Potential Economic Benefits of an Early Childhood Screening and Treatment Initiative

The Child Health and Development Project: Mississippi Thrive!

Prepared by Cael Warren for Mississippi Thrive!, a partnership of The University of Mississippi Medical Center and Mississippi State University's Social Science Research Center, with funding from the Health Resources Services Administration

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Executive summary

This study, conducted on behalf of the Child Health and Development Project: Mississippi Thrive!, aims to estimate the potential economic benefits associated with early childhood screening and the interventions that follow (referral, treatment, care coordination) when certain developmental conditions are identified. Conditions being examined include autism spectrum disorders (ASD), ADHD, dyslexia, dyscalculia, disruptive behavior disorder, and anxiety. For each condition, we use existing literature to identify common interventions and evidence of their effects on the condition and associated symptoms. Wherever possible, we then link these effects of the interventions to their indirect outcomes, focusing on those for which it is possible to assign a monetary value. For example, intervening early for a child on the autism spectrum can greatly improve the child's ability to thrive in a classroom full of neurotypical children (i.e., intervention can significantly reduce the "symptoms" of ASD). As a result, the child may require fewer special education resources than they otherwise would – an impact with a monetary value that can be quantified.

We add up the expected per-child economic impacts of intervention for each condition, and then use the estimated prevalence of each condition to compute the statewide economic benefits of the intervention in a range of scenarios with varying screening rates. For each condition, we estimate the share of these benefits that accrue to each of three groups of stakeholders: taxpayers (i.e., government/public agencies), the children themselves (participants), and other individuals in society. Although each phase of this analysis is limited by the availability of evidence in the literature (e.g., the extent to which the existing literature enables us to link the impacts of the interventions to economic outcomes), this study synthesizes the available evidence to piece together a lower-bound estimate of the economic value of early childhood screening and subsequent treatment.[1]

By a conservatively low estimate, the potential value of screening, referral, treatment, and care coordination for Mississippi's young children ranges from $177 million for a program reaching 30% of children to more than $590 million for a universal screening, referral, and treatment program with care coordination (Table 1). We believe these estimates undercount the true benefits because data were not available to quantify the intervention benefits for several conditions (such as speech and language disorders). In addition, we were only able to quantify the value of a limited number of outcomes for the

[1] One goal of this study was to explore the possibility of separately quantifying the benefits of each component: screening, referral, treatment, and care coordination. In the end, we were able to separately quantify the benefits of care coordination (which we represent as something of a multiplier effect, enhancing the benefits of the other components). Separating the effects of screening, referral, and treatment, on the other hand, turned out to be difficult to execute. (This is described in greater detail below.) Because of the importance of screening and referral in facilitating a successful treatment strategy, we label the results as the shared benefits of screening, referral, and treatment, though technically speaking, most of the value estimates are derived from the treatment literature.

conditions that are included in the study. These "totals" represent only a partial estimate of the true value, but they nonetheless present a potential aggregate net benefit of well over half a billion dollars for the population of Mississippi children under age 6 today.[2]

Nearly half of these benefits ($286 million) accrue to the children, largely in the form of increased future earnings, while 38% ($225 million) comes in the form of increased tax revenues and avoided public costs (e.g., special education and health care).

1. Selected lifetime net benefits of screening, referral, treatment, and care coordination for early childhood developmental/behavioral health conditions

	Taxpayers	Participants	Others	Total
Net benefits per child reached with screening, referral, treatment, and care coordination	$1,006	$1,285	$375	$2,666
Aggregate benefits by assumed percentage of children reached with screening, referral, treatment and care coordination				
% of children reached	**Taxpayers**	**Participants**	**Others**	**Total**
30%	$66,765,000	$85,621,000	$24,900,000	$177,286,000
60%	$133,530,000	$171,241,000	$49,799,000	$354,571,000
100%	$222,550,000	$285,402,000	$82,998,000	$590,952,000

Sources. Author's summary computations based on secondary data as annotated throughout the report.
Note. Values have been adjusted from 2018 USD to 2020 USD. Due to rounding, totals may differ slightly from the sum of the row or column to which the total applies.

[2] Most benefits are estimated over the course of the child's lifetime, net of the treatment costs (i.e., the costs of the intervention required to generate those benefits). In the studies referenced in this report, treatment costs tend to be shorter-term, as the treatments occurred over a matter of a few months to a few years.

Contents

Introduction

Developmental screening in early childhood involves the use of an evidence-based screening tool to evaluate a child's development, communication, and social behaviors, based on observation or discussion between a child's parent or caregiver and a health care, child care, or other screening professional. Early discovery of developmental delays, along with early intervention upon discovery, is crucial during the first few years of a child's life, a vital time of rapid brain growth and development. The American Academy of Pediatrics recommends that developmental and behavioral screening with a validated screening tool should occur at 9 months, 18 months, and 30 months so any issues can be promptly addressed (Hagan et al., 2017). Although the magnitude of the early-intervention advantage has not yet been rigorously quantified for most early childhood conditions, intervening early is known to yield stronger outcomes for the child in the long run (see Guralnick, 2011; Guralnick, 1997; Haberstroh & Schulte-Körne, 2019; Sanfilippo et al. 2020). This is echoed by Nobel-Prize-Winning economist James Heckman, who has spent decades studying the long-term impacts of early childhood education (First Five Years Fund, 2012):

> *The highest rate of return in early childhood development comes from investing as early as possible, from birth through age five, in disadvantaged families. Starting at age three or four is too little too late, as it fails to recognize that skills beget skills in a complementary and dynamic way. Efforts should focus on the first years for the greatest efficiency and effectiveness.*

The Child Health and Development Project: Mississippi Thrive! is a partnership of The University of Mississippi Medical Center and Mississippi State University's Social Science Research Center, with funding from the Health Resources Services Administration. Mississippi was selected for this project as a high-need, low-resource state; Congress stipulated that this funding opportunity be directed to a state with a high poverty rate among young children, a low rate of early childhood development screening, and high rates of developmental delays and other early childhood health problems (Health Resources and Services Administration, 2017). The goal of Mississippi Thrive! is to improve the early childhood developmental/behavioral health system in the state, inclusive of robust developmental/behavioral screening, referral, treatment, and coordinated care for children 0-71 months. This early detection and treatment of developmental and health problems in young children has the potential to reduce Medicaid spending, save other preventable costs to families and taxpayers, and help to set young children on track for success in school and, ultimately, in their careers.

Wilder Research was hired to quantify the monetary value of some of these benefits for children, families, and taxpayers. This study compiles a variety of research conducted elsewhere[3] to quantify the impact of treatment on a child's symptoms and on their medium- to long-term economic outcomes, such as school expenditures, health care costs, and the child's earnings (and taxes paid) in adulthood. This report provides a number of estimates of these benefits, but due to the widely acknowledged dearth of literature in this area (Knapp & Wong, 2020; Jullien, 2021; Beecham, 2014; Haberstroh & Schulte-Körne, 2019), the estimated values should be considered only a lower bound for the true value.

In addition, the estimated benefits, drawn from existing literature, are generally based on the impacts of treatment, which may have occurred without the screening and referral that are central to the approach of the Mississippi Thrive! initiative. Given the potential value of screening and referral in correctly diagnosing a condition and identifying the appropriate course of treatment, these estimated treatment benefits likely underestimate the combined value of screening, treatment, and referral.

Finally, the benefits of identifying and treating several conditions (such as speech/language disorders and vision/hearing issues) are not included because we were unable to locate rigorous research quantifying treatment impacts that could be monetized. Even for those conditions with benefits quantified here, there are likely numerous other yet-to-be-documented benefits to the families and to local and state government. As we continue to learn more about the monetary benefits of investing in healthy early childhood development, future researchers could incorporate that new knowledge into this analysis. In the meantime, we reiterate that the estimated values shown here are very conservatively low, a theme that will be echoed and further explained throughout this document.

[3] Details and citations of these studies are provided throughout the report.

