

## Elementary and Middle School Teacher Perceptions of Attention-Deficit/Hyperactivity Disorder Prevalence

Gregory A. Fabiano · William E. Pelham Jr. · Antara Majumdar · Steven W. Evans · Michael J. Manos · Donald Caserta · Erin L. Girio-Herrera · Stewart Pisecco · Jane N. Hannah · Randy L. Carter

Published online: 9 February 2013  
© Springer Science+Business Media New York 2013

### Abstract

*Background* Estimates of ADHD diagnosis and stimulant medication use vary across studies. Few studies ascertain the teacher perspective on these rates.

*Objective* To ascertain teachers' perceptions of ADHD prevalence and medication treatment within their classrooms.

*Method* The present school survey collected teacher report of identified children with ADHD as well as unidentified but suspected children with ADHD in an effort to determine the occurrence of ADHD and related behaviors in elementary and middle school classrooms. The number of children treated with stimulant medication was also collected. Results are grouped by elementary/middle school level.

*Results* Results indicated 5.58 % of elementary and 3.53 % of middle school students were identified to the teacher as diagnosed with ADHD. A comparable number were suspected to have ADHD, but were not formally identified. Three-quarters of identified elementary school, and two-thirds of middle school students, received medication treatment. Few moderators of prevalence rates were identified.

---

G. A. Fabiano (✉) · W. E. Pelham Jr. · A. Majumdar  
University at Buffalo, State University of New York, 334 Diefendorf Hall, Buffalo,  
NY 14214, USA  
e-mail: fabiano@buffalo.edu

S. W. Evans · E. L. Girio-Herrera  
Ohio University, Athens, OH, USA

M. J. Manos · D. Caserta  
Cleveland Clinic Children's Hospital, Cleveland, OH, USA

S. Pisecco  
University at Houston, Houston, TX, USA

J. N. Hannah  
Vanderbilt University, Nashville, TN, USA

R. L. Carter  
University at Buffalo, Buffalo, NY, USA

**Conclusion** Teacher perceptions suggest an under-identification of children with ADHD in elementary and middle school classrooms. Stimulant medication treatment wanes as children progress to middle school, per teachers' reports.

**Keywords** Attention-deficit/hyperactivity disorder · Prevalence · Stimulant medication · Diagnosis

## Introduction

Attention-deficit/hyperactivity disorder (ADHD) is a condition that includes developmentally inappropriate levels of inattention, impulsivity, and hyperactivity, and these behaviors cause considerable impairment in school settings. The prevalence of ADHD is estimated to be between 3 and 5 % of the school-age population (American Psychiatric Association 2000). However, studies on the prevalence of ADHD yield widely discrepant ranges from a low of 1.7 % to a high of 17.8 % (Rowland et al. 2002). Much of the variability in prevalence estimates within these studies can be attributed to differences in study approaches, including using a limited geographic area, the age of the children, and the definition of ADHD "caseness" used in the study.

Larger, national surveys convey a more restricted range of ADHD prevalence. In a national survey of United States (US) pediatrician records for children 0–17, the average rate of ADHD was 1.90 % (Hoagwood et al. 2000). Pelham et al. (1992) collected teacher ratings for DSM-III-R ADHD from across 48 states and Canadian provinces. Results yielded an overall prevalence rate of ADHD ranging from 5.8 to 8.5 % across age groups using a conservative diagnostic algorithm. A national parent survey of US youth 4–17 across all 50 states reported an overall prevalence rate of 7.8 % in 2003 (Visser and Lesesne 2005), which increased to 9.5 % in 2007 (Visser et al. 2010). In another national survey, Froehlich et al. (2007) reported a prevalence of 8.7 %. Thus, depending on the survey methods, timing, and sources of information, ADHD prevalence rates in large, national surveys range from 1.9 % to 9.5 %, which is less than half the range of prevalence findings reported in regional studies. Again, differences in the definition of caseness as well as individual study factors may have

---

*Present Address:*

W. E. Pelham Jr.

Department of Psychology, Florida International University, Miami, FL, USA

*Present Address:*

A. Majumdar

Bristol-Myers Squibb, New York, NY, USA

*Present Address:*

E. L. Girio-Herrera

Department of Psychology, University of Miami, Coral Gables, FL, USA

*Present Address:*

S. Pisecco

Pearson Education, Inc, Upper Saddle River, NJ, USA

*Present Address:*

J. N. Hannah

Currey Ingram Academy, Brentwood, TN, USA

influenced these results. These results can be placed within the context of an estimated worldwide prevalence of 5.29 % (Polanczyk et al. 2007).

