps.* Retrieved October 8, 2015, from http://www.cdc.gov/obesity/data/prevalence-maps.html

Centers for Disease Control and Prevention (2015d, June 4). *How much physical activity do you need?*. Retrieved August 6, 2015, from http://www.cdc.gov/physicalactivity/basics/index.htm

Centers for Disease Control and Prevention (2016, February 1). *Behavioral Risk Factor Surveillance System.* Retrieved February 27, 2016, from http://www.cdc.gov/physicalactivity/basics/index.htm

Cleland, C. L., Hunter, R. F., Tully, M. A., Scott, D., Kee, F., Donnelly, M., … Cupples, M. E. (2014). Identifying solutions to increase participation in physical activity interventions within a socio-economically disadvantaged community: a qualitative study. *The International Journal of Behavioral Nutrition and Physical Activity*, *11*, 68. http://doi.org/10.1186/1479-5868-11-68

Cleland, V., Timperio, A., Salmon, J., Hume, C., Telford, A., & Crawford, D. (2011). A Longitudinal Study of the Family Physical Activity Environment and Physical Activity Among Youth. *American Journal of Health Promotion*, *25*(3), 159–167.

Cohen, A. K., Rehkopf, D. H., Deardorff, J., & Abrams, B. (2013). Education and obesity at age 40 among American adults. *Social Science & Medicine (1982)*, *78*, 34–41. http://doi.org/10.1016/j.socscimed.2012.11.025

Cohen, S., & Janicki-Deverts, D. (2009). Can We Improve Our Physical Health by Altering Our Social Networks? *Perspectives on Psychological Science (Wiley-Blackwell)*, *4*(4), 375–378. http://doi.org/10.1111/j.1745-6924.2009.01141.x

Craig, C. L., Marshall, A. L., Sjöström, M., Bauman, A. E., Booth, M. L., Ainsworth, B. E., … Oja, P. (2003). International physical activity questionnaire: 12-country reliability and validity. *Medicine and Science in Sports and Exercise*, *35*(8), 1381–1395. http://doi.org/10.1249/01.MSS.0000078924.61453.FB

da Silva, I. C. M., Azevedo, M. R., & Gonçalves, H. (2013). Leisure-time physical activity and social support among Brazilian adults. *Journal of Physical Activity & Health*, *10*(6), 871–879.

Dickie, K., Micklesfield, L. K., Chantler, S., Lambert, E. V., & Goedecke, J. H. (2014). Meeting physical activity guidelines is associated with reduced risk for cardiovascular disease in black South African women; a 5.5-year follow-up study. *BMC Public Health*, *14*, 498. http://doi.org/10.1186/1471-2458-14-498

Dishman, R. K., McIver, K. L., Dowda, M., Saunders, R. P., & Pate, R. R. (2015). Motivation and Behavioral Regulation of Physical Activity in Middle School Students. *Medicine and Science in Sports and Exercise*, *47*(9), 1913–1921. http://doi.org/10.1249/MSS.0000000000000616

Dishman, R. K., Rooks, C. R., Thom, N. J., Motl, R. W., & Nigg, C. R. (2010). Meeting U.S. Healthy People 2010 Levels of Physical Activity: Agreement of 2 Measures across 2 years. *Annals of Epidemiology*, *20*(7), 511–523. http://doi.org/10.1016/j.annepidem.2010.04.004

Dor, A., Ferguson, C., Langwith, C., & Tan, E. (2010). A Heavy Burden: The Individual Costs of Being Overweight and Obese in the United States.

Eyler, A. A., Brownson, R. C., Bacak, S. J., & Housemann, R. A. (2003). The Epidemiology of Walking for Physical Activity in the United States. *Medicine & Science in Sports & Exercise*, *35*(9), 1529–1536. http://doi.org/10.1249/01.MSS.0000084622.39122.0C

Eyler, A., Chriqui, J., Maddock, J., Cradock, A., Evenson, K. R., Gustat, J., … Zieff, S. G. (2014). Opportunity meets planning: an assessment of the physical activity emphasis in state obesity-related plans. *Journal of Physical Activity & Health*, *11*(1), 45–50. http://doi.org/10.1123/jpah.2012-0037

Fakhouri, T. H. I., Hughes, J. P., Brody, D. J., Kit, B. K., & Ogden, C. L. (2013). Physical activity and screen-time viewing among elementary school–aged children in the united states from 2009 to 2010. *JAMA Pediatrics*, *167*(3), 223–229. http://doi.org/10.1001/2013.jamapediatrics.122