Where to attribute the benefits? A philosophical question

When the process goes as intended, a child with any of these conditions would have their symptoms or concerns detected in screening, after which they would be referred to a specialist for further evaluation, and finally, they would complete the recommended treatment and reap the treatment benefits that are quantified later in this document. In the end, the treatment benefits for these newly screened children are generated because the screening and referral both occurred, which prompts something of a philosophical question: how should we distribute the credit for these benefits? Are the benefits a result of screening, referral, or treatment? The estimates of benefits in this study are based on the documented impacts of the treatment alone, but given that many children may never arrive at that stage without the screening and referral that occurred prior, it seems inaccurate to attribute the full set of benefits to the treatment phase.

This philosophical question does have a practical issue at its core: in a world of scarce resources, where we have to prioritize where our efforts and funds are allocated, it would be helpful to know the amount of value generated by each stage in the process. We searched the literature for any existing study or data source that might point us to a defensible strategy for allocating the benefits across the three stages, but our search came up empty. In the end, we've concluded as follows.

- This is a very difficult (albeit maybe not impossible) question to answer, and it is beyond what is feasible to accomplish in this report.
- The theoretical importance of screening and referrals is fairly straightforward (it's clear that one is more likely to find something if they look for it, and more likely to get where they need to be if someone gives them a map and directions to get there).
- Ultimately, screening, referrals, and treatment all appear to be vital components of health care system that provides effective and efficient support for healthy early childhood development.

We therefore attribute the majority of the benefits in this report to the full trio of early childhood screening, referrals, and treatment.

In addition to the benefits generated by this trio, we have documented additional benefits that are generated by a fourth component: care coordination. Care coordination enhances the benefits of treatment by simplifying the process for the family and improving communication between and among medical providers and the family. Care coordination takes three valuable components and wraps them into a coordinated system with the potential for synergistic benefits, a whole that is greater than the sum of the parts, to more effectively support children and families.

Study methods

This report describes the methods used to assign a value to the diagnosis and treatment of several of the most common developmental/behavioral health conditions that may occur in young children. In general, the estimates presented in this document represent the values associated with the treatment of the condition, i.e., not specifically an early treatment. We make the conservative assumption that treatment generates the same benefits as the treatments documented in the literature, because we are unable to quantify the additional value generated by an effective system of screening and referral.

Our approach: Estimating impacts with existing literature

In general, we follow one of two paths to use existing literature to estimate the impacts (and associated value) of identifying and treating each condition.

In one path, we comb through the existing studies of treatment effects for the condition, aiming to identify the effective interventions and the size of their effects on the condition or its associated outcomes. For example, the existing literature documents the effects of ABA (applied behavior analysis) therapy for autism spectrum disorder, indicating the range of observed outcomes and the proportion of children who attain each (for example, Sallows & Graupner, 2005; Cidav et al., 2017). When a study shows a statistically significant impact of their intervention, that study may be a candidate for use in estimating the potential effects of a similar intervention employed elsewhere. We also check for practical significance, making sure that the impact of the intervention is more than just a thumbs-up from our statistics software; the impact should be large enough to be meaningful in a practical sense as well as a statistical sense.

After we confirm that a study's reported effect is significant, we look at the details of the intervention.[4] Is it recognized as a standard approach for the condition, or is it a pilot study of a new method that is unlikely to be replicated in our jurisdiction of interest? When the answer to either of those questions is "yes," the decision is simple to include or exclude the study in our analysis. Of course, the intervention often lies somewhere in the middle, perhaps an adjustment (small or large) to improve on an established model. These sorts of innovative interventions may also make it into our analysis, so long as the results are generally aligned with findings for the more conventional intervention, and so long as intervention is not radically different from the intervention(s) being employed in our jurisdiction of interest.

[4] Terminology note: in this document, we use the terms "intervention" and "treatment" interchangeably.

As illustrated above, we take many factors into consideration when evaluating the existing literature for use in our analysis. In addition to the criteria above, we also search for high-quality studies with scientifically rigorous research designs like randomized controlled trials.

The second path to estimating treatment impacts and benefits is simpler, because much of the searching and sifting described above has already been completed by the Washington State Institute for Public Policy (WSIPP) in their cost-benefit analysis series (WSIPP, 2019g). WSIPP employs a thorough and exacting approach in their cost-benefit and return on investment (ROI) work (theirs is the approach on which the Wilder Research methods are based). WSIPP has estimated some of the benefits of specific treatments for several mental health conditions among children, including ADHD, anxiety, and disruptive behavior disorder. This analysis draws from their results, using the estimated benefits reported in one or more of their ROI meta-analyses for each condition.

We first select the treatment option(s) that are appropriate for young children, as indicated by treatment best practices that have been identified during the literature review. Where more than one treatment is considered valid for this age group, we select two treatments and take the simple average of their ROI values.

We also adjust the values estimated by WSIPP, in order to ensure their applicability to the state of Mississippi. Because WSIPP ROI values are based on parameters for Washington state, we employ an adjustment parameter for each outcome to estimate values that are appropriate for the state of Mississippi. For example, annual per-capita spending on corrections in Washington is $141, compared to spending of $111 per person in Mississippi. Therefore, the impacts of treatments on criminal/corrections-related outcomes are multiplied by 111/141= 79%, to estimate values that are appropriately scaled for the state of Mississippi.

Other specific parameters from WSIPP have also been adjusted as needed, e.g., to adjust the currency year to be consistent with the one used in this report (2020 USD). Other adjustments are described in their respective sections.[5]

Note that we are generally not able to make statements about the value of early treatment in particular. It is widely understood that intervening earlier is better than later (see Guralnick, 2011; Guralnick, 1997), but unfortunately, the existing literature doesn't allow us to identify exactly how much of the benefit of treatment is specifically due to the early timing of the intervention. As a result, we usually present the value of treatment more broadly defined, rather than *early* treatment. If early treatment does indeed result in stronger outcomes, then our use of these more general treatment effects is yet another way in which these results are conservatively low.

[5] In the interest of simplicity, we exclude WSIPP's "Indirect" category of costs and benefits, along with the Deadweight Loss (and also the reverse, the gains when market distortions are corrected). In addition, costs of higher education are lumped in with program costs, again for simplicity's sake.

Types of benefit estimates

This report contains three broad categories of benefit estimates:

- The estimated intervention benefits per child with each condition: based on the parameters available in the body of literature for each condition, we estimate the value generated when one child with the condition is treated.
- The estimated intervention benefits per child overall: using the benefits per child with each condition, combined with the rates of prevalence of each condition among Mississippi children under age 6, we compute an average benefit value per child.[6]
- Aggregate estimates of intervention benefits: these represent the total value of benefits generated when a given percentage of children under age 6 are screened and referred/ treated as needed. For example, Table 2 shows the estimated aggregated benefits if 60% of Mississippi children under age 6 are screened and referred/treated as appropriate.

Throughout the report, benefits are allocated into three groups based on the "recipient" of the benefit. The three groups of recipients are:

- Participants (the children being screened/referred/treated), whose future increases in income and other benefits can be anticipated based on the available evidence in the literature.
- Taxpayers (aka government/public agencies), who benefit from cost savings in education and publicly funded health care, along with increased future tax revenue when a given treatment has been linked to an increase in future earnings for the participating child.
- Others, a group that includes parents of participants, for example, along with a small percentage of the general public who might have fallen victim to a crime if the intervention had not reduced the likelihood that participating children would engage in criminal activity in the future.

Society's total benefit is computed as the sum of the benefits of these three groups.

In the sections that follow, we will illustrate our process of using existing evidence to estimate the potential future savings that will result from diagnosing and treating several conditions. Before we dig into those details, we will begin with some general assumptions that will apply across all conditions that we study.

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[6] In essence, this value is computed by multiplying the per-child-with-condition value by the estimated number of Mississippi children with the condition (see Table 2 for these values), adding those totals up across the six conditions, and then dividing by total population size of 221,521 children under age 6. It's effectively a value per child screened, accounting for (a) the probability that the child will require referral and treatment for one or more of the six conditions covered in this analysis and (b) the estimated value generated when the referral and treatment occur.

General assumptions

- Our population of interest is children under age 6 in Mississippi, an estimated 221,521 children (U.S. Census Bureau, 2015-2019b). This is the assumed population that is targeted for screening, with referral/treatment as needed.
- Unless specified otherwise, the per-child benefits are counted through age 65.
- Our estimates do not account for the cost of the screening, though they do account for any documented treatment costs (unless stated otherwise) that are associated with the estimated benefits.
- In estimating benefits based on existing studies of treatment effects, we are implicitly assuming that the treatment provided to the Mississippi child will be as effective as the treatment(s) captured in the literature.