Although these studies suggest ADHD is a prominent concern in school settings with one to two students per classroom estimated as exhibiting ADHD-consistent behaviors, it is important to note that these studies do not provide information that permits an understanding of the impact of ADHD on teachers and their classrooms. This is because they do not include children with sub-threshold ADHD symptoms or undiagnosed cases. Studies that are exclusively focused on cases that meet rigorous psychiatric diagnostic criteria provide important information on the prevalence rate of ADHD, but they may underestimate the impact of ADHD and ADHD related-behaviors. For example, Angold et al. (1999) reported that a considerable number of children who failed to meet DSM symptom thresholds for ADHD experienced impairment in daily life functioning at home and at school. Children with ADHD-related behaviors, but less severe symptoms and/or impairment are less likely to receive targeted interventions such as mental health services (Bussing et al. 1998). Further, not all children are formally diagnosed with ADHD at the time of school entry. In fact, diagnostic rates for boys and girls do not peak until middle/high school age (Visser and Lesesne 2005), in spite of the diagnostic criterion that requires the presence of impairing symptoms before 7 years of age (APA 2000). Finally, there is no “ADHD” special education category, but many children with levels of inattentive and disruptive behavior receive special education services within other categories, even if a formal diagnosis of ADHD is not provided (Schnoes et al. 2006). Thus, prevalence estimates that count only children who meet strict psychiatric diagnostic criteria for ADHD do not convey the total impact of ADHD on school settings.

Arguably, a teacher’s perception of the number of students in the class with ADHD (i.e., diagnosed and undiagnosed) could provide useful information on the potential overall impact of the disorder on school settings. One reason teachers’ perception is important to study is that it is impractical to ask educators to complete ADHD rating scales for all students in the class. In fact, best practice screenings for social behavior concerns often use teacher nominations of students with problematic behavior as the first step in a multiple-gate screening process (Lane et al. 2012; Walker et al. 1990). Thus, it is important to study the ways in which teachers may play a role in diagnostic referrals and decision-making for ADHD in applied community settings. This is because teachers are often the first to suggest comprehensive ADHD evaluations due to the impairing impact of ADHD-related behaviors in schools, teachers typically make referrals for accommodations or special education, and they have a larger frame of reference for observing normative behavior (i.e., can compare the target child to classmates). Teachers also routinely implement behavior management approaches to target behaviors that are disruptive to classroom functioning (e.g., Epstein et al. 2008). Thus, this consideration of caseness is one with direct relevance and practical utility for educators because it portrays the actual demands per classroom related to the continuum of ADHD-related behaviors.

Unfortunately, few studies exist to estimate the prevalence and therefore impact of ADHD on schools using a broader and more practical definition of caseness (i.e., identified and suspected ADHD). Glass and Wegar (2000) asked teachers in Southeastern Virginia to report the incidence of children diagnosed with ADHD in the classroom as well as the number of students the teachers thought had ADHD, but were not formally identified. Results indicated on average that 36 % of teachers thought between 6 and 15 % of students in the class had behaviors consistent with ADHD, 36 % thought more than 15 % of students had ADHD, and 28 % reported 5 % of fewer of the students in

their class had behaviors consistent with ADHD. Havey et al. (2005) replicated the Glass and Weagar study in a rural, Midwestern area, and found that teachers reported 4.93 % of students in their classrooms were formally identified as having ADHD. However, when teachers were asked how many students in their class they perceived to have ADHD (i.e., identified and unidentified students with ADHD), their report increased to 8.63 %. The results of these studies are interesting—in both cases teachers thought more students in their classroom had ADHD than were formally identified, suggesting an under-identification of the disorder. These studies can be contrasted with other reports that suggest a possible over-diagnosis of ADHD (e.g., LeFever et al. 1999), suggesting further study is warranted.

In addition to overall levels of identified and suspected ADHD in classrooms, questions remain regarding school parameters that may influence the presentation of disruptive behavior in classrooms. For instance, national studies have suggested some geographical diversity in the extent of reports of ADHD diagnoses (Visser and Lesesne 2005). There is also some indication that children from disadvantaged neighborhoods, and therefore schools, may be less likely to be diagnosed with ADHD and subsequently treated (Bussing et al. 2003). Yet, other studies suggest no relation (Ford et al. 2004). Finally, the pupil to teacher ratio can have an impact on disruptive behaviors in the classroom, including those due to ADHD, which is one reason that children with behavior problems are moved to more restrictive classroom placements. These possible moderators of ADHD presentation in classrooms are in need of additional study.

Overall, based on the current literature, questions about the actual extent and impact of ADHD in general education classrooms at the elementary and middle school level remain. The present investigation aims to identify the percentage of children with ADHD perceived to have ADHD by teachers. Moderators of the results are also investigated including indicators of socioeconomic status, locale, geographic region, and pupil to teacher ratio. This report provides a practical estimate of the impact of ADHD on schools from the point of view of general education teachers at the elementary and middle school levels.

## Method

### Sample

As part of a larger survey of school-based interventions for children with ADHD, standard survey packets were mailed to schools across the United States (US). The initial survey design called for choosing sites to obtain a geographically diverse sample. Thus, Erie county in New York, Cuyahoga county in Ohio, Harris county in Texas, Putnam county in Tennessee, and one rural county (Rockingham) and one rural county-equivalent (Harrisonburg) in Virginia were selected. However, once the survey was underway, based on variability of responses both within and across sites, a decision was made to expand the survey to include the entire U.S. To accomplish this, 21 states were randomly selected from the remaining 45 US states. Using 1990 US census data, all the counties in the randomly selected state that had at least one city with 100,000 people or more were identified, and one of these counties was randomly selected. Then, within each selected county, a sample of schools was randomly selected to receive a survey packet. A list of the counties surveyed within the 21 states is available upon request from the first author.

