REPORT OF THE
VIRGINIA DEPARTMENT OF HEALTH

The Prevalence of Methylphenidate and Amphetamine Prescriptions in the Commonwealth

TO THE GOVERNOR AND
THE GENERAL ASSEMBLY OF VIRGINIA

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TO: The Honorable Mark R. Warner

and

The General Assembly of Virginia

The report contained herein is pursuant to House Joint Resolution 122, agreed to by the 2002 General Assembly.

This report constitutes the response of the Virginia Department of Health (VDH) to examine the prevalence of methylphenidate and amphetamine prescriptions in Virginia.

The cost to VDH to conduct this study was $7,999. The study involved 400 hours of staff time.

Respectfully submitted,

Robert B. Stroube, M.D., M.P.H.
State Health Commissioner

AUTHORITY

Pursuant to House Joint Resolution 122 (HJ 122), the Virginia Department of Health (VDH) examined the prevalence of methylphenidate and amphetamine prescriptions in the Commonwealth and has prepared this study report for the Governor and the General Assembly. A copy of HJ 122 is included in Appendix A on page 54.

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EXECUTIVE SUMMARY:

Background

Following a recommendation of House Joint Resolution 660 (HJ 660) passed by the 2001 General Assembly, the 2002 Virginia General Assembly passed House Joint Resolution 122 (HJ 122) requesting the Virginia Department of Health (VDH) to examine the prevalence of methylphenidate and amphetamine prescriptions in the Commonwealth of Virginia.

Children in Virginia with Diagnosed Attention Deficit Hyperactivity Disorder

In 2001, the Virginia Department of Education (DOE) found that 1.5 percent of the student population took medication for Attention Deficit Hyperactivity Disorder (ADHD) at school.

The National Institutes of Mental Health (NIMH) estimates that 3-5 percent of school age children have ADHD which would translate to 44,253 to 73,755 school age children (ages 5-19) in Virginia based on the 2000 US Census.

Based on data voluntarily provided by the Virginia Association of Health Plans from five members, nearly 24,000 children had an ADHD diagnosis and the Virginia Department of Medical Assistance Services (DMAS) identified over 12,000 children with Medicaid fee for service claims with this disorder. The data are not representative of the whole state and describe only those groups examined. The proportion of children identified with ADHD within insured population groups ranged from 2 percent to 6.5 percent. Demographics of children in the Commonwealth identified with ADHD largely mirrored national patterns.

The Treatment of Attention Deficit Hyperactivity Disorder

Treatment modalities for ADHD include medication treatment and psychosocial interventions such as behavioral modification through parent and teacher training, counseling, and psychotherapy. Stimulant medication treatment has been found to be effective for up to 90 percent of children with ADHD according to studies such as the NIMH sponsored Multimodal Study (MTA). Although the proportion varies by study, roughly three-quarters of children with ADHD receive stimulant therapy.

While methylphenidate (MPH), also known through brand names Ritalin, Metadate, Methylin, and Concerta, remains the most common ingredient used, amphetamine prescriptions are quickly rising for ADHD treatment. Amphetamines (amphetamine salts, dextroamphetamine) used to treat ADHD include trade names Adderall, Dexedrine and Dextrostat. Following their introduction in the past few years, intermediate and long acting versions of stimulants, which are taken every 4-12 hours, are being prescribed most frequently. An additional 10-15 percent of ADHD patients are often treated with other Central Nervous System (CNS) medications such as antidepressants.

Trends in Stimulant Medication Treatment

Increases in stimulant medication use continue to be reported by numerous sources. It is estimated that 5.3 percent of children receive a psychoactive medication, including those used

for ADHD. Combination therapies have also increased as has off label use of psychoactive medications and medication use for preschoolers.

Increases have been attributed to children taking medications for longer periods of time through adolescence, more preschoolers and females being diagnosed with ADHD, more adults being diagnosed and treated for ADHD, direct marketing to consumers, increased insurance coverage for visits and drugs, more available medications and wider acceptance of psychosocial medication use.

Methylphenidate And Amphetamine Use Among Children in Virginia

Based on a sample (n = 398,149) of prescription claims data, VDH estimates that 3 percent of children (ages 19 and under) had a prescription filled for a stimulant medication in 2001. In addition, VDH estimates that between 3-4 percent of children had prescriptions filled for medications often used to treat ADHD. This range nears national estimates, such as from the Medical Expenditure Panel Survey, which has shown 3.5 percent of children through age 20 to be taking these medications.