Fanning, J., Awick, E. A., Wójcicki, T. R., Gothe, N., Roberts, S., Ehlers, D. K., … McAuley, E. (2015). Effects of a DVD-Delivered Exercise Intervention on Maintenance of Physical Activity in Older Adults. *Journal of Physical Activity & Health*. http://doi.org/10.1123/jpah.2015-0173

Fletcher, G. F., Froelicher, V. F., Hartley, L. H., Haskell, W. L., & Pollock, M. L. (1990). Exercise standards. A statement for health professionals from the American Heart Association. *Circulation*, *82*(6), 2286–2322. http://doi.org/10.1161/01.CIR.82.6.2286

Florindo, A. A., Salvador, E. P., & Reis, R. S. (2013). Physical Activity and Its Relationship With Perceived Environment Among Adults Living in a Region of Low Socioeconomic Level. *Journal of Physical Activity & Health*, *10*(4), 563–571.

Fraad, H. (2011). The Great Recession and Gender Marriage Transformation. *Journal of Psychohistory*, *39*(2), 129–132.

Gallagher, E. J., & LeRoith, D. (2015). Obesity and Diabetes: The Increased Risk of Cancer and Cancer-Related Mortality. *Physiological Reviews*, *95*(3), 727–748. http://doi.org/10.1152/physrev.00030.2014

Geraghty, A. B., Seifert, W., Preston, T., Holm, C. V., Duarte, T. H., & Farrar, S. M. (2009). Partnership Moves Community Toward Complete Streets. *American Journal of Preventive Medicine*, *37*, S420–S427. http://doi.org/10.1016/j.amepre.2009.09.009

Gerstel, N., Riessman, C. K., & Rosenfield, S. (1985). Explaining the Symptomatology of Separated and Divorced Women and Men: The Role of Material Conditions and Social Networks. *Social Forces*, *64*(1), 84–101. http://doi.org/10.2307/2578973

Giles-Corti, B., & Donovan, R. J. (2002). The relative influence of individual, social and physical environment determinants of physical activity. *Social Science & Medicine (1982)*, *54*(12), 1793–1812.

Glanz, K., Rimer, B. K., & Viswanath, K. (Eds.). (2008). *Health behavior and health education: theory, research, and practice* (4th ed). San Francisco, CA: Jossey-Bass.

Go AS, Mozaffarian D, Roger VL, Benjamin EJ, Berry JD, Borden WB, Bravata DM, Dai S, Ford ES, Fox CS, Franco S, Fullerton HJ, Gillespie C, Hailpern SM, Heit JA, Howard VJ, Huffman MD, Kissela BM, Kittner SJ, Lackland DT, Lichtman JH, Lisabeth LD, Magid D, Marcus GM, Marelli A, Matchar DB, McGuire DK, Mohler ER, Moy CS, Mussolino ME, Nichol G, Paynter NP, Schreiner PJ, Sorlie PD, Stein J, Turan TN, Virani SS, Wong ND, Woo D, Turner MB; on behalf of the American Heart Association Statistics Committee and Stroke Statistics Subcommittee. Heart disease and stroke statistics—2013 update: a report from the American Heart Association.Circulation.2013;127:e6-e245

Goodwin, I. C. (2007). Rural African American women's perception of exercise. *The Alabama Nurse*, *34*(2), 18–19.

Goodwin, P. J., & Stambolic, V. (2015). Impact of the obesity epidemic on cancer. *Annual Review of Medicine*, *66*, 281–296. http://doi.org/10.1146/annurev-med-051613-012328

Gordon-Larsen, P., Nelson, M. C., & Popkin, B. M. (2004). Longitudinal physical activity and sedentary behavior trends: Adolescence to adulthood. *American Journal of Preventive Medicine*, *27*(4), 277–283. http://doi.org/10.1016/j.amepre.2004.07.006

Grace, S. L., Williams, A., Stewart, D. E., & Franche, R.-L. (2006). Health-Promoting Behaviors Through Pregnancy, Maternity Leave, and Return to Work: Effects of Role Spillover and Other Correlates. *Women & Health*, *43*(2), 51–72. http://doi.org/10.1300/J013v43n02_04

Griffin, S. F., Wilson, D. K., Wilcox, S., Buck, J., & Ainsworth, B. E. (2008). Physical activity influences in a disadvantaged African American community and the communities' proposed solutions. *Health Promotion Practice*, *9*(2), 180–190. http://doi.org/10.1177/1524839906296011

Hagströmer, M., Oja, P., & Sjöström, M. (2006). The International Physical Activity Questionnaire (IPAQ): a study of concurrent and construct validity. *Public Health Nutrition*, *9*(6), 755–762.

