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### ADHD and the Rise in Stimulant Use Among Children

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## PERSPECTIVES

# ADHD and the Rise in Stimulant Use Among Children

Rick Mayes, PhD, Catherine Bagwell, PhD, and Jennifer Erkulwater, PhD

Attention-deficit/hyperactivity disorder (ADHD) holds the distinction of being the most extensively studied pediatric mental disorder and one of the most controversial, in part because it is also the most commonly diagnosed mental disorder among minors. Currently, almost 8% of youth aged 4 to 17 years have a diagnosis of ADHD, and approximately 4.5% both have the diagnosis and are using a stimulant (methylphenidate or amphetamine) as treatment for the disorder. Yet a diagnosis of ADHD is not simply a private medical finding; it carries with it a host of policy ramifications. The enduring controversy over ADHD in the public arena therefore reflects the discomfort over what happens when science is translated into policies and rules that govern how children will be treated medically, educationally, and legally. This article (1) summarizes the existing knowledge of ADHD, (2) provides the relevant history and trends, (3) explains the controversy, (4) discusses what is and is not unique about ADHD and stimulant pharmacotherapy, (5) outlines future directions of research, and (6) concludes with a brief analysis of how two North Carolina counties have established community protocols that have improved the screening, treatment, and societal consensus over ADHD and stimulants. (HARV REV PSYCHIATRY 2008;16:151–166.)

**Keywords:** ADHD, adolescents, children, controversy, stimulants, trends

Attention deficit-hyperactivity disorder (ADHD) holds the distinction of being both the most extensively studied pediatric mental disorder and one of the most controversial,<sup>1</sup> in part because it is also the most commonly diagnosed mental disorder among minors.<sup>2</sup> On average, 1 in every 10 to 15 children in the United States has

been diagnosed with the disorder, and 1 in every 20 to 25 uses a stimulant medication—often methylphenidate (either as Ritalin or an extended-release form, Concerta) or amphetamine/dextroamphetamine (Adderall)—as treatment.<sup>3,4</sup> The biggest increase in youth that were diagnosed with ADHD and prescribed a stimulant drug occurred during the 1990s, when the prevalence of physician visits for stimulant pharmacotherapy increased fivefold.<sup>5–8</sup> This unprecedented jump in U.S. children using psychotropic medication triggered an intense public debate.<sup>9</sup>

Ironically, neither the debate nor the use of stimulants for ADHD was new. Methylphenidate was introduced in the United States in 1955 and approved by the Food and Drug Administration (FDA) in 1961 for use in children with severe behavioral problems.<sup>10</sup> Prior to methylphenidate, and as early as 1937, another stimulant, racemic amphetamine sulfate (trade name, Benzedrine) had been tested and used by small numbers of children.<sup>11</sup> As for ADHD, the basic symptoms of the disorder have gone by several different diagnostic labels since the early 1930s: “organic drivenness,” “minimal brain damage,” “hyperkinetic impulse disorder,” “minimal brain dysfunction,” “hyperkinesis,” “hyperactive child syndrome,” and “attention deficit

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disorder.”<sup>12</sup> Even the core of the controversy—children using physician-prescribed psychoactive drugs—dates back almost four decades. Nevertheless, negative publicity over the “drugging of problematic children” in the early 1970s—together with another negative media blitz and a wave of lawsuits against physicians, school personnel, and the American Psychiatric Association in the late 1980s—greatly reduced the prevalence of ADHD diagnoses and pharmacotherapy, relative to both prior and current levels. When the 1990s began, most schools across the country had few, if any, children diagnosed with ADHD and using stimulants.<sup>13</sup> By 2000, every classroom in the United States had, on average, at least one to two such students treated for the disorder.<sup>4,14,15</sup> Currently, almost 8% of youth aged 4 to 17 years have a diagnosis of ADHD, and approximately 4.5% both have the diagnosis and are taking medication for the disorder.<sup>16,17</sup>

The massive increase in the number of U.S. children diagnosed with ADHD and using stimulants stemmed primarily from a confluence of *trends* (clinical, economic, educational, political), an alignment of *incentives* (among clinicians, educators, policymakers, health insurers, the pharmaceutical industry), and the sizable growth in scientific *knowledge* about ADHD and stimulants, all of which converged in the first half of the 1990s. The growing political strength of children’s welfare advocates and mental health consumers,<sup>18–24</sup> coupled with the decreasing stigma associated with mental disorders, led to three seemingly minor policy changes—in a federal income-support program (Supplemental Security Income), in a federal special-education program (Individuals with Disabilities Education Act), and in a joint federal-state public health insurance program (Medicaid)—that helped trigger the surge in ADHD diagnoses and related stimulant use.<sup>25,26</sup>

ADHD and stimulant use have been and remain controversial, partly because most children are diagnosed and medicated as the result of decisions made by their parents and clinicians. In short, the treatment is ordinarily decided *for* them instead of *by* them—a scenario that invites criticism that a patient’s autonomy has been being compromised.<sup>27–29</sup> Yet many medical decisions involving children are made in this way and are not considered controversial. Mental disorders such as ADHD, however, are different. They are regularly diagnosed based mainly, if not solely, on the presence of behavioral symptoms—inattentiveness, hyperactivity, and impulsiveness—that are common in children.\* The key difference is one of degree. Children with ADHD are *significantly* more inattentive, impulsive, distractible, or fidgety than their peers, such that their symptoms cause ma-

JOR PERSONAL IMPAIRMENT AND INTERFERE WITH DAILY HUMAN FUNCTIONING.<sup>30</sup>

Since many mental disorders other than ADHD involve matters of degree, why has ADHD, in particular, been the subject of such controversy? One reason concerns the disorder’s dominant educational aspect. The majority of ADHD diagnoses originate with the observations of teachers,<sup>31</sup> and many of the disorder’s symptoms—rated on behavioral scales—require teacher reports in order to make a diagnosis (e.g., the child “often fails to give close attention to details or makes careless mistakes in schoolwork, work, or other activities,” “often does not follow through on instructions and fails to finish schoolwork, chores, or duties in the workplace,” “often avoids, dislikes, or is reluctant to engage in tasks that require sustained mental effort [such as school work or homework],” “often leaves seat in classroom or in other situations in which remaining seated is expected,” “often blurts out answers before questions have been completed”).<sup>32–35</sup> With ADHD, teachers are typically the primary source of diagnostic information.<sup>36</sup> Only a minority of children with the disorder exhibit symptoms during a physician’s office visit.<sup>37,38</sup>

