

ABSTRACT

Title of thesis: INDEPENDENT AND JOINT EFFECTS OF PARENTAL ATTITUDES AND SPECIAL HEALTH CARE NEEDS ON PHYSICAL ACTIVITY AND SCREEN TIME AMONG CHILDREN AND ADOLESCENTS IN THE UNITED STATES

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Sedentary lifestyles pose a threat to the health of children, especially those with special health care needs (SHCN). Using data from the 2007 National Survey of Children's Health, this study examined relationships between parental attitudes and low physical activity and high screen time among 6- to 17-year-olds with and without SHCN. Perceived limitation was associated with increased likelihood of low physical activity (AOR, 1.339; 95%CI, 1.079-1.662). Parenting stress (AOR, 1.189; 95%CI, 1.052-1.344) and lack of trust (AOR, 1.243; 95%CI, 1.104-1.399) were associated with increased likelihood of high screen time. Perceived limitation modified the effect of special health care needs status on high screen time. The likelihood of combined low physical activity and high screen time was greatest among children with SHCN whose parents reported both functional limitations in the child and parenting stress (AOR, 2.659; 95%CI, 1.741-4.060). Parental attitudes and SHCN should be addressed in interventions to promote active lifestyles.

INDEPENDENT AND JOINT EFFECTS OF PARENTAL ATTITUDES AND
SPECIAL HEALTH CARE NEEDS ON PHYSICAL ACTIVITY AND SCREEN TIME
AMONG CHILDREN AND ADOLESCENTS IN THE UNITED STATES

by

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List of Abbreviations

AAP	American Academy of Pediatrics
AOR	Adjusted odds ratio
BMI	Body mass index
CDC	Centers for Disease Control and Prevention
CI	Confidence interval
CSHCN	Child with special health care needs
EBD	Emotional, behavioral and developmental conditions
HRSA	Health Resources and Services Administration
MVPA	Moderate-to-vigorous physical activity
NCHS	National Center for Health Statistics
NHANES	National Health and Nutrition Examination Survey
NIS	National Immunization Survey
NSCH	National Survey of Children's Health
OR	Odds ratio
PA	Physical activity
SBLA	Screen-based leisure activity
SE	Standard error
SHCN	Special health care needs
SLAITS	State and Local Area Integrated Telephone Survey
YRBS	Youth Risk Behavior Survey

I. INTRODUCTION

All children need physical activity to maintain an appropriate energy balance and to promote healthy growth and development. Physical activity stimulates physiologic and anatomic adaptations that improve the strength of muscle and bone while building cardio-respiratory capacity. Fundamental physical skills learned in childhood pave the way for continued physical activity across the life course. Because people tend to become less active as they get older and inadequate activity is associated with numerous chronic conditions, promoting active lifestyles during childhood is essential for lifelong health.^{1,2}

For children with special health care needs (SHCN), finding appropriate opportunities for physical activity creates extra challenges for parents.³ While most children with SHCN are able to be physically active, their health care needs might affect their choice of activities because of physical limitations or because of their own preferences and the expectations of the adults in their lives. For children with SHCN, it is especially important to optimize physical activity, not only to minimize the impact of the existing condition on quality of life, but also to decrease the likelihood of developing co-morbidities, such as obesity and diabetes.^{3,4}

Children's participation in various activities is highly dependent upon their parents' perceptions and attitudes about what they can and should do.^{5,6,7} The demands of parenting a child with SHCN create stresses that challenge parents' coping abilities and affect mental health.^{3,8,9,10,11} When there are many competing priorities, sedentary activities, including screen-based leisure activity (screen time), sometimes displace more physically active pursuits. Parental perceptions of their child's abilities and limitations, confidence in their ability to make good decisions about their child's activities, and their

trust in other adults who might interact with the child are potentially modifiable factors that can affect children's opportunities to engage in appropriate activities. Better understanding of the relationships between parental attitudes and the daily activities of children can facilitate interventions that address the needs of the family so that children with and without SCHN can engage in activities that optimize their growth and development while preventing obesity and its co-morbidities.

II. RESEARCH QUESTIONS AND HYPOTHESES

According to the 2008 *Physical Activity Guidelines for Americans*, children should engage in at least one hour of moderate-to-vigorous physical activity (MVPA) daily, and this should include at least 20 minutes of vigorous activity at least three times a week.^{1,2} However, only 18.4% of adolescents met this guideline in 2009.¹² The American Academy of Pediatrics (AAP) recommends that children engage in no more than two hours of screen-based leisure activities (SBLA) daily.^{13,14} While estimates of current media use vary widely by how it is measured, a Kaiser Family Foundation report estimates that in 2009, the average 8-18 year old spent about four hours a day with television, videos, movies, video games and recreational computer use.¹⁵ Compared with children without SHCN, children SHCN have been found to spend less time engaged in MVPA, to spend more time engaged in SBLA, and to have a higher prevalence of overweight and obesity.⁴ Because parents play a central role in creating opportunities for their children to engage in activities that promote optimal growth and development, understanding the relationship between parental attitudes and children's activities is essential for developing family-based interventions for this high-risk subpopulation.

Using data on 6- to 17-year-old US children from the 2007 National Survey of Children's Health (NSCH),¹⁶ we investigated the independent and joint effects of various parental attitudes and special health care needs status (SHCN with emotional, behavioral or developmental condition (EBD), SHCN without EBD or no SHCN) on children's engagement in physical activity and screen-based leisure activity. We predicted that the parent's perception of the child's limitations, the parent's mental health and perceived

stress due to parenting, the parent's perception of social support and trust in neighbors and the parent's perception of the child's safety would be associated with varying levels of physical activity and screen-based leisure activity, and that the strength of these associations would vary with special health care needs status.

Question #1: Are parental attitudes (perceptions of their child's limitations, the stress of parenting, social support, trust in neighbors and perception of child's safety) associated with the child's engagement in adequate physical activity?

Null Hypothesis #1: The proportion of children who do not engage in adequate physical activity will not vary with parental attitudes.

Hypothesis #1: The proportion of children who do not engage in adequate physical activity will be greater among households where parents' perceptions of the child's limitations are greater, where parents report greater stress of parenting and poorer mental health, where parents report less social support and less trust in neighbors, and where parents perceive their child as less safe, compared with households with more positive attitudes.

Question #2: Are parental attitudes (perceptions of their child's limitations, the stress of parenting, social support, trust in neighbors and perception of child's safety) associated with the child's engagement in leisure-based screen activities?

Null Hypothesis #2: The proportion of children who engage in excessive screen-based leisure activity will not vary with parental attitudes.

Alternative Hypothesis #2: The proportion of children who engage in excessive screen-based leisure activity will be greater among households where parents' perceptions of the child's limitations are greater, where parents report greater

stress of parenting and poorer mental health, where parents report less social support and less trust in neighbors, and where parents perceive their child as less safe, compared with households with more positive parental attitudes.

Question #3: Do parental attitudes (perceptions of their child's limitations, the stress of parenting, social support, trust in neighbors and perception of child's safety) modify the effect of special health care needs status on children's engagement in physical activity and screen-based leisure activities?

Null Hypothesis #3: The association between SHCN status and child's engagement in adequate physical activity and excessive screen-based leisure activity will not vary with parental attitudes.

Alternative Hypothesis #3: The presence of unfavorable parental attitudes will increase the proportion of children who engage in inadequate physical activity and excessive screen-based leisure activity for children in each of three special health care needs categories (no SHCN, SHCN without EBD and SHCN with EBD). The effect will be greatest for children with SHCN with EBD and least for those with no SCHN.

Question #4: Which constellation of parental attitudes and special health care needs places children is associated with the greatest likelihood of combined inadequate physical activity and excessive screen-based leisure activity?

Null Hypothesis #4: The odds of engaging in both inadequate physical activity and excessive screen-based leisure activity will not change with parental attitudes or SHCN status.

Alternative Hypothesis #4: The odds of engaging in both inadequate physical activity and excessive screen-based leisure activity will be significantly greater for those children who have both SCHN with EBD and parents who perceive their child's limitations as greater, who have poorer mental health and greater stress due to parenting, who have less social support and trust in neighbors, and who perceive their child as less safe.

We aimed to shed light on parental factors that could be modified in future family-based interventions for promoting more active lifestyles to optimize growth and development.

III. BACKGROUND: REVIEW OF LITERATURE

1. Relationships between physical activity and screen time and childhood obesity

Between 1980 and 2008, the prevalence of obesity among 6- to 11-year-olds in the US almost tripled.¹⁷ Childhood overweight and obesity have been linked to numerous health risks, including hypertension, hyperlipidemia, type 2 diabetes, sleep disturbance, orthopedic problems and psychological problems in childhood. Obese children, particularly adolescents, have been found to be more likely to become obese adults with related chronic diseases.¹⁷ Both physical activity and screen-based leisure activity have been shown to be associated with childhood overweight and obesity.¹⁷ Failure to meet guidelines for both physical activity and screen time increased the risk of overweight for boys by a factor of 4.5 and for girls by a factor of 3, compared with those who met both guidelines.¹⁸ Less active children tend to become less active adults.¹⁹

Sisson's (2010) analysis of 2003 NSCH data revealed that for both boys and girls, the odds of everyday physical activity decreased as hours of TV/video watching increased, and the combined influence of low levels of physical activity and high levels of TV/video watching increased the odds of being overweight.²⁰ While evidence does not support the idea that TV viewing directly displaces physical activity,^{21,22} excessive TV viewing has been linked with overweight, irregular sleep, and mental health problems.^{23,24}

A growing body of evidence has linked greater screen time with increased risk of poor dietary habits,^{25,26} obesity,^{27,28,29} metabolic syndrome and cardiovascular risk

factors. Using data on 2964 children in the National Health and Nutrition Examination Survey (NHANES), 2001-2004 Anderson et al²² estimated that 37.3% of US 4- to 11-year-old children engaged in active play less than seven days a week, 65% engaged in more than 2 hours of screen time daily, and 26.3% had both low active play and high screen time. Combined low activity and high screen time was associated with BMI greater than the 95th percentile, female gender and non-Hispanic black race/ethnicity.²²

The most successful interventions for prevention and treatment of childhood obesity involve changing parental behavior to affect the behavior of the child.^{17,30,31,32} Studying the interaction between parent attitudes and special health care needs is important because children with SHCN are at greater risk for obesity, low physical activity levels and excessive use of screen-based leisure activities,⁴ and the special stress of having a child with SHCN can impact parental ability to channel the child's activity appropriately.^{3,7,9,33}

2. Parental influence on children's physical activity and screen time

Among the numerous correlates of physical activity that have been investigated, parental support emerges as a consistent positive association.^{17,20,34,35,36,37,38} Parenting practices have also been associated with screen time.^{1,17}

In a recent review of 103 studies of parental influence on children's physical activity, Trost and Loprinzi³⁹ found consistent association between parent support (informational, emotional, appraisal, instrumental or combined) and physical activity, with somewhat stronger associations found for adolescents than for younger children. They found few studies that examined parenting style as an influence on physical activity, and only 2 of 7 showed positive significant association with authoritative parenting style. Mixed findings

of 8 studies that examined family cohesion and physical activity led to a conclusion that the evidence was "inconclusive." Regarding the association of child and parent physical activity, just 19 of 46 studies in children 6-12 years old and 8 of 27 studies in adolescents 13-18 years old showed significant positive associations.³⁹

Welk et al explored mechanisms of parental influences on physical activity in 994 children in grades 3-6 using child self-report and parental questionnaires to measure both direct and indirect effects of parents on child physical activity (PA).⁴⁰ They measured four different dimensions of parental support (role modeling, encouragement, involvement and facilitation) as well as a composite "parental influence." They found that parental influence affects child PA directly and through mediation by child intrapersonal factors (enjoyment of PA and perceived PA competency). Facilitation and overt encouragement were most strongly associated, but all of the tested scales contributed significantly to predicted PA.⁴⁰

Heitzler et al⁴¹ used structural equation modeling to study relationships among interpersonal variables (parent MVPA, parent support, peer support), intrapersonal variables (self-efficacy, enjoyment, barriers) and MVPA measured by accelerometer in 720 10-17 year olds. They found that perceived social support from both parents and peers were significantly related to intrapersonal factors that promote physical activity, but that peer support was more strongly correlated with MVPA than was parent support. Parental MVPA, reported by parents through a detailed activity questionnaire, was significantly associated with youth MVPA.⁴¹

Most studies of parental influence on children's physical activity have focused on parental support for PA and parental physical activity, without looking at factors that

might affect the parent's ability to provide appropriate support and engage in active play with their child, such as parent's mental health, parenting stress and social support. While several studies have investigated the associations between specific chronic conditions in childhood and physical fitness or obesity-related behaviors,^{42,43,44,45} little is known about the determinants of physical activity and screen-based leisure activity in CSHCN as a group, or how CSHCN with and without EBD differ from children without special health care needs.

Parenting practices have also been associated with screen time. Household rules about television watching are associated with decreased screen time¹⁵ and having a television in the bedroom is associated with increased screen time.⁴⁶

3. The independent variables

a. Identifying children with special health care needs

Approximately 20% of children in the US have at least one chronic condition that requires special health care, educational services, counseling or therapy. Comorbidities are common: 3.9% of US children have two chronic conditions and 4.8% have three or more chronic conditions.⁴⁵ Children with chronic medical conditions are up to three times more likely than the general population to have a coexisting emotional, behavioral or developmental condition.¹⁰

Van Cleave et al⁴⁸ studied three cohorts of children for six years, from age 2-8 through age 8-14 and found that while the prevalence of chronic conditions in children is increasing with time, many chronic conditions are dynamic. Many children who had a chronic condition at the outset did not have the same condition at the end of the six year study period; most of the chronic conditions present at the end developed during the 6

year study period. For example, just 42% of those who had asthma at the outset still had asthma after six years, while 78 percent of the children who had asthma at the end of follow-up did not have asthma at the outset. Similarly, just 37% of children who were obese at the outset were still obese at the end of follow-up, while 67% of the children who were obese at the end of follow-up were not obese at the outset.⁴⁸

To better plan for the needs of children with chronic conditions, the Health Resources Services Administration (HRSA) Maternal and Child Health Bureau has recently developed a non-categorical approach to identifying them, rather than relying on condition-specific prevalences. The Child With Special Health Care Needs (CSHCN) Screener is a brief questionnaire that identifies children with SHCN by consequences and service needs rather than by diagnosis.^{49,50} To be identified as a child with SHCN, a child must have at least one of these five special needs due to any medical, behavioral or other health condition that has lasted or is expected to last more than twelve months:

1. Child needs prescription medicine other than vitamins
2. Child needs or uses more medical care, mental health or educational services than is usual for most children of the same age
3. Child is limited or prevented in any way in his/her ability to do the things most children of the same age can do
4. Child needs or get special therapy, such as physical occupational or speech therapy
5. Child has any kind of emotional, developmental or behavioral problem for which (he/she) needs treatment or counseling

The CSHCN screener has been validated by comparison with the Questionnaire for Identifying Children with Chronic Conditions--Revised, and it was found to be equally reliable when used in telephone surveys or in self-administered mail questionnaires.^{47,48} In a national sample of 17,985 children, Bethell et al⁵⁰ found that 15.3% met at least one screener criterion. They found that the proportion of children who met at least one of the CSHCN screener criteria changed with age. The percent of children meeting CSHCN criteria was 8.0 in preschoolers, 17.2% in 5-9 year olds, 17.9% in 10-14 year olds and 18.4% in 15-18 year olds. Males (17.7%) were significantly more likely than females (12.8%) to meet CSHCN screener criteria. Among 0-13 year olds, 12.8% of Hispanic children, 15.1% of non-Hispanic white children, 14.6% of non-Hispanic black children and 9.7% of children from "other" racial/ethnic groups met CSHCN screener criteria.⁵⁰

Data from the 2003 NSCH⁵¹ showed that children with SHCN (identified by the CSHCN screener) were more likely than those without SHCN to have unemployed parents and live in poverty. Children 12- to 17-years-old were more likely to have SHCN than those 6- to 11-years-old. While the overall prevalence of children with SHCN in adolescents was not significantly different from the prevalence of children with SHCN in pre-teens, 12- to 17-year olds were more likely than 6- to 11-year-olds to have SHCN with frequent headaches and with depression or anxiety. Males were more likely than females to have SHCN. While non-Hispanic black preschoolers were more likely to be identified as children with SHCN than non-Hispanic white or Hispanic children, among 6- to 17-years-olds, non-Hispanic white children were more likely to be identified as children with SHCN than non-Hispanic black or Hispanic children. Children whose parents had fair or poor mental health were more likely to have SHCN than children

whose parents had excellent mental health. Children in two-parent households were less likely to have SCHN with EBD than children without two parents in the home.⁵¹

Children from households where the primary language is English were three times as likely as those from households primarily using other languages to be identified as children with SHCN. Parents who attended college were more likely to have children with SHCN than parents who did not attend college.⁵¹ Newacheck et al point out that these differences may arise because parents who are better able to navigate the medical care system are more likely to obtain diagnoses and services.⁵¹

b. Parental perceptions of child's limitations

Illness during infancy or childhood can cause parents to perceive the child as especially vulnerable, even after the illness abates. This "Vulnerable Child Syndrome", as described by Green and Solnit,⁵² can distort the parent-child relationship, resulting in child behavior problems, difficulty with separation, infantile behavior, hypochondriasis and academic underachievement.^{8,52,53} Parents who perceive their child as vulnerable have been described as unnecessarily restricting their children's physical activity.³³ While parental perception of child vulnerability and parental over-protectiveness have been investigated as determinants of child adjustment and academic achievement,^{7,8,54} we have not found any recent population-based studies that examined this construct with regard to obesity-related behaviors in children with SHCN with and without EBD.

This association is of interest because of theoretical links between intrapersonal characteristics (outcome expectancy, self-efficacy, and perceived competence) and health behaviors, and the influence of parental perceptions on opportunities and encouragement that promote development of these characteristics in children.^{5,39,54} In a study of asthmatic

children, for example, Pianosi and Davis found that the child's perceived competence at physical activity was correlated with aerobic fitness, but asthma severity was not.⁴³

Similarly, Fong et al found that children with developmental coordination disorder were more likely to be more active when they perceived themselves to have more motor ability.⁴²

c. Parental mental health and parenting stress

Having a child with SHCN puts special stresses on the family. Considerable work has been done in clinical settings to evaluate the relationship between chronic illness in childhood and family adjustment.⁹ Most of these studies have focused on small groups with a particular diagnosis (cystic fibrosis, cancer, limb deficiency, sickle cell anemia), but less is known about the impact of chronic conditions in general at the population level. Wallander and Varni developed a conceptual model of child and family adjustment to pediatric chronic physical disorders designed to be "generic," that is, to address the psychosocial issues that are common to children with children with chronic conditions, independent of their specific diagnosis.⁹ This model illustrates the interplay of various intrapersonal and social-ecological factors with factors related to disease and disability as related to the mental, social and physical adjustment of the child. Notably, the adjustment of family members and social support provided by the family affects cognitive appraisal and coping strategies that enable affected children to deal with the stresses of condition-related problems, daily hassles and major life events in a way that promotes their appropriate "development into autonomous, healthy, and well-functioning adults."⁹

Among parents of 2- to 17-year-old children with SHCN with EBD, 42.8% report coping "very well" with parenting compared with 57.2% of CSHCN without EBD⁴ and

60% of all parents surveyed.⁴⁷ In a study of multiple social risks on children's general health using data from the 2003 NSCH, Larson et al found that low maternal mental health increased the odds of that the child would be overweight and that the parents would rate the child's general health as less than “very good.”⁵⁵ We have not found any previous analysis of population-level data regarding the association of parental mental health and parenting stress with obesity-related behaviors in children with SHCN.

