Child Mental Health, Family Circumstance, and Long-Term Success: The Effect of Household Income

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Abstract

We use data from a long-running experiment in which American Indian households received income transfers from a casino while other households did not. Using a difference in difference analysis, we find that the treated children had fewer depression and anxiety symptoms at age 30. In adulthood, individuals with more years of treatment exposure also had greater economic well-being around age 30. The untreated children, in adulthood, showed strong persistence in measures of mental health from adolescence through age 30, while in treated children persistence was greatly attenuated. The estimated effects are slightly stronger for treated children who experienced fewer mental health symptoms before the transfers began at ages 16 and 21, but by age 30 all affected children showed reduced symptoms of anxiety and depression and improved economic outcomes.

Keywords: Children, Household Income, Mental Health, American Indian
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Data Availability:The GSMS data that was used in this study is proprietary; data collection is on-going and there are several active grants funding this research. The application process to gain data access includes submitting a project description for approval by the study PI. The contact person is BILL's contact information. In addition to approval by the scientific committee, separate approval by the tribal IRB is required for all new projects. The contact person is William E. Copeland at Professor, Department of Psychiatry, Department of Psychiatry, UHC Campus, Burlington, Vermont, 05405 (william.copeland@med.uvm.edu).

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1 Introduction

According to the Centers for Disease Control (CDC), 7.1 percent of children (aged 2-17) have diagnosed anxiety, 3.2 percent have diagnosed depression, 9.4 percent have diagnosed Attention Deficit Hyperactivity Disorder (ADHD), and 7.4 percent of children have a diagnosed behavioral disorder. These diagnoses are not concentrated in older children; approximately one in six US children aged 2-8 years have a diagnosed mental, behavioral, or developmental disorder. The rates of ADHD, depression and anxiety have been rising over time. Family circumstance is increasingly linked to both the incidence of mental health and behavioral problems and the likelihood that children receive treatment for these issues (Ghandour et al., 2019). In particular, children from low income families may suffer both from a higher incidence of mental health problems and from delayed or inadequate treatment. Both of these factors would contribute to a strong negative association between childhood mental health conditions and long-term economic success.

The connection between family economic circumstance and child mental health is not well understood. On the one hand, there is evidence of hereditary components in some mental health disorders (Athanasiadis et al., 2022), and a well established connection between poor mental health and education and earnings (Dobson et al., 2021; Hale et al., 2015; Sareen et al., 2011). This implies a correlation between parental income and child mental health that depends on (usually) unobservable characteristics of parents' mental health. On the other hand, there is increasing evidence that income shocks lead to negative mental health outcomes in adults, and positive income changes contribute to improvements in mental health (Apouey and Clark, 2015; Haushofer and Shapiro, 2016). Our study aims to identify the relationship between family circumstance, in particular household income, and the incidence of depression and anxiety in adolescence and young adulthood.[1] We investigate whether extra unearned household income, due to a program intervention, affects the long-run mental health and economic outcomes for the households' children at different stages in their late teenage years and into young adulthood.

Our analysis is based on longitudinal panel data from a survey that followed three cohorts of children initially aged 9, 11 and 13 until age 30; the data includes both American Indians and non-American Indians residing in the same geographic region. Children and their parents were asked questions to assess the child's level of psychological wellbeing annually until the children turned 16. Subsequently, the children were interviewed alone after age 18. Our data contains clinically-validated measures of mental health symptoms and disorders from childhood (Farmer et al., 1994) which allows us to trace out the effects of an exogenous and permanent increase in household income on the children's mental health disorder symptoms up to age 30.

The intervention we study is the introduction of an unconditional cash transfer program initiated by the tribal government. After the 4th wave of the survey, American Indian families started receiving unearned cash transfers. The tribal government provided cash transfers to all tribally enrolled citizens regardless of their economic conditions or employment status. We find that children treated to four extra years of higher household incomes during their teenage years have approximately one fewer symptom of depression or anxiety by age 30. Examining the progression of psychological wellbeing

[1] We also show some results for oppositional defiant disorder (ODD) and attention deficit hyperactivity disorder (ADHD) during childhood. These additional measures as they are not well defined into adulthood so we limit the analysis to childhood only.

over the lifespan, we find that up to age 21, the largest improvements accrue to those who had the lowest levels of depression or anxiety symptoms prior to the intervention. By age 30 all of the treated children report lower levels of depression and anxiety symptoms. Turning to economic wellbeing in adulthood, we find that exposure to increased household income during childhood substantially improves economic wellbeing at age 30. The gains are similar across the initial distributions of anxiety and depression symptoms, but children who start out with more depression symptoms before the cash transfers experience larger improvements in long-run economic wellbeing.

Our findings contribute to the growing literature arguing that providing additional income and resources to parents improves the immediate and longer-term outcomes for the household's children. In a comprehensive review of social welfare programs aimed at children and households with children, Hoynes and Schanzenbach (2018) find that access to these programs improves children's outcomes in the long-run along several dimensions. Several papers have examined in particular how the Earned Income Tax Credit (EITC), which benefits low income households with positive labor earnings, affects children's long-term outcomes (Bastian and Michelmore, 2018; Dahl and Lochner, 2012). Milligan and Stabile (2011) find that increased income due to expansion of tax benefits for households with children results in better educational achievement and child mental health. Finally, in a series of papers, Akee et al. (2018, 2010) show that additional unearned household income improves educational attainment and personality traits by ages 19 and 16 respectively, all of which likely contribute substantially to long-term economic success. Our current paper builds on these previous analyses by extending the analysis to ages 25 and older as well as examining the prevalence of the child's own mental health disorder symptoms in adulthood and economic wellbeing measures.

We also contribute to the literature focused on the relationship between health and long-run economic outcomes. Previous research has documented the strong positive relationship between physical health and adult economic success (Almond and Currie, 2011; Case et al., 2005; Lindeboom et al., 2016), but less is known about the connection between mental health and economic wellbeing. Until recently, mental health received much less attention than physical health from policy-makers and health care systems, despite existing evidence that childhood mental health problems could be much more consequential for long-term economic success than physical health problems (Currie et al., 2010). Previous research has established a positive association between economic wellbeing and mental health (Lund et al., 2010). Poor mental health may affect labor market success and personal income - individuals with anxiety, clinical depression or other disorders may be unable to work in standard settings or complete work-related tasks. Mental health problems in adulthood are also associated with more days of missed work (Smith and Smith, 2010). Thus, individuals with such problems are at higher risks of job termination and the loss of income. In theory, interventions that improve psychological wellbeing should also improve labor market outcomes (Almlund et al., 2011; Cunha and Heckman, 2008). Yet there could be a reverse link where economic problems lead to worse mental health, and alleviating financial stress could also positively affect psychological wellbeing (Haushofer et al., 2020). Our analysis shows that increased household resources results in better mental health outcomes and better economic wellbeing outcomes by age 30.

American Indian children experience the highest rates of mortality from preventable and treatable diseases in the US (Gorzig et al., 2022; Sarche and Spicer, 2008). The suicide rate among American Indian adolescents and young adults aged 15-24 is double the US average and the second leading cause

of death in this age group (Alcantara and Gone, 2007). Their relative under-representation in publicly available national datasets has impeded research into the mechanisms driving these negative outcomes. There could be many different contributing factors: suboptimal mental health support services, differences in socio-economic background and persistent trauma from centuries of colonisation policies, to name a few. Our findings suggest that the high incidence of poverty is likely one of the causes of disparities in mental health outcomes between American Indian children and others.

Finally, we contribute to the emerging literature showing the effect of changes in household income on child outcomes. Cesarini et al. (2016) provide evidence that there is only modest effects on the long-run health of children of lottery winners in Sweden; they mention that this may be due to existing safety nets already in place in Sweden. Kilburn et al. (2016), on the other hand, found that unconditional cash transfers reduce depressive symptoms for children residing in treated households in Kenya. Kenya does not have a well developed set of safety net programs in place. In a meta analysis, Thomson et al. (2022) found across dozens of studies that lifting people out of poverty generally improves a person's mental health. The extant literature suggests that changes in overall economic wellbeing play an important role in societies where there are less existing support services or social programs.

2 Dataset Description

We use individual panel data from the Great Smoky Mountain Study of Youth (GSMS), which to date has collected 25 years of data on development and psychological and social indicators following three cohorts of children aged 9, 11 and 13 at survey intake who resided in Western North Carolina in the early 1990s. The first survey wave took place in 1993 and the survey has been on-going ever since.

The GSMS was specifically designed to detect symptoms of psychological distress during childhood and adolescence. Symptoms of mental health disorders were reported by the parent or the child (or by both). The interview questions focused on three-month recall of symptoms, to improve accuracy. The screener questions and symptoms definitions were based on the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV, American Psychiatric Association). In addition to allowing us to work with symptoms that might not reach the threshold for a clinical diagnosis, interview-based data likely offer a more accurate representation of the prevalence of these conditions in the survey population. Actual conditions might be either over- or under-diagnosed in claims data or survey results based on parent recall of physician diagnosis. Further, the rate of over- or under-diagnosing could be related to race and socio-economic conditions of the household.