As in the case of all mental disorders, there is no definitive medical (blood, urine, radiological) test to verify an ADHD diagnosis. The diagnosis consequently involves a large element of subjectivity, which leaves it open to competing definitions of what is considered “normal” childhood behavior.<sup>39</sup> The United States, for example, consumes the majority of the world’s production of stimulants, with American school-age children using as much as three times more psychiatric medication than children in the rest of the world combined.<sup>40,41</sup> In some European countries, only a child psychiatrist can prescribe a stimulant for a minor diagnosed with ADHD, and in other countries the drugs can be prescribed only if approved by three independent professionals.<sup>42</sup> These regulations have precluded a similar growth in stimulant use in those countries, even as international studies suggest that the prevalence of ADHD is similar across different Western countries when clinicians use roughly the same diagnostic procedures.<sup>43,44</sup>

For these and other reasons, people debate whether the ADHD and stimulant phenomenon in the United States is primarily a story of medical science making progress on a long misunderstood disorder or, instead, whether ADHD has largely been “socially constructed,” under the biological vision of mental health, as a response to nonmedical problems such as underperforming schools, increased academic demands and expectations, and higher poverty and divorce rates than existed before the 1970s.<sup>46</sup> What makes this question so contentious is that the debate is political and philosophical in nature. ADHD and stimulants do not exist in a clinical vacuum;<sup>47,48</sup> like all mental disorders and mental health care, notes medical anthropologist Byron Good,<sup>49</sup> they are “social, psychological and cultural to the core,”

\*By contrast, rather than relying exclusively on a rating of symptoms, DSM-IV outlines a much more detailed, rigorous approach to making a proper diagnosis of ADHD.

powerfully influenced by public opinion and varying expectations of what is considered normal and abnormal behavior by girls and boys of very different ages and stages of development. Meanwhile, teachers, parents, clinicians, health plans, and policymakers are all trying to determine—within their separate, but overlapping, spheres of influence—what is in the best interests of literally millions of children.

## AN INTRODUCTION TO ADHD

ADHD is one of the most prevalent disorders in childhood and adolescence. As many as 50% of children seen in child psychiatry clinics have been diagnosed with ADHD. The disorder is often persistent. Approximately 50%–80% of children with ADHD will continue to meet diagnostic criteria for the disorder into adolescence and adulthood. Perhaps, most importantly, ADHD has a significant impact on children's academic, social, and emotional development and interferes with functioning in important life domains, such as school, family, and peers. ADHD is also one of the most well-researched psychiatric disorders in children, and as a result, we know much about its features, developmental course, etiologies or causes, and management and treatment.

Current conceptualizations of ADHD focus on two behavioral dimensions that underlie the core symptoms of ADHD—inattention and hyperactivity/impulsivity (see text box). The diagnostic criteria in the latest *Diagnostic and Statistical Manual of Mental Disorders* (4th ed., text. rev.)<sup>50</sup> includes 18 specific symptoms. The 9 symptoms that reflect impaired attention indicate that children with ADHD are unable to sustain attention and follow through on instructions, and that they are easily distracted. The hyperactivity/impulsivity dimension of ADHD is captured in 9 specific symptoms, with 6 for hyperactivity and 3 for impulsivity. These behavioral symptoms involve an inability to inhibit responses. Children with these symptoms of ADHD have an excessively high level of activity—including fidgetiness, running and climbing, and failing to sit still—and act impulsively by blurting out responses, interrupting others, and having trouble waiting for a turn. Three subtypes of ADHD are based on an individual's pattern of symptoms. ADHD combined type is diagnosed when children display at least six symptoms of inattention and at least six symptoms of hyperactivity/impulsivity.

One reason that the diagnosis of ADHD has been criticized is that many, if not most, children can display behavioral characteristics of inattention and hyperactivity/impulsivity. Take toddlers and preschoolers, for example. It is rare that preschoolers are *not* easily distracted by things around them, *not* impatient and challenged by having to wait their turn, and *not* described by parents as “on the

go.” Thus, if one naively focuses only on these 18 concrete behavioral symptoms, it is easy to see why there has been public concern about an overdiagnosis of ADHD. A correct diagnosis of ADHD depends, however, on much more than this checklist of behaviors.

There are five criteria for a diagnosis of ADHD. The first defines the specific symptoms (described above) and indicates that these behaviors must occur at a level that is developmentally inappropriate and must have persisted for at least six months. In other words, the child must display levels of inattention and hyperactivity that are significantly higher than what is expected for children at his or her age or developmental level, and these symptoms must be persistent and chronic. Second, at least some of the symptoms of ADHD must have an onset before the age of seven years. This criterion of onset age has been questioned because it may exclude children whose symptoms (particularly of inattention) are not readily apparent until school-related demands increase, and adults may not have clear records of their developmental history.<sup>51</sup> The third criterion requires that the symptoms cause significant difficulty for the child in at least two different settings, such as at home and at school. Meeting this criterion assures that the symptoms are pervasive and do not occur only in specific situations. Fourth, the symptoms of ADHD must cause significant impairments in the child's functioning in salient life domains. These impairments can include those in family and peer relationships, in educational and academic settings, and, for adults, in the domain of work and career. Finally, the symptoms and impairments must not be better explained by another disorder. Consequently, the criteria for diagnosing ADHD are not lax or vague (as they are sometimes presented in the media). They are detailed and specific.

