THE UNINTENDED CONSEQUENCES OF MEDICAL ADAPTATION TO ACADEMIC PRESSURE: ADHD DIAGNOSES, SOCIOECONOMIC STATUS, AND CHILDREN'S LATER WELL-BEING

Jayanti Owens

Brown University

ABSTRACT

With a 41% rise in childhood diagnoses of ADHD over the past decade alone, diagnoses have increased among children from higher socioeconomic status (SES) families with lower pre-diagnosis behavioral problems in response to mounting academic pressure. Although it is implicitly assumed that diagnosis is beneficial for these children because it opens legitimate channels to medications that effectively control even mild behavior problems, diagnosis can also bring stigma. Using the nationally representative Early Childhood Longitudinal Study-Kindergarten Cohort of 1998, matching techniques are used to estimate the net marginal effects of diagnosis, revealing that diagnosed higher SES (but not lower SES) children with lower pre-diagnosis behavior problems exhibit significantly worse teacher-rated school behaviors and child-rated self-competence following diagnosis relative to otherwise comparable undiagnosed matches. Higher SES parents do not report lower educational expectations for diagnosed children. Medical adaptation to academic pressure can, under certain conditions, have unintended negative consequences for advantaged children.

INTRODUCTION

Childhood diagnoses of ADHD have risen by 41% in the U.S. over the last decade alone (Schwarz and Cohen 2013). Today, ADHD is the most common neurobehavioral disorder of American childhood: 11% (over 6.4 million) American children ages 4-17 have been diagnosed, and over 67% of those diagnosed have received medication to control behavior problems (Visser et al. 2014). Lacking an objective genetic marker for the proper identification of ADHD, one of the defining features of the rise in childhood ADHD diagnoses is its spread to children with increasingly mild behavior problems (Hinshaw and Scheffler 2014; Schwarz 2017). These include problems with inattention, hyperactivity, and impulsivity, and commonly co-occurring oppositional defiance (Gadow and Nolan 2002). Experts have publicly expressed concern over the rise of diagnoses among this group (Hinshaw and Scheffler 2014). One child neurologist stated: "Those are astronomical numbers [of childhood ADHD diagnoses]… Mild symptoms are being diagnosed so readily, which goes well beyond the disorder and beyond the zone of ambiguity to pure enhancement of children who are otherwise healthy" (Schwarz and Cohen 2013).

An implicit – but empirically untested – belief underlying this rise is that ADHD diagnosis is beneficial for diagnosed children. This study empirically examines this claim, with a focus on children from higher socioeconomic status (SES) families. Higher SES children are thought to be most likely to use ADHD diagnosis and treatment for children with mild behavior problems in response to mounting academic pressure (King, Jennings and Fletcher 2014; Schwarz 2017). One of the primary benefits of ADHD diagnosis is that it brings legitimate access to pharmacological treatments, often prescribed stimulants like Ritalin and Adderall (Olfson et al. 2003).[1] These treatments have proven efficacious in improving attention and

concentration and reducing hyperactivity/impulsivity not only for diagnosed relative to diagnosed but untreated children (Swanson, Baler and Volkow 2010), but also for undiagnosed children with low levels of behavior problems who may be considered to be normally functioning, compared to undiagnosed children not receiving medication (Smith and Farah 2011). Improvements in attention, concentration, and self-control are linked to higher academic achievement (Duncan et al. 2007). Moreover, an ADHD diagnosis can also offer families a "legitimate" medical explanation for the child's difficulties, avoiding blame on the child for his/her challenges (Koro-Ljungberg and Bussing 2009). Whereas prior research documents higher SES children's heightened levels stimulant use in response to mounting academic pressure (King, Jennings and Fletcher 2014), research has not examined the consequences of medical adaptation in the form of ADHD diagnosis and stimulant use among this group. Unprescribed stimulant use is more common among older youth, including college students, but is generally accompanied by a diagnosis among younger children (Smith and Farah 2011).

In spite of these benefits associated with an ADHD diagnosis, research on labeling and stigma suggests there may be a negative side to ADHD diagnosis (Pescosolido et al. 2008). Stigma, a "mark" or attribute that reduces a person from "whole" and "usual" to "tainted and discounted," is a key mechanism through which negative labels exert power and influence over labeled individuals' behaviors, health, and well-being (Goffman 1963; Pescosolido 2013). Indeed, findings from the National Stigma Study-Children document high levels of social rejection of and a desire for social distance from children with ADHD, greater than that associated with children with depression, daily troubles, and physical illness (Martin et al. 2007; Pescosolido 2013; Pescosolido et al. 2008). A diagnosed child's internalization of the shame associated with an ADHD diagnostic label can trigger status loss and "self-stigma," which can

have net negative effects even if others outside of the diagnosed and child and his/her parents do not know of the child's diagnostic label. There are reasons to believe that status loss, and therefore labeling and stigma, may be especially pronounced among children from higher SES families given the academic pressure experienced by these groups (Cookson and Hodges Persell 1985; Espenshade and Radford 2009; Rivera 2016). The labeling associated with an ADHD diagnosis can lead to poorer school behaviors and worsening mental health when comparing diagnosed and undiagnosed children with the same pre-diagnosis behavior problems, cognitive skills, and demographic characteristics (Link et al. 1989; Owens and Jackson 2017).

However, existing research has not examined how family SES and pre-diagnosis ADHD-related behavioral severity shape the consequences of ADHD diagnosis, particularly for high SES children with *lower* pre-diagnosis behavior problems. These children are understudied in the literature on labeling, but are increasingly diagnosed and treated for ADHD (Hinshaw and Scheffler 2014; Schwarz 2017). This study uses the Early Childhood Longitudinal Study-Kindergarten Cohort of 1998-99, the most recent, nationally-representative sample of kindergarteners in 1998-99 followed longitudinally through eighth grade (in 2007-08) to examine three conditions under which a childhood ADHD diagnosis may differentially shape diagnosed children's later mental health and school behaviors compared to their otherwise comparable, undiagnosed peers: (1) family socioeconomic status, (2) pre-diagnosis behavioral severity, and (3) medication use. Coarsened exact matching (CEM) techniques are used to stratify children by SES and pre-diagnosis behavioral severity. Within SES and pre-diagnosis behavioral severity groups, propensity score matching (PSM) is subsequently used to isolate the marginal "effect" of ADHD diagnosis (i.e., "diagnostic labeling effects") by comparing

diagnosed and undiagnosed children with comparable pre-diagnosis behavior problems, cognitive skills, and school, family, and demographic characteristics.

This study has three major findings. First, even when receiving medication, an early elementary school ADHD diagnosis is on average associated with significantly worse 5th grade school behaviors and mental health among higher SES children who have lower pre-diagnosis behavior problems relative to their *undiagnosed* higher SES peers with comparable lower pre-diagnosis behavior problems. Strikingly, this marginal diagnostic labeling effect appears even during a developmental period when most children's behaviors improve (Caspi et al. 1995). This finding runs counter to the implicit belief on the part of some higher SES parents that the medications made legitimately accessible through ADHD diagnosis are sufficiently beneficial, on balance, to produce similar outcomes between diagnosed and treated compared to undiagnosed higher SES children with comparably low pre-diagnosis behavior problems.

Second, to understand processes underlying this striking labeling effect, two stigma-related mechanisms are contrasted – child self-stigma and parental affiliate stigma. Whereas higher SES parents of diagnosed and undiagnosed children with lower pre-diagnosis behavior problems exhibit comparable educational expectations, diagnosed children express lower self-rated competence than their undiagnosed matches, consistent with the existence of self-stigma. The study sheds light on the differing underlying meanings associated with ADHD diagnosis between higher SES parents and their children with lower pre-diagnosis behavior problems.

Adjudicating between the possibilities that stigma is driven by between-school versus within-school processes leads to the conclusion that differences between schools in the degree to which they reinforce stigma surrounding an ADHD diagnostic label do not account for differences in the self-perceived competence of diagnosed versus otherwise comparable

undiagnosed higher SES children with lower pre-diagnosis behavior problems. To address the possibility of differing behavior standards across *classrooms* within a given school, the study examines and concludes that labeling effects on self-rated competence persist among teachers with the same ratings of average classroom behavior. To address several possible family-based alternate explanations, such as differential maternal mental health or parental emphasis on academic achievement at school entry, matching includes maternal depression and kindergarten parent educational expectation. Taken together with the literature on concerted cultivation and the role of family SES in shaping families' ability to adapt to mounting academic pressures, findings suggest that the practice of diagnosing higher SES children with lower pre-diagnosis behavior problems has unintended negative consequences for children's subsequent mental health and school behaviors.

Finally, results are contrasted with those for higher SES children with higher pre-diagnosis behavior problems and lower SES children with lower pre-diagnosis behavior problems. Findings indicate that negative labeling effects are specific to children with intersection social class advantages and lower pre-diagnosis behavior problems. These children are most likely to be diagnosed as a response to mounting academic pressure and intensifying academic demands given the high educational expectations of many higher SES parents.

SOCIOECONOMIC STATUS AND MEDICAL ADAPTATION TO ACADEMIC PRESSURE

Macro level changes have led to mounting academic pressure for many American youth. Admission rates at highly-selective U.S. colleges and universities have declined substantially, increasing competition for limited numbers of spots at the institutions favored by employers recruiting for the most elite jobs (Espenshade and Radford 2009; Rivera 2011; Rivera 2012).

Simultaneously, the introduction of school accountability policies has led to increasing testing demands and pressure beginning as early as kindergarten, causing teachers to increase curricular time on the math, reading, and writing skills measured by the state standardized tests that evaluate student progress (Koretz 2008; Russell 2011).

These shifts place attention, concentration, and self-control – the very behaviors targeted through ADHD diagnoses and medication – at even more of a premium (Plank and Condliffe 2013; Rouse et al. 2013). These behaviors are predictive of learning, academic performance, and educational attainment (Duncan et al. 2007; Heckman and Rubinstein 2001). One way in which teachers and schools have responded to the increased need for these "non-cognitive" skills is by recommending ADHD evaluations for children with even relatively minor behavior problems (Sax and Kautz 2003; Snider, Busch and Arrowood 2003). AIZER.

Not all children with lower levels of pre-diagnosis behavior problems are equally likely to be diagnosed with ADHD and to receive medication treatment to help control behavior problems. Especially for children from higher SES backgrounds, academic pressures are often also reflected in their home environments, which are tailored for the development of the behavioral and academic skills valued in schools (Calarco 2011; Lareau 2003). Although children from higher SES backgrounds may start school with higher levels of attention and concentration, on average, there is nonetheless substantial variation in children's levels of these non-cognitive skills even within social class (Duncan and Magnuson 2011; Magnuson et al. 2004). Due to their greater knowledge of the "hidden curriculum" and their ability to access necessary resources, higher SES families are in unique positions to respond to these mounting academic pressures by seeking out and adopting new medical forms of "concerted cultivation"

practices (Lareau 2003). Imparting the attention, concentration, and pro-social behaviors valued and rewarded in school is one key mechanism of concerted cultivation practices (Calarco 2011).

Indeed, recent scholarship links family socioeconomic status (SES) to the stimulants typically used for ADHD, arguing that stimulants are used as a form of medical adaptation in response to academic pressure that intentionally or unintentionally serve as a means for high SES families to transmit intergenerational social advantage to children (King, Jennings and Fletcher 2014). As with many medical technologies, rates of ADHD diagnosis and treatment are high among children from higher socioeconomic status (SES) families (Conrad 2008). As of 2013, almost 11% of children ages 4-17 whose mothers have at least some college education have been diagnosed with ADHD and roughly 2/3 of those have received medication treatment to help control behavior problems (Visser et al. 2014). By contrast, only 8.5% of children ages 4-17 whose mothers have less than a high school degree have been diagnosed with ADHD and only roughly 50% receive medication treatment (Visser et al. 2014). However, prior work has not examined the consequences associated with this practice and in particular the role of ADHD diagnosis, which usually accompanies medication use among elementary school-aged children.

POSSIBLE UNINTENDED CONSEQUENCES OF AN ADHD DIAGNOSIS

In light of the concerted cultivation practices consciously or subconsciously used by middle and upper-middle class parents for the intergenerational transmission of social advantage (Lareau 2003; Rivera 2016), it would be natural to suspect that the diagnoses that accompany legitimate medication use provide additional benefits for high SES kids. On the other hand, in a competitive high SES culture (Friedman 2013), an ADHD diagnosis can lead higher SES children with mild behavior problems to perceive that their parents pursued an ADHD diagnosis because they did not believe their child could succeed of his/her own merits without additional

assistance (Eisenberg and Schneider 2007). Alternatively, they might believe that they truly have ADHD. While moderately inflated perceptions of ability relative to objective ability can be motivating for children with ADHD, unrealistically high educational expectations on the part of parents can create dissonance for diagnosed children, leading to fatalism (Hoza et al. 2004; Owens et al. 2007). Either could lead to the child's perceived status loss and lower perceived competence, which can manifest as a self-fulfilling prophecy that leads to worse behaviors and self-rated competence relative to their otherwise comparable, undiagnosed peers (Iudici et al. 2014).

This possibility is consistent with a body of psychological research on grit, which suggests that the most highly-gifted individuals, many of whom classified as such in school and come from higher SES families emphasizing academic achievement, are not always those who achieve the highest academic success (Duckworth et al. 2007; Olszewski-Kubilius 2018). Talents, or cognitive skills, must also be accompanied by "perseverance and passion for long-term goals" (Perkins-Gough 2013), which may be particularly called into question for diagnosed higher SES children with mild behavior problems due to a heightened sense of status loss within the contexts of highly competitive environments. The result is that diagnosed higher SES children with lower pre-diagnosis behavior problems might be susceptible to labeling and stigma, which can manifest through poorer mental health and school behaviors relative to otherwise comparable, undiagnosed peers.