The GSMS oversampled children of American Indian descent from one tribe in Western North Carolina. Four years into the survey, the tribe opened a tribal casino on their reservation. Our data contains information on family income and various mental health symptoms reported across different ages. Part of the profits from the casino operations are shared with all enrolled tribal members; these payments were already in place at the fifth wave of the survey; four survey waves took place before the start of unearned income payments. The payments are disbursed twice per year and the amounts are dependent on the profitability of the casino.[2] All tribal members receive the same amount of

[2]While the study children were minors in their parents' households, the per capita payments averaged about $4,000-$5,000 per year. The per capita payments depend on the profits of the casino and fluctuate in size over time. During the first several years, the payments were increasing as the size of the gaming operations was growing.

unconditional cash transfers, regardless of income levels or other life circumstances. In prior research (Akee et al., 2010), we show that the casino payments do not measurably affect parental labor force participation or marital status. We take this as evidence that the primary effect observed in this study setting is due to the increased household incomes, rather than family disruption or changes in labor market participation by the parents. Given the panel nature of our data, we are able to follow the same individuals prior to and after the start of the casino operations; there are no new subjects added to the survey and attrition does not appear to be related to any of the study characteristics.

The GSMS continued following subjects as they aged. Annual assessments were completed with the participants and their primary caregivers until participants turned 16; thereafter participants were interviewed alone at ages 19, 21, 25, and 30. Our analysis focuses only on results up to age 30.[3] In the adult waves of the survey (ages 19 and onward), questions were asked about everyday functioning. These questions cover a broad array of indicators of overall financial and economic wellbeing. The dichotomous indicators were summed up into scales. Standardized scale scores were obtained by subtracting the individual score from the group mean and dividing the resultant score by the standard deviation. We use the economic wellbeing score at age 30 as the main indicator of long-term economic success. By age 30, individuals are on a steady trajectory that is less likely to be affected by obtaining additional education or other training.

The GSMS has clinically-validated measures of childhood and adolescent mental health symptoms and disorders. When we consider outcomes in childhood, we focus on four of the most common conditions in children: depression, anxiety, oppositional defiant disorder (ODD) and attention deficit hyperactivity disorder (ADHD). The survey instrument was specifically designed to capture symptoms of these disorders. The survey records the number of symptoms for each disorder in each survey wave. In the analysis that follows, we separate individuals based on the presence of symptoms of these disorders in their youth. We have measures for the first four survey waves (prior to any household income transfer intervention) and take an average number of symptoms over those initial periods. We separate the observations into individuals who are above or below the median of that average for each of the four disorders and conduct our heterogeneity analyses separately for the two groups of respondents. Broadly speaking, the children above the median reported one or more symptoms of the respective condition in each survey wave. The median separates those who had some indication of psychological distress during childhood and those who did not.

In Table 1 we show the correlations of child mental health disorder symptoms from the first four survey waves prior to the casino operations. The counts of depression, anxiety, ODD and ADHD symptoms are positively related to each other. However, the correlation coefficients vary from a high of 0.59 between depression and anxiety, to a low of 0.32 between anxiety and ADHD.

We consider two sets of outcome variables. The first is the count of symptoms of ODD, ADHD, anxiety and depression at age 16, and anxiety and depression only at ages older than 16 (age 19 or 21, and age 25 or 30). The focus on anxiety and depression only in adulthood is because these two conditions are relatively well defined over the childhood, adolescence, and adulthood periods. Oppositional defiant disorder is largely resolved by young adulthood, while ADHD symptoms are self-reported after age 16, and thus generally considered unreliable. To construct the childhood mental health variables, we use

[3]The latest survey waves at ages 37-40 partly overlapped with the COVID pandemic. The outcomes describing economic functioning were likely affected by the pandemic for some of the respondents.

Table 1: Pairwise correlations of Child Mental Health Disorder Symptoms by Disorder Prior to Casino Opening

Symptom	Depression	Anxiety	ODD	ADHD
Depression	1	0.59	0.36	0.35
Anxiety	0.59	1	0.33	0.32
ODD	0.36	0.33	1	0.36
ADHD	0.35	0.32	0.36	1

Note: Pairwise correlations of the child mental health disorder symptoms prior to casino operations. ODD stands for oppositional defiant disorder and ADHD stands for attention deficit hyperactivity disorder.

the symptoms reported in various waves. Symptoms for depression, anxiety and oppositional defiant disorder are taken from joint interviews with the children and parents. We use symptoms of ADHD reported by the parents, as is customary in the psychology literature. At ages older than 16, depression and anxiety symptoms are reported by only the subjects themselves.

Our second outcome variable of interest is an economic wellbeing scale constructed at age of 25 or 30 years old for all survey participants. The scale is based on the following information provided by the respondents: being impoverished was coded based on thresholds issued by the Census Bureau based on income and family size; whether an individual was a high school dropout or not; being fired from a job or quitting a job without financial preparations or being unemployed for 2 or more years; failing to honor debts or financial obligations and being a poor manager of one's finances; not having insurance or having some sort of financial need. The economic wellbeing index was re-scaled so that higher numbers indicate better economic outcomes.

An average of 83% of all possible interviews (N= 11,230) were completed by age 30; by age 30, 39 participants had died. We find no difference in the probability of attrition by ages 25/30 by American Indian (AI) race (p=0.271), by the presence of depression symptoms (p=0.274), anxiety symptoms (p=0.243), ADHD (p=0.294) and ODD (p=0.408) in the last survey wave before the transfers start. We have also examined whether participation in the age 25 and older survey waves were related to the casino treatment effect and we do not find any statistically significant effects. Thus, we fail to reject the null hypothesis that there is no difference in attrition for later survey waves by treatment status.

Table 2 shows the means of the main variables used in the analysis by American Indian and non-American Indian status. About half of the survey sample for both the non-American Indian and American Indian populations in the data are male. The average household income (interpolated based on $5,000 income bins) in the first four survey waves was about $32,700 for the non-AI households and about $23,500 for the AI households; the difference in sample means is statistically significant. We also report a measure of standardized birth weight for the two populations. On average non American Indians tend to be below average, while American Indians tend to have above average birth weight; however, these differences are not statistically significant at conventional levels.

The next four measures report the use of any mental health services in survey wave four - which is the latest wave before the casino payments start - by non American Indian and American Indian children. These variables are derived from the parents' responses. We use indicator variables that capture whether mental health services were received in a clinic setting, informal setting, at school, and a summary variable that equals one if any mental health services were sought in any of these settings. The use of professional services is not statistically significantly different across the two groups; however, non-American Indian children report seeking slightly more professional mental health services

Table 2: Summary Statistics for Initial Four Survey Waves

	Non American Indian		American Indian		P-Value
	Obs	Mean	Obs	Mean	
Pre-Casino Survey Wave Averages					
Male	1,041	0.563	297	0.532	0.344
Household Income	1,041	32.775	297	23.578	<0.0001
Average Parental Mental Health	1039	0.482	296	0.264	<0.0001
Birth Weigth Standardized	1041	-0.011	297	0.045	0.378
Professional Svcs	840	0.085	269	0.059	0.184
School Svcs	840	0.11	269	0.152	0.06
Informal Svc	840	0.082	269	0.1	0.355
Any Svcs	840	0.246	269	0.26	0.65
Survey Wave 4 Mental Health Disorder Symptoms					
Depression	840	0.794	269	0.833	0.569
Anxiety	840	0.698	269	0.669	0.781
Oppositional	840	0.563	269	0.401	0.032
ADHD	823	0.592	265	0.426	0.277
Age 19/21 Mental Health Disorder Symptoms					
Depression	891	0.831	294	0.833	0.974
Anxiety	891	1.008	294	0.588	0.002
Age 25+ Mental Health Disorder Symptoms					
Depression	924	1.292	274	0.442	<0.0001
Anxiety	924	1.57	274	0.347	<0.0001
Economic Wellbeing	924	-0.177	274	0.075	<0.0001

Note: The household income and male indicator variables are reported in the first survey wave. Average household income is shown in thousands of dollars. The Economic Wellbeing Index is shown for age 25 or 30 and is re-scaled so that a positive number is associated with better economic and financial outcomes. The means for the count mental health disorder symptoms are reported for the fourth survey wave. The indicator variables flagging the utilization of any mental health assistance are reported in wave 4.

(8.5 percent vs. 5.9 percent). On the other hand, American Indian children receive more school-based mental health (15.2 percent vs. 11 percent) services; the difference in means is statistically significantly different at the 10% level. The informal services sought by both non-American Indian and American Indian children are approximately the same ranging between 8-10 percent. The next category (Any Mental Health Services utilization) is not statistically different by race group, but indicates that one in four children have received some type of psychological counseling before the transfers began.

The next four variables measure the count of disorder symptoms during the fourth survey wave for the indicated mental health disorders. Non-AI children indicate having slightly lower average depression symptoms than American Indians, however, these differences are not statistically significant. Non-American Indian children and American Indian children have very similar rates of reported anxiety; these are not statistically significantly different from one another. Non-American Indians have higher average oppositional defiant disorder symptoms than American Indian children and the difference is statistically significant. Finally, non-American Indian parents report higher average ADHD symptoms in their children than American Indians but the difference is not statistically significant.