Youth with ADHD often show considerable variability in their symptoms, depending on the situational context.<sup>52</sup> For example, children with ADHD often function better in play settings than in settings that require persistence in work (such as completing homework) or that place limits on activity levels (such as restaurants or the library). Teachers may also see variability in symptoms throughout the school day, with more problem behavior in the classroom than at lunch or at recess, where less work-related persistence is necessary.<sup>53,54</sup> This situational variability reflects the interaction between a child's vulnerabilities and the demands of the particular environment that he or she is in at the moment. Such interactions are not unique to ADHD but explain variability in many mental disorders. Although symptoms of ADHD may be most likely to emerge in situations that are boring or repetitive, they also manifest in play settings. A common complaint of parents is that their children with ADHD start an activity and then move from one toy or game to the next, eventually pulling all of their toys off the shelves and leaving them strewn on the floor around them. Similarly,

#### DSM-IV Criteria for ADHD

- I. Either A or B
- A. Six or more of the following symptoms of inattention have been present for at least 6 months to a point that is disruptive and inappropriate for developmental level:
- Inattention
1. Often does not give close attention to details or makes careless mistakes in schoolwork, work, or other activities.
  2. Often has trouble keeping attention on tasks or play activities.
  3. Often does not seem to listen when spoken to directly.
  4. Often does not follow instructions and fails to finish schoolwork, chores, or duties in the workplace (not due to oppositional behavior or failure to understand instructions).
  5. Often has trouble organizing activities.
  6. Often avoids, dislikes, or doesn't want to do things that take a lot of mental effort for a long period of time (such as schoolwork or homework).
  7. Often loses things needed for tasks and activities (e.g. toys, school assignments, pencils, books, or tools).
  8. Is often easily distracted.
  9. Is often forgetful in daily activities.
- B. Six or more of the following symptoms of hyperactivity-impulsivity have been present for at least 6 months to an extent that is disruptive and inappropriate for developmental level:
- Hyperactivity
1. Often fidgets with hands or feet or squirms in seat.
  2. Often gets up from seat when remaining in seat is expected.
  3. Often runs about or climbs when and where it is not appropriate (adolescents or adults may feel very restless).
  4. Often has trouble playing or enjoying leisure activities quietly.
  5. Is often "on the go" or often acts as if "driven by a motor."
  6. Often talks excessively.
- Impulsivity
1. Often blurts out answers before questions have been finished.
  2. Often has trouble waiting one's turn.
  3. Often interrupts or intrudes on others (e.g., butts into conversations or games).
- II. Some symptoms that cause impairment were present before age 7 years.
- III. Some impairment from the symptoms is present in two or more settings (e.g., at school/work and at home).
- IV. There must be clear evidence of significant impairment in social, school, or work functioning.
- V. The symptoms do not happen only during the course of a Pervasive Developmental Disorder, Schizophrenia, or other Psychotic Disorder. The symptoms are not better accounted for by another mental disorder (e.g., Mood Disorder, Anxiety Disorder, Dissociative Disorder, or a Personality Disorder).
- Based on these criteria, three types of ADHD are identified:
1. ADHD, *Combined Type*: if both criteria 1A and 1B are met for the past 6 months
  2. ADHD, *Predominantly Inattentive Type*: if criterion 1A is met but criterion 1B is not met for the past 6 months
  3. ADHD, *Predominantly Hyperactive-Impulsive Type*: if Criterion 1B is met but Criterion 1A is not met for the past six months
- Source: DSM-IV-TR (2000).<sup>50</sup>

once children begin to play on organized sports teams, parents and coaches often note that children with ADHD have trouble focusing on their own activity and, instead, are distracted by the game on the next field, the dog walking by, or the bees on the clover in right field. In addition to this situational variability, the behavior and task performance of children with ADHD are often inconsistent, with good performance (completing homework, getting a high test score, finishing chores at home) one day and poor performance the next.<sup>55</sup>

A careful clinical diagnosis of ADHD must be based on a detailed history of the child's symptoms and their developmental course, including the child's medical, neurological, and social history.<sup>56</sup> Variability in diagnoses is thus due, in part, to variability in assessment and in how strictly DSM-IV criteria are applied. In order to rule out alternative explanations, most thorough assessment batteries rely on a combination of clinical interviews, behavior rating scales, and various other tests and observations, including IQ and achievement tests, computerized continuous-performance

tests, or medical tests. In addition, information is gathered from multiple sources, including parents, teachers, the child, and others who might have knowledge about the child's functioning. This multi-method approach is important for assuring that all DSM-IV criteria are met. For example, the assessment of developmental inappropriateness of symptoms is better accomplished with rating scales that have well-established norms than with clinical interviews that require a parent's, educator's, or clinician's subjective assessment of where this child's behavior fits with other children of the same age.<sup>55</sup>

ADHD typically emerges in the preschool period, often around age 3 or 4 years.<sup>57</sup> A number of studies demonstrate that particular ADHD symptoms have a different age of onset and developmental course. Hyperactive and impulsive behavior has the earliest onset, and inattentive behaviors often emerge after school entry.<sup>51</sup> Although some cross-sectional studies show declining rates of ADHD with increasing age,<sup>58</sup> this finding is likely due in part to the character of the symptom list in DSM-IV itself. The list is based on children between the ages of 4 and 16, and the behavioral symptoms of hyperactivity decline with development.<sup>59</sup>

Long-term studies indicate that children do not "outgrow" ADHD. Findings from a handful of carefully designed studies that follow children with ADHD into adolescence and adulthood emphasize the persistence and pervasive impairment associated with ADHD symptoms. In two cohorts of approximately 100 children, 31% to 43% continued to be diagnosed with ADHD at a mean age of 18.5 years.<sup>60,61</sup> In another study, 50% of the sample of adolescents with a history of childhood ADHD had a current diagnosis of ADHD in late adolescence (approximately age 19).<sup>62</sup> With parent reports of ADHD symptoms, Barkley and colleagues<sup>63</sup> found that ADHD persisted for 46% to 66% of the probands (the follow-up group who had an ADHD diagnosis in childhood) at age 21. These rates are even higher in mid-adolescence. At an average age of 15, 70% of adolescents with a diagnosis of ADHD in childhood continued to meet DSM criteria for the disorder.<sup>64</sup> Likewise, Joseph Biederman and colleagues<sup>65</sup> found that by age 14, only 15% of the probands no longer had a diagnosis of ADHD. Severity of ADHD in childhood appears to be one of the best predictors of persistence of symptoms into adulthood.<sup>66</sup>

