New Developments in Childhood Health: Trends and Consequences in Young Adulthood†

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Robert Bozick
RAND Corporation

Narayan Sastry
University of Michigan

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ABSTRACT

We document how rates of childhood health conditions have changed over the past two decades and assess the implications of these health conditions for the transition to adulthood. As a means to focus our inquiry, we looked at health conditions that are directly affected by increases in technology use and declines in physical activities – key trends shaping the daily lives of American youth as they grow and develop. These health conditions include asthma, mental health problems, and obesity. All three health conditions have been increasing in their prevalence during childhood over the past two decades. We find that mental health conditions in childhood appear to be most consequential for young adults, as evidenced by lower rates of educational attainment and sustained financial dependence on their parents among those exhibiting mental health impairments in childhood.

1. Introduction

Childhood health is influenced by a number of environmental, medical, and social factors – some of which have improved over the past two decades while others have deteriorated. In the United States, environmental and medical factors have led to drastic progress in promoting childhood health since the country's inception: sanitation has improved, access to health insurance has expanded, air and water are cleaner, and vaccinations against/treatment for a number of childhood diseases have been developed and disseminated. Despite these improvements, seemingly more benign, but nevertheless consequential, *social* factors may be creating new health challenges for current and future generations. These include less time spent in physical activity, more time spent indoors, and more time spent behind computer screens. In this paper, we focus on childhood health conditions that have been uniquely exacerbated by these changing social factors. Specifically, we track trends in these childhood health conditions over time, and ask: What might the future hold for children who experience health impairments?

2. Background

Child health remains an enduring focus of researchers and policy makers because child health represents an important and broad marker of societal well-being and because improving child health represents an important societal investment in

human and health capital with substantial future returns throughout the life course, over time, and across generations. This explains why infant mortality and average life span are key indicators for assessing the overall health of a nation: these indicators reflect a society and its government's prioritization of broad-based indicators of health and well-being through investments in infrastructure, health care, education, and meeting the needs of disadvantaged populations. In many developing countries, public health officials struggle with severe threats to child health, including diarrheal disease, pneumonia, and premature birth, which lead to high rates of infant mortality. Such threats were present in the United States at the start of the 20th century, but rapid improvements in medicine, medical technology, health care delivery, sanitation, and education have practically eliminated them. Accordingly, across the 20th century the United States witnessed considerable declines in infant mortality and increasingly longer average life spans.

Can we expect past progress in child health to continue over the course of the 21st century? While it is unlikely that we will see dramatic reversals in the long-running improvement in infant mortality or in average life span (or at least components of life span calculations owing directly to infant and child mortality),[1] the rapid pace of technological innovation and the way it has altered the social organization of American

[1] There have been recent downward shifts in average life span resulting from the opioid epidemic and other factors, and not due to childhood health conditions.

life may yield new concerns about specific child health conditions. In particular, although poor sanitation and a lack of access to health care are no longer widespread threats to child well-being, there are more seemingly benign byproducts of modernization that appear to be making a distinct contribution to the rise of specific health conditions. For example, more than ever before, the daily life of American children is defined by access to and maneuvering across multiple screens: from the screens of televisions to the screens of computers to the screens of smartphones to the screens of tablets and e-readers. Spanning these multiple screens are messaging/email systems, applications such as social media and social gaming, and other programs that connect us to friends and family. Further, these platforms are gradually replacing books and print media. Many youth (and adults alike) toggle back and forth across multiple screens with ease throughout the course of their day. While computers and televisions have been a mainstay in American homes the last 20 years, the real game changers were the introduction of the iPhone in 2007 and the iPad in 2010. Now over a decade later, 95 percent of teenagers have access to a smartphone and 45 percent report that they are online almost constantly (Anderson and Jiang, 2018). These trends are not just evident in teenagers, but in young children as well: Over 80 percent of children under the age of eight have ever used a digital device (Common Sense Media, 2017). The health consequences of this new digital reality are just now beginning to be understood, as there are concerns that constant online connectivity may be contributing to social

isolation, anti-social behaviors, and risk-taking behaviors, and that the constant exposure to screens may impact our vision as well as how our brains perceive and process information.

Coinciding, if not fueled by, the ubiquity of online connectivity is an increase in sedentary behaviors. Across the past four decades, the volume and intensity of daily physical activity among youth has gradually declined (Institute of Medicine, 2013). The recommended standard is for children to participate in at least 60 minutes of moderate intensity or vigorous physical activity daily, but less than half of American youth meet this standard (Institute of Medicine, 2013). Between 2011 and 2016, there was a decline in sports participation: In 2016, only about a third of children played a team sport and only half of children played an individual sport (Aspen Institute, 2017). Moreover, children are spending an increasing amount of time indoors and less time at parks, in nature, or in the outdoors more generally (Kellert et al., 2017). Accordingly, the capacity of today's youth to accumulate "health capital" may be declining.

As the United States approaches nearly two full decades into the new century, these social changes in the contours of daily American life – i.e., nearly universal online connectivity and declining physical activity – raise questions about the health of current and future generations. While the last two decades have seen positive trends in many aspects of population health and health-related behaviors, including a steady and continuing reduction in tobacco use, rapid technological improvements in health care

delivery, and historically high rates of health insurance coverage, a number of core health challenges are persisting – with many afflicting the youngest members of the population. For example, there is a growing concern that the emergence of a handful of chronic health conditions linked with online connectivity and sedentary lifestyles (namely depression, attention-deficit/hyperactivity disorder, and obesity) may attenuate gains in socioeconomic wellbeing over the long term. These conditions may even create new, unforeseen health care challenges similar to, for example, the rapid intensification of the current opioid epidemic.

Thirty years from now, today's children will be in their peak years for earnings, and will form the most economically productive segment of the adult population. They will be doing so as the first generation to navigate their entire lives online and with potentially less "health capital" than previous generations. Additionally, in thirty years, today's children will be the parents of the next generation of Americans and will be providing for their own children's health, development, and education. With cumulative health and developmental trajectories shaped by the rapid technological advancements that define the new century, will today's youth have the capacity to successfully navigate the transition to adulthood at mid-century and beyond?

The answer to this question depends fundamentally on the prevalence of specific health conditions among today's youth, and the long-term consequences of those conditions for socioeconomic well-being in adulthood. In this paper, we address this

question by examining the implications of chronic health conditions experienced by children in the United States for their subsequent life course trajectories. Recognizing that childhood health problems are more prevalent among disadvantaged populations, including racial/ethnic minorities and children growing up in poverty, our analysis is based on population-level data and so focuses on population health in the aggregate. Certain patterns of health conditions and their consequences may be more detrimental in shaping the life course of disadvantaged populations, which is a dynamic not explicitly captured in our analysis.

We focus our analysis on three types of health conditions that have garnered attention in the public health community due in part to their increasing prevalence and their potential long-term implications for health (Delaney and Smith, 2012; Perrin, Bloom, and Gortmaker, 2007): asthma, mental health problems, and obesity. In this study, we examine the relationship between these three childhood health conditions and several socioeconomic attainment outcomes measured in young adulthood across four domains: education (high school graduation and college enrollment), work (labor force participation and employment), independence from parents (residential and financial), and family formation (marriage and childbearing). In what follows, we provide background on each of our three focal health conditions and briefly review the research on their relationships with socioeconomic outcomes.

2.1 Asthma

One unfortunate consequence of television viewing, and a by-product of innovation in online connectivity, is that children spend more time indoors. As children spend more time indoors, they are increasingly exposed to in-home allergens and in some cases, cigarette smoke, which greatly contribute to the onset of asthma (Bukowski et al., 2002; Jie et al., 2011; Perrin, Bloom, and Gortmaker, 2007). Affecting over 26 million Americans, asthma is a chronic condition that triggers inflammation in the airways of the lungs, leading to constrained breathing, wheezing, coughing, and tightness/pain in the chest. These "asthma attacks" can range from mild discomfort to severe distress requiring a hospital visit. Asthma is the cause of 1.9 million emergency room visits annually (Centers for Disease Control and Prevention, 2012). Asthma only affects a small share of the youth population, but the evidence suggests this share is growing. In Figure 1, we plot trends in the proportion of the population under the age of 18 having ever been diagnosed with asthma. Though not dramatic, there has been a steady increase over the past 20 years in children receiving asthma diagnoses: 13.0 percent of children had ever received an asthma diagnosis in 2017, up from 11.4 percent of children in 1997.[2]

[2] Though racial/ethnic differences are not the focus of our analysis, we include trends in prevalence rates for asthma, ADHD, and obesity by race/ethnicity in Appendix A. Note that we only show trends separately for Blacks, Hispanics, and Whites. We do not include trends for Asians as the sample sizes are too small to support reliable estimates. These trend lines show that black children have the highest rates of asthma while white and Hispanic children have very similar, and lower, asthma rates (Figure A.1). Black and white children have similar rates of childhood ADHD, while Hispanic children have lower

[Figure 1 about here]

While most children diagnosed with asthma will live healthy, productive lives, the cumulative effects of asthma attacks can exert their toll – especially during childhood because asthma often directly interferes with sleep, school attendance, and participation in school-related activities. Research to date shows that the severity of asthma is associated with an increased likelihood of absenteeism in school (Moonie et al., 2006). In 2007, asthma was estimated to be responsible for 10.5 million missed days of school (Akinbami, Moorman, and Liu, 2011). Asthma attacks in the evening can be particularly detrimental to children as they can lead to difficulty sleeping, which in turn may limit children's potential in the classroom the next day and, over time, may affect longer-term cognitive outcomes.