Finally, we provide mental health disorder symptom counts at ages 19 (or 21) and age 30 (or 25). At age 19, we find that the level of depression is approximately similar across both groups at

0.8. However, American Indians at ages 19/21 have statistically significantly less reported anxiety. By age 25 and older, American Indians have significantly lower depression and anxiety. We also show the mean of the economic wellbeing measure. By age 30 (or 25, if data at age 30 are not available), non American Indian adults have a lower (worse) economic wellbeing index measure than their American Indian counterparts; these differences are statistically significant.

2.1 Distribution of Initial Disorder Symptoms Prior to Casino Operations

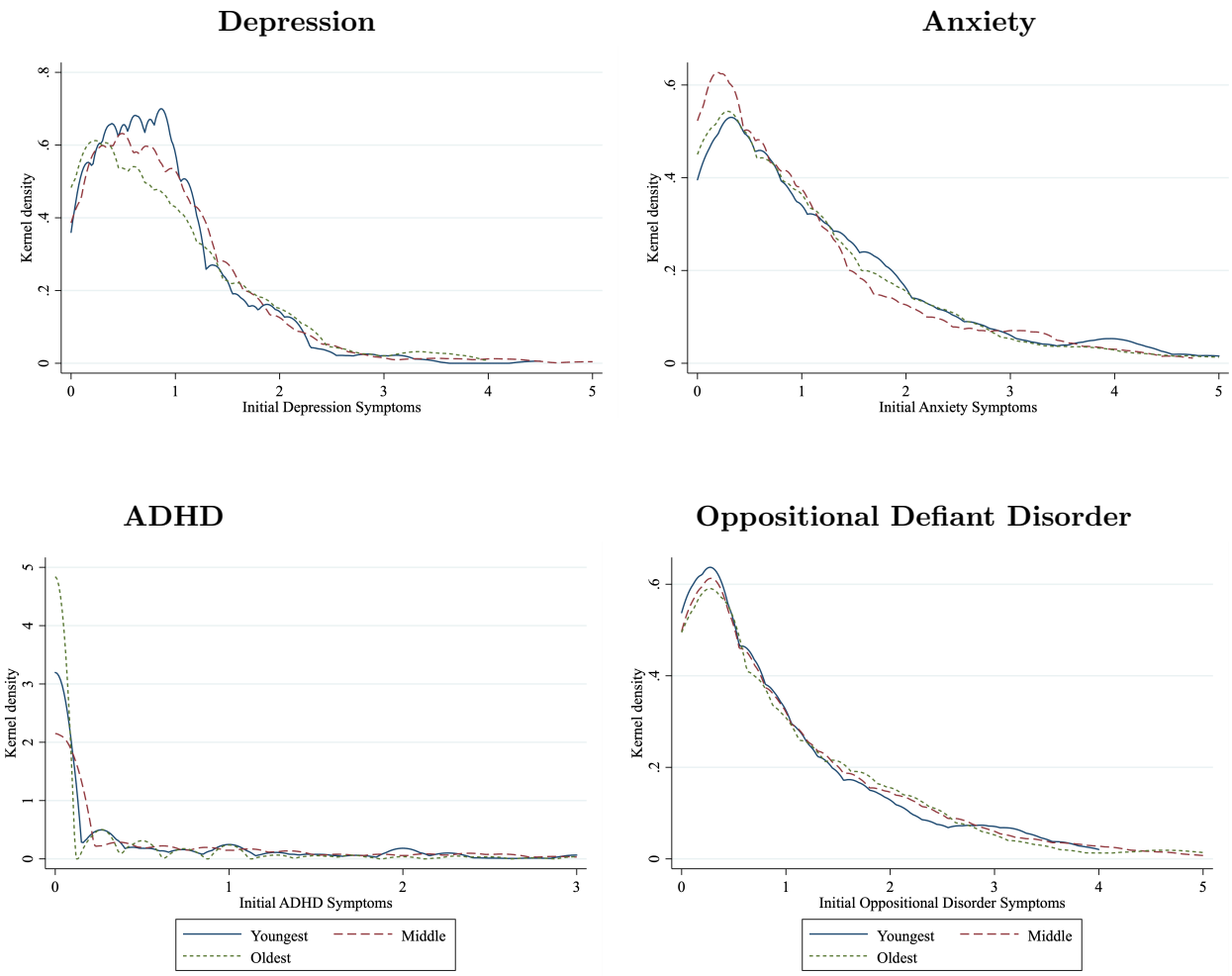
In the analysis in this section, we provide the distributions of initial disorder symptoms in the first 4 survey waves for both American Indians and non American Indians combined. In addition to providing a snapshot of child mental health before any cash transfers began, this analysis helps compare the measures reported by the GSMS to other sources of similar data. Figure 1 shows that the distribution of symptoms across the three cohorts is very similar; this is expected given that up to this point there had been no intervention. The median number of depression and anxiety symptoms reported in the first 4 survey waves is 0.75, for opposition disorder it is 0.5 symptoms. ADHD has a large mass at 0, and the median number of symptoms reported on average in the first 4 survey waves is 0 with a mean of 0.84. The 75th percentile of the ADHD distribution report 0.75 symptoms on average. Only 190 person-year observations in the first four survey waves qualified for a diagnosis of anxiety disorder, while more then 2,300 responses identified one or more anxiety symptoms. The mean number of symptoms among those who were flagged for a diagnosis of anxiety disorder based on the scale used by clinical psychologists was 6.8. The corresponding numbers for ODD are on average 4.8 reported symptoms for a diagnosis; for depression we have 4.3 symptoms on average for a diagnosis and for ADHD 11.7 symptoms, with 6 being the smallest count of symptoms qualifying for a diagnosis. A much larger number of observations contain a report of non-zero symptoms than would be flagged for a diagnosis of any of these conditions. This underscores the benefit of using survey data and symptoms of disorders that might not qualify for a diagnosis by a clinician.

According to the CDC's analysis of data from the National Survey of Children's Health, 8.9 percent of children were ever diagnosed with ADHD in North Carolina in 2003.[4] These data are based on reports by parents of ADHD diagnoses received by medical professionals. We pick the year 2003 because it is the earliest available, the closest in terms of timing, and because the prevalence of ADHD has exploded since the turn of the century. According to the comparable data in the GSMS, collected during the early 1990s, 5.6 percent of the interviewed children would have received an ADHD diagnosis at some point during the first 4 survey waves. Consistent with the national statistics, ADHD symptoms are significantly more likely to appear in boys, who are about 5 percent more likely to qualify for a diagnosis in our data.

Anxiety is the second most common mental health diagnosis in children, currently affecting about 9.4 percent of those aged 3-17. In our data, about 13.3 percent of children would have received a diagnosis of anxiety in at least one of the four survey waves. The higher rates we observe in our data are at least partly due to the difference in age ranges. Our data cover the period 9 through 16 year olds, as opposed to 3-17. Girls were slightly more likely to qualify for an anxiety diagnosis, which again is consistent with patterns in the national data.

[4]Center for Disease Control State-based Prevalence of ADHD Diagnosis and Treatment 2003-2011; retrived on 12/13/2022 at https://www.cdc.gov/ncbddd/adhd/data/diagnosis-treatment-data-2003-2011.html

Figure 1: Initial Disorder Symptoms Prior to Casino Opening by Age Cohort



Behavioral problems and depression are also more likely to have been diagnosed using GSMS data as compared to averages for North Carolina. Oppositional defiant disorder diagnosis is more likely in boys, and depression is equally likely across both genders. About one fifth of the children would qualify for ODD diagnosis at some point (compared to 8.9 percent reported by the CDC) and about 8 percent would qualify for a depression diagnosis (compared to 4.4 percent reported by the CDC). These differences are most likely due to the relatively lower socio-economic status of the GSMS population, but also due to the self-reported nature of the data by both parents and children, as opposed to parental reports of actual medical diagnoses used by the CDC.

2.2 Persistence of Mental Health Disorder Symptoms at Different Ages

In this section we document the persistence of mental health problems in non-American Indians over time. As the children age from childhood to adolescence to adulthood, the progression of recorded mental health symptoms could be affected by several factors. First, symptoms of depression and anxiety are different in childhood and adulthood, and they are reported by a different set of individuals (parents and children and only children). The other two conditions that we have data for in childhood - ODD and ADHD are either not diagnosed in adulthood (for ODD) or diagnosed very differently (adult

ADHD is different from child ADHD). Second, the progression of symptoms, regardless of measurement, needs to be recorded. Meta analysis by Costello and Maughan (2015) finds that about twenty five percent of children with any mental health disorders enter adulthood with little or no impairment or symptoms. Third, there may be "critical ages" in mental health symptom development, which mark inflection points determined by the lifecourse. For example, graduation from high school or college, or the realization of independence from parents and other role models that may come at different times for different individuals. The non-American Indian population should not be directly affected by casino operations and the cash transfers, while it is reasonable to assume that other unobserved factors described in the previous paragraph would affect both racial groups in a similar manner.

We first show the correlation of the count of symptoms of anxiety and depression disorders prior to the casino operations (in survey wave 3) and at age 16 with the count of symptoms at age 30 in Table 3. In the first four columns we demonstrate that for non American Indians there is a positive and statistically significant correlation of depression (and anxiety) symptoms in survey wave 3 and for the same person at age 30. In the next two columns we show that there is a stronger correlation between depression (and anxiety) symptoms at age 16 and symptoms of the same disorders reported at age 30. Overall, there appears to be a strong persistence in mental health disorders across time, although the presence of symptoms at age 16 does not necessarily result in chronic mental health issues. This is consistent with evidence from the literature on child psychological development. A meta study by Costello and Maughan (2015) reports that only about half of the adolescents who suffered from mental health problems would continue to experience these problems in adulthood.