In order to estimate the total potential value of savings, we require the estimated percentage of children with each condition. For three of the six conditions analyzed here, the aggregate results are based on the conditions' rates of prevalence among Mississippi children ages 3-17, from the National Survey of Children's Health (NSCH) (Child and Adolescent Health Measurement Initiative, 2018-2019). Although this analysis focuses on children under age 6, we expect that the available parent-reported data for this age group would most certainly conceal many cases of these conditions among Mississippi's young children, the majority of whom have never been screened, whose parents are therefore unlikely to be aware of the condition. The rates among the broader age group (3-17) arguably provide a more realistic representation of the true prevalence among young children, including cases that are currently undetected but would be detected by screening and a subsequent referral for further assessment.[7] We base our prevalence estimates on this population for our analyses of ADHD, autism spectrum disorder, and disruptive behavior/conduct disorder.

For the analysis of anxiety, however, it may not be reasonable to assume the rate among children ages 3-17 to be a fair proxy for the true rate for children under age 6. The incidence of anxiety in children could reasonably be expected to increase with age, and the data confirm this (Child and Adolescent Health Measurement Initiative, 2018-2019). As a result, we err on the conservative side; we assume the reported rate for children ages 3-5 to be correct for that age range, and we assume a 0% rate among children ages 0-2.

[7] In fact, using the rates for ages 3-17 is still a conservative approach, as this rate is likely biased downward by the inclusion of ages 3-5, among whom the conditions are less likely to have been identified, even though symptoms may already be present. One could argue that the more appropriate proxy would be the [higher] rates for ages 6-17, the population that has all reached school age and therefore had the opportunity to have their conditions detected. We choose the more conservative rates, for ages 3-17.

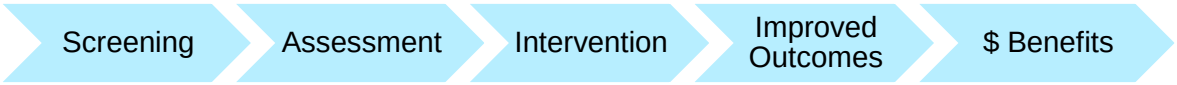
Finally, because dyslexia and dyscalculia are not explicitly covered by the NSCH (they likely appear in the "learning disability" responses, but cannot be isolated from other learning disabilities in the data), we estimate their prevalence based on rates reported by Hoeft et al. (2015) and Haberstroh & Schulte-Körne (2019). They reported prevalence ranges of 5-10% and 3-7% for dyslexia and dyscalculia, respectively. We assume the midpoint of each range (7.5% and 5%) and assume that half may not be exhibiting symptoms yet, resulting in our assumed rates of 3.8% and 2.5% of children under age 6 that should have detectable symptoms of dyslexia and dyscalculia, respectively.

We believe our assumed rates of prevalence for all conditions are conservatively low. Notably, when a condition's prevalence is underestimated, the benefits per screened child are also underestimated, as are the aggregate benefits. This adds to the list of reasons for which we can be certain that the estimated benefits shown below are conservatively low as well.

Finally, it is important to note that a formal diagnosis of a given condition is not required for the child (and society overall) to see the benefits we have documented below. The screening tool identifies areas of concern, which can lead to a referral and appropriate treatment even without a formal diagnosis. For several of the conditions covered here, formal diagnoses of the conditions may be rare among young children, but society may reap the benefits of screening, referral, and treatment for these conditions among young children, even before the conditions are diagnosed. It's the attention to the symptoms (not the diagnosis) that generates the benefits shown here.

Our methods for computing the benefits of this treatment are described in greater detail below.

General model



As described above, we assume that developmental concerns will be identified during screening, leading to further assessment, after which the children will receive the interventions described in the following sections. The intervention leads to improved outcomes of some kind (increased future earnings or a reduced need for special education services, for example), which then translates to an increase in benefits or a reduction in costs.

More specifically, we compute the statewide benefits in the following way:

$$Statewide\ benefit = nb * N$$

$\boldsymbol{nb}$ = net benefit of intervention per child

N = # of children who receive intervention

$$\mathbf{N} = pop * s * c$$

pop = statewide population of age-eligible children (221,521)

s = % of children screened

c = % with the condition (varies by condition)

$\boldsymbol{nb}$ is computed based on benefits documented in the existing literature. The exact method and required assumptions vary across conditions, so the specifics are covered in the sections that follow.

s is set by assumption, as noted throughout the report. Table 8 presents a range of scenarios for the value of s.

c is estimated for each condition based on the best available data source, as described in further detail below.

Many of the interventions have been shown to generate long-term benefits. Following the standard approach in quantifying future benefits, we discount these future values to their net present value, using a discount rate of 3.5%.

Economic benefits of identifying and treating early childhood health and developmental conditions

Table 2 summarizes the estimated intervention benefits per child with each condition, along with the estimated aggregate net benefits for screening, referral, and treatment if 60% of children ages 0-5 in Mississippi were screened and referred/treated if needed. Net benefits (that is, benefits minus treatment costs) are shown for each condition. Each of these estimates can be considered a lower-bound value, e.g., intervening early for a child who shows early signs of autism spectrum disorder will generate at least $27,600 in benefits over the course of the child's lifetime, based only on the benefits of reduced special education costs and lower short-term health care costs. Many additional treatment benefits likely exist, but the available literature did not contain sufficient documentation to allow us to include other potential treatment benefits in this analysis.

2. Selected lifetime net benefits of screening, referral, and treatment for early childhood developmental/behavioral health conditions

Condition	Est. prevalence among children ages 0-5[a]	Est. # children age 0-5 with condition[b]	Net benefit per child with condition				Aggregate benefits if 60% of children are screened and referred/ treated (if needed)
			Taxpayers	Participants	Others	Total	
Autism/ASD	3.0%	6,646	$25,806	$1,874	-	$27,680	$110,378,000
Disruptive Behavior/ Conduct Disorder	12.4%	27,469	$587	$1,702	$1,387	$3,676	$60,580,000
ADHD	14.1%	31,234	$139	$1,830	$1,113	$3,082	$57,749,000
Dyslexia	3.8%	8,418	$359	$9,379	-	$9,738	$49,184,000
Dyscalculia	2.5%	,538	$433	$10,175	-	$10,608	$35,248,000
Anxiety	1.1%	2,326	$2,123	$3,353	$1,114	$6,591	$9,198,000
Subtotal: estimated benefits of screening, referral, and treatment							*$322,337,000*
Additional benefit of care coordination							$32,234,000
Total estimated net benefits of screening, referral, treatment, and care coordination for 60% of Mississippi children ages 0-5							$354,571,000

Sources. Author's summary computations based on secondary data as annotated throughout the report.

Note. Values have been adjusted from 2018 USD to 2020 USD. Due to rounding, values in the aggregate benefits column may differ slightly from totals that can be computed using the components of the table.

[a] Prevalence rates are from the 2018-2019 National Survey of Children's Health (Child and Adolescent Health Measurement Initiative, 2018-2019) and estimates derived from Hoeft et al. (2015; dyslexia) and Haberstroh & Schulte-Körne (2019; dyscalculia) as described in the Methods section.

[b] Computed based on conditions' prevalence rates and the U.S. Census Bureau (2015-2019b) population estimate for children ages 0-5.

It is important to note that, although these estimates can all be considered lower-bound values, the coverage of different types of benefits varies across the conditions shown in Table 2. Table 3 illustrates how this coverage varies; it summarizes the categories of benefits quantified for each condition in this analysis.

As a result of this variation across conditions, these value estimates do not lend themselves to a direct comparison of the benefits of treating each condition. (This will become clearer in the sections that follow, as each condition's benefits and costs are presented in greater detail.) For example, the estimated benefits of treating dyslexia and dyscalculia only include the value of increased future earnings (and corresponding tax revenue), because the existing literature was insufficient to quantify the impact of treatment on other important outcomes, such as the need for special education. The estimated benefits of treating autism spectrum disorder (ASD), however, exclude any potential impact on future earnings because those benefits could not be quantified based on the existing literature. Although the per-child net treatment benefits are not directly comparable to one another, they are presented together in Table 2 to summarize the results in the sections that follow, and to sum the benefits across these six conditions to provide an aggregate estimate.