## Procedures

The survey packet mailed to the schools contained a cover letter to the principal describing the project. If the principal agreed to participate, he/she was instructed to distribute a survey to the first 10 regular education teachers on the alphabetical faculty list. Teachers then completed the survey. The survey was anonymous and mailed directly back to the survey coordinator. Each individual who completed a survey was paid \$10.00 via a check mailed to the principal. Principals who did not respond to the initial mailing of the survey packet were remailed a second packet and again invited to participate. The study procedures were approved and overseen by the Social and Behavioral Sciences Institutional Review Board.

A survey was mailed to a total of 631 schools and 245 responded, yielding an overall school response rate of 38.8 %. Overall, 1,127 teachers within the schools responded, of whom 971 teachers were from regular education classrooms. Thus, the response of teachers from schools that had a principal who chose to participate was 46 % (yielding a 40 % response rate for regular education teachers), which is comparable or better than national teacher surveys that used similar methods (e.g., Chafouleas et al. 2006). Schools who responded versus those who did not respond were not significantly different in terms of school size (i.e., number of students), pupil to teacher ratio, locale (e.g., urban, suburban, rural), or the percentage of students receiving free or reduced school lunch ( $p > .05$ ).

## Dependent Measures

Each survey packet contained a number of measures related to demographic information, behavioral classroom management, and ADHD identification and treatment. Included in this report are the answers to questions pertaining to ADHD prevalence and the extent of CNS stimulant medication use in classrooms. All dependent measures were standardized by dividing each dependent variable by the number of students in the class to yield a percentage of students in the class in each category.

### *Percent of Children in the Class Identified as ADHD*

Teachers were asked to write a number following the statement, “Please report the number of children who have been *identified* with attention-deficit/hyperactivity disorder (ADHD) enrolled in your class this year.”

### *Percent of Children in the Class not Identified, but the Teacher Thinks Have ADHD*

Teachers were asked to write a number after the question, “How many additional children in your class do you believe *have ADHD but have not been identified?*”

### *Percent of Children in the Class Medicated for ADHD*

The survey form included the names of stimulant medications for ADHD (The choices were Ritalin/methylphenidate, Adderall, Dexedrine, Cylert/pemoline, Other, Taking medication but don't know the name.). Teachers were asked to report the number of children in each class taking each of the medications. Teachers were asked to deliver a

survey to the school nurse for each identified child, and a child was coded as taking medication if either or both rater indicated medication use.

### Moderator Variables

School characteristics thought to influence rates of disruptive behavior and identified ADHD were identified, and this information was obtained from the National Center for Education Statistics databases (<http://nces.ed.gov/ccd/bat/>). These variables included the percentage of students eligible for free and reduced price lunch, the US census locale of the school (e.g., urban, suburban, or rural), and the pupil to teacher ratio for the school. Using the 1990 census codes for geographical regions (U.S. Department of Commerce, Economics and Statistics Administration, Bureau of the Census 1994), an additional moderator variable was created by grouping the states included in the survey into one of four geographic locations: Northeast, Midwest, South, and West (note: Hawaii was included in the West grouping). Analyses were also separated by elementary and middle school.

### Statistical Methods

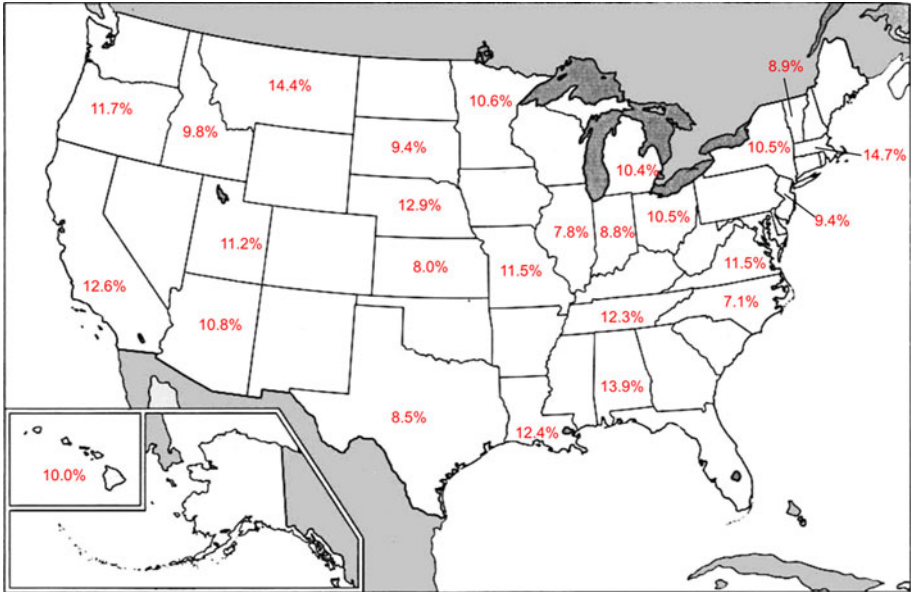
Data were organized by the total sample, elementary grades (kindergarten–5th grade), and middle school grades (grades 6–8). For each of the primary dependent measures, unadjusted descriptive information is presented.