Data from the 2003 NSCH indicated that children with SHCN were more likely than children without SHCN to be in families that deal with conflict by arguing or shouting and families that eat fewer meals together.⁵¹ Among 6-17 year olds, children whose parents reported close relationships with their children were less likely to have SHCN with a behavioral/conduct problem than those who did not have close relationships.⁵¹

d. Parental social support and trust in neighbors

Using data from 2003 NSCH, Singh et al found that low social capital was significantly associated with increased risk of physical inactivity even after adjusting for other factors.⁵⁶ This study did not look for differences between the general population and the subpopulation of children with SHCN. Children living in supportive neighborhoods were less likely to have SHCN with EBD than children in less supportive neighborhoods.⁵¹

e. Parental perception of child's safety

In the 2003 NSCH, children whose parents reported less neighborhood safety were more likely to have frequent headaches, developmental problems and behavior/conduct problems.⁵¹ Larson found that perception of the neighborhood as unsafe increased the odds of overweight,⁵⁵ but Singh found no association between neighborhood safety and

physical inactivity.⁵⁶ Using data from the 2007 NSCH, Danielson⁵⁷ found that children with EBD conditions were more likely to live in neighborhoods perceived as unsafe and more likely to have inadequate activity levels compared with those without EBD conditions. There was significant interaction between EBD status and perceived neighborhood safety.⁵⁷

4. Measuring physical activity and screen time

The literature includes studies that measure physical activity levels by self-report, proxy report, direct observation, and objective measurement by pedometer or accelerometer, and variations in measuring physical activity complicates comparisons across studies.²¹ Self-report methods include single questions, multiple questions, 24 hour recall and 3-day recall. Both self-report and proxy reports have been shown to lack validity when compared with objective measurements.^{58,59,60,61} Because of cognitive limitations in young children, proxy reports by parents are used in studies of young children where objective measures are not feasible. Murphy et al found that a single multiple choice question to elicit a description of the child's overall activity level was a good predictor of child fitness levels.⁶² Measures of vigorous activity have been found to be more reliable than measures of moderate activity.⁶⁰

Many studies dichotomize physical activity levels based on whether the reported level of physical activity does or does not meet current guidelines. Current guidelines recommend that children get at least 60 minutes of moderate-to-vigorous physical activity daily, including at least 20 minutes of vigorous activity at least three days a week.² In the 2007 NSCH parents were asked "During the past week, on how many days did (child) exercise, play a sport, or participate in physical activity for at least 20 minutes

that made him/her sweat and breathe hard?”⁶³ Both moderate and vigorous activity cause sweating and increased respiration; they are distinguished by intensity, and *how much* sweat production and respiratory increase they cause. Therefore, while the intensity description captures both moderate and vigorous activity, the duration (20 minutes) is better aligned with guidelines for vigorous activity. The analysis of Singh et al^{56, 64, 65, 66} and the NSCH chartbook⁴⁷ use a 3-day cut point to define those who engage in "regular" physical activity, whereas Anderson²² et al use a 6-day cut point when analyzing a similar question from NHANES. Objective measures of children's physical activity have shown that children often engage in short bursts of vigorous activity⁶⁷ which may not be included in the answer to the NSCH question. As young people become more autonomous and spend more time away from home, parental report of their unstructured activity levels might become less reliable.⁶⁰ Nonetheless, Singh notes that NSCH parental reports are similar to youth self-reports about physical activity in the Youth Risk Behavior Survey (YRBS).⁵⁶

Until recently, studies of sedentary activities have emphasized television viewing, but in the last decade computer-based leisure activities may have displaced some television viewing for some children. Therefore, measures of screen-based leisure activity in more recent studies include both TV and computer use.⁶⁸ The 2007 NSCH includes a question about TV, videos and video games, and a separate question about non-school related computer use.⁶³ Together these questions allowed calculation of total minutes of screen-based leisure activity, which we dichotomized using a 2-hour cut point consistent with the AAP guidelines.

Summary of the conceptual model

Drawing from Wallander's model⁹ based on family dynamics and Singh's model⁶⁵ of social and behavioral determinants of childhood obesity, [Figure 1](#) shows a conceptual model based on the interrelationships described above. We posit that parental attitudes, including their perception of a child's physical limitations, their mental health and ability to cope with day-to-day demands of parenting, their perception of available social support, their ability to trust their neighbors and their perception of their child's safety, affect their ability to provide appropriate opportunities for, and to set appropriate limits on, behaviors that affect growth and development. Parental attitudes also influence the child's self concept and perceived competence, which in turn affect the child's choice of activities. Furthermore, we posit that the presence of special health care needs can have both direct and indirect effects on both sedentary behavior and obesity. Some conditions interfere with mobility, precluding physical activity, and some require medications that cause excess weight gain. SHCN can also affect the parent's ideas about what the child can and should do, while also affecting the child's self concept and perceived competence. The focus of the current study is the association of parental attitudes and SHCN with variation in physical activity and screen time.

IV. RESEARCH DESIGN AND METHODS

For this cross-sectional study of a nationally representative sample of 6- to 17-year-old boys and girls in the United States, we performed a secondary analysis of the publicly available dataset from the 2007 National Survey of Children's Health.

1. Study Population

The 2007 National Survey of Children's Health (NSCH) is a module of the State and Local Area Integrated Telephone Survey (SLAITS), conducted by the National Center for Health Statistics (NCHS), Centers for Disease Control and Prevention (CDC), funded by the Maternal and Child Health Bureau of the Health Resources and Services Administration.¹⁶ SLAITS uses random-digit dialing of land-line phones to identify households for the National Immunization Survey (NIS), and households from this NIS sample that include children less than 18 years old are eligible for the NSCH. When screening questions indicate that the household includes more than one child, one child is randomly selected from the household to be the subject of the interview. The respondent was the adult in the household who knows the most about the child's health. A total of 91,642 interviews were completed in 2007 and 2008, surveying approximately 1,700 households in each of the 50 states and the District of Columbia. For this study we limited our focus to all 64,076 children ages 6-17, including 15,049 children with SHCN and 49,027 without SHCN. The respondents were 74.6% mothers, 18.8% fathers and 6.6% others. (We will subsequently refer to the respondents as "parents.")

2. Defining dependent variables

We based our determination of physical activity on responses to the question, “During the past week, on how many days did (child) exercise, play a sport, or participate in physical activity for at least 20 minutes that made him/her sweat and breathe hard?”⁶³ We categorized children as having **low MVPA** if the parent reported physical activity on five or fewer days per week.

We based our determination of screen-based leisure activity on responses to these questions:

- On an average weekday, about how much time does (child) use a computer for purposes other than schoolwork?
- On an average weekday, about how much time does (child) usually watch TV, watch videos or play video games?⁶³

We computed the sum of the minutes for recreational computer use plus the minutes for watching TV and videos and playing video games. We categorized children as having **high screen time** if the total was greater than 120 minutes.

We categorized children as having a **sedentary lifestyle** if they had both low MVPA (20 minutes of MVPA on five or fewer days/week) and high screen time (more than 120 minutes of screen time per day.)

3. Description of independent variables

Children were categorized by **special health care needs status** (SHCN) based on responses to the CSHCN screener and questions about specific EBD conditions. Children who met no CSHCN screener criteria were classified as "without SHCN." If children met at least one CSHCN screener criterion and the parent indicated that the child needed counseling or therapy for an EBD condition or the parent indicated that the child

currently had one of the specific EBD conditions in Table 2, they were classified as "SHCN with EBD." If children met at least one CSHCN screener criterion but did not need counseling or therapy for an EBD condition and did not currently have EBD condition listed in Table 2, they were classified as "SHCN without EBD."

To measure the parent's **perception of the child's limitations**, we used the dichotomous answer to the question, "Is child limited or prevented in any way in his/her ability to do the things most children of the same age can do?"⁶³

To provide a summary measure of parent's **mental health and parenting-related stress**, we created an index ranging from 0-5 that sums dichotomized answers to questions asking parents to rate

- Their general mental and emotional health
- How well they are coping with the demands of parenthood
- How often they feel the child is much harder to care for than most children his/her age
- How often he/she does things that really bother them
- How often they felt angry with him/her⁶³

Because questions about the other parent were not asked in single-parent households, and because the respondent was the parent who knows the most about the child and his/her medical issues, we used only information about the mental health of the respondent.⁶¹ For the logistic regression modeling, we collapsed this into two categories to compare those with a score of zero to those with a score of 1 through 5.

Parental perception of **social support** was measured by the answer to the question, "Is there someone you can turn to for day-to-day emotional help with parenthood/raising children?"⁶³ To measure the parent's perception of the child's **safety**, we summed the (dichotomized) answers to questions about safety at school and safety in the neighborhood,⁶³ for a scale ranging from 0 (usually or always safe at both school and in

the neighborhood) to 2 (usually or always safe in neither school nor neighborhood.) This was collapsed into two categories ("zero" vs "1 through 2") for modeling.

As a measure of the parent's **trust in neighbors**, or their perception of social capital in their community, we used an index ranging from 0-4 that sums dichotomized answers regarding whether they agree or disagree with the statements

- People in this neighborhood help each other out
- We watch out for each other's children in this neighborhood
- There are people I can count on in this neighborhood
- If my child were outside playing and got hurt or scared, there are adults nearby who I trust to help my child⁶³

This was collapsed into two categories ("zero" vs "1 through 4") for modeling.

Additional covariates considered as potential confounders included age, gender, race/ethnicity, body mass index (BMI) classification, parental education, poverty level,^{50,58} severity of condition and number of conditions.⁴

4. Data analysis

Data were analyzed using SAS 9.2 (SAS Institute, Inc.) survey procedures, applying appropriate sampling weights because of the complex survey design. PROC SURVEYFREQ was used to describe frequencies of each outcome for each parental attitude variable (child's limitations, mental health/parenting stress, social support, trust, safety), SHCN and covariate (age, gender, race/ethnicity, parental education, poverty level, BMI classification, severity of condition). Rao-Scott χ^2 statistics were used to test for significant associations. (Table 3). We also used PROC SURVEYFREQ to determine frequencies and prevalence of each parental attitude variable and covariate for each

SHCN category and used Rao-Scott χ^2 statistics to test for significant associations. (Table 4). Where covariates were significantly associated with both the outcomes and SHCN category, they were considered potential confounders. Multicollinearity was evaluated using PROC CORR to compute Pearson correlation coefficients. Observations with data missing for the relevant variables were excluded from the analysis. "Don't know" and "refused" responses were recoded as missing.

PROC SURVEYLOGISTIC was used to create logistic regression models to determine the effects of each of the parental attitude variables, SHCN status and covariates on each of three outcome variables: (1) low physical activity (20 minutes of physical activity less than six days/week) (2) high screen time (television, videos, video games and recreational computer use greater than 120 minutes/day), and (3) sedentary lifestyle (both low physical activity and high screen time). Adjusted odds ratios were calculated for children SHCN with and without EBD using children without SHCN as the reference group. To evaluate interactions between the predictor variables, we tested interaction terms for significant effects and created models stratified by special health care needs status and by attitude indicators to examine effects separately in different subgroups. To analyze joint effects, we created variables for various constellations of parental attitudes and special health care needs status and used logistic regression to determine adjusted odds ratios for sedentary life style using those without any of the characteristics in the constellation as the reference group.

5. Human Subjects

Respondents to the NSCH were informed that participation was voluntary and gave informed consent.¹⁶ We used de-identified data in a publicly available dataset. No attempt

was made to link any data to individuals. The proposal was submitted to the University of Maryland Institutional Review Board for approval, and was declared exempt because the data set does not include personal identifiers.

V. RESULTS

1. Descriptive statistics

a. Characteristics of the population

The 2007 NSCH included interviews about 64,076 school-aged children 6-17 years of age. [Table 1](#) shows the distribution of various sociodemographic characteristics in the study population. The sample included 33,292 boys and 30,693 girls. There were 27,792 children (6-11 years old) and 36,284 adolescents (12-17 years old). The respondents included 46,750 mothers (including adoptive and step-mothers), 13,388 fathers (including adoptive and step-fathers), and 3926 “others” acting in a parenting capacity.

[Table 2](#) shows the frequency of specific diagnostic categories in the sample and population estimates computed using sampling weights to adjust for the complex sampling design. While an estimated 23% of the population were identified by the CSHCN screener as children with SHCN, an estimated 24% of the population had one of the listed chronic conditions, 11% had two, 5% had three and 7% had four or more. An estimated 4.7% of children had one of the listed conditions which the parent described as severe and 1.6% had two or more severe conditions.

The sample included 49,027 children without special health care needs, 7,527 children with SHCN without EBD, and 7,522 children with SHCN with EBD. Using appropriate weights, this indicates that 77.1% (SE, 0.41) of the US population of 6- to 17-year-olds, or an estimated 37,997,602 children and adolescents have no SHCN. An estimated 11.2% (SE, 0.31) or 5,531,804 have SHCN without EBD and an estimated 11.7% (SE, 0.31) or 5,749,742 have SCHN with EBD ([Figure 2](#)). As seen in [Figure 3](#), the most

common of the specific diagnoses listed were respiratory allergies (19.0%; SE 0.40%), asthma (10.3%; SE, 0.30%), learning disabilities (9%; SE, 0.30), and attention deficit disorder (8.2%; SE, 0.26%).

The prevalence of all three outcomes (low MVPA, high screen time and sedentary lifestyle) varied significantly with gender, age ([Figure 4](#)), BMI classification (for those 10 and older), race/ethnicity ([Figure 5](#)), respondent's education, household poverty ratio, and special health care needs status ([Figure 6](#)). [Table 3](#) shows the prevalence of each outcome among different subpopulations.

b. Low moderate-to-vigorous physical activity

As shown in [Table 3](#), we found that 64.2% (SE, 0.5%) of US 6-17 year olds get 20 minutes of moderate-to-vigorous physical activity less than 6 days a week (low MVPA). A significantly higher proportion of girls than boys had low MVPA. A significantly higher proportion of adolescents than of younger children had low MVPA. The prevalence of low MVPA also varied significantly with race/ethnicity, with the highest prevalence of low MVPA less than 6 days a week being among Hispanics and the lowest prevalence being among non-Hispanic multi-racial children and adolescents. The prevalence of low MVPA was significantly greater among children from poor households than among the more affluent. There was also a significant association between low MVPA and respondent's education, with higher prevalence among children of the less educated. The prevalence of low MVPA varied by state, from a low of 56% in North Carolina to a high of 73% in Connecticut. Maryland ranked eighteenth, with 64% and the District of Columbia ranked fiftieth with 71%.

As shown in [Table 3](#), the prevalence of low MVPA did not differ significantly by special health care needs status ($p=.1714$). The prevalence of low MVPA was significantly higher among children with perceived limitations (70.2%; 95% CI, 66.72-73.79) than among children without perceived limitations (63.7%; 95% CI, 62.74-64.74). The prevalence of low MVPA was lower among children whose parents reported that they had social support (63.2%; 95% CI, 62.21-64.25) than among children whose parents did not report that they had social support (70.1%; 95% CI, 67.77-73.39).

Children whose parents indicated less trust in their neighbors had higher prevalence of low MVPA than those indicating greater trust, but this difference was not significant ($p=.0648$). Those who had zero scores on the trust index had a significantly lower prevalence of low MVPA (63.41%; 95% CI, 62.31-64.50) than those with scores of 1-4 (67.0%; 95% CI, 64.81-69.25). Prevalence of low MVPA was least among children whose parents considered them usually or always safe both in school and in their neighborhood, and greatest among those whose parents considered them usually or always safe in neither school nor neighborhood.

For the parental the mental/health stress index, the chi square test indicated significant differences in low MVPA ($p=.035$); the highest prevalence was among those with a score of 3 out of 5 and the lowest prevalence was among those few with scores of 4 and 5. Among children whose parents had a zero score on the mental health/stress index the prevalence of low MVPA (63.2%; 95% CI, 62.14-64.28) was significantly less ($p=.0006$) than among children whose parents had a score of 1-5 (67.6%; 95% CI, 65.41-69.84).

c. High screen time

Overall, 48.4% (SE, 0.5%) of 6-17 year olds exceeded 2 hours of screen time daily (high screen time). The prevalence of high screen time was significantly greater among adolescents than among younger children, and significantly greater among boys than girls. Non-Hispanic black children had a significantly higher prevalence (63.7%; SE, 1.19%) of high screen time than non-Hispanic white children (44.8%; SE, 0.56%), Hispanic children (48.2%; SE, 1.57%) or non-Hispanic children of other races (43.8%; SE, 2.89%). Lower household income and lower parental education were associated with significantly higher prevalence of high screen time. Among the 50 states and the District of Columbia, Vermont had the lowest prevalence of high screen time (36%) and Florida had the highest prevalence (57%). Maryland ranked thirty-second at 49% and the District of Columbia ranked forty-second at 52%.

There were significant differences in the proportions of children with high screen time by SHCN status, with the highest prevalence among children with SHCN with EBD (53.2%) and the lowest prevalence among those with no SHCN (48.0%). The proportion of children with high screen time was greater among children with perceived limitations than among those without perceived limitations. The proportion of children with high screen time was lower among children whose parents had social support than among those whose parents did not have social support. There was also a significant difference in screen time related to perceived safety; 47% of children who were considered safe both in school and their neighborhoods and 59.7% of those considered safe in neither school nor neighborhood had high screen time. The proportion of children with high screen time also varied significantly by scores on the parental mental health/stress index, with highest

prevalence among those with scores of 4 and 5 and lowest among those with a score of zero. Higher scores on the trust in neighbors index were also associated with higher prevalence of high screen time.

d. Sedentary life style

Overall, an estimated 33.3% of US 6-17 year olds had sedentary lifestyles (combined low MVPA and high screen time). The prevalence of the sedentary lifestyle combination was higher among adolescents than among younger children. While girls had higher prevalence of low MVPA and boys had higher prevalence of high screen time, the combination was significantly more prevalent among girls (35.1%) than among boys (31.5%). Race/ethnicity was also associated with significant differences in the prevalence of sedentary lifestyle, with the highest prevalence among non-Hispanic black children (42.2%). Prevalence of sedentary lifestyle was significantly lower among children whose parents had more than twelve years of education than among those with twelve years or less. Household income was also associated with significant differences in prevalence of sedentary lifestyle, with the lowest prevalence among the most affluent. Among the 50 states and the District of Columbia, Vermont had the lowest prevalence of sedentary lifestyle (24%) and Florida had the highest (39%). Maryland ranked twenty-second with 32% and the District of Columbia ranked fiftieth with 38%.

Special health care needs status was significantly associated with sedentary lifestyle, with prevalence of 31.5% among children with no SHCN, 39.1% among children with SHCN without EBD and 41.6% among children with SHCN with EBD. Children with perceived limitations had a significantly higher prevalence of sedentary lifestyle than those without perceived limitations. There was a lower prevalence of sedentary lifestyle

among children whose parents had social support than among those whose parents did not have social support. Among children who were considered safe both in school and in their neighborhood, the prevalence of sedentary lifestyle was significantly lower than among those considered safe in neither school nor neighborhood. Scores on the trust index were also associated with significant differences in sedentary lifestyles, with lowest prevalence (32.3%) among those with a score of zero and highest prevalence (43.3%) among those with a score of 4. Scores on the mental health/stress index were also associated with significant differences in prevalence of sedentary lifestyle, with the highest prevalence among those with a score of 3 out of 5 (44.4%) and lowest prevalence among those with scores of zero (31.5%) and five (31.1%).

e. Associations of covariates with special health care needs status

As shown in [Table 4](#), Rao-Scott chi square tests indicated significant associations between special health care needs status and gender, race/ethnicity, respondent, respondent's education, household poverty ratio, number of conditions and number of severe conditions.

All of the parental attitudes of interest were also significantly associated with special health care needs status. Among children with no perceived limitations, 81.6% had no SHCN, 10.3% had SHCN without EBD and 8.2% had SHCN with EBD. Among children with perceived limitations, 19.1% had no SHCN, 23.6% had SHCN without EBD and 57.2% had SHCN with EBD. There was a higher prevalence of SHCN with EBD and a lower prevalence of SHCN without EBD among those without social support, compared with those with social support. There was lower prevalence of SHCN with EBD among those considered safe both in school and in the neighborhood compared with those not

considered usually or always safe in school, neighborhood or both. Non-zero scores on the trust index were associated with higher prevalence of SHCN with EBD and lower prevalence of no SHCN than zero scores. Among children whose parents' reports yielded scores greater than one on the mental health/stress index, there was a higher prevalence of children with SHCN with EBD and a lower prevalence of no SHCN and SHCN without EBD than among those with scores of zero or one.

f. Correlations between covariates

To evaluate colinearity between variables we used proc corr to generate a correlation matrix. Because respondent's education was highly correlated with poverty ratio (Pearson correlation coefficient ($\rho=.417$), and the poverty ratio had more missing data, we chose to use only the respondent's education to indicate socio-economic status in the models. We also noted correlations between SHCN status and perceived limitations ($\rho=.404$), SHCN and mental health/stress ($\rho=.246$) SHCN status and number of conditions ($\rho=.665$) and SHCN status and severity ($\rho=.337$). Number of conditions was also correlated with condition severity ($\rho=.430$) and mental health/stress ($\rho=.223$). Therefore we did not include number or severity of conditions in the models.