With asthma both directly and indirectly interfering with school via absenteeism, limited participation in school activities, and interruptions in sleep, over time the disease might steadily deplete the academic, social, and physiological resources to make a successful transition to adulthood. The research to date on this proposition is mixed. For example, Champaloux and Young's (2015) analysis of the 1997 National Longitudinal Survey of Youth finds that adolescents with asthma are less likely to finish high school than their peers without asthma. Despite this educational set-back, Maslow

rates (Figure A.2). Finally, blacks and Hispanic children have similarly high rates of obesity while white children have lower obesity rates (Figure A.3). For all race/ethnic groups, there was an increase in the rates for each of these health conditions over the study period.

and colleagues (2011) find that young adults who experienced asthma in adolescence are somewhat *more* likely to be residentially independent from their parents than their peers who did not experience asthma in adolescence. Studies that use other indicators of a successful transition to adulthood, such as employment, earnings, and economic self-sufficiency, find no young adulthood penalty associated with childhood asthma (Goodman, Joyce, and Smith, 2011; Maslow et al., 2011).

2.2 Mental Health Conditions

Unlike asthma, which has clear, outwardly detectable symptoms that are easily observed by parents, teachers, and health care professionals, the symptoms of mental health conditions are often misunderstood and sometimes hidden. Hence, many mental health conditions often go undiagnosed and untreated. Prevention efforts are equally fraught with challenges, as there are a myriad of causes and triggers – including genetic, behavioral, and family and social environment – that factor into the onset of mental health conditions. Further, many mental health conditions are highly co-morbid, such that individuals often experience more than one at the same time (e.g., anxiety co-occurring with depression). Therefore, preventing and addressing the consequences of mental health conditions is particularly challenging. To efficiently depict a coherent portrait of mental health in childhood, we focus on two broad categories of conditions: *internalizing* conditions and *externalizing* conditions. The former includes conditions

such as depression and anxiety in which the individual internalizes their problems and directs negative energy and attention toward themselves. The latter includes conditions in which the individual experiences emotion dysregulation and impulsivity that produces aggressive, rambunctious, and antisocial behaviors.

The most common internalizing mental health condition is depression, which is a condition characterized by feelings of prolonged and intense sadness, hopelessness, and loneliness. Common symptoms of depression include shifts in eating and sleeping patterns, difficulty paying attention, disinterest in play and other social activities, and diminished energy. In young children, behaviors that are often thought to be "temper tantrums" such as excessive crying or feet stomping, may in fact be symptoms of depression. In adolescents, depression often manifests itself in the form of irritability and moodiness, more so than just general feelings of sadness. In the most severe cases, depression can lead to substance abuse, self-injury, or suicide.

Anxiety is a close cousin of depression, with a rate of co-occurrence around 60 percent (Cameron, 2007). Anxiety is characterized by persistent, excessive feelings of fear and worry. Common symptoms of anxiety in children include frequent complaints of stomachaches or headaches (even when there is no medical reason for them), lack of appetite, difficulty falling asleep, crying, and tense muscles. Depression and anxiety are linked with other health issues, such as increased risk of chronic pain, stroke, or cardiovascular disease in adulthood (Goodwin, 2006; Kang et al., 2017). Thus, future

generations could bear the scars of internalizing mental health conditions should they go untreated, which unfortunately is common. For example, nearly two-thirds of adults with depression do not receive any treatment for it (Olfson, Blanco, and Marcus, 2016).

Internalizing mental health conditions such as depression and anxiety can be difficult to diagnosis. There are no specific medical or psychological tests that can unequivocally determine whether a child has depression or anxiety, and hence, there are no readily available national data sources that permit us to document trends in diagnoses. Most diagnoses are made by health care professionals after one-on-one discussions with the child and their family members regarding the aforementioned symptoms and behaviors. Given a lack of unified, widely-accepted diagnostic criteria, social scientists studying internalizing mental health conditions have limited sources and measures to gauge their prevalence and implications.

In addition to internalizing conditions, we also focus on attention-deficit/hyperactivity disorder (ADHD), which is the most prevalent externalizing mental health condition among children. ADHD is a neurodevelopmental disorder in which the individual has difficulty paying attention and exhibits excessive amounts of energy. The most common signs of ADHD are impulsivity, inattention, and hyperactivity. This is evidenced in young children via daydreaming, forgetting or losing things, fidgeting, and talking too much. ADHD typically emerges in childhood,

and continues into adulthood in approximately two-thirds of individuals who had the condition as children (Asherson, 2016).

Diagnoses of ADHD have been on the rise over the past few decades. In Figure 1, we plot trends of childhood diagnoses of ADHD from 1997 through 2017.[3] Across the two decades, there is a steady upward trend in diagnoses of ADHD. In 1997, 5.2 percent of children had been diagnosed with ADHD. This grew to 8.9 percent in 2017.[4] Youth with ADHD are more likely to use computers and smart phones, and more likely to snack, than their peers without ADHD (Tong, Xiong, and Tan, 2016); although the causal direction of the relationship is not clear, these relationships suggest that the broader social changes affecting childhood health are creating distinctive co-morbidities that include mental health impairments.

A robust body of evidence shows that children who experience any type of mental health conditions are at increased risk for a host of negative developmental sequelae, which can have both immediate and enduring consequences for children's education and health over the life course. In the short-term, depression and anxiety can limit children's motivation to pay attention in the classroom, to study, to engage with

[3] ADHD may be under-diagnosed in the youth population. Therefore, this upward trend may reflect increases in incidence rates or it may reflect increases in rates of diagnosis among individuals with the condition. The data do not allow us to identify which dynamic is operating here.

[4] Although we do not focus specifically on gender differences in the present study, it is worth noting that ADHD is often considered a male disorder because there are substantially more diagnoses made for young boys than for young girls (Skogli et al., 2013). There is evidence suggesting that young girls are just as likely to have ADHD as young boys, but, because the intensity of their symptoms is somewhat muted relative to young boys, young girls with ADHD often go undiagnosed and untreated (Skogli et al., 2013).

their classmates and teachers, and to participate in school-related activities. Youth with ADHD may be unable to concentrate on classroom activities or their assignments and unable to control their impulses while in the classroom. Not surprisingly, research to date shows that children's mental health conditions are linked with poor performance in school (Fröjd et al., 2008; Riglin et al., 2014), which over the long-term may impede their ability to develop the knowledge, skills, and abilities to function in adulthood.

Given these known linkages, it is possible that mental health conditions in childhood could have negative implications for youth as they make the transition to adulthood. To date, the research suggests this is indeed the case. Across an array of samples and study designs, mental health problems in childhood have been linked with diminished socioeconomic attainment later in life: Adults with mental health problems in childhood are less likely to finish high school, less likely to work, less likely to have higher earnings, and more likely to be on social assistance than their peers without mental health problems in childhood (Currie et al., 2010; Goodman, Joyce, and Smith, 2011; Lundborg, Milsson, and Rooth, 2014; Mikkonen et al., 2018).

2.3 Obesity

In contrast to the 1980s and 1990s, when tobacco use garnered the bulk of attention of public health practitioners and policy makers, the main focus of most public health efforts in the new century has been the obesity epidemic. Obesity is a chronic

neurobehavioral disease in which increases in body fat encourage adipose tissue dysfunction and abnormal fat mass, producing undesirable metabolic and psychosocial health consequences. Obesity is of particular concern because it directly influences the onset of high blood pressure, diabetes, heart disease, and stroke – and subsequent mortality associated with these conditions as well as approximately $147 billion in annual medical care costs (National Heart, Lung, and Blood Institute, 2013).

BMI for children is based on weight in kilograms divided by height in meters squared, but must be adjusted for age and sex using pre-established reference standards in order to account for gender-specific childhood growth trajectories. Child obesity is defined as being above the 95th percentile of the distribution while children are classified as overweight if their BMI is between the 85th and 95th percentiles. With less time spent outdoors and engaged in physical activity, it is not surprising that we see an increase in the prevalence of obesity (as shown in Figure 1). In 2016, 18.5 percent of children were exceeding the BMI percentile threshold for obesity, up from 13.9 percent in 1999.