Labeling and stigma require several conditions. First, there must be negative stereotypes in society about the abilities, behaviors, or other characteristics of particular groups or categories of individuals (Crocker, Major and Steele 1998). Second, individuals must be associated with particular undesirable groups or categories and must internalize their membership in these

devalued groups. Here, the individual internalizes their "label," or association with the negatively stereotyped group (Goffman 1963). Pinel (1999) calls this "stigma consciousness." Notably, the earlier individuals are labeled, the more likely they are to internalize the label and form expectations that they will be socially rejected or devalued, regarded as incompetent or less competent, or otherwise disgraced or looked down upon if their label becomes public (Goffman 1963). Third, the labeled or marked individual must perceive social distance between himself/herself as a member of the labeled group and those in society who are not associated with the discredited label and associated negative stereotypes (Link and Phelan 2001). Finally, the internalization of the stigmatized identity label must be associated with status loss – or downward placement in a social hierarchy, a manifestation of structural discrimination (Link and Phelan 2001).

To be attributable to an ADHD diagnosis, the internalization of a negative ADHD diagnostic label and the experience of stigma should appear after diagnosis, though internalization and stigma can unfold over time. The most proximate results may be psychological and behavioral: strained or worsening social interactions, lowered self-esteem or perceived competence, and poorer learning-related behaviors like task persistence (Link et al. 1989). Through "self-stigma," the labeled individual may him/herself experience worsening mental health and behaviors across a developmental period when those of most children improve (Caspi et al. 1995; Dodge, Coie and Lynam 2008; Sameroff 2009). Stigma may not only affect labeled individuals, but also close affiliates, like family (i.e., "affiliate stigma") (Goffman 1963; Koro-Ljungberg and Bussing 2009). However, it is possible for the reasons described above that diagnosed higher SES children with mild pre-diagnosis behavior problems may experience self-

stigma, while their parents, seeing the diagnosis and treatment solely as an educational tool in response to mounting academic pressure, do not experience affiliate stigma.

Only one study to date has empirically examined the *net, or marginal, effect* of these positive and negative forces associated with a childhood ADHD diagnosis. Unlike studies examining the effects of high ADHD-related behaviors themselves (Currie and Stabile 2006), Owens and Jackson (2017) isolate the marginal effect of an ADHD diagnosis (or "diagnostic label") above and beyond the effects of the behavior problems themselves. They do so by comparing diagnosed and otherwise similar, undiagnosed children *with comparable pre-diagnosis ADHD-related behaviors*, cognitive skills, and demographic characteristics, thus addressing a competing alternative explanation to labeling: that the behavior problems themselves, rather than the label, lead to poorer outcomes. Owens and Jackson (2017) find that the negatives associated with an early elementary school ADHD diagnosis, like stigma, outweigh the positives, such as medication. The result is a net negative association between an ADHD diagnosis and 8th grade achievement scores when comparing diagnosed and otherwise comparable undiagnosed children whose pre-diagnosis ADHD-related behavior problems score falls toward the bottom in a nationally-representative sample of kindergartners (those with "less severe" pre-diagnosis ADHD-related behavior problems). This is referred to as a "diagnostic labeling effect."

The following analysis builds from this analytic strategy of identifying ADHD diagnostic labeling effects. However, in light of prior research suggesting that higher SES families on average view diagnosis as a form of efficacious medical adaptation in competitive academic contexts, this study examines how family SES intersects with, or moderates, the relationship between an ADHD diagnosis and later school behaviors and mental health for children with

lower pre-diagnosis behavior problems. Whereas labeling theories have traditionally focused on more severe mental or neurobehavioral disabilities (Thoits and Link 2016), this study not only expands focus to include children with *lower* pre-diagnosis behavior problems who are understudied in the literature on labeling. This study therefore examines how social class structures labeling effects and stigma in an era of rising ADHD diagnosis and stimulant use for strategic, educational enhancement in response to mounting academic pressure.

DATA AND METHODS

Data and Sample

This study draws on the restricted-use Early Childhood Longitudinal Study-Kindergarten Cohort of 1998 (ECLS-K) collected by the U.S. Department of Education's National Center for Education Statistics. The ECLS-K, spanning 1998 to 2008, follows an initial, nationally-representative, school-based cohort of 21,410 kindergarteners from 1,280 public (72%) and private (28%) schools through eighth grade (cell sizes rounded to the nearest 10 in compliance with the restricted data agreement). To remain in this study's longitudinal sample, children must have been present in all five rounds of data collection between the fall of kindergarten and the spring of 5th grade, excluding 170 children who were added to the 1st grade sample to restore national representativeness. Only a 50% subsample of the fall kindergarten baseline sample who transferred schools prior to a given follow-up was eligible for inclusion, reducing the longitudinal sample to 18,080 in 1st grade, 16,670 in 3rd grade, and 12,030 in 5th grade.

Of the 12,030 kindergartners eligible for sampling in the 5th grade wave, 77% remain in the sample at all six waves between the fall of kindergarten and 5th grade, resulting in a 5th grade sample of 9,260. This 77% retention rate through six waves over six years is on par with the highest among longitudinal studies of children, families, and schools (Tourangeau et al.

2009). Nonetheless, the 22% sample attrition is consequential. Combined with U.S. population composition shifts since 1998-99, the 5th grade sample is not nationally representative of all U.S. 5th graders in 2003-04: they are more likely to be white, have mothers with slightly higher educational levels, and have slightly lower inattentive behavior scores at baseline. However, the 5th grade sample is not significantly different from the kindergarten sample in their kindergarten achievement scores or hyperactive/impulsive behaviors scores.

The ECLS-K: 98-99 data are ideally suited for this study because they enable the isolation of diagnostic labeling effects by comparing diagnosed and undiagnosed children with the same teacher- and parent-rated underlying behavior problems, thus examining diagnostic labeling net of, or apart from, the underlying behavior problems. As a nationally-representative, longitudinal sample of kindergartners of whom only 5% of children ages 4-10 are diagnosed with ADHD between the diagnostic observation period of kindergarten through 3rd grade, 95% of children in the sample are not diagnosed with ADHD but are nonetheless available as potential matches for diagnosed children. In addition to matching diagnosed and undiagnosed children on a rich set of family and demographic characteristics and cognitive skills measured prior to diagnosis, the ECLS-K: 98-99 data also enable the matching of diagnosed and otherwise comparable undiagnosed children because pre-diagnosis behavior ratings are available even for *undiagnosed* children: both diagnosed and undiagnosed children's pre-diagnosis ratings of ADHD-related behavior problems span the full range from "never" to "almost always." Moreover, with access to certain individual-level behavior items with copyright approval from the publisher, children are matched on the individual sub-scales of ADHD-related behaviors: inattention, hyperactivity, and impulsivity. Although not perfect proxies for ADHD symptoms, these parent and teacher reports resemble those used by medical professionals in the diagnostic

evaluation process and have the added advantage of being less subject to reporting bias because behaviors are measured prior to and independent of any diagnostic evaluation (Currie and Stabile 2006; Swanson, Baler and Volkow 2010).

Additionally, because the data consist of a complete cross-section of kindergartners, results generalize to wide cross-section of American children. The national distribution of children also allows for the ability to exploit differences in consequential educational policy regimes across states, thus testing a plausibly exogenous extra-familial source of variation in exposure to academic pressure. Although strict consequential educational policies are only one of many forms of academic pressure to which higher SES children are exposed, stimulant use among higher SES children is in fact tied to this form of academic pressure (King, Jennings and Fletcher 2014). These data are therefore well-situated to examine whether labeling effects differ by policy regime among children from higher SES families when comparing diagnosed and undiagnosed higher SES children with lower pre-diagnosis behavior problems.

Finally, two additional features of the data allow for testing of alternative hypotheses. First, owing to sufficient clustering of children within the same schools prior to diagnosis, the data allow for testing of whether labeling effects persist when diagnosed and undiagnosed matches are constrained to the same school, not only to similar schools in terms of exposure to strict consequential accountability policies. Second, the presence of the special education data supplement enables testing of whether labeling effects are not driven by the internalization of the diagnostic label and status loss within a given classroom context, but rather due to differing classroom contexts or the presence of additional, more visible stigmatized label (e.g., special education services receipt or special accommodations in a general instruction classroom through a 504 Plan).

Measures

The diagram in **Figure 1** visualizes the framework used to isolate labeling effects on later mental health and school behaviors.

[FIGURE 1 ABOUT HERE]

ADHD diagnosis between kindergarten and 3rd grade.[2] ADHD diagnosis was ascertained based on whether or not the parent answered "yes" to all three of the following questions in a given wave between kindergarten and 3rd grade: (1) "Has the child been evaluated by a professional in response to a problem in paying attention, learning, behaving, or in activity level?" (2) "Has the child received a diagnosis by this professional?" and; (3) "Was the diagnosis for ADHD, ADD, or hyperactivity?" (see Bussing et al. (2003), Faraone, Biederman and Milberger (1995), Morgan et al. (2013), and Tourangeau et al. (2009) for advantages of this conservative approach to identifying diagnosed children). Children whose parents answered "no" to any of these questions were coded as not having been diagnosed with ADHD in a given wave.

Medication treatment receipt between 3rd and 5th grades. The receipt of pharmacological treatment was ascertained based on parent report of whether the child was "taking medication to control his/her behavior" as of 3rd or 5th grade (children already receiving medication treatment by kindergarten were excluded). Because medication is by design measured after diagnosis but may shape the magnitude of labeling effects, it is analyzed as a moderator of the diagnosis-behaviors relationship. Two dummy variables separately capture 'ADHD diagnosis with subsequent medication' or 'ADHD diagnosis without subsequent medication treatment,' relative to children who are 'undiagnosed and untreated for ADHD'. To guard against reverse-causality issues, sensitivity analyses relied on only 3rd grade medication receipt; estimates of labeling remained substantively unchanged.

School behaviors in 5th grade. The first two dependent variables consisted of two sub-scales from the Social Rating Scale: 1) "positive approaches to learning," or attentiveness, task persistence, eagerness to learn, learning independence, flexibility, and organization, and; 2) "externalizing behavior problems," or social problems like the frequency of arguing, fighting, getting angry, acting impulsively, and disturbing ongoing activities (Morgan et al. 2013; Tourangeau et al. 2009). Each scale averaged across items ranging from 0 = "rarely" to 3 = "always," allowing estimates to be interpreted along the same rating scale used by teachers.[3]

Mental health in the 5th and 3rd grades. In both the 5th and 3rd grades, mental health is based on self-rated competence, the averaged of six items of child-rated "perceived competence and interest" in school academic subjects including reading and math from the Self-Description Questionnaire (SDQ), on a scale from "0" (not at all true) to "3" (very true) (see Marsh (1992)).

Parent educational expectations in 5th grade. This dependent variable consisted of parent report of the highest degree the parent expects their child to complete by the end of formal schooling, from "0" (less than a high school diploma), "1" (high school diploma), "2" (some college), "3" (bachelor's degree), "4" (master's degree or equivalent), to "5" (advanced degree).

Pre-diagnosis ADHD-related behavior problems ("behavior problems" for short). Children's parent- and teacher-reported behavior problems are captured as proximately prior to diagnosis as possible. Diagnosed children's behavior problems were measured in the wave prior to diagnosis. Undiagnosed children's behavior problems were measured in 1st grade, the nearest mid-point for the kindergarten to 3rd grade period over which children were observed for possible ADHD diagnosis.[4] Access to individual subscales for attention, hyperactivity, impulsivity, and oppositional defiance made available through copyright approval from the publisher and a restricted-use data license through NCES. Relevant ADHD-specific items were

separated out from the "externalizing problems" and "positive approaches to learning" scales of the psychometrically validated Social Rating Scale (Tourangeau et al. 2009).[5] The inattentive subscale included two items measuring attention and concentration *skills*, which were reverse-coded so that higher values reflected more problems. The hyperactive subscale included two items for the frequency of impulsiveness (acts without thinking) and restlessness (overly active, cannot sit still). An oppositional/defiant (ODD) subscale measured seven commonly co-occurring problems: arguing, fighting, getting angry, throwing tantrums, ease in joining in play (reverse-coded), ability to make and keep friends (reverse-coded), and positive interactions with peers (reverse-coded). Each sub-scale averaged across its respective items, resulting in aggregate scales which, like individual items, ranged from 0= "rarely" to 3= "always."

Although not clinical assessments, these parent- and teacher-reported ADHD-related behavior sub-scales approximate those used in ADHD screeners such as the Connor's, SNAP-IV, and DSM-IV (Currie and Stabile 2006; Swanson, Baler and Volkow 2010; Swanson et al. 2001). Moreover, the use of parent and teacher reports help capture behaviors in the two most common settings considered during evaluation (school and home). As such, teacher- and parent-rated subscales were averaged, following well-established practices for capturing situational and contextual variability in behavior (Achenbach 1991; Achenbach, McConaughy and Howell 1987). Excluding the 14% of ADHD diagnoses reported at the first kindergarten survey, precluding measurement of ADHD-related behaviors prior to diagnosis, did not substantive change estimates of labeling effects.