Among the parental attitudes, we noted correlation between perceived safety and trust in neighbors ($\rho=.276$) and between perceived limitations and mental health/stress ($\rho=.209$). Other combinations had correlation coefficients less than 0.2.

2. Hierarchical logistic regression models

For each outcome, we used PROC SURVEYLOGISTIC to compute crude odds ratios for each of the study variables (special health care needs status, perceived limitations,

trust in neighbors, parental mental health/stress, social support and perceived safety) and covariates (gender, race/ethnicity, respondent's education and age). Model 1 adjusts for gender race/ethnicity, respondent's education and age. Model 2 adjusts for gender, race/ethnicity, respondent's education, age and special health care needs status. Model 3 is the fully adjusted model, which adjusts for gender, race/ethnicity, respondent's education, child's age, special health care needs status, perceived limitations, mental health/stress, trust in neighbors, social support and perceived safety.

a. Low moderate-to-vigorous physical activity

[Table 5](#) shows the prevalence of low MVPA for each of the SHCN categories and dichotomized parental attitude variables. The differences between the SHCN categories are not statistically significant. There are significant differences in prevalence for the all of the parental attitude indicators, with higher prevalence associated with presence of perceived limitations, lack of social support, and non-zero scores on the mental health/stress, trust in neighbors and safety indices..

[Table 6](#) shows the crude odds ratios and three models for low MVPA. Unadjusted odds ratios for all of the variables of interest except special health care needs status show significant effects (Wald chi square with $p < .05$). Model 1 shows that adjusting for gender, race/ethnicity, respondent's education and child's age caused little change in odds ratios for those variables. Model 2 shows that after adjusting for the sociodemographic variables, children with SHCN with EBD had significantly greater odds of low MVPA than children with no SHCN (, 1.241; 95%CI, 1.092-1.411). In the fully adjusted model, the effect of SHCN status was no longer significant, and the effects of mental health/stress, trust in neighbors, social support and perceived safety were no longer

significant (Wald chi square with $p > .05$). Children with perceived limitations were significantly more likely than those without perceived limitations to have low MVPA after adjusting for demographic characteristics, special health care needs status and the other parental attitude variables ($\beta = 1.339$; 95% CI, 1.079-1.662).

[Figure 7](#) summarizes the results of logistic regression for the effects of the five parental attitude variables on low MVPA in each of the following models:

- Unadjusted
- Model 1: Adjusted for demographic variables (age, gender, race/ethnicity, and respondent's education)
- Model 2: Adjusted for demographic variables and SHCN status
- Model 3: Adjusted for demographic variables and the other attitudes

While unadjusted logistic regression shows significant effects on the odds of low MVPA for all of the parental attitude variables, only perceived limitations remains significant in the fully adjusted model.

c. High screen time

[Table 7](#) shows the prevalence of high screen time for each category by SHCN status and dichotomized parental attitude indicators. The proportion of children with high screen time is significantly higher among those with SHCN with EBD than those without SHCN. The proportion with high screen time among those with SHCN without EBD is not significantly different from the other two SHCN categories. All of the parental attitude indicators show significant differences, with higher prevalence among those with perceived limitations, lack of social support and non-zero scores on mental health/stress, trust in neighbors and perceived safety indices.

[Table 8](#) shows the crude odds ratios and adjusted odds ratios computed from three logistic regression models for high screen time. For high screen time, all of the demographic covariates, special health care needs status and parental attitudes variables showed significant effects on the unadjusted odds of high screen time (Wald chi square with $p < .05$). Model 1 (adjusting for gender, race/ethnicity, education of respondent and age of child) resulted in little change in these effects. Model 2 showed that after adjusting for gender, race/ethnicity, education of respondent and age of child, children with SHCN with EBD were more likely than children without SHCN to have high screen time (, 1.172; 95%CI, 1.031-1.333). In the fully adjusted model which included the parental attitude variables, this relationship was no longer significant.

After adjusting for all the other covariates, effects of special health care needs status, perceived limitations, social support and perceived safety on the odds of high screen time were not significant (Wald chi square with $p > .05$). The fully adjusted model also showed

that girls were significantly less likely than boys to have high screen time (AOR, 0.887; 95%CI, 0.815-0.966), non-Hispanic black children were twice as likely as likely as non-Hispanic white children to have high screen time (AOR, 2.007; 95% CI, 1.77-2.276) and children of high school graduates were more likely than children whose parents have more than 12 years of education to have high screen time (AOR, 1.45; 95% CI, 1.280-1.564). The child's age in years also had a significant positive effect on the odds of sedentary life style. Children whose parents scored 1 through 5 on the mental health/stress index were significantly more likely to have high screen time than those whose parents scored zero (AOR, 1.189; 95%CI, 1.052-1.344). Children whose parents scored 1-4 on the trust in neighbors index were more likely than those whose parents scored zero to have high screen time (AOR, 1.243; 95%CI, 1.104-1.399). Adding attitudes to the model lowered the AOR for non-Hispanic black children by 6%.

[Figure 8](#) summarizes the results of logistic regression models for high screen time for effects of each of the parental attitude variables

- Unadjusted
- Model 1: Adjusted for demographic variables (age, gender, race/ethnicity, and respondent's education
- Model 2: Adjusted for demographic variables and SHCN status
- Model 3: Adjusted for demographic variables and the other attitudes

Similar to the analysis for low MVPA, all of the attitude variables show significant effects in the unadjusted regression. However, only the mental health/stress and trust in neighbors variables show significant effects after adjusting for the other covariates.

c. Sedentary lifestyle

[Table 9](#) shows the prevalence of sedentary lifestyle (both less than six days/week with 20 minutes of exercise and more than 120 minutes/day of screen time) for each category by SHCN status and dichotomized parental attitude indicators. The prevalence of sedentary lifestyle is significantly greater among children with SHCN with EBD than among children without SHCN, but the prevalence among children with SHCN without EBD is not significantly different from the other two categories. All of the parental attitude indicators are associated with significant differences in prevalence, with higher prevalence among those with perceived limitations, lack of social support and non-zero scores on the mental health/stress, trust in neighbors and perceived safety indices..

[Table 10](#) shows crude odds ratios and adjusted odds ratios computed in three logistic regression models for sedentary lifestyle. Unadjusted logistic regression showed significant effects for all of the sociodemographic characteristics, special health care needs status and parental attitudes variables (Wald chi square with $p < .05$). In Model 1, adjusting for gender, race/ethnicity and age slightly attenuated the effect of respondent's education. In Model 2, the effect of special health care needs status was significant after adjustment for gender, race/ethnicity, respondent's education and child's age, with children with SHCN with EBD (AOR, 1.267; 95%CI, 1.111-1.445) and children with SHCN without EBD (AOR, 1.177; 95%CI, 1.020-1.358) more likely to have sedentary lifestyle than children without SHCN.

After adjusting for all the other covariates in Model 3, the effect of special health care needs status was no longer significant. Adding attitudes to the model decreased the AOR for non-Hispanic black children by 5%. In the fully adjusted model, the effects of social

support and perceived safety on the odds of sedentary life style were no longer significant (Wald chi square with $p > .05$). Children with perceived limitations were more likely to have sedentary lifestyles than children without perceived limitations (AOR, 1.245; 95% CI, 1.018-1.522). Children whose parents scored 1 - 5 on the mental health/stress index were more likely to have sedentary lifestyles than those whose parents scored zero (AOR, 1.206; 95% CI, 1.068-1.363). In the fully adjusted model, children whose parents scored 1 - 4 on the trust in neighbors index were also more likely to have sedentary lifestyles than those whose parents scored zero (AOR, 1.149; 95% CI, 1.02-1.295).

[Figure 9](#) summarizes the results of logistic regression for the effects of each of the parental attitude variables on sedentary lifestyle, giving unadjusted odds ratios and AOR for each of the three models as described before. As for low MVPA and high screen time, all of the attitude variables had significant effects on sedentary lifestyle. However, only the perceived limitations, mental health/stress and trust in neighbors variables had significant effects after adjusting for the covariates.

3. Testing for effect modification

To test whether parental attitudes modify the effect of special health care needs on the outcomes, we used PROC SURVEYLOGISTIC to produce logistic regression models that included interaction terms. For each of the outcomes, we created models that included gender, race/ethnicity, education of respondent, age of child, special health care needs status, the attitude variable and the interaction term. None of the interaction terms had significant effects on odds of low MVPA or sedentary lifestyle. Only the interaction term for perceived limitations and special health care needs had a significant effect on the

odds of high screen time ([Table 11](#)). Tables 12-15 list results of logistic regression using domain analysis to stratify by SHCN status and level of parental attitude indicators.

a. Low moderate-to-vigorous physical activity

[Table 12](#) lists results of separate logistic regression models predicting low MVPA for each attitude variable adjusted for demographic characteristics, both for the overall population and for each subpopulation defined by SHCN status. Among all 6- to 17-year-olds, those with perceived limitations were more likely to have low MVPA than those without perceived limitations (AOR, 1.445; 95%CI, 1.182-1.765) This relationship was essentially the same for children with SHCN without EBD; the AOR point estimate increased for children without SHCN and decreased for children with SHCN with EBD, but because of wider confidence intervals (smaller numbers) those differences were not significant. There was no significant change in the adjusted odds ratios in the SHCN status subpopulations for the other attitude variables.

[Table 13](#) lists results from logistic regression models that use domain analysis to examine changes in the adjusted odds of low MVPA with changes in SHCN status when stratified by the attitude variables. Among all 6- to 17-year-olds, after adjusting for gender, race/ethnicity, respondent's education and age of child, the odds of low MVPA for children with SHCN without EBD was not significantly different from the odds of low MVPA for children with no SHCN, but the odds of low MVPA for children with SHCN with EBD was significantly greater (AOR, 1.241; 95%CI, 1.092-1.411). Among children whose parents had zero scores on the mental health/stress index, this relationship was unchanged, but among children whose parents had scores of 1 - 5 on the mental health/stress index, there was no significant difference among the SHCN categories.

Similar patterns were seen for the other parental attitude indicators, with significantly different adjusted odds for children with SHCN with EBD among those with more "favorable" attitudes, but no significant effect of SHCN status on low MVPA among those with less trust, less perceived safety, greater perceived limitations and less social support.

b. High screen time

[Table 14](#) shows how the adjusted odds ratios for the effects of parental attitudes on high screen time change with stratification by SHCN status. Among all 6- to 17-year-olds, there was no significant difference between those children who had perceived limitations and those who did not in the odds of high screen time. Stratifying by special health care needs status, we found that among children with SHCN without EBD, those with perceived limitations had significantly greater odds of high screen time than those without perceived limitations (AOR, 1.494; 95%CI, 1.135-1.967). The odds of high screen time did not differ significantly by perceived limitations among children without SHCN or among children with SHCN with EBD ([Figure 10](#)). Among all 6- to 17-year-olds, the adjusted odds of high screen time was significantly higher for those whose parents scored 1 - 4 on the trust in neighbors index than for those who scored zero (AOR, 1.287; 95%CI, 1.149-1.442). The stratified analysis showed similar results for children without SHCN, but the relationship was attenuated among those with SHCN without EBD (AOR, 1.042; 95%CI, 0.735-1.473) and amplified among those with SHCN with EBD (AOR, 1.509; 95%CI, 1.172-1.942). The stratified models for mental health/stress score, perceived safety and social support showed similar results in all three special health care needs strata.

[Table 15](#) shows how the adjusted odds ratios for the effect of special health care needs status on the odds of high screen time changes with stratification by the parental attitude indicators. Among all 6- to 17-year-olds, the likelihood of high screen time was slightly, but significantly, higher among children with SHCN with EBD than among those without SHCN (AOR, 1.172; 95%CI, 1.031-1.333). Stratifying by presence/absence of perceived limitations, we found a similar relationship among children with perceived limitations: those with SHCN with EBD were significantly more likely than those without SHCN to have high screen time (AOR, 1.237; 95%CI, 1.171-1.428). This difference was not found among those without perceived limitations. Among children without perceived limitations, the odds of high screen time for children with SHCN without EBD was 1.452 (95%CI, 0.902-2.337) times the odds of high screen time for children without SHCN (p=.0798).

Stratifying by scores on the trust in neighbors index, we found a slightly amplified relationship among those who indicated some lack of trust in their neighbors (score 1 - 4): children with SHCN with EBD were more likely than those without SHCN to have high screen time (AOR, 1.409; 95%CI, 1.100-1.804). Among those who did not indicate lack of trust there was no significant difference in odds of high screen time by SHCN status.

c. Sedentary lifestyle

[Table 16](#) shows how the adjusted odds ratios for effects of parental attitude indicators on sedentary lifestyle change with stratification by special health care needs status. Among all 6- to 17-year-olds, the odds of sedentary lifestyle was significantly higher among those with perceived limitations than among those without perceived

limitations (AOR, 1.407; 95% CI, 1.17-1.69). Stratifying by SHCN status, we found that this relationship persisted among children with SHCN without EBD, (AOR, 1.565; 95% CI, 1.173-2.0870). This difference was attenuated and no longer significant among children without SHCN and among children with SHCN with EBD. Among all 6- to 17-year-olds, the odds of sedentary lifestyle was significantly higher for those whose parents indicated some lack of trust in neighbors (AOR, 1.191; 95% CI, 1.061-1.338) and point estimates were similar in the SHCN subpopulations. Among all 6-17 year olds, children whose parents indicated some mental health/stress problem were more likely than those whose parents indicated no mental health/stress problem to have sedentary lifestyles (AOR, 1.280; 95% CI, 1.058-1.402). The point estimate for this relationship was higher among children with SHCN without EBD, but the confidence interval was wider (AOR, 1.395 95% CI, .964-2.019).

To determine if parental attitudes had different effects on sedentary lifestyle depending on special health care needs status, we stratified by parental needs indicators and examined adjusted odds ratios for children with SHCN without EBD and SHCN with EBD ([Table 17](#)). Among all 6- to 17-year-olds the odds of sedentary life style was slightly higher for children with SHCN without EBD (AOR, 1.177; 95% CI, 1.02-1.358) and SCHN with EBD (AOR, 1.267; 95% CI, 1.111-1.445) than for those without SHCN. Among those without perceived limitations, children with SHCN with EBD had significantly greater odds of sedentary lifestyle than children without SHCN (AOR, 1.233; 95% CI, 1.066-1.425) but this difference was not found among those with perceived limitations (AOR, 0.883; 95% CI, 0.546-1.428).

Among children whose parents had social support, children with SHCN with EBD had a significantly greater likelihood of sedentary lifestyle (AOR, 1.33; 95%CI, 1.154-1.533) than those without SHCN, but this difference was not found among those without social support. For parental mental health/stress, perceived safety and trust in neighbors, AORs were similar for the “zero” score strata and the non-zero score strata for those with SHCN with EBD. Among children whose parents reported some mental health/stress problem, the point estimate for AOR for children with SHCN without EBD was 30% higher than among children whose parents reported no mental health/stress problem but confidence intervals for these estimates overlap. Similarly, among children whose parents have social support, the odds of sedentary lifestyle was greatest among those with SHCN with EBD (AOR, 1.330; 95% CI, 1.154-1.533). Among children whose parents lack social support the differences in odds of sedentary lifestyle by SHCN status was not significant.

4. Joint effects

To evaluate joint effects of attitudes and special health care needs status on the likelihood of sedentary lifestyle, we created combination variables involving the parental attitude variables that showed significant associations in the fully adjusted model in [Table 10](#) (perceived limitations, mental health/stress and trust in neighbors). We calculated the odds ratios adjusted for age, gender, race/ethnicity and respondent's education, using children with none of the characteristics in the combination as the reference category.

[Table 18](#) and [Figure 12](#) shows AORs for combinations of a single parental attitude variables with each SHCN status, with children without SHCN and without that parental attitude as the reference category.

[Table 19](#) and [Figure 13](#) show how different combinations of these three parental attitude variables are related to the odds of sedentary lifestyle after adjustment for demographic factors. Children whose parents perceived them as having limitations and also reported mental health/stress problems had significantly increased odds of sedentary lifestyle, compared with those with neither perceived limitations nor parental mental health/stress problems (AOR, 1.42; 95%CI, 1.082-1.864). The combination of parental mental health/stress problems and lack of trust is also associated with a significant increase in the odds of sedentary life style (AOR, 1.614; 95%CI, 1.337-1.948). The combination of perceived limitations and lack of trust is also associated with a significant increase in the odds of sedentary life style (AOR, 1.557; 95%CI, 1.163-2.086). These adjusted odds ratios are somewhat greater than the AORs for these factors separately, as seen in [Figure 9](#). The AOR for mental health/stress problems alone was 1.28 (95% CI, 1.139-1.438). The AOR for lack of trust alone was 1.191 (95%CI, 1.061-1.338). The AOR for perceived limitations alone was 1.407 (95%CI, 1.117-1.690).

[Table 20](#) shows the effects of combinations of multiple parental attitudes and special health care needs on the odds of sedentary life style. Two constellations increased the odds of sedentary lifestyle over two-fold: parental mental health/stress, limitations and SHCN without EBD (AOR, 2.659; 95%CI, 1.741-4.06) and lack of trust, limitations and SHCN without EBD (2.434; 95%CI, 1.436-4.126). From [Table 16](#) in the subpopulation who had SHCN without EBD, the AOR for perceived limitations was 1.565 (95%CI, 1.173-2.087), for parental mental health/stress was 1.395 (95%CI, 0.964-2019) and for lack of trust was 1.064 (95%CI, 0.747-1.517). As shown in [Figure 14](#), the three constellations with the highest AORs all involve children with SHCN without EBD.

VI. DISCUSSION

1. Association between parental attitudes and low MVPA

Our first research question asked if there was an association between parental attitudes and low MVPA. Consistent with our hypothesis, we found that perception of functional limitations in the child, lack of social support, perceived lack of safety, mental health/stress problems and lack of trust were all associated with an increased prevalence of low MVPA. However, after adjusting for demographic factors and special health care needs status, only the presence of perceived limitations was associated with significantly increased odds of low MVPA.

2. Association between parental attitudes and high screen time

Our second research question asked if there is an association between parental attitudes and high screen time. Consistent with our hypothesis, we found that perception of functional limitations in the child, lack of social support, perceived lack of safety, mental health/stress problems and lack of trust were all associated with an increased prevalence of high screen time. However, after adjusting for demographic factors and special health care needs status, only mental health/stress problems and lack of trust were associated with significantly increased odds of high screen time.

3. Interaction between parental attitudes and special health care needs status

Our third research question concerned whether the effects of special health care needs on low MVPA and high screen time were modified by parental attitudes. The effects of special health care needs on low MVPA and high screen time were small. We found no

evidence of multiplicative interaction for mental health/stress, perceived safety, social support or trust in neighbors. We did find support for interaction between the effects of perceived functional limitations and special health care needs on high screen time. However, contrary to our expectations, the odds of high screen time was amplified among children with SHCN without EBD, but not among children with SHCN with EBD.

Nonetheless, the results concerning the interaction between parental perception of the child's limitations and SHCN status need to be interpreted with caution. In the stratified analysis, we compared the adjusted odds of high screen time in children with perceived limitations who had SHCN with the adjusted odds of high screen time in children with perceived limitations who had no SHCN. This reference group (children without SHCN who have perceived limitations) is relatively small, and might be quite variable. This group is comprised of 717 sample children, representing a population prevalence of 1.77% (SE, 0.17) of the children without SHCN. Of these, 54.0% (SE, 5.0) had high screen time. Both the point estimate and the standard error for this group are higher than for the general population (48.4%, SE, 0.50) and for all children without SHCN (47.6%; SE, 0.58). Among children with perceived limitations and SHCN with EBD, on the other hand, the prevalence of high screen time is 51.7% (SE, 2.66).

Of the children whose parents perceive them as having functional limitations, 80.8% meet at least one criterion in the CSHCN screener. Those who do not may have a limiting condition expected to last less than 12 months, or they may lack access to appropriate care for diagnosis and treatment. Alternatively, they may have health belief systems that cause them not to identify the child's limitation as due to "a medical, emotional,

behavioral or developmental condition." Hence, the apparent attenuation of the association between SHCN with EBD and high screen time may be due to higher risk of high screen time for this atypical reference group rather than due to lower risk of high screen time for children with SHCN with EBD.