What are the socioeconomic implications of being obese in childhood? Evidence to date suggests that obesity interferes with academic and social dimensions of childhood. For example, clinical research finds that obese youth have a decreased attention span, less mental flexibility, and a smaller hippocampus which may impede recall of new information (Yau et al., 2012) and in turn diminish academic performance

(Taras and Potts-Datema, 2005). Further, overweight youth are at a greater risk of social ostracization and bullying from their peers (Harrist et al., 2016), and so consequently less engaged in school. These academic, social, and health penalties associated with obesity in childhood appear to yield long term consequences: Research to date finds that on average, obese youth are less likely to graduate from high school (de Ridder et al. 2013; Okunade, Hussey, and Karakus, 2009) and less likely to enroll in college (Crosnoe, 2007).

2.4 Aims and Contribution of the Present Study

The central aim of the present study is to identify the relationship between each of our three focal childhood health conditions (asthma, mental health problems, and obesity) and key markers of socioeconomic attainment during the transition to adulthood. One of the more notable changes affecting the contours of the transition to adulthood over the past few decades has been the expansion of opportunities in and demand for higher education (Bozick, 2008). The historically high rates of enrollment in postsecondary institutions for both young women and men is associated with an increase in the age at first marriage and parenthood in recent decades (Fussell and Furstenberg, 2005; Matthews and Hamilton, 2009). Exacerbating these life course delays in family formation, the volatile economy of the 2000s and the "Great Recession" have increased the odds that young adults will reside with their parents (Qian, 2012). As a

result, young adulthood in the 21st century is best characterized as a period of "semi-autonomy" from one's natal family, with economic and residential independence emerging as more meaningful markers of adulthood (Fussell and Furstenberg, 2005). With a more prolonged and precarious transitional phase between adolescence and "full" adulthood, we expect young adults who experienced poor health in childhood to have an elevated risk of "floundering" in their 20s—i.e., acquiring less education, being less able to secure stable employment, and having lower rates of independence from their parents compared to their more healthy peers. Identifying which health conditions are most consequential for socioeconomic attainment in young adulthood can inform programmatic and policy efforts to position youth to reach their full potential as they leave their parents' homes and embark on their adult lives.

Recognizing that a number of studies on this topic already exist, our analysis of the relationship between childhood health conditions and socioeconomic attainment in young adulthood is distinctive in three ways. First, many of the population-based studies on this topic rely on samples *outside* of the U.S. [for example Currie et al.'s (2010) analysis of Canadian youth; Goodman, Joyce, and Smith's (2011) analysis of British youth; Lundborg, Nilsson, and Rooth's (2014) analysis of Swedish youth; and Mikkonen et al's (2018) analysis of Finnish youth]. Given the unique domestic context, particularly with respect to mental health and obesity, it is imperative to understand how the dynamics observed internationally operate in the U.S. There are notable national-level

analyses of youth in the U.S. that are exceptions, such as the 1997 National Longitudinal Survey of Youth used in Champaloux and Young's (2015) analysis and the National Longitudinal Survey of Adolescent Health used in Maslow et al.'s (2011) analysis.[5] However, these two prominent longitudinal studies begin with cohorts recruited and first interviewed in late adolescence, and so are subject to recall error and misreporting regarding key metrics of health and development during early childhood. Further, these two studies rely on self-reported height and weight to calculate BMI. In our study, we analyze data from a cohort of American youth *prospectively* followed from childhood into adolescence and young adulthood, with anthropometric techniques used to measure height and weight – thus, facilitating an analysis of health conditions measured directly while sample members were children.

Second, recognizing the multifaceted nature of young adulthood, we examine an array of socioeconomic outcomes covering four domains of attainment: education, work, independence from parents, and family formation. Given that youth now have a broader set of viable pathways to follow as they move from adolescence to adulthood, any limitations directly owing to health can be potentially compensated for by pursuing alternative pathways (e.g., not completing college but instead securing a stable, well-

[5] There are a number of large scale studies of the relationships between subjective reports of overall health and outcomes in young adulthood in the U.S. (e.g. Haas, 2006; Jackson, 2009; Le, Roux, and Morgenstern, 2013). However, these studies do not look at specific health conditions and so are unable to determine what dimensions of health are most/least detrimental to outcomes in young adulthood.

paying job; or not getting married, but instead establishing residential and financial independence from parents). It is likely the case that childhood health impairments are more salient for certain young adult outcomes and not others. In identifying the life course domains most affected by childhood health, our findings could suggest potential areas of focus for practitioners who directly work with youth that struggle with asthma, mental health problems, or obesity (e.g., practitioners might focus on promoting employability and career development skills should we detect negative effects of poor childhood health for work outcomes).

Third, we employ quasi-experimental statistical methods, which allow us to better approximate causal relationships than the methods used in prior research. A persistent analytic challenge in population health researcher is that health conditions are non-randomly contracted and ethically cannot be randomized in an experimental setting. Instead, to gain leverage on potential causal relationships, most researchers use either standard regression approaches (such as used in Goodman, Joyce, and Smith, 2011; Lundborg, Nilsson, and Rooth, 2014; Maslow et al., 2011; Mikkonen et al., 2018) or sibling-fixed effects approaches (such as used in Champaloux and Young, 2015; Currie et al., 2010).

Standard regression modeling provides an approach to adjusting for factors that may confound the relationship between childhood health and young adult outcomes, such as family socioeconomic status, and thereby potentially provides a clearer

estimates of the effects of childhood health. However, family socioeconomic status may itself be affected by prior child health outcomes (e.g., if parents alter their work behavior because of a child's illness) and hence cannot be controlled if we want to estimate the complete effect of prior child health. In addition, unobserved factors that influence young adult outcomes may be correlated with child health status and family socioeconomic factors, thereby introducing a spurious correlation into this relationship and potentially yielding biased estimates from standard regression models.

The sibling-fixed effects approach provides a direct way to control for unobserved factors at the family level that are correlated with the key covariates of interest (childhood health and family socioeconomic status). These models, which assume that the unobserved factors are time-invariant, require longitudinal data with sibling pairs and rely on differences in health conditions and outcomes within sibling pairs to produce estimated effects of childhood health conditions on young adult outcomes. These models can directly incorporate controls for child specific characteristics and, through the family fixed effects, also control for all observed and unobserved family factors that are shared between sibling pairs. At the same time, these models cannot control for unobserved differences across children, are unable to account for time-vary unobserved heterogeneity, and are very demanding of the data in terms of requiring discordant childhood health conditions among sibling pairs—which can be rare and thus can frequently result in estimates that are statistically imprecise.

In our study, we are address these limitations of prior studies by using marginal structural models with inverse probability of treatment weights (IPTW). Based on propensity score methods developed to permit causal inference from observational data (Rosenbaum and Rubin, 1983), IPTWs are used to mimic random assignment of our treatment – which in our study is either asthma, a mental health condition, or obesity – based on observed sociodemographic and academic characteristics of youth and health and socioeconomic characteristics of their family. Applying IPTWs essentially adjusts for observed confounding factors by generating a weighted "pseudo-population" comparison group that is observationally similar to the treatment group of children with the health condition in question. We develop IPTWs to reweight our sample so that the treatment and control groups (i.e., those with the health condition and those without the health condition) are similar to each other. The result is the estimated treatment effects are less susceptible to bias than those produced by standard regression models, treatment effects that are more robust than those produced sibling fixed-effect approaches, and that are more statistically efficient than either of these other approaches.

3. Methods

To ascertain the relationship between childhood health and the transition to adulthood, we analyze data from the U.S. Panel Study of Income Dynamics (PSID)

which is a longitudinal study of a representative sample that started in 1968 with approximately 5,000 U.S. families. In the PSID, a primary respondent in each family reports on behalf of the family. For our analysis, we draw on two supplementary cohort studies contained within the PSID: the Child Development Supplement and the Transition into Adulthood Supplement. The Child Development Supplement began in 1997 with a sample of up to two children per family who were between the ages of 0 and 12 years. In the initial wave of this supplement, a total of 3,563 children and their primary caregivers were interviewed with a response rate of 88%. The second wave was conducted in 2002 (with a 91% response rate) and the third wave in 2007 (with a 90% response rate). In each wave, primary caregivers provided information about their child's health status and conditions, as well as information about many other aspects of children's development, well-being, and home environment. The Transition into Adulthood Supplement was first fielded in 2005 with young adults who participated in the Child Development Supplement but "aged out" by reaching age 18 years and finishing or leaving high school, and is conducted biennially. Together, the PSID Child Development Supplement and the PSID Transition into Adulthood Supplement provides a nationally-representative sample of individuals who had a parent or grandparent alive in the U.S. in 1968 or in families that immigrated to the U.S. between 1968 and 1997. Our analysis sample includes information on all children who

participated in the Child Development Supplement and completed at least one Transition into Adulthood Supplement interview by 2017.

3.1 Predictor Variables

Our key predictor variables of interest measure the presence of asthma, mental health problems, and obesity during childhood. Asthma is a measured by a single dichotomous variable coded '1' if the parent of the child ever reported that a doctor or health professional ever told them that their child has asthma and '0' if they did not.

Mental health conditions are measured by three dichotomous variables. The first two are based on the Behavior Problem Index, which asks parents to report on a list of 32 problem behaviors that are "often, sometimes, or never true" of the targeted child (e.g., my child is disobedient, my child lies and/or steals, my child clings to adults). These items are then divided into two subscales: 1) a measure of externalizing or aggressive behavior, and 2) a measure of internalizing, withdrawn, or sad behavior. These subscales are continuous and so to make them interpretable and comparable with our application of IPTWs to the other binary outcomes, we dichotomized these two scales at the 75th percentile of the overall distribution such that those coded '1' have a high number of reported behavior problems and those coded '0' have an average or low

number of reported behavior problems.[6] The third measure of mental health is a dichotomous variable coded '1' if the parent of the child reported that a doctor or health professional ever told them that their child has ADHD and '0' if they did not.

Lastly, as part of the Child Development Supplement, interviewers weighed the children and measured their height at each wave. Using the most recently available anthropometric measurements, we calculated each sample members' Body Mass Index and classified whether the child was overweight (coded '1') or not (coded '0') by whether they exceeded the 95th percentile of the corresponding age and sex norms available in the National Center of Health Statistics' child growth charts (Kuczmarski et al. 2002).

3.2 Outcome Variables

Our key outcome variables of interest measure socioeconomic attainment during the transition to adulthood across four key domains: education (high school graduation and college enrollment), work (labor force participation and employment), independence from parents (residential and financial independence), and family

[6] The Behavior Problem Index is a validated, often used tool to gauge the extent of problem behaviors of youth in a survey setting. It is not a diagnostic tool, and so lacks explicit thresholds/ranges for determining the clinical nature of externalizing or internalizing behaviors. In preliminary analyses, we tested different thresholds to inform the construction of this measure. We settled on the 75th percentile as it provides a more conservative measure, with those at or just above the mean considered to have a low or average degree of problem behaviors and those near the top of the distribution considered to have a high degree of problems behaviors. The percentiles were calibrated on the full Child Development Supplement sample and so the distribution of these two measures are not exactly 25%.

formation (marriage and childbearing). All outcome measures are derived from questions asked of the sample member in the questionnaires administered as part of the Transition into Adulthood Supplement. We have dichotomized each outcome measure to indicate whether the sample member has attained the marker of interest (coded '1') or not (coded '0') by age 24 years. Education includes two measures: whether the sample member had attained a high school diploma and whether the sample member had ever enrolled in college. Work includes two measures that mirror official definitions used by the U.S. Bureau of Labor Statistics: labor force participation and employment. The former indicates that sample members were either actively looking for work or were employed in the previous year, and the latter indicates that sample members were both in the labor market and employed in the previous year. Independence from parents is based on questions which ascertain whether the sample member is residentially independent from their parents (i.e., living on their own) and financially independent. Lastly, family formation includes whether the sample member has married and whether the sample member has had a child. In Table 1, we show the distribution of our key outcome variables for our treatment and our comparison groups.

[Table 1 about here]

3.3 Covariates

To attenuate the effects of potentially confounding factors in our estimation of the relationship between childhood health and socioeconomic attainment in young adulthood, we draw on an array of characteristics of the sample member and their families measured during interviews for the Core PSID or the Child Development Supplement. These include the child's gender, child's race/ethnicity, mother's marital status at birth, mother's age at birth, mother's education, father's education, household head's employment status, household head's marital status, household head's health status, family income, family size, child's birthweight, child's score on a standardized reading assessment, and the age at which the child's health conditions are assessed. The coding and distribution of these variables are shown in Appendix B. Our findings are derived from 80 separate regression models (five health condition measures x eight outcomes x two different estimation strategies). It is no feasible for us to present the coefficients associated with these covariates. Thus, we do not present their associated coefficients, nor do we discuss them. They are, however, available upon request from the authors.

3.4 Analytic Approach

In our analysis, we estimate a series of logistic regression models separately predicting our eight outcomes of interest. The models take the general form:

$$Y_i = \alpha_j + \beta\mathbf{HEALTH}_{ij} + \sum_{n=1}^{N} \beta_n \mathbf{X}_{in} \quad \text{(Equation 1)}$$

In this model, the outcome, Y_i, is an indicator of whether sample member *i* has achieved the socioeconomic attainment outcome of interest by age 24 years during the transition to adulthood. On the right-hand side of the equation, the key parameter of interest is represented by the β coefficient on the variable **HEALTH** which includes each health condition entered into the model separately. β_n are the main effects of the control variables $\mathbf{X}_{in}$ (n = 1, …, N).

Our model as specified above is a standard covariate adjustment model. Additionally, we apply inverse probability of treatment weights (IPTW) which follows a two-step process. In the first step, we create weights of the following form:

$$w_j = \Pi_{j=1}^{T} \frac{P(Z_j = z|\bar{Z}_{j-1})}{P(Z_j = z|\bar{Z}_{j-1}, \bar{X}_{j-1})}$$

where *w* is the weight; *j* indicates the period (corresponding to the three waves of the Child Development Supplement) in which health conditions are observed up to three times; *Z* is a binary variable indicating the health condition measured at the wave that most closely precedes age 18; and taking on values *z*, $\bar{Z}_{j-1}$ is the history of health conditions up through the time *j* – 1. Lastly, $\bar{X}_{j-1}$ is the set of observed covariates. The resulting weight *w* creates a comparison group (i.e. those without the health condition) whose sociodemographic profile based on observed covariates and earlier measured health is approximately the same as those in the treatment group (i.e. those with the

health condition). We apply the product of the resulting inverse probability of treatment weight, *w*, and sampling weights from the Transition into Adulthood Supplement within a standard regression modeling framework to obtain our IPTW-based estimates.

4. Results

We show findings from our covariate adjustment and our IPTWs for each of our eight outcomes in Table 2, which shows the estimated effects of asthma; in Table 3, which shows the estimated effects of mental health conditions; and in Table 4, which shows the estimated effects of obesity. For ease of interpretation, we converted the resulting coefficients into marginal effects; thus the coefficients in the table represent the change in the likelihood of the young adult outcome occurring in the presence of the childhood health condition being examined. We also present the estimated standard errors and an indicator of the statistical significance level of the estimated parameter. We focus largely on the IPTW results as those provide the most rigorous evaluation of *potential* causal relationships.

As an extension to our main set of findings, which are based on the main effects for the full sample, we also examined interactive effects of the childhood health conditions with the child's sex and with the child's race/ethnicity. We found no statistically significant interactions with child race/ethnicity and hence do not present

the results. The interaction results by child sex, shown as average marginal effects for males and for females, are presented in Appendix B, Table B.1.

With asthma both directly and indirectly interfering with school via absenteeism, limited participation in school activities, and interruptions in sleep, over time does the disease steadily deplete the academic, social, and physiological resources to make a successful transition to adulthood? To ascertain the severity of the cumulative toll of asthma, we examined rates of attainment of major markers of the transition to adulthood for those who were diagnosed with asthma in childhood compared to observationally similar individuals who did not have asthma. The results are summarized in Table 2, and show that having asthma in childhood appeared to have no statistically significant effects on any of the young adult outcomes we examined in the domains of education, work, independence, and family formation. Note that the estimated effects of having childhood asthma are in most cases extremely close to zero, which appears to be the main factor behind the absence of statistically significant effects. Our results in Appendix B indicate that there are statistically significant negative effects of asthma for females, but no effects for males, with a statistically significant difference in the effects for males and females. Apparently, having asthma in childhood does not have longer-term consequences for key outcomes in the transition to adulthood, with one exception. This finding may be explained by the fact that asthma often appears in early or middle childhood, and by the time they reach young

adulthood, individuals with asthma often have sought and received treatments to cope with the condition and its effects.