Even though these values capture only a subset of their potential benefits, we estimate that society would gain *at least* $322 million in net benefits if 60% of Mississippi's children under age 6 were screened and then referred/treated when concerns were identified during screening. When the additional benefit of care coordination is added to the treatment value (see the section "The Value of Care Coordination" below), total net benefits exceed $354 million over the course of the children's lifetimes.

3. Benefit categories included in value estimates, by condition

Condition	Types of benefits included in value estimates			
	Labor market earnings/ tax revenue	Health care	Education	Legal/ Criminal
Autism/ASD		✓	✓	
Disruptive Behavior/ Conduct Disorder	✓	✓	✓	✓
ADHD	✓	✓	✓	✓
Dyslexia	✓			
Dyscalculia	✓			
Anxiety	✓	✓	✓	✓

In the sections that follow, we provide an overview of each condition and describe our methods and data used to estimate the benefits of treating the conditions. These sub-sections present the per-child treatment benefits estimated for each condition and each benefit category. These are the building blocks for Table 2 above.

Attention Deficit Hyperactivity Disorder (ADHD)

Attention-deficit/hyperactivity disorder (ADHD) is one of the most common mental health disorders in children (Pelham et al., 2007). According to the National Survey of Children's Health (NSCH), 14.1% of Mississippi children ages 3-17 have been diagnosed with ADHD at some point, compared to 9.5% of children nationally (Child and Adolescent Health Measurement Initiative, 2018-2019). Based on these estimates, approximately 31,000 of Mississippi's children under age 6 have ADHD.

ADHD is characterized by a lack of sustained attention, impulse control, and modulation of activity level compared to other children of the same age (Pelham et al., 2007). These symptoms begin in childhood and generally follow an individual throughout their life, potentially impacting their success in school and the numerous outcomes in adulthood that are tied to their performance in school. For example, unmanaged ADHD reduces the likelihood of high school graduation, which reduces the child's earning potential throughout adulthood (WSIPP, 2019b).

Family-focused psychotherapy is the first-line treatment approach for ADHD in young children (Gleason et al., 2016), while stimulants are not recommended for young children (American Academy of Pediatrics, 2011). Behavior therapy for ADHD can include parent training, child-adult dyadic therapy, behavioral classroom management, and behavioral peer intervention, which all work to help shape a child's behavior and improve regulation skills (American Academy of Pediatrics, 2011).

WSIPP provides estimated benefits of three ADHD treatments, two of which have been selected for this analysis: behavioral parent training and multimodal therapy (a combination of child-focused therapies and behavioral parent training) (WSIPP, 2019a; WSIPP, 2019b). The simple average of the lifetime benefits and costs of these two types of treatments, after adjustments as described above, are shown in Table 4 below.

These ADHD treatments generate an estimated net benefit of over $3,000 to society for each child treated. This total is based on a limited set of benefits, including the impact of successful treatment in the form of increased future labor market earnings, reduced health care costs, reduced education costs (due to decline in level of need for grade repetition and special education), and lower costs associated with criminal activity. Note that, although these estimates may reflect a variety of outcomes, they are based on a series of conservative assumptions (Hirsch, 2019), resulting in estimated benefits that are conservatively low.

The bulk of the benefits accrue to the participants and others around them, but the government and taxpayers come out ahead as well, despite our assumption that the state covers 80% of the program cost.

4. Selected lifetime benefits and treatment costs of non-pharmacological treatments for ADHD in young children (per child treated for ADHD)

Outcome	Taxpayers	Participants	Others	Total
Labor market earnings	$884	$2,076	$88	$3,048
Health care	$850	$240	$878	$1,969
Education	$159	-	-	$159
Legal/Criminal	$66	-	$147	$213
Subtotal	$1,959	$2,316	$1,113	$5,388
Treatment costs[a]	-$1,821	-$486	-	-$2,307
Net benefit per child with ADHD	$139	$1,830	$1,113	$3,082

Sources. WSIPP, 2019a; WSIPP, 2019b

Note. Values have been adjusted from 2018 USD to 2020 USD. Due to rounding, totals may differ slightly from the sum of the row or column to which the total applies.

[a] Treatment costs also include a small cost for higher education expenses, due to the impact of the program on the likelihood of post-secondary enrollment.

Social-emotional and behavior disorders

Social-emotional and behavioral concerns in early childhood include anxiety, attachment-to-caregiver concerns, depression, oppositional/defiant problems, emotional concerns, sleep concerns, aggressive behaviors, tantrums, trauma, and emotional concerns. These disorders can stem from innate brain chemistry in children or from traumatic prenatal and/or post-natal experiences (Ogundele, 2018), and they often persist into adulthood (Edwards et al., 2007). This can lead to lifelong behavioral, health, and social problems (Rivenbark et al., 2018).

To help children with SEDs, there are a variety of therapies that increase self-management skills, provide positive behavioral support, and strengthen anger management skills (Ogundele, 2018). These therapies can include child-adult dyadic therapy, one-on-one therapy with a child and a therapist, and/or they may involve parents and teachers promoting pro-social behavior. Parent-only cognitive behavioral therapy teaches parents of young children with anxiety how to use cognitive behavioral approaches with their anxious children (WSIPP, 2019c). These interventions are typically led by therapists in an outpatient setting and can be individual or group therapy. Medications are usually not recommended for very young children and can have adverse side effects (Ogundele, 2018). Psychotherapies also have more lasting effects than medications, with some preschool psychotherapy treatment effects having lasting effects for years after treatment ended (Gleason et al., 2016).

Based on data availability, this analysis focuses on anxiety and disruptive behavior disorder, two of the more common social-emotional and behavioral issues among young children.

Anxiety

While worries and sadness are normal feelings at all ages, anxiety and depression are different in that the child has fears that are not developmentally appropriate or they experience "persistent or extreme forms of fear and sadness" (Centers for Disease Control and Prevention, 2021). Both anxiety and depression can manifest in physical symptoms such as fatigue, headaches, and changes in eating or sleep.

Based on the NSCH, 2.1% of Mississippi children ages 3-5 have been diagnosed with anxiety at some point (Child and Adolescent Health Measurement Initiative, 2018-2019), leading us to conclude that about 1.1% of children under age 6 have been diagnosed with anxiety.[8] This rate is comparable to national rates for this age range. In Mississippi, this rate means an estimated 2,300 children under age 6 have been diagnosed with anxiety (a likely undercount, as discussed in the Methods section).

The go-to treatment for anxiety in young children is psychotherapy, including behavioral and cognitive behavioral therapies. WSIPP analyzed one set of interventions that aligns well with this first-line approach: "group and individual cognitive behavioral therapy."

Table 5 shows the lifetime benefits and costs of cognitive behavioral therapy for anxiety in children, as quantified by WSIPP (2019c), after adjustments as described above. With relatively low treatment costs, the per-child net benefit of treatment is over $6,500, including $2,100 in cost savings or tax revenue for public agencies.

5. Selected lifetime benefits and treatment costs of non-pharmacological treatments for anxiety in young children (per child treated for anxiety)

Outcome	Taxpayers	Participants	Others	Total
Labor market earnings	$1,350	$3,171	-	$4,521
Health care	$969	$274	$1,001	$2,243
Education	$124	-	-	$124
Legal/Criminal	$48	-	$114	$161
Subtotal	*$2,491*	*$3,445*	*$1,114*	*$7,050*
Treatment costs	-$367	-$92	-	-$459
Net benefit per child with anxiety	$2,123	$3,353	$1,114	$6,591

Sources. WSIPP, 2019c

Note. Values have been adjusted from 2018 USD to 2020 USD. Due to rounding, totals may differ slightly from the sum of the row or column to which the total applies.

[8] We assume a 0% anxiety rate among children ages 0-2. See the Methods section for additional detail on prevalence estimates.

Disruptive behavior/conduct disorder

Children with behavior disorders display intense or frequent behaviors that could put themselves or others at risk (Ogundele, 2018).[9] Among them are conduct disorders, which violate the boundaries of peers, for instance through bullying, or violate "basic social rules," such as running away from home (Rivenbark et al., 2018, p2).