These pre-diagnosis behavior problems were also used to categorize all sample children into either "mild"/"less severe" pre-diagnosis behavior problems or "more severe" pre-diagnosis behavior problems. In the main text, the 25th percentile, or first quartile, of averaged teacher and

parent reports of inattention, hyperactivity/impulsivity, and oppositional defiance was used as the cut-point between less severe and more severe, as shown in **Figure 2** (Hinshaw and Lee 2003).[6]

Family socioeconomic status in kindergarten. In the main text, mother's receipt of a bachelor's degree or higher when the child began kindergarten (versus less than a bachelor's degree) is used as a proxy for family socioeconomic status. Although socioeconomic status is complex, I use maternal bachelor's degree receipt because families where mothers hold a bachelor's degree are more likely to engage in what Lareau (1989) refers to as the "concerted cultivation" of children's education-enhancing skills, helping produce the behaviors that shape children's ability to navigate the educational system (Calarco 2011). Maternal education is also correlated with a range of help-seeking behaviors (e.g., use of psychiatrists, diagnosis-seeking, pharmacological or behavioral treatment use), and attitudes toward mental illness that shape family orientations toward a child's potential ADHD diagnosis. Analytically, other measures of SES follow a similar pattern of alignment with the maternal BA/non-BA threshold, as shown in Table 1. However, results using top quartile household income, another correlate of socioeconomic status, yields similar patterns of results. Finally, PSM models also match on other socioeconomic status measures, such as insurance coverage, discussed below.[7]

Consequential educational accountability standards present in child's kindergarten state of residence. An indicator based on Dee and Jacob (2011) for child's residence in kindergarten in one of 25 states that "both reported school performance [based on annual state tests administered to all public elementary schools in reading and math] and attached the possibility of sanctions to school performance (e.g., ratings, takeover, closure, reconstitution, replacing the principal, and allowing student mobility)" (Dee and Jacob 2011). The kindergarten (1998) to 3rd grade (2001) ADHD diagnosis measurement period used in this study concluded prior to implementation of

the federal No Child Left Behind act in 2002, when all states became beholden to educational accountability standards.

Other variables in the propensity score matching (PSM) equation. To improve quality of matches, the pre-diagnosis inattention, hyperactivity/impulsivity, and commonly co-occurring ODD behavior scales were included in the PSM equation in addition to 19 child, family, and school context factors measured in kindergarten, which shape both a child's propensity for ADHD diagnosis and their later mental health and schooling behaviors (see **Appendix A**). These include: math and reading cognitive test scores, residence in a state with strict consequential educational accountability, teacher-rated average classroom behavior, child in special education, internalizing problems score, age in months at kindergarten entry, low birth weight, health insurance status, number of children in household, and maternal educational expectations, age, sex, race, age, and (CES-D) depressive symptoms score.

Missing Data

Of the 9,260 kindergartners included in the 5th grade sample, 15.4% (n=1,430) lacked complete information on variables other than the outcomes or ADHD diagnosis. Item-missingness on these covariates was more common among boys, African-Americans, and children with mothers with less than a college degree. Multiple imputation of 20 datasets was used to address item-missingness on all covariates except ADHD diagnosis and the 5th grade outcome variables, although ADHD diagnosis and the outcomes are included in the imputation equation and then dropped before conducting analyses, following Von Hippel (2007).

Sample Restrictions

The final analytic sample required several sample restrictions guided by best practices for cleanly identifying labeling effects. First, analyses excluded 150 children who received

medication treatment prior to kindergarten or without ADHD diagnosis in order to isolate medication use due to ADHD diagnosis (as opposed to another condition for which medication is used) (Owens and Jackson 2017). Additionally, the working sample excluded 420 twins and higher-order births because they are at higher risk of low birth weight and other health outcomes and because the presence of twins may influence reports of children's behaviors differently than if there were no twin in the household (Royer 2009). Following best practices for efficient matches (Caliendo and Kopeinig 2008), 340 undiagnosed children of the remaining 7,680 children were excluded to improve the efficiency of matches because their aggregate behavior problems score fell below that of any diagnosed child, as shown in **Figure 2**, such that they were off the area of common support of the diagnosed sample and could not have been suitable matches for diagnosed children (Imbens and Rubin 2015). The final analytic sample of 7,340 children includes 380 children diagnosed with ADHD between kindergarten and 3rd grade and 6,960 possible undiagnosed "matches" (see **Appendix Tables A.1-A.2** for counts).

[FIGURE 2 ABOUT HERE]

Analytic Strategy

Most research estimating labeling effects must contend with the reality that the label of interest (e.g., ADHD diagnosis) is not assigned at random. To help address this issue, coarsened exact matching (CEM) was used to match diagnosed and undiagnosed children on family socioeconomic status and pre-diagnosis ADHD-related behavioral severity. Next, propensity score matching (PSM) was conducted *within coarsened groups* to ensure that estimates of labeling effects were generated from comparisons between diagnosed and undiagnosed children with similar pre-diagnosis ADHD-related behaviors, family SES, and 19 other variables included in the PSM equation (Imbens and Rubin 2015).

The PSM estimation strategy proceeded in four steps. First, propensity scores for the probability of diagnosis with medication receipt or diagnosis without medication receipt were generated for every child in the sample using the logistic regression in equation 1:

$$logit(\pi_i) = x_i'\beta \quad (1)$$

Here, π_i was the underlying probability of diagnosis with or without subsequent medication receipt, x_i was a vector of covariates including all pre-diagnosis behavioral, cognitive, and demographic variables shown in **Table 1** and listed above, and β was a vector of corresponding regression coefficients. Second, diagnosed and undiagnosed children were matched using their estimated propensity scores using nearest neighbor matching with replacement. While different matching strategies carry a trade-off between bias and efficiency, nearest neighbor matching with replacement maximized opportunities for strong matches and withstood increased standard errors due to matching with only one nearest neighbor (Caliendo and Kopeinig 2008). Third, balance statistics were examined to ensure strong matches on each covariate used to estimate the propensity score (see **Appendix Tables A.3** for a sample balance table). Finally, average treatment effects on the treated (ATT), Δ, or differences in the outcomes (Y) of matched pairs of diagnosed (D=1) and undiagnosed (D=0) children, were estimated, per equation 2:

$$ATT \sim \Delta = E(Y_1|D = 1) - E(Y_0|D = 0) \quad (2)$$

Importantly, PSM estimation strategies enabled the silencing of three sets of direct pathways **(paths a, b, and c in Figure 2)** that would otherwise have confounded estimates of the association between an ADHD diagnosis and outcomes – the "labeling effects" of interest **(path d)**. Neither the term "labeling effects" nor the estimates themselves should be interpreted causally due to risk of omitted variables bias given non-random selection into ADHD diagnosis, imperfect control measures, and measurement error.

RESULTS

Table 1 shows that higher SES children both enter school with fewer pre-diagnosis behavior problems and higher parent educational expectations and exhibit better behavior and higher average educational expectations in 5th grade when outcomes are measured. Higher SES children also attend class with better-behaved classmates. These patterns reflect high levels of residential socioeconomic segregation and the ability of higher SES families to engage in the "concerted cultivation" that leads higher SES children to engage in the behaviors rewarded in schools (Calarco 2014; Lareau 2003). Still, 66% of higher SES children with lower pre-diagnosis behavior problems receive medication, compared to only 50% of their lower SES counterparts. Among children with higher pre-diagnosis behavior problems, only 9% of higher SES children receive special education compared to 13% of lower SES children. This may likewise reflect higher SES parents' ability to strategically navigate family-school relationships avoidance of special education, which can have negative educational implications for otherwise comparable children (Morgan et al. 2010; Shifrer 2013). Roughly two-thirds of children in each SES and pre-diagnosis behavioral severity group live in states with consequential accountability standards during the diagnostic observation period (K-3rd grades).

[TABLE 1 ABOUT HERE]

Higher SES Children with Lower Pre-Diagnosis Behavior Problems

PSM estimates shown in models 1 and 3 of **Table 2** indicate that higher SES and lower pre-diagnosis behavior problems do not protect, or buffer, against the effects of labeling and stigma. Model 1 shows that higher SES children with lower pre-diagnosis behaviors who receive medication exhibit 0.25-points (0.43 SD) lower 5th grade teacher-rated positive learning-related behaviors and model 3 shows 0.25-points (0.48 SD) higher 5th grade teacher-rated externalizing

problems compared to undiagnosed counterparts. As expected, labeling effects are much larger for higher SES children with lower pre-diagnosis behavior problems who do not receive medication. Without medication, model 1 also shows that higher SES children with lower pre-diagnosis behaviors exhibit 0.57-points (0.98 SD) lower 5th grade positive learning-related behaviors and model 3 shows 0.41-points (0.85 SD) higher 5th grade externalizing problems relative to undiagnosed counterparts. That estimates are roughly twice the magnitude as among comparable children not receiving medication is consistent with prior research showing that medication is efficacious in controlling behaviors. However, though smaller, labeling effects persist even with medication.[8]

[TABLE 2 ABOUT HERE]

When it comes to the mechanisms accompanying labeling effects, results shown in models 1, 3, and 5 of **Table 3** are broadly consistent with the notion that child and parent knowledge of the child's label can lead to stigma – even without necessarily requiring knowledge of the label by teachers or peers. Model 1 shows that diagnosed higher SES children with lower pre-diagnosis behaviors not receiving medication exhibit a statistically significant 0.46-points (0.61 SD) lower self-rated competence in 5th grade compared to undiagnosed matches. Diagnosed higher SES children with lower pre-diagnosis ADHD-related behaviors who receive medication likewise exhibit 0.28-points (0.37 SD) lower 5th grade self-competence relative to undiagnosed matches. Model 3 reveals that higher SES parents whose children have lower pre-diagnosis behaviors and receive medication exhibit 0.06-points (0.07 SD) lower educational expectations relative to parents of undiagnosed matches. However, model 3 also shows that the parents of higher SES children with lower pre-diagnosis behaviors *not* receiving medication report 0.38-points (0.46 SD) significantly lower educational expectations relative to

parents of undiagnosed matches. Findings suggest that self-stigma accompanies the lower attention/learning-related behaviors and higher externalizing problems of higher SES children with lower pre-diagnosis behaviors relative to undiagnosed counterparts and that affiliate stigma is only present among higher SES parents whose children do not receive medication.

[TABLE 3 ABOUT HERE]

In order for lowered self-rated competence to be a mechanism associated with ADHD diagnostic labeling, diagnosed children should not experience lowered self-rated competence until well after diagnosis, after which point the child should have internalized the stigmatized label and experienced associated status loss. Modified labeling theory further suggests that status loss and stigma can unfold gradually over time. As such, higher SES children with lower pre-diagnosis behaviors would be expected to manifest comparable levels of self-competence in 3rd grade as their undiagnosed peers. Irrespective of medication receipt, model 5 of Table 3 shows that the diagnosis-self competence relationship in 3rd grade is 40% smaller and not statistically significantly different from that of undiagnosed matches. Nonetheless, the estimated -0.17-points (0.25 SD) lower 3rd grade self-competence among those receiving medication and -0.28-points (0.41 SD) lower 3rd grade self-competence among those not receiving medication, both compared to undiagnosed matches, is not trivial. This suggests that the process of internalizing the stigmatized ADHD diagnostic label is likely already underway by 3rd grade, but that internalization of the stigmatized identity and associated status loss increases over the years following diagnosis.

Results shown in **Table 4** test whether labeling effects on 5th grade behaviors, self-perceived competence, and parent educational expectations are concentrated among higher SES children in states with strict consequential accountability standards in place at the time of ADHD

diagnosis. Consistent with Bokhari and Schneider (2011), the "N/A's" in Table 4 indicate model non-convergence due to such few diagnoses among higher SES children living in non-accountability states. Importantly, this lack of diagnosis is not for lack of exposure to non-accountability, as roughly equivalent number of higher SES ($N^{undiagnosed}$=490) and lower SES ($N^{undiagnosed}$=410) children could have been diagnosed in non-accountability states. Nonetheless, labeling effects and stigma are almost exclusively concentrated among children living in states with strict consequential accountability laws. Model 1 shows that, among diagnosed, higher SES children with lower pre-diagnosis behaviors living in accountability states, diagnosis is associated with 0.23-points (0.40 SD) statistically significantly lower 5th grade positive learning behaviors among children receiving medication and 0.80-points (1.38 SD) lower positive learning behaviors among children not receiving medication. Model 3 likewise indicates statistically significantly higher 5th grade externalizing problems (0.30-points or 0.63 SD among children receiving medication and 0.57-points or 1.19 SD among those who are not) compared to undiagnosed matches.

[TABLE 4 ABOUT HERE]

Moreover, models 5 and 7 indicate that diagnosed, higher SES children with lower pre-diagnosis behaviors who receive medication exhibit a statistically significant 0.45-points (0.59 SD) lower 5th grade self-rated competence; those who do not receive medication likewise exhibit 0.65-points (0.86 SD) lower self-competence in 5th grade relative to their undiagnosed counterparts. Only the parents of children not receiving medication exhibit lower educational expectations (-0.70-points or 0.84 SD). When it comes to the timing of the internalization of the stigmatized ADHD label, model 9 indicates that internalization of the stigmatized label and associated status loss is typically not immediately apparent. Higher SES children with lower pre-

diagnosis behaviors exhibit only a non-significant 0.14- to 0.18-points (0.20 SD or 0.26 SD) lower self-rated competence in 3rd grade (model 9). Together, results indicate descriptively meaningful increases in labeling effects and stigma among children living in accountability states. Although unable to compare estimates to children in non-accountability states, the fact that so few children in these contexts are diagnosed is in itself a strong indication that diagnosis, and by extension, labeling effects, are a response to academic pressure correlated with strict consequential educational accountability policies.

Are Labeling Effects and Self-Stigma Specific to Children who are both Higher SES and have Lower Pre-Diagnosis Behavior Problems?

Thus far I have focused on the higher SES children with lower pre-diagnosis behavior problems who would be most expected to receive ADHD diagnoses as a form of adaptation to academic pressure. However, it is possible that labeling effects and self-stigma are ubiquitous across either family SES and/or lower pre-diagnosis problem behaviors. In the former case, labeling effects and self-stigma should also extend to higher SES children with higher pre-diagnosis behavior problems (i.e., apply uniformly across social class). In the latter case, labeling effects and self-stigma should also extend to lower SES children with lower pre-diagnosis behavior problems (i.e., apply uniformly across pre-diagnosis behavioral severity).