In addition, VDH estimates that less than one percent of children under age 6, between 5 to 6 percent of children ages 6-10, and between 4 to 5 percent of children ages 11-19 take medication for ADHD.

Less than five percent (4.8 percent) of medication patients were under age 6, 40.1percent were ages 6-10, and 55.1 percent were ages 11-19. Seven out of ten (69.7 percent) patients were male. Regional variations were found with a low of 6.1 percent of ADHD medications out of all medications in Health Planning Region (HPR) 2 (Northern Virginia) up to a high of 9.4 percent in HPR 5 (Tidewater).

Three quarters of children (76.1 percent) were taking stimulants only. An additional 10.9 percent were given stimulants plus another drug type, 16.4 percent received an antidepressant and 8.2 percent received clonidine (alone or in combination with other medications). Of all stimulant patients, 47.6 percent had taken an intermediate or long acting amphetamine and 40.8 percent had taken an intermediate or long acting methylphenidate. Less than one half of one percent (n= 83) of medications examined were for pemoline, a drug not currently recommended due to potential liver toxicity.

Virginia Association of Health Plans members providing data on insured groups had from 1.0 percent to 7.9 percent of their child members on ADHD medications.

Populations with Higher Prevalence of Attention Deficit Hyperactivity Disorder

Higher prevalence of ADHD was found among Department of Juvenile Justice admissions, children hospitalized for mental conditions, and children evaluated at VDH Child Development Clinics.

History of stimulant medication use was found in 37. 9 percent of males and 31.8 percent of females among 2001 Department of Juvenile Justice admissions through the Bon Air Diagnostic

Center. These rates were triple those observed in 1993. Based on admitting evaluations, 23.9 percent of males and 25.6 percent of females met the *Diagnostic and Statistical Manual 4th Edition* (DSM IV) criteria for ADHD. Over two-thirds of admitted youth had unmet mental health treatment needs in 2001.

Admission for mental diseases and disorders was the second most common major diagnostic category for resident children ages 1-19 hospitalized in Virginia in 2001. Nearly a quarter (23.9 percent) of admissions related to mental diseases contained either a primary (3.3 percent) or secondary (20.6 percent) diagnosis of ADHD. Among all child hospitalizations, 4.7 percent had a primary or secondary diagnosis of ADHD.

ADHD occurred most frequently with oppositional defiant disorder, bipolar disease, and depression. Average costs for these hospitalizations with ADHD ranged from to $8,188 (primary) to $ 9,777 (secondary). A higher than average share of admissions (33 percent) with ADHD were under Medicaid.

Eleven Child Development Clinics (CDC) operated by VDH found that ADHD was the most common referral reason and diagnosis made between FY 98 and FY 02. One quarter of all patients had a primary ADHD diagnosis. CDCs diagnosed 405 children with ADHD in FY 02, a small fraction of the estimated cases in Virginia.

Conclusions

These data provide a snapshot about use of methylphenidates and amphetamines among children in Virginia, largely mirroring national trends. The data do not, however, answer questions about appropriateness of medication and/or diagnosis. This type of analysis would likely require longitudinal survey data from subjects, providers, parents and school personnel or other measures such as medical record review.

While the estimated use of methylphenidates and amphetamines among children in Virginia appears to fall within the national ranges according to pharmaceutical claims data, these data do not reflect the magnitude of increases which have taken place in the past two decades. Regional variances were also found in the data, lending some support to prior studies in the Tidewater area suggesting higher levels of ADHD medication use.

With greater use of intermediate and long acting medications, the proportion of children taking ADHD medication while at school will continue decreasing.

High-risk populations demonstrate consistently higher than average prevalence rates for ADHD. The burden from ADHD among these populations appears to be much greater and illustrates the need for early and accurate diagnosis and adequate mental health treatment.

Recommendations:

Based on the analysis the following recommendations are made:

1.) Continue surveillance efforts, as resources allow, to monitor ADHD prevalence and medication treatment among children in Virginia through mechanisms such as the Behavioral Risk Factor Surveillance System annual survey sponsored by VDH.