Follow-up studies show that adolescents and adults with a history of ADHD in childhood not only often continue to have the disorder, but also experience a host of other psychiatric, cognitive, and psychosocial impairments. By mid-adolescence, youth with a childhood history of ADHD have higher rates of conduct disorders and substance use;<sup>64,65,67</sup> greater impairment in academic functioning, including reading and mathematics achievement and failing a grade;<sup>67</sup> and more problems with parents, siblings, and peers com-

pared to control groups.<sup>68</sup> Findings have been inconsistent as to whether children with ADHD have an elevated risk for anxiety and depression in adolescence and adulthood. Biederman and colleagues<sup>65</sup> identified a higher rate of both disorders for youth with ADHD in mid-adolescence, and Mariellen Fischer and colleagues reported an increased risk for depression in adulthood.<sup>69</sup> Other studies have shown no differences, however, between adolescents and adults with a history of childhood ADHD and control groups in rates of anxiety and depressive disorders.<sup>70,71</sup> There is some indication that increased risk for these disorders is limited to youth who also have serious aggression and disruptive behavior.<sup>72</sup>

## HISTORY OF ADHD AND STIMULANTS

ADHD is a long-standing disorder.<sup>73-75</sup> Its diagnostic origins lie with an English pediatrician, Sir George Frederick Still, who made the first description of inordinately hyperactive and inattentive children in 1902.<sup>76</sup> The disorder was first officially listed as "attention deficit disorder" in the DSM-III in 1980.<sup>77</sup> During the period between Still's initial description and the listing of ADD in 1980, the diagnostic terms used to describe excessively hyperactive and inattentive children changed frequently, as did the claims for what caused the disorder.<sup>78</sup> What remained relatively consistent over the seven decades were the symptoms exhibited by the children.

In the latter half of the 1980s, several major clinical and policy developments related to ADHD and stimulants converged. This convergence helped spark the huge increase in the number of children who diagnosed with the disorder and prescribed stimulant medication in the following decade. During the 1980s, spending on mental health services and treatment increased tremendously, with a marked expansion of inpatient psychiatric facilities for adolescents and those with substance abuse problems.<sup>79-82</sup> The dramatic increase in spending on mental health gave rise to employers' and insurers' cost-control response: managed care. Managed behavioral health companies emerged in the late 1980s and focused on finding less expensive ways of treating mental disorders with decreased hospitalizations, shorter lengths of stay, greater use of primary care physicians, limited psychotherapy, and increased use of psychotropic drugs (see Table 1).<sup>84,85</sup> These new trends coincided with major changes in the pharmaceutical industry, the introduction of fluoxetine (Prozac), and the rise of a new mental health advocacy organization: Children and Adults with Attention-Deficit/Hyperactivity Disorder (CHADD).

The large and rapid increase in ADHD diagnoses and stimulant use occurred in the early 1990s after three seemingly minor changes in federal disability, education, and

**TABLE 1. Characteristics of Patient Population Diagnosed with ADHD, 1980–1990**

	1980	1983	1985	1987	1990
Patient sex					
Male	69%	71%	76%	72%	83%
Female	31%	29%	24%	28%	17%
Physician specialty					
Pediatrician	21%	22%	27%	38%	40%
Psychiatrist	65%	68%	59%	49%	40%
Neurologist	3%	3%	2%	4%	6%
Family practitioner	5%	5%	6%	7%	4%
Others, combined	6%	2%	6%	2%	10%
Treatment prescribed					
Stimulant drugs	28%	32%	45%	57%	86%
No stimulant drugs	72%	68%	55%	43%	14%

Source: IMS Health (1980, 1983, 1985, 1987, 1990).<sup>83</sup>

public health insurance policy in the early 1990s. First, in 1990, a Supreme Court ruling modified the Supplemental Security Income (SSI) program—which provides financial assistance for the disabled—to include low-income children diagnosed with ADHD. Policymakers rescinded this expansion in 1996, with the consequence that many children with ADHD were cut from the SSI program in the late 1990s, but in the first half of that decade, rates of new children enrolling in the program with a qualifying diagnosis of ADHD increased almost threefold.<sup>85</sup> Second, due largely to lobbying pressure from parents of children with ADHD, Congress in 1991 adjusted the Individuals with Disabilities Education Act (IDEA) to include ADHD as a protected disability.<sup>87</sup> As a result, children diagnosed with the disorder became eligible for special accommodations on tests (including the SAT), homework, and other school-related activities. Low-income children with ADHD could receive the same benefits in school plus cash assistance for their families from SSI (at least until the 1996 cutback mentioned above). And third, beginning in the early 1990s, Congress significantly expanded the number of individuals, especially children, eligible for Medicaid.<sup>88,89</sup> These expansions fueled massive increases in Medicaid spending on psychotropic drugs, in general—from \$0.6 billion in 1991 to \$6.7 billion in 2001—and on stimulants, in particular: between 1991 and 2001, real (inflation-adjusted) spending per child on stimulants grew almost ninefold, as the number of prescriptions increased sixfold.<sup>90</sup>

These changes in public policy were partly the result of years of lobbying efforts by a broad coalition of medical professionals, antipoverty activists, and disability and children's health and welfare advocates.<sup>91</sup> The coalition had been pushing for more generous and expansive interpretations of how children qualified for programs designed to aid

**TABLE 2. Diagnosis and Treatment of ADHD and U.S. Production of Methylphenidate (1990–1993)**

Variable	1990	1991	1992	1993
Number of patients diagnosed with ADHD	902,000	1,161,000	1,701,000	2,019,000
Number of outpatient visits for ADHD	1,687,000	2,256,000	3,168,000	4,195,000
Amount of methylphenidate produced (in kilograms)	1,784	3,162	3,884	5,110

Source: Swanson et al. (1995).<sup>13</sup>

those with disabilities.<sup>92</sup> Their efforts—alongside changes in public perceptions of mental disorders—inadvertently provided the spark that led to a huge surge in ADHD diagnoses and in stimulant use (see Table 2), as well as to growing public debates over their appropriateness.<sup>93</sup>

A public backlash arose in response to the increasing number of ADHD diagnoses and stimulant use in the latter half of the 1990s, the period when most Americans first became familiar with ADHD and stimulants.<sup>94,95</sup> Old allegations that children were being diagnosed improperly and for nonmedical reasons—poorly performing schools, family problems, pharmaceutical greed—resurfaced in newspapers, books, television reports, school board hearings, and other venues.<sup>96,97</sup> The FDA Modernization Act of 1997 provided new financial incentives to pharmaceutical companies for developing and testing drugs on children by extending their patent exclusivity.<sup>98,99</sup> As a result, pediatric psychopharmacology research underwent a major expansion,<sup>100</sup> which led to the development of new, once-a-day or “long acting” stimulants. These new drugs represented an important clinical advance that, among other things, addressed various concerns about the drugs. Children no longer had to be embarrassed by having to take the drugs during the school day, and the drugs were far less likely to be diverted in school settings for illicit use.<sup>101,102</sup> In addition, by avoiding the need for school personnel—particularly the dwindling numbers of school nurses—and by increasing confidentiality for families, the long-acting drugs made stimulant treatment an easier and more attractive choice for many parents and children.<sup>103</sup>

## THE CONTROVERSY OVER ADHD AND STIMULANTS

It seems virtually impossible to give a presentation on, or even just talk about, ADHD and stimulants without being asked if the drugs are overused in the United States. We assume that many readers of this article will have the same question. The answer is “yes” and “no.” In some geographic areas and among specific childhood populations, ADHD

appears to be overdiagnosed, and the drugs overused. However, several of the same research findings that identify this overuse also identify areas and populations in which ADHD is very likely underdiagnosed, and the drugs underused, with serious personal and public health consequences.<sup>104–108</sup>

This more complicated and nuanced reality of both over- and underuse of stimulants is rarely presented in the popular press, but it reflects two key factors. First, though ADHD is an actual, legitimate disorder,<sup>30</sup> it is also—similar to many mental disorders—one that primary care physicians often diagnose with less than full rigor because of the intense economic and time constraints they face, coupled with their training (or lack thereof) in the area of mental disorders.<sup>109–111</sup> This reality is important since primary care physicians make the majority of ADHD diagnoses and stimulant drug prescriptions.<sup>112,113</sup> In addition, it is not clear to clinicians, researchers, or the general public if ADHD is primarily a medical disorder, a behavioral problem manifesting primarily in schools, a mental illness, or an evolutionary disorder of human adaptation.<sup>114,115</sup> It is also not self-evident how hyper, inattentive, or impulsive a child has to be to warrant a diagnosis, because the benchmark of comparison for diagnosing a child is whatever is considered “normal” for his or her particular age group.

The ambiguity over ADHD’s classification, along with the manner in which it is regularly diagnosed, contributes to significant variation in diagnostic and treatment styles by clinicians: prevalence rates for the disorder range from as low as 2% to as high as 18% in different U.S. communities.<sup>116,117</sup> This variation results in a serious mismatch between the need for, and provision of, pharmacotherapy, with both “undertreatment” of ADHD<sup>118</sup> and the “overuse” of stimulants, both by many children who do not meet full ADHD diagnostic criteria and by some children who exhibit no symptoms of ADHD at all.<sup>107</sup>

The second factor that fuels the debate is that stimulants are heavily regulated Schedule II drugs, which are effective in helping individuals with or without ADHD.<sup>119,120</sup> In other words, they enhance most individuals’ ability to sustain their level of concentration<sup>121,122</sup>—which is not the way that the public understands medical interventions to operate. The general view of medicines is that they treat people with chronic or acute episodes of an illness or disorder, but that they would either have no effect or possibly be harmful to someone who did not have an illness or a disorder. Consequently, when stimulants help those with ADHD and enhance the performance of individuals without the disorder, they often invite skepticism about the appropriateness of stimulant use by millions of children.<sup>122</sup>

While the use of stimulant medication for the management and treatment of ADHD has vocal supporters and critics alike, the controversy is no longer focused as much on whether or not ADHD is a “real” disorder. It is widely rec-

ognized as such. There are several reasons for this change. During the 1990s, in particular, greater recognition of the biological factors that contribute to ADHD led to much wider acceptance of the disorder as having neurological and genetic, rather than environmental, origins. Given this evidence, it was more difficult to argue that the disorder was socially constructed or the invention of incompetent and overburdened parents and schools. This is not to say that social or environmental factors are irrelevant. To be sure, clinical descriptions and empirical research suggest that environmental factors play a critical role in how the symptoms of ADHD are expressed, in the impairments that result from those symptoms, and in the management and treatment of the disorder, with the consequence that environmental factors interact with neurological and other biological ones. However, environmental factors—parenting styles, discipline practices, and diet, for example—are no longer widely considered to be the primary causes of ADHD, and it appears that “nonshared” environmental influences (i.e., those that are not shared between siblings) may be the most critical environmental factors.

#### ARE ADHD AND STIMULANTS UNIQUE?

How unique is the significant increase in use of stimulant medication to treat ADHD in recent decades? This increase should not be viewed in isolation. Between 1987 and 1996, there was a nearly threefold increase in use of psychotropic medications—including stimulants (fourfold increase), antidepressants (well over a threefold increase), and other classes of medications—among children and adolescents in the United States.<sup>123</sup> Antidepressant use among children and adolescents (and especially the latter) continued to increase significantly between 1997 and 2002,<sup>124</sup> especially because of the increased use of selective serotonin reuptake inhibitors (SSRIs) and other newer antidepressants (use of older tricyclic antidepressants decreased during this same period). A recent study of prescriptions for antipsychotic medications also shows a significant increase in the number of prescriptions written for children and adolescents. According to records of visits to physicians, approximately 1,400 per 100,000 children and adolescents received a prescription for antipsychotic medication in 2002, compared to 275 per 100,000 between 1993 and 1995—a fivefold increase.<sup>125</sup> In contrast, the period 1987 to 1996 was characterized by a relatively constant level of antipsychotic use among children.<sup>123,124</sup> Thus, the increase in use of antipsychotic medication lags five to ten years behind the explosion in stimulant use. The bottom line is that use of many psychotropic medications among U.S. children and adolescents—and not stimulants alone—has increased dramatically in recent years.



Nevertheless, the increase in diagnoses of ADHD and in the associated use of stimulants is unique in several respects. First, the sheer number of children who use stimulant medication for the management of ADHD is much higher than the number of children taking antidepressant or antipsychotic medication, even if the rates of increase are similar.

Second, the increase in use of antidepressant and antipsychotic medications is explained, in part, by the development of new types of medication that are used more frequently with children and adolescents than earlier, first-generation medications. For example, fluoxetine was first marketed in the United States in 1988, and other SSRIs soon followed. Newer atypical antipsychotic medications, also called second-generation antipsychotics, were first available in the early and mid-1990s. These new drugs had fewer of the significant side effects that had precluded the more widespread use of earlier antidepressant and antipsychotic medications among children and adolescents. In contrast, stimulants have been available and used since the 1950s.