4. Joint effects of parental attitudes and SHCN on sedentary lifestyle

We found that some combinations of parental attitudes and special health care needs increased the odds of sedentary lifestyle above the expected effects of the individual factors. However, contrary to our expectations, combined effects were greater for children with SHCN without EBD than for children with SHCN with EBD. The constellation of factors with the greatest likelihood of sedentary lifestyle was parental mental health/stress along with perceived limitations and SHCN without EBD (AOR, 2.659; 95%CI, 1.741-4.06). The constellation of perceived limitations along with lack of trust and SHCN without EBD was also associated with a greater than two-fold increase in the odds of sedentary lifestyle (AOR, 2.434; 95%CI, 1.436-6.126). We expected that the greatest likelihood would be among those with all five "unfavorable" attitudes and SHCN with EBD. Only 40 sample children had parents with all five unfavorable attitudes and only 9 of these had SHCN with EBD. Of these, 3 had sedentary lifestyles and 6 did not. The adjusted odds ratio for this group (with the reference group having all favorable attitudes and no SHCN) was 0.509 (95%CI, 0.115-2.25), but with less than 30 observations in this group, estimates are not considered reliable.¹⁶ Other constellations with four or more factors also had too few children in each category for reliable estimates.

5. Summary and implications

In the fully adjusted models, we found significant associations between perceived limitations and low MVPA. Parental mental health/stress problems and lack of trust were associated with a significant increase in the likelihood of high screen time. Perceived limitations, parental mental health/stress problems and lack of trust were associated with significantly increased likelihood of sedentary lifestyle. The joint presence of two of these three factors further increased the odds of sedentary lifestyle, as did the presence of SHCN without EBD.

Our analysis supports the expectation that children with SHCN are more likely to be perceived as having functional limitations than children without SHCN. However, as described by Green and Solnit⁵² and Perrin⁵³ parents' perception of their children's limitations are not always realistic. From this survey, we cannot tell how many of these children have physical limitations that would preclude moderate-to-vigorous physical activity. However, most physical disabilities need not preclude physical activity when appropriate modifications are made.¹⁷ The association found between perceived limitations and the likelihood of low MVPA and sedentary lifestyle, especially in children with SHCN without EBD, suggests that further attention to perceived barriers to participation in active play and other organized activities among parents in this group is indicated.

The 2007 NSCH asks three additional questions about parents' perceptions of their child's limitations: whether they are limited in their ability to attend school regularly, to participate in sports and other activities and to make friends.⁶³ We did not include these responses in our analysis because the questions were only asked when children met at

least one of the CSHCN screener criteria. However, responses to these questions indicate that there are significant differences between children with SHCN without EBD and children with SHCN with EBD. Limited ability to attend school regularly was reported by parents of 9.1% (95% CI, 7.53-10.63) of children with SHCN without EBD and 16.8% (95% CI, 14.68-19.00) of children with SHCN with EBD. Limited ability to participate in sports and other activities was reported for 14.8% (95% CI, 13.00-16.58) of children with SHCN without EBD and 25.8% (95% CI, 23.22-28.31) of children with SHCN with EBD. Children with SHCN with EBD (28.5%; 95% CI, 26.10-30.95) were ten times more likely than those with SHCN without EBD (2.5%; 95% CI, 1.80-3.35) to be limited in their ability to make friends. These differences underscore the variability of concerns that parents have about their children and the potential impact of these perceived limitations on the opportunities that parents provide for their children to be physically active and productively engaged.

When parents are unable to trust in their neighbors' ability or willingness to look out for their children or help them if they are hurt or scared, children may have fewer opportunities for unstructured outdoor play or participation in neighborhood sports and other activities. The association of such concerns with high screen time and sedentary lifestyles indicates a need to address concerns about the neighborhood when developing a plan for a more active lifestyle.

The association of mental health and parenting stress issues with high screen time and sedentary lifestyles further raises the importance of considering parental mental health and coping styles when advising changes in a child's routine. Allowing children to engage in screen time often affords stressed parents an important respite. Guidance about

screen time limits might be more effective if it is coupled with advice about stress-relieving, non-competitive physical activities that families can enjoy together.

6. Strengths and Limitations

The NSCH collects information about a variety of parental perceptions that might affect parental influence on children's activities. The large sample size in the NSCH allows detection of differences between groups even when stratified. The CSHCN screener contained within the NSCH allowed us to identify a subpopulation of children whose medical, behavioral, emotional and behavioral characteristics might impact their parents' attitudes about the importance of various activities for their growth and development. As described by van der Lee et al, the comparison of findings about children with chronic conditions is complicated by a wide variety of definitions involving functional limitations, service needs and duration of conditions.⁶⁹ While the CSHCN screener provides some clarity in separating those without SHCN from those with SHCN, our attempt to separate those with and without emotional, behavior and developmental conditions was complicated by lack of information. The incomplete list of specific diagnoses limited our ability to separate children who have only an EBD condition or only a physical condition from those who have both a physical condition and an EBD condition.

Furthermore, our ability to adjust for the severity of the child's condition was limited because information about the severity of the condition was only available for listed diagnoses; children with rare but severe conditions that were not listed (e.g. congenital heart disease, sickle cell disease, cancer, HIV) were therefore counted among those having SHCN because they met at least one CSHCN screener criterion, but would not be

counted among those having severe conditions. Lack of a global indicator of the severity of the child's condition interfered with the ability to adjust for severity.

Because this is a secondary data analysis, we were limited to the questions that were asked. We did not have direct questions about perceived vulnerability or parent's concerns about the effect of PA on their child's condition. Our analysis was limited to the attitudes of the respondent, who was designated as the adult who knows the most about the child's health.⁶³ However, the other parent or other adults in the household may also influence the child's activities.

Our measures of attitudes have not been validated. For our index of parental mental health and parenting stress we included parent's self-rated mental health as well as responses to questions about parenting stress. Through this measure we aimed to capture parents whose ability to cope with day-to-day demands might impact their ability to provide opportunities for their children to engage in appropriate activities. However, this measure does not enable us to determine whether the observed score is attributable to a depressed, withdrawn parent or a difficult, oppositional child.

We only know about the SHCN status of the sample child. The parent's experience with other children in the household (with or without SHCN or EBD) might impact their attitudes, especially with respect to their mental health/stress index or their perception of functional limitations.

The measurement of physical activity by a single-question parental report is particularly problematic because parents don't necessarily know how much activity their children do while away from home. Moreover, the wording of the physical activity question is not well aligned with current guidelines. The guidelines call for 60 minutes of

moderate-to-vigorous activity daily, including at least 20 minutes of vigorous activity at least three days a week.² The NSCH question asks about the number of days per week when the child was active for 20 minutes and the activity description in the question (enough to make him/her sweat and breathe hard) can be interpreted as either moderate or vigorous activity.⁶³ Using a “less than six days” cutoff to define low physical activity improves upon previous work that used a 3-day cutoff, but does not accurately identify all children who fail to meet the current physical activity guidelines.

Unlike some previous analyses of the data from 2007 NSCH,⁷⁰ we have included both recreational computer use and time spent with television, videos and video games in our measurement of screen time. This is better aligned with the AAP guidelines, and indicates that a higher proportion of the population exceeds the guidelines. However, the 2007 NSCH asks only about media use “on a typical weekday,” and this might underestimate the average daily screen time including weekends. Our estimate of mean screen time was considerable lower than the Kaiser Family Foundation estimates which included weekends as well.¹⁵ There may be some question about how accurate parent reports are, especially with older children.

The health implications of screen-based leisure activity lying on a sofa between the remote and a bowl of snack food can be quite different from accessing the same content while on the go. The 2007 NSCH predates widespread use of smart phones and tablet computers; further research will be needed to examine changing patterns of media use with greater availability of more portable devices. Moreover, new ways of accessing viewing content has changed both the programming and the advertising that children are exposed to. New tools such as ecologic momentary assessment coupled with

accelerometry data would provide a more complete assessment of physical activity and sedentary behavior.⁷¹

BMI is a potentially important covariate because it is associated with low MVPA, high screen time, sedentary lifestyle and special health care needs.^{4,26,65,66,68} In the 2007 NSCH, the BMI classification was based on parental reports of height and weight. Because the BMI classification was found to lack reliability for children less than 10 years old, it was not included in the publicly available data set for children under 10. We did not include BMI in our models because it was no available for the younger children and because of concerns about the validity of parental reports of heights and weights.⁷²

Parental report of special health care needs and specific diagnoses in this study are not confirmed by physician diagnosis or other objective documentation of the child's needs and condition. The survey did not provide information about physical mobility issues that might interfere with physical activity. Because of the limited list of specific diagnostic categories, we were unable to define a category of those with emotional or behavioral problems without a diagnosis of a physical problem. Because of these issues, the implications of the findings about parental perception of the child's limitations are unclear. Elucidation of the factors that contribute to low MVPA and high screen time, especially among those with functional limitations, will require more specific surveys to explore perceived barriers to participation in more active pursuits.

Random-digit dialing does not capture households without landline phones. While sampling weights include adjustments for non-response and lack of phone lines, we cannot know how respondents differ from non-respondents in terms of the key variables.

In our analysis, we did not make adjustments for multiple comparisons. Because we made many comparisons, this increases the probability that some of the "significant" associations may have occurred by chance.

Because the data are cross-sectional, causal inferences cannot be made. The cross-sectional data also do not adequately capture the dynamic nature of chronic conditions in childhood.

7. Public health significance

Advances in technology have enabled more children to survive to live with the consequences of prematurity, congenital anomalies, cystic fibrosis, sickle cell anemia, cancer, HIV/AIDS and other conditions which previously caused death during childhood.⁷² With the availability of better pharmaceutical treatments, identification of children with more common, less lethal conditions, such as allergies, asthma and attention deficit disorder has increased.⁷³ However, this growing population of children with special health care needs strains the resources of families⁹ and the health care delivery system.⁵⁰ Optimizing the health and well-being of the subpopulation of children who have SHCN is important, not only to improve their quality of life and decrease their need for expensive health care and therapies, but also to decrease the development of comorbidities. Common chronic conditions of adulthood, such as obesity, type 2 diabetes, and resultant cardiovascular consequences have their roots in childhood.^{74,75}

Physical activity and screen-based leisure activity are modifiable factors that can have ramifications for health throughout the life course. The American Academy of Pediatrics recommends that pediatricians routinely ask screening questions about physical activity

and screen time during well child visits.¹ When children do not meet the current guidelines, health care providers can help parents reevaluate priorities and find ways to work more activity into daily routines. The advice of health professionals is especially important for children whose parents perceive them as having functional limitations, so that inappropriate restriction of activity can be avoided and appropriate activities can be recommended. Health care professionals and educators should help families optimize their children's engagement in developmentally appropriate activities within the ever-changing constraints of their special health care needs.

Schools and communities play an essential role in providing opportunities for all children to be physically active. CDC school health guidelines call for inclusive physical education programs with appropriate modifications so that all children can be more active.¹⁷ School-based programs that monitor physical fitness and provide fitness report cards⁷⁶ can help parents and school personnel recognize physical activity and physical fitness as important priorities as they decide how children should be spending their time.

Because of the recent trends in childhood obesity, improved surveillance of common obesity-related behaviors in children is warranted. To determine whether progress is being made toward the achievement of Healthy People 2020 objectives regarding physical activity, the National Survey of Children's Health should revise the questions for parents of school-aged children to better identify whether or not children get at least 60 minutes of moderate-to-vigorous physical activity daily, at least 20 minutes of vigorous activity 3 days a week and muscle strengthening activity three days a week. Further study of the impact of media use on activity levels, including accelerometer data

and ecological momentary assessment, will be important as children spend more time with an ever-expanding array of electronic devices.

Changing the behavior of children requires changing the behavior of parents. Our data indicate a significant association between sedentary lifestyles and parental perception of functional limitations in the child, parenting stress and parents' trust in their neighbors. Better understanding of parents' ideas about what their children can and should do, as well as their perceived barriers to participation in active endeavors, can aid in the development of interventions to promote lifestyles that optimize the growth and development of all children, including those with special health care needs.

VII. APPENDIX 1: TABLES

Table 1: Socio-demographic characteristics of the 2007 National Survey of Children's Health study population, with population percents. United States, 2007		
	Number in sample	Population Percent (weighted)
Total	64076	
Gender	63985	
Boys	33292	51.14
Girls	30693	48.86
Age in years	64076	
6 to 11	27792	48.53
12 to 17	36284	51.47
Race/ethnicity	62985	
Non-Hispanic white	43789	57.22
Non-Hispanic black	6450	15.06
Hispanic	7357	19.36
Non-Hispanic multiracial	2776	3.79
Non-Hispanic other race	2613	4.57
Respondent's relationship to child	64064	
Mother	46750	74.61
Father	13388	18.83
Other	3926	6.57
Respondent's education	63248	
< 12 years	5269	12.33
High school graduate	13075	25.70
More than high school	44904	61.96
Household poverty ratio	58700	
<= 100%	6113	16.60
>100 and <=200%	9623	20.61
>200 and <=300%	10787	18.38
>300 and <=400%	9469	14.18
>400%	22708	30.22
Special Health Care Needs Status	64076	
No SHCN	49027	77.11
SHCN without EBD	7527	11.23
SHCN with EBD	7522	11.67

Note: Number of sample children for varies because observations with missing data were excluded from analysis. Data from National Survey of Children's Health, 2007

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Table 2. Frequency of specific diagnostic categories listed in National Survey of Children's Health 2007, with population estimates

	Number in sample	Population Prevalence (percent) (weighted)	Estimated population frequency
Emotional Behavioral and Developmental Conditions			
Attention deficit disorder	5338	8.18	4,010,749
Depression	1662	2.49	1,224,562
Anxiety	2530	3.52	1,731,070
Behavior or conduct disorder	2182	4.00	1,967,373
Autism spectrum disorder	759	1.16	569,154
Developmental delay	1983	3.49	1,716,259
Tourette's Syndrome	147	0.19	92,087
Other specific conditions			
Learning disability	5477	8.98	4,408,694
Asthma	6357	10.31	5,066,022
Diabetes	329	0.55	270,170
Speech problem	1844	3.37	1,661,124
Hearing problem	995	1.54	759,984
Vision problem (not correctable with glasses)	887	1.56	766,903
Seizure disorder	422	0.75	370,748
Brain injury/concussion	196	0.43	209,487
Bone, muscle or joint problem	1824	2.73	1,343,779
Respiratory allergy	13238	18.99	9,340,978
Food allergy	2925	4.28	2,103,831
Skin allergy	6986	11.08	5,457,175
Migraine headaches	3579	5.29	2,606,054
Recurrent ear infections	2217	3.86	1,898,390

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Table 3: Weighted prevalence of low physical activity, high screen time and sedentary lifestyle by selected demographic characteristics, parental attitude indicators and special health care needs status. United States, 2007

	No. in sample	Low MVPA		High screen time		Sedentary lifestyle	
		Percent (weighted)	p value	Percent (weighted)	p value	Percent (weighted)	p value
Total	64076	64.2		48.4		33.3	
Gender			.0001		.0038		.0001
Boys	33292	57.9		49.8		31.5	
Girls	30693	70.8		46.9		35.1	
Age in years			0.0001		0.0001		0.0001
6	4447	52.8		31.9		17.6	
7	4520	53.4		34.7		19.2	
8	4521	56.3		37.1		22.0	
9	4554	54.9		38.4		21.8	
10	4903	60.8		44.8		29.6	
11	4641	65.5		47.1		33.3	
12	5246	69.0		49.5		34.4	
13	5332	66.3		56.5		38.2	
14	5793	69.0		56.9		43.3	
15	6008	73.0		59.4		45.2	
16	6632	73.6		61.0		46.8	
17	6837	73.8		59.7		44.9	
Race/ethnicity			0.0001		0.0001		0.0001
Non-Hispanic white	43789	61.6		44.8		30.4	
Non-Hispanic black	6450	64.9		63.7		42.2	
Hispanic	7357	71.5		48.2		36.3	
Non-Hispanic multiracial	2776	55.0		48.7		30.1	
Non-Hispanic other race	2613	69.2		43.8		31.2	
Respondent's relationship to child			0.2859		0.0001		0.0023
Mother	46750	64.0		46.5		32.3	
Father	13388	65.7		52.7		36.2	
Other	3926	62.4		57.0		36.1	
Respondent's education			0.0001		0.0001		0.0001
< 12 years	5269	71.5		50.7		37.5	
High school graduate	13075	66.0		56.2		39.3	
More than high school	44904	62.0		44.6		30.1	
Household poverty ratio			0.1182		0.0001		0.0001
<= 100%	6113	66.9		50.2		34.7	
>100 and <=200%	9623	64.7		54.0		36.8	
>200 and <=300%	10787	63.4		52.4		36.2	
>300 and <=400%	9469	64.0		47.4		32.5	
>400%	22708	62.8		42.5		29.6	
Special Health Care Needs Status			0.1714		0.0006		0.0005
No SHCN	49027	63.8		47.6		32.6	
SHCN without EBD	7527	64.8		48.3		34.9	
SHCN with EBD	7522	66.5		53.5		37.8	

Table 3 (cont'd): Weighted prevalence of low physical activity, high screen time and sedentary lifestyle by selected demographic characteristics, parental attitude indicators and special health care needs status. United States, 2007

	No. in sample	Low MVPA Percent (weighted)	p value	High screen time Percent (weighted)	p value	Sedentary lifestyle Percent (weighted)	p value
Child with perceived limitations			0.0009		0.0026		0.0001
no	59143	63.7		48.0		32.7	
yes	4208	70.3		54.0		41.1	
Parental mental health/parenting stress			0.035		0.0001		0.0001
zero	52003	63.2		46.4		31.5	
one	8399	67.0		54.3		39.1	
two	1816	69.9		58.8		41.6	
three	747	71.4		57.4		44.4	
four	234	61.2		61.9		41.8	
five	54	62.1		61.5		31.1	
Social Support			0.0001		0.006		0.0048
yes	57312	63.2		47.7		32.7	
no	6490	70.6		52.4		37.2	
Trust in neighbors			0.0648		0.0001		0.0001
zero	51736	63.4		46.6		32.2	
one	4916	66.5		53.3		36.7	
two	2368	65.4		45.3		34.5	
three	1522	68.6		54.7		39.0	
four	1420	69.1		61.2		43.6	
Perceived safety			0.0001		0.0001		0.0001
zero	52658	63.1		47.0		32.3	
one	6957	68.1		52.9		36.2	
two	2063	71.4		59.6		43.3	
Number of conditions			0.3831		0.0001		0.0002
none	33583	63.5		46.0		31.4	
one	15720	64.8		50.6		35.2	
two	7211	66.3		52.9		36.8	
three	3272	63.3		49.1		34.9	
four or more	4075	65.1		52.0		35.8	
Severity of condition			0.0535		0.7223		0.407
none severe	59625	64.4		48.8		33.2	
one severe	2976	59.5		49.9		33.6	
more than one severe	1027	68.1		48.3		37.9	
BMI classification (ages 10-17 years)			0.0001		0.0001		0.0001
<5	2186	66.4		55.0		37.9	
5 to 85	29121	66.7		51.9		36.9	
85-95	6754	72.8		58.8		44.8	
>95	6040	72.9		63.7		47.7	

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Table 4: Weighted prevalence of special health care needs status among 6-17 year olds by selected demographic characteristics and parental attitude indicators. United States 2007