2.) Continue to support the requirement that persons seeking licensure to teach in Virginia complete study in attention deficit disorder (§ 22.1-298).

3.) Continue to support Department of Education State Special Education Advisory Committee efforts to improve joint training of parents and school personnel and continue support of local parent resource centers, which offer information and may also offer training sessions on ADHD.

4.) Monitor community-based pilot efforts such as the Fairfax County Medical Society and Lee's Corner collaborative project between schools, parents, and providers; the Virginia Beach Public School system efforts to provide parent training on ADHD and behavior modification; and the Center for Pediatric Research's community-based ADHD study, which will provide further data on prevalence, risk factors, outcomes and possible management tools which could be replicated in other areas of the state.

5.) Provide training on the Bright Futures Mental Health Tool Kit, including the National Initiative for Children's Healthcare Quality ADHD tool kit, for school personnel, primary care providers and mental and behavioral health providers. Training would be provided under collaboration between DOE, VDH, VDMHMRSAS and the Virginia Chapter of the American Academy of Pediatrics as funding and resources allow.

INTRODUCTION AND BACKGROUND

Attention deficit hyperactivity disorder (ADHD) is the most common diagnosed behavioral disorder in childhood. The core symptoms of ADHD include developmentally inappropriate levels of attention, concentration, activity, distractibility and impulsivity (NIMH, 1998). ADHD symptoms present in the preschool or early elementary years. Children with ADHD experience functional impairment in multiple settings, such as school and home.

Children with ADHD may experience rejection by peers, academic difficulties and higher injury rates. Adolescents, and later some adults, with untreated ADHD are at greater risk for substance abuse, injuries and dysfunctional social relationships. Parents of children with ADHD experience frustration, marital discord and financial expense. Long term adverse consequences from ADHD include negative effects on academic performance, vocational success and social functioning. Children with ADHD often need more services from health care, judicial, education and social service systems (NIH, 2000).

ADHD has two subtypes: primarily hyperactive/impulsive, more commonly diagnosed in boys, and primarily inattentive. No physiological assessment currently exists to identify ADHD. According to the *Diagnostic and Statistical Manual, 4th Edition* (DSM IV) criteria, a diagnosis for ADHD requires observation of at least six symptoms for inattention or hyperactivity/ impulsivity that are maladaptive and inconsistent with the expected developmental level. The symptoms must have caused impairment prior to seven years of age and be observed in at least two settings (e.g. school, home and or work). In addition, the symptoms must not occur exclusively with symptoms related to other developmental disorders, schizophrenia, or other psychotic disorder and must not be better accounted for by other another mental disorder. ADHD is diagnosed and treated by a variety of professionals including pediatricians, family practitioners, neurologists, psychologists and psychiatrists.

ADHD frequently occurs with other mental diseases and disorders. Frequent co-morbidities include learning disabilities (15-25 percent), language disorders (30-35 percent), conduct disorders (15-20 percent), oppositional defiant disorders (up to 40 percent), mood disorders (15-20 percent) and anxiety disorders (20-25 percent) (NIMH).

Current research and guidelines recommend treating ADHD as a chronic condition which can be managed. Treatment for ADHD includes medication and psychosocial interventions. Stimulant treatment and/or behavioral therapy is recommended by groups such as the American Academy of Pediatricians (AAP), who released new treatment guidelines in 2001. Stimulant medication treatment is the most common therapy given to approximately three-quarters of ADHD patients today.

Stimulant treatment of children first emerged in the media in the 1970s following reports that an estimated ten percent of children in an Oklahoma school were taking these medications. Since then, stimulant medication in children has created controversy amid concerns that children are being overmedicated and that ADHD may not be legitimately identified in many being treated. The debate has resulted in numerous media stories, lawsuits against stimulant manufacturers and

legislation, such as state laws barring teachers from suggesting the need for stimulant treatment and exempting parents from neglect charges for refusal to medicate their children.

Increased stimulant use has been reported. In 2000, the US Drug Enforcement Agency (DEA) testified to Congress about annually increasing production quotas for stimulants, which are Schedule II drugs, and concerns over possible diversion. Using prescription auditing data, the DEA identified Virginia as having the 8th highest per capita methylphenidate prescription use (4,207 grams per 100,000 persons) and the 10th highest per capita for amphetamine prescription use (1,404 grams per 100,000 persons) for 1999.