Third, because ADHD has traditionally been viewed as a disorder of childhood, the increase in use of stimulants began with *children* and *adolescents*—the result of numerous carefully controlled studies that demonstrated their effectiveness in managing symptoms of ADHD. It is only recently that the number of prescriptions for stimulant medications given to adults has dramatically increased—as much as 90% between March 2002 and June 2005.<sup>126</sup> In contrast, when the newer antipsychotic and antidepressant medications were developed and marketed, they were first approved for use among *adults*, and the increase in use began with adults and has much more recently trickled down to children and adolescents. This change is not surprising, given that major depressive disorders and disorders that might be treated with antipsychotic medication, such as schizophrenia and bipolar disorder, were not diagnosed in children and adolescents in significant numbers until recently; in fact, only two of the second-generation antipsychotic medications (risperidone [Risperdal] and aripiprazole [Abilify]) are approved by the FDA for use in children. In comparison to studies of the effectiveness of stimulants for managing ADHD, very few studies are available to document the use of antipsychotic medications in youth, and the earliest controlled clinical trials demonstrating the effectiveness of SSRIs for depression in children were published in the late 1990s.<sup>127</sup>

## FUTURE DIRECTIONS

Given the overwhelming interest in ADHD in the scientific and medical communities, the media, and the general public, there is no doubt that the next decade will witness additional dramatic developments in our knowledge about, and

perceptions of, the disorder. From the clinical perspective, we anticipate important advances in at least three areas. First, although ADHD is already the most well-researched disorder in childhood, the body of scientific research continues to grow at a rapid pace. Particularly important developments are likely to occur within the next decade in our understanding of the neurological and especially the genetic basis of ADHD. These discoveries will further the understanding of the causes of the disorder. Molecular genetic research on ADHD is still in its infancy but is growing rapidly. Several candidate genes for the disorder have been identified, particularly dopamine receptor and transporter genes, and studies have linked specific gene combinations and expressions with ADHD symptoms, behavior problems, and outcomes.<sup>128,129</sup> Likewise, the continued explosion of neuropsychology and especially neuroimaging research affords great possibility for understanding the causes and biological origins of ADHD, differences among subtypes of ADHD, and responses to particular treatments.<sup>130</sup>

Second, in the area of treatment, additional long-term studies and carefully controlled, randomized clinical trials comparing various treatment alternatives and combinations of treatments are needed. Interestingly, the most recent follow-up study of the Multimodal Treatment Study of Children with ADHD (MTA) found the following: three years later, the “treatment groups did not differ significantly on any measure”; unwelcome and statistically significant “growth suppression effects” resulted in children who used stimulant drugs; those on stimulants had significantly greater symptom deterioration from 24 to 36 months in the trial; and “by 36 months, the earlier advantage of having had 14 months of the medication algorithm was no longer apparent.”<sup>131</sup> These findings have only added to the on-again, off-again controversy over stimulant pharmacotherapy. In addition, much attention is being paid to disorders that commonly occur with ADHD and to the ways in which co-occurrence affects the response to particular treatment interventions, such as the enhanced effectiveness of behavioral treatments in children with both ADHD and anxiety disorders.<sup>132</sup> As evidenced by the growth in use of atomoxetine (Strattera, a nonstimulant treatment for ADHD) since its FDA approval in 2003, coupled with the development of innovative delivery systems for stimulant medications, continued advances related to the pharmacological treatment of ADHD are surely to be expected. These developments are especially welcome in view of the increasing, illicit use of stimulant medications, particularly among college students. Atomoxetine, for example, does not have abuse potential, and the delivery systems used for some of the extended-release forms of stimulants make them much less amenable to abuse than traditional formulations.

Third, interest in ADHD in adulthood, alongside children and adolescents, has never been stronger. A quick perusal

of book titles in the psychology and self-help sections of any major bookstore reveals the considerable attention now being paid by the general public to evidence of the disorder in adults. Research on ADHD in adulthood comes from two primary sources. As more and more research teams are following their samples of children with ADHD into adolescence and adulthood, we are gaining a much better understanding of the long-term course of the disorder and developing a much more thorough lifespan perspective on it. A second source of information about ADHD in adults comes from adults who present to clinics for ADHD assessments and who have never been diagnosed or previously sought treatment. The field is wide open for careful empirical study of many aspects of the disorder in adulthood, including the impact of comorbid disorders; impairments in emotional, occupational, and social functioning; neuropsychological deficits; and the effectiveness of various pharmacological and behavioral or psychosocial treatment interventions.

Yet even as scientific understanding of ADHD advances, it is hard to imagine the social and political controversy over ADHD abating. As a diagnosis and form of treatment, ADHD and stimulant pharmacotherapy illustrate both the success that science is capable of producing—when applied to the study of mental disorders—and its limitations. Researchers have made tremendous progress over the last three decades in increasing our understanding of ADHD, but when it comes to diagnosing most mental disorders, our system is still far behind other branches of medicine, notes E. Jane Costello,<sup>133</sup> a professor of psychiatry and behavioral sciences at Duke University: “On an individual level, for many parents and families, the experience can be a disaster; we must say that.” For these families, the search for a diagnosis is best seen as a process of trial and error that may not end with a definitive answer. If a family can find some combination of treatments that help a child improve, Costello adds, “then the diagnosis may not matter much at all.” ADHD is more straightforward and easier to diagnosis in children than are, for example, bipolar disorder and autism. Yet, as previously noted, diagnosing ADHD still relies on some combination of interviews with children (who often do not exhibit symptoms in a clinician’s office or are reluctant or unable to talk about themselves in the way that an adult would), behavioral checklists, less-than-precise rating scales (that measure the existence and severity of ADHD symptoms along the lines of “never,” “occasionally,” “often,” “very often”), and reports from teachers and parents.