	No. in sample	Without SHCN Percent (weighted)	SHCN without EBD Percent (weighted)	SHCN with EBD Percent (weighted)	p value
Total	64076	77.11	11.23	11.67	
Gender					0.0001
Boys	33292	73.53	11.06	15.41	
Girls	30693	80.83	11.41	7.76	
Age					
6	4447	79.07	12.20	8.74	
7	4520	78.74	12.18	9.08	
8	4521	78.01	10.35	11.64	
9	4554	74.95	11.53	13.52	
10	4903	77.00	11.05	11.95	
11	4641	77.49	11.07	11.44	
12	5246	77.49	11.64	10.88	
13	5332	77.55	10.18	12.27	
14	5793	76.32	11.59	12.09	
15	6008	74.50	11.09	14.41	
16	6632	77.56	11.06	11.38	
17	6837	76.66	10.77	12.57	
Race/ethnicity					0.0001
Non-Hispanic white	43789	75.27	12.31	12.41	
Non-Hispanic black	6450	75.96	10.69	13.34	
Hispanic	7357	81.95	9.22	8.83	
Non-Hispanic multiracial	2776	73.24	11.51	15.24	
Non-Hispanic other race	2613	86.09	7.98	5.94	
Respondent's relationship to child					0.0001
Mother	46750	76.06	11.95	12.00	
Father	13388	82.37	9.37	8.26	
Other	3926	74.00	8.38	17.62	
Respondent's education					0.001
< 12 years	5269	79.48	8.34	12.18	
High school graduate	13075	76.82	10.48	12.69	
More than high school	44904	76.57	12.20	11.23	
Household poverty ratio					0.0001
<= 100%	6113	72.74	10.24	17.01	
>100 and <=200%	9623	77.11	9.93	12.96	
>200 and <=300%	10787	77.63	11.47	10.84	
>300 and <=400%	9469	76.68	13.48	8.84	
>400%	22708	77.34	12.53	10.13	

Data from the 2007 National Survey of Children's Health

Table 4 (cont'd): Weighted prevalence of special health care needs status among 6-17 year olds by selected demographic and characteristics and parental attitude indicators. United States 2007

	No. in sample	Without SHCN Percent (weighted)	SHCN without EBD Percent (weighted)	SHCN with EBD Percent (weighted)	p value
Child with perceived limitations					
no	59723	81.558	10.2771	8.1671	0.0001
yes	4266	19.1714	23.6061	57.2224	
Mental health/parenting stress score					
zero	52003	80.27	11.43	8.29	0.0001
one	8399	70.99	11.67	17.34	
two	1816	53.69	8.86	37.45	
three	747	42.76	8.38	48.86	
four	234	37.71	3.86	58.44	
five	54	34.36	21.48	44.16	
Social Support					
yes	57312	77.16	11.63	11.22	0.0001
no	6490	76.43	8.66	14.90	
Trust in neighbors score					
zero	51736	77.93	11.33	10.74	0.0001
one	4916	75.71	11.85	12.44	
two	2368	71.46	11.21	17.33	
three	1522	68.54	11.05	20.42	
four	1420	71.20	11.58	17.22	
Perceived safety score					
zero	52658	77.65	11.34	11.01	0.0028
one	6957	74.99	10.78	14.24	
two	2063	73.69	11.15	15.15	
Number of conditions					
none	33583	96.28	3.03	0.69	0.0001
one	15720	74.08	18.07	7.85	
two	7211	50.94	27.17	21.89	
three	3272	30.15	31.67	38.18	
four or more	4075	12.01	12.11	75.88	
Severity of conditions					
none severe	59625	80.76	10.40	8.85	0.0001
one severe	2976	43.21	23.15	33.64	
more than one severe	1027	4.65	12.82	82.53	
BMI classification (ages 10-17)					
Total in sample	44101				0.0002
<5%ile	2186	76.743	9.713	13.544	
5-85%ile	29121	78.167	10.745	11.088	
85-95%ile	6754	74.088	12.590	13.322	
>95%ile	6040	71.926	12.492	15.582	

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Table 5. Prevalence of low moderate-to-vigorous physical activity among 6- to 17-year-olds by special health care needs status and parental attitude indicators. United States 2007					
	No. in sample	Percent (weighted)	95% CI		p value
Special health care needs status	63434				0.1714
Without SHCN	48531	63.7906	62.6749	64.9063	
SHCN without EBD	7466	64.8183	62.0599	67.5768	
SHCN with EBD	7437	66.4606	63.9236	68.9977	
Child with perceived limitations	63351				0.0009
no	59143	63.743	62.7433	64.7427	
yes	4208	70.2561	66.7227	73.7896	
Mental health/stress score	62656				0.0006
zero	51599	63.2157	62.1466	64.2848	
1 to 5	11057	67.6297	65.4147	69.8446	
Trust in neighbors score	61404				0.0047
zero	51330	63.4062	62.3139	64.4986	
1 to 4	10074	67.0288	64.8054	69.2523	
Social Support	63170				<.0001
yes	56812	63.2357	62.2147	64.2566	
no	6358	70.5818	67.7743	73.3893	
Child's perceived safety score	63434				<.0001
zero	54566	63.1618	62.1085	64.2151	
1 to 2	8868	68.9655	66.6577	71.2734	
p values indicate the probability of the observed Rao Scott chi square if there are no true differences between categories. Data from 2007 National Survey of Children's Health					

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Table 6: Hierarchical logistic regression models for effects of demographic characteristics, special health care needs status and parental attitudes on low moderate-to-vigorous physical activity in 6-17 year old children. United States 2007

	Unadjusted			Model 1*				
	OR	95% CI		p value	AOR	95% CI		p value
Gender								
Boys	reference							
Girls	1.748	1.6	1.909		1.77	1.62	1.93	
Race/ethnicity								
Non-Hispanic white	reference							
Non-Hispanic black	1.149	1.019	1.295		1.11	0.978	1.263	
Hispanic	1.577	1.356	1.834		1.51	1.293	1.765	
Non-Hispanic multiracial	0.791	0.639	0.979		0.82	0.652	1.04	
Non-Hispanic other race	1.362	1.047	1.772		1.46	1.12	1.897	
Respondent's education								
< 12 years	1.566	1.334	1.838		1.34	1.132	1.588	
High school graduate	1.18	1.068	1.303		1.12	1.012	1.241	
More than high school	reference							
Age in years								
	1.101	1.087	1.115		1.1	1.09	1.119	
Special Health Care Needs Status								
No SHCN	reference							
SHCN without EBD	1.05	0.918	1.2					
SHCN with EBD	1.107	0.974	1.258					
Child with perceived limitations								
no	reference							
yes	1.379	1.145	1.662					
Mental health/stress score								
zero	reference							
1 - 5	1.224	1.089	1.375					
Trust in neighbors score								
zero	reference							
1 - 4	1.189	1.062	1.331					
Social Support								
yes	reference							
no	1.384	1.19	1.609					
Child's perceived safety score								
zero	reference							
1 - 2	1.391	1.237	1.565					

*Model 1 adjusts for gender, race/ethnicity, respondent's education and child's age

Table 6 (cont'd): Hierarchical logistic regression models for effects of demographic characteristics, special health care needs status and parental attitudes on low moderate-to-vigorous physical activity

	Model 2**			Model 3***		
	AOR	95% CI	p value	AOR	95% CI	p value
Gender						
Boys						
Girls	1.798	1.646	1.964	1.8	1.645	1.962
Race/ethnicity						
Non-Hispanic white						
Non-Hispanic black	1.113	0.98	1.264	1.06	0.932	1.207
Hispanic	1.525	1.306	1.782	1.47	1.254	1.727
Non-Hispanic multiracial	0.82	0.649	1.035	0.81	0.637	1.019
Non-Hispanic other race	1.483	1.139	1.929	1.42	1.091	1.857
Respondent's education						
< 12 years	1.336	1.127	1.583	1.27	1.068	1.507
High school graduate	1.118	1.01	1.238	1.09	0.987	1.213
More than high school						
Age in years						
	1.104	1.09	1.118	1.1	1.089	1.118
Special Health Care Needs Status						
No SHCN						
SHCN without EBD	1.097	0.961	1.252	1.06	0.923	1.214
SHCN with EBD	1.241	1.092	1.411	1.12	0.977	1.288
Child with perceived limitations						
no						
yes				1.34	1.079	1.662
Mental health/stress score						
zero						
1- 5				0.99	0.868	1.118
Trust in neighbors score						
zero						
1 - 4				1.07	0.949	1.201
Social Support						
yes						
no				1.15	0.976	1.345
Child's perceived safety score						
zero						
1 - 2				1.1	0.965	1.257

**Model 2 adjusts for gender, race/ethnicity, respondent's education, child's age and special health care needs status

***Model 3 adjusts for gender, race/ethnicity, respondent's education, child's age, special health care needs status, perceived limitations, parental mental health/stress, trust in neighbors, social support and perceived safety

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Table 7. Prevalence of high screen time among 6- to-17-year-olds by special health care needs status and parental attitude indicators. United States 2007					
	No. in sample	Percent (weighted)	95% CI		p value
Special health care needs status	64076				0.0006
Without SHCN	49027	47.584	46.446	48.722	
SHCN without EBD	7527	48.2617	45.3813	51.1421	
SHCN with EBD	4151	53.5214	50.7685	56.2743	
Child with perceived limitations	63989				0.0026
no	59723	47.9562	46.9301	48.9824	
yes	4266	53.9768	50.2132	57.7404	
Mental health/stress score	63253				<.0001
zero	52003	46.4086	45.3145	47.5027	
1 to 5	11250	55.477	53.1526	57.8014	
Trust in neighbors score	61962				<.0001
zero	51736	46.5649	45.4583	47.6715	
1 to 4	10226	55.1882	52.8082	57.5681	
Social Support	63802				0.006
yes	57312	47.7374	46.7002	48.7746	
no	6490	52.363	49.2375	55.4885	
Child's perceived safety score	64076				<.0001
zero	55056	46.945	45.8751	48.015	
1 to 2	9020	54.6341	52.0852	57.183	
p values indicate the probability of the observed Rao Scott chi square if there are no true differences between categories					
Data from 2007 National Survey of Children's Health					

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Table 8: Hierarchical logistic regression models for effects of demographic characteristics, special health care needs status and parental attitudes on high screen time among 6-17 year old children, United States 2007

	Unadjusted			Model 1*			
	OR	95% CI		OR	95% CI		p value
Gender							0.004
Boys	reference						
Girls	0.887	0.817	0.962	0.881	0.809	0.959	0.0036
Race/ethnicity							<.0001
Non-Hispanic white	reference						
Non-Hispanic black	2.173	1.938	2.438	2.144	1.9	2.418	<.0001
Hispanic	1.164	1.014	1.337	1.14	0.982	1.323	
Non-Hispanic multiracial	1.138	0.926	1.399	1.218	0.996	1.489	
Non-Hispanic other race	0.926	0.729	1.175	1.028	0.805	1.314	
Respondent's education							<.0001
< 12 years	1.296	1.111	1.511	1.215	1.03	1.434	<.0001
High school graduate	1.581	1.435	1.743	1.462	1.323	1.615	
More than high school	reference						
Age in years							<.0001
	1.13	1.115	1.144	1.13	1.115	1.144	<.0001
Special health care needs status							0.0026
No SHCN							
SHCN without EBD	1.031	0.907	1.173				
SHCN with EBD	1.242	1.098	1.404				
Child with perceived limitations							0.0007
no	reference						
yes	1.379	1.145	1.662				
Mental health/stress score							0.0007
zero	reference						
1 through 5	1.224	1.089	1.375				
Trust in neighbors score							0.0027
zero	reference						
1 through 4	1.189	1.062	1.331				
Social Support							0.0057
yes	reference						
no	1.223	1.06	1.41				
Child's perceived safety score							<.0001
zero	reference						
1 through 2	1.391	1.237	1.565				

*Model 1 adjusts for gender, race/ethnicity, respondent's education and child's age

Table 8 (cont'd): Hierarchical logistic regression models for effects of demographic characteristics, special health care needs status and parental attitudes on high screen time in 6-17 year old children, United States 2007

	Model 2*			Model 3*				
	OR	95% CI		p value	OR	95% CI		p value
Gender				0.0081				0.0057
Boys	reference				reference			
Girls	0.891	0.818	0.971		0.887	0.815	0.966	
Race/ethnicity				<.0001				<.0001
Non-Hispanic white	reference				reference			
Non-Hispanic black	2.146	1.902	2.421		2.007	1.77	2.276	
Hispanic	1.147	0.988	1.332		1.079	0.927	1.256	
Non-Hispanic multiracial	1.213	0.992	1.484		1.178	0.961	1.443	
Non-Hispanic other race	1.04	0.814	1.33		1.005	0.786	1.286	
Respondent's education	reference			<.0001	reference			<.0001
< 12 years	1.213	1.028	1.431		1.127	0.952	1.334	
High school graduate	1.46	1.322	1.613		1.415	1.28	1.564	
More than high school								
Age in years	reference			<.0001	reference			<.0001
	1.13	1.115	1.144		1.129	1.115	1.144	
Special health care needs status				0.0472				0.4332
No SHCN	reference				reference			
SHCN without EBD	1.057	0.929	1.202		1.042	0.91	1.193	
SHCN with EBD	1.172	1.031	1.333		1.093	0.951	1.257	
Child with perceived limitations								0.8005
no					reference			
yes					1.025	0.846	1.242	
Mental health/stress score								0.0056
zero					reference			
1 - 5					1.189	1.052	1.344	
Trust in neighbors score								0.0003
zero					reference			
1 - 4					1.243	1.104	1.399	
Social Support								0.6128
yes					reference			
no					1.041	0.89	1.219	
Child's perceived safety score								0.6551
zero					reference			
1 - 2					1.03	0.904	1.173	

**Model 2 adjusts for gender, race/ethnicity, respondent's education, child's age and special health care needs status

***Model 3 adjusts for gender, race/ethnicity, respondent's education, child's age, special health care needs status, perceived limitations, parental mental health/stress, trust in neighbors, social support and perceived safety

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Table 9. Prevalence of sedentary lifestyle among 6- to 17-year-olds by special health care needs status and parental attitude indicators. United States 2007					
	No. in sample	Percent (weighted)	95% CI		p value
Special health care needs status	63434				0.0005
Without SHCN	48531	32.3991	31.3391	33.4591	
SHCN without EBD	7466	34.9007	32.053	37.7484	
SHCN with EBD	7437	37.8302	35.2155	40.4448	
Child with perceived limitations	63351				<.0001
no	59143	32.7374	31.7746	33.7002	
yes	4208	41.0508	37.4058	44.6958	
Mental health/stress score	62656				<.0001
zero	51599	31.5243	30.5101	32.5386	
1 to 5	11057	39.9264	37.6468	42.2059	
Trust in neighbors score	61404				<.0001
zero	51330	32.1966	31.1634	33.2298	
1 to 4	10074	37.6902	35.3964	39.9841	
Social Support	63170				
yes	56812	32.7054	31.7364	33.6743	0.0048
no	6358	37.1527	34.1393	40.1662	
Child's perceived safety score	63434				<.0001
zero	54566	32.2592	31.2541	33.2643	
1 to 2	8868	38.0467	35.6366	40.4568	
p values indicate the probability of the observed Rao Scott chi square if there are no true differences between categories. Data from 2007 National Survey of Children's Health					

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Table 10 Hierarchical logistic regression models for effects of demographic characteristics, special health care needs status and parental attitudes on sedentary lifestyle in 6-17 year old children, United States 2007

	Unadjusted			Model 1*		
	OR	95% CI		AOR	95% CI	
Gender						
Boys	reference			reference		
Girls	1.155	1.06	1.259	1.167	1.068	1.275
Race/ethnicity						
Non-Hispanic white	reference			reference		
Non-Hispanic black	1.651	1.475	1.848	1.61	1.427	1.818
Hispanic	1.326	1.149	1.531	1.297	1.115	1.509
Non-Hispanic multiracial	0.998	0.803	1.241	1.073	0.861	1.337
Non-Hispanic other race	0.975	0.758	1.253	1.09	0.852	1.394
Respondent's education						
< 12 years	1.416	1.207	1.66	1.275	1.074	1.513
High school graduate	1.503	1.361	1.66	1.392	1.257	1.541
More than high school	reference			reference		
Age in years						
	1.151	1.136	1.166	1.151	1.136	1.167
Special Health Care Needs Status						
No SHCN	reference					
SHCN without EBD	1.129	0.983	1.298			
SHCN with EBD	1.255	1.107	1.422			
Child with perceived limitations						
no	reference					
yes	1.45	1.227	1.713			
Mental health/stress score						
zero	reference					
1 - 5	1.506	1.349	1.681			
Trust in neighbors score						
zero	reference					
1 - 4	1.286	1.152	1.437			
Social Support						
yes	reference					
no	1.259	1.088	1.457			
Child's perceived safety score						
zero	reference					
1 - 2	1.318	1.173	1.481			

*Model 1 adjusts for gender, race/ethnicity, respondent's education and child's age

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Table 10 (cont'd): Hierarchical logistic regression models for effects of demographic characteristics, special health care needs status and parental attitudes on sedentary lifestyle among 6-17 year old children, United States 2007

	Model 2**			Model 3***		
	AOR	95% CI		AOR	95% CI	
Gender						
Boys	reference			reference		
Girls	1.187	1.087	1.298	1.184	1.084	1.294
Race/ethnicity						
Non-Hispanic white	reference			reference		
Non-Hispanic black	1.616	1.432	1.824	1.529	1.351	1.73
Hispanic	1.313	1.128	1.527	1.253	1.072	1.464
Non-Hispanic multiracial	1.066	0.856	1.327	1.04	0.832	1.3
Non-Hispanic other race	1.112	0.869	1.424	1.078	0.839	1.384
Respondent's education						
< 12 years	1.274	1.074	1.511	1.181	0.992	1.407
High school graduate	1.392	1.257	1.541	1.352	1.219	1.498
More than high school	reference			reference		
Age in years						
	1.151	1.136	1.167	1.151	1.135	1.166
Special Health Care Needs Status						
No SHCN	reference			reference		
SHCN without EBD	1.177	1.02	1.358	1.131	0.973	1.314
SHCN with EBD	1.267	1.111	1.445	1.114	0.967	1.284
Child with perceived limitations						
no				reference		
yes				1.245	1.018	1.522
Mental health/stress score						
zero				reference		
1 - 5				1.206	1.068	1.363
Trust in neighbors score						
zero				reference		
1 - 4				1.149	1.02	1.295
Social Support						
yes				reference		
no				1.043	0.892	1.219
Child's perceived safety score						
zero				reference		
1 - 2				0.991	0.87	1.129

**Model 2 adjusts for gender, race/ethnicity, respondent's education, child's age and special health care needs status

***Model 3 adjusts for gender, race/ethnicity, respondent's education, child's age, special health care needs status, perceived limitations, parental mental health/stress, trust in neighbors, social support and perceived safety. Data from the 2007 National Survey of Children's Health

Table 11. Effects of interaction terms in models for effects of parental attitudes, adjusted for age, gender, race/ethnicity, education of respondent and special health care needs status

	SHCN without EBD		SHCN with EBD		p for effect
	β coefficient	p value	β coefficient	p value	
Low MVPA					
limitations*SHCN status	-0.123	0.7457	-0.3011	0.4221	0.5772
mental health/stress*SHCN status	0.1739	0.3781	-0.0356	0.806	0.6201
trust in neighbors* SHCN status	0.0296	0.8659	-0.2191	0.1537	0.3287
social support*SHCN status	0.2312	0.3429	-0.1747	0.3595	0.3478
perceived safety*SHCN status	-0.0755	0.7069	-0.2811	0.0855	0.2269
High screen time					
limitations*SHCN status	0.0135	0.2728	0.0024	0.9605	0.0252
mental health/stress*SHCN status	0.1672	0.3866	-0.0404	0.7757	0.6181
trust in neighbors* SHCN status	-0.0893	0.6252	0.152	0.2925	0.7217
social support*SHCN status	0.3062	0.3199	-0.2273	0.2278	0.2422
perceived safety*SHCN status	0.1528	0.4379	-0.017	0.9195	0.7217
Sedentary lifestyle					
limitations*SHCN status	0.1928	0.5154	-0.1227	0.676	0.2973
mental health/stress*SHCN status	0.0141	0.9248	-0.0177	0.7755	0.9519
trust in neighbors* SHCN status	0.0219	0.9076	0.0011	0.9943	0.9932
social support*SHCN status	0.2453	0.4382	-0.2955	0.1151	0.1758
perceived safety*SHCN status	0.1989	0.3314	-0.096	0.5705	0.4817

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Table 12: Effects of parental attitudes on odds of low moderate-to-vigorous physical activity, adjusted for age, gender, race/ethnicity and education of respondent, stratified by special health care needs status