According to the NSCH (Child and Adolescent Health Measurement Initiative, 2018-2019), 12.4% of Mississippi children ages 3-17 (including over 27,000 children under age 6) have been diagnosed with behavioral or conduct problems, compared to 8.4% nationally.

Of the set of interventions for disruptive behavior/conduct disorder that are covered by WSIPP, the following two were selected as most closely related to typical therapeutic approaches as described in the literature: behavioral parent training and multimodal therapy (a behavioral or cognitive behavioral therapy that takes place in multiple settings in the child's life) (WSIPP, 2019d; WSIPP, 2019e).

Net lifetime benefits for these non-pharmacological treatments are more than $3,600 per child with disruptive behavior disorder, including more than $3,000 for individuals (participants and others nearby) and more than $500 per child in net gains for the government (Table 6).

6. Selected lifetime benefits and treatment costs of non-pharmacological treatments for disruptive behavior disorder in young children (per child treated for disruptive behavior disorder)

Outcome	Taxpayers	Participants	Others	Total
Labor market earnings	$764	$1,794	$948	$3,506
Health care	$383	$108	$396	$887
Education	$130	-	-	$130
Legal/Criminal	$18	-	$43	$61
Subtotal	*$1,294*	*$1,902*	*$1,387*	*$4,583*
Treatment costs[a]	-$708	-$200	-	-$908
Net benefit per child with disruptive behavior disorder	$587	$1,702	$1,387	$3,676

Sources. WSIPP, 2019d; WSIPP, 2019e

Note. Values have been adjusted from 2018 USD to 2020 USD. Due to rounding, totals may differ slightly from the sum of the row or column to which the total applies.

[a] Treatment costs also include a small cost for higher education expenses, due to the impact of the program on the likelihood of post-secondary enrollment.

[9] Disruptive behavior disorders are actually a family of specific disorders, including conduct disorders and oppositional-defiant disorder. ADHD may be categorized with this list as well, but has been separated for this analysis because ADHD-specific estimates of benefits were available.

Learning disabilities

According to data from the NSCH, 8.4% of children age 3-17 in Mississippi have been diagnosed with a learning disability, compared to 7.3% nationally (Child and Adolescent Health Measurement Initiative, 2018-2019). And as with most early childhood conditions, early detection and treatment is key to successful remediation (Rubinsten, 2015; Witzel & Mize, 2018).

The DSM-5 recognizes three learning disabilities:

- dyscalculia (developmental learning disorder with impairment in math)
- dyslexia (developmental learning disorder with impairment in reading)
- dysgraphia (developmental learning disorder with impairment in writing)

Dyslexia and dyscalculia are often comorbid because language processing is critical to understand mathematics processing (Snowling et al., 2020). These two are also the most frequently discussed in the literature and will therefore be the focus of the remainder of this section.

Dyslexia

Dyslexia may have several presentations, and generally it is categorized by low reading or pre-reading ability compared to others of the same age. Dyslexia is an inability to "map" letter sounds onto letters, and therefore trouble reading or decoding new words (Snowling et al., 2020). This core deficit can lead to other downstream deficits, so dyslexia manifests in many ways. This also means that in screening, it's impossible for a provider to determine if a reading deficiency is caused by dyslexia or due to environmental factors. Studies to date have shown the best treatment for dyslexia is phenome awareness and letter knowledge "combined with structured reading practice" (Snowling et al 2020, p 508).

As described in the Methods section, we estimate that about 7.5% of children have some form of dyslexia, but that under age 6, only about half of those dyslexia cases (3.8%, an estimated 8,400 children) can be expected to be identified via screening and follow-up assessment.

In a meta-analysis of the impacts of phonics training, McArthur et al. (2018) present a set of effect sizes for the impact of phonics training on students' performance on various standardized assessments. To represent the range of assessments, we use the simple average of their effect sizes: an estimated 0.48 standard deviations.

WSIPP technical guidance details a methodology for monetizing improvements in standardized test scores by quantifying the future earnings implications of stronger performance on tests during childhood (Hirsch, 2019). The formula is fairly complex, but it effectively boils down to computing the following two components:

- The local median wage trajectory from ages 18 to 65 (U.S. Census Bureau, 2015-2019a), adjusted to account for fringe benefits and the expected rate of wage growth over time (Hirsch, 2019).
- The impact parameter representing the percentage change in income that results from the change in test scores. Hirsch (2019) provides a base parameter of 0.0978, indicating an almost 10% impact on wages when test scores improve by a full standard deviation. However, because the measured effects of test scores on earnings were based on high school test scores, and because the impact of treatment tends to decline as the treatment falls further into the past, Hirsch also provides a "decay" parameter, to adjust for this declining impact when analyzing the impact of test scores during younger years. After inputting the decay parameter, the estimated effect size of early childhood changes in test scores on wages in adulthood falls to about 2.1%. After multiplying this by the estimated effect size of 0.48 standard deviations, we arrive at our estimated impact on lifetime wages: a 1.0% increase.

After multiplying the impact parameter by the median earnings trajectory (U.S. Census Bureau, 2015-2019a) and then discounting the future earnings to present value, we have the estimated lifetime impact of the phonics intervention on future wages: about $10,400, of which we assume 8.6% is paid in taxes (Tax Foundation, 2016).

Finally, although we have no directly applicable data to estimate treatment costs, we do have treatment cost estimates from other early childhood conditions. In order to include some measure of treatment cost, we use the simple average of the treatment costs for two other conditions, anxiety and destructive behavior disorder, for a total treatment cost estimate of $686. The result is a net benefit of $9,738 per child whose dyslexia symptoms are identified and treated.[10]

Dyscalculia

Similar to dyslexia, dyscalculia can also have a variety of presentations (Kaufmann & Aster, 2012), but advances in the field are making it easier to identify cases of dyscalculia during early childhood, when intervention can have the greatest impact (Rubinsten, 2015; Haberstroh & Schulte-Körne, 2019).

[10] This benefit is based only on the income-related benefits of treating dyslexia. We assume there are numerous other benefits that have not yet been rigorously documented in the literature.

As described in the Methods section, we estimate that about 5% of children have some form of dyscalculia, including an estimated 2.5% of children under age 6 (about 5,500 young children in Mississippi) whose dyscalculia would be identified during screening or follow-up assessment.

Studies have shown success in dyscalculia interventions that work with basic numerical skills, as opposed to those that worked with pre-numeric skills or problem solving (Kaufmann & Aster, 2012). Unfortunately, the existing literature is limited in the availability of effect sizes to quantify the benefits of these treatments.

Haberstroh & Schulte-Körne (2019), in reviewing the studies that do exist, computed a mean treatment effect size of 0.52 standard deviations of improvement on standardized assessments. Using the same approach as described in the dyslexia section above, we multiply the 0.52 standard deviation effect size by the estimated effect size of early childhood changes in test scores on wages in adulthood (2.1%) to arrive at the following conclusion: identifying and treating dyscalculia is expected to increase a child's future wages by about 1.1%.

After multiplying this 1.1% impact parameter by the median earnings trajectory (U.S. Census Bureau, 2015-2019a) and then discounting the future earnings to present value, we arrive at the estimated lifetime impact of the dyscalculia intervention on future wages: about $11,300, of which we assume 8.6% is paid in taxes (Tax Foundation, 2016).

Once again, we use a proxy for the dyscalculia treatment costs: $686, as described in the dyslexia section above. The total net benefit, based on income impacts alone, is $10,608 per child whose dyscalculia is identified and treated.

Autism spectrum disorder (ASD)

Autism spectrum disorder (ASD) is a developmental disability that can manifest in many different ways and to widely varying degrees, though it generally does cause difficulties with communication and other social-emotional tasks. According to the NCHS, about 3% of Mississippi children ages 3-17 have been diagnosed with ASD, including an estimated 6,600 children under age 6.[11]

Based on the available literature documenting the cost savings associated with intervening early for ASD, we have computed two streams of potential cost savings from early detection and treatment of ASD: avoided special education costs and reduced health care costs.[12]

[11] The national prevalence of autism among children ages 3-17 is also 3%.