For the overall analyses, a General Estimating Equations (GEE) model (Liang and Zeger 1987) with logit link was fitted to data with binomial outcomes, and a working exchangeable covariance model was assumed—such a model accounts for correlation between schools within states (i.e., clustering). For moderator analyses, the sample consisted of too few teachers within a school for the large number of schools surveyed (i.e., some schools had only one teacher who responded) to conduct hierarchical linear modeling. Therefore, observations were averaged over the teachers within a school to obtain one observation per school. This reduced the three levels of data to two (i.e., schools within states). Therefore, state is treated in these analyses as the primary sampling unit. Moderators of the primary dependent variables were hypothesized to be pupil to teacher ratio, the percent of children receiving free or reduced school lunch, the locale of the school, and the geographic area. For each of the dependent measures, the moderating effect of these variables was investigated.

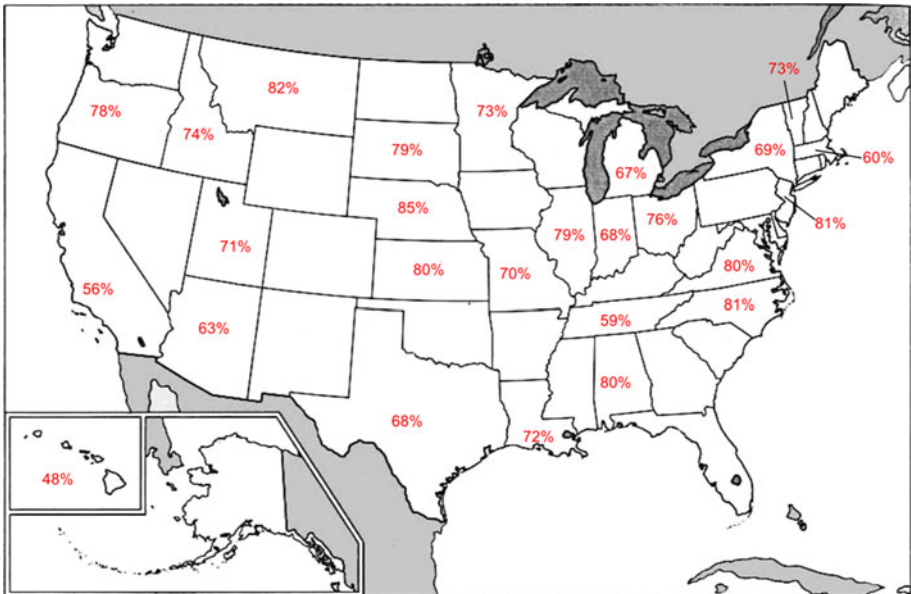
## Results

### Overall Results

Collapsed across states and grades, an unadjusted average of 5.25 % (SD = 5.31 %) of students were identified to the teacher as having ADHD with another 5.46 % (SD = 6.36) being suspected to have ADHD. Figure 1 displays the overall unadjusted prevalence rates for ADHD, either identified or suspected, for each state in the study. As can be seen from Fig. 1, prevalence rates ranged from 7.1 % (North Carolina) to 14.7 % (Massachusetts). Figure 2 lists the unadjusted percentage of identified children with ADHD medicated for the disorder, with ranges from a low of 48 % (Hawaii) to a high of 85 % (Nebraska).



**Fig. 1** Unadjusted percent of children identified to the teacher as being diagnosed with ADHD or suspected by the teacher as having ADHD even if not formally identified



**Fig. 2** Unadjusted percent of identified children with ADHD across elementary and middle schools receiving stimulant medication

## Elementary Schools

### *Prevalence of ADHD*

Unadjusted percentages were calculated for each of the primary dependent measures at the elementary school level. Collapsed across all states, the overall prevalence of identified ADHD in elementary schools was 5.58 % (SD = 5.60 %). Teachers reported an additional 6.09 % (SD = 6.72 %) of elementary school students who they thought had ADHD, but had not yet been identified. Overall, 4.09 % (SD = 5.02 %) of the students in the study were medicated for ADHD, meaning that 73.3 % of students identified with ADHD in elementary school were receiving stimulant medication based on teacher report.

To investigate moderators of ADHD prevalence, the GEE model described above was used. Results indicated that the percent of children receiving free or reduced school lunch was a significant moderator  $\chi^2(1) = 6.32, p < .05$ . For a one unit increase in the percent of children receiving free or reduced school lunches, there was a 52 % decrease in the odds of children being identified as ADHD ( $p < .001$ ). When the variable for the percent of children who the teacher thought had ADHD but not been identified was considered, none of the moderators impacted the prevalence rate.

### *Prevalence of Stimulant Medication Use*

To investigate moderators of ADHD medication prevalence, a GEE model was used. Results indicated that the percent of children receiving free or reduced school lunch was a significant moderator  $\chi^2(1) = 6.67, p < .01$ . Similar to the results above for a child being identified as ADHD, for a one unit increase (i.e., one percentage point) in the percent of children receiving free or reduced school lunches, there was a 57 % decrease in the odds of a child being medicated for ADHD ( $p < .001$ ).