Halfon, N., Larson, K., & Slusser, W. (2013). Associations between obesity and comorbid mental health, developmental, and physical health conditions in a nationally representative sample of US children aged 10 to 17. *Academic Pediatrics*, *13*(1), 6–13. http://doi.org/10.1016/j.acap.2012.10.007

Hamer, M., Ingle, L., Carroll, S., & Stamatakis, E. (2012). Physical activity and cardiovascular mortality risk: possible protective mechanisms? *Medicine and Science in Sports and Exercise*, *44*(1), 84–88. http://doi.org/10.1249/MSS.0b013e3182251077

Hamilton, M. T., Hamilton, D. G., & Zderic, T. W. (2007). Role of low energy expenditure and sitting in obesity, metabolic syndrome, type 2 diabetes, and cardiovascular disease. *Diabetes*, *56*(11), 2655–2667. http://doi.org/10.2337/db07-0882

Harley, A. E., Buckworth, J., Katz, M. L., Willis, S. K., Odoms-Young, A., & Heaney, C. A. (2009). Developing Long-Term Physical Activity Participation: A Grounded Theory Study with African American Women. *Health Education & Behavior*, *36*(1), 97–112.

Harley, A. E., Katz, M. L., Heaney, C. A., Duncan, D. T., Buckworth, J., Odoms-Young, A., & Willis, S. K. (2009). Social support and companionship among active African American women. *American Journal of Health Behavior*, *33*(6), 673–685.

Harley, A. E., Odoms-Young, A., Beard, B., Katz, M. L., & Heaney, C. A. (2009). African American social and cultural contexts and physical activity: Strategies for navigating challenges to participation. *Women & Health*, *49*(1), 84–100. http://doi.org/10.1080/03630240802690861

Haskell, W., Lee, I.-M., Pate, R., Powell, K., Blair, S., Franklin, B., … Bauman, A. (2007). Physical Activity and Public Health: Updated Recommendation for Adults From the American College of Sports Medicine and the American Heart Association. *Circulation*, *116*, 1081–1093.

Hatchett, S. J., & Jackson, J. S. (1993). African American extended kin systems: An assessment. In *Family ethnicity: Strength in diversity* (pp. 90–108). Thousand Oaks, CA, US: Sage Publications, Inc.

Hays, W. C., & Mindel, C. H. (1973). Extended Kinship Relations in Black and White Families. *Journal of Marriage and Family*, *35*(1), 51–57. http://doi.org/10.2307/351096

Hillier, A., Tappe, K., Cannuscio, C., Karpyn, A., & Glanz, K. (2014). In an urban neighborhood, who is physically active and where? *Women & Health*, *54*(3), 194–211. http://doi.org/10.1080/03630242.2014.883659

Horney, J., Davis, M. K., Davis, S. E. H., & Fleischauer, A. (2013). An Evaluation of Community Assessment for Public Health Emergency Response (CASPER) in North Carolina, 2003-2010. *Prehospital and Disaster Medicine*, *28*(02), 94–98. http://doi.org/10.1017/S1049023X13000071

House, J. S. (1981). *Work stress and social support*. Reading, Mass: Addison-Wesley Pub. Co.

Huai, P., Xun, H., Reilly, K. H., Wang, Y., Ma, W., & Xi, B. (2013). Physical Activity and Risk of Hypertension A Meta-Analysis of Prospective Cohort Studies. *Hypertension*, *62*(6), 1021–1026. http://doi.org/10.1161/HYPERTENSIONAHA.113.01965

IPAQ Scoring Protocol. 2008. http://www.ipaq.ki.se

James, A. S., Hudson, M. A., & Campbell, M. K. (2003). Demographic and psychosocial correlates of physical activity among African Americans. *American Journal of Health Behavior*, *27*(4), 421–431.

Janisse, H. C., Nedd, D., Escamilla, S., & Nies, M. A. (2004). Physical activity, social support, and family structure as determinants of mood among European-American and African-American women. *Women & Health*, *39*(1), 101–116. http://doi.org/10.1300/J013v39n01_06

Joseph, R. P., Ainsworth, B. E., Keller, C., & Dodgson, J. E. (2015). Barriers to Physical Activity Among African American Women: An Integrative Review of the Literature. *Women & Health*, *55*(6), 679–699. http://doi.org/10.1080/03630242.2015.1039184

Kaczynski, A. T., & Glover, T. D. (2012). Talking the talk, walking the walk: examining the effect of neighbourhood walkability and social connectedness on physical activity. *Journal of Public Health (Oxford, England)*, *34*(3), 382–389. http://doi.org/10.1093/pubmed/fds011

Kegler, M., Swan, D., Alcantara, I., Feldman, L., & Glanz, K. (2014). The Influence of Rural Home and Neighborhood Environments on Healthy Eating, Physical Activity, and Weight. *Prevention Science*, *15*(1), 1–11. http://doi.org/10.1007/s11121-012-0349-3

Kelsey, M. M., Zaepfel, A., Bjornstad, P., & Nadeau, K. J. (2014). Age-related consequences of childhood obesity. *Gerontology*, *60*(3), 222–228. http://doi.org/10.1159/000356023

Kesaniemi, Y. K., Danforth, E., Jensen, M. D., Kopelman, P. G., Lefèbvre, P., & Reeder, B. A. (2001). Dose-response issues concerning physical activity and health: an evidence-based symposium. *Medicine and Science in Sports and Exercise*, *33*(6 Suppl), S351–358.

King, A. C. (2001). Interventions to Promote Physical Activity by Older Adults. *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences*, *56*(suppl 2), 36–46. http://doi.org/10.1093/gerona/56.suppl_2.36

Kirchhoff, A. C., Elliott, L., Schlichting, J. A., & Chin, M. H. (2008). Strategies for physical activity maintenance in African American women. *American Journal of Health Behavior*, *32*(5), 517–524.

Koball, H. L., Moiduddin, E., Henderson, J., Goesling, B., & Besculides, M. (2010). What do we know about the link between marriage and health? *Journal of Family Issues*, *31*(8), 1019–1040. http://doi.org/10.1177/0192513X10365834

Kouvonen, A., De Vogli, R., Stafford, M., Shipley, M. J., Marmot, M. G., Cox, T., … Kivimäki, M. (2012). Social support and the likelihood of maintaining and improving levels of physical activity: the Whitehall II Study. *European Journal of Public Health*, *22*(4), 514–518. http://doi.org/10.1093/eurpub/ckr091

Kral, T. V. E., & Rauh, E. M. (2010). Eating behaviors of children in the context of their family environment. *Physiology & Behavior*, *100*(5), 567–573. http://doi.org/10.1016/j.physbeh.2010.04.031

Kremer, P., Elshaug, C., Leslie, E., Toumbourou, J. W., Patton, G. C., & Williams, J. (2014). Physical activity, leisure-time screen use and depression among children and young adolescents. *Journal of Science and Medicine in Sport / Sports Medicine Australia*, *17*(2), 183–187. http://doi.org/10.1016/j.jsams.2013.03.012

Kwagyan, J., Retta, T. M., Ketete, M., Bettencourt, C. N., Maqbool, A. R., Xu, S., & Randall, O. S. (2015). OBESITY AND CARDIOVASCULAR DISEASES IN A HIGH-RISK POPULATION: EVIDENCE-BASED APPROACH TO CHD RISK REDUCTION. *Ethnicity & Disease*, *25*(2), 208–213.

Kwak, L., Kremers, S. P. J., Bergman, P., Ruiz, J. R., Rizzo, N. S., & Sjöström, M. (2009). Associations between Physical Activity, Fitness, and Academic Achievement. *The Journal of Pediatrics*, *155*(6), 914–918.e1. http://doi.org/10.1016/j.jpeds.2009.06.019

Laroche, H. H., Wallace, R. B., Snetselaar, L., Hillis, S. L., Cai, X., & Steffen, L. M. (2013). Weight gain among men and women who have a child enter their home. *Journal of the Academy of Nutrition and Dietetics*, *113*(11), 1504–1510. http://doi.org/10.1016/j.jand.2013.05.022

Lavizzo-Mourey, R., Cox, C., Strumpf, N., Edwards, W. F., Lavizzo-Mourey, R., Stinemon, M., & Grisso, J. A. (2001). Attitudes and beliefs about exercise among elderly African Americans in an urban community. *Journal Of The National Medical Association*, *93*(12), 475–480.