Escalating concerns regarding potential overmedication, over diagnosis of ADHD, and diversion of stimulants led to the passage of House Joint Resolution 660 (HJ 660) by the 2001 Virginia General Assembly, appointing a ten member Joint Subcommittee to Investigate the Improper Prescription and Illegal Use and Diversion of Ritalin and OxyContin and to Study the Effects of Attention Deficit Disorder and Attention Deficit Hyperactivity Disorder on Student Performance. The Joint Subcommittee was tasked with multiple items including determining the number of students diagnosed as having ADHD in public schools and whether these children receive treatment, evaluating effects on academic performance and ascertaining the number of prescriptions in the last five years to determine the rate of increase or decrease.

Pursuant to HJ 660, the Virginia Department of Education (DOE) conducted a survey in 2001 to ascertain the use of these medications in the public school system. With 129 school divisions reporting (a 95.5 percent response rate), DOE identified 16,521 students (1.5 percent of the student population) as taking medication for ADHD. The majority of students were reported to be taking Ritalin (45 percent). DOE found the highest proportions of ADHD medication use among fourth (2.2 percent) and fifth (2.1 percent) graders. Boys comprised 76 percent of those taking medication at school. Students with disabilities (in special education, being evaluated for special education, or with a 504 plan) represented 59 percent of the students receiving ADHD medication. The survey did not identify any significant differences among racial/ethnic groups.

Also reporting to the subcommittee, ADHD researcher Gretchen LeFever with the Center for Pediatric Research in Norfolk, cited her published study showing that 8 and 10 percent of elementary school children in two Southeastern Virginia cities were on stimulant medications. Her work also found that 17 to 18 percent of white males in fourth and fifth grades were on these medications. She provided testimony and data reflecting that children with ADHD had higher rates of absenteeism, repeated grades, special education participation and suspensions/ expulsions.

The Joint Subcommittee also found some reported cases of medication theft. A US General Accounting Office report cited that eight percent of surveyed U.S. school principals reported one incident of diversion or abuse of ADHD medications. Half of Virginia public schools indicated they did not have a policy or procedure regarding the storage, maintenance and administration of medications. Citing the work of HJR 660, Superintendent's Memorandum No. 158 (October 26, 2001) encouraged schools to review current policies and procedures regarding storage, maintenance and administration of medication.

The Joint Subcommittee concluded that medication is one component of effective ADHD treatment. The final report noted the need for medical supervision and ongoing communication between physicians and parents and school personnel with parental permission. Other concerns identified were to review reimbursement mechanisms and assure effective evaluation. The study did note concerns about rates of ADHD diagnoses and methylphenidate prescriptions in Virginia.

Following the recommendations of the HJ 660 study, the *Code of Virginia* was amended through HB 692 in 2002 to include "the theft or attempted theft of student prescription medications" as incidents which must be reported to school principals or their designees. In addition, SB 425 established a Prescription Monitoring System in Health Planning Region 3 for two years for Schedules I-IV drugs to be implemented once funding becomes available.

The HJ 660 report also recommended "that the Department of Health, in collaboration with the Departments of Education, Health Professions and Mental Health, Mental Retardation and Substance Abuse Services, with the assistance of researchers with public health and education expertise, conduct a statewide epidemiological study examining the prevalence of methylphenidate use and ADHD diagnoses in the Commonwealth; that such study incorporate, among other things, consideration of (i) contributing factors to any such prevalences; (ii) any relevant nutritional and educational issues; and (iii) the identification of age-appropriate behaviors by education and health professionals; and that such study include the input of psychologists, physicians, and other health professionals."

HJ 122, which originated from HJ 660, passed in the 2002 General Assembly which requested "the State Department of Health to collect data to determine the prevalence of methylphenidate and amphetamine prescriptions in the Commonwealth." (A copy of the resolution can be found in Appendix A)

PRACTICE GUIDELINES AND MAJOR RESEARCH STUDIES ON ADHD

History of ADHD

Although concern has been expressed that attention disorders were only recently recognized, the first article in the medical literature appeared in *Lancet* in 1902. G. F. Still described a group of children who had difficulty concentrating and learning, were hyperactive and had conduct problems. He attributed these behaviors to both organic and environmental factors. Shortly after World War I, clinicians came to believe that the disorder was more organic in nature. This belief was spurred in part by the recognition of a behavioral disorder, characterized by overactivity and impulsivity, among survivors of the influenza epidemic and encephalitis. In the 1940s, a group of children with hyperactivity and impulsivity was identified as having *minimal brain damage syndrome*. In 1962, the term *minimal brain dysfunction* (MBD) was proposed and accepted (Stubbe, 2000).