In the next four columns of Table 3 we show the same correlations for the American Indian children. The correlation between a child's symptoms in survey wave 3 and at age 30 is not statistically significant in columns 5 and 6. Further, compared to the corresponding estimates for non-American Indians, the sizes of the correlations are smaller in magnitude. Similarly, in the next two columns the correlations between age 16 depression or anxiety symptoms and age 30 symptoms are not statistically significant and much smaller than those for the non-American Indians shown in the first four columns of Table 3. We take these results as suggestive evidence that the cash transfer attenuates the well-established persistence of mental health problems across the lifespan.

In Appendix Table A1 we separate out the correlation analysis by age cohorts for the American Indian children. If increased household income plays a role in attenuating mental health problems for household children, we would expect the youngest age cohort to display the lowest correlation of symptoms in the long run after treatment as they are affected by the cash transfer for the longest amount of time. The results appear to indicate that this is the case as three out of the four correlations are negative in sign (and small in magnitude). The middle cohort has slightly positive correlations while the oldest cohort (which was the least treated cohort) has the most consistently positive correlations. Although none of these correlations are statistically significant (possibly due to small sample sizes) they are still strongly suggestive that there is a difference across the age cohorts of American Indians that were treated the longest and other American Indians and non-American Indians.

Table 3: Correlation at Wave 3 and Age 16 Initial Symptoms with Contemporaneous Disorder Symptoms at Age 30 by Race

	Non-American Indians				American Indians			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	Depression Symptoms at Age 30	Anxiety Symptoms at Age 30	Depression Symptoms at Age 30	Anxiety Symptoms at Age 30	Depression Symptoms at Age 30	Anxiety Symptoms at Age 30	Depression Symptoms at Age 30	Anxiety Symptoms at Age 30
Depression	0.152**				0.0943			
Symptoms Wave 3	(0.0600)				(0.131)			
Anxiety		0.218***				-0.00525		
Symptoms Wave 3		(0.0695)				(0.0414)		
Depression			0.382***				-0.00207	
Symptoms Age 16			(0.0692)				(0.0507)	
Anxiety				0.290***				0.0850
Symptoms Age 16				(0.0763)				(0.0801)
Observations	830	830	745	745	246	246	239	239
R-squared	0.079	0.074	0.126	0.097	0.040	0.040	0.042	0.056

Note: The top panel of the table provides the regression of the count of disorder symptoms as reported in the third survey wave on the adult depression or anxiety symptoms count (at age 25 or 30)for all non-American Indians in the survey. The bottom panel regresses the adult depression or anxiety symptoms count (at age 25 or 30) on a measure of disorder symptoms reported at age 16. Additional control variables include survey wave fixed effects, age cohort dummies, gender, a dummy for outcome measured at age 25, initial household income, initial parental mental health and the child's birth weight and a constant. Symptoms in the first four survey waves and at age 16 are reported by both the parents and the children; symptoms at age 30 are reported by the children only.

The break in persistence of mental health symptoms for American Indians is specific to the long-run and the period after the transfers begin. In Appendix Table A2 we show that in the period prior to the casino operations (survey waves 1-4) there were strong positive correlations in anxiety and depression symptoms for both non-American Indian and American Indian children. The persistence of mental health disorder symptoms appears to have held for all household types prior to the start of casino operations, but it disappears for the American Indian respondents after the implementation of the cash transfers.

2.3 Long-Run Economic Outcomes and Mental Health in Childhood

In this section we examine the relationship between mental health and adult economic outcomes. There has been prior research documenting the negative relationship between psychological distress in childhood and adolescence and economic wellbeing in adulthood (Currie and Stabile, 2007; Fletcher, 2014; Smith and Smith, 2010). We report correlations between mental health disorder symptoms during childhood and our long-term economic wellbeing score. We do this as a validation exercise to compare our sample to the rest of the literature.

The analysis is restricted to non-American Indians as they are not directly affected by the change in household incomes arising from the unconditional cash transfers. Assuming that the association between mental health at different ages and economic wellbeing is similar across American Indian and non-American Indians, these correlations are indicative of the long-run relationship between childhood mental health disorder symptoms and long-run adult outcomes. We include control variables for age cohort, initial household income in the first 4 survey waves, gender, an indicator for parental mental health issues reported in the first four waves of the survey before the cash transfers begin, and standardized birth weight. A higher economic index score indicates better economic conditions in adulthood.

The top panel of Appendix Table A3 restricts measures of mental health disorder symptoms to the third survey wave which precedes the opening of the tribal casino. As a result, there is no possibility for any of the households (American Indian or otherwise) to have been treated to additional household income at the time when the mental health symptoms were reported. Here we hold the survey wave (roughly the calendar time) at which the questions were answered constant. The three age cohorts are approximately 11, 13 and 15 years of age at this survey wave, with an average age of about 13. A higher count of mental health disorder symptoms at these ages is associated with a lower economic index score at age 30 for the same individual. An additional reported depression symptom reduces the economic wellbeing score by 7 percent of a standard deviation; we find a similar correlation with anxiety (6.5 percent reduction in a standard deviation) and oppositional disorder symptoms (10 percent reduction in a standard deviation). The correlation with ADHD symptoms is the weakest at 3.5 percent and only borderline statistically significant. We note, however, that ADHD symptoms are least likely to be reported in this population.

Next, we hold the age constant at 16 and compute correlations between mental health symptoms at that age and long-term economic wellbeing. Columns 5-8 show the economic wellbeing correlations with mental health at age 16. These correlations are even stronger than what we saw at younger ages in wave 3 in columns (1)-(4). It is notable that depression and oppositional disorder symptoms tend to have the largest coefficients in this panel. The correlation with ADHD is the lowest as compared to the other symptoms.

Mental health distress in childhood has clear negative associations with economic wellbeing in adulthood for the sample of non-American Indian children. An additional depressive symptom or ODD symptom at age 16 is associated with a reduction of economic wellbeing at age 30 in the order of 0.2 standard deviations. This is equivalent to a difference in initial average household income of thirteen thousand dollars (see initial household income estimated coefficient from column 1 of Table 8). The associations with ADHD and anxiety are smaller, but non-trivial. An additional symptom of either condition is correlated with reductions in relative economic wellbeing similar to lowering initial average annual household income by five thousand dollars.

Using the British National Child Development Study, Smith and Smith (2010) report that having any mental health problems in childhood, as assessed by a physician's examination, on adult income, earnings, and job retention (among others). They find that psychological problems at age 16 are associated with a 22 percent decline in income by age 33, 13.4 percent lower earnings, and 10 percent lower probability of being employed. In this study we consider the count of symptoms at age 16, and our outcome measure is a composite index. Nevertheless, the estimates are quite similar to those reported in Smith and Smith (2010).

3 Empirical Strategy

The previous section shows a disruption in the persistence of mental health disorder symptoms for American Indians and the negative correlation of symptoms of depression and anxiety with economic wellbeing. As our main empirical specification, we employ a difference in difference regression strategy to account for potential cohort and/or race group unobserved differences that were not controlled for in the analysis of correlations. Our analysis relies on the fact that there are three separate age cohorts surveyed in the Great Smoky Mountain Study. All three cohorts of American Indian children were treated to the casino transfers, albeit for different amounts of time and at different initial ages. We compare American Indians to the rest of the survey sample at ages 16, 21 (or 19, if missing in the age 21 survey wave), and 30 (or 25, if missing in the age 30 survey wave). Non-American Indian children's households were never treated to the unconditional cash transfers. At age 16, the youngest cohort of American Indian children have been receiving the transfers for 3 to 4 years; the middle cohort have received them for 1 to 2 years; and the oldest cohort had not received them. Thus, when we compare children's outcomes at age 16 across race and cohorts, we are studying the short-term effects of casino transfers on those who received them as compared to those who did not from the same cohort (comparing AI to non-AI) or race (comparing the youngest and middle to the oldest cohorts of AI).

By age 17 all American Indian children have been treated to the casino payments. However, the treatment duration and the age at first exposure differ across the cohorts. When we consider long-term effects of transfer treatments, we compare American Indian to non-American Indian children. We set up the analysis to compare the youngest to the middle and the oldest cohorts at age 21, and age 30 for American Indians and non-American Indians. The interpretation of the results in this setup is different from that at age 16. The coefficients on the youngest and middle cohorts of American Indians show the differential effects of 3 to 4 (for the youngest) and 1 to 2 (for the middle) additional years of exposure to the cash transfers during childhood, relative to the oldest age group of American Indians.

The main estimating equation is the same across all ages:

$$Y_i = \alpha + \beta_1 \times YoungestCohort_i + \beta_2 \times MiddleCohort_i + \delta_1 \times AI_i + \\ \gamma_1 \times YoungestCohort_i \times AI_i + \gamma_2 \times MiddleCohort \times AI_i + X'\theta + \mu \times Wave_i + \epsilon_i \quad (1)$$

Where Y_i is an outcome variable such as a measure of individual mental health or economic wellbeing at different ages. Youngest and Middle Cohort are indicators that the child belongs to these cohorts, which were aged 9 and 11 at survey intake and aged around 13 and 15 when the casino opened. The age cohorts also control for any potential unobserved differences across the birth cohorts. The variable AI_i is an indicator variable for whether the child is American Indian or not. The wave dummy variables control for any time-specific unobserved differences that are affecting all children interviewed in the same survey wave. The vector X includes additional variables, determined from the first 4 survey waves (before the casino payments started), such as the (standardized) child's weight at birth, gender, average household income, and a measure of parental mental health. These initial characteristics are intended to control for differences in households prior to the start of the casino transfer payments The omitted category in our difference in difference analysis is the oldest cohort, which has been the least exposed to the casino transfers. The coefficients of interest are γ_1 and γ_2, which identify the difference between American Indian children of the youngest and middle cohort and those of the oldest cohort, relative to the non-American Indian children of the same cohorts.[5]

The receipt of additional household income may work differently depending on whether the child has already developed symptoms of mental health distress before the transfers started. To test for differential effects of the cash transfers on those who exhibited symptoms before the casino opened, we estimate the model separately for the group of children who have evidence of such symptoms recorded in the first four survey waves. The most straightforward way to do this is to stratify the data above and below the median for depression, anxiety, ADHD or oppositional disorder as measured during the first four survey waves.

We first study the effect of exposure to cash transfers on reported symptoms of mental health distress, such as anxiety, depression, ADHD and ODD at age 16 and anxiety and depression at ages 21 and 30. We are also interested in long-run measures of child wellbeing that can only be measured in adulthood. To test for the effects of additional household income on long-term socio-economic success, we create an index of labor market success and financial stability based on a series of questions asked of participants at ages 25 and 30. The score was standardized, and a higher score indicates better outcomes. We use the composite scores to avoid multiple tests across a large number of potential outcome variables. We stratify the sample according to the presence of symptoms in the first four survey waves to test for differential effects across the initial mental health distribution.

[5]We note that the different age across cohorts at the beginning of the transfers has two implications. First, we have differences in the duration of transfer receipt during childhood by age 18. Second, we have differences in the age at first treatment, which varies between 13 (youngest) and 17 (oldest) depending on the cohort. We are not able to test whether the duration or age at first exposure is the mechanism driving the estimated effects. Recent research has shown that the earlier the onset of trauma and/or abuse towards a child, the more pronounced and persistent will be the mental health outcomes and behavioral disorders (Dunn et al., 2020; Kaplow and Widom, 2007).

4 Results

4.1 Effect of Cash Transfer on Household Incomes

As a first step, we establish that the casino transfers had sizeable effects on the household income of American Indian families. We use a slightly modified version of the model shown in Equation 1, taking advantage of the fact that children in different cohorts were treated at different ages. In the model, we control flexibly for child age and compare household income across children from different cohorts at the same age. Appendix Table A4 shows that at ages 14-16, during the first three years of cash transfers, households of American Indian children of the youngest cohort (first treated at ages 13/14) were reporting around $6,900 on average more than households of American Indian children of the oldest cohort at the same ages (first treated at age 17). In the next three columns we consider differences at specific ages (at age 14, 15, and 16). As columns 2, 3, and 4 make clear, the amount of additional income received by the youngest cohort's households increases over time. At age 14, the middle and oldest cohort are not receiving transfers and the youngest cohort have just began to get them. At age 15 the middle cohort is starting to get the transfers and the youngest have been receiving them for up to 2 years. At age 16 the youngest children from American Indian households are receiving almost $8,500 more than the oldest cohort, who are not yet treated to the transfers. These estimates make clear that the unconditional cash transfers had large positive effects on household incomes for the youngest cohort of American Indian children by the time they reached age 16.

4.2 Effect of Cash Transfer on Depression and Anxiety Symptoms at Various Ages

In this section, we examine the impact of cash transfers on reported mental health disorder symptoms at various ages. Our analysis uses the difference in difference framework specified in Equation (1) and the results are provided in Table 4. In addition to the main coefficients of interest, we report estimates for the coefficients on gender, initial annual household income (measured in thousands of dollars as the average in the first 4 survey waves), standardized birth weight, and a variable flagging average parental mental health in the first 4 survey waves.[6] Butikofer et al. (2023) find that parental mental health diagnoses are associated with an almost 40% increase in the diagnosis of their own adolescent child; therefore, this is an important control variable to include in our analysis. American Indian children are just as likely to exhibit depression and anxiety symptoms at age 16, though they show relatively fewer symptoms at age 21 and age 30. Higher initial household income is protective of mental health at all ages. Parental mental health problems have strong positive correlations with children's mental health problems, similarly to what was reported in Butikofer et al. (2023). This could be because of genetic transmission or due to household-related stress. Considering the pattern of coefficients across different ages, the latter appears more plausible as the correlations are much reduced once the children are out of their parents' households. Boys have fewer symptoms of depression and anxiety, and the correlation appears to strengthen as the children age, which is consistent with findings in other studies (Prager, 2009). Higher birth weight is generally associated with fewer symptoms of depression and anxiety, though the coefficients are small.

The first two columns in Table 4 show the effect of the cash transfer on the number of depression

[6]This variable ranges between 0 - no mental health problems- and 2 and is recorded every year. We take the average measure from the first 4 survey waves.

and anxiety symptoms at age 16. This is the oldest age at which we have reports on household income and reports from parents on the mental health status of their children. The comparison here is between children of the same age whose households have been exposed to the cash transfers for a short period of 3 to 4 years to those who have been exposed for between 1 and 2 years and those who have not yet been exposed (oldest cohort of American Indian children) or will never be exposed to the transfers (non-American Indians of all cohorts). The coefficients for the youngest age cohort of American Indian children that have been treated the longest at age 16 are negative but not statistically significant. Relative to the oldest American Indian children and to non-American Indians of all cohorts, children from the middle age cohort also do not show significant effects on average.[7]

The next two columns in Table 4 provide results from the same analysis for age 21. At this age all American Indian children are receiving the transfers, but have received them for a different number of years. The estimated coefficients continue to be negative but lack statistical significance. Finally, in columns 5 and 6 we present the results for age 30 and show that the estimated coefficients are negative, much larger, and statistically significant. The reductions in depression and anxiety symptoms are quite large at age 25 and older. At those ages, all American Indian children are reporting fewer symptoms than non-AI children, as reflected in the AI dummy coefficient. Still, the differential difference with the youngest and longest treated cohort is striking. The implication is that the youngest cohort of American Indian children, whose households received the cash transfers since they were around age 13, reported on average one fewer symptom of anxiety and depression by their late 20s. The mean number of reported depression symptoms is around 1 (range from 0 to 9) at these ages and the mean number of anxiety symptoms is 1.2 (range from 0 to 17). These results are consistent with the correlations in mental health symptoms as children age reported in Table A1. A potential concern is that there are differential trends across treatment status over time. In Appendix Figures A1 and A2 we show the event analysis for anxiety and depression symptoms across various waves (note that we combine results for a post casino intervention outcome).[8]

The effects of additional household income may differ by the initial mental health status in the population of children. For those who rarely or never experienced mental health symptoms before the transfers started, the additional income might not have the same impact as those who already reported symptoms in the first 4 survey waves. The improvement in household financial wellbeing could prevent new symptoms from developing, or reduce the number of already existing symptoms, or both.[9]

To investigate the potential heterogeneity in effects by severity of initial symptoms, in Tables 5 and 6 we estimate separate models by the median initial level of mental health disorder symptoms for all children prior to the fourth survey wave. Our choice of separating the median initial level of mental health disorder symptoms is motivated by the need to maintain roughly equal-sized samples for the

[7]Symptoms of ADHD and ODD were reported by parents for the last time when the children were aged 16. In Appendix Table A5 we show the corresponding estimates for ADHD and ODD at age 16. Among the youngest cohort of American Indians, there appears to be a substantial reduction in the average number of ADHD symptoms and a modest decrease in the number of reported ODD symptoms associated with the transfers.

[8]In unreported analysis, we do not find strong differences in the effects of the cash transfer during childhood by gender. We have also conducted the analysis shown in Table 4 with a balanced panel for children represented at all ages and the results are very similar to those shown in the table we show here. Finally, the results shown here are robust to a re-coding of the outcome variable to any depression symptoms at the various ages instead of using the actual counts.

[9]In Appendix Table A6 we show that the income changes due to the casinos were of similar size above and below the median number of initial symptoms.

Table 4: Symptoms at Ages 16, 21 and 30

VARIABLES	(1) Dep Symp at 16	(2) Anx Symp at 16	(3) Dep Symp at 21	(4) Anx Symp at 21	(5) Dep Symp at 30	(6) Anx Symp at 30
AI x Youngest	-0.111	-0.290	-0.137	-0.0706	-1.075***	-1.132***
Age Cohort	(0.177)	(0.283)	(0.211)	(0.304)	(0.202)	(0.275)
AI x Middle	-0.0933	-0.0261	0.0346	-0.0267	-0.300	-0.310
Age Cohort	(0.161)	(0.193)	(0.209)	(0.264)	(0.198)	(0.266)
Youngest Age Cohort	0.0463	0.335**	0.256	0.295	0.666***	0.798***
	(0.0959)	(0.169)	(0.233)	(0.394)	(0.150)	(0.227)
Middle Age Cohort	-0.111	-0.224*	0.128	0.389	0.0340	0.0874
	(0.0905)	(0.120)	(0.219)	(0.368)	(0.133)	(0.205)
AI Indicator	0.00799	-0.132	0.0155	-0.360*	-0.453***	-0.843***
	(0.115)	(0.140)	(0.149)	(0.197)	(0.160)	(0.209)
Male	-0.112*	-0.345***	-0.346***	-0.501***	-0.202**	-0.491***
	(0.0657)	(0.108)	(0.0762)	(0.116)	(0.0867)	(0.131)
Initial	-0.00441**	-0.00276	-0.00294	-0.00210	-0.00493*	-0.00642
Household Income	(0.00202)	(0.00379)	(0.00245)	(0.00401)	(0.00258)	(0.00397)
Average Parental	0.192***	0.331***	0.0859	0.257**	0.0844	0.0689
Mental Health	(0.0524)	(0.103)	(0.0567)	(0.100)	(0.0678)	(0.0958)
Birth Weight	-0.0434	0.00980	-0.0652*	-0.0954*	-0.0631	-0.0907
	(0.0345)	(0.0485)	(0.0354)	(0.0497)	(0.0494)	(0.0695)
Mean of Dep. Variable	0.7530	0.7557	0.8308	0.9027	1.0987	1.2929
Observations	1,101	1,101	1,182	1,182	1,195	1,195
R-squared	0.031	0.048	0.032	0.050	0.109	0.099

Note: The difference in difference regression analysis includes an age variable(columns 3-6) and a constant. The estimated coefficients are the difference in difference interactions for the two youngest age cohorts of American Indian children that were treated to the casino payments during childhood. The oldest age cohort is the omitted comparison group for this analysis. Robust standard errors are reported in the table. Initial Household Income variable has been re-scaled in thousands of dollars. Symptoms are reported by parents and children at age 16; by children only at ages 21 (19) and 30 (25). The coefficients on the youngest and middle age groups in the last two columns are statistically significantly different from each other.

Table 5: Depression Symptoms Below and Above Initial Median Symptoms at Ages 16, 19/21 or 25/30

VARIABLES	(1) Depression Symptoms at 16	(2) Depression Symptoms at 16	(3) Depression Symptoms at 21	(4) Depression Symptoms at 21	(5) Depression Symptoms at 30	(6) Depression Symptoms at 30
AI x Youngest	-0.322**	0.137	-0.161	-0.00220	-0.963***	-1.133**
Age Cohort	(0.162)	(0.434)	(0.210)	(0.539)	(0.210)	(0.453)
AI x Middle	-0.287**	0.0575	0.121	-0.235	-0.217	-0.335
Age Cohort	(0.130)	(0.357)	(0.218)	(0.477)	(0.212)	(0.429)
Youngest Age Cohort	0.350***	-0.381**	0.220	0.210	0.566***	0.892***
	(0.0976)	(0.163)	(0.138)	(0.186)	(0.168)	(0.235)
Middle Age Cohort	0.140*	-0.518***	-0.000672	-0.100	-0.0273	0.132
	(0.0770)	(0.164)	(0.123)	(0.170)	(0.154)	(0.207)
AI Indicator	0.187**	0.131	0.0127	0.222	-0.243	-0.754*
	(0.0931)	(0.242)	(0.134)	(0.407)	(0.152)	(0.397)
Sample:	Below Med Depression	Above Med Depression	Below Med Depression	Above Med Depression	Below Med Depression	Above Med Depression
Mean of Dep. Var.	0.488	1.15	0.663	1.07	0.861	1.43
Observations	658	443	701	481	693	502
R-squared	0.039	0.038	0.026	0.046	0.102	0.121

Note: Each column in the table separates observations according to whether the average initial count of depression symptoms were above or below the median count for all survey respondents over the first four survey waves. The number of observations are not perfectly split given that the distribution of symptoms for the below median category often has a value of 0; therefore, it was not possible to reduce the number of observations in the below median category to create evenly sized groups for these disorder symptoms. The difference in difference regression analysis includes an age variable(columns 3-6), gender, average household income measure prior to the casino operations, parental mental health measure and the child's birthweight measure and a constant. The estimated coefficients are the difference in difference interactions for the two youngest age cohorts of American Indian children that were treated to the casino payments during childhood. The oldest age cohort is the comparison group for this analysis. Robust standard errors are reported in the table.

analysis.

The median number of reported symptoms in the first 4 waves for depression and anxiety is 0.75 (it is 0.5 for ODD and 0 for ADHD). We show the progression over ages 16, 21 (or 19 if 21 is not available), and 30 (25 if 30 is not available) below and above the median number of reported symptoms for each condition. In Table 5 the first two columns present the estimated coefficients for a difference in difference analysis for children at age 16, who had below the median count of depressive symptoms and those that had above median count of depressive symptoms in the first 4 survey waves. The estimates show an interesting pattern. In the short run and at younger ages, additional household cash appears to benefit children who reported less than one symptom of depression on average in the first 4 survey waves. The effects are similar for the youngest and middle cohorts, though the magnitude is larger for the youngest cohort. We see no significant effects for the children who were initially above the median level of depression symptoms. At age 21, when all American Indian children have been receiving the transfers, we find no statistically significant effects of receiving additional household income for longer across the entire distribution of initial symptoms. Still, the coefficient on the youngest cohort of treated children initially below the median number of depression symptoms is negative. Finally, the last two columns provide the estimated coefficients for depressive symptoms reported at age 30. The negative effects reported in Table 4 are coming from the entire distribution of initial symptoms, though the point estimate is larger for those who reported some symptoms in initial waves.

Table 6 provides a similar analysis of the effect of cash transfers on the count of anxiety symptoms at various ages by the initial level of anxiety symptoms in the earliest survey waves. The pattern over time is strikingly similar to the one we observed for depression symptoms. At age 16 the effects are concentrated in the subset of children with below median reported symptoms in the first 4 survey waves. We see smaller and statistically insignificant effects in that group at age 21, though the coefficient of interest in column 3 is still negative and relatively large in size. The largest effects are estimated at ages older than 25, and here again we see the reduction in symptoms is more substantial for those who were initially above the median in terms of anxiety symptoms in childhood.

Appendix Table A7 shows the corresponding estimates for ODD and ADHD at age 16. In contrast to what we observe with depression and anxiety, the reductions in ADHD and ODD symptoms happen in the sample of children who are initially above the median - their parents have reported some ADHD symptoms and there are reports of at least one symptom of ODD in more than two survey waves. Unfortunately symptoms for these conditions are not well defined for ages older than 16 and we cannot follow the evolution of these patterns at later stages of life.

For robustness, we ran separate analyses by terciles of the initial distributions of symptoms. Appendix Figures A3 and A4 demonstrate similar patterns to what we report using the median split.[10] In another robustness test, in Appendix Table A8 we show that the estimated effects for the mental health disorder symptoms were not present in the third survey wave, when the children were aged roughly 11, 13 and 15.

[10]In unreported analyses, we split the sample of initial children depending on whether they reported 1 or more symptoms in the first 4 survey waves or less. The results are very similar to those we report using the median (at 0.75 symptoms on average), but the sample sizes are less balanced.

Table 6: Anxiety Symptoms Below and Above Initial Median Symptoms at Ages 16, 21 or 30

VARIABLES	(1) Anxiety Symptoms at 16	(2) Anxiety Symptoms at 16	(3) Anxiety Symptoms at 21	(4) Anxiety Symptoms at 21	(5) Anxiety Symptoms at 30	(6) Anxiety Symptoms at 30
AI x Youngest	-0.468**	-0.253	-0.284	0.0193	-0.882***	-1.616***
Age Cohort	(0.220)	(0.609)	(0.264)	(0.670)	(0.300)	(0.588)
AI x Middle	-0.314**	0.104	-0.0673	-0.204	-0.0393	-0.774
Age Cohort	(0.144)	(0.426)	(0.247)	(0.577)	(0.235)	(0.594)
Youngest	0.468***	0.102	0.357**	0.0963	0.696**	0.996***
Age Cohort	(0.149)	(0.293)	(0.168)	(0.315)	(0.278)	(0.321)
Middle	0.189**	-0.716***	0.166	-0.338	-0.113	0.430
Age Cohort	(0.0943)	(0.222)	(0.180)	(0.288)	(0.209)	(0.326)
AI Indicator	0.0809	-0.0378	-0.0460	-0.434	-0.640***	-0.818
	(0.0821)	(0.354)	(0.165)	(0.487)	(0.189)	(0.519)
Sample:	Below Med Anxiety	Above Med Anxiety	Below Med Anxiety	Above Med Anxiety	Below Med Anxiety	Above Med Anxiety
Mean of Dep. Var.	0.378	1.22	0.531	1.36	0.887	1.77
Observations	609	492	650	532	645	550
R-squared	0.053	0.038	0.034	0.044	0.091	0.102

Note: Each column in the table separates observations according to whether the average initial count of anxiety symptoms were above or below the median count for all survey respondents over the first four survey waves. The number of observations are not perfectly split given that the distribution of symptoms for the below median category often has a value of 0; therefore, it was not possible to reduce the number of observations in the below median category to create evenly sized groups for these disorder symptoms. The difference in difference regression analysis includes an age variable(columns 3-6), gender, average household income measure prior to the casino operations, parental mental health measure and the child's birthweight measure and a constant. The estimated coefficients are the difference in difference interactions for the two youngest age cohorts of American Indian children that were treated to the casino payments during childhood. The oldest age cohort is the comparison group for this analysis. Robust standard errors are reported in the table.

4.2.1 Discussion of Observed Mental Health Outcomes by Age

Our findings indicate that the increase in household income during childhood predicts a reduction in adult symptoms of depression and anxiety. We also find a reduction in symptoms for treated 16 year olds who had below the median number of symptoms; however, these effects disappear in subsequent measures taken at ages of 19/21. In this section, we discuss why this may occur and offer several hypotheses. The phenomenon known as program effect "fadeout" has been found in a number of child and young adult domains (Currie and Thomas, 1995; Ludwig and Miller, 2007). Most of the economics research has focused on the effect of educational interventions on short and medium run student outcomes and many have noted that initial positive effects have tended to moderate over time. Subsequent work that examined longer term outcomes notice a rebounding of noticeable effects (Deming, 2009; Pages et al., 2020).

In our setting, we examine the effect of changes in household income on the mental health of children at various points over their life. "Fadeout" of program effects may occur in this scenario due to the various changes occurring in the late adolescence and early adulthood time period. There are physical, emotional and environmental changes occurring in the transition to adulthood that may make this period especially prone to uneven growth and development. Thus, there may be less of a direct path between any potential programmatic effects and observed outcomes. This may be especially relevant for mental health measures.

There is increasing evidence that different mental health disorders and symptoms may become more or less apparent at different points over the lifecourse. In Costello et al. (2011), the authors conduct a meta analysis of research on the trends of mental health disorders and their prevalence over different ages. They find that different types of disorders appear and disappear at different developmental ages. In the transition between childhood and adolescence they find, "an increase in rates of depression, panic disorder, agoraphobia, and substance use disorders (SUD), and a decrease in separation anxiety disorder (SAD) and attention-deficit hyperactivity disorder (ADHD)." Subsequently, from late teen age years to early adulthood they find, "there is a further increase in panic disorder, agoraphobia, and substance use disorders." Overall, the research on this topic indicates that different disorders become salient over a person's lifetime and there is not a constant risk of experiencing these symptoms; they tend to wax and wane at different points in time.

Yet another possible explanation is more mechanical and related to measurement. The recorded measures may suffer from referral bias in the transition from childhood to adulthood. For example, ADHD is primarily a disorder of children as their parents and/or teachers are apt to report these potential problems (and seek medical help or diagnosis). In adulthood, no such pathway for reporting of ADHD symptoms exists. While we rely on anxiety and depression symptoms that are consistently reported and identifiable over time, the reporting changes from parents and children to young adults to adults. At ages 16 and over 25 there is an adult providing the assessment of symptoms - either a parent or the adult child herself. At ages 21 or 19 only the adolescent or young adult is providing the assessment of their own condition.

While we cannot conclusively distinguish between the different possibilities, the evidence we present underscores the importance of using panel data and observations across the lifecourse when evaluating long-term effects of childhood interventions. Critical ages, structural differences in how diagnoses are derived and reported, and the potential variability of factors that are salient to mental

Table 7: Mental Health Service Utilization During Adolescence

	(1)	(2)	(3)	(4)
	In the past 3 months, sought any:			
VARIABLES	Prof Health	School Mental Health	Informal Mental Health	Any Mental Health
AI x Youngest	-0.0142	-0.0821	-0.117**	-0.179**
Age Cohort	(0.0478)	(0.0552)	(0.0584)	(0.0773)
AI x Middle	-0.0344	-0.0319	-0.0659	-0.0776
Age Cohort	(0.0479)	(0.0629)	(0.0662)	(0.0838)
Youngest	0.0192	-0.0480**	-0.0495*	-0.0381
Age Cohort	(0.0252)	(0.0233)	(0.0256)	(0.0373)
Middle	0.0245	-0.0125	-0.00477	0.00154
Age Cohort	(0.0254)	(0.0253)	(0.0277)	(0.0379)
AI Indicator	-0.00793	0.0699	0.0878*	0.0927
	(0.0362)	(0.0495)	(0.0524)	(0.0649)
Observations	1,101	1,101	1,101	1,101
R-squared	0.011	0.031	0.030	0.041

Note: Regressions include race, birth cohort measures, age, survey wave measures, gender, household income measures, birthweight measures and average parent mental health and a constant.

wellbeing make the analysis of policy effects on the mental health of children and adolescents particularly challenging.

4.2.2 Use of Mental Health Services at Various Ages for the Children and Parental Mental Health Outcomes

We turn next to the potentially important question of whether the improvements in mental health outcomes for some children at age 16 are driven by higher utilization of mental health counseling services. On the one hand, it is possible that the cash transfers facilitated the use of mental health services and this resulted in better mental health. On the other hand, improved household finances could reduce the incidence of mental health problems through some other channels, and thus decrease the need for interventions by mental health professionals. Our finding that the effects of additional unearned income manifest first in those displaying fewer symptoms suggests that at least in the short run, the mechanism goes through a reduction in the probability of developing new symptoms, rather than a decrease in symptoms among those who already display elevated levels of psychological distress.

When we study the impact of additional cash transfers on the probability of using different types of psychological counseling at age 16 we find supporting evidence for this hypothesis. As the results in Table 7 suggest, receiving cash transfers reduces the utilization of mental health services by the youngest cohort of American Indian children relative to everyone else. In particular, we see large reductions in the probability of receiving mental health treatment in an informal setting, also reflected in the probability of receiving any mental health counseling. The middle cohort of American Indian children is also less likely to receive services, but the effects are much smaller (and do not attain statistical significance).

When we split the analysis below and above the median for depression and anxiety in Appendix

Table A9 we find again that the impact is concentrated among children who initially displayed fewer symptoms of mental health distress. This is concordant with the pattern of results in Tables 5 and 6. These children are less likely to develop symptoms by age 16 and they are also less likely to seek help for mental health problems. This suggests that rather than increasing the incidence or intensity of mental health treatments, the cash transfers affect children's mental health through reducing the need for treatment. The differences in mental health care utilization attributable to exposure to the transfers are large. In a study of the entire Danish population, Kristiansen (2021) reports increases in the probability of mental health treatments for adolescents of forty percent associated with serious parental illness and over 200 percent associated with parental death. The effects of positive and negative shocks are not necessarily symmetric, and the incidence of serious parental illness or death is much more complex than the intervention we study here. Further, we consider any mental health help, while Kristiansen (2021) focuses on professional help following a diagnosis. Still, our estimates are within the range identified in her study.

We show the pattern for any type of mental health counseling and for school-based interventions in particular. We focus on school-based counseling because it is less likely to be affected by parents' beliefs or differential propensity to seek help conditional on their children's mental health state. Indeed, we again find a reduction in the probability of school-based interventions for the youngest cohort of American Indian children, and again for the group of children initially below the median level of depression and anxiety symptoms.

In additional, unreported analysis, we examine whether the individuals who were treated to the higher household income during childhood are more likely to use any mental health services at older ages (19 year and older). We do not find any statistically significant differences in the use of mental health services at older ages. We conclude that our findings are unlikely to be due to differential mental health service utilization.

4.3 Cash Transfers during Childhood and Economic Wellbeing Index Measures at Age 30

We now turn to examining if longer exposure to increased household incomes during childhood resulted in better adult Economic Wellbeing index score. Recent research in economics has focused on establishing the causal link between childhood mental health and long-term outcomes. In a series of papers, several researchers have examined the association between common childhood mental health conditions (ADHD, anxiety, depression, and conduct disorders) and education outcomes (Currie and Stabile, 2006, 2007; Currie et al., 2010). They find consistent negative correlations between all disorders and children's education outcomes, though ADHD is the most detrimental. They also report no significant mediating effects of family income or maternal education, although their estimation is based on siblings fixed effects models without exogenous shocks to family income. Currie et al. (2010) show that mental health problems in childhood (ADHD and conduct disorder) have strong predictive power for adult outcomes regardless of whether similar problems are present in adulthood. In a related series of papers Fletcher (2010, 2014) and Fletcher and Wolfe (2008) show that mental health problems in adolescence are negatively correlated with long-term economic and educational success. Using the Panel Study of Income Dynamics (PSID) Smith and Smith (2010) estimate lifetime loss of family income associated with psychological problems during childhood of approximately $300,000. Studies that can control

Table 8: Economic Wellbeing Index at Age 30

Variables	Economic Wellbeing	Economic Wellbeing	Economic Wellbeing	Economic Wellbeing	Economic Wellbeing
AI x Youngest	0.388**	0.293	0.559**	0.481**	0.408*
Age Cohort	(0.155)	(0.201)	(0.241)	(0.211)	(0.230)
AI x Middle	0.0594	0.155	0.0109	0.192	0.00997
Age Cohort	(0.151)	(0.188)	(0.236)	(0.203)	(0.226)
Youngest Age Cohort	-0.0968	-0.233*	0.0651	-0.217*	-0.0220
	(0.0937)	(0.131)	(0.132)	(0.130)	(0.129)
Middle Age Cohort	-0.0326	-0.240**	0.180	-0.188	0.0833
	(0.0890)	(0.118)	(0.128)	(0.125)	(0.122)
AI Indicator	0.224*	0.112	0.234	0.109	0.189
	(0.116)	(0.138)	(0.184)	(0.151)	(0.179)
Male	-0.153***	-0.181**	-0.113	-0.133*	-0.193**
	(0.0564)	(0.0788)	(0.0805)	(0.0780)	(0.0809)
Initial	0.0149***	0.0137***	0.0150***	0.0151***	0.0135***
Household Inc	(0.00169)	(0.00209)	(0.00253)	(0.00212)	(0.00264)
Average Parental	-0.0442	0.0180	-0.0248	0.0832	-0.0606
Mental Health	(0.0436)	(0.0708)	(0.0566)	(0.0679)	(0.0565)
Birth Weight	0.0321	-0.0120	0.0397	0.00301	0.0511
	(0.0306)	(0.0397)	(0.0436)	(0.0419)	(0.0437)
Sample:	Total	Below Med Depress	Above Med Depress	Below Med Anxiety	Above Med Anxiety
Mean of Dep Var	-0.12	0.095	-0.3	0.056	-0.268
Observations	1,195	546	649	549	646
R-squared	0.097	0.098	0.106	0.108	0.086

Note: Regressions include a constant. Outcome variable is an index comprised of the following variables indicating whether an individual is a: high school dropout, has ever been fired, fired 2 or more times, quit a job without a plan, unable to pay bills, has a perceived financial need, no insurance, 2+ years of unemployment, and an in poverty indicator. The outcome has been re-scaled so that a higher value indicates an improvement in economic conditions for this outcome variable. Initial Household Income variable has been re-scaled in thousands of dollars.

for unobserved family characteristics through siblings regressions provide suggestive evidence that the connection between psychological wellbeing in childhood and long-term outcomes is causal in nature. In a recent publication Algan et al. (2022) go a step further and analyze the results from a randomized control study that aimed to increase children's social and self-control skills in kindergarten. They find positive long-run impacts on marriage, employment, and incomes in adulthood. In this section, we directly analyse whether exposure to increased household incomes affects economic wellbeing.

In column 1 of Table 8 we show differences between cohorts and race in the Economic Wellbeing index at age 30.[11] The estimated coefficient on the youngest group of American Indians is positive and statistically significant. It is positive but not statistically significant for the middle age cohort of treated children. Women have a higher economic wellbeing score, as well as those who grew up in households with higher incomes. We find no significant correlations with parental mental health problems or birth weight, though the coefficients have the anticipated signs.

[11]In cases where an individual does not have an age 30 observation we use their age 25 observation in its place. We include an indicator variable for age in the model.

In the next four columns, we separate the observations for individuals who were below or above the initial (prior to survey wave 4) median counts of disorder symptoms (depression or anxiety). Columns 2 and 3 focus on depression symptoms and indicate the treatment of additional household income generally is related to a positive and higher level of the economic success index at age 30. The coefficient is larger and is only statistically significant for individuals who started out with above median levels of depression symptoms. Columns 4 and 5 focus on initial anxiety symptoms. In this case, we find that the additional household income equally positively affects a person's economic wellbeing index at ages 25 and 30.[12]

Is it plausible that the positive effects of extra household income on mental health in adulthood are contributing to the improvements in economic wellbeing? Previous research has shown that positive income shocks improve non-cognitive skills during childhood and adolescence (Akee et al., 2018; Milligan and Stabile, 2011) and negative wealth or economic shocks result in increased depression and anxiety (Avdic et al., 2021; Li and Toll, 2021; McInerney et al., 2013). To further investigate this possibility, we first demonstrate the relationship between symptoms of mental health disorders at age 30 and contemporaneous measures of the economic wellbeing index.

In Appendix Table A11 we show the correlations between contemporaneous measures of depression and anxiety symptoms measured at age 30 and the economic success index measured at the same time for non-American Indians. The negative correlations are larger at these older ages compared to the estimates from childhood reported in Table A3. An additional depressive symptom during a person's late 20s decreases the economic wellbeing index by 0.2 and an additional anxiety symptom decreases it by 0.13.

According to these estimates, a reduction in depression symptoms at age 30 would lead to a 0.2 standard deviations increase in the economic wellbeing measure (given that the standard deviation for the economic wellbeing index for non-American Indians is 1.06). A reduction of one symptom of anxiety disorder would lead to a corresponding increase of 0.13 standard deviations in economic wellbeing. Taking these at face value and in combination with the estimates reported in Appendix Table A10, we can explain almost the entire improvement in the economic wellbeing index for those with below median depression symptoms with the improvements in mental health; about forty percent of the difference in the economic wellbeing for those above the median of initial depressive symptoms could be attributed to the alleviation of mental health distress. There are no significant differences in economic wellbeing for those above and below the median in initial anxiety symptoms. Approximately forty to fifty percent of the increase in economic wellbeing could be attributed to the reduction in anxiety symptoms experienced by the youngest group of American Indians by age 30.

To investigate the channels that drive the estimated effects on the economic wellbeing index, we study separately its different components. In particular, we are interested in the group of children who initially displayed above median symptoms of anxiety or depression. These individuals only show improvements in mental health at age 30, and a concurrent improvement in economic wellbeing. One

[12]In Appendix Table A10 we conduct a similar analysis of separating out the initial disorder symptom counts for above and below median levels of ODD and ADHD. In the first two columns we show that the effect of additional household income has a positive effect on the economic wellbeing index measure for the group that initially had above the median symptom counts for ODD. The next two columns provide similar analysis for individuals with below and above median symptoms of ADHD. Similarly to what we find with depression, the positive effects are concentrated in the group of children with below median ADHD symptoms initially.

Table 9: Quit Job by Initial Disorders at Age 30

VARIABLES	Quit Job w/o Plan	Quit Job w/o Plan	Quit Job w/o Plan	Quit Job w/o Plan
AI x Youngest	-0.269**	-0.0607	-0.235*	-0.118
Age Cohort	(0.127)	(0.0908)	(0.123)	(0.100)
AI x Middle	-0.251**	0.0164	-0.115	-0.102
Age Cohort	(0.116)	(0.0873)	(0.117)	(0.0949)
Youngest	0.0578	0.0963	0.0723	0.0985
Age Cohort	(0.0613)	(0.0611)	(0.0586)	(0.0634)
Middle	-0.0248	0.0782	-0.0113	0.0826
Age Cohort	(0.0615)	(0.0602)	(0.0584)	(0.0636)
AI Indicator	0.454	1.301*	-0.278	1.419*
	(0.739)	(0.669)	(0.740)	(0.767)
Sample:	Above Median Depression	Below Median Depression	Above Median Anxiety	Below Median Anxiety
Observations	646	545	644	547
R-squared	0.071	0.089	0.078	0.068

Each column in the table separates observations according to whether the average initial count of anxiety symptoms were above or below the median count for all survey respondents over the first four survey waves. The number of observations are not perfectly split given that the distribution of symptoms for the below median category often has a value of 0; therefore, it was not possible to reduce the number of observations in the below median category to create evenly sized groups for these disorder symptoms. The difference in difference regression analysis includes birth cohort variables, a race by age variable, gender, average household income measure prior to the casino operations, parental mental health measure and the child's birth weight measure. The estimated coefficients are the difference in difference interactions for the two youngest age cohorts of American Indian children that were treated to the casino payments during childhood. The coefficient on the oldest age cohort is the comparison group for this analysis. Robust standard errors are reported in the table.

concern was that there could be a mechanical effect of income receipt that is driving the probability of being below the federal poverty rate among American Indian respondents. We found no significant differences in that component of the index. We did find significant differences in employment-related behaviors, in particular among the group that displayed above median mental health issues before the transfers. Table 9 reports the effects by subgroup on the binary outcome indicating that the responded quit a job on a whim, without considering future plans. There are clear differences in responses across the initial distribution of depression symptoms, and some differences across the distribution of anxiety symptoms. These differences are at least partly responsible for the improved economic wellbeing scores for those with above median initial symptoms.

5 Conclusion

A growing body of research has demonstrated the causal link between family economic resources and children's long-term health and labor market success. Parallel strands of work have shown positive correlations between family economic circumstance and child mental health, and between better child mental health and adult outcomes. A natural question is whether improved family economic resources affect children's long-term economic wellbeing partly by ameliorating children's mental health.

This study utilizes twenty years of longitudinal survey data from the Great Smoky Mountains Study of Youth - a survey specifically designed to identify mental health and behavioral issues in youth and follow these youth over the life-cycle. We find that by age 30, survey respondents who were treated longer (since ages 13 or 14) to exogenous unearned cash transfers reported fewer symptoms of anxiety and depression and better economic wellbeing. We find a strong persistence of symptoms of mental health distress in the long-run in the sample of children unaffected by the cash transfers, and in years before the transfers began. Yet we find much reduced or no long-run correlation in symptoms in the children who received the transfers. When we consider mental health outcomes in late childhood (age 16) and young adulthood (age 21), we find that the negative correlation between receiving additional household income and children's mental health symptoms first manifests in those who are less likely to suffer from depression and anxiety before the transfers begin. This suggests that the impact of additional household resources evolves differently over time depending on the presence of initial symptoms.

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