Lawman, H. G., Wilson, D. K., Van Horn, M. L., Resnicow, K., & Kitzman-Ulrich, H. (2011). The Relationship between Psychosocial Correlates and Physical Activity in Underserved Adolescent Boys and Girls in the ACT Trial. *Journal of Physical Activity & Health*, *8*(2), 253–261.

Leach, H. J., Mama, S. K., Soltero, E. G., & Lee, R. E. (2014). The influence of sitting time and physical activity on health outcomes in public housing residents. *Ethnicity & Disease*, *24*(3), 370–375.

Lee, R. E., Mama, S. K., McAlexander, K. P., Adamus, H., & Medina, A. V. (2011). Neighborhood and PA: neighborhood factors and physical activity in African American public housing residents. *Journal of Physical Activity & Health*, *8 Suppl 1*, S83–90.

Lee, R. E., Mama, S. K., Medina, A. V., Reese-Smith, J. Y., Banda, J. A., Layne, C. S., … Estabrooks, P. A. (2011). Multiple measures of physical activity, dietary habits and weight status in African American and Hispanic or Latina women. *Journal of Community Health*, *36*(6), 1011–1023. http://doi.org/10.1007/s10900-011-9403-5

Loprinzi, P. D. (2013). Objectively measured light and moderate-to-vigorous physical activity is associated with lower depression levels among older US adults. *Aging & Mental Health*, *17*(7), 801–805. http://doi.org/10.1080/13607863.2013.801066

Loprinzi, P. D., & Trost, S. G. (2010). Parental influences on physical activity behavior in preschool children. *Preventive Medicine: An International Journal Devoted to Practice and Theory*, *50*(3), 129–133. http://doi.org/10.1016/j.ypmed.2009.11.010

Malnick, S. D. H., & Knobler, H. (2006). The medical complications of obesity. *QJM*, *99*(9), 565–579. http://doi.org/10.1093/qjmed/hcl085

Marques, A., Martins, J., Sarmento, H., Rocha, L., & Carreiro da Costa, F. (2015). Do students know the physical activity recommendations for health promotion? *Journal of Physical Activity & Health*, *12*(2), 253–256. http://doi.org/10.1123/jpah.2013-0228

Massoudi, B. L., Olmsted, M. G., Zhang, Y., Carpenter, R. A., Barlow, C. E., & Huber, R. (2010). A web-based intervention to support increased physical activity among at-risk adults. *Journal of Biomedical Informatics*, *43*(5 Suppl), S41–45. http://doi.org/10.1016/j.jbi.2010.07.012

McAuley, E., Jerome, G. J., Elavsky, S., Marquez, D. X., & Ramsey, S. N. (2003). Predicting long-term maintenance of physical activity in older adults. *Preventive Medicine: An International Journal Devoted to Practice and Theory*, *37*(2), 110–118. http://doi.org/10.1016/S0091-7435(03)00089-6

McLeroy, K. R., Bibeau, D., Steckler, A., & Glanz, K. (1988). An ecological perspective on health promotion programs. *Health Education Quarterly*, *15*(4), 351–377. http://doi.org/10.1177/109019818801500401

Mealing, N. M., Bowles, H. R., Merom, D., & Bauman, A. (2011). Impact of scoring algorithm on physical activity prevalence estimates in Australian adults. *Journal of Science and Medicine in Sport*, *14*(1), 27–32. http://doi.org/10.1016/j.jsams.2010.05.003

Michaels, C. N., & Greene, A. M. (2013). Worksite wellness: increasing adoption of workplace health promotion programs. *Health Promotion Practice*, *14*(4), 473–479. http://doi.org/10.1177/1524839913480800

Milteer, R. M., Ginsburg, K. R., Council On Communications And Media, & Committee On Psychosocial Aspects Of Child And Family Health. (2012). The importance of play in promoting healthy child development and maintaining strong parent-child bond: focus on children in poverty. *Pediatrics*, *129*(1), e204–213. http://doi.org/10.1542/peds.2011-2953

Mitchell, A. B., Cole, J. W., McArdle, P. F., Cheng, Y.-C., Ryan, K. A., Sparks, M. J., … Kittner, S. J. (2015). Obesity increases risk of ischemic stroke in young adults. *Stroke; a Journal of Cerebral Circulation*, *46*(6), 1690–1692. http://doi.org/10.1161/STROKEAHA.115.008940