[Table 2 about here]

Next we turn our attention to our three types of mental health problems: externalizing problems, internalizing problems, and ADHD. Our results in Table 3 indicate that children who experienced externalizing or internalizing problem behaviors in childhood had less favorable educational outcomes in young adulthood. Specifically, externalizing/internalizing problem behaviors in childhood are associated with a statistically significant lower likelihood of graduating from high school or attending college. In addition, higher internalizing behaviors in childhood are associated with a statistically significant increase in childbearing by age 24; at the same time, the higher likelihood of childbearing is not associated with a higher likelihood of marriage. Our results in Appendix Table B.1 reveal some differences in the effects of childhood behavioral problems on young adult outcomes for males versus females; in particular, we find the negative estimated effects of internalizing and externalizing health conditions in childhood for high school completion are much stronger for females than for males. The estimated effect is close to zero for males, while having externalizing problems reduces the likelihood of high school completion by ten percentage points for females. Other statistically significant differences between males and females are for marriage and childbearing outcomes: females with externalizing behavior problems are

significantly less likely to have married by age 24 years, and males with internalizing behavior problems are significantly more likely to have had a child by age 24 years.

[Table 3 about here]

We next focus in on diagnoses of ADHD, which is one specific mental health condition that is on the rise. Overall the, effects are weak, with negative (but non-statistically significant) effects of childhood ADHD on the likelihood of attending college and being in the labor force. However, there also appear to be a statistically significant negative effects of childhood ADHD on the likelihood in young adulthood of residential independence. When we examined differences in effects between males and females, we found that the negative effects of ADHD on residential independence are present exclusively for females. The models with interactions by sex also reveal negative effects of ADHD among males for residential independence and marriage (but no such effects for females).

Lastly, we examine the relationship between childhood obesity and socioeconomic attainment in young adulthood, with our key coefficients shown in Table 4. Across all of these outcomes, we find no evidence that childhood obesity has any statistically significant effect; further, none of the interactions with sex are statistically significant. The point estimates for the effects of obesity on all of these outcomes in young adulthood are all small in magnitude and close to zero, suggesting that it is not small sample sizes that leads to this result. While obesity has well-

established health consequences, within the PSID cohort, we do not observe any immediate consequences for key developmental markers in the transition to adulthood.

[Table 4 about here]

5. Summary of Findings

In this paper, we examined how rates of childhood health conditions have changed over the past two decades and assessed the implications of these health conditions for the transition to adulthood. As a means to focus our inquiry, we looked at health conditions that are directly affected by increases in technology use and declines in physical activity – two social and cultural forces that have distinctively reshaped the daily lives of American youth in the first two decades of the new century. With a substantial portion of the day now spent on screens of all varieties (including computers, smart phones, tablets, e-readers, and televisions), increased time spent indoors, and less time spent engaged in physical activity, the immediate contexts that support or diminish health are vastly different than those experienced by previous generations of youth. We examined three sets of health conditions that are known to be directly affected by these changes in daily social life: asthma, mental health problems, and obesity. There are concerns that these three conditions may be intensifying and creating new challenges for youth as they navigate the transition to adulthood. Our analysis provided some empirical insight into whether there are new reasons to be concerned about the changing ecology of childhood health.

Our main finding is that mental health problems appears to be the most problematic health condition in terms of their long-term effects on socioeconomic attainment. Specifically, we find that youth exhibiting internalizing and externalizing behavioral problems in childhood are less likely to complete high school and less likely to enroll in college than their peers who do not exhibit such behaviors. Additionally, we find that youth diagnosed with ADHD are less likely to establish financial independence from their parents during the transition to adulthood. While identifying and examining the mechanisms linking mental health problems with long term outcomes is beyond the scope of this paper, we speculate that depression, anxiety, and ADHD in childhood limit one's ability to reap the full cognitive and social benefits of school, precluding stable trajectories of human capital acquisition that extend into adulthood.

While we draw upon evidence from high quality population-level surveys used to study health and socioeconomic attainment, we caution readers that our measures of childhood health conditions may be biased to an extent that is challenging to determine. In particular, the measures of asthma and ADHD are based on parent reports of a medical provider offering an explicit diagnosis. For an actual condition experienced by a child to be reported in a survey requires several steps: for a child to have seen a medical provider (e.g., to have health insurance and receive regular medical check-ups), for the provider to have reported this condition to the parent, and for the parent to have

accurately recalled this condition to the interviewer. The likelihood of these three steps occurring may be lower for families with limited economic resources because they have worse access to health care, face other challenges in the day-to-day life, and may have greater recall error. Hence, the true prevalence of these health conditions may be under-reported, leading to attenuated estimated effects of these conditions on socioeconomic outcomes in young adulthood.

Additionally, we caution readers to interpret our estimates of causal effects as just that: estimates. While we have applied state-of-art quasi-experimental methods to attenuate bias that could be introduced via potentially confounding observed variables, we cannot unequivocally confirm that socioeconomic penalties in young adulthood that we detect in our analysis are directly caused by mental health problems in childhood. In other words, we find strong, robust associations, but we cannot unequivocally ascertain causality. Having said that, our findings complement other major studies that detect similar relationships (Currie et al., 2010; Goodman, Joyce, and Smith, 2011; Lundborg, Milsson, and Rooth, 2014; Mikkonen et al., 2018), lending confidence to our assertion that mental health problems experienced in childhood may have lasting implications that reverberate across the life course.

6. The Future of Child Health

What does the future hold for childhood health, particularly as it relates to asthma, mental health problems, and obesity? As documented at the outset of this paper, in 2017 nearly one in three children suffered from asthma; nearly one in ten parents reported that their child had ADHD; and one in five children were classified as obese. These relatively high prevalence rates are not surprising given the aforementioned declines in physical activity and outdoor time. However, not only do asthma, mental health problems, and obesity affect a substantial portion of the youth population, these conditions have been *increasing* in their prevalence in recent years. While there have been focused public health efforts to curb obesity and to a lesser extent, mental health problems, these efforts do not appear to be stalling the growth of these conditions at the population level.

5.1 The Future of Childhood Asthma

Can we expect to see the upward trend in asthma diagnoses to continue? To answer that question requires a comprehensive accounting of the different mechanisms that contribute to the onset of asthma and the extent to which these mechanisms will become more or less prevalent over the coming years. Individuals are genetically predisposed to asthma, but like many health conditions, asthma attacks are largely activated or muted depending on conditions in the immediate environment. It is estimated that about 50 to 60 percent of asthma cases are attributed to intergenerational

genetic transmission and about 40 to 50 percent are due to environmental triggers (Duffy et al., 1990). The most common environmental triggers of asthma attacks are pollution, cigarette smoke, and allergens. Over the past couple of decades, air quality in the United States has been improving (U.S. Environmental Protection Agency, 2018) and cigarette use has been on the decline (Centers for Disease Control and Prevention, 2016), and so we might expect an overall decline in asthma. However, there has been a potentially off-setting rise in sedentary behaviors wherein children are spending more time indoors and thus increasingly exposed to in-home allergens and in some cases, cigarette smoke (Bukowski et al., 2002; Jie et al., 2011; Perrin, Bloom, and Gortmaker, 2007; Kellert et al., 2017).

5.2 The Future of Mental Health Conditions in Childhood

We are particularly concerned with the future of mental health in childhood, in large part because it appears to have the most negative consequences for the transition to adulthood. Predicting the future of childhood depression and anxiety is complicated because there are a multitude of determinants. While assessing all possible determinants of depression is beyond the scope of this project, there are three that are particularly worth highlighting: family poverty, social media use, and exercise. Children in families experiencing economic insecurity tend to grow up in unstable, unpredictable living situations that can increase the chances of depression. Social media

use can exacerbate feelings of anxiety and low self-esteem as frequent users often compare their lives with those of their peers. Additionally, social media replaces real life relationship-building, and so can further isolate children from feeling genuinely connected to their peers with cyber bullying being an extreme example of the negative effects of social media use. Lastly, although the physiological explanations are not fully established, there is evidence that a lack of regular exercise and sedentary behaviors more generally are risk factors that increase the risk of depression (Morgan et al., 2018). Trends in these three determinants portend that we may see a sustained increase in the prevalence of internalizing mental health conditions: Child poverty has been slowly increasing over the past two decades (Child Trends, 2018); social media use among teens has been growing and is nearly universal (Anderson and Jiang, 2018); and physical activity among children has been on the decline (Institute of Medicine, 2013).

5.3 The Future of Childhood Obesity

Can we expect the upward rise in childhood obesity to continue? Two of the biggest drivers of obesity are sedentary behaviors and food intake, and so whether these behaviors are changing can provide clues as to what we can expect moving forward. As described at the outset of this paper, there has been an increase in sedentary behaviors among children in the United States, including less time involved in vigorous physical activity, less participation in organized sports, and less time spent

outdoors. In terms of food intake, there is evidence that in the early part of the century there has been an increase in snacking (Piernas and Popkin, 2010) and a decline in fruit and vegetable consumption (Larson et al., 2007) among youth. Therefore, while there has been a growing investment in preventative measures of childhood obesity, including most notably Michelle Obama's "Let's Move!" campaign, these trends in sedentary behaviors and food intake suggest that it is unlikely we will see a nonnegligible decline in obesity in the short-term. Amplifying these patterns, the highest rates of childhood obesity are among Hispanic youth (see Appendix A), which is the fastest growing segment of the youth population.

5.5 Concluding Remarks

In closing, the background and analyses we presented in this paper speak to a series of concerns about childhood health that should be taken into consideration by policy makers, health care practitioners, and researchers concerned with optimizing the potential of children to grow and thrive in a quickly changing world. Our analysis highlights that mental health problems may constitute the most serious challenge as we move into the coming decades: mental health problems affect a sizeable proportion of the child population and this proportion is growing. Moreover, mental health problems may curtail progress toward key markers of healthy development during the transition to adulthood, namely educational attainment and financial independence from parents.

Such concerns are particularly important as children growing up with mental health impairments will be providing for their own children's health, development, and education at mid-century. This could potentially amplify the intergenerational transmission of health disadvantage, creating greater dependencies on health care services for treatment and greater dependencies on family members for financial support. In closing, while all domains of health require critical care for children experiencing specific problems, at the population-level, our study suggests that large-scale efforts toward improving the health of the youth population will yield the largest benefits if a substantial part of that effort is geared toward attenuating depression, anxiety, and ADHD.

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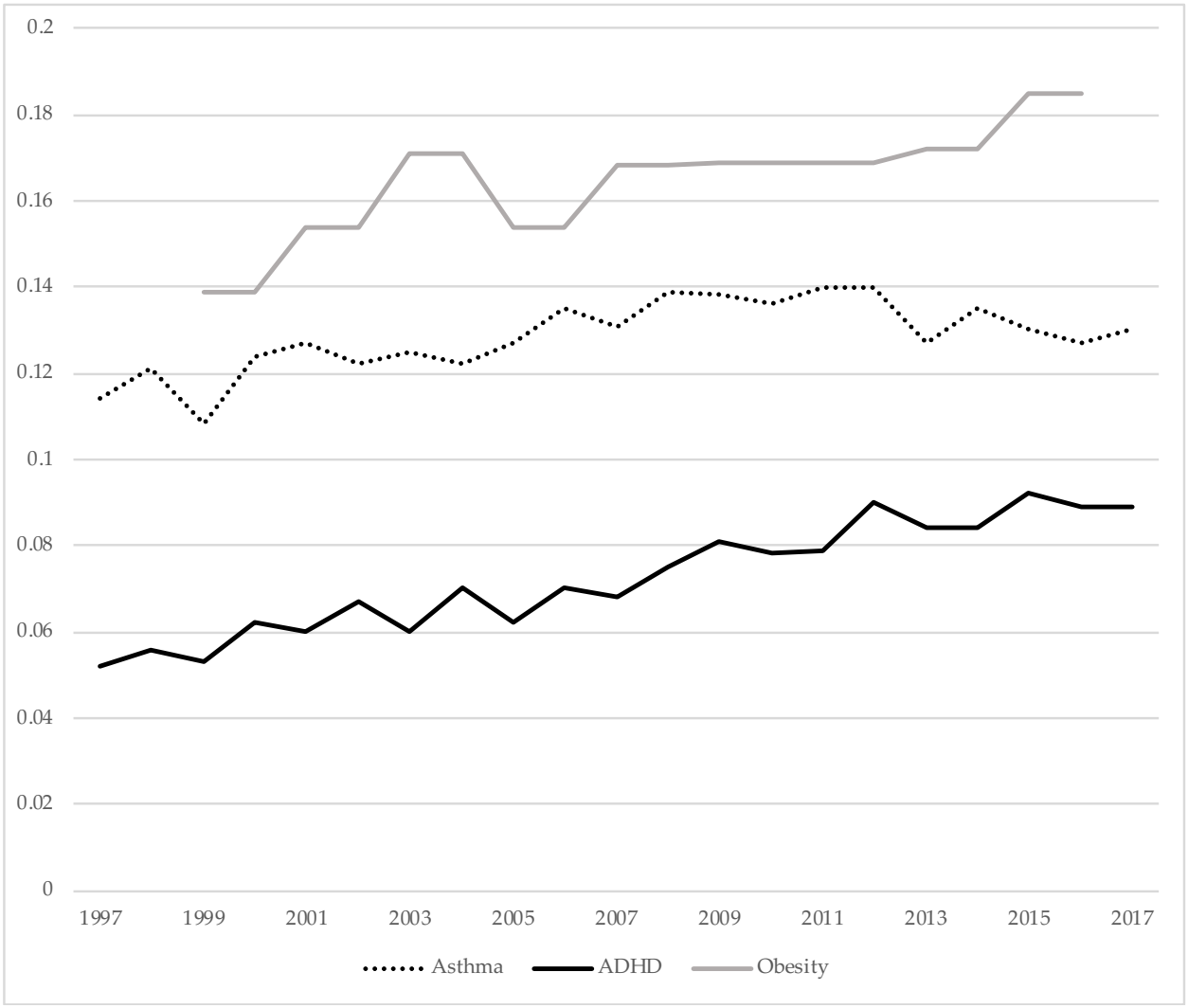
Figure 1. Rates of Childhood Health Conditions: Asthma (1997–2017), Attention Deficit and Hyperactivity Disorder (1997–2017), and Overweight (1999–2016)



Note. Rates of asthma and ADHD were calculated using the National Health Interview Survey. Rates of obesity were calculated using the National Health and Nutrition Examination Survey.

Table 1. Distribution of Socioeconomic Attainment Outcomes in Young Adulthood by Childhood Health Conditions

	% Completed high school	% Enrolled in collge	% In the labor force	% Employed	% Residentially independent from parents	% Financially independent from parents	% Married	% Has children
Asthma								
Yes	80.7	73.9	82.7	87.6	54.6	42.7	23.1	43.5
No	86.1	76.7	79.4	90.1	51.6	35.8	22.4	39.1
Externalizing Problems								
Yes	76.4	69.4	82.4	86.0	57.9	40.3	22.5	43.3
No	86.5	80.5	82.8	88.2	53.0	38.9	22.5	42.1
Internalizing problems								
Yes	71.7	64.2	81.3	87.5	56.4	36.1	21.2	50.1
No	88.9	82.9	83.2	87.6	53.4	40.5	25.1	39.3
ADHD								
Yes	71.4	59.3	81.6	91.1	51.1	36.9	18.4	43.3
No	87.1	78.3	79.7	90.3	52.9	36.6	23.4	39.4
Obesity								
Yes	82.6	77.3	83.5	87.1	43.9	39.0	23.9	44.1
No	86.4	78.3	79.7	89.4	55.7	39.8	24.3	36.4

Note: Observations vary by cell from a minium of 770 to a maximum of 2,831, depending on health condition and young adulth outcome.

Table 2. Average marginal effects from logistic regression models predicting socieonomic attainment in young adulthood as a function of asthma in childhood

	Covariate Adjustment Models		IPTW Models	
	dy/dx	SE	dy/dx	SE
Predictor = Asthma				
High school completion	0.019	0.022	0.001	0.024
College enrollment	0.012	0.027	-0.005	0.028
In labor force	-0.006	0.033	-0.014	0.031
Employed	-0.036	0.033	0.032	0.038
Residential Independence	0.030	0.053	0.035	0.060
Financial Independence	0.008	0.054	-0.035	0.061
Married	-0.001	0.049	-0.008	0.050
Has children	-0.026	0.047	-0.019	0.050

Note: #p <0.10; *p <0.05; **p <0.01; ***p<.001. N=1,945 (Row 1), 1,959 (Row 2), 823 (Rows 3, 5 -8), or 815 (Row 4)

Table 3. Average marginal effects from logistic regression models predicting socioeconomic attainment in young adulthood as a function of mental health problems in childhood

	Covariate Adjustment Models			IPTW Models		
	dy/dx		SE	dy/dx		SE
Predictor = Externalizing problems						
High school completion	-0.059	***	0.016	-0.057	***	0.017
College enrollment	-0.055	**	0.019	-0.056	**	0.021
In labor force	-0.019		0.020	-0.028		0.029
Employed	-0.001		0.026	-0.005		0.030
Residential Independence	-0.020		0.038	-0.034		0.050
Financial Independence	0.056		0.038	0.072		0.045
Married	-0.038		0.033	-0.023		0.039
Has children	-0.040		0.035	-0.023		0.043
Predictor = Internalizing problems						
High school completion	-0.076	***	0.016	-0.073	***	0.018
College enrollment	-0.078	***	0.019	-0.073	***	0.022
In labor force	-0.002		0.021	0.011		0.030
Employed	0.008		0.028	-0.023		0.034
Residential Independence	-0.013		0.039	-0.031		0.049
Financial Independence	0.024		0.038	0.016		0.046
Married	-0.022		0.034	0.018		0.041
Has children	0.060	#	0.035	0.093	*	0.045
Predictor = ADHD						
High school completion	-0.033		0.023	-0.041		0.028
College enrollment	-0.045		0.030	-0.053		0.040
In labor force	0.021		0.042	0.022		0.048
Employed	-0.034		0.054	-0.002		0.060
Residential Independence	-0.136	*	0.063	-0.108		0.073
Financial Independence	-0.093		0.070	-0.178	*	0.085
Married	-0.104		0.067	-0.101		0.085
Has children	-0.036		0.056	0.025		0.066

Note: #p <0.10; *p <0.05; **p <0.01; ***p<.001. For internalizing and externalizing problems, N = 2,831 (Row 1); 2,851 (Row 2); 1,453 (Rows 3, 5-8); and 1,427 (Row 4). For ADHD, N = 1,891 (Row 1); 1,904 (Row 2), 790 (Row 3, 5-8); and 782 (Row 4).