## Middle Schools

### *Prevalence of ADHD*

Unadjusted percentages were calculated for each of the primary dependent measures at the middle school level. Collapsed across all states, the overall prevalence of ADHD in middle schools was 3.53 % (SD = 3.11 %). Teachers reported an additional 2.63 % (SD = 2.86 %) of middle school students who they thought had ADHD, but were not identified. Overall, 2.28 % (SD = 2.74 %) of the students in the survey were medicated for ADHD, meaning 64.59 % of students identified with ADHD in middle school were receiving stimulant medication as per the teacher's report.

To investigate moderators of ADHD prevalence, a GEE model was used. Results indicated that the percent of students receiving a free or reduced cost lunch was a significant moderator for the prevalence of being identified as a child with ADHD,  $\chi^2(1) = 5.61, p < .05$ . Specifically, there was a 57 % decrease in the odds of a student being identified with a unit increase in the percent of children receiving free or reduced cost lunch ( $p < .001$ ). None of the other moderators were related to identified ADHD prevalence. When the variable for the percent of children who the teacher thought had ADHD but had not been identified was considered, the percent of students receiving free or reduced cost lunch also moderated prevalence,  $\chi^2(1) = 3.92, p < .05$ . Specifically, there was a 120 % increase in the odds of a student being suspected of having ADHD, but not



being identified with a unit increase in the percent of children receiving free or reduced cost lunch. None of the other moderators were related to identified ADHD prevalence.

### *Prevalence of Stimulant Medication Use*

To investigate moderators of ADHD medication prevalence, a GEE model was used. Results indicated that the pupil to teacher ratio was a significant moderator  $\chi^2(1) = 4.53$ ,  $p < .05$ . For a one unit increase in the pupil to teacher ratio, there was a 8 % decrease ( $p < .05$ ) in the odds of a child in a class being medicated for ADHD. The percent of students receiving free or reduced cost lunch also moderated medication prevalence in middle schools,  $\chi^2(1) = 3.71$ ,  $p < .01$ . Specifically, there was a 59 % decrease in the odds of a student being suspected of having ADHD but not being identified, with a unit increase in the percent of children receiving free or reduced cost lunch.

## **Discussion**

This paper represents a teacher survey that includes a large sample of states from the US to identify general education teacher perceptions of diagnosed *and* suspected ADHD along with the prevalence of medication use for ADHD in school settings. The survey used an approach that obtained estimates of teachers' perceptions of ADHD prevalence and medication use, and it used information available in public databases to investigate potential moderators of these variables. Further, this study reported information on elementary and middle school students and collected novel information on ADHD caseness. Each of the major study results will be discussed below.

The overall prevalence rate of children identified to teachers as diagnosed with ADHD was generally robust to moderators and suggested 5.58 % of children in elementary school and 3.53 % of middle school students have an ADHD diagnosis that is known to the child's teacher. This identification rate is comparable to professional estimates (i.e., 3–5 % of children; American Psychiatric Association, 2000), as well as other studies of ADHD prevalence (e.g., Jensen et al., 1999). Compared to other studies, however, this rate is significantly lower (e.g., Froehlich et al., 2007; LeFever et al. 2002). Adding together the identified and undiagnosed children with ADHD approximates the identification rates obtained in other studies of ADHD prevalence (e.g., Nolan et al. 2001; Pelham et al. 1992). The present results suggest ADHD is perhaps not "over-diagnosed" if one considers a diverse geographic sample and a practical definition of caseness.

This study also provides a potentially broader view than other studies on the impact of ADHD-related behavior on schools. On average, teachers reported an equal number of children in their class that they thought had ADHD to those identified. This suggests that many children with ADHD-consistent behavior may not be formally diagnosed, or at least this information was not provided directly to the teacher. Presumably, the children the teacher perceived as having ADHD, but had not been identified, were rated as such because they behaved similarly to children identified as having ADHD. When teacher burden and costs of ADHD are considered, it is important to include an accounting for these undiagnosed students as well as the diagnosed ones. For example, whether the child has a formal diagnosis of ADHD or not, if the child needs multiple prompts to begin work and stay on task, breaks classroom rules, disturbs peers, and disrupts the classroom instructional environment, the child will arguably impact the academic climate as much as a diagnosed student. These results also suggest that when the costs of ADHD on the school

system are considered (e.g., Pelham et al. 2007; Robb et al. 2011), or staffing for school mental health initiatives is planned, estimates based only on children formally diagnosed with ADHD may underestimate the true need.

### CNS Stimulant Medication Prevalence

The overall point prevalence of stimulant medication in school settings was estimated to be 4 % of elementary school students (73 % of identified students with ADHD) and 2 % of middle school students (63 % of identified students with ADHD). The rates of students in school medicated with stimulants are comparable to some studies (e.g., Rowland et al. 2002), but different from others (e.g., Visser and Lesesne 2005; LeFever et al. 2002). An additional contributor to the prevalence of stimulant medication that may have underestimated overall use is our reliance on current use (i.e., point prevalence). Studies suggest that stimulant medication use is variable, with approximately 5 months of sustained use being an average upper limit for persistence with the prescription (Marcus et al. 2005). Thus, had the survey been administered at the end of the school year and asked whether a child was medicated *at any time* during the school year, the results may have indicated greater use.

The results indicating stimulant medication use suggest two interesting findings. First, the use of stimulant medication was reported to decrease as students progressed to middle school. This is consistent with other studies that clearly indicate medication use peaking around fourth or fifth grade and with decreasing use as children enter middle school and high school (Visser et al. 2010; Visser and Lesesne 2005). The present results suggest that middle school teachers might be both increasingly unaware of diagnosis/treatment related to ADHD as the use of evidence-based pharmacological interventions are concurrently decreasing.

### Moderators of ADHD Prevalence and Medication Use

Few variables moderated the prevalence of ADHD or stimulant medication use; these results are consistent with other studies that have attempted to identify moderators of ADHD diagnosis (Ford et al. 2004). In elementary school, schools with larger proportions of students who received free or reduced school lunch were less likely to have children with identified ADHD or receiving stimulant medication. Similarly, in middle schools, as the percent of children receiving free or reduced school lunches increased, the odds of a child being identified to the teacher as ADHD decreased. These results are consistent with a growing literature that suggests less effective identification and treatment of ADHD in schools or families characterized by low socioeconomic status (e.g., Bussing et al. 2003; Froehlich et al. 2007).

The results of the middle school moderators indicate that teacher to pupil ratio was related to teacher reports of stimulant medication use such that as the number of students in each class increased, teachers reported fewer students taking stimulants. It seems unlikely that as classrooms become more crowded that ADHD treatment would decrease. It is perhaps more likely that teachers in middle school, who teach large classes, are less likely to be aware of students' individual characteristics and ongoing interventions (Evans et al. 2005).

### Limitations

Although the results included in this report provide unique contextual information on the impact of ADHD on general education classrooms, there are limitations of this study. Limitations include the response rate of the study. Approximately 40 % of schools

surveyed responded. Therefore, a potential limitation is that the schools that included teachers who contributed responses differed in some way from non-responders. However, there were no significant differences between schools that responded versus those that did not on demographic characteristics. This risk is also tempered by the diverse nature of respondents: teachers were distributed across grades kindergarten through eighth, schools were located in rural, suburban, and urban settings, and the student bodies of schools represented diverse socioeconomic strata. Further, because of the nature of the school selection methods, any bias related to non-response is distributed across the entire national sample rather than concentrated in a particular geographic area. A related limitation is that teachers who participated in the survey within a responding school may have differed in some way from those who did not respond.

Another consideration relates to the definition of caseness used in the present study. Some surveys of ADHD prevalence used methods such as structured interviews to establish ADHD diagnosis (e.g., Jensen et al. 1999). This approach has value for identifying the prevalence of ADHD in the community as defined by psychiatric diagnostic criteria. The goal of the present report was to identify the occurrence of ADHD in classrooms as it is perceived by teachers. Therefore, although we cannot be certain the children identified as ADHD would meet psychiatric criteria and were diagnosed using evidence-based methods (e.g., Pelham et al. 2005), teachers can be accurate at identifying children in their class with learning problems and behavioral challenges even without the aide of formal assessment (Gresham et al. 1997; Lane 2003); they may be just as accurate at identifying ADHD, a disorder partially diagnosed through teacher report of behavioral symptoms and associated impairments.

Finally, this study suggests several, potential future directions. Future studies should further investigate whether children currently unidentified as having ADHD actually meet diagnostic criteria, are subthreshold cases, or were previously identified but this diagnosis was unknown to the teacher. Future investigations should also ascertain whether differences in identification and treatment were due to differences in severity, interventions, or some combination of both. Finally, a comparison of teacher impressions of caseness with objective indicators of ADHD diagnosis is needed to better understand these findings.

### Implications for School Mental Health

These results suggest that current community methods for identifying children with ADHD may be only identifying about half of potential cases, and that under-identification may be most pronounced in disadvantaged schools. Therefore, increased efforts devoted toward employing evidence-based, ADHD assessments and screenings in schools appear to be warranted (e.g., Pelham et al. 2005). Furthermore, because teachers are reporting these rates of ADHD-related behavior in their classroom, identification efforts should occur in tandem with efforts to improve classroom management strategies, including school- and class-wide positive behavioral interventions to promote school mental health (e.g., DuPaul and Stoner 2003; Epstein et al. 2008; Evans et al. 2005; Molina et al. 2005; Owens et al. 2008; Pelham et al. 2005; Sugai et al. 2000; Walker et al. 2003; Waschbusch et al. 2005), as many teachers may not be equipped with the skills and strategies needed to work with youth with challenging behaviors in schools (e.g., Martinussen et al. 2011). These universal and/or class-wide approaches hold promise because relying only on targeted school mental health interventions for children with identified ADHD may fail to support teachers dealing with disruptive or difficult behavior in their classrooms.