Moore, L. V., Harris, C. D., Carlson, S. A., Kruger, J., & Fulton, J. E. (2012). Trends in no leisure-time physical activity--United States, 1988-2010. *Research Quarterly for Exercise and Sport*, *83*(4), 587–591. http://doi.org/10.1080/02701367.2012.10599884

Moore, S. C., Patel, A. V., Matthews, C. E., Berrington de Gonzalez, A., Park, Y., Katki, H. A., … Lee, I.-M. (2012). Leisure time physical activity of moderate to vigorous intensity and mortality: a large pooled cohort analysis. *Plos Medicine*, *9*(11), e1001335–e1001335. http://doi.org/10.1371/journal.pmed.1001335

Mowen, A., Orsega-Smith, E., Payne, L., Ainsworth, B., & Godbey, G. (2007). The role of park proximity and social support in shaping park visitation, physical activity, and perceived health among older adults. *Journal of Physical Activity & Health*, *4*(2), 167–179.

Müller, A. M., & Khoo, S. (2014). Non-face-to-face physical activity interventions in older adults: a systematic review. *The International Journal of Behavioral Nutrition and Physical Activity*, *11*, 35. http://doi.org/10.1186/1479-5868-11-35

Müller, A. M., Khoo, S., & Morris, T. (2016). Text Messaging for Exercise Promotion in Older Adults From an Upper-Middle-Income Country: Randomized Controlled Trial. *Journal of Medical Internet Research*, *18*(1). http://doi.org/10.2196/jmir.5235

Nauman, J., Aspenes, S. T., Nilsen, T. I. L., Vatten, L. J., & Wisløff, U. (2012). A prospective population study of resting heart rate and peak oxygen uptake (the HUNT Study, Norway). *PloS One*, *7*(9), e45021. http://doi.org/10.1371/journal.pone.0045021

Nielsen, T. L., Wraae, K., Brixen, K., Hermann, A. P., Andersen, M., & Hagen, C. (2006). Prevalence of overweight, obesity and physical inactivity in 20- to 29-year-old, Danish men. Relation to sociodemography, physical dysfunction and low socioeconomic status: the Odense Androgen Study. *International Journal of Obesity*, *30*(5), 805–815. http://doi.org/10.1038/sj.ijo.0803197

Nobles, W. W. (2007). Black Families. In *African American Family Life: An Instrument of Culture* (pp. 69–79). Thousand Oaks, CA: SAGE Publications, Inc. Retrieved from http://knowledge.sagepub.com/view/black-families-4e/n5.xml

Nomaguchi, K. M., & Bianchi, S. M. (2004). Exercise Time: Gender Differences in the Effects of Marriage, Parenthood, and Employment. *Journal of Marriage and Family*, *66*(2), 413–430. http://doi.org/10.1111/j.1741-3737.2004.00029.x

Nutrition, Physical Activity and Obesity Data, Trends and Maps web site. U.S. Department of Health and Human Services, Centers for Disease Control and Prevention (CDC), National Center for Chronic Disease Prevention and Health Promotion, Division of Nutrition, Physical Activity and Obesity, Atlanta, GA, 2015. Available at http://www.cdc.gov/nccdphp/DNPAO/index.html

Nyaku, M. K., Wolkin, A. F., McFadden, J., Collins, J., Murti, M., Schnall, A., … Bayleyegn, T. M. (2014). Assessing radiation emergency preparedness planning by using community assessment for public health emergency response (CASPER) methodology. *Prehospital and Disaster Medicine*, *29*(3), 262–269. http://doi.org/10.1017/S1049023X14000491

Ogden, C. L., Carroll, M. D., Kit, B. K., & Flegal, K. M. (2012). Prevalence of obesity and trends in body mass index among US children and adolescents, 1999-2010. *JAMA*, *307*(5), 483–490. http://doi.org/10.1001/jama.2012.40

Ogden, C. L., Carroll, M. D., Kit, B. K., & Flegal, K. M. (2014). Prevalence of childhood and adult obesity in the united states, 2011-2012. *JAMA*, *311*(8), 806–814. http://doi.org/10.1001/jama.2014.732

Parham, G. P., & Scarinci, I. C. (2007). Strategies for achieving healthy energy balance among African Americans in the Mississippi Delta. *Preventing Chronic Disease*, *4*(4), A97–A97.

Parks, S. E., Housemann, R. A., & Brownson, R. C. (2003). Differential correlates of physical activity in urban and rural adults of various socioeconomic backgrounds in the United States. *Journal of Epidemiology and Community Health*, *57*(1), 29–35.