With the advent of the Diagnostic and Statistical Manual of Mental Disorders, Second Edition (DSM-II) classification system in 1968, the disorder was renamed *hyperkinetic syndrome of children.* It described children with persistent overactivity and inattention, but excluded children who had any other conduct difficulty along with their overactivity. Revision of the DSM in 1980

(DSM-III) termed the disorder as *attention deficit disorder with or without hyperactivity* (ADHD or ADD) with the core symptoms being inattention, impulsiveness and restlessness. Further revision in 1987 resulted in DSM-III-R dropping the inattention component. The latest revision, DSM-IV (1994) identified three subgroups—one with inattention, one with hyperactivity-impulsivity and a combined type with both (Stubbe, 2000).

The most common neurobehavioral disorder of childhood (AAP, 2000), ADHD is also arguably the most studied with over 1,000 articles published each year. Several recent major academic works have reported the use of extensive literature reviews, meta-analyses, rigorous methodological techniques and evidenced-based medicine guidelines to develop practice guidelines, consensus statements and treatment recommendations. Results of these major works are outlined here.

American Academy of Pediatrics Clinical Practice Guidelines for Diagnosis and Management of ADHD

In 2000, the American Academy of Pediatrics (AAP) developed and published a practice guideline for primary care physicians to guide the diagnosis and management of ADHD. A panel of physicians, developmental specialists and epidemiologists, assisted by the Agency for Healthcare Research and Quality (AHRQ) and Technical Resources International, conducted an evidence-based literature review to create the guideline, which underwent extensive peer review.

AAP recommended that primary care clinicians evaluate children between the ages of 6-12 for ADHD who present with inattention, hyperactivity, impulsivity, academic underachievement or behavior problems. Guidelines specify that DSM-IV criteria be met which require demonstration of symptoms prior to age seven and functional impairment in two settings (e.g. school and home). The AAP requires evidence to come directly from caregivers or parents as well as from the classroom teacher (or other school personnel) regarding core ADHD symptoms, duration of symptoms and degree of functional impairment. ADHD-specific questionnaires and scales are recommended; however, use of broad global type rating scales are discouraged. The AAP recommends using assessments from other caregivers, such as former teachers, religious leaders and coaches to resolve discrepancies between parent and teacher reports.

Guidelines call for the assessment of coexisting conditions such as oppositional defiant disorder, mood disorders, anxiety disorders and learning disabilities. The AAP guidelines also note that other tests such as blood lead levels and thyroid levels do not assist in diagnosis. It is also noted that brain imaging studies and electroencephalographs (EEG) do not show reliable differences between ADHD children and control groups, although this remains an area for future research and potential use.

AAP stresses that the DSM-IV criteria are designed for children aged 6-12 and that inadequate information exists about its applicability to younger and older children. The Academy calls for further research into using normative and community-based samples to develop more valid and precise diagnostic criteria, better assessment tools for practical use in the primary care setting, and additional information on current practices of primary care physicians in the treatment of ADHD. The practice guideline concludes by emphasizing the need to use the explicit criteria of DSM-IV in diagnosing ADHD, the importance of obtaining information from more than one

source (home and school) and the need to search for coexisting conditions which may complicate the treatment picture.

AAP Clinical Practice Guidelines for the Treatment of School-Aged Children with ADHD

The American Academy of Pediatrics partnered with AHRQ and the McMaster University Evidence-based Practice Center to develop the evidence base for these clinical guidelines published in 2001, as well as review results of the Multimodal Treatment Study (MTA) and the Canadian Coordinating Office for Health Technology Assessment report (CCOHTA). Drafts of the guidelines underwent extensive review by components of the AAP and numerous external organizations. Intended for use by primary care clinicians in the treatment of children with ADHD between the ages of 6 and 12, the guidelines emphasize collaboration with both parents and school-based professionals to monitor the progress and effectiveness of interventions. These recommendations and guidelines are summarized below.

Recommendation 1: Primary care clinicians should establish a management program that recognizes ADHD as a chronic condition.

Clinicians should establish a management program that recognizes ADHD as a chronic condition, with possibly 60-80 percent persistence into adolescence. They should provide information and counseling about the condition, including educating parents and children about "the ways in which ADHD can affect learning, behavior, self-esteem, social skills, and family function." Clinicians should ensure the coordination of health care services and help families set specific goals. "What distinguishes this condition from most other chronic conditions managed by primary care clinicians is the important role that the education system plays in the treatment and monitoring of children with ADHD" (AAP, 2001).

Recommendation 2: The treating clinician, parents, and the child, in collaboration with school personnel, should specify appropriate target outcomes to guide management.

At least 3-6 target outcomes should be developed to guide management and monitoring by the clinician, parents, child and school personnel. The primary goal of treatment should be to maximize function and six desired results are outlined.

Recommendation 3: The clinician should recommend stimulant medication, as appropriate, to improve target outcomes in children with ADHD.

Extensive research demonstrates the efficacy of stimulant medications on "measures of observable social and classroom behaviors and on core symptoms of attention, hyperactivity, and impulsivity" with modest effects on intelligence and achievement tests.

- First-Line Treatment: Methylphenidate, dextroamphetamine and amphetamine salts are approved in various forms (short, intermediate and long-acting) and do not require serologic, hematologic, or cardiac monitoring. Appetite suppression and weight loss are common side effects, although no long-term impairment of growth/height has been found.
- Second-Line Treatment: Tricyclic antidepressants and bupropion are the only other supported medications, although they should only be used after stimulants have failed. Clonidine "falls outside the scope of this guideline" and its use is documented primarily in children with coexisting conditions, especially sleep disturbances. Pemoline is no longer recommended due to its rare, but potentially fatal, hepatic effects.

Recommendation 3A: For children on stimulants, if one stimulant does not work at the highest feasible dose, the clinician should recommend another.

Eighty percent of children are reported to respond to one of the stimulants. Behavior therapy is described as specific interventions with the goal of modifying the physical and social environment to alter or change behavior. Behavior therapy is usually implemented by training parents and teachers in positive reinforcement or consequences for behavior. Psychological interventions (such as play therapy or cognitive therapy) are designed to change emotional status or thought patterns without proven efficacy in treating ADHD. Effective behavioral techniques such as positive reinforcement, time-out, response cost and token economies are discussed. Behavior therapy may improve results of medication therapy and commonly includes parent training and classroom management. The MTA study found parent and teacher satisfaction with behavior therapy. Students can receive behavior therapy as part of an individualized education plan (IEP) or Section 504 plan. Section 504 plans require schools to make classroom adaptations to help children with ADHD and may include preferential seating, decreased assignments and homework, and behavior techniques implemented by the teacher.

Recommendation 4: When the selected management for a child with ADHD has not met target outcomes, clinicians should evaluate the original diagnosis, use of all appropriate treatments, adherence to the treatment plan, and presence of coexisting conditions.

Criteria for treatment failure are provided, along with the recommendation that the child should be referred to a mental health specialist.

Recommendation 5: The clinician should periodically provide a systematic follow-up for the child with ADHD. Monitoring should be directed to target outcomes and adverse effects by obtaining specific information from parents, teachers, and the child.

The AAP identified the following areas for future research: expanded treatment options, tailoring treatments to children and outcomes, long-term outcomes, service delivery, and epidemiology and etiology. The etiology of ADHD must be determined in order to develop prevention strategies (AAP, 2001).

American Academy of Child and Adolescent Psychiatry Practice Parameters for the Use of Stimulant Medications in the Treatment of Children, Adolescents and Adults

The American Academy of Child and Adolescent Psychiatry (AACAP) uses an evidence-based medicine approach to develop "minimal standards," "clinical standards," "options," and "not endorsed" guidelines for the clinical care of individuals with ADHD using stimulants. The guide notes that stimulants were first found to be effective on disruptive behaviors in 1937. Based on 161 randomized control trials, the guide refers to the "steