Children's Physical Activity and Parental Characteristics in the 2005-2006 NHANES

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Abstract
Physical activity promotion is a public health priority, particularly for children who may experience the long-term impacts of early sedentary lifestyles. The role of family structure and the interrelationship of children's and their parents' behaviors led us to investigate the relationship between children's physical activity and family characteristics. We used the 2003 to 2006 National Health and Nutrition Examination Survey (NHANES) (n = 3,388), a nationally representative sample of children aged 6-19 to explore this relationship. Drawing on objectively measured physical activity using accelerometers, we find evidence that children of parents who have never married spend more time in physical activity. Examining this relationship further, we find evidence that for children whose parents' have never married lower income and parents' younger ages are related to higher levels of physical activity.

Physical activity, in conjunction with nutrition and obesity, has been identified as a leading health indicator by Healthy People 2020 (U.S. Department of Health and Human Services, 2010) in part because few adults and, of particular interest here, children meet the minimum recommendations for daily physical activity (Troiano et al., 2008). Children's physical activity has drawn considerable attention as evidence mounts linking physical activity with improved physical health, mental health, and academics (e.g., Coe, Pivarnik, Womack, Reeves, & Malina, 2006; Janssen & LeBlanc, 2010; Kirkcaldy, Shephard, & Siefen, 2002; Ussher, Owen, Cook, & Whincup, 2007).

Children's physical activity is likely a product of many different aspects of their lives including the home environment. As the life course approach suggests (Elder, Johnson, & Crosnoe, 2003), children's family context may be a powerful predictor of time spent in physical activity. Time spent caring for children, shared activities, and coordination of activities across family members ensure that children participate and understand their physical activities through the values and priorities of their parents. Though some smaller studies have investigated this relationship , including small or restricted samples in studies using more objective measurement of physical activity and self-reported physical activity in nationally representative studies, (Bogaert, Steinbeck, Baur, Brock, & Bermingham, 2003; Davison, Cutting, & Birch, 2003; Fogelholm, Nuutinen, Pasanen, Myöhänen, & Säätelä, 2000; Freedson & Evenson, 1991; Gilmer, Harrell, Miles, & Hepworth, 2003; Moore et al., 1991; Stucky-Ropp & DiLorenzo, 1993; Yang, Telama, & Laakso, 1996), the limitations of such research raise questions regarding whether this experience is broadly applicable. This study aims to investigate how the amount of time children (ages 6 to 18) spend in physical activity as measured by an accelerometer is related to parental characteristics. Specifically, are marital status, socioeconomic status, and competition for shared family resources related to children's time spent in vigorous and/or moderate physical activity?

Children's Physical Activity and Parental Characteristics

Much of the prior research on children's physical activity has focused on the impact of settings such as schools and organized sports, or individual characteristics on physical activity levels early in life (e.g., Biddle & Goudas, 1996; Dollman, Norton, & Norton, 2005; Wechsler, Devereaux, Davis, & Collins, 2000). However, fewer studies have considered that children are situated within families that should be expected to facilitate or create barriers to physical activity. Though a parent is unlikely to completely determine a childs physical activity level, parents play a powerful role in shaping a child's interest through their family activities, purchasing opportunities for exercise (through enrollment in sports programs or purchasing equipment), placement (when possible) in schools with greater access to physical activity, and encouragement to become physically active (e.g. limiting screen time). This role may be more pronounced in early childhood and diminish in later years as peers becomes more influential on behavior.

Families, and parents in particular, are expected to have a powerful impact on children's physical activity in part due to ideas promoted by the life course approach. As it relates to the intergenerational transmission of physical activity, the life course approach highlights the importance of linked lives and social convoys that shape our experiences (Elder et al., 2003). Children are linked to their parents throughout the life course. This manifests in many ways including resources and constraints (e.g. income and unemployment) but is also demonstrated in the guidance and exposure that parent's coordinate for their children whether planned or otherwise. Specific for patterns of physical activity, parental interest and emphasis placed on physical activity is expected to directly influence the child's interest and priority placed on physical activity. Similarly, though the composition of children's social convoys change with age and greater independence, in most cases parents are the first to frame the interactions and

activities of a child including physical activity such as active play, riding a bike, or participating in sports. Therefore, what children view as normative and expected within their family will likely come to shape their own behaviors and expectations.

Research investigating the relationship between family characteristics and children's physical activity has generally found a significant relationship between parental characteristics or activity and children's activity levels (Bogaert et al. 2003; Davison, Cutting, and Birch 2003; Ferreira et al. 2007; Fogelholm et al. 2000; Freedson and Evenson 1991; Gilmer et al. 2003; Moore et al. 1991; Stucky-Ropp and DiLorenzo 1993; Yang, Telama, and Laakso 1996), however, questions remain regarding the generalizability of such findings for two reasons. First, much of the research to date has investigated small, targeted samples of children (Bogaert et al., 2003; Davison et al., 2003; Fogelholm et al., 2000; Freedson & Evenson, 1991; Gilmer et al., 2003; Moore et al., 1991; Stucky-Ropp & DiLorenzo, 1993; Yang et al., 1996), which may differ from the larger population by the child's gender, the family's economic resources, and the parent's marital status. Though it is unclear what subgroup differences may be unmeasured in smaller studies, gendered assumptions regarding appropriate behavior for children (Martin, 1998) starts at a very young age and impacts children's chosen activities (Biddle, Whitehead, O'Donovan, & Nevill, 2005; Vilhjalmsson & Kristjansdottir, 2003). In addition, the intergenerational transmission of advantage identified in other literatures (e.g.. Bowles & Gintis, 2002; Lareau, 2003) suggests that socioeconomic advantage may foster the transmission of physical activity from parent to child. Lastly, the limited time and resources available to single parents (Sanik & Mauldin, 1986) - in particular, single mothers - may result in limited time for children to be physically active.

Second, few large, population-based studies are able to examine objectively measured accelerometer data (Aarnio et al. 1997; Bogaert et al. 2003; Davison et al. 2003; Deflandre et al.

2001; Fogelholm et al. 2000; Gilmer et al. 2003; Stucky-Ropp and DiLorenzo 1993; Yang et al. 1996). Much of the prior literature draws on self-report measures of physical activity, which may be challenging to estimate for respondents and subject to bias (Prince et al., 2008; Westerterp, 2009). Survey questions that ask respondents to estimate the amount of time spent in moderate and/or vigorous physical activity across a day, week, or month require complex calculations of deciding what is moderate or vigorous physical activity and adding up chunks of time across a specific span of time that may not have a clear end or beginning to the respondent. Such challenges may potentially lead to biased results.

In the following analysis we investigate how family characteristics are related to children's patterns of physical activity. Specifically, we consider the importance of household characteristics, parental socioeconomic status, and parental marital status time spent in moderate and/or vigorous activity and whether or not a child meets the recommendations for physical activity on an average day.

Methods

Data

We draw on data from the 2003 to 2006 National Health and Nutrition Examination Survey (NHANES) (Centers for Disease Control and Prevention, 2013). NHANES is a national study of health status, health behaviors and nutrition among a nationally representative sample of children and adults in the United States conducted by the National Center for Health Statistics (NCHS). The sampling strategy is a complex, multistage probability design that is intended to be nationally representative of the resident civilian noninstitutionalized population in the United States. Mexican-American, African-American, those below 130% of the poverty level, those older than age 70, and adolescents aged 12 to 19 were oversampled. Analyses were completed

in Stata 12.1 and all results were weighted and procedures were used to account for the complex sample design to produce nationally representative results.

Data were collected via household interviews and physical examinations completed in mobile examination centers. The physical examination took between one to three hours for children younger than 12 and between two and a half to four hours for older respondents. During the physical exam portion of the interview, selected respondents were asked to wear an Actigraph (an accelerometer calibrated to measure physical activity) to objectively measure their physical activity levels (Centers for Disease Control and Prevention, 2005). The activity monitor captured the intensity of activity at 1-minute intervals. All respondents ages six and older that participated in the exam were asked to wear the Acitigraph on their right hip during the waking hours for seven days.

The full NHANES examined sample included 9,950 respondents. To focus on the physical activity levels of children and adolescents, we limited the analytic sample to those respondents aged 6 to 19 with no missing data on the variables of interest (n = 3,388).

Measures

Three measures of physical activity levels were constructed from the raw data collected by the Actigraph including time spent wearing the device, time spent in vigorous and/or moderate physical activity, and whether or not the child met recommendations for physical activity for their age (Troiano et al., 2008). The raw data from NHANES was first edited using programs available by the Applied Research Cancer and Population Sciences division of the National Cancer Institute (2013) to calculate minutes and bouts (blocks of time longer than 10 minutes) spent in moderate, vigorous, and moderate or vigorous activities by minute as well as time spent wearing the device. Number of minutes spent wearing the device and time spent in moderate, vigorous, and moderate or vigorous activities were continuous measures of time

averaged for a single day. Bouts of physical activity was the total time spent in physical activity for those episodes of physical activity that were 10 or more minutes in duration (i.e., episodes of 9 or fewer continuous minutes were not included in this measure). The minimum recommended time spent in physical activity varies by age and this variable was constructed accordingly (US Department of Health and Human Services, 2008). Children age 6 to 17 were coded as "1" for meeting the recommendations if they spent more than 60 minutes total in physical activity on an average day (minutes or bouts)(US Department of Health and Human Services, 2008). Adolescents ages 17 to 19 were coded as "1" for meeting the recommendations if they spent at least 22 minutes daily in physical activity on average in bouts of 10 minutes or more (i.e. 150 minutes per week). Seasonality and year were controlled for in the models with a dummy variables for winter (November through April) and year of the survey.

Family characteristics were captured in the household survey asked of the household reference person and the focal child[1]. Family characteristics included parental marital status, parental education, family income, parental age at the birth of the child, and number of household members. Parental marital status includes married; separated, widowed, or divorced; and never married. Children with married parents are the comparison group. Parental education included less than a high school degree, high school degree, some college and a college degree or higher (college degree is the reference group). Family income included income from all family members and is divided into five quintiles (less than $20,000, $20,000 to $34,999, $35,000 to

[1] The household reference person is the owner or renter of the residence. The relationship between the child and the household reference person cannot be verified in these data. To minimize misclassification of the relationship, children are excluded who are too similar in age to the household reference person to plausibly be their child (age difference less than 14 years). This is likely to capture alternative living arrangements including siblings or other family members. Approximately 6% of the original sample are excluded. Other family relationships (e.g. grandparents or aunts and uncles) that may be captured in the remaining sample that are not parent-child relationships are expected to have similar though weaker effects on children's physical activity levels and therefore any statistically significant estimates will be more conservative.

$54,999, $55,000 to $74,999, and above $75,000). Respondents in the highest income bracket are the comparison group. Parental age at birth of the child was the age difference between the child and the household reference person and was measured continuously. Number of household members was a continuous measure of the number of individuals living in the home. Demographic characteristics included in the models were gender (boys are the reference), the child's age, race/ethnicity (white, Non-Hispanic Black, Hispanic and other; white children are the reference), and immigrant status (natural citizens are the reference).

Analytic Approach

We began by using demographic characteristics (gender, age, race, and immigrant status) to predict time spent in physical activity for each of our three outcomes. Next, we included family characteristics (parental marital status, family income, parental education, focal parent's age at birth, and number of individuals in the household) in the model and tested for improvement in model fit using a Wald test. Next, we explored the moderating effects of marital status on family characteristics using stratified analyses.

Results

Summary statistics describing the sample are shown in Table 1. Approximately 40% of the sample met the minimum recommendation for physical activity and spent an average of 58 minutes in moderate or vigorous physical activity. The sample is 49% girls with a mean age of 12.4 years. 15% of the sample is African American and 17% of the sample is Hispanic. 72% of the sample comes from married parent households. The majority of the sample comes from families with income higher than $75,000 and with high school degree. On average parents were 28 years old at the time of the child's birth and the households have an average of 4 people living in the home.

The patterns in physical activity outcomes by demographic characteristics are shown in Table 2 for the entire analytic sample. We found that demographic characteristics including gender, age, and race/ethnicity are important predictors of time spent in physical activity. Regardless of how physical activity is measured, girls were less physically active and less likely to meet the minimum recommendations for physical activity compared to boys. Older respondents spent more time wearing the Actigraph (Model 1) but spend less time in vigorous or moderate physical activity (Models 2 through 7). Moreover, older (compared with younger) respondents were less likely to meet the minimum requirement for physical activity. Finally, Non-Hispanic Black and Hispanic children spend more time wearing the device (Model 1) as compared to white children but there were no statistically significant differences in time spent in physical activity by race/ethnicity.

When examining children's physical activity levels across the entire sample, we find some evidence that family characteristics are associated with physical activity particularly marital status. Children of parents who have never been married spend more time in moderate or vigorous activity (min and bouts) and moderate activity (min and bouts). In addition, children who share their household with more family members spend more minutes in moderate or moderate and vigorous activity (Models 3 and 7) and 11% greater probability of meeting the minimum recommendations for physical activity (Model 8). In contrast, measures of parental socioeconomic status were not consistent statistically significant predictors of time spent in physical activity.

Next we examined how patterns of physical activity were related to parental characteristics for children whose parents never married (Table 3). Within this subsample of respondents, the role of parental characteristics for children's physical activity began to take shape. Similar to full sample, girls and older respondents spent less time in physical activity

compared to boys and younger respondents. In contrast to the full sample, income and parental age at the child's birth are statistically significantly related to time spent in physical activity, which were confirmed by Wald tests. Specifically, children in families making less than $20,000 annually spend 23 additional minutes in moderate or vigorous physical activity compared to those making more than $75,000 per year (Model 3) and a similar pattern was evident for moderate or vigorous (bouts), moderate (min), and vigorous (min) activity. Single parent families that make between $55,000 and $74,999 annually spend less time in physical activity compared to the highest income families (Models 3, 4, and 5). We also found that children whose parents were older at the time of their birth spent less time in physical activity (Model 2, 3, 4, 5, 7, 8). For example, a child whose parent was 30 at the time of his or her birth is estimated to spend 9.8 fewer minutes in physical activity per day compared to a child whose parent was 20.

Discussion

We find that physical activity levels among children are patterned by parent characteristics but in unexpected ways. Specifically, children of parents that have never been married and children from larger households spend more time in physical activity while parental education and family income are not related to such outcomes. Such results demonstrate the potential importance of parents' behaviors and values regarding leading an active lifestyle and may be an important point of intervention for children's health and healthy behaviors within such family types. However, despite the hypothesized importance of family resources for physical activity, greater income and higher education are not related to higher levels of physical activity.

When investigating these patterns further it became evident that family characteristics are particularly important for children of parents that have never been married but in an

unexpected direction. Contrary to common assumptions that with socioeconomic resources children are uniformly advantaged, we found that children in lower income families whose parents were unmarried spent 23 minutes more in physical activity compared to children in the highest income families. Similarly, though children of older parents may have access to resources and networks that children of younger parents do not, children of the former spent less time in physical activity. In fact, each additional year of age was associated with 1% reduced probability of meeting the minimum recommendations for physical activity.

Such findings are contrary to many assumptions regarding socioeconomic advantage and health behaviors. Yet, it is possible that such patterns may demonstrate how some types of advantage may hinder healthy behaviors like physical activity and some types of disadvantage may promote activity. Though it is not clear what advantaged children in never married households are doing instead of playing at the playground or playing sports based on our results, it is possible that the resources provided by parents may serve as barrier for children's physical activity – particularly increased access to computers and video games as well as greater coordination of free time. Children from never married households with lower income may spend less time with direct supervision and instead engage in active play similar to previous arguments made regarding parenting styles (Lareau, 2003). Future research will need to investigate this relationship further to better understand this counterintuitive relationship in addition to understanding why this benefit may not last into adulthood.

Despite the consistency of the findings presented here, this research is subject to several limitations including the cross-sectional nature of the data, the potential misclassification of parent/child relationships, and the information available regarding parental characteristics and health. First, though the data is cross-sectional, it is the only objectively measured, nationally representative data for children and adolescences. Future research should

attempt to examine longitudinal patterns of physical activity for children within families. Second, the relationship between the child and the household reference person cannot be verified in these data. Though steps were taken to minimize misclassification, other family relationships (e.g. grandparents or aunts and uncles) were likely to be included in the analysis. Despite this limitation the relationship children have with other family members were expected to have similar though weaker effects on children's physical activity levels and therefore any statistically significant estimates would be more conservative. Finally, NHANES does not include detailed information regarding parental characteristics that would have been informative in this analysis. In particular, we are unable to account for the health status of the parent as well as their physical activity levels. Future research will need to investigate this possible relationship.

Despite these limitations, this research contributes to our understanding of children's physical activity in three important ways. First, we drew on a nationally representative sample of children and objectively measured physical activity levels, which allowed us to better understand how parental characteristics matter (or not) for physical activity. Such generalizations are limited with small, targeted samples of children or those that draw on self-reported measures of physical activity. Second, we investigated the association between an important health behavior – physical activity – and family characteristics. Expanding on this relationship will help us to identify and act on keys points of intervention to increase children's physical activity levels. Finally, we demonstrated the counterintuitive relationship between socioeconomic resources and physical activity for children. Despite expectations for the importance of family resources, most children are not harmed or helped by parental education or family income. Yet, for children of parents who have never married, those with fewest resources seem to benefit the most.

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Table 1. Descriptive Statistics: Children aged 6 to 19, 2003-2006 NHANES.

	Mean/%	SE
Dependent Variables		
Mean counts per minute	13.95	0.06
Time spent in vigorous or moderate physical activity (min)		
All minutes	58.45	1.30
Bouts	24.33	0.95
Time spent in vigorous physical activity (min)		
All minutes	8.89	0.47
Bouts	2.76	0.37
Time spent in moderate physical activity (min)		
All minutes	49.56	0.97
Bouts	12.81	0.54
Meeting the minimum recommendation for physical activity	40%	0.01
Independent Variables		
Parental Marital Status		
Married	72%	0.01
Separated, widowed, or divorced	18%	0.01
Never married	11%	0.01
Parental Education		
Less than a high school degree	27%	0.02
High school degree	35%	0.01
Some college	22%	0.01
College degree or higher	15%	0.01
Family income		
Up to $15,000	20%	0.02
$15,000 to $24,999	17%	0.01
$25,000 to $44,999	18%	0.01
$45,000 to $75,000	14%	0.01
$75,000 and above	31%	0.02
Parental age at child's birth	28.30	0.33
Number of household members	4.39	0.04
Demographic controls		
Female	49%	0.01
Child's age	12.46	0.12
Race/ethnicity		
White	62%	0.03
Non-Hispanic Black	15%	0.02
Hispanic	17%	0.02
Other	7%	0.01
Immigrant	7%	0.01

Notes: Bouts of physical activity was the total spent in physical activity for those episodes that were 10 minutes or more in duration. Weights were applied and estimation processes accounted for complex sample design.

Table 2. Predicted Time Spent in Moderate and/or Vigorous Activity by Family Characteristics for Children Aged 6 to 19, 2003-2006 NHANES.

	Model 1			Model 2			Model 3			Model 4		
	Minutes Wearing Device			Minutes in Moderate or Vigorous Activity (bouts)			Minutes in Moderate or Vigorous Activity (min)			Minutes in Moderate Activity (bouts)		
	Coef.		SE	Coef.		SE	Coef.		SE	Coef.		SE
Female	-0.24	**	0.08	-14.02	***	1.91	-19.87	***	2.24	-8.10	***	0.99
Age	0.08	***	0.01	-4.21	***	0.33	-8.47	***	0.34	-1.99	***	0.23
Race/Ethnicity												
White (reference)												
Non-Hispanic Black	0.81	***	0.10	3.01		1.67	4.22		2.29	-0.51		0.95
Hispanic	0.19	*	0.09	2.83		2.28	1.86		2.58	0.10		1.04
Other	0.32	*	0.15	-1.24		2.42	-1.69		2.87	-1.25		1.25
Immigrant	-0.06		0.09	-2.29		2.49	-1.92		3.09	-0.27		1.06
Parents Marital Status												
Married (reference)												
Separated/Widow/Divorced	0.00		0.10	0.96		1.70	0.99		2.27	0.75		0.97
Never Married	0.12		0.15	7.56	*	3.65	14.99	**	4.62	5.98	**	1.99
Parental Education												
College Degree (reference)												
Some College	0.05		0.10	0.15		2.66	0.06		3.34	0.89		1.91
High School Degree	-0.08		0.11	1.95		4.03	2.86		4.53	2.62		3.72
Less than a High School Degree	-0.11		0.13	3.80		2.98	5.24		3.60	1.96		2.17
Family Income												
Up to $20,000	0.12		0.12	-2.564		3.10	-0.27		3.73	-3.14		2.48
$20,000 to $34,999	0.15		0.11	-3.16		2.23	-2.12		2.46	-2.41		1.94
$35,000 to $54,999	0.06		0.11	-3.229		3.50	-2.02		3.72	-2.73		2.36
$55,000 to $74,999	0.36	**	0.12	-1.194		2.46	0.31		2.38	-1.47		1.79
$75,000 or greater (reference)												
Parental Age at Birth of Child	0.00		0.00	-0.14		0.07	-0.22	*	0.09	-0.08	*	0.04
Number of Household Members	0.06		0.04	1.44	*	0.53	1.77	*	0.76	0.42		0.25
Constant	12.48	***	0.26	81.36	***	6.40	170.76	***	6.49	42.82	***	4.18

Note: n = 3,388. Models 1 through 7 are estimated using Ordinary Least Squares Regression. Model 8 is estimated using Logistic Regression and risk differences are calculated using the Margins command in Stata. Weights were applied and estimation processes accounted for complex sample design. Models control for seasonality and year of survey. RD = Risk Difference. [a]Statistically significant ($p < .05$) Wald test for improvement of fit after including parental characteristics.

*p < .05. **p < .01. ***p < .001.

Table 2 cont. Predicted Time Spent in Moderate and/or Vigorous Activity by Family Characteristics for Children Aged 6 to 19, 2003-2006 NHANES.

	Model 5			Model 6			Model 7			Model 8		
	Minutes in Moderate Activity (min)[a]			Minutes in Vigorous Activity (bouts)			Minutes in Vigorous Activity (min)			Minimum Requirement		
	Coef.		SE	Coef.		SE	Coef.		SE	RD		SE
Female	-15.67	***	1.64	-1.83	*	0.79	-4.20	***	0.95	-0.13	***	0.13
Age	-6.97	***	0.28	-0.33	***	0.07	-1.50	***	0.09	-0.07	***	0.03
Race/Ethnicity												
White (reference)												
Non-Hispanic Black	2.33		1.85	0.28		0.79	1.89	*	0.88	0.04		0.18
Hispanic	-0.13		1.78	1.44		1.36	1.98		1.52	0.01		0.22
Other	-1.50		2.26	-0.17		0.61	-0.19		0.99	0.02		0.23
Immigrant	-0.12		2.12	-2.25		1.65	-1.80		1.72	-0.02		0.22
Parents Marital Status												
Married (reference)												
Separated/Widow/Divorced	0.90		1.78	-0.33		0.97	0.09		1.06	0.02		0.20
Never Married	14.42	***	3.45	-1.57		1.65	0.57		1.82	0.11	*	0.31
Parental Education												
College Degree (reference)												
Some College	0.33		2.82	0.09		0.77	-0.27		0.97	-0.04		0.17
High School Degree	2.78		4.21	0.08		0.67	0.08		0.89	-0.04		0.18
Less than a High School Degree	3.01		3.04	2.60		1.64	2.23		1.75	-0.03		0.30
Family Income												
Up to $20,000	-0.67		3.18	0.645		1.63	0.407		1.57	0.02		0.27
$20,000 to $34,999	-1.63		2.15	-0.653		0.80	-0.488		0.83	0.03		0.19
$35,000 to $54,999	-1.71		2.86	-0.053		0.83	-0.308		1.06	0.06	**	0.15
$55,000 to $74,999	-0.03		1.92	0.152		1.02	0.341		1.08	-0.02		0.19
$75,000 or greater (reference)												
Parental Age at Birth of Child	-0.19	**	0.07	-0.04		0.07	-0.04		0.07	0.00		0.01
Number of Household Members	1.01		0.53	0.53		0.37	0.76		0.41	0.02	**	0.05
Constant	143.69	***	4.86	7.08	**	2.50	27.07	***	2.94			

Note: n = 3,388. Models 1 through 7 are estimated using Ordinary Least Squares Regression. Model 8 is estimated using Logistic Regression and risk differences are calculated using the Margins command in Stata. Weights were applied and estimation processes accounted for complex sample design. Models control for seasonality and year of survey. RD = Risk Difference. [a]Statistically significant ($p < .05$) Wald test for improvement of fit after including parental characteristics.
*$p < .05$. **$p < .01$. ***$p < .001$.

Table 3. Predicted Time Spent in Moderate and/or Vigorous Activity by Family Characteristics for Children Aged 6 to 19 of Single Parents, 2003-2006 NHANES.

	Model 1			Model 2			Model 3			Model 4		
	Minutes Wearing Device			Minutes in Moderate or Vigorous Activity (bouts)[a]			Minutes in Moderate or Vigorous Activity (min)[a]			Minutes in Moderate Activity (bouts)[a]		
	Coef.		SE	Coef.		SE	Coef.		SE	Coef.		SE
Female	-0.17		0.20	-16.53	***	4.04	-25.28	***	5.08	-9.97	**	2.93
Age	0.10	***	0.03	-5.07	***	0.64	-9.11	***	0.80	-2.22	***	0.41
Race/Ethnicity												
White (reference)												
Non-Hispanic Black	0.96	**	0.33	-5.84		3.94	-11.50		5.87	-5.19		2.64
Hispanic	0.77		0.43	-7.44		5.74	-17.50	*	7.49	-3.06		3.05
Other	0.47		0.36	-2.47		8.86	-8.72		10.64	0.44		6.15
Immigrant	-0.52		0.70	1.76		8.04	6.33		10.02	1.80		5.56
Parental Education												
College Degree (reference)												
Some College	0.81		0.54	-11.51		10.87	-20.54		13.71	-3.52		6.50
High School Degree	0.10		0.57	-16.62		11.21	-25.28	*	12.27	-7.12		6.60
Less than a High School Degree	0.45		0.63	-13.29		11.37	-18.15		13.97	-6.43		6.53
Family Income												
Up to $20,000	-0.04		0.40	13.72	*	6.13	23.11	**	6.86	3.83		4.18
$20,000 to $34,999	-0.30		0.51	9.15		6.50	8.57		6.40	2.17		5.59
$35,000 to $54,999	-0.17		0.57	4.09		10.12	4.62		11.24	-2.22		5.40
$55,000 to $74,999	1.23		0.90	-14.22		8.70	-28.58	*	13.76	-11.66	*	4.71
$75,000 or greater (reference)												
Parental Age at Birth of Child	0.02		0.01	-0.54	**	0.17	-0.98	***	0.23	-0.28	*	0.12
Number of Household Members	0.03		0.08	1.06		1.22	-0.35		1.42	0.70		0.87
Constant	11.51	***	0.76	113.19	***	16.84	231.50	***	20.93	57.51	***	10.79

Note: n = 452. Models 1 through 7 are estimated using Ordinary Least Squares Regression. Model 8 is estimated using Logistic Regression and risk differences are calculated using the Margins command in Stata. Weights were applied and estimation processes accounted for complex sample design. Models control for seasonality and year of survey. RD = Risk Difference. [a]Statistically significant ($p < .05$) Wald test for improvement of fit after including parental characteristics.

*$p < .05$. **$p < .01$. ***$p < .001$.

Table 3 cont. Predicted Time Spent in Moderate and/or Vigorous Activity by Family Characteristics for Children Aged 6 to 19 of Single Parents, 2003-2006 NHANES.

	Model 5			Model 6			Model 7			Model 8		
	Minutes in Moderate Activity (min)[a]			Minutes in Vigorous Activity (bouts)			Minutes in Vigorous Activity (min)[a]			Minimum Requirement[a]		
	Coef.		SE	Coef.		SE	Coef.		SE	RD		SE
Female	-20.41	***	4.54	-1.64	**	0.57	-4.87	***	1.00	-0.20	***	0.30
Age	-7.34	***	0.70	-0.38	***	0.08	-1.77	***	0.14	-0.07	***	0.05
Race/Ethnicity												
White (reference)												
Non-Hispanic Black	-10.78	*	4.82	0.18		0.64	-0.71		1.41	-0.09		0.51
Hispanic	-14.45	*	6.08	-0.37		0.90	-3.06		1.87	-0.13		0.77
Other	-7.48		9.17	1.35		1.09	-1.24		2.06	0.16		0.80
Immigrant	5.68		8.91	-0.78		0.63	0.66		1.67	-0.07		1.14
Parental Education												
College Degree (reference)												
Some College	-16.16		11.87	-1.34		0.95	-4.38	*	2.13	-0.16		0.82
High School Degree	-20.85		10.31	-1.06		0.84	-4.43		2.23	-0.15		0.78
Less than a High School Degree	-14.90		11.81	-0.56		0.84	-3.26		2.51	-0.20		0.68
Family Income												
Up to $20,000	18.37	**	5.82	0.61		0.85	4.74	*	2.19	0.11		0.55
$20,000 to $34,999	5.52		5.79	-0.54		0.93	3.05		2.05	-0.01		0.62
$35,000 to $54,999	1.88		8.92	0.44		1.36	2.74		3.01	-0.04		0.62
$55,000 to $74,999	-24.77	*	11.03	-1.42		1.42	-3.81		3.48	-0.32		1.76
$75,000 or greater (reference)												
Parental Age at Birth of Child	-0.86	***	0.21	-0.03		0.02	-0.13	**	0.04	-0.01	**	0.01
Number of Household Members	-0.56		1.27	0.17		0.19	0.21		0.31	0.02		0.12
Constant	194.90	***	18.42	7.72	***	2.06	36.60	***	4.10		***	1.24

Note: n = 452. Models 1 through 7 are estimated using Ordinary Least Squares Regression. Model 8 is estimated using Logistic Regression and risk differences are calculated using the Margins command in Stata. Weights were applied and estimation processes accounted for complex sample design. Models control for seasonality and year of survey. RD = Risk Difference. [a]Statistically significant ($p < .05$) Wald test for improvement of fit after including parental characteristics.

*p < .05. **p < .01. ***p < .001.