	All children			Children without SHCN		
	AOR	95% CI	p value	AOR	95% CI	p value
Child with perceived limitations			0.0003			0.1697
no	reference			reference		
yes	1.445	1.182 1.765		1.602	0.818 3.141	
Mental health/stress score			0.2888			0.5918
zero	reference			reference		
1 - 5	1.067	0.946 1.204		1.107	0.763 1.608	
Trust in neighbors score						
zero	reference		0.065	reference		0.078
1 - 5	1.115	0.993 1.252		1.132	0.986 1.299	
Social Support			0.0464			0.0892
yes	reference			reference		
no	1.172	1.003 1.371		1.174	0.976 1.412	
Child's perceived safety score						
zero	reference		0.0415	reference		0.0231
1 - 2	1.143	1.005 1.301		1.191	1.024 1.385	
	Children with SHCN without EBD			Children with SHCN with EBD		
	AOR	95% CI	p value	AOR	95% CI	p value
Child with perceived limitations			0.0231			0.0917
no	reference			reference		
yes	1.423	1.05 1.93		1.272	0.962 1.684	
Mental health/stress score			0.5918			0.6843
zero	reference			reference		
1 - 5	1.107	0.763 1.608		1.053	0.82 1.354	
Trust in neighbors score						
zero	reference		0.6203	reference		0.7549
1 - 5	1.084	0.789 1.489		0.958	0.73 1.256	
Social Support			0.2489			0.8832
yes	reference			reference		
no	1.292	0.836 1.997		1.027	0.72 1.464	
Child's perceived safety score						
zero	reference		0.7831	reference		0.8074
1 - 2	0.947	0.641 1.399		0.963	0.713 1.302	

p values indicate the probability of the observed Wald chi square if there is no true difference in odds of low MVPA by level of parental attitude indicator.
Data from the 2007 National Survey of Children's Health

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Table 13. Effect of special health care needs status on adjusted odds of low moderate-to-vigorous physical activity, adjusted for age, gender, race/ethnicity and education of respondent, stratified by parental attitudes

	Children without SHCN	Children with SHCN without EBD			Children with SHCN with EBD			p value
		AOR	95% CI	1.252	AOR	95% CI	1.411	
Overall (age 6-17)		1.097	0.961	1.252	1.241	1.092	1.411	0.0028
Stratified by								
Mental health/stress								
zero	reference	1.047	0.908	1.206	1.249	1.068	1.46	0.0194
1 - 5	reference	1.242	0.884	1.746	1.154	0.917	1.453	0.284
Trust in neighbors score								
zero	reference	1.07	0.924	1.24	1.285	1.111	1.487	0.0031
1 - 4	reference	1.118	0.819	1.526	1.013	0.786	1.305	0.7809
Perceived safety score								
zero	reference	1.078	0.936	1.242	1.271	1.104	1.463	0.0033
1 - 2	reference	1.088	0.763	1.552	1.045	0.782	1.396	0.8739
Child with perceived limitations								
no	reference	1.035	0.895	1.196	1.179	1.026	1.354	0.0651
yes	reference	0.823	0.446	1.518	0.703	0.402	1.229	0.3527
Social support								
yes	reference	0.703	0.402	1.229	1.26	1.099	1.444	0.0036
no	reference	1.296	0.797	2.106	0.975	0.696	1.364	0.5522

p values indicate the probability of the observed Wald chi square if there is no true difference in odds of low MVPA among SHCN categories

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Table 14: Effects of parental attitudes on odds of exceeding 2 hours of screen-based leisure activity, adjusted for age, gender, race/ethnicity and education of respondent, stratified by special health care needs status

	All children			Children without SHCN		
	AOR	95% CI	p value	AOR	95% CI	p value
Child with perceived limitations			0.146			0.7617
no	reference			reference		
yes	1.14	0.955 1.361		0.932	0.59 1.472	
Mental health/stress score			0.0002			0.0044
zero	reference			reference		
1 through 5	1.249	1.113 1.403		1.239	1.069 1.435	
Trust in neighbors score			<.0001			0.0003
zero	reference			reference		
1 through 4	1.287	1.149 1.442		1.283	1.121 1.469	
Social Support			0.1826			0.1687
yes	reference			reference		
no	1.11	0.952 1.293		1.132	0.949 1.351	
Child's perceived safety score			0.0904			0.1552
zero	reference			reference		
1 through 2	1.114	0.983 1.263		1.112	0.961 1.287	
	Children with SHCN without EBD			Children with SHCN with EBD		
	AOR	95% CI	p value	AOR	95% CI	p value
Child with perceived limitations			0.0042			0.5347
no	reference			reference		
yes	1.494	1.135 1.967		0.918	0.701 1.202	
Mental health/stress score			0.25			0.1864
zero	reference			reference		
1 through 5	1.234	0.862 1.765		1.171	0.927 1.48	
Trust in neighbors score			0.8157			0.0014
zero	reference			reference		
1 through 4	1.042	0.737 1.473		1.509	1.172 1.942	
Social Support			0.3444			0.4704
yes	reference			reference		
no	1.332	0.735 2.413		0.889	0.646 1.223	
Child's perceived safety score			0.6998			0.55
zero	reference			reference		
1 through 2	1.081	0.727 1.608		1.095	0.813 1.474	
p values indicate the probability of observed Wald chi square if there is no true difference between levels of the parental attitude indicators. Data from the 2007 National Survey of Children's Health						

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Table 15. Effect of special health care needs status on odds of exceeding 2 hours of screen-based leisure activity, adjusted for age, gender, race/ethnicity and education of respondent, stratified by parental attitudes

	Children without SHCN	Children with SHCN without EBD			Children with SHCN with EBD			p value
		AOR	95% CI		AOR	95% CI		
Overall		1.057	0.929	1.202	1.172	1.031	1.333	0.0472
Stratified by								
Mental health/stress								
zero	reference	1.015	0.886	1.163	1.152	0.976	1.359	0.2461
1-5	reference	1.148	0.813	1.621	1.067	0.857	1.328	0.676
Trust in neighbors score								
zero	reference	1.072	0.935	1.229	1.104	0.954	1.278	0.296
1 -4	reference	0.938	0.679	1.296	1.409	1.1	1.804	0.0167
Perceived safety score								
zero	reference	1.041	0.909	1.192	1.195	1.037	1.377	0.0473
1-2	reference	1.09	0.769	1.545	1.155	0.868	1.538	0.5797
Child with perceived limitations								
no	reference	0.985	0.856	1.135	1.237	1.071	1.428	0.0128
yes	reference	1.452	0.902	2.337	1.047	0.662	1.656	0.0798
Social support								
yes	reference	0.703	0.402	1.229	1.26	1.099	1.444	0.0036
no	reference	1.296	0.797	2.106	0.975	0.696	1.364	0.5522

p values indicate the probability of the observed Wald chi square if there is no true difference in odds of high screen time among the SHCN categories

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Table 16: Effects of parental attitudes on odds of sedentary lifestyle adjusted for age, gender, race/ethnicity and education of respondent, stratified by special health care needs status								
	All children			Children without SHCN				
	AOR	95% CI		p value	AOR	95% CI		p value
Child with perceived limitations				0.0003				0.3073
no	reference				reference			
yes	1.407	1.17	1.69		1.296	0.788	2.133	
Mental health/stress score				<.0001				0.0094
zero	reference				reference			
1 - 5	1.28	1.139	1.438		1.212	1.048	1.402	
Trust in neighbors score				0.0031				0.0148
zero	reference				reference			
1 - 4	1.191	1.061	1.338		1.187	1.034	1.363	
Social Support				0.2127				0.1441
yes	reference				reference			
no	1.102	0.946	1.283		1.139	0.957	1.356	
Child's perceived safety score				0.3512				0.1826
zero	reference				reference			
1 - 2	1.062	0.936	1.206		1.054	0.91	1.221	
	Children with SHCN without EBD				Children with SHCN with EBD			
	AOR	95% CI		p value	AOR	95% CI		p value
Child with perceived limitations				0.0023				0.3462
no	reference				reference			
yes	1.565	1.173	2.087		1.14	0.868	1.497	
Mental health/stress score				0.0774				0.0601
zero	reference				reference			
1 - 5	1.395	0.964	2.019		1.259	0.99	1.601	
Trust in neighbors score				0.7311				0.1381
zero	reference				reference			
1 - 4	1.064	0.747	1.517		1.214	0.94	1.568	
Social Support				0.5542				0.3465
yes	reference				reference			
no	1.199	0.657	2.19		0.86	0.627	1.178	
Child's perceived safety score				0.7709				0.963
zero	reference				reference			
1 - 2	1.062	0.709	1.591		1.007	0.742	1.367	

p values indicate the probability of the observed Wald chi square if there is no true difference in odds of sedentary life style by level of parental indicator.

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Table 17. Effect of special health care needs status on odds of sedentary lifestyle, adjusted for gender, age, race/ethnicity and respondent's education, stratified by parental attitude indicators

	Children without SHCN	Children with SHCN without EBD			Children with SHCN with EBD			p value
		AOR	95% CI		AOR	95% CI		
Overall	reference	1.177	1.02	1.358	1.267	1.111	1.445	0.0004
Stratified by								
Mental health/stress								
zero	reference	1.096	0.939	1.28	1.197	1.014	1.412	0.0682
1 - 5	reference	1.408	0.996	1.991	1.185	0.951	1.477	0.0812
Trust in neighbors score								
zero	reference	1.164	0.994	1.363	1.251	1.076	1.454	0.0043
1 -4	reference	1.165	0.843	1.61	1.245	0.962	1.611	0.2047
Perceived safety score								
zero	reference	1.135	0.973	1.323	1.274	1.102	1.474	0.0023
1 -2	reference	1.324	0.927	1.892	1.21	0.91	1.609	0.1665
Child with perceived limitations								
no	reference	1.092	0.93	1.283	1.233	1.066	1.425	0.0138
yes	reference	1.195	0.734	1.945	0.883	0.546	1.428	0.1791
Social support								
yes	reference	1.151	0.999	1.327	1.33	1.154	1.533	0.0002
no	reference	1.348	0.744	2.44	0.908	0.658	1.254	0.4701

p values indicate the probability of the observed Wald chi square if there is no true difference in the odds of sedentary lifestyle among SHCN categories

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Table 18. Joint effects of single attitudes with SHCN with or without EBD on the adjusted odds of sedentary lifestyle among 6- to 17-year-olds. United States 2007

	Population Percent (weighted)	Prevalence of Sedentary lifestyle		AOR	95% CI	p value
		Percent	95% CI			
No stress and no SHCN	74.506	31.036	29.903-32.17		reference	
Stress and SHCN without EBD	1.975	45.277	37.68-52.874	1.777	1.287-2.454	0.0005
Stress and SHCN with EBD	1.606	40.744	36.655-44.832	1.498	1.234-1.82	<.0001
All others	21.914	35.995	34.181-37.81	1.183	1.071-1.307	0.0009
No limitations and no SHCN	75.798	32.196	31.129-33.262		reference	
Limitations and SHCN without EBD	3.244	45.675	40.113-51.238	1.761	1.384-2.242	<.0001
Limitations and SHCN with EBD	1.687	37.854	32.853-42.854	1.383	1.087-1.758	0.0082
All others	4.057	35.848	33.681-38.014	1.165	1.039-1.306	0.009
No lack of trust and no SHCN	62.574	31.332	30.169-32.495		reference	
Lack of trust and SHCN without EBD	2.270	39.847	32.930-46.764	1.437	1.062-1.944	0.0189
Lack of trust and SHCN with EBD	3.095	40.474	35.398-45.55	1.55	1.22-1.97	0.0003
All others	32.061	35.921	34.187-37.655	1.213	1.102-1.336	<.0001

p value indicates the probability of the observed Wald chi square if there is no true difference between adjusted odds of sedentary lifestyle in this category and the reference category

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Table 19. Joint effects of combinations of parental attitudes on the odds of sedentary life style among 6-17 year olds. United States, 2007

	Population Percent (weighted)	Prevalence of Sedentary lifestyle		AOR	95% CI	p value
		Percent	95% CI			
No stress and no limitations	75.2	30.9	29.8-31.9	reference		
Stress and limitations	3.4	40.3	34.8-45.8	1.42	1.082-1.864	0.0114
All others	22.6	40.8	38.5-43.1	1.386	1.237-1.554	<.0001
No stress and no lack of trust	53.2	30.5	29.3-31.7	reference		
Stress and lack of trust	6.9	44.8	40.5-49.0	1.614	1.337-1.948	<.0001
All others	26.9	36.2	34.3-38.1	1.197	1.078-1.328	.0007
No limitations and no lack of trust	75.4	31.7	30.6-32.7	reference		
Limitations and lack of trust	2.0	43.9	37.3-50.5	1.557	1.163-2.086	0.0029
All others	22.6	37.7	35.6-39.8	1.228	1.100-1.371	.0003
No stress, no limitations and no lack of trust	11.9	32.8	30.1-35.5	reference		
Stress and limitations and lack of trust	1.2	40.0	30.6-49.4	1.322	0.842-2.076	0.2251
All others	87.0	33.2	32.3-34.3	.991	.863-1.137	.8954

p value indicates the probability of the observed Wald chi square if there is no true difference between adjusted odds of sedentary lifestyle in this category and the reference category

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Table 20. Joint effects of constellations of parental attitudes and special health care needs status on the odds of sedentary lifestyle among 6-17 year olds. United States, 2007

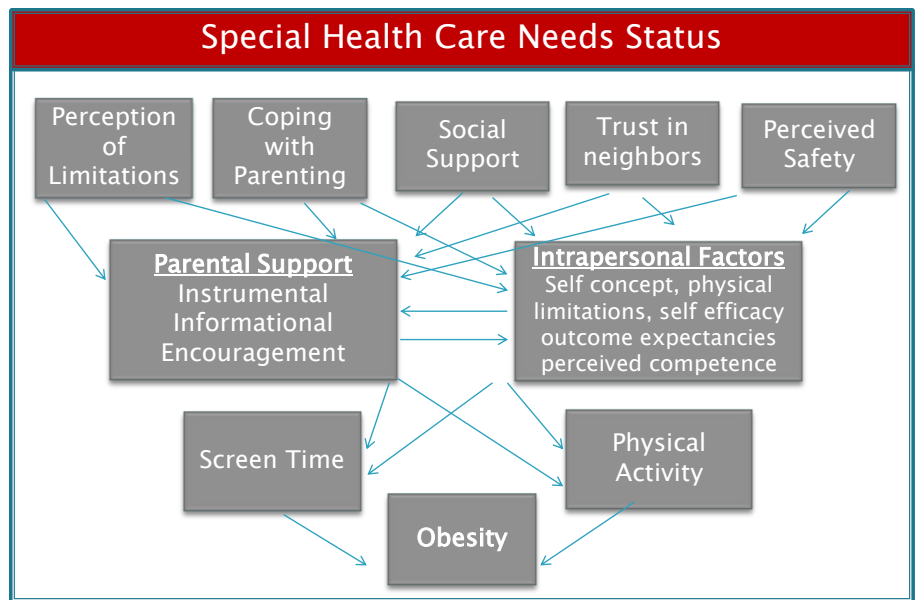
	Population Percent (weighted)	Prevalence of Sedentary lifestyle		AOR	95% CI	p value
No stress, no limitations and no SHCN	62.3	30.8	29.6-31.9	reference		
Stress and limitations and no SHCN	0.6	35.7	19.5-51.9	0.857	.341-2.155	0.7425
Stress and limitations and SHCN without EBD	0.6	57.4	48.2-66.6	2.659	1.741-4.06	<.0001
Stress and limitations and SHCN with EBD	2.3	37.0	30.9-43.2	1.397	1.041-1.874	0.0258
All others	34.3	37.3	35.6-39.0	1.270	1.156-1.395	<.0001
No stress, no lack of trust and no SHCN	53.2	30.5	29.3-31.7	reference		
Stress and lack of trust and no SHCN	4.3	46.3	40.7-51.9	1.551	1.221-1.969	0.0003
Stress and lack of trust and SHCN without EBD	0.8	44.8	30.6-59.0	1.544	0.84-2.835	0.1616
Stress and lack of trust and SHCN with EBD	1.9	41.3	34.3-48.4	1.498	1.096-2.048	0.0112
All others	13.9	35.0	33.5-36.6	1.146	1.044-1.258	.0041
No limitations, no lack of trust and no SHCN	61.7	31.2	30.0-32.3	reference		
Limitations and lack of trust and no SHCN	0.3	49.8	35.4-64.3	1.619	0.925-2.833	0.0917
Limitations and lack of trust and SHCN without EBD	0.5	56.4	45.0-67.8	2.434	1.436-4.126	0.0009
Limitations and lack of trust and SHCN with EBD	1.2	37.1	28.2-46.1	1.307	0.86-1.984	0.2097
All others	36.3	36.3	34.6-37.9	1.207	1.100-1.325	<.0001
No stress, no lack of trust, no limitations and no SHCN	52.7	30.3	29.0-31.5	reference		
Stress and lack of trust and limitations and no SHCN	0.2	56.5	32.5-80.5	2.223	0.837-5.907	0.109
Stress and lack of trust and limitations and SHCN without EBD	0.2	53.1	36.7-69.4	2.11	1.033-4.309	0.0404
Stress and lack of trust and limitations and SHCN with EBD	0.8	34.3	22.9-45.7	1.277	0.713-2.287	0.4105
All others	46.1	36.6	35.1-38.1	1.141	1.136-1.166	<.0001

p value indicates the probability of the observed Wald chi square if there is no true difference between adjusted odds of sedentary lifestyle in this category and the reference category

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VIII. APPENDIX 2: ILLUSTRATIONS

Conceptual framework



Adapted from Wallander et al and Singh et al

Figure 1. Conceptual framework showing relationships among attitudes, parental support, intrapersonal factors, behaviors and obesity. Special health care needs can affect the dynamics. (Combining ideas from models of Wallander⁹ and Singh⁶⁵)

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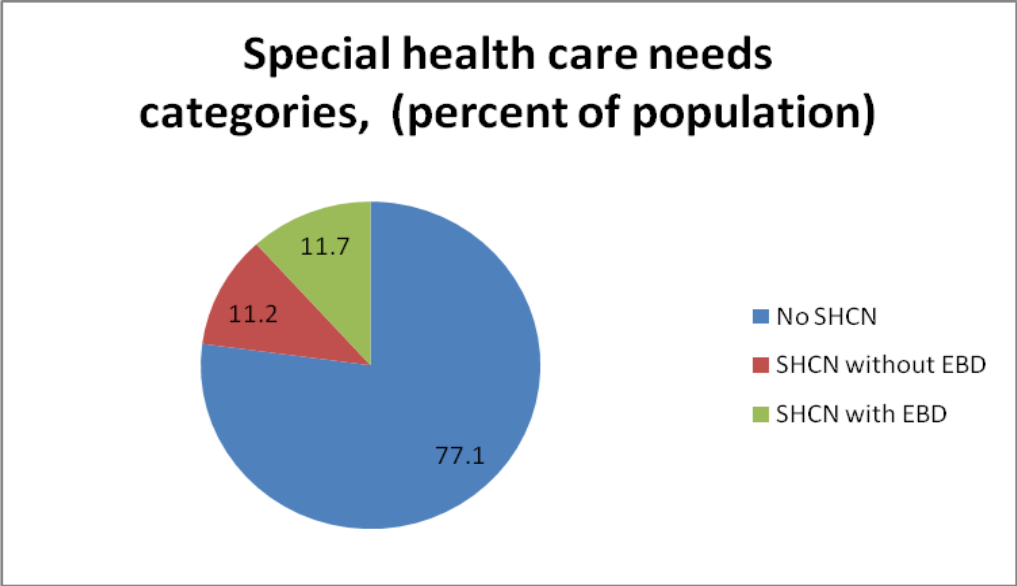


Figure 2. Prevalence of special health care needs with and without emotional, behavioral and developmental conditions. Data from 2007 National Survey of Children's Health.