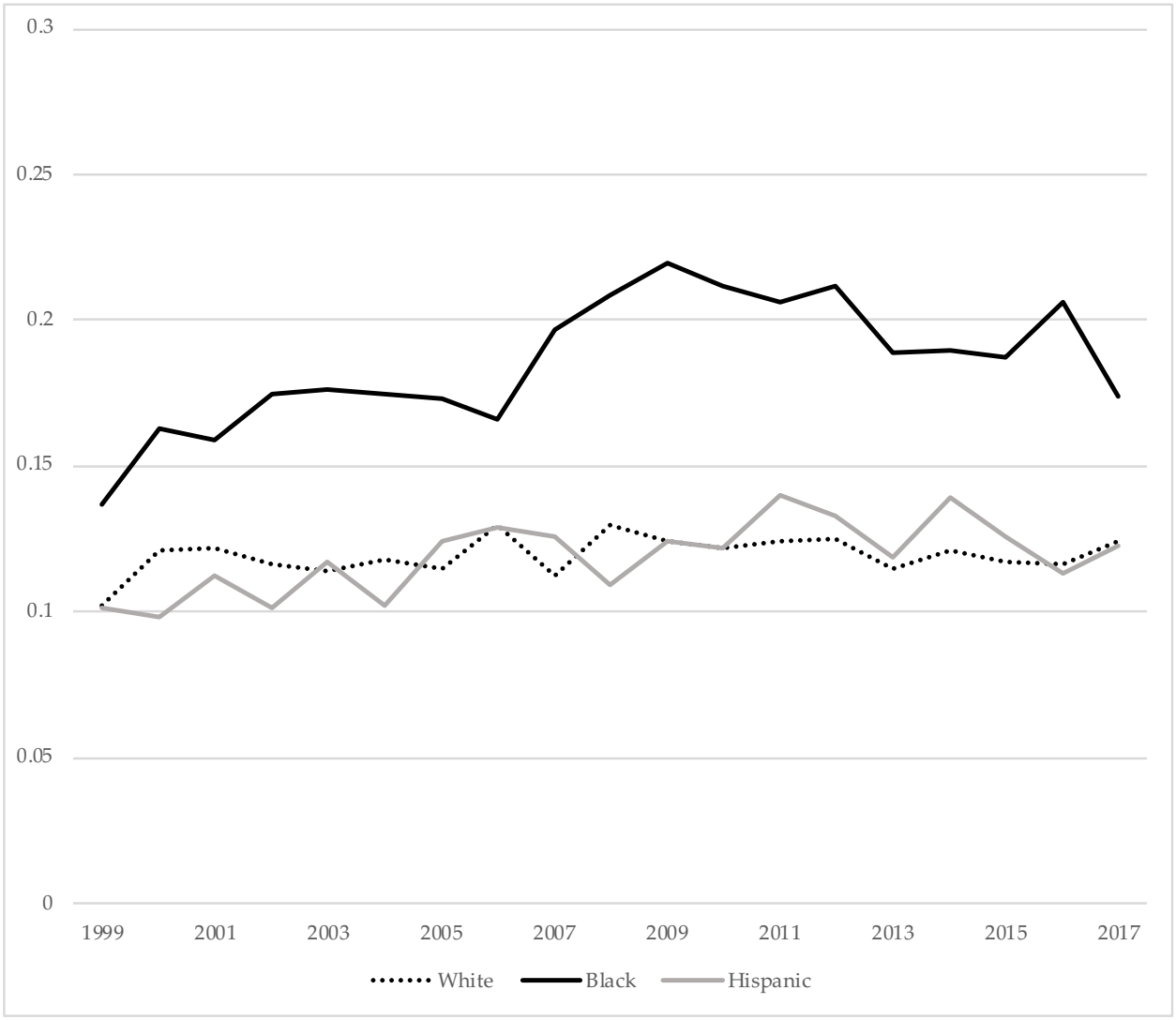
Table 4. Average marginal effects from logistic regression models predicting socioeconomic attainment in young adulthood as a function of obesity in childhood

	Covariate Adjustment Models			IPTW Models	
	β		SE	β	SE
Predictor = Obesity					
High school completion	0.037	#	0.020	0.025	0.019
College enrollment	0.000		0.022	-0.018	0.024
In labor force	-0.001		0.025	-0.016	0.027
Employed	0.003		0.030	0.008	0.029
Residential Independence	-0.034		0.045	-0.034	0.051
Financial Independence	-0.056		0.045	-0.040	0.047
Married	0.037		0.038	0.047	0.037
Has children	0.030		0.042	0.018	0.049

Note: #p <0.10; *p <0.05; **p <0.01; ***p<.001. N = 2,831 (Row 1); 2,851 (Row 2); 1,453 (Rows 3, 5-8); and 1,427 (Row 4).

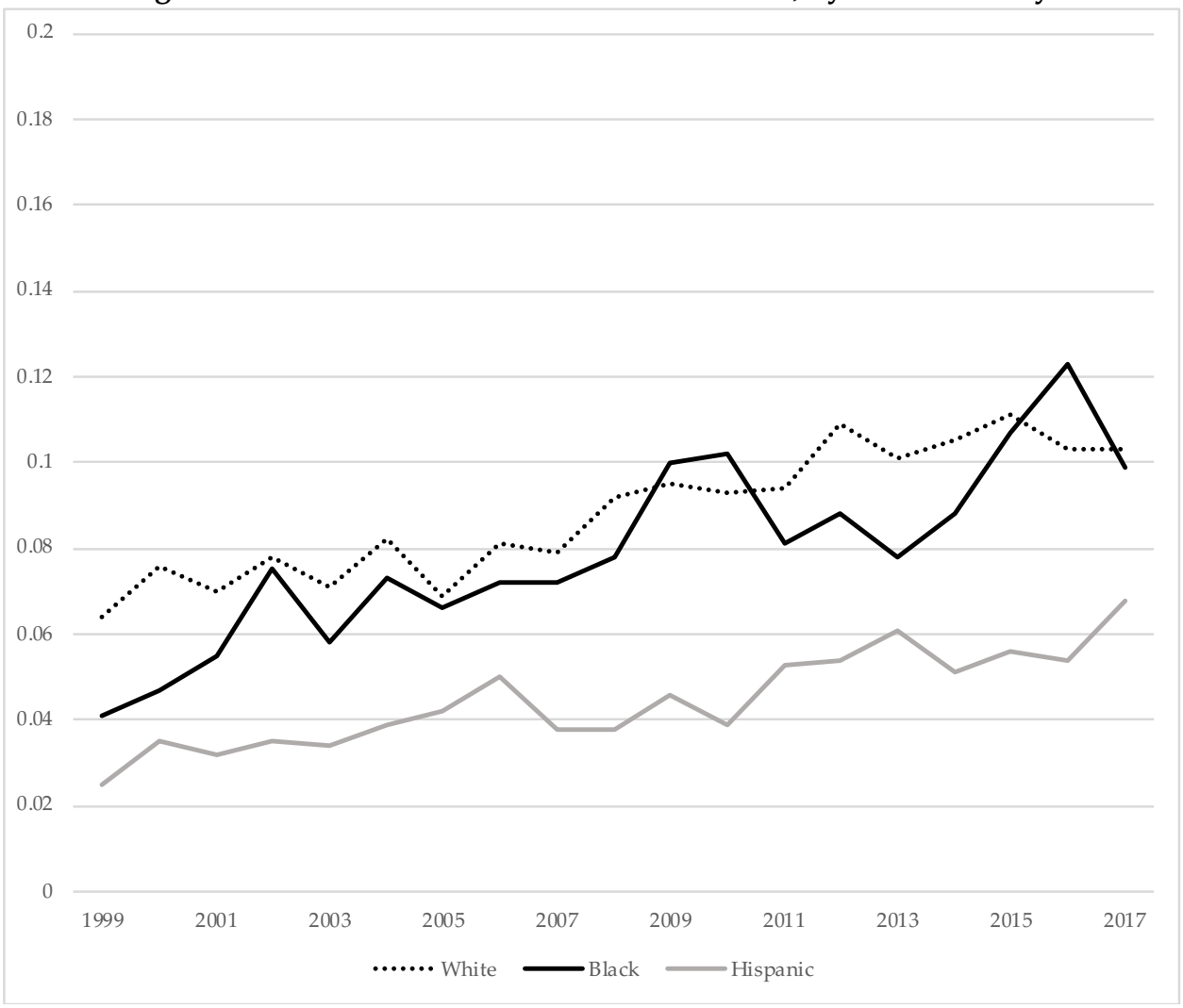
Appendix A.
Trends in Rates of Childhood Health Conditions, by Race/Ethnicity

Figure A1. Trends in Rates of Childhood Asthma, by Race/Ethnicity



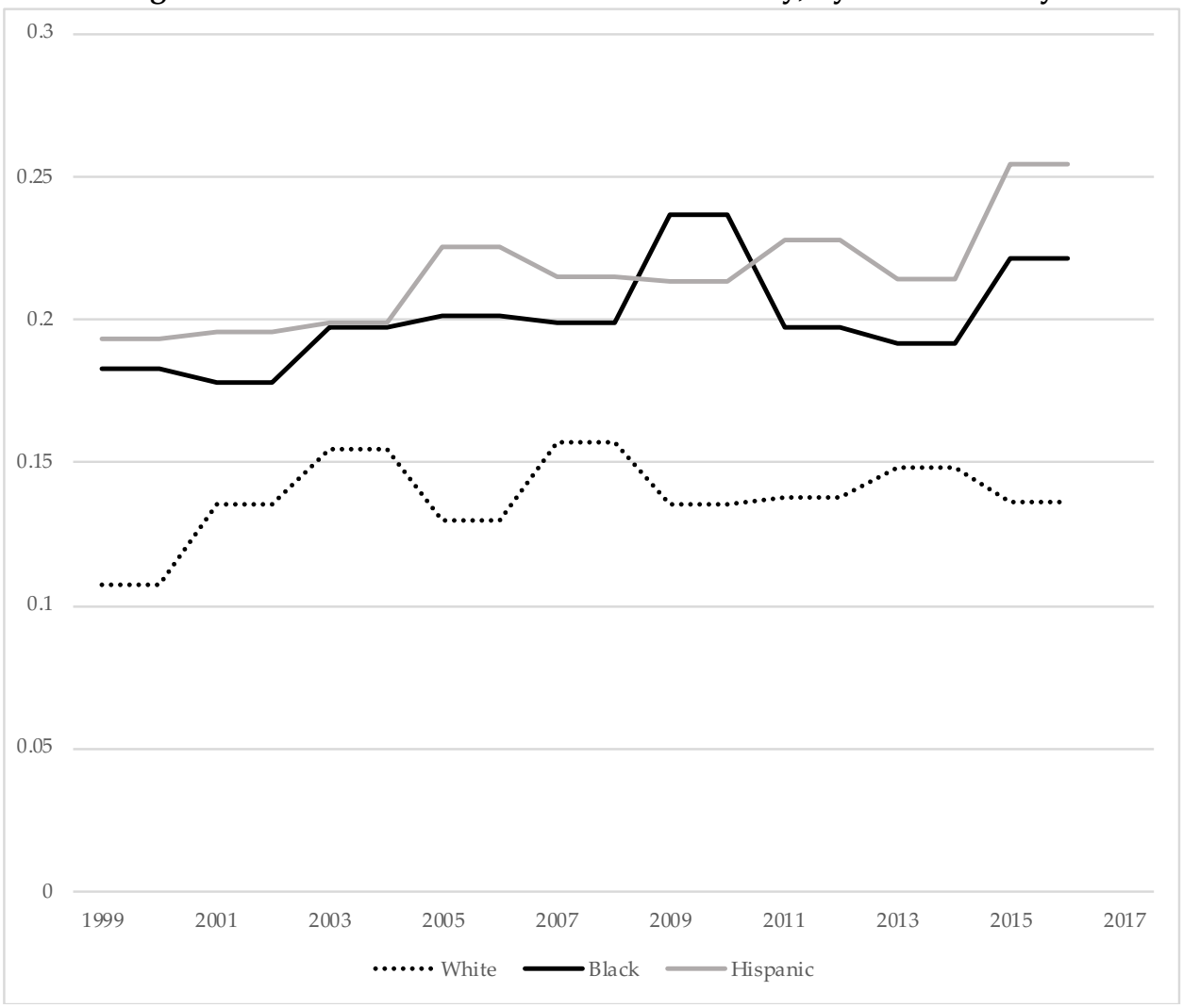
Note. Rates of asthma were calculated using the National Health Interview Survey.

Figure A2. Trends in Rates of Childhood ADHD, by Race/Ethnicity



Note. Rates of ADHD were calculated using the National Health Interview Survey.

Figure A3. Trends in Rates of Childhood Obesity, by Race/Ethnicity



Note. Rates of obesity were calculated using the National Health and Nutrition Examination Survey.

Appendix B.
Results for IPTW Models with Interactions of Childhood Health Conditions with Child Sex

Table B.1. Average marginal effects from logistic regression models predicting socioeconomic attainment in young adulthood as a function of childhood health conditions: Models stratified by sex

	IPTW Results for Males			IPTW Results for Females			F-test for sex interaction
	dy/dx		SE	dy/dx		SE	
Predictor = Asthma							
High school completion	0.064		0.033	-0.075	*	0.038	8.18**
College enrollment	0.022		0.043	-0.037		0.038	1.14
In labor force	0.003		0.035	-0.040		0.064	0.21
Employed	0.056		0.040	-0.007		0.051	1.19
Residential Independence	0.101		0.078	-0.054		0.081	2.09
Financial Independence	-0.023		0.080	-0.052		0.088	0.06
Married	-0.007		0.063	-0.009		0.072	0.00
Has children	-0.039		0.064	0.013		0.073	0.33
Predictor = Externalizing problems							
High school completion	-0.025		0.027	-0.102	***	0.028	7.53**
College enrollment	-0.060	#	0.034	-0.055	#	0.031	0.07
In labor force	-0.033		0.036	-0.024		0.047	0.34
Employed	0.033		0.041	-0.044		0.043	1.64
Residential Independence	-0.022		0.071	-0.048		0.065	0.10
Financial Independence	0.133	*	0.066	0.007		0.065	1.82
Married	0.056		0.056	-0.105	*	0.051	4.35*
Has children	0.039		0.060	-0.090		0.060	2.09
Predictor = Internalizing problems							
High school completion	-0.061	*	0.028	-0.099	**	0.029	2.94#
College enrollment	-0.072	*	0.033	-0.082	*	0.033	0.42
In labor force	0.031		0.032	-0.014		0.048	0.87
Employed	0.002		0.046	-0.055		0.050	0.60
Residential Independence	-0.007		0.070	-0.062		0.066	0.36
Financial Independence	0.061		0.067	-0.038		0.067	1.04
Married	0.064		0.058	-0.035		0.057	1.61
Has children	0.166	**	0.063	0.002		0.063	4.36*
Predictor = ADHD							
High school completion	-0.044		0.045	-0.051		0.055	0.12
College enrollment	-0.074		0.057	-0.033		0.071	0.07
In labor force	-0.026		0.059	0.070		0.047	1.19
Employed	-0.035		0.084	0.029		0.078	0.32
Residential Independence	-0.220	**	0.082	0.031		0.123	2.57
Financial Independence	-0.040		0.109	-0.326	***	0.071	4.95*
Married	-0.192	***	0.042	0.023		0.118	5.43*
Has children	-0.055		0.060	0.133		0.117	2.14
Predictor = Obesity							
High school completion	0.015		0.031	0.036		0.023	0.94
College enrollment	0.004		0.038	-0.040		0.031	0.96
In labor force	-0.034		0.031	0.001		0.039	0.77
Employed	0.029		0.044	-0.012		0.036	0.66
Residential Independence	-0.086		0.072	0.015		0.060	1.29
Financial Independence	-0.012		0.071	-0.065		0.060	0.34
Married	0.004		0.053	0.083	#	0.050	0.86
Has children	-0.042		0.065	0.071		0.059	1.81

Note: #p<0.10; *p<0.05; **p<0.01; ***p<.001. For internalizing and externalizing problems, N = 2,831 (Row 1); 2,851 (Row 2); 1,453 (Rows 3, 5-8); and 1,427 (Row 4). For ADHD, N = 1,891 (Row 1); 1,904 (Row 2), 790 (Row 3, 5-8); and 782 (Row 4).