Results in Table 2 indicate that labeling effects on school behaviors are indeed concentrated among higher SES children with lower pre-diagnosis behavior problems. That is, neither higher SES children with higher pre-diagnosis behavior problems, not lower SES children with lower pre-diagnosis behavior problems exhibit poorer school behaviors in 5th grade than their undiagnosed counterparts. Models 5 and 7 of Table 2 show that, without medication treatment, higher SES children with higher pre-diagnosis behaviors exhibit 0.07-

points (0.12 SD) non-significantly lower 5th grade positive learning problems and 0.14-points (0.23 SD) non-significantly higher 5th grade externalizing problems compared to undiagnosed counterparts. Among these higher SES children receiving medication, estimates are even closer to 0 (0.03-points higher 5th grade positive learning behaviors and 0.06-points higher 5th grade externalizing problems). Although estimated diagnostic labeling effects for children with lower and higher pre-diagnosis behavior problems are not statistically significantly different from one another, the net negative marginal labeling effect associated with ADHD diagnosis is statistically significantly different from 0 only for children with lower pre-diagnosis behavior problems.

Among lower SES children with lower pre-diagnosis behaviors not receiving medication, estimates in model 2 of Table 2 reveal a non-statistically significant 0.23-point (0.36 SD) lower 5th grade learning behaviors score and a 0.02-point (0.03 SD) higher externalizing problems score. Model 2 also shows that, among these lower SES children receiving medication, the diagnosis – later positive learning behaviors relationship is only -0.05-points (0.08 SD). Moreover, model 4 shows that the relationship between ADHD diagnosis and 5th grad externalizing problems remains near 0, or 0.01-points (0.02 SD).

The above patterns are consistent with those observed for mental health outcomes, an indicator of self-stigma. Model 2 shows that diagnosed lower SES children with lower pre-diagnosis behaviors also do not exhibit lower self-rated competence in 5th grade (0.09-points, or 0.11 SD, lower self-competence with medication and -0.02-points (0.03 SD) lower self-competence without medication compared to undiagnosed matches). However, model 4 shows that the parents of diagnosed lower SES children with lower pre-diagnosis ADHD-related behaviors not receiving medication exhibit significantly (-0.27-points or 0.26 SD) lower expectations for their children. This aligns with the previously discussed substantively large (but

not quite statistically significant) 0.23-points (0.36 SD) lower positive learning behaviors among the same group (model 2 of Table 2).

Robustness Checks

Four issues may complicate the observed pattern of labeling effects: choice of cut-point between higher and lower pre-diagnosis behavior problems, visibility of the diagnostic label if combined with a school label, school transfers, and within-school versus between-school comparisons between diagnosed and undiagnosed children. One concern is that estimates of labeling effects for diagnosed children with lower ADHD may be an artifact of the clustering of diagnosed children within the bottom quartile of the aggregate ADHD symptoms distribution. To address the possibility that results are driven by use of an idiosyncratic cut-point to differentiate lower from higher pre-diagnosis behavior problems, **Appendix Figure A.1** displays CEM estimates with PSM within coarsened groups of diagnostic labeling effects on school behaviors based on cut-points ranging from the 25th to the 55th percentiles on the aggregate measure of ADHD-related behaviors. Estimates of labeling effects for high SES children with lower pre-diagnosis behavior problems are remarkably stable across these cut-points.

Second, labeling effects might be due to diagnosed children being systematically more likely than undiagnosed matches to receive a *visible school label*, such as an Individualized Education Plan (IEP) or a 504 Plan for educational accommodations within general instruction classrooms. This visible school label in addition to the child's or family's internalization of the medicalized label alone may instead produce observed labeling effects, for example, if teachers use different reference groups of children when rating the behaviors of diagnosed compared to undiagnosed matches. To test this, two mediators of classroom context are sequentially added into OLS models estimating labeling effects (note that baseline OLS estimates shown in

Appendix Table A.4 are nearly identical to PSM estimates shown in Table 2). The first mediator is receipt of special education services or educational accommodations between 3rd and 5th grades, including through an IEP or a 504 Plan. The second mediator is teachers' average ratings of the typical level of behavior in their class on a scale from 0 "poor" to 4 "excellent" in 3rd grade and 5th grade. Results shown in **Appendix Table A.5** indicate that estimates of labeling effects are changed by no more than 0.01-points on the 4-point positive learning behaviors and externalizing problems scales. Results suggest that differential tracking and differential association with the special education label between diagnosed and undiagnosed children do not drive observed labeling effects.

Third, labeling effects may be driven by school transfers (i.e., children changing schools) between diagnosis by 3rd grade and the time that outcomes are measured in 5th grade. If diagnosed children are more likely to move schools as a result of their diagnosis or another factor that is associated with both their diagnosis and their teacher's rating of the child's behavior, this could bias estimates of labeling effects. To test this, analyses are restricted to the 43% (N= 3,130 of 7,340) of children who remain in the same elementary school through fifth grade. PSM estimates shown in **Appendix Table A.6** indicate that substantive conclusions remain unchanged.

Finally, it is unclear whether labeling effects are driven by between-school or within-school differences in exposure to academic pressure.[9] To test this, **Appendix Tables A.7** displays results from OLS regression models with kindergarten school fixed effects (these can be compared to OLS estimates without school fixed effects shown in Appendix Table A.3). Estimates of labeling are generally robust to the inclusion of school fixed effects, except for positive learning behaviors and externalizing problems among higher SES children with lower

pre-diagnosis behavior problems who receive medication. For higher SES children with lower pre-diagnoses behavior problems who receive medication, labeling effects are associated with significant reductions in self-perceived competence in 5th grade but do not manifest in the form of poorer school behaviors relative to undiagnosed matches in the same school. For all other groups, labeling effects are driven by academic pressures that uniquely affect children labeled with ADHD even within a given school.

DISCUSSION

Rates of childhood ADHD diagnosis have increased dramatically in recent decades, including among children from socioeconomically advantaged backgrounds who have lower levels of pre-diagnosis behavioral problems (Hinshaw and Scheffler 2014; Schwarz 2017). In an era of mounting academic pressure, higher SES families are especially likely to reflect increasing academic demands in their childrearing practices through the concerted cultivation of the behaviors and skills rewarded in schools and college admissions offices (Espenshade and Radford 2009; Lareau 2003). For higher SES children and families, elite educational credentials remain viable avenues to the highest paying and most prestigious jobs, thus playing an important role in the intergenerational transmission of social and economic advantage (Rivera 2011; Rivera 2016). As attention, concentration, and self-control become increasingly paramount to meeting intensifying academic demands (Heckman and Rubinstein 2001), research documents how family SES plays an important role in shaping the use of the stimulant medications as a form of medical adaptation to academic pressure, such as through exposure to strict consequential educational accountability policies in school (King, Jennings and Fletcher 2014). These medications have proven efficacious in improving attention and concentration even among

undiagnosed children with lower levels of pre-diagnosis behavior problems, many of whom may be considered to be normally functioning (Smith and Farah 2011).

Although it is implicitly assumed that the ADHD diagnoses that accompany medication use among young children are beneficial for diagnosed children, existing research has not examined how family SES and pre-diagnosis ADHD-related behavioral severity shape the consequences of ADHD diagnosis, particularly for high SES children. Contrary to the benefits of medication, labeling theory predicts a net negative marginal effect of an ADHD diagnosis on children's behavioral and mental health outcomes as a result of status loss associated with the internalization of a stigmatized mental health label (Link et al. 1989). Because labeling theories have traditionally focused on more severe mental or neurobehavioral disabilities (Thoits and Link 2016), one of the contributions of this study is to expand focus to include children with *lower* pre-diagnosis behavior problems who are understudied in the literature on labeling, but are increasingly diagnosed and treated for ADHD.

This study helps isolate marginal diagnostic labeling effects above and beyond a key alternate explanation – the effects of the behavior problems themselves – through the matching of diagnosed and undiagnosed children with comparable teacher- and parent-rated pre-diagnosis behavior problems. This study shows that, especially when exposed to academic pressure through strict consequential accountability in schools, even higher SES children with lower pre-diagnosis behavior problems who receive medication are not protected against negative diagnostic labeling effects on teacher ratings of later school behaviors following diagnosis, compared to otherwise comparable undiagnosed peers.

These results extend to labeling effects on children's mental health. Contrasting two stigma-related mechanisms – child self-stigma and parental affiliate stigma – the study sheds

light on the differing underlying meanings associated with ADHD diagnosis between higher SES parents and their children with lower pre-diagnosis behavior problems. Whereas higher SES parents of diagnosed and undiagnosed children with lower pre-diagnosis behavior problems exhibit comparable educational expectations, diagnosed children express lower self-rated competence, consistent with the existence of self-stigma. There are at least two potential school-based explanations for this finding. Diagnosed children may attend schools that are more prone to foster self-stigma than their undiagnosed counterparts (between-school differences in stigma). Alternatively, diagnosed children may experience lower self-rated competence even within the same schools as their undiagnosed counterparts (within-school stigma processes).

Adjudicating between the possibilities that stigma is driven by between-school versus within-school processes leads to the conclusion that differences between schools in the degree to which they reinforce stigma surrounding an ADHD diagnostic label do not account for differences in the self-perceived competence of diagnosed versus otherwise comparable undiagnosed higher SES children with lower pre-diagnosis behavior problems. Lower self-rated competence also persists when restricting the sample to children who do not move schools between kindergarten and the measurement of outcomes in 5th grade, further weakening the possibility that diagnosed and undiagnosed higher SES children with lower pre-diagnosis behavior problems are exposed to differing contexts across schools.

These findings suggest either that diagnosed and undiagnosed higher SES children with lower pre-diagnosis behavior problems are exposed to differing contexts in families or within the same schools, or that diagnosis per say is associated with lower self-rated competence even within the same family and school contexts. To address the possibility of differing behavior standards across *classrooms* within a given school, the study examines and concludes that

labeling effects on self-rated competence persist among teachers with the same ratings of average classroom behavior. To address several possible family-based alternate explanations for the finding of negative diagnostic labeling effects on self-rated competence, such as differential maternal mental health or parental emphasis on academic achievement, the study matches diagnosed and undiagnosed higher SES children with lower pre-diagnosis behavior problems on maternal depression and parent educational expectations for the child in kindergarten. Taken together with the literature on concerted cultivation and the role of family SES in shaping families' ability to adapt to mounting academic pressures, findings suggest that the practice of diagnosing higher SES children with lower pre-diagnosis behavior problems has unintended negative consequences for children's subsequent mental health.

Finally, results are contrasted with those for higher SES children with higher pre-diagnosis behavior problems and lower SES children with lower pre-diagnosis behavior problems –those who we would expect to also experience labeling to the extent either of these dimensions alone, rather than their intersection, drive labeling effects. I find that neither of these two groups experience negative labeling effects on later mental health or school behaviors. This suggests that negative labeling effects are specific to children with intersection social class advantages and lower pre-diagnosis behavior problems, those who are most likely to be diagnosed as a response to medical adaptation to mounting academic pressure and rising academic demands given the high educational expectations of higher SES parents.

Beyond these substantive empirical findings, the study also has a number of theoretical implications. Although cumulative disadvantage is a primary mechanism underlying many instances of stigmatized labeling effects, such as labels associated with a criminal record or a school suspension (Okonofua and Eberhardt 2015; Pager 2003; Pager and Quillian 2005), this

study shows that, under certain conditions, even higher SES children are not protected against negative diagnostic labeling effects and that lower SES children exhibit psychological and behavioral resilience against negative labeling effects. There are several possibilities for reconciling these different patterns of labeling effects across domains (e.g., criminal versus mental health labeling) and for advantaged and disadvantaged groups (e.g., along lines of race or social class).

One possibility is to consider that the internal versus external identification, or knowledge, of an individual's label on a day-to-day basis can shape the lived experience of having the label. When it comes to criminal labeling through a school suspension or criminal conviction, knowledge of the label is made available to those in gate-keeping roles, for example when applying for a job. Whites and typically higher socioeconomic status individuals may be partially protected from negative labeling effects relative to persons of color and lower socioeconomic status individuals because others outside the individual who evaluate behaviors and make decisions about future suspensions, arrests, and convictions.

Another possibility for the substantively different meanings associated with a criminal versus medical label for members of advantaged versus disadvantaged groups has to do with the way these labels interact with pre-existing stereotypes, or tropes, about poor and minority individuals in American society. For all groups, a criminal label may be understood as a stigma or negative mark received by an individual as a result of actions within their control (e.g., you were arrested or convicted because you broke the law), but it may be only for members of disadvantaged groups, like poor people or Blacks and Latinos, that this stigma or mark interacts with tropes about these groups as "lazy," "violent," or "incompetent," thus serving to justify disproportionately their harsh or negative treatment (Fiske 1998). By contrast, an ADHD

diagnostic label may be conceptualized as resulting from a deficit that is *outside* the control of the labeled individual, for example, as a result of genetics, biology, or heredity. In this case, members of *advantaged* rather than disadvantaged groups may be more likely to be negatively impacted by the diagnostic label than by a criminal label, because "inherent ability" is viewed as a necessary attribute for academic, social, and economic success (Duckworth et al. 2007). By contrast, for members of disadvantaged groups, the effects of an ADHD diagnostic label may pale in comparison to the materially larger and more detrimental consequences of other forms of disadvantage, like racial discrimination, poverty, and insecurity in various forms (Hannon 2003).