## COMMUNITY PROTOCOLS

Ultimately, then, diagnosing and treating ADHD is still partially an art, even though the science applied to it has improved dramatically in recent decades. What appears

to be one of the better ways for resolving this dilemma is for communities to develop protocols that integrate the communications and interactions of teachers, physicians, school personnel, and parents.<sup>134</sup> As has been partially successful in two North Carolina counties, the community process through which the protocol is developed and implemented has an educational component that “increases the knowledge of school personnel about ADHD and its treatment, increasing the likelihood that referrals will be appropriate and increasing the likelihood that children will benefit from coordination of interventions among school personnel, physicians, and parents.”<sup>2</sup>

In 2002–03, a group of pediatric researchers<sup>134</sup> from Wake Forest University School of Medicine surveyed 42 pediatricians in two rural North Carolina counties who treated most of the children with Medicaid in comprehensive pediatric clinics “known collectively as Child Health (CH). The CH pediatricians were the catalysts for the development of the community collaboration process for ADHD,” note Wake Forest pediatricians Jane Meschan Foy and Marian Earls:

The schools were also frustrated with the haphazard referral process and the variation in treatment patterns. Teachers, psychologists, and administrators all desired better communication. School nurses were often in the untenable position of responding to questions from school personnel about ADHD medications with no information from the physician. Parents were often poorly informed and uncomfortable with medication decisions. Communication problems frequently resulted in an adversarial relationship between the parents and the school, the physician, or both. It was in this setting that conversation among the participants became imperative.

Using the guidelines of American Academy of Pediatrics (AAP) for the assessment and treatment of children with ADHD (see Figure 1), the CH pediatricians worked with school personnel to establish standardized screening methods at local schools for children needing assessment because of inattention and classroom behavior problems.<sup>134</sup> Children who appear to need medical assessment are referred by school personnel to a contact person or team at each physician’s office. After a thorough diagnostic process, as outlined by the AAP guidelines, the physicians devise individual plans for treatment and monitoring of children that involve school personnel, physicians, school nurses, and mental health professionals. The protocol concludes with forms for collecting and exchanging information at every step, and specifies “processes and key contacts for flow of communication at every step,” as well as “a plan for educating school and health care professionals about the new processes.”

Revisiting the communities in 2007, the Wake Forest pediatric researchers found that the protocols, continuing medical education, newsletters, and resource guides were

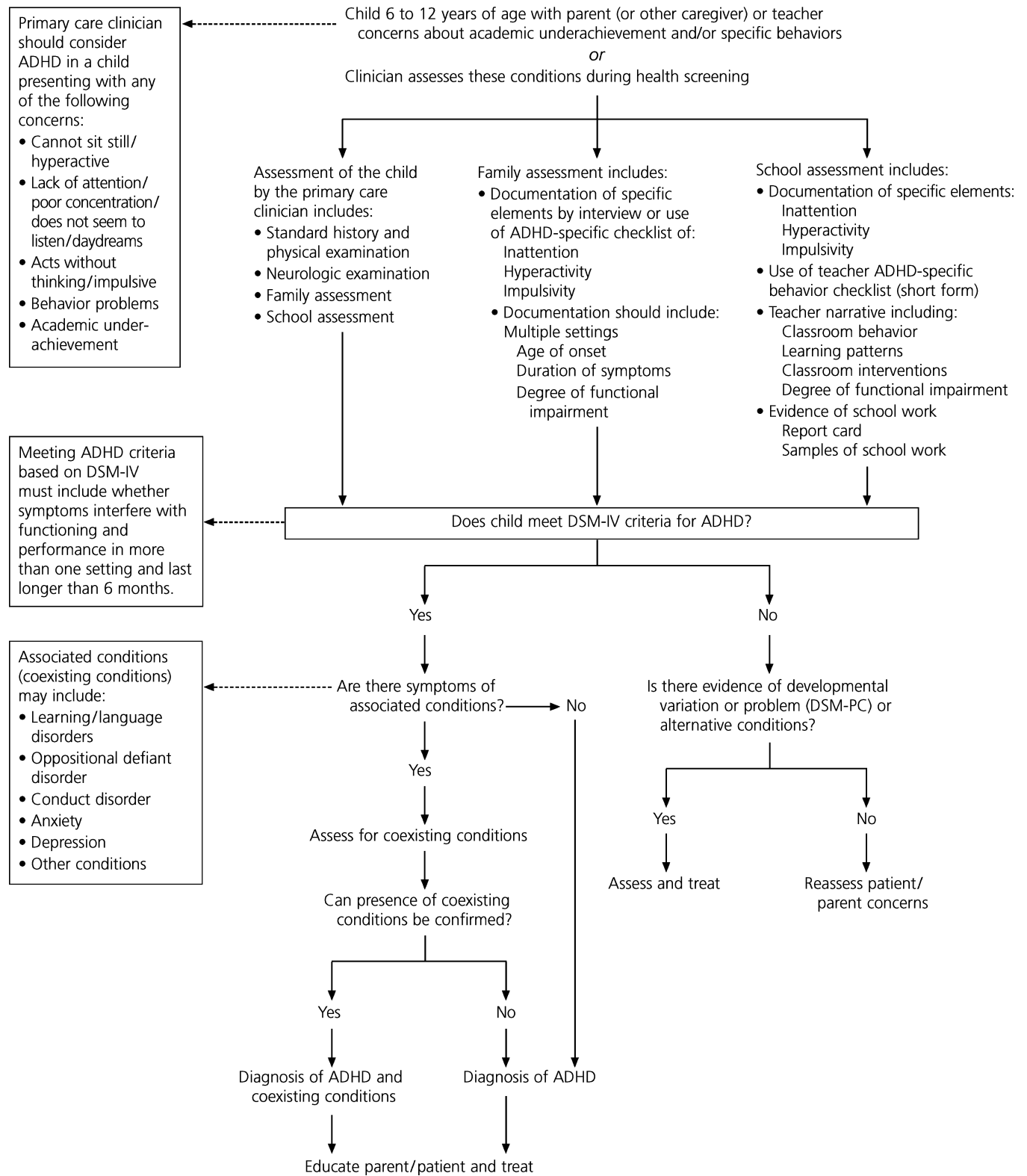


FIGURE 1. Clinical practice guideline: algorithm to aid in the diagnosis and evaluation of the children with attention-deficit/hyperactivity disorder (incorporating criteria from DSM-IV-TR<sup>50</sup> and DSM-IV-PC).<sup>135</sup> Reprinted with permission from Pediatrics 2000;105:1158-70, Copyright © 2000 by the American Academy of Pediatrics.<sup>136</sup>

partially successful in changing the way that pediatricians handled behavioral health problems.<sup>137</sup> “Black box warnings” from the FDA had a much bigger impact in terms of changing clinicians’ prescribing practices (decreasing considerably the proportion of pediatricians who used SSRIs to treat depression in children from 52% to 26%). Nevertheless, 83% of the pediatricians reported that with the protocols, related services, and informational materials, they regularly consulted with mental health colleagues concerning pediatric patients with mental health problems.

Although requiring more time and effort, this kind of collaboration by clinicians, educators, child advocates, mental health workers, and parents is replicable at regional and even state levels. With a community protocol, along with the consensus produced in the process of developing it, undiagnosed children with ADHD are more likely to receive help (often minority children, girls, and children from low-income families), while pediatricians report being less frustrated with a lack of data for making a proper diagnosis and assessing requests for stimulant medication from parents who had been advised by teachers to make such requests.<sup>134</sup> The potential of community protocols is as great as the need for them. Without improved communication among those in charge of children’s development and well-being, and without significantly increased physician compliance with scientifically established diagnostic and treatment guidelines, the debates over ADHD, stimulants, and other mental disorders diagnosed in children are likely only to increase in the future.

## CONCLUSION

Research findings from the past three decades strongly suggest that ADHD is a legitimate disorder with neurobiological underpinnings and that stimulants are generally safe and effective treatment for it when used properly.<sup>138</sup> Even so, the disorder is often diagnosed, and the drugs prescribed, in a less than thorough manner due to numerous pressures experienced by parents, children, teachers, and primary care clinicians.<sup>139–141</sup> In everyday clinical settings, ADHD is often seen as a somewhat messy, ambiguous, and even residual diagnosis,<sup>142</sup> which leaves many clinicians uncertain whether a child’s complex of ADHD behaviors—or symptoms when the behaviors are medicalized—are more a form of developmental delay<sup>143</sup> than indications of a single condition (often with three unstable subtypes)<sup>144</sup> having a common etiology.<sup>145–147</sup> One of the many reasons that ADHD is such a controversial mental disorder is that the symptom complex of inattentiveness, hyperactivity, and impulsiveness can reflect not ADHD but some other mental disorder or a learning disorder, or it could simply reflect a child’s maturational lag, differences in temperament, or rigid or age-inappropriate parental or societal expectations.<sup>148</sup>

It must also be remembered that most children are on something of a continuum in terms of their vulnerability to ADHD.<sup>149–151</sup> And while the standard diagnostic conceptualization of ADHD is that children either do or do not have the disorder, the reality is that children diagnosed with ADHD vary considerably in terms of the severity and number of symptoms they exhibit.<sup>152</sup> Furthermore, psychosocial and environmental factors—such as more demanding school environments,<sup>153</sup> busier home settings, and different forms and rates of cognitive development—play important roles in the complex interaction with biological vulnerabilities to the disorder; not only can these factors not be disaggregated,<sup>154</sup> they are more decisive for children on the high-functioning end.<sup>155–158</sup> For example, “A disproportionate number of children labeled ‘ADHD without hyperactivity’ are exceptionally bright and creative children,” notes Sydney Spiesel, a pediatrician at Yale University School of Medicine (personal communication, October 2007). “I’ve often thought that these kids find their own inner theater much richer and more interesting than the outer theater of the classroom and, so, naturally, focus on it at the expense of classroom attention . . . The proper fix for this problem would be done at the school level, a place where I am unlikely to have any significant effect. I can, however, help these children concentrate and return their attention to the classroom.” Arguably, one of the most important things for many clinicians and parents regarding an ADHD diagnosis is that it provides the basis for financial reimbursement by health insurance companies and access to a variety of therapies and educational accommodations.<sup>159</sup> In other words, for many the diagnosis is primarily a bureaucratic necessity to get a struggling child treated and helped.<sup>160</sup>

Much of the ongoing controversy with ADHD and stimulants, therefore, is not over the comparatively smaller number of children with clear and extreme cases of ADHD, which often coexist with other problems such as depression, learning disabilities, and conduct disorders (and who also constitute the majority of subjects in clinical research studies).<sup>161,162</sup> The controversy centers, instead, around the much larger number of children with milder cases of ADHD—those with a “shadow” of the disorder—who use stimulants despite the ongoing disagreement over how best to treat them.<sup>163,164</sup> This debate is not likely to be resolved any time soon, especially since the number of children using antipsychotic drugs for treatment of bipolar disorder continues to grow. Pediatric psychopharmacology, in general, will continue to generate intense controversy because “facts don’t have much sway when you’re in the grip of a religion,” observes *New York Times* columnist Judith Warner. “The beliefs underlying the Ritalin wars (I am using “Ritalin” here as shorthand for the whole practice of diagnosing children and treating them with psychotropic drugs) have truly now become like a creed. They’re only superficially about

diagnosis and medication. For most people, they're more profoundly about a sense of menace bearing down upon the world of our children."<sup>165</sup>

The enduring public controversy about ADHD reflects not so much the validity of the science behind ADHD, but the discomfort about what happens when the science is translated into policies and rules that govern how children will be treated.<sup>166</sup> For some, this dilemma over how (and how much) to accommodate children diagnosed with ADHD—in terms of education, health insurance, and disability policy—calls into question what childhood is really about. Over the last hundred years, expectations of, and roles for, children have changed dramatically.<sup>167</sup> As a nation, we have moved very quickly—in human evolutionary terms—from child labor and minimal organized schooling to educational systems that regularly have 25 to 30 students per teacher and eight-to-ten-hour days for five-year-olds.<sup>167</sup> So while expecting students to maintain sustained levels of concentration, adults also expect children to be impulsive, energetic, and raucous; we expect them to daydream, to blurt out what is on their mind, to leap before they look, and to think little of the consequences of their actions. In fact, for many adults, to be carefree and impetuous is still the essence of childhood before it is reined in by parental discipline, an adult's awareness of social obligations, and the demands of school. To them, the decision to medicate children—even children who are significantly more impulsive, energetic, and raucous than their peers, perhaps destructively so—seems a tragedy, a move that, when applied to too many children, could strip them of their “natural exuberance.” But it is also a tragedy to see children suffer from academic failure, rejection by their peers, conflict with parents and teachers, and difficulty participating in many of the joys of childhood when effective treatments may be available.

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