**Acknowledgments** This project was supported by an unrestricted educational grant from the Alza Corporation, a member of the Johnson & Johnson family of companies.

## References

- American Psychiatric Association. (2000). *Diagnostic and Statistical Manual of Mental Disorders-TR* (4th Ed., TR). Washington, D.C.: Author.
- Angold, A., Costello, E.J., Farmer, E.M.Z., Burns, B.J., & Erkanli, A. (1999). Impaired but undiagnosed. *Journal of the American Academy of Child and Adolescent Psychiatry*, *38*, 129–137.
- Bussing, R., Zima, B. T., & Belin, T. R. (1998). Differential access to care for children with ADHD in special education settings. *Psychiatric Services*, *49*, 1226–1229.
- Bussing, R., Zima, B. T., Gary, F. A., & Garvan, C. W. (2003). Barriers to detection, help-seeking, and service use in children with ADHD symptoms. *The Journal of Behavioral Health Services and Research*, *30*, 176–189.
- Chafouleas, S. M., Riley-Tillman, T. C., & Sassu, K. A. (2006). Acceptability and reported use of daily behavior report cards among teachers. *Journal of Positive Behavioral Interventions*, *8*, 174–182.
- DuPaul, G. J., & Stoner, G. (2003). *ADHD in the schools, assessment and intervention strategies* (2nd ed.). New York: The Guilford Press.
- Epstein, M., Atkins, M., Cullinan, D., Kutash, K., & Weaver, R. (2008). *Reducing behavior problems in the elementary school classroom: a practice guide (NCEE #2008-012)*. Washington DC: National Center for Educational Evaluation and Regional Assistance.
- Evans, S. W., Allen, J., Moore, S., & Strauss, V. (2005a). Measuring symptoms and functioning of youth with ADHD in middle schools. *Journal of Abnormal Child Psychology*, *33*, 695–706.
- Evans, S. W., Langberg, J., Raggi, V., Allen, J., & Buvinger, E. C. (2005b). Development of a school-based treatment program for middle school youth with ADHD. *Journal of Attention Disorders*, *9*, 343–353.
- Ford, T., Goodman, R., & Meltzer, H. (2004). The relative importance of child, family, school, and neighbourhood correlates of child psychiatric disorder. *Social Psychiatry and Psychiatric Epidemiology*, *39*, 487–496.
- Froehlich, T. E., Lanphear, B. P., Epstein, J. N., Barbaresi, W. J., Katusic, S. K., & Kahn, R. S. (2007). Prevalence, recognition, and treatment of attention-deficit/hyperactivity disorder in a national sample of US children. *Archives of Pediatric and Adolescent Medicine*, *161*, 857–864.
- Glass, C. S., & Wegar, K. (2000). Teacher perceptions of the incidence and management of attention-deficit hyperactivity disorder. *Education*, *121*, 412–420.
- Gresham, F. M., MacMillan, D. L., & Bocian, K. M. (1997). Teachers as “tests”: Differential validity of teacher judgements in identifying students at-risk for learning difficulties. *School Psychology Review*, *26*, 47–60.
- Havey, J. M., Olson, J. M., McCormick, C., & Cates, G. L. (2005). Teachers’ perceptions of the incidence and management of attention-deficit hyperactivity disorder. *Applied Neuropsychology*, *12*, 120–127.
- Hoagwood, K., Kelleher, K. J., Feil, M., & Comer, D. M. (2000). Treatment services for children with ADHD: A national perspective. *Journal of the American Academy of Child and Adolescent Psychiatry*, *39*, 198–206.
- Jensen, P. S., Kettle, L., Roper, M. T., Sloan, M. T., Dulcan, M. K., Hoven, C., et al. (1999). Are stimulants overprescribed? Treatment for ADHD in four US communities. *Journal of the American Academy of Child and Adolescent Psychiatry*, *38*, 797–804.
- Lane, K. (2003). Identifying young students at risk for antisocial behavior: The utility of “teachers as tests”. *Behavioral Disorders*, *28*, 360–389.
- Lane, K., Menzies, H. M., Oakes, W. P., & Kalberg, J. R. (2012). *Systematic screenings of behavior to support instruction*. New York, NY: The Guilford Press.
- LeFever, G. B., Dawson, K. V., & Morrow, A. L. (1999). The extent of drug therapy for attention deficit-hyperactivity disorder among children in public schools. *American Journal of Public Health*, *89*, 1359–1364.
- LeFever, G. B., Villers, M. S., Morrow, A. L., & Vaughn, E. S. (2002). Parental perceptions of adverse educational outcomes among children diagnosed and treated for ADHD: A call for improved school/provider collaboration. *Psychology in the Schools*, *39*, 63–71.
- Liang, K. Y., & Zeger, S. L. (1987). Longitudinal data analysis using generalized linear models. *Biometrika*, *73*, 13–22.
- Marcus, S. C., Wan, G. J., Kemner, J. E., & Olfson, M. (2005). Continuity of methylphenidate treatment for attention-deficit/hyperactivity disorder. *Archives of Pediatric and Adolescent Medicine*, *159*, 572–578.