[12] While most treatment benefits in this study are lifetime estimates, the estimated benefits of autism treatment are limited to 15 years of special education savings (following the approach of Jacobson et al., 1998) and health care savings only for about 2 years post-intervention (additional explanation in the following section).

Avoided special education costs

We compute the avoided special education costs based on the approaches of Jacobson et al. (1998) and Chasson et al. (2007), including the following assumptions and conditions:

- All children with ASD would require intensive special education for 15 years in the absence of intervention.[13]
- We assume that 72% of children with ASD can be "mainstreamed" and require no special education as a result of early treatment, while the remaining 28% will require intensive special education, just as they would have without the intervention. This is a simplification of the range of responses to the intervention, an approach taken by Chasson et al. (2007) for the sake of mathematical convenience.
- The 3-year Early Intensive Behavioral Intervention as described in Chasson et al. (2007) is based on a parent-directed model that costs $29,800/year (after adjusting for inflation to 2020 USD).
- While the assumptions above are drawn from the two studies cited above, the assumed cost of special education relies on data specific to Mississippi. Intensive special education is assumed to cost approximately $13,500 per student per year, about 2.2 times as much as the average special education cost per student14 (where 2.2 is a multiplier derived from the ratio of special education costs shown in Jacobson et al., 1998).
- The baseline (no intervention) cost is 15 years of special education, starting three years from now (and therefore discounted for those years), at $13,500/year,[15] for a total cost of about $145,500 per child.

For the group receiving the intervention, the costs include the intervention itself, at about $86,500, plus the intensive special education costs for the 28% of children who are not "mainstreamed" after the three-year intervention. This results in an average total cost of about $126,700 per child. The special education savings, therefore, are about $18,300 per child on average.[16]

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13 This assumption is drawn from the more conservative approach of Jacobson et al. (1998); Chasson et al. (2007) assumes 18 years of special education costs are required in the absence of intervention.

14 The average special education cost per student is computed as follows. We begin with the 2019-20 budgeted amount for Mississippi special education salaries and fringe benefits (Mississippi Department of Education, 2019). To account for other special education costs (facilities, etc.), we use data from the Special Education Expenditure Project (Chambers et al., 2004, Table B-1) to estimate that special education salaries/benefits make up 88% of special education costs. After adding in the remaining 12% of cost, we divide the total special education cost by the number of students in special education part B (U.S. Department of Education, 2020) to arrive at the annual per-pupil special education cost for Mississippi.

15 Note that this cost estimate for special education is very low relative to others in the literature; after adjusting for inflation, Chasson et al. (2007) estimate the cost of intensive special education in Texas to be over $27,000 per student per year, while the value used by Jacobson et al. (1998) exceeds $47,500 per student per year after adjusting for inflation. If our figure underestimates the true cost of special education, the true cost savings of this intervention could be much larger.

16 If we assume intensive special education costs to be higher, as in the Texas cost estimate of about $27,000 in Chasson et al. (2007), the average savings per child spike to $119,000.

Avoided health care/therapy costs

To estimate the avoided health care/therapy costs due to an intervention for ASD, we use the values presented in Cidav et al. (2017), a randomized trial used to assess the cost savings associated with the Early Start Denver Model, a 2-year ABA-based program.

We summed the health care costs for the intervention and comparison groups over the intervention years and an assumed 26 months post-intervention,[17] subtracting out the special education costs to avoid double-counting (with the special education costs already estimated above). The comparison group's total cost was $187,100, while the intervention group's total cost was $177,700, for an estimated $9,400 per child in health care cost savings.

Combining this result with the special education savings, we have a total savings of approximately $28,200 per child whose ASD is identified and treated.

Speech disorders

Speech and language disorders are very common in early childhood. Although problems with speech and language development have been reported for 11% of Mississippi children ages 3-17 (8.7% of children nationally), speech issues in early childhood are still not well understood by researchers. From systematic reviews published in 2003 (Law et al.), 2006 (Nelson et al.), 2015 (Wallace et al.), and 2021 (Jullien), the clearest conclusion is that there are still very few clear and concrete conclusions in the research on early childhood speech and language disorders or the value of screening or intervening to address them.

As Jullien (2021) notes, with what we understand about the plasticity of young brains, one may reasonably conclude that early screening and intervention should indeed be quite valuable. Somehow, the data have not managed to keep up with the logical extensions of this argument. Wilson and Law (2019), as cited in Jullien (2021, p. 5), highlights the difficulty in proving the value of neurodevelopmental screening stems from the "lack of evidence of effectiveness, rather than evidence of lack of effectiveness." It's not that the current body of research shows that screening and interventions do not improve outcomes; the issue is that the current body of research still says very little on the subject, due in part to some issues with sample size and quality in design of past studies.[18] As multiple

[17] The authors state that the average starting age was 23 months and average age at final assessment was 73 months, leaving 50 months in between. The intervention occupied 24 months, so the remaining time before the final assessment was 26 months.

[18] In fact, many of the studies summarized by Wallace et al. (2015, supplemental tables) appear to show improvements in various speech and language indicators among the treatment groups, often in contrast to a control group that showed minimal improvement. Unfortunately, with the issues of small sample size, attrition, and other design aspects that reduced the reviewers' confidence in the validity of the findings, we are unable to use these findings to estimate a potential dollar value associated with screening and treatment for speech and language concerns in early childhood.

systematic reviews show, more research is needed in order to understand when and how we should screen and intervene for speech and language issues in early childhood. For the moment, the available research is not sufficiently robust to inform an estimate of the value of detecting and addressing speech and language concerns in early childhood.[19]

The value of care coordination

In our review of the literature, we uncovered a small but seemingly growing body of research on the benefits of care coordination (also commonly referred to as collaborative care[20]). Silverstein et al. (2015) found that collaborative care improved ADHD symptoms among children with ADHD, while Kolko et al. (2014) showed the significant positive impact of collaborative care on children with behavior problems, ADHD, and anxiety. WSIPP has also developed an estimate of the ROI of collaborative care for children with behavior disorders, finding total benefits of just over $1,000 and a net gain of $665 per child (after treatment costs and after adjustments as described above) (WSIPP, 2019f). Relative to the overall estimated net benefits of the treatment of behavior disorders, care coordination adds about 10% of additional value on top of the treatment benefit.

Because the available literature on the economic value of care coordination remains relatively limited, we are unable to directly measure these benefits for most other conditions. However, we might reasonably expect care coordination to be similarly beneficial in managing the other conditions analyzed in this report. Therefore, we assume that care coordination also magnifies the net benefits of treatment for the other conditions, increasing those benefits by 10%. This impact is shown in Tables 1 and 5.

Summary of net benefits by category

Based on this selected set of early childhood conditions and the handful of measurable outcomes for each, our analysis indicates that the potential value of early childhood screening, referral, and treatment for Mississippi's young children adds up to a net benefit of about $1,255 *per child screened* (Table 7). (This is in contrast to the approach in most of the figures above, which have focused on the benefits *per child treated for each condition*.) The values shown in Table 7 take into consideration the percentages of

[19] It is important to note that these systematic reviews turned up no evidence of harm from screening or early interventions on these issues, aside from perhaps some time spent on further testing and interventions that may not have been strictly necessary (Jullien, 2021). From all indications, the shortcomings have been found in the research, not in the implementation of screening and interventions.

[20] For the purposes of our review of the literature on care coordination, we have essentially considered the concepts of care coordination, collaborative care, and integrated care (usually) to refer to the same general concept, though we recognize that there may be some nuance that we are setting aside in the process.

children for whom screening will reveal no concerns (i.e., they generate no treatment benefits), as well as those for whom screening is expected to reveal concerns that are ultimately addressed with the treatments described above. The result averages out the net benefits across all children to arrive at the estimated $1,255 net benefit per child screened. This is a conservatively low estimate, leaving out a number of conditions with insufficient data to document the impacts of treatment, and capturing only a small subset of the many potential benefits of keeping Mississippi's young children happy and healthy.

Nearly three-quarters of these benefits relate to labor market earnings, including $123 in future tax revenue gained per child screened. Savings in health care ($254 per child screened), education cost savings ($106), and avoided legal/criminal costs ($10) are also included in this total, but those benefits are assumed to be substantially underestimated because they could only be quantified for a subset of the conditions.