Quarmby, T. (2013). Exploring the role of the family in the construction of young people's health discourses and dispositions. *Educational Review*, *65*(3), 303–320. http://doi.org/10.1080/00131911.2012.659658

Resnick, B., Orwig, D., Magaziner, J., & Wynne, C. (2002). The Effect of Social Support on Exercise Behavior in Older Adults. *Clinical Nursing Research*, *11*(1), 52–70. http://doi.org/10.1177/105477380201100105

Richter, D. L., Wilcox, S., Greaney, M. L., Henderson, K. A., & Ainsworth, B. E. (2002). Environmental, policy, and cultural factors related to physical activity in African American women. *Women & Health*, *36*(2), 91–109.

Roos, E., Sarlio-Lähteenkorva, S., Lallukka, T., & Lahelma, E. (2007). Associations of work-family conflicts with food habits and physical activity. *Public Health Nutrition*, *10*(3), 222–229. http://doi.org/10.1017/S1368980007248487

Ross, C. E., Mirowsky, J., & Goldsteen, K. (1990). The Impact of the Family on Health: The Decade in Review. *Journal of Marriage and Family*, *52*(4), 1059–1078. http://doi.org/10.2307/353319

Russell, H. A., Rufus, C., Fogarty, C. T., Fiscella, K., & Carroll, J. (2013). "You need a support. When you don"t have that . . . chocolate looks real good'. Barriers to and facilitators of behavioural changes among participants of a Healthy Living Program. *Family Practice*, *30*(4), 452–458. http://doi.org/10.1093/fampra/cmt009

Samitz, G., Egger, M., & Zwahlen, M. (2011). Domains of physical activity and all-cause mortality: systematic review and dose-response meta-analysis of cohort studies. *International Journal of Epidemiology*, *40*(5), 1382–1400. http://doi.org/10.1093/ije/dyr112

Scharff, D. P., Homan, S., Kreuter, M., & Brennan, L. (1999). Factors associated with physical activity in women across the life span: Implications for program development. *Women & Health*, *29*(2), 115–134. http://doi.org/10.1300/J013v29n02_08

Schutzer, K. A., & Graves, B. S. (2004). Barriers and motivations to exercise in older adults. *Preventive Medicine*, *39*(5), 1056–1061. http://doi.org/10.1016/j.ypmed.2004.04.003

Seefeldt, V., Malina, R. M., & Clark, M. A. (2012). Factors Affecting Levels of Physical Activity in Adults. *Sports Medicine*, *32*(3), 143–168. http://doi.org/10.2165/00007256-200232030-00001

Siddiqi, Z., Tiro, J. A., & Shuval, K. (2011). Understanding Impediments and Enablers to Physical Activity among African American Adults: A Systematic Review of Qualitative Studies. *Health Education Research*, *26*(6), 1010–1024.

Sisson, S. B., Broyles, S. T., Newton, R. L., Baker, B. L., & Chernausek, S. D. (2011). TVs in the bedrooms of children: does it impact health and behavior? *Preventive Medicine*, *52*(2), 104–108. http://doi.org/10.1016/j.ypmed.2010.11.019

Social-Ecological Model - Active Canada 20/20. (n.d.). Retrieved August 24, 2015, from http://www.activecanada2020.ca/sections-of-ac-20-20/appendix-a/appendix-b/appendix-c-1/appendix-d

Steptoe, A., Lundwall, K., & Cropley, M. (2000). Gender, family structure and cardiovascular activity during the working day and evening. *Social Science & Medicine*, *50*(4), 531–539. http://doi.org/10.1016/S0277-9536(99)00324-X

Street, 1615 L., NW, Washington, S. 700, & Inquiries, D. 20036 202 419 4300 | M. 202 419 4349 | F. 202 419 4372 | M. (n.d.). The Return of the Multi-Generational Family Household. Retrieved from http://www.pewsocialtrends.org/2010/03/18/the-return-of-the-multi-generational-family-household/

Tavares, L. S., & Plotnikoff, R. C. (2008). Not Enough Time? Individual and Environmental Implications for Workplace Physical Activity Programming Among Women with and without Young Children. *Health Care for Women International*, *29*(3), 244–281. http://doi.org/10.1080/07399330701880911

Taylor, R. J., Chae, D. H., Lincoln, K. D., & Chatters, L. M. (2015). Extended family and friendship support networks are both protective and risk factors for major depressive disorder and depressive symptoms among African-Americans and black Caribbeans. *The Journal of Nervous and Mental Disease*, *203*(2), 132–140. http://doi.org/10.1097/NMD.0000000000000249

The State of Obesity (n.d.) *Obesity Rates & Trends Overview.* Retrieved August 30, 2015, from http://stateofobesity.org/obesity-rates-trends-overview/

Turtiainen, P., Karvonen, S., & Rahkonen, O. (2007). All in the Family? The Structure and Meaning of Family Life among Young People. *Journal of Youth Studies*, *10*(4), 477–493. http://doi.org/10.1080/13676260701262889

United States Department of Health and Human Services, Healthy People 2020. (2011, June 29). *About Healthy People*. Retrieved October 1, 2015, from http://www.healthypeople.gov/2020/About-Healthy-People

United States Department of Health and Human Services, Healthy People 2020. (2011, June 29). *Physical Activity*. Retrieved October 1, 2015, from http://www.healthypeople.gov/2020/topics-objectives/topic/physical-activity

U.S. Census Bureau. (n.d.). *Households and Persons Per Household.* Retrieved August 6, 2015, from http://quickfacts.census.gov/qfd/meta/long_HSD310213.htm

Viner, R. M., Ozer, E. M., Denny, S., Marmot, M., Resnick, M., Fatusi, A., & Currie, C. (2012). Adolescence and the social determinants of health. *Lancet (London, England)*, *379*(9826), 1641–1652. http://doi.org/10.1016/S0140-6736(12)60149-4

Wanner, M., Tarnutzer, S., Martin, B. W., Braun, J., Rohrmann, S., Bopp, M., … Swiss National Cohort (SNC). (2014). Impact of different domains of physical activity on cause-specific mortality: a longitudinal study. *Preventive Medicine*, *62*, 89–95. http://doi.org/10.1016/j.ypmed.2014.01.025

Wilbur, J., Chandler, P., Dancy, B., Choi, J., & Plonczynski, D. (2002). Environmental, Policy, and Cultural Factors Related to Physical Activity in Urban, African American Women. *Women & Health*, *36*(2), 17–28.

Wilcox, S., Oberrecht, L., Bopp, M., Kammermann, S. K., & McElmurray, C. T. (2005). A Qualitative Study of Exercise in Older African American and White Women in Rural South Carolina: Perceptions, Barriers, and Motivations. *Journal of Women & Aging*, *17*(1-2), 37–53. http://doi.org/10.1300/J074v17n01_04

Williams, B. R., Bezner, J., Chesbro, S. B., & Leavitt, R. (2006). The effect of a walking program on perceived benefits and barriers to exercise in postmenopausal African American women. *Journal of Geriatric Physical Therapy (2001)*, *29*(2), 43–49.

Wilson, M. N., Greene-Bates, C., McKim, L., Simmons, F., Askew, T., Curry-El, J., & Hinton, I. D. (1995). African American family life: The dynamics of interactions, relationships, and roles. *New Directions for Child and Adolescent Development*, *1995*(68), 5–21. http://doi.org/10.1002/cd.23219956803

Wolin, K. Y., Heil, D. P., Askew, S., Matthews, C. E., & Bennett, G. G. (2008). Validation of the International Physical Activity Questionnaire-Short among Blacks. *Journal of Physical Activity & Health*, *5*(5), 746–760.

Woodcock, J., Franco, O. H., Orsini, N., & Roberts, I. (2011). Non-vigorous physical activity and all-cause mortality: systematic review and meta-analysis of cohort studies. *International Journal of Epidemiology*, *40*(1), 121–138. http://doi.org/10.1093/ije/dyq104

Ylitalo KR, Stone K, Umstattd Meyer MR, Doyle EI, Curtis R. Using the Community Assessment for Public Health Emergency Response (CASPER) to address the obesity epidemic: Assessing barriers to healthy eating and active living in a low-income community. [In press].

Young, D. R., Gittelsohn, J., Charleston, J., Felix-Aaron, K., & Appel, L. J. (2001). Motivations for Exercise and Weight Loss Among African-American Women: focus group results and their contribution towards program development. *Ethnicity & Health*, *6*(3/4), 227–245. http://doi.org/10.1080/13557850120078143

Young, D. R., He, X., Harris, J., & Mabry, I. (2002). Environmental, Policy, and Cultural Factors Related to Physical Activity in Well-Educated Urban African American Women. *Women & Health*, *36*(2), 29–41.