In spite of its contributions, this study has a number of limitations. First, teacher and parent reports of children's behaviors may contain measurement error. One way in which this may occur is because of different standards or norms for behavior across different types of school, the teacher's own background and teaching experiences, or salient demographic characteristics such as race or social class of the school and the child. Measurement error in behavior reports may also result from the fact that different teachers report behaviors in 1st grade (or the wave prior to diagnosis) and in 5th grade. In addition, to the extent that the teachers reporting behaviors in 5th grade experience affiliate stigma or otherwise contribute to the stigma experienced by the diagnosed child, teacher reports may additionally be "biased." However, that teachers teaching less advantaged students do *not* report decreases in positive learning behaviors or increases externalizing problems following diagnosis suggests that any teacher "bias" in rating fifth grade behaviors would have to be unique to the teachers of high SES students. In addition, these opportunities for measurement error also reflect the inherent biases, or shifting relative standards, that guide evaluation decisions on the ground. In this sense, these potential measurement errors are *substantively meaningful* in that they mimic the best practices in place in

the process of contextualizing children's symptoms relative to the expectations of their environments, which are inherently different and subjective. Additionally, the fact that the same teachers who rate children's behaviors prior to diagnosis are not those who rate 5th grade behaviors is a strength because the teachers rating outcomes are less likely to be predisposed to surveil for evidence that the diagnosis helps or does not.

Second, the use of propensity score matching techniques within coarsened family SES and pre-diagnosis behavior problems groups does not protect against bias from unobserved factors. Omitted variables bias poses a threat to the inherent assumption that diagnoses are assigned effectively at random conditional on observed covariates in the propensity score matching equation. Related, learning demands and social norms around controlled behavior increase substantially between the 3rd and 5th grades, when this study's outcomes are measured. In spite of beginning school with the same behaviors, diagnosed children's behaviors may worsen by 5th grade compared to their undiagnosed matches as a result of factors such as unobserved worsening in their home, neighborhood, or school environments after 1st grade, which uniquely influence the behavior of diagnosed children. However, this would require disproportionately worsening circumstances for diagnosed children from high SES families who have less severe pre-diagnosis behavior problems compared to undiagnosed matches, which seems unlikely given the many resources available to higher SES children and the efficacy of medication in controlling less severe pre-diagnosis behavior problems.

Finally, cumulative disadvantage may become more powerful as a mechanism if a longer time horizon was examined – for example high school or later. It may be that the relatively short time horizon prevents the realization for accumulating disadvantages for the relatively disadvantaged children in my sample. Future work should examine this possibility.

Future work should consider explicitly examining how visibility of the child's ADHD label by school officials and peers through the receipt of special education services (including not only an IEP or contained classroom placement, but also educational accommodations within a general instruction classroom such as through a 504 Plan), which serve as visible labels that can be stigmatized within the school context. Explicit visibility of a stigmatized school label may, in addition to the potentially less-visible medical version of the label, serve to enhance the degree to which children's "mark" or "difference" is linked to teacher evaluations of the child. In addition to influencing teacher ratings of child behavior, the school label in addition to the medical label may shape teacher ratings of children's academic skills, both of which are strong predictors of children's learning. The latter may be fruitfully measured through student test scores in contrast to teacher ratings of academic skills in corresponding content areas like reading/writing and mathematics.

Nevertheless, the findings of this study carry implications for policy and practice. Foremost, findings call for increased awareness among educators, parents, and medical practitioners about the real threats posed by the use of ADHD diagnoses and associated medication treatments as a way to push educational advantages on young children from advantaged backgrounds. Not only do findings suggest that social advantage is associated with unique implications for children's experience of the effects of behavioral labeling, but also that social advantage may lead children to respond to the effects of labeling in ways that not only run counter to the educational goals that motivated diagnosis and medication treatment, but also in ways that exacerbate their sense of social privilege. For children from disadvantaged backgrounds, ADHD diagnosis may serve as another form of social control which may be exacerbated by academic pressures. In light of prior work on the negative externalities associated

with high levels of behavior problems in the classroom (Aizer 2008), the implications of diagnosing children from both advantaged and disadvantaged backgrounds may extend not only to the diagnosed child and his/her family, but also to others in the learning environment.

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NOTES

[1]An ADHD diagnosis is also associated with educational services, like receipt of accommodations through a 504 Plan or an Individualized Education Plan (IEP), which might in certain circumstances help boost the achievement of diagnosed children by providing services like extra testing time, tutoring, modified curricula, and smaller classes (Gius 2007; Holler and Zirkel 2008). However, with mixed evidence regarding the efficacy of these services for student achievement (Morgan et al. 2010), this study focuses on differences in the marginal effects of an ADHD diagnosis with or without medication treatment.

[2] Some children in this sample may have been diagnosed with ADHD later in schooling or as adults. However, because ADHD diagnosis is only measured in this study between kindergarten and 3rd grade, those diagnosed later were treated as possible undiagnosed matches. To the extent these children have undiagnosed ADHD, this downwardly biases my estimates of diagnostic labeling effects, leading to conservative estimates of ADHD diagnostic labeling.

[3] Another approach would have been to standardize indexes that summed (rather than averaged) across constituent items. However, this approach was not possible because only averaged scales ranging from 1 to 4 are available from the publisher for the 5th grade wave. Additionally, this approach would have been less preferred because it unreasonably assumes that teachers' behavior ratings, which are a function of the behavioral norms of their specific classroom and school contexts, follow a stable logic across contexts.

[4] Measuring pre-diagnosis ADHD-related behaviors in the wave immediately prior to diagnosis helped guard against the possibility that child behavior problems increased after school entry and before a child is diagnosed. If behavior problems were to increase among children who are subsequently diagnosed, matching diagnosed and undiagnosed children on school-entry behaviors could increase the likelihood of inappropriate matches (Elder 2010; Evans, Morrill and Parente 2010; Johnston et al. 2014). Since behavior problems generally decrease with age, matching on kindergarten behaviors for undiagnosed children would have generated lower-bound (i.e., inflated) estimates of labeling. As such, 1st grade behavior problems were used for undiagnosed children, as this was the nearest mid-point across the kindergarten to 3rd grade diagnostic observation period. Regardless, estimates of labeling effects did not change by more than 10% with the use of kindergarten measures.

[5] Complete externalizing behaviors and approaches to learning scales available in the ECLS-K were also used to approximate ADHD-related behaviors; estimates of labeling effects were virtually identical.

[6] To guard against the possibility that results are driven by choice of cut-point, sensitivity analyses used varied severity cut-points between the 25th and 55th percentiles.

[7] In addition, indicators for household income below the federal poverty line and region of residence (Midwest, West, and Northeast relative to South) were initially included in the matching equation as other measures of social class, but were dropped because of high multicollinearity with maternal possession of a bachelor's degree or higher.

[8] Hypotheses pertain to testing differences from 0 between diagnosed and undiagnosed pairs. However, t-tests reported in the tables reveal few statistically significant differences in labeling effects across SES groups (within severity).

[9] Another way to think of this is that schools serve as an important source of variation in academic pressure above and beyond the variation in academic pressure associated with family social class.

Table 1. Means and Standard Deviations or Proportions and Minimum and Maximum Values of All Variables in the Analyses, by Pre-Diagnosis ADHD-Related Behavioral Severity and Family SES

	Lower ADHD-Related Behaviors (N=5,330)					Higher ADHD-Related Behaviors (N=2,010)						
	Higher SES (N=1,730)		Lower SES (N=3,600)			Higher SES (N=390)		Lower SES (N=1,620)				
	Mean or Proportion	SD	Mean or Proportion	SD	SES Diff?	Mean or Proportion	SD	Mean or Proportion	SD	SES Diff?	Min	Max
Dependent Variables (5th Grade)												
Attention/Positive Approaches to Learning Behaviors Score (Teacher Report)-5th Grade	2.30	0.58	2.14	0.63	***	1.82	0.60	1.63	0.65	***	0	3
Social/Externalizing Behaviors Score (Teacher Report)-5th Grade	0.50	0.48	0.57	0.51	***	0.83	0.59	1.00	0.65	***	0	3
Child's Self-Reported Competence-5th Grade (Perceived Competence)	2.20	0.76	2.06	0.78	***	2.11	0.80	1.92	0.85	***	0	3
Parent's Educational Expectations for Child-5th Grade	3.44	0.83	2.94	1.03	***	3.26	0.91	2.58	1.13	***	0	5
Child's Self-Reported Competence-3rd Grade (Perceived Competence)	3.39	0.69	3.35	0.71		3.33	0.74	3.30	0.77		0	3
School Context (3rd-5th Grades) (Mediators Only)												
Classroom Average Positive Behavior (Teacher Report)	2.76	0.61	2.62	0.65	***	2.68	0.64	2.45	0.66	***	0	4
Parent Requested Special Services (Parent Report)	0.04		0.04			0.05		0.03			0	1

Receiving Special Education Services (IEP) or 504 Plan Accommodations	0.04		0.05			0.09		0.13		*	0	1
Child Changed Schools During Elementary School	0.17		0.17			0.16		0.17				
ADHD Diagnosis (K-3rd Grades); Medication (3rd-5th Grades)												
Diagnosed with ADHD in Kindergarten-3rd Grade	0.03		0.02			0.15		0.13			0	1
Receiving Medication (among Diagnosed)	0.66		0.50			0.67		0.69			0	1
Early ADHD-Related Behaviors (K-1st Grades)												
Hyperactivity Behaviors Score in Wave Prior to Diagnosis, else 1st Grade (Average of Teacher and Parent Reports)	-0.20	0.30	-0.18	0.33		0.45	0.42	0.52	0.47	**	-1	2
Inattentive Behaviors Score in Wave Prior to Diagnosis, else 1st Grade (Average of Teacher and Parent Reports)	-0.26	0.43	-0.18	0.45	***	0.48	0.45	0.56	0.46	**	-1	2
ODD or CD Behaviors Score in Wave Prior to Diagnosis, else 1st Grade (Average of Teacher and Parent Reports)	-0.18	0.28	-0.15	0.29	**	0.36	0.27	0.44	0.32	***	-1	2
Internalizing Behavior Problems Score in Wave Prior to Diagnosis, else 1st Grade (Teacher Report)	0.09	0.45	-0.07	0.45	***	0.13	0.54	0.22	0.57	**	-1	2
Early Cognitive Skills (Kindergarten)												
Reading Score in Kindergarten (std.)	0.43	0.97	-0.17	0.94	***	0.06	0.98	-0.61	0.90	***	-4	4

Math Score in Kindergarten (std.)	0.49	0.88	-0.08	0.92	***	0.11	0.94	-0.58	0.91	***	-4	4
Early Educational Context (Kindergarten)												
Child in Consequential Educational Accountability State	0.71		0.70			0.67		0.70			0	1
Child Age at Kindergarten Entry (in Months)	65.41	4.51	65.53	4.42		64.88	4.28	65.64	4.21	**	39	84
Classroom Average Positive Behavior (Teacher Report)	2.60	0.76	2.45	0.79	***	2.44	0.77	2.30	0.82	***	0	4
Child Received Any Special Education Services	0.10		0.11			0.11		0.10			0	1
Parent Educational Expectations for Child in Kindergarten	0.32	0.83	-0.06	1.09	***	0.23	0.88	-0.26	1.21	***	-3	2
Maternal, Family, Other Child Controls (Kindergarten)												
Male	0.50		0.47			0.68		0.63		*	0	1
Black	0.05		0.10		***	0.09		0.20		***	0	1
Hispanic	0.09		0.21		***	0.08		0.22		***	0	1
White	0.74		0.58		***	0.71		0.48		***	0	1
Asian or Other Race/Ethnicity	0.13		0.11			0.11		0.10			0	1
Child Born Weighing Less than 5.5 lbs (LBW)	0.06		0.08		*	0.08		0.10			0	1
Child was in Childcare Outside of Home Before Schooling	0.55	0.50	0.47		***	0.61		0.52		**	0	1
Child Not Covered by Insurance	0.15		0.18		*	0.10		0.17		**	0	1
Current Mother Age at Kindergarten Round	37.62	5.18	33.04	6.34	***	35.76	5.83	32.52	7.16	***	18	73

Mother Has CES-D Score >9 (Clinical Depression)	0.10		0.17		***	0.18		0.29		***	0	1
Household Income Below Federal Poverty Line	0.03		0.20		***	0.07		0.31		***	0	1
Number of Other Children in Household	1.47	0.97	1.6	1.20	***	1.4	0.99	1.56	1.19	*	0	9
Live in Midwest in Kindergarten/First Wave Available	0.30		0.28			0.32		0.27		*	0	1
Live in West in Kindergarten/First Wave Available	0.20		0.22			0.19		0.20			0	1
Live in Northeast in Kindergarten/First Wave Available	0.22		0.17		***	0.18		0.15			0	1
Live in South in Kindergarten/First Wave Available	0.27		0.32		***	0.29		0.36		**	0	1

*p<0.05 **p<0.01 ***p<0.001 (two tailed t-tests).

Notes: Displaying means and SD for continuous variables and proportions for binary variables. Higher SES is defined as maternal possession of a bachelor's degree or higher at kindergarten.

Source: ECLS-K:98 children who were eligible for sampling and present in all waves used in the analyses, who had complete information on ADD/ADHD diagnosis and the behavioral and achievement outcome measures, and whose composite ADHD-related behaviors score did not fall below that of the diagnosed child with the least severe ADHD-related behaviors composite score or above that of the diagnosed child with the most severe ADHD-related behaviors composite score. Multiple imputation was used to produce 20 datasets to address item-missingngess on variables other than the outcomes, ADHD diagnosis, and pre-diagnosis ADHD-related behaviors.