7. Selected lifetime net benefits of screening, referral, and treatment for early childhood developmental/behavioral health conditions, by benefit category (benefits per child screened)

	Value of benefit or cost per child screened (assuming referral and treatment occur as needed)			
	Taxpayers	**Participants**	**Others**	**Total**
Labor market earnings	$123	$767	$30	$921
Health care	$161	$42	$50	$254
Education	$106	-	-	$106
Legal/Criminal	$3	-	$7	$10
Subtotal	$393	$809	$87	$1,291
Treatment costs	-$118	-$31	-$1	-$150
Net benefits of screening, referral, and treatment	$275	$778	$86	$1,141
Additional benefit of care coordination	$28	$78	$9	$114
Total estimated net benefits of screening, referral, treatment, and care coordination	$303	$856	$95	$1,255

Sources. Author's summary computations based on secondary data as annotated throughout the report.
Note. Due to rounding, totals may differ slightly from the sum of the row or column to which the total applies.

Finally, Table 8 presents the aggregate statewide benefits for a system of screening, referral, treatment, and care coordination in a range of scenarios, from the assumed status quo (30% of children screened) to a system of universal screening (100% of children screened). While we note once again that these estimated benefits are a partial and conservative accounting of the benefits, the aggregate net benefits are nonetheless quite large – up to $590 million, in a system of universal screening. If approximately 30% of children are currently being screened and receiving follow-up care as needed, those efforts are generating at least $177 million in benefits for today's population of 0-to-5-year-olds. If that rate were doubled to 60%, those net benefits would increase to over $354 million, including over $135 million in tax revenue and avoided public costs.

8. Selected lifetime net benefits of screening, referral, and treatment for early childhood developmental/behavioral health conditions, by scenario

***Scenario*: % of MS children ages 0-5 who are screened and treated for any concerns that emerge in screening**	**Total estimated net benefits of screening, referral, treatment, and care coordination**			
	Taxpayers	**Participants**	**Others**	**Total**
30% (estimate of status quo)	$66,765,000	$85,621,000	$24,900,000	$177,286,000
40%	$89,020,000	$114,161,000	$33,199,000	$236,381,000
60%	$133,530,000	$171,241,000	$49,799,000	$354,571,000
80%	$178,040,000	$228,321,000	$66,399,000	$472,761,000
100%	$222,550,000	$285,402,000	$82,998,000	$590,952,000

Sources. Author's summary computations based on secondary data as annotated throughout the report.
Note. Due to rounding, totals may differ slightly from the sum of the row or column to which the total applies.

With each passing year, one-sixth of this population of youngsters turns six years old and moves on to kindergarten. Meanwhile, another cohort of young children reaches screening age (the first screening is recommended at 9 months of age), and the potential value of this initiative increases by one-sixth. In a system of universal (100%) screening, that means roughly another $100 million in benefits is generated for society with each new one-year cohort, including more than $37 million in government revenues and avoided public expenditures.

Issues to consider

We generally don't need dollar signs to understand the value of investing in early childhood development. In a world of scarce resources and competing priorities, though, even something as indisputably valuable as early childhood development can get lost in the shuffle if we are unable to assign it some hard numbers with a dollar sign in front of them. In our effort to rigorously compute these hard numbers, we have reviewed hundreds of studies related to each of the conditions analyzed for this report (along with a handful of other conditions for which the existing literature did not contain the detailed numbers that are required for this work). Where the body of existing literature was sufficient to estimate even a partial treatment benefit, we have done so. And yet, despite this fairly robust effort, we have arrived at a somewhat unsatisfying conclusion, recognizing that these estimated benefits most likely represent only a small fraction of the true benefits of a system of early childhood screening, referral, treatment, and care coordination.

The key to a more satisfying conclusion is, of course, more research. There is a desperate need for rigorous studies of the impacts of each of these components and of the system as a whole. As a research community, we know surprisingly little about the impacts of various interventions in early childhood. For example, we were unable to uncover any research that would allow us to quantify and monetize the benefits of identifying and treating speech disorders, despite the fundamental and crucial role of speech in our social and economic lives. Although these gaps in the field are frustrating today, they represent a remarkable opportunity to advance this field, a body of research that will enable future researchers to capture and quantify the additional value that's missing from this study, but that we all know is there.

References

American Academy of Pediatrics. (2011). ADHD: Clinical practice guideline for the diagnosis, evaluation, and treatment of attention-deficit/hyperactivity disorder in children and adolescents. Subcommittee on Attention-Deficit/Hyperactivity Disorder, Steering Committee on Quality Improvement and Management. *Pediatrics, 128*(5), 1007-1022. https://doi.org/10.1542/peds.2011-2654

Beecham, J. (2014). Annual research review: Child and adolescent mental health interventions: a review of progress in economic studies across different disorders. *Journal of Child Psychology and Psychiatry, and Allied Disciplines, 55*(6), 714–732. https://doi.org/10.1111/jcpp.12216

Centers for Disease Control and Prevention. (2021). *Anxiety and depression in children*. https://www.cdc.gov/childrensmentalhealth/depression.html

Chambers, J. G., Parrish, T. B., & Harr, J. J. (2004). *What are we spending on special education services in the United States, 1999-2000?* Special Education Expenditure Project. http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.371.3397&rep=rep1&type=pdf

Chasson, G. S., Harris, G. E., & Neely, W. J. (2007). Cost comparison of early intensive behavioral intervention and special education for children with autism. *Journal of Child and Family Studies, 16*(3), 401–413. https://doi.org/10.1007/s10826-006-9094-1

Child and Adolescent Health Measurement Initiative. (2018-2019). 2018-2019 National Survey of Children's Health (NSCH) [Data set]. Generated 9/21/21 by Wilder Research using Data Resource Center for Child and Adolescent Health. www.childhealthdata.org

Cidav, Z., Munson, J., Estes, A., Dawson, G., Rogers, S., & Mandell, D. (2017). Cost offset associated with Early Start Denver Model for children with autism. *Journal of the American Academy of Child and Adolescent Psychiatry, 56*(9), 777–783. https://doi.org/10.1016/j.jaac.2017.06.007

Edwards, R. T., Céilleachair, A., Bywater, T., Hughes, D. A., & Hutchings, J. (2007). Parenting programme for parents of children at risk of developing conduct disorder: Cost effectiveness analysis. *BMJ: British Medical Journal, 334*(7595), 682. https://doi.org/10.1136/bmj.39126.699421.55

First Five Years Fund. (2012). *Nobel Prize winning economist professor James Heckman releases statement on investing in early learning*. https://www.ffyf.org/nobel-prize-winning-economist-professor-james-heckman-releases-statement-on-investing-in-early-learning/

Gleason, M. M., Goldson, E., & Yogman, M. W. (2016). Addressing early childhood emotional and behavioral problems. *Pediatrics*, *138*(6), e20163025. https://doi.org/10.1542/peds.2016-3025

Guralnick, M. J. (1997). Effectiveness of early intervention for vulnerable children: A developmental perspective. *American Journal on Mental Retardation*, *102*(4), 319–345. https://doi.org/10.1352/0895-8017(1998)102<0319:EOEIFV>2.0.CO;2

Guralnick, M. J. (2011). Why early intervention works: A systems perspective. *Infants and Young Children*, *24*(1), 6. https://doi.org/10.1097/IYC.0b013e3182002cfe

Haberstroh, S., & Schulte-Körne, G. (2019). The diagnosis and treatment of dyscalculia. *Deutsches Aerzteblatt Online*. https://doi.org/10.3238/arztebl.2019.0107

Hagan, J. F., Shaw, J. S., Duncan, P. M. (Eds.). (2017) *Bright futures: Guidelines for health supervision of infants, children, and adolescents (4th ed.).* [pocket guide]. American Academy of Pediatrics. https://brightfutures.aap.org/Bright%20Futures%20Documents/BF4_POCKETGUIDE.pdf

Health Resources and Services Administration. (2017). *Early Childhood developmental health system: Implementation in a high need state – Notice of Funding Opportunity (HRSA-17-125).* https://grants.hrsa.gov/2010/Web2External/Interface/Common/EHBDisplayAttachment.aspx?dm_rtc=16&dm_attid=3d2725fc-11a6-400f-90eb-a535414cf64e

Hirsch, M. (2019). *Benefit-cost technical documentation: Washington State Institute for Public Policy benefit-cost model*. Washington State Institute for Public Policy. https://www.wsipp.wa.gov/TechnicalDocumentation/WsippBenefitCostTechnicalDocumentation.pdf

Hoeft, F., McCardle, P., & Pugh, K. (2015). *The myths and truths of dyslexia in different writing systems.* International Dyslexia Association. https://dyslexiaida.org/the-myths-and-truths-of-dyslexia/

Jacobson, J. W., Mulick, J. A., & Green, G. (1998). Cost-benefit estimates for early intensive behavioral intervention for young children with autism—General model and single state case. *Behavioral Interventions*, *13*(4), 201-226. https://doi.org/10.1002/(SICI)1099-078X(199811)13:4<201::AID-BIN17>3.0.CO;2-R

Jullien, S. (2021). Screening for language and speech delay in children under five years. *BMC Pediatrics*, *21*(1), 362. https://doi.org/10.1186/s12887-021-02817-7

Kaufmann, L., & Aster, M. von. (2012). The diagnosis and management of dyscalculia. *Deutsches Aerzteblatt Online*. https://doi.org/10.3238/arztebl.2012.0767

Knapp, M., & Wong, G. (2020). Economics and mental health: The current scenario. *World Psychiatry*, *19*(1), 3-14. https://doi.org/10.1002/wps.20692

Kolko, D. J., Campo, J., Kilbourne, A. M., Hart, J., Sakolsky, D., & Wisniewski, S. (2014). Collaborative care outcomes for pediatric behavioral health problems: A cluster randomized trial. *Pediatrics*, *133*(4), e981–e992. https://doi.org/10.1542/peds.2013-2516

Law, J., Garrett, Z., & Nye, C. (2003). Speech and language therapy interventions for children with primary speech and language delay or disorder. *Cochrane Database of Systematic Reviews*. https://doi.org/10.1002/14651858.CD004110

McArthur, G., Sheehan, Y., Badcock, N. A., Francis, D. A., Wang, H. C., Kohnen, S., Banales, E., Anandakumar, T., Marinus, E., & Castles, A. (2018). Phonics training for English-speaking poor readers. *Cochrane Database of Systematic Reviews*. https://www.cochrane.org/CD009115/BEHAV_phonics-training-english-speaking-poor-readers

Mississippi Department of Education. (2019). *FY 2020 Budget Request*. https://www.mdek12.org/sites/default/files/mde-k12_fy_20_request-house_appropriations_subcommittee_presentation_january_16_2019.pdf

Nelson, H. D., Nygren, P., Walker, M., & Panoscha, R. (2006). Screening for speech and language delay in preschool children: Systematic evidence review for the US Preventive Services Task Force - Interventions. In *Database of Abstracts of Reviews of Effects (DARE): Quality-assessed Reviews*. Centre for Reviews and Dissemination (UK). https://www.ncbi.nlm.nih.gov/books/NBK73164/

Ogundele, M. O. (2018). Behavioural and emotional disorders in childhood: A brief overview for paediatricians. *World Journal of Clinical Pediatrics*, *7*(1), 9–26. https://doi.org/10.5409/wjcp.v7.i1.9

Pelham, W. E., Foster, E. M., & Robb, J. A. (2007). The economic impact of attention-deficit/ hyperactivity disorder in children and adolescents. *Journal of Pediatric Psychology, 32*(6), 711–727. https://doi.org/10.1093/jpepsy/jsm022

Rivenbark, J. G., Odgers, C. L., Caspi, A., Harrington, H., Hogan, S., Houts, R. M., Poulton, R., & Moffitt, T. E. (2018). The high societal costs of childhood conduct problems: evidence from administrative records up to age 38 in a longitudinal birth cohort. *Journal of Child Psychology and Psychiatry*, *59*(6), 703-710.

Rubinsten, O. (2015). Link between cognitive neuroscience and education: The case of clinical assessment of developmental dyscalculia. *Frontiers in Human Neuroscience*, *9*. https://doi.org/10.3389/fnhum.2015.00304

Sallows, G. O., & Graupner, T. D. (2005). Intensive behavioral treatment for children with autism: Four-year outcome and predictors. *American Journal on Mental Retardation*, *110*(6), 417–438. https://doi.org/10.1352/0895-8017(2005)110[417:IBTFCW]2.0.CO;2

Sanfilippo, J., Ness, M., Petscher, Y., Rappaport, L., Zuckerman, B., & Gaab, N. (2020). Reintroducing Dyslexia: Early Identification and Implications for Pediatric Practice. *Pediatrics*, *146*(1). https://doi.org/10.1542/peds.2019-3046

Silverstein, M., Hironaka, L. K., Walter, H. J., Feinberg, E., Sandler, J., Pellicer, M., Chen, N., & Cabral, H. (2015). Collaborative care for children with ADHD symptoms: A randomized comparative effectiveness trial. *Pediatrics, 135*(4), e858–e867. https://doi.org/10.1542/peds.2014-3221

Snowling, M. J., Hulme, C., & Nation, K. (2020). Defining and understanding dyslexia: Past, present and future. *Oxford Review of Education*, *46*(4), 501–513. https://doi.org/10.1080/03054985.2020.1765756

Tax Foundation. (2016). *State-local tax burden rankings FY 2012.* https://taxfoundation.org/state-local-tax-burden-rankings-fy-2012/

U.S. Census Bureau. (2015-2019a). *American Community Survey 5-Year estimates: Earnings data by age and educational attainment for Mississippi* [Data set]. Generated September 28, 2021, by Wilder Research using data.census.gov. https://data.census.gov/cedsci/

U.S. Census Bureau. (2015-2019b). *American Community Survey 5-Year estimates: Population* count by age for Mississippi [Data set]. Generated September 28, 2021, by Wilder Research using data.census.gov. https://data.census.gov/cedsci/

U.S. Department of Education. (2020). *Number of children and students served under IDEA, Part B, by age group and state*. https://www2.ed.gov/programs/osepidea/618-data/static-tables/index.html#partb-cc

Wagner, R. K., Zirps, F. A., Edwards, A. A., Wood, S. G., Joyner, R. E., Becker, B. J., Liu, G., & Beal, B. (2020). The prevalence of dyslexia: A new approach to its estimation. *Journal of Learning Disabilities*, *53*(5), 354–365. https://doi.org/10.1177/0022219420920377

Wallace, I. F., Berkman, N. D., Watson, L. R., Coyne-Beasley, T., Wood, C. T., Cullen, K., & Lohr, K. N. (2015). Screening for speech and language delay in children 5 years old and younger: A systematic review. *Pediatrics, 136*(2), e448–e462. https://doi.org/10.1542/peds.2014-3889

Washington State Institute for Public Policy (WSIPP). (2019a). *Behavioral parent training (BPT) for children with ADHD*. https://www.wsipp.wa.gov/BenefitCost/Program/88

Washington State Institute for Public Policy (WSIPP). (2019b). *Multimodal therapy (MMT) for children with ADHD*. https://www.wsipp.wa.gov/BenefitCost/Program/90

Washington State Institute for Public Policy (WSIPP). (2019c). *Group and individual cognitive behavioral therapy (CBT) for children & adolescents with anxiety*. https://www.wsipp.wa.gov/BenefitCost/Program/65

Washington State Institute for Public Policy (WSIPP). (2019d). *Multimodal therapy (MMT) for children with disruptive behavior*. https://www.wsipp.wa.gov/BenefitCost/Program/92

Washington State Institute for Public Policy (WSIPP). (2019e). *Other behavioral parent training (BPT) for children with disruptive behavior*. https://www.wsipp.wa.gov/BenefitCost/Program/93

Washington State Institute for Public Policy (WSIPP). (2019f). *Collaborative primary care for children with behavior disorders*. https://www.wsipp.wa.gov/BenefitCost/Program/750

Washington State Institute for Public Policy (WSIPP). (2019g). *Benefit-cost results: Children's mental health*. https://www.wsipp.wa.gov/BenefitCost?topicId=5

Witzel, B., & Mize, M. (2018). Meeting the Needs of Students with Dyslexia and Dyscalculia. *SRATE Journal*, 27(1), 31-39.

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