- Martinussen, R., Tannock, R., & Chaban, P. (2011). Teachers' reported use of instructional and behavior management practices for students with behavior problems: Relationship to role and level of training in ADHD. *Child & Youth Care Forum*, *40*, 193–210.
- Molina, B. S. G., Smith, B. H., & Pelham, W. E. (2005). Development of a school-wide behavior program in a public middle school: An illustration of deployment-focused intervention development, stage I. *Journal of Attention Disorders*, *9*, 333–344.
- Nolan, E. E., Gadow, K. D., & Sprafkin, J. (2001). Teacher reports of DSM-IV ADHD, ODD, and CD symptoms in school children. *Journal of the American Academy of Child and Adolescent Psychiatry*, *40*, 241–249.
- Owens, J. S., Murphy, C. E., Richerson, L., Girio, E. L., & Himawan, L. K. (2008). Science to practice in underserved communities: The effectiveness of school mental health programming. *Journal of Clinical Child and Adolescent Psychology*, *37*, 434–447.
- Pelham, W. E., Gnagy, E. M., Greenslade, K. E., & Milich, R. (1992). Teacher ratings of DSM-III-R symptoms for the disruptive behavior disorders. *Journal of the American Academy of Child and Adolescent Psychiatry*, *31*, 210–218.
- Pelham, W. E., Fabiano, G. A., & Massetti, G. M. (2005a). Evidence-based assessment of attention-deficit/hyperactivity disorder in children and adolescents. *Journal of Clinical Child and Adolescent Psychology*, *34*, 449–476.
- Pelham, W. E., Massetti, G. M., Wilson, T., Kipp, H., Myers, D., Newman Standley, B. B., et al. (2005b). Implementation of a comprehensive schoolwide behavioral intervention: The ABC Program. *Journal of Attention Disorders*, *9*, 248–260.
- Pelham, W. E., Foster, E. M., & Robb, J. A. (2007). The economic impact of ADHD in children and adolescents. *Ambulatory Pediatrics*, *7*, 121–131.
- Polanczyk, G., Silva de Lima, M., Horta, B. L., Biederman, J., & Rohde, L. A. (2007). The worldwide prevalence of ADHD: A systematic review and meta-regression analysis. *American Journal of Psychiatry*, *164*, 942–948.
- Robb, J. A., Sibley, M. H., Pelham, W. E., Foster, E. M., Molina, B. S. G., & Kuriyan, A. B. (2011). The estimated annual cost of ADHD to the US education system. *School Mental Health*, *3*, 169–177.
- Rowland, A. S., Lesesne, C. A., & Abramowitz, A. J. (2002a). The epidemiology of attention-deficit/hyperactivity disorder (ADHD): A public health view. *Mental Retardation and Developmental Disabilities*, *8*, 162–170.
- Rowland, A. S., Umbach, D. M., Stallone, L., Naftel, J., Bohlig, M., & Sandler, D. P. (2002b). Prevalence of medication treatment for attention-deficit/hyperactivity disorder among elementary school children in Johnston County, North Carolina. *American Journal of Public Health*, *92*, 231–234.
- Schnoes, C., Reid, R., Wagner, M., & Marder, C. (2006). ADHD among students receiving special education services: A national survey. *Exceptional Children*, *72*, 483–496.
- Sugai, G., Horner, R. H., Dunlap, G., Hieneman, M., Lewis, T. J., Nelson, C. M., et al. (2000). Applying positive behavioral support and functional behavioral assessment in schools. *Journal of Positive Behavioral Interventions*, *2*, 131–143.
- U.S. Department of Commerce, Economics and Statistics Administration, Bureau of the Census. (1994). *Geographic areas reference manual*. Washington, D.C.: U.S. Department of Commerce.
- Visser, S. N., & Lesesne, C. A. (2005). Mental health in the United States: Prevalence of diagnosis and medication treatment for attention-deficit/hyperactivity disorder—United States, 2003. *Morbidity and Mortality Weekly Report*, *54*, 842–847.
- Visser, S. N., Bitsko, R. H., Danielson, M. L., Perou, R., & Blumberg, S. J. (2010). Increasing prevalence of parent-reported attention-deficit/hyperactivity disorder among children—United States, 2003 and 2007. *Morbidity and Mortality Weekly Report*, *59*, 1439–1443.
- Walker, H. M., Severson, H., Todis, B. J., Block-Pedego, A. E., Williams, G. J., & Barkley, M. (1990). Systematic Screening for Behavior Disorders (SSBD): Further validation, replication, and normative data. *RASE, Remedial and Special Education*, *11*, 32–46.
- Walker, H. M., Ramsey, E., & Gresham, F. M. (2003). Heading off disruptive behavior: How early intervention can reduce defiant behavior-and win back teaching time. *American Educator*, Winter, 2003–2004, 6–21.
- Waschbusch, D. A., Pelham, W. E., Massetti, G. M., & Northern Partners In Action for Children and Youth. (2005). The Behavior Education Support and Treatment (BEST) school intervention program: Pilot project data examining school-wide, targeted-school, and targeted-home approaches. *Journal of Attention Disorders*, *9*, 313–322.