Table 2. Propensity Score Matching and OLS Regression Estimates of the Effect of an ADHD Diagnosis between K-3rd Grades on 5th Grade Attention/Positive Learning-Related Behaviors and Impulsive/Externalizing Problems, by ADHD Severity, Family Social Class, and Medication Treatment Status

	Positive Approaches to Learning (Teacher Report) - 5th Grade		SES Diff.?	Externalizing Behavior Problems (Teacher Report) - 5th Grade		SES Diff.?
	Lower ADHD (N=5,330)					
	(1)	(2)		(3)	(4)	
	Higher SES (N=1,730)	Lower SES (N=3,600)		Higher SES (N=1,730)	Lower SES (N=3,600)	
Diagnosed with ADD/ADHD, Receiving Medication	-0.25**	-0.05		0.25+	-0.01	
	(0.09)	(0.14)		(0.16)	(0.12)	
Diagnosed with ADD/ADHD, Not Receiving Medication	-0.57**	-0.23		0.41*	0.02	
	(0.19)	(0.18)		(0.20)	(0.13)	
	Higher ADHD (N=2,010)					
	(5)	(6)		(7)	(8)	
	Higher SES (N=390)	Lower SES (N=1,620)		Higher SES (N=390)	Lower SES (N=1,620)	
Diagnosed with ADD/ADHD, Receiving Medication	0.03	-0.19**		0.06	0.01	
	(0.13)	(0.07)		(0.08)	(0.07)	
Diagnosed with ADD/ADHD, Not Receiving Medication	-0.07	-0.23***		0.14	0.03	
	(0.14)	(0.07)		(0.20)	(0.11)	

+p<0.10, *p<0.05, **p<0.01, ***p<0.001.

Notes: Displaying propensity score matching estimates with standard errors in parentheses. All models matched on all early ADHD-related behaviors prior to diagnosis, early cognitive skills, early educational context, and maternal, family, and other child controls shown in Table 1 (all factors were measured in kindergarten except where noted). Higher SES is defined as maternal possession of a bachelor's degree or higher.

Source: ECLS-K:98 children who were eligible for sampling and present in all survey waves used, who had complete information on ADD/ADHD diagnosis and the behavioral and achievement outcome measures, and whose composite ADHD-related behaviors score prior to diagnosis did not fall below that of the diagnosed child with the least severe pre-diagnosis composite score or above that of the diagnosed child with the most severe pre-diagnosis composite score. Multiple imputation was used to produce 20 datasets to address item-missingngess on variables other than the outcomes, ADHD diagnosis, and ADHD-related behaviors.

Table 3. Propensity Score Matching Estimates of the Effect of an ADHD Diagnosis on Learning-Related Behaviors and Externalizing Problems, by ADHD Severity, Mother's Education and Medication Treatment Status

	Self-Perceived Competence (Child Report) - 5th Grade		SES Diff.?	Educational Expectations for Child (Parent Report) - 5th Grade		Sig. Diff.?	Self-Perceived Competence (Child Report) - 3rd Grade		SES Diff.?
	Lower ADHD (N=5,330)								
	(1)	(2)		(3)	(4)		(5)	(6)	
	Higher SES (N=1,730)	Lower SES (N=3,600)		Higher SES (N=1,730)	Lower SES (N=3,600)		Higher SES (N=1,730)	Lower SES (N=3,600)	
Diagnosed with ADD/ADHD, Receiving Medication	-0.28*	-0.09		-0.06	-0.14		-0.17	0.07	*
	(0.12)	(0.10)		(0.22)	(0.19)		(0.10)	(0.04)	
Diagnosed with ADD/ADHD, Not Receiving Medication	-0.46*	-0.02	+	-0.38**	-0.27*		-0.28	-0.17	
	(0.22)	(0.12)		(0.13)	(0.12)		(0.25)	(0.15)	
	Higher ADHD (N=2,010)								
	(7)	(8)		(9)	(10)		(11)	(12)	
	Higher SES (N=390)	Lower SES (N=1,620)		Higher SES (N=390)	Lower SES (N=1,620)		Higher SES (N=390)	Lower SES (N=1,620)	
Diagnosed with ADD/ADHD, Receiving Medication	0.12	-0.07		-0.13	-0.20*		0.13	0.05	
	(0.14)	(0.08)		(0.15)	(0.09)		(0.12)	(0.09)	
Diagnosed with ADD/ADHD, Not Receiving Medication	0.15	-0.12		-0.13	-0.43**		0.20	-0.02	
	(0.14)	(0.15)		(0.12)	(0.14)		(0.10)	(0.10)	

+p<0.10, *p<0.05, **p<0.01, ***p<0.001.

*Notes:*Displaying propensity score matching estimates with standard errors in parentheses. All models matched on all early ADHD-related behaviors prior to diagnosis, early cognitive skills, early educational context, and maternal, family, and other child controls shown in Table 1 (all factors were measured in kindergarten except where noted). Higher SES is defined as maternal possession of a bachelor's degree or higher.

Source: ECLS-K:98 children who were eligible for sampling and present in all survey waves used, who had complete information on ADD/ADHD diagnosis and the behavioral and achievement outcome measures, and whose composite ADHD-related behaviors score prior to diagnosis did not fall below that of the diagnosed child with the least severe pre-diagnosis composite score or above that of the diagnosed child with the most severe pre-diagnosis composite score. Multiple imputation was used to produce 20 datasets to address item-missingngess on variables other than the outcomes, ADHD diagnosis, and ADHD-related behaviors.

Table 4. Propensity Score Matching Estimates of the Relationship Between ADHD Diagnosis and Positive Learning-Related Behaviors, Externalizing Problems, Self-Perceived Competence, and Parent Educational Expectations among Higher SES children with Lower Pre-Diagnosis Behavior Problems, by State Consequential Accountability Laws and Medication Treatment Status

	Positive Approaches to Learning (Teacher Report) - 5th Grade		SES Diff. ?	Externalizing Problems (Teacher Report) - 5th Grade		SES Diff. ?	Self-Perceived Competence (Child Report) - 5th Grade		SES Diff. ?	Educational Expectations (Parent Report) - 5th Grade		SES Diff. ?	Self-Perceived Competence (Child Report) - 3rd Grade		SES Diff. ?
	(1)	(2)		(3)	(4)		(5)	(6)		(7)	(8)		(9)	(10)	
	A	**NA**		**A**	**NA**		**A**	**NA**		**A**	**NA**		**A**	**NA**	
Diagnosed, Medication	-0.23*	N/A		0.30*	N/A		-0.45***	N/A		-0.06	N/A		-0.14	N/A	
	(0.10)			(0.15)			(0.12)			(0.25)			(0.18)		
Diagnosed, No Medication	-0.80***	N/A		0.57***	N/A		-0.65*	N/A		-0.70***	N/A		-0.18	N/A	
	(0.07)			(0.10)			(0.27)			(0.09)			(0.25)		

+p<0.10, *p<0.05, **p<0.01, ***p<0.001.

Notes: Displaying propensity score matching estimates. Standard errors in parentheses. All models matched on all early ADHD-related behaviors. early cognitive skills, early educational context, and maternal, family, and other child controls shown in Table 1 (all factors were measured in kindergarten except where noted). Higher SES is defined as maternal possession of a bachelor's degree or higher. A=child is living in a state with consequential accountability at the time of diagnosis (or in 1st grade for non-diagnosed), NA=child living in a non-accountability state at the time of diagnosis (or 1st grade for undiagnosed).

Source: ECLS-K:98 children who were eligible for sampling and present in all survey waves used, who had complete information on ADD/ADHD diagnosis and the behavioral and achievement outcome measures, and whose composite ADHD-related behaviors score did not fall below that of the diagnosed child with the least severe ADHD-related behaviors composite score or above that of the diagnosed child with the most severe ADHD-related behaviors composite score. Multiple imputation was used to produce 20 datasets to address item-missingngess on variables other than the outcomes, ADHD diagnosis, and ADHD-related behaviors.

Figure 1. Framework for Estimating ADHD Diagnostic Labeling Effects with or without Medication Treatment and Later Mental Health and School Behaviors

Childhood Structural Factors	School-Entry Factors (Kindergarten)	Kindergarten - 3rd Grade	3rd Grade - 5th Grade	5th Grade
(Stratifying / within-group matching dimensions)		*(Diagnosis)*	*(Medication)*	*(Outcomes)*

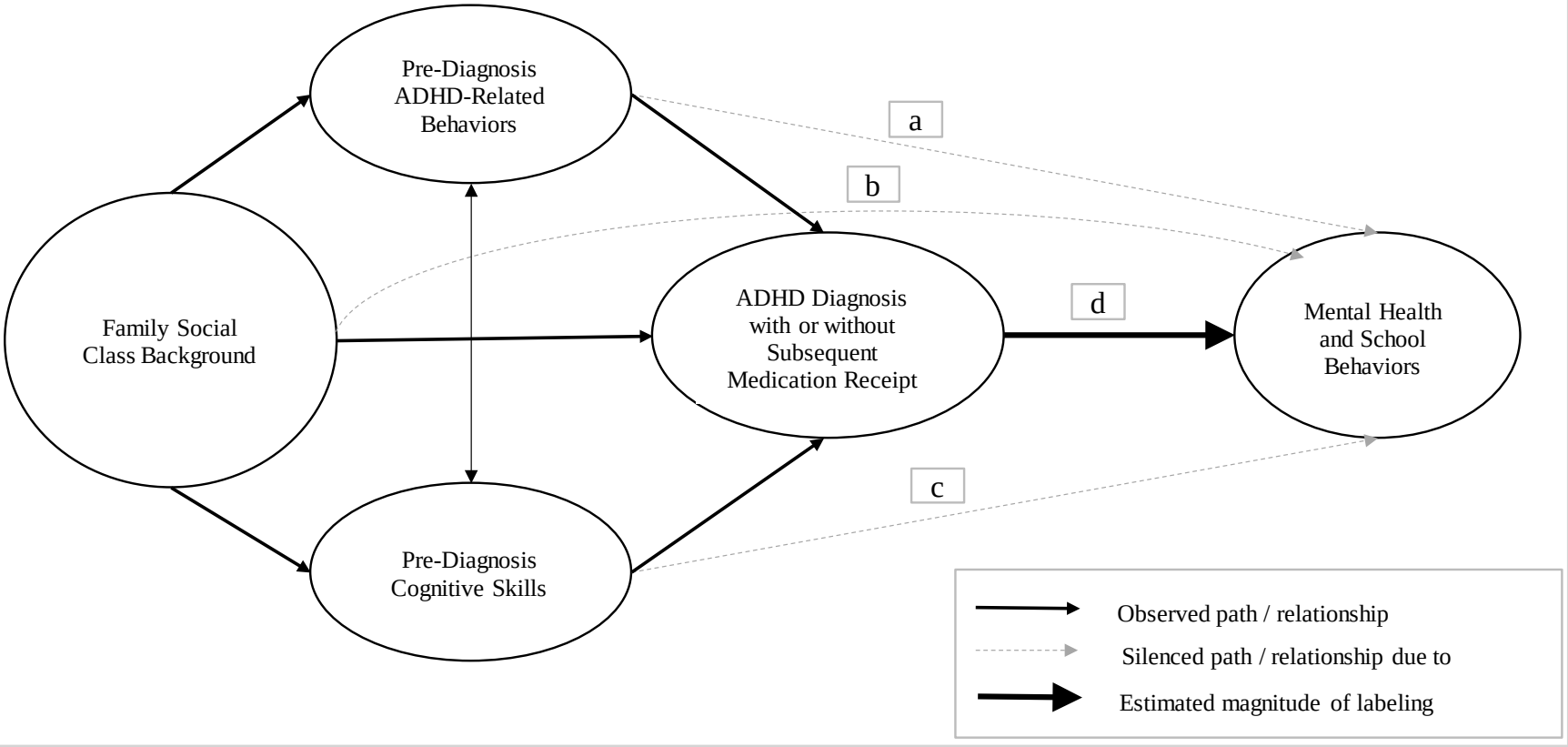
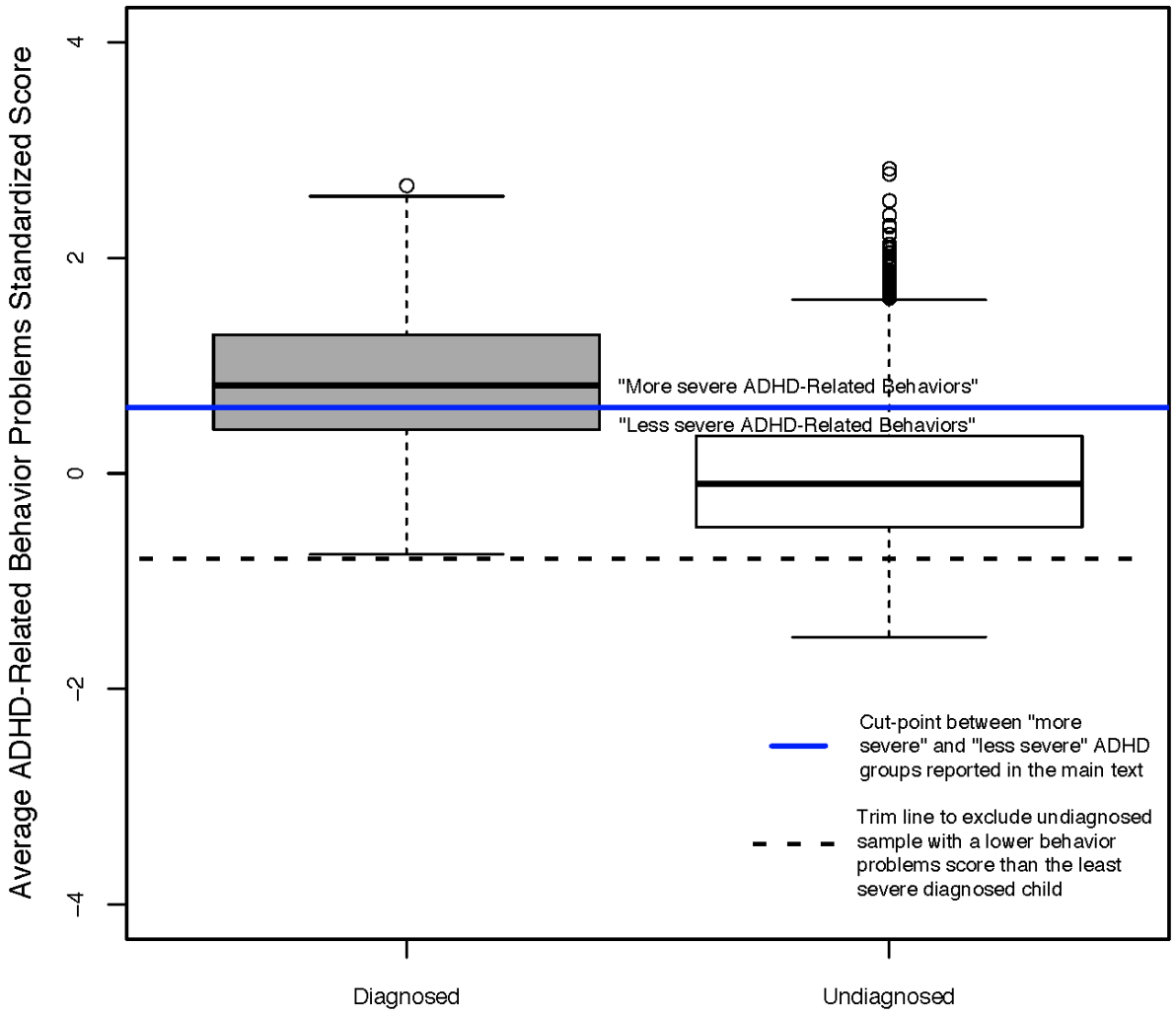


Figure 2. Distributions of Average ADHD-Related Behavior Scores of Diagnosed and Undiagnosed Children



Appendix A. Variables in the propensity score matching (PSM) equation.

The PSM equation included the averaged teacher and parent reports of inattention, hyperactivity/impulsivity, and commonly co-occurring oppositional defiant disorder (ODD) behaviors. Their inclusion in the PSM equation ensured individual matched pairs of diagnosed and non-diagnosed children were comparable on each individual scale, improving quality of matches. Additionally, based on prior research showing that these factors shape a child's propensity for ADHD diagnosis and later schooling and mental health-related behaviors, the PSM equation additionally included the following 16 child, family, and school context factors measured in kindergarten.

Math and reading cognitive skills scores in kindergarten. Because cognitive skills factors into the impairment criterion of the DSM-IV in effect during the period of this study, the matching equation included standardized kindergarten math and reading scores on psychometrically validated, untimed tests containing 50-70 items (Baker 1993; Hinshaw and Scheffler 2014; Spencer, Biederman and Mick 2007; Tourangeau et al. 2009). Reading assessments emphasized grade-appropriate reading skills/comprehension, while math assessments measured grade-appropriate conceptual number sense, properties, and operations skills (Tourangeau et al. 2009).

Additional measures of kindergarten schooling context. School context included teacher ratings of average classroom behavior in kindergarten on a scale from 0 "poor" to 4 "excellent," an indicator for whether the child received special education services through an Individualized Education Plan (IEP) provisioned through the Federal Individuals with Disabilities and Education Act (IDEA) in kindergarten, and mother's educational expectations for her child in

kindergarten. Expectations ranged from 0 (will not complete high school) to 5 (advanced or professional degree).

Child demographic factors. These included kindergarten measures of child sex (male) and child age in months in light of research showing that both boys and young-for-grade children are more likely to be diagnosed with ADHD[1] (Biederman, Faraone and Monuteaux 2002; Elder 2010), child race (indicator for Black or Latino/Hispanic only due to small numbers of diagnosed minority children), low birth weight status, daycare outside home prior to formal schooling, and child's internalizing problems score (i.e., depression-related behaviors) in the wave prior to diagnosis for diagnosed children and 1st grade for non-diagnosed children. Internalizing problems are included as a matching variable because anxiety, low self-esteem, loneliness, and sadness are key symptoms of depression, which is a known comorbidity of ADHD (Cuffe, Moore and McKeown 2005; Zahn-Waxler, Klimes-Dougan and Slattery 2000).

Family demographic factors. These included indicators from kindergarten for child not covered by health insurance, maternal age, number of other children living in the household, and a binary indicator for mother's Center for Epidemiologic Studies-Depression (CES-D) symptoms score above 9 (the cusp of clinically significant depressive symptoms).[2] Maternal CES-D was originally on a scale from 0 to 36 and taps into child and maternal depressive behaviors (Nord et al. 2004). Sensitivity analyses used the continuous measure for maternal depression score. Substantive findings did not change.

Appendix Table A.1. Counts of Children by Pre-Diagnosis ADHD-Related Behavior Severity, Diagnosis, Medication Treatment Status, and Family Social Class

	Undiagnosed		Diagnosed			
			With Medication		Without Medication	
ADHD Severity:	Higher SES	Lower SES	Higher SES	Lower SES	Higher SES	Lower SES
Higher Severity	330	1,400	40	150	20	70
Lower Severity	1,700	3,540	30	40	10	20

Notes: Counts rounded to the nearest 10 in compliance with NCES restricted-data reporting requirements. Higher SES is defined as maternal possession of a bachelor's degree or higher at kindergarten.

Source: ECLS-K:98 children who were eligible for sampling and present at all waves used in the analyses, who had complete information on ADD/ADHD diagnosis and the behavioral and mental health outcome measures, and whose composite pre-diagnosis ADHD-related behaviors score did not fall below that of the diagnosed child with the least severe pre-diagnosis ADHD-related behaviors composite score or above that of the diagnosed child with the most severe pre-diagnosis ADHD-related behaviors composite score. Multiple imputation was used to produce 20 datasets to address item-missingngess on variables other than the outcomes, ADHD diagnosis, and pre-diagnosis ADHD-related behaviors.

Appendix Table A.2. Counts of Children Living in Accountability versus Non-Accountability States among Children who Experience Labeling Effects on Behaviors, by Diagnosis Status, Medication Receipt, and Family SES

Groups who Experience Labeling Effects:	Undiagnosed		Diagnosed			
			With Medication		Without Medication	
	A	**NA**	**A**	**NA**	**A**	**NA**
Higher SES, Lower Severity	1,180	490	20	0	10	0

Notes: A=Accountability State, NA=Non-Accountability State. Higher SES is defined as maternal possession of a bachelor's degree or higher at kindergarten. Counts rounded to the nearest 10 in compliance with NCES restricted-data reporting requirements.

Source: ECLS-K:98 children who were eligible for sampling and present at all waves used in the analyses, who had complete information on ADD/ADHD diagnosis and the behavioral and mental health outcome measures, and whose composite pre-diagnosis ADHD-related behaviors score did not fall below that of the diagnosed child with the least severe pre-diagnosis ADHD-related behaviors composite score or above that of the diagnosed child with the most severe pre-diagnosis ADHD-related behaviors composite score. Multiple imputation was used to produce 20 datasets to address item-missingngess on variables other than the outcomes, ADHD diagnosis, and pre-diagnosis ADHD-related behaviors.

Appendix Table A.3. Balance Statistics for PSM Estimates of Differences in Positive Learning-Related Behaviors in 5th Grade between Diagnosed (Treated) and Undiagnosed (Control Group) Children with Lower Pre-Diagnosis ADHD-Related Behavioral Severity, by Family Social Class and Medication Treatment Status among those Diagnosed

Variable	Higher SES, Diagnosed and Receiving Medication			Lower SES, Diagnosed and Receiving Medication			Higher SES, Diagnosed and not Receiving Medication			Lower SES, Diagnosed and not Receiving Medication		
	Mean Treated	Mean Control	t-stat.	Mean Treated	Mean Control	t-stat.	Mean Treated	Mean Control	t-stat.	Mean Treated	Mean Control	t-stat.
Pre-Diagnosis Hyperactive Behaviors Score	-0.10	-0.16	0.57	0.02	-0.01	0.36	-0.01	-0.02	0.09	-0.06	0.06	0.02
Pre-Diagnosis Inattentive Behaviors Score	0.00	-0.03	0.20	0.20	0.22	-0.13	0.20	0.15	0.37	0.23	0.25	-0.19
Pre-Diagnosis ODD/CD Behaviors Score	-0.18	-0.18	0.02	-0.14	-0.17	0.45	0.01	0.09	-0.71	-0.23	-0.16	-0.76
Pre-Diagnosis Internalizing Behaviors Score (Teacher)	0.02	0.03	-0.07	-0.07	-0.05	-0.19	0.11	0.06	0.27	0.17	0.19	-0.11
Reading Score (std.)	-0.04	-0.07	0.10	-0.26	-0.28	0.09	0.19	0.20	-0.03	-0.60	-0.65	0.16
Math Score (std.)	-0.05	-0.06	0.04	-0.23	-0.34	0.54	0.18	0.23	-0.14	-0.62	-0.62	-0.01
Child in Consequential Educational Accountability State	0.88	0.92	-0.33	0.83	0.80	0.33	0.80	0.88	-0.47	0.80	0.81	-0.08
Child Age at Kindergarten Entry (in Months)	63.94	64.79	-0.50	66.43	66.18	0.24	63.30	62.92	0.21	63.75	63.62	0.08
Classroom Average Positive Behavior (Teacher)	3.59	3.61	-0.09	3.43	3.27	0.84	3.40	3.42	-0.06	3.35	3.34	0.04

Child Received Any Special Education Services				0.10	0.07	0.46	0.10	0.12	-0.14	0.10	0.06	0.46
Parent Educational Expectations for Child	0.22	0.24	-0.09	-0.38	-0.41	0.12	-0.08	-0.04	-0.11	0.07	0.08	-0.02
Male	0.65	0.60	0.28	0.70	0.70	0.00	0.60	0.60	0.00	0.55	0.57	-0.12
Black or Latino/Hispanic				0.03	0.03	0.00				0.35	0.34	0.06
Child Born Weighing Less than 5.5 lbs (LBW)	0.12	0.14	-0.20	0.03	0.05	-0.32	0.20	0.20	0.00	0.05	0.07	-0.26
Child was in Childcare Outside of Home Before Schooling	0.76	0.85	-0.59	0.50	0.48	0.13				0.35	0.40	-0.32
Child Not Covered by Insurance												
Current Mother Age at Kindergarten Round	38.30	38.44	-0.07	32.68	32.94	-0.32	36.50	36.07	0.18	33.51	33.89	-0.17
Mother Has CES-D Score >9 (Clinical Depression)	0.12	0.07	0.46	0.27	0.35	0.13	0.30	0.24	0.29	0.25	0.22	0.22
Number of Other Children in Household	1.29	1.28	0.03	1.03	0.93	-0.15	1.30	1.26	0.11	2.05	2.19	-0.26

Notes: Higher SES is defined as maternal possession of a bachelor's degree or higher at kindergarten. All pre-diagnosis ADHD-related behaviors measures are from the wave before diagnosis among diagnosed children and 1st grade among undiagnosed children. Hyperactive, Inattentive, and ODD/CD behaviors average across parent and teacher reports. The internalizing behaviors measure is based on teacher report only. All other measures are taken from kindergarten unless otherwise noted. Empty cells indicate that a given predictor variable was dropped from the PSM equation due to perfect collinearity with one or both of the stratifying variables (SES or pre-diagnosis ADHD-related behavioral severity).

Appendix Table A.4. OLS LDV Regression Estimates of the Effect of an ADHD Diagnosis on Learning-Related Behaviors and Externalizing Problems among High SES Children with Lower Pre-Diagnosis Behavior Problems, by Medication Treatment Status

	Positive Approaches to Learning (Teacher Report)-5th Grade		SES Diff.?	Externalizing Behavior Problems (Teacher Report)-5th Grade		SES Diff.?	Self-Perceived Competence (Child Report)-5th Grade		SES Diff.?	Educational Expectations for Child (Parent Report)-5th Grade		SES Diff.?	Self-Perceived Competence (Child Report)-3rd Grade		SES Diff.?
	(1)	(2)		(3)	(4)		(5)	(6)		(7)	(8)		(9)	(10)	
	Higher SES (N=1,730)	Lower SES (N=3,600)		Higher SES (N=1,730)	Lower SES (N=3,600)		Higher SES (N=1,730)	Lower SES (N=3,600)		Higher SES (N=1,730)	Lower SES (N=3,600)		Higher SES (N=1,730)	Lower SES (N=3,600)	
Diagnosed with ADD/ADHD,	-0.35***	-0.12	+	0.30+	0.05		-0.41*	0.01		-0.16	-0.25		-0.19	0.06	
Receiving Medication	(0.10)	(0.09)		(0.16)	(0.08)		(0.20)	(0.12)		(0.17)	(0.14)		(0.22)	(0.12)	
Diagnosed with ADD/ADHD,	-0.57**	-0.17	+	0.36+	0.08		-0.37*	-0.09		-0.51**	-0.30		-0.32	-0.25	
Not Receiving Medication	(0.17)	(0.12)		(0.16)	(0.09)		(0.16)	(0.20)		(0.16)	(0.20)		(0.24)	(0.16)	

+p<0.10, *p<0.05, **p<0.01, ***p<0.001.

Notes: Displaying OLS lagged dependent variable estimates with standard errors clustered at the school level in parentheses. All models controlled for all early ADHD-related behaviors prior to diagnosis, early cognitive skills, early educational context, and maternal, family, and other child controls shown in Table 1 (all factors were measured in kindergarten except where noted). Higher SES is defined as mother BA receipt or higher in kindergarten.

Source : ECLS-K:98 children who were eligible for sampling and present all waves used in the analyses, who had complete information on ADD/ADHD diagnosis and the behavioral and achievement outcome measures, and whose composite pre-diagnosis ADHD-related behaviors score did not fall below that of the diagnosed child with the least severe pre-diagnosis ADHD-related behaviors composite score or above that of the diagnosed child with the most severe pre-diagnosis ADHD-related behaviors composite score. Multiple imputation was used to produce 20 datasets to address item-missingngess on variables other than the outcomes, ADHD diagnosis, and pre-diagnosis ADHD-related behaviors.

Appendix Table A.5. Special Education Services (IEP) and Accommodations (504 Plan) and Average Classroom Behavior as Mediators of Estimated Labeling Effects from OLS LDV Models among High SES Children with Lower Pre-Diagnosis Behavior Problems, by Medication Treatment Status

	Positive Approaches to Learning (Teacher Report) - 5th Grade						Externalizing Behavior Problems (Teacher Report) - 5th Grade					
	(1)		(2)		(3)		(4)		(5)		(6)	
Diagnosed with ADHD No Medication in 3rd-5th Grades	-0.57**	(0.17)	-0.57***	(0.17)	-0.57***	(0.17)	0.36*	(0.16)	0.40*	(0.16)	0.37*	(0.16)
Diagnosed with ADHD Receiving Medication in 3rd-5th Grades	-0.35***	(0.10)	-0.35***	(0.10)	-0.34***	(0.10)	0.30	(0.16)	0.34*	(0.15)	0.30	(0.15)
Child in Special Education in 3rd-5th Grades			0.01	(0.06)					-0.17***	(0.05)		
Average Classroom Behavior in 3rd-5th Grades (Teacher Report)					0.03	(0.02)					-0.04**	(0.01)
Adjusted R-Squared	0.21		0.21		0.21		0.16		0.17		0.17	

+p<0.10, *p<0.05, **p<0.01, ***p<0.001.

Notes: Displaying OLS LDV estimates. Clustered standard errors in parentheses. All models controlled for all pre-diagnosis ADHD-related behaviors, early cognitive skills, early educational context, and maternal, family, and other child controls shown in Table 1 (all factors were measured in kindergarten except where noted).

Source: ECLS-K:98 children who were eligible for sampling and present all waves used in the analyses, who had complete information on ADD/ADHD diagnosis and the behavioral and achievement outcome measures, and whose composite pre-diagnosis ADHD-related behaviors score did not fall below that of the diagnosed child with the least severe pre-diagnosis ADHD-related behaviors composite score or above that of the diagnosed child with the most severe pre-diagnosis ADHD-related behaviors composite score. Multiple imputation was used to produce 20 datasets to address item-missingngess on variables other than the outcomes, ADHD diagnosis, and pre-diagnosis ADHD-related behaviors.

Appendix Table A.6. Analysis of Non-Movers by 5th Grade: Propensity Score Matching Estimates of the Effect of an ADHD Diagnosis on Positive Learning-Related Behaviors and Externalizing Problems, by Family SES, Pre-Diagnosis ADHD-Related Behavioral Severity, and Medication Treatment Status

	Positive Approaches to Learning (Teacher Report) - 5th Grade		Sig. Diff. by SES?	Externalizing Behavior Problems (Teacher Report) - 5th Grade		Sig. Diff. by SES?
	Lower Pre-Diagnosis ADHD-Related Behavior Severity (N=2,280)					
	Higher SES (N=740)	Lower SES (N=1,540)		Higher SES (N=740)	Lower SES (N=1,540)	
Diagnosed with ADD/ADHD, Receiving Medication	-0.26**	0.07	*	0.19*	0.12	
	(0.09)	(0.14)		(0.09)	(0.14)	
Diagnosed with ADD/ADHD, Not Receiving Medication	-0.50*	-0.45**		0.29*	0.30***	
	(0.28)	(0.14)		(0.11)	(0.19)	
	Higher Pre-Diagnosis ADHD-Related Behavior Severity (N=850)					
	Higher SES (N=170)	Lower SES (N=680)		Higher SES (N=170)	Lower SES (N=680)	
Diagnosed with ADD/ADHD, Receiving Medication	-0.18***	-0.35***	+	-0.17	-0.06	
	(0.04)	(0.09)		(0.16)	(0.09)	
Diagnosed with ADD/ADHD, Not Receiving Medication	-0.04	-0.24***		0.01	-0.03	
	(0.22)	(0.10)		(0.32)	(0.08)	

+p<0.10, *p<0.05, **p<0.01, ***p<0.001.

Notes: Displaying propensity score matching estimates with standard errors in parentheses. Models matched on all early ADHD-related behaviors prior to diagnosis, early cognitive skills, early educational context, and maternal, family, and other child controls shown in Table 1 (all factors were measured in kindergarten except where noted). Higher SES is defined as maternal possession of a bachelor's degree or higher.

Source: ECLS-K:98 children who were eligible for sampling and present all waves used in the analyses, who had complete information on ADD/ADHD diagnosis and the behavioral and achievement outcome measures, and whose composite pre-diagnosis ADHD-related behaviors score did not fall below that of the diagnosed child with the least severe pre-diagnosis ADHD-related behaviors composite score or above that of the diagnosed child with the most severe pre-diagnosis ADHD-related behaviors composite score. Multiple imputation was used to produce 20 datasets to address item-missingngess on variables other than the outcomes, ADHD diagnosis, and pre-diagnosis ADHD-related behaviors.

Appendix Table A.7. School Fixed Effects Models: OLS LDV Estimates of Differential ADHD Labeling Effects among Lower SES and Higher SES Children Attending the Same School in Kindergarten, by Pre-Diagnosis ADHD-Related Behavioral Severity

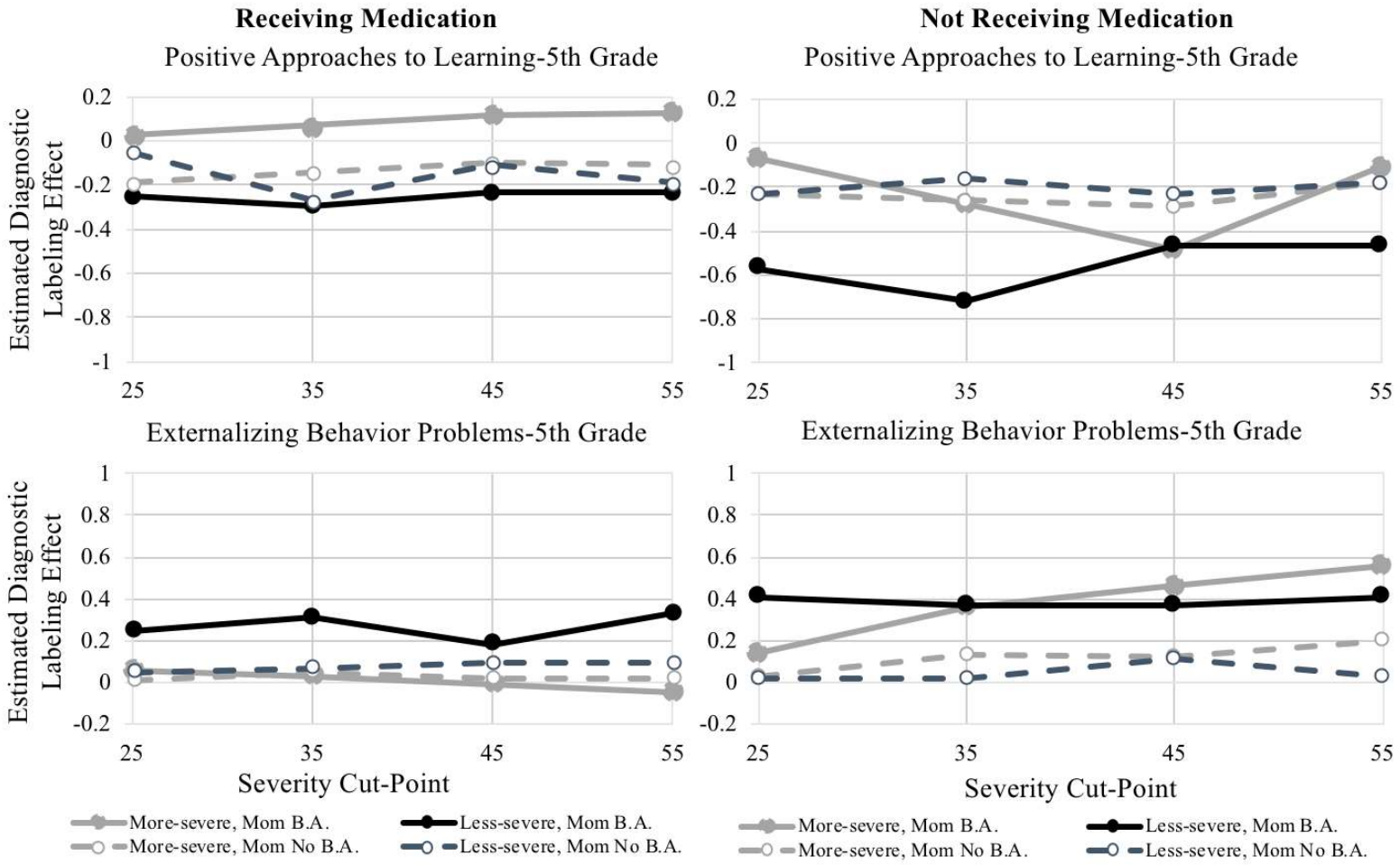
	Positive Approaches to Learning (Teacher)-5th Grade		SES Diff.?	Externalizing Behavior Problems (Teacher Report)-5th Grade		SES Diff.?	Self-Perceived Competence (Child Report)-5th Grade		SES Diff.?	Educational Expectations for Child (Parent Report)-5th Grade		SES Diff.?	Self-Perceived Competence (Child Report)-3rd Grade		SES Diff.?
	Less Severe Pre-Diagnosis ADHD-Related Behavior Severity (N=5,300)														
	(1)	(2)		(3)	(4)		(5)	(6)		(7)	(8)		(9)	(10)	
	Higher SES	Lower SES		Higher SES	Lower SES		Higher SES	Lower SES		Higher SES	Lower SES		Higher SES	Lower SES	
Diagnosed with ADHD,	-0.15	-0.08		0.06	0.10		-0.48*	0.01		-0.07	-0.12		0.10	0.06	
Receiving Medication	(0.14)	(0.10)		(0.12)	(0.09)		(0.21)	(0.14)		(0.21)	(0.17)		(0.19)	(0.13)	
Diagnosed with ADHD,	-0.58**	-0.03	**	0.48***	-0.02	*	-0.43+	-0.00		-0.45+	-0.20		-0.12	-0.16	
Not Receiving Medication	(0.15)	(0.12)		(0.13)	(0.10)		(0.22)	(0.17)		(0.23)	(0.21)		(0.21)	(0.16)	
	More Severe Pre-Diagnosis ADHD-Related Behavior Severity (N=1,990)														
	(11)	(12)		(13)	(14)		(15)	(16)		(17)	(18)		(19)	(20)	
	Higher SES	Lower SES		Higher SES	Lower SES		Higher SES	Lower SES		Higher SES	Lower SES		Higher SES	Lower SES	
Diagnosed with ADHD	-0.23	-0.26***		0.12	0.12		-0.37	-0.05		-0.36	-0.22+		0.02	-0.02	
Receiving Medication	(0.20)	(0.07)		(0.18)	(0.07)		(0.28)	(0.10)		(0.25)	(0.12)		(0.24)	(0.09)	
Diagnosed with ADHD,	-0.09	-0.26*		0.37	0.17		0.62	0.21		0.11	-0.30+		0.08	0.12	
Not Receiving Medication	(0.30)	(0.10)		(0.27)	(0.10)		(0.43)	(0.14)		(0.37)	(0.17)		(0.37)	(0.13)	

+p<0.10, *p<0.05, **p<0.01, ***p<0.001.

Notes: Displaying OLS lagged dependent variable estimates with standard errors clustered at the school level in parentheses. All models controlled for all early ADHD-related behaviors prior to diagnosis, early cognitive skills, early educational context, and maternal, family, and other child controls shown in Table 1 (all factors were measured in kindergarten except where noted). Higher SES is defined as mother BA receipt or higher in kindergarten.

Source : ECLS-K:98 children in the bottom quartile for pre-diagnosis ADHD-related symptoms who were eligible for sampling and present at all survey waves used, who had complete information on ADD/ADHD diagnosis and the behavioral and achievement outcome measures, and whose composite pre-diagnosis ADHD-related behaviors score did not fall below that of the diagnosed child with the least severe pre-diagnosis ADHD-related behaviors composite score or above that of the diagnosed child with the most severe pre-diagnosis ADHD-related behaviors composite score. Multiple imputation was used to produce 20 datasets to address item-missingngess on variables other than the outcomes, ADHD diagnosis, and pre-diagnosis ADHD-related behaviors.

Appendix Figure A.1. Propensity Score Matching Estimates of the Relationship between an Early Elementary School ADHD Diagnosis with or without Subsequent Medication Receipt and Late Elementary School Behavior Outcomes within Coarsened and Exact Matching Groups Based on Severity of Pre-Diagnosis Behavior Problems and Maternal Education



Source: ECLS-K:98 children who were eligible for sampling and present at all waves used in the analyses, who had complete information on ADD/ADHD diagnosis and the behavioral and achievement outcome measures, and whose composite pre-diagnosis ADHD-related behaviors score did not fall below that of the diagnosed child with the least severe pre-diagnosis ADHD-related behaviors composite score or above that of the diagnosed child with the most severe pre-diagnosis ADHD-related behaviors composite score. Multiple imputation was used to produce 20 datasets to address item-missingness on variables other than the outcomes, ADHD diagnosis, and pre-diagnosis ADHD-related behaviors.

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[1] Exact matching was also conducted on child gender and above/below median age-for-grade in kindergarten in light of prior work by Biederman, Faraone and Monuteaux (2002); Elder (2010) showing that boys and young-for-grade children are more likely to be diagnosed with ADHD; substantive results did not change.

[2] Indicators for household income below the federal poverty line and region of residence (Midwest, West, and Northeast relative to South) were initially included in the matching equation, but were dropped due to limited variation among diagnosed children whose mothers do/do not possess a bachelor's degree or higher.