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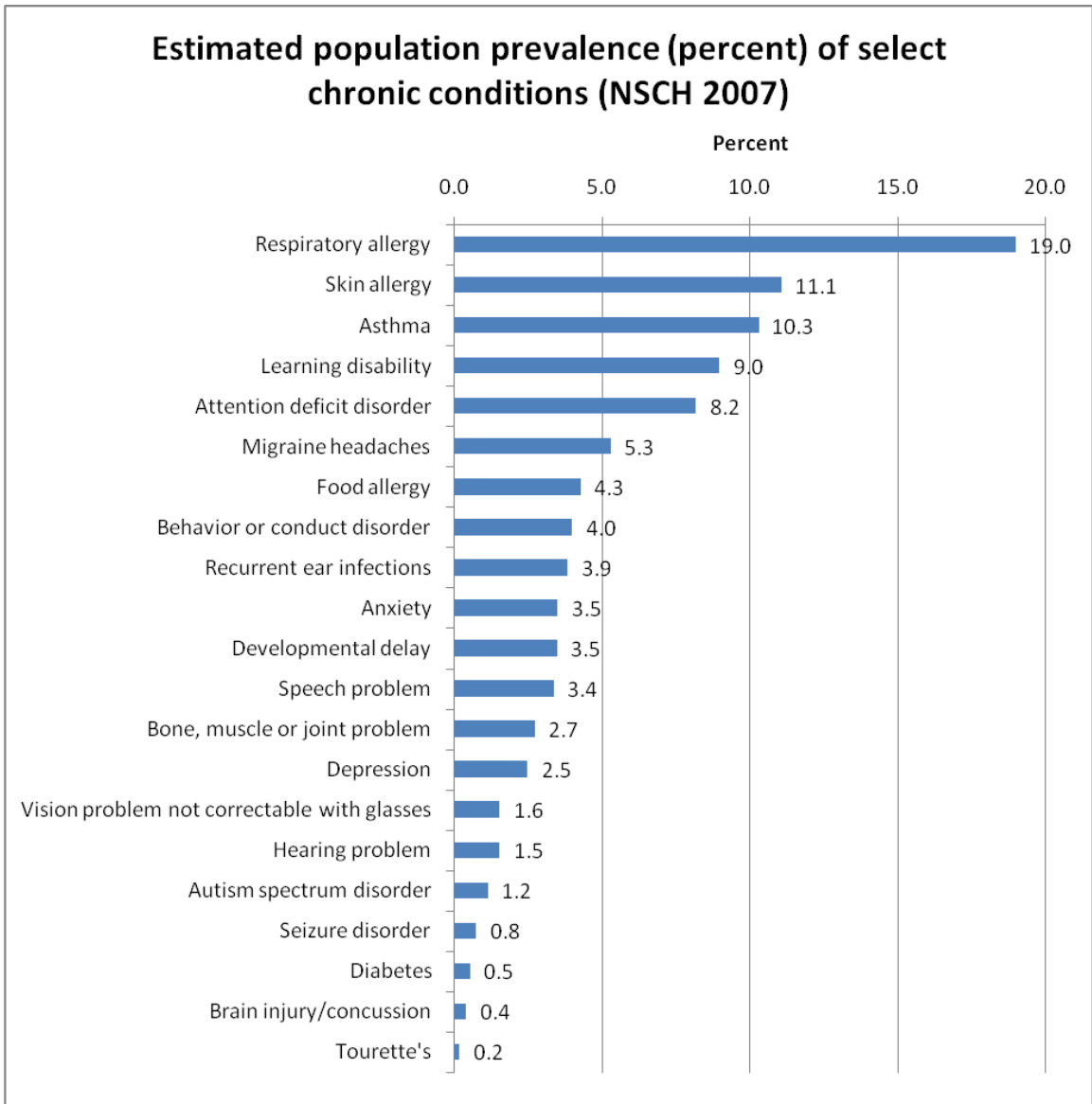


Figure 3. Prevalence of specific chronic conditions. Data from 2007 National Survey of Children's Health.

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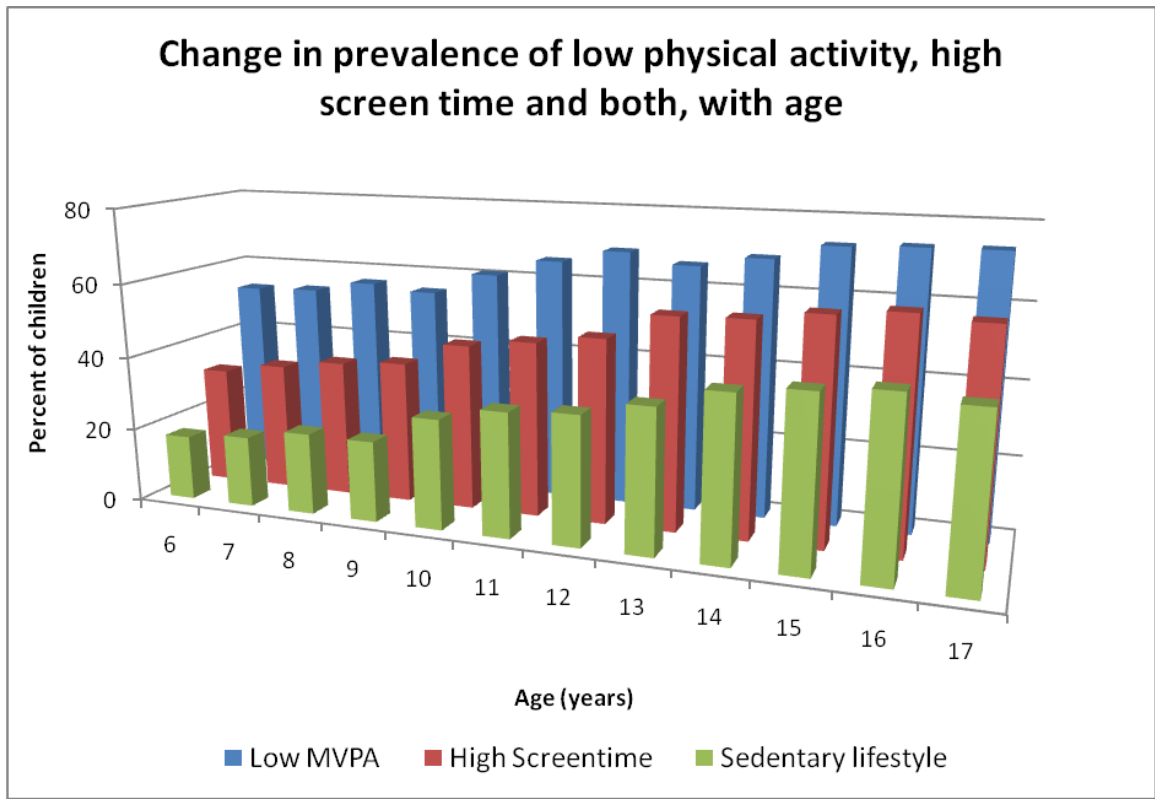


Figure 4. The prevalence of low MVPA, high screen time and sedentary lifestyle rise with age. Data from [Table 3](#).

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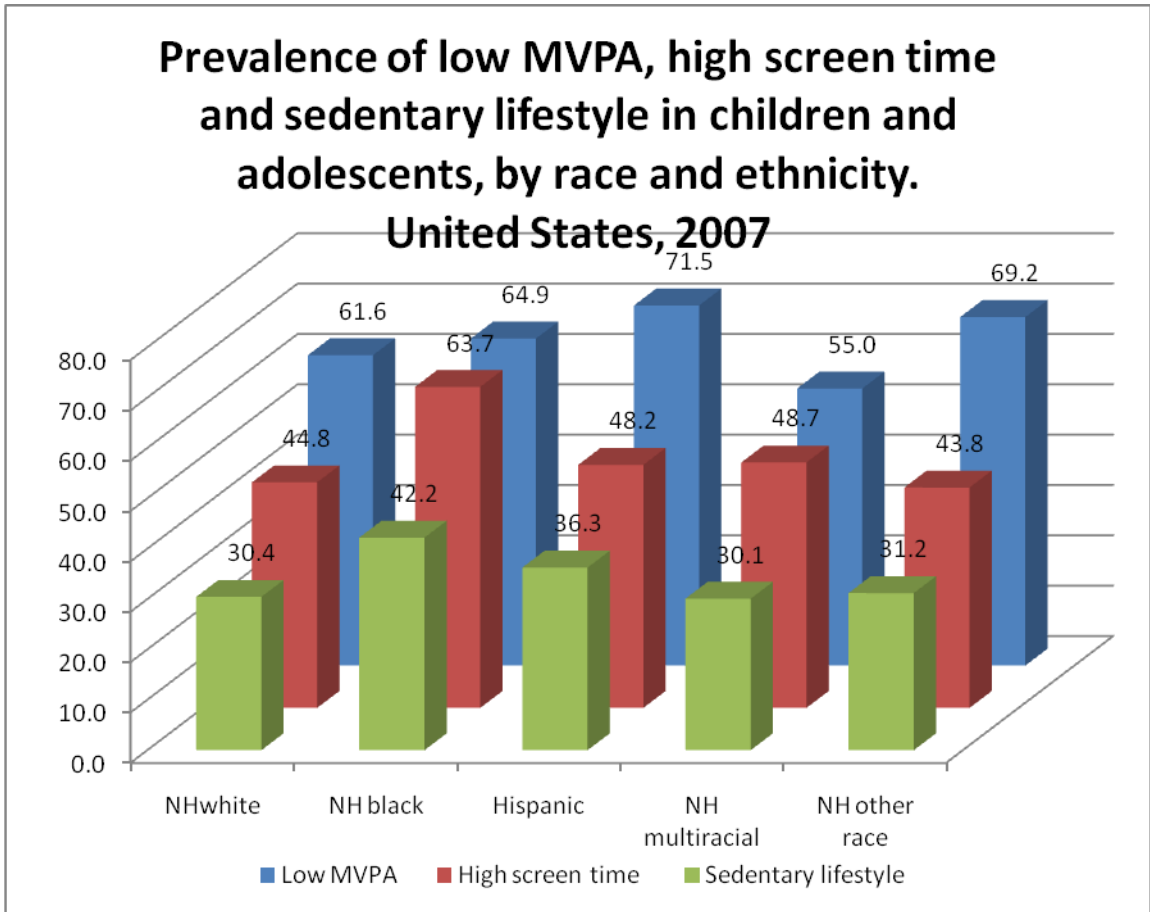


Figure 5. Sedentary behaviors vary by race and ethnicity. High screen time and sedentary lifestyle are most prevalent among non-Hispanic black children. Low MVPA is most prevalent among Hispanic children and children of other races. Data from [Table 3](#). *p<.05

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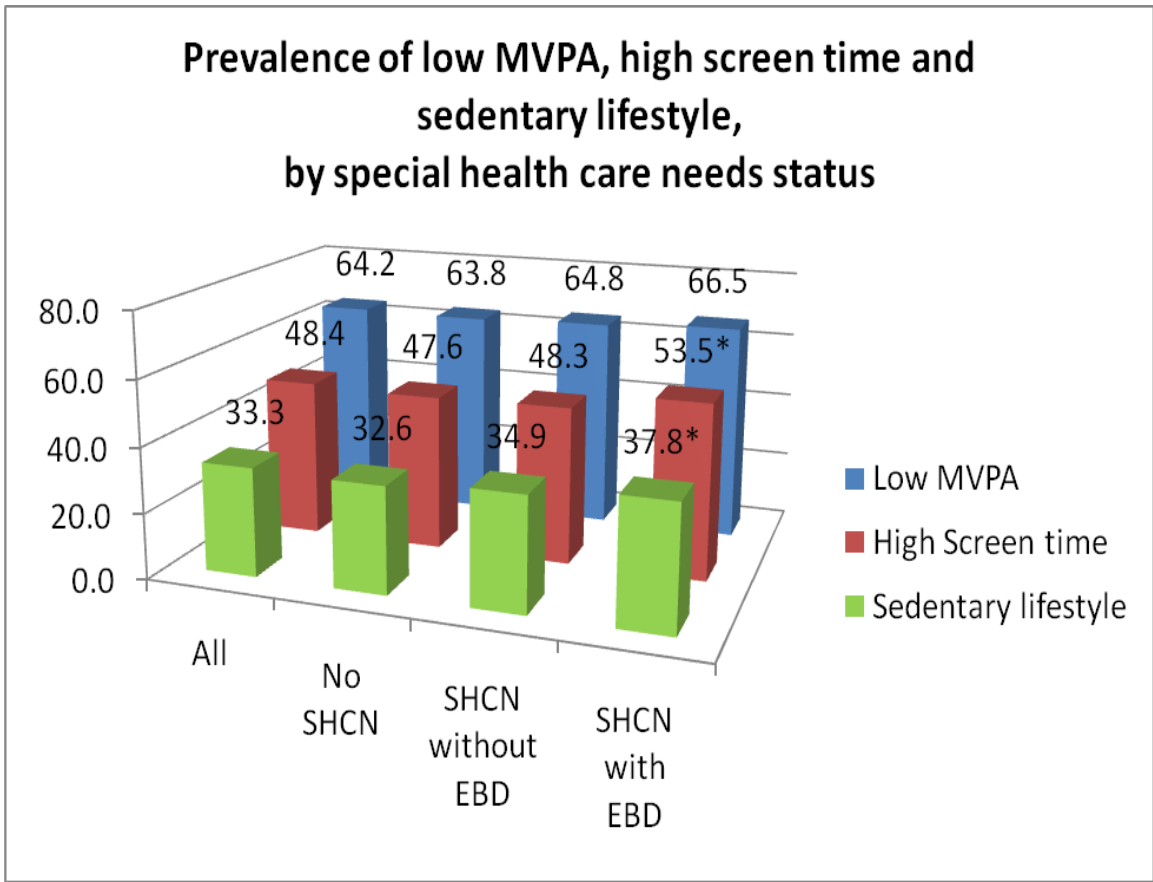


Figure 6. Prevalence of low MVPA does not vary significantly by SHCN status. High screen time and sedentary lifestyle are more prevalent among children with special health care needs with emotional, behavior and developmental conditions. Data from [Table 3](#). *p<.05

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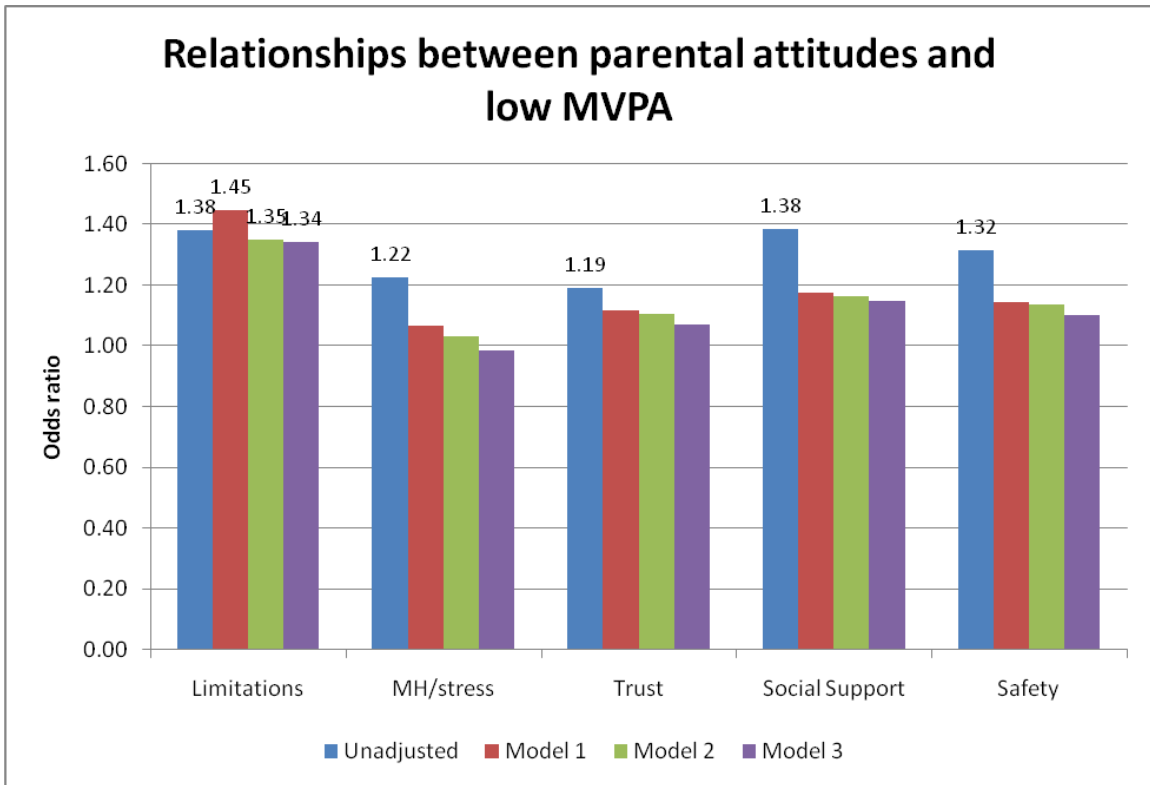


Figure 7. Relationships between parental attitudes and low MVPA. Model 1 adjusts for demographic factors (gender, race/ethnicity, education of respondent and child's age). Model 2 adjusts for demographic factors and special health care needs status. Model 3 adjusts for demographic factors, special health care needs status and the five attitudes. Only perceived limitations has a significant association after adjustment. The numbers shown have p values less than .05. See [Table 6](#).

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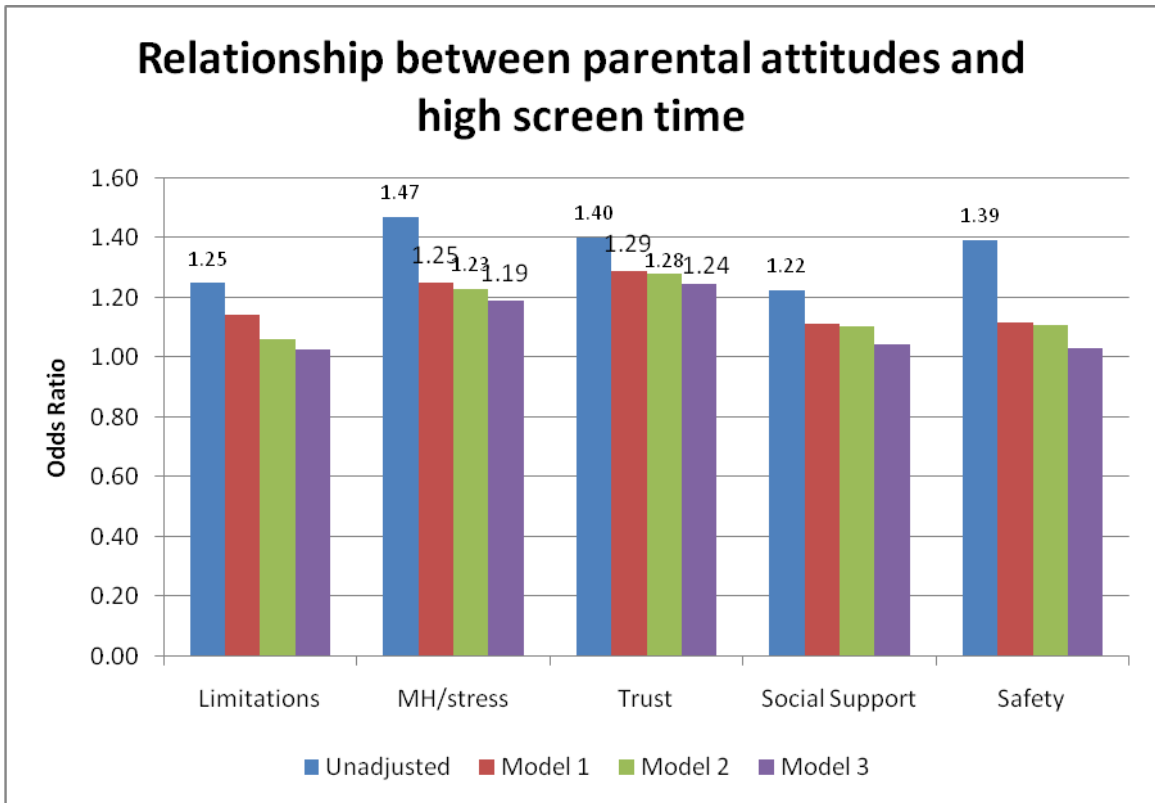


Figure 8. Relationship between parental attitudes and high screen time. Model 1 adjusts for demographic factors (gender, race/ethnicity, education of respondent and child's age). Model 2 adjusts for demographic factors and special health care needs status. Model 3 adjusts for demographic factors, special health care needs status and the five attitudes. Only MH/stress and trust variables have significant associations after adjustment. The numbers shown have p values less than .05. (See [Table 8.](#))

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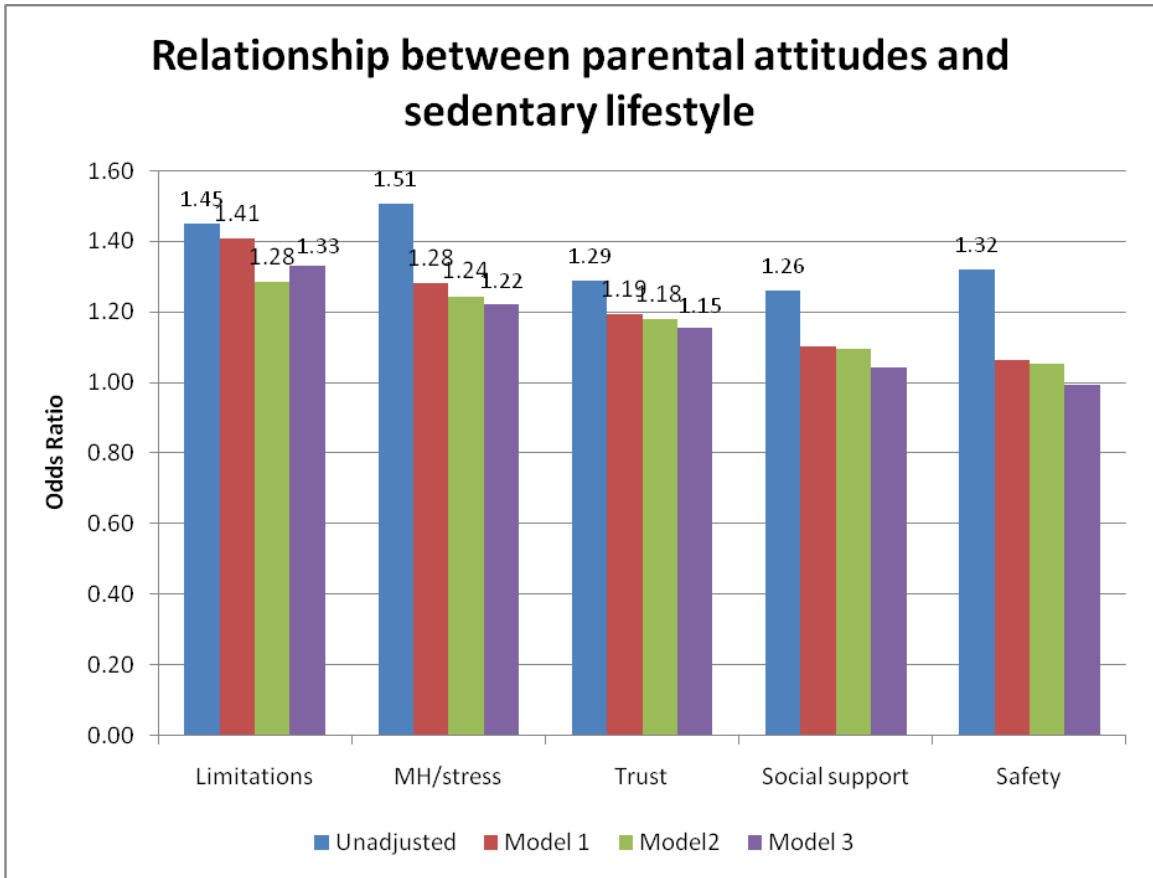


Figure 9. Relationship between parental attitudes and sedentary lifestyle. Model 1 adjusts for demographic factors (gender, race/ethnicity, education of respondent and child's age). Model 2 adjusts for demographic factors and special health care needs status. Model 3 adjusts for demographic factors, special health care needs status and the five attitudes. Perceived limitations, MH/stress and trust variables have significant associations after adjustment. The numbers shown have p values < .05. (See [Table 10](#))

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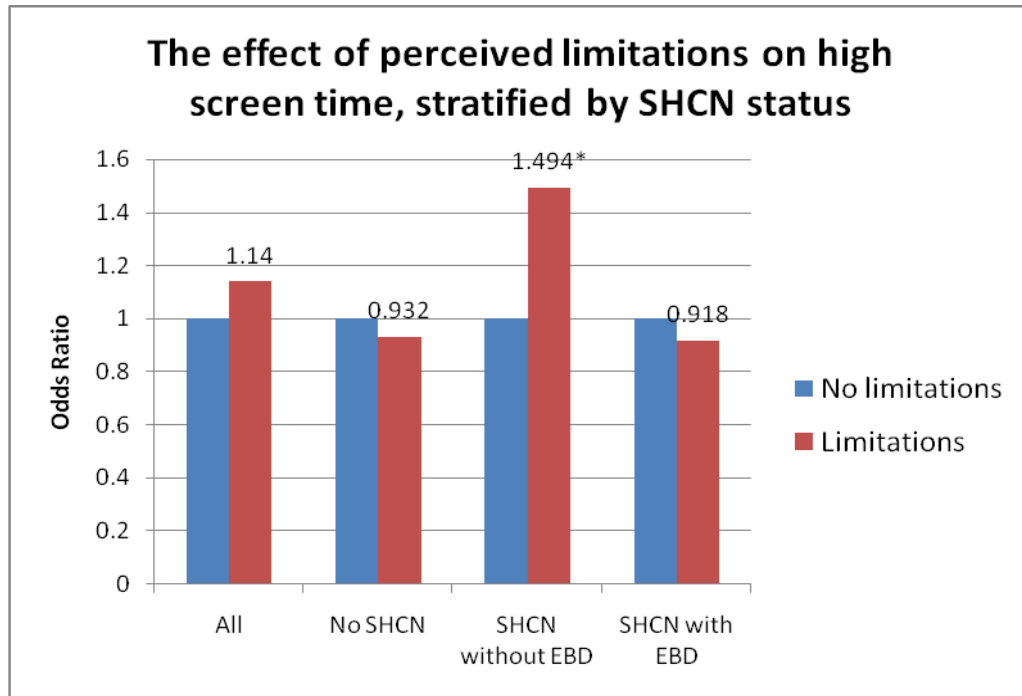


Figure 10. Parental perception of perceived limitations has a significant positive association with high screen time among children with SHCN without EBD but not among children without SHCN or with SHCN with EBD. (See [Table 14.](#))

*p<.05

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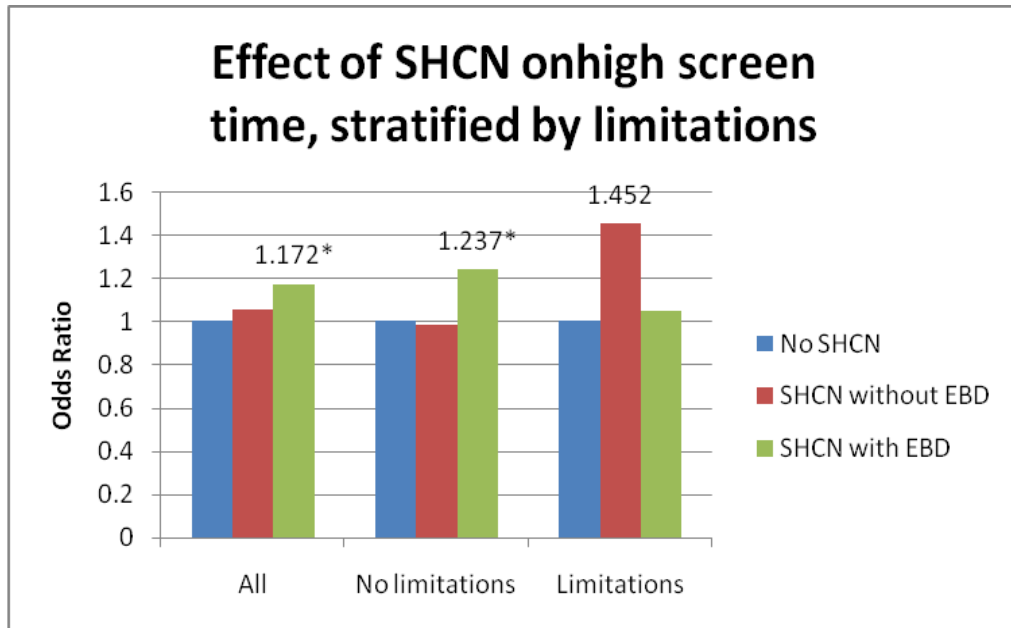


Figure 11. SHCN with EBD has a significant positive association with high screen time among those without perceived limitations. Among those with limitations, the differences for children with SHCN with and without EBD are not statistically significant. (See [Table 15.](#)) *p<.05

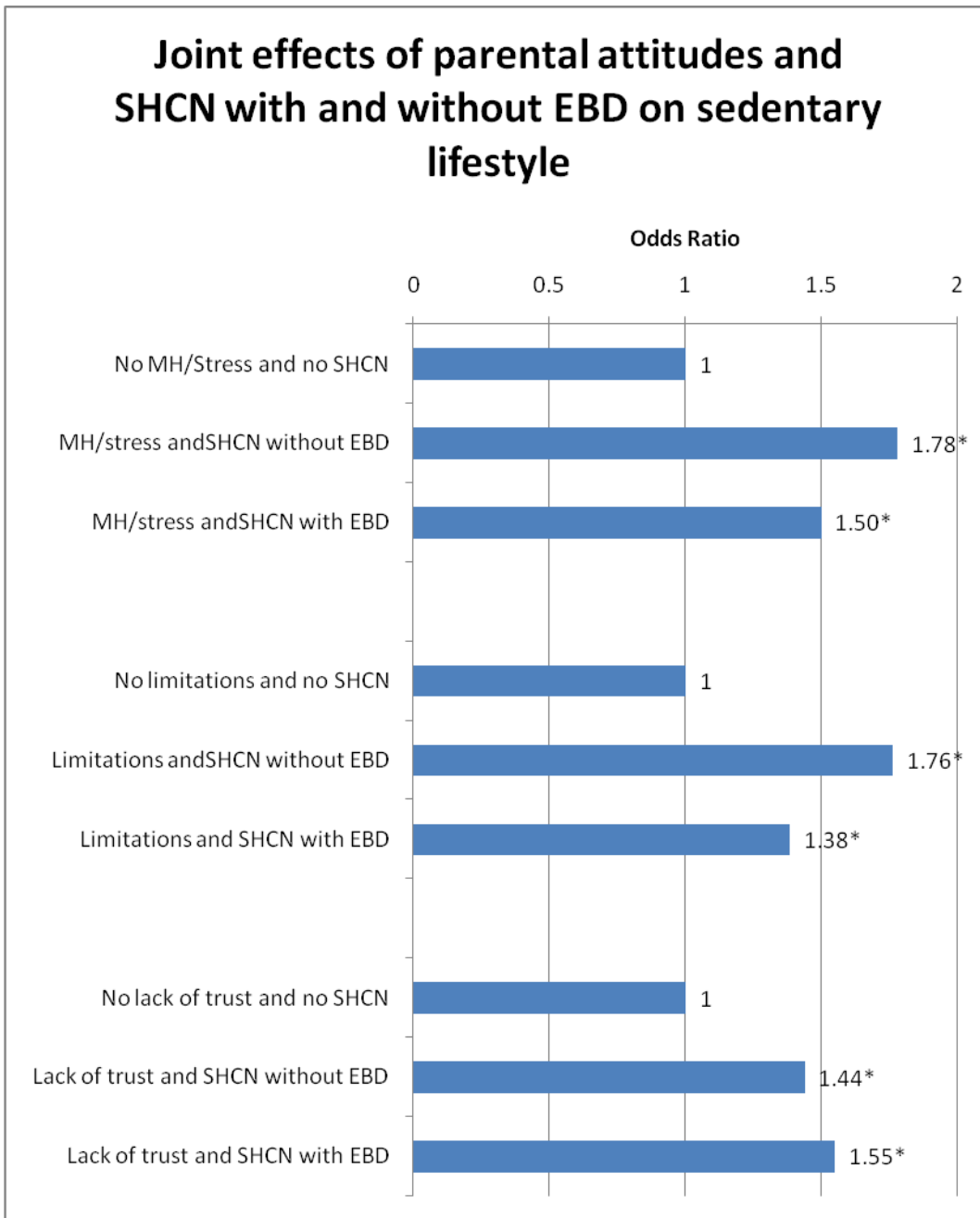


Figure 12. When mental health/stress, perceived limitations or lack of trust is combined with SHCN with or without EBD, the odds of sedentary lifestyle is significantly greater than when neither the attitude nor the SHCN is present. (See [Table 18.](#)) * $p < .05$

[back to text](#)

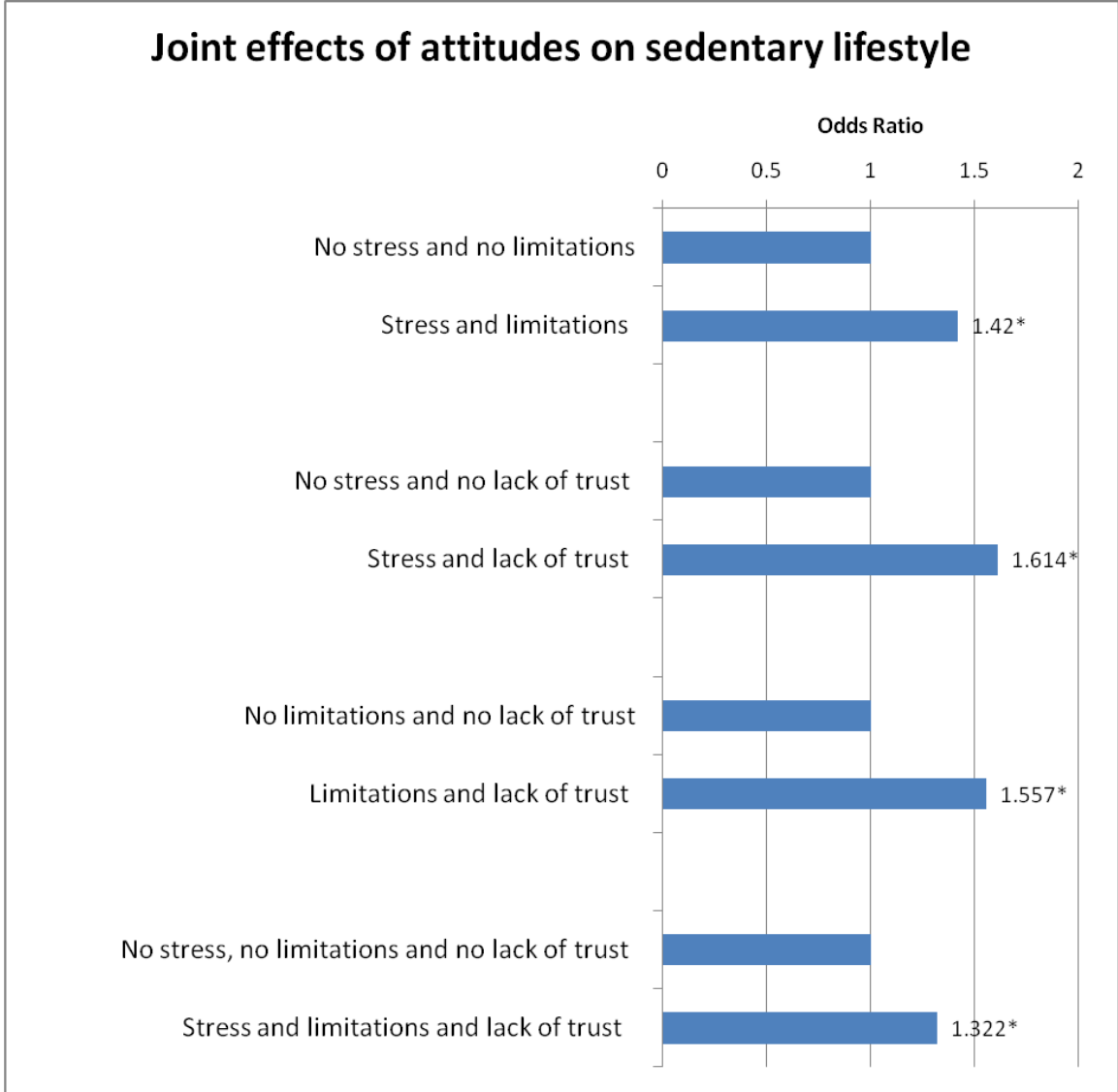


Figure 13. Combinations mental health/stress, lack of trust and perceived limitations are associated with increased likelihood of sedentary lifestyle. (See [Table 19.](#))
 *p < .05

[back to text](#)

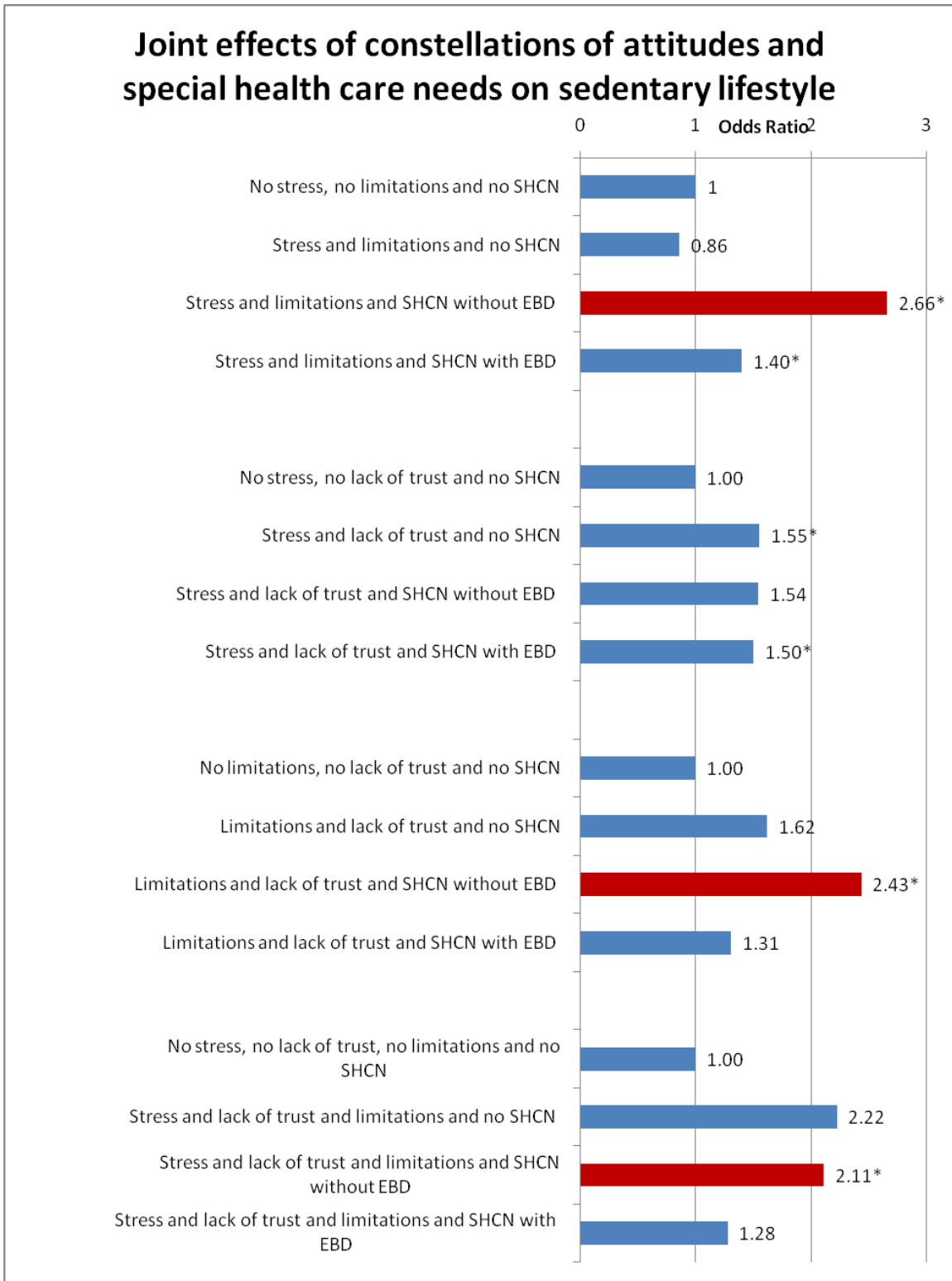


Figure 14. Several constellations of attitudes and special health care needs are associated with increased likelihood of sedentary lifestyle. The three constellations with greatest odds ratios (red bars) are among children with SHCN without EBD. (See [Table 20.](#))
 *p < .05 [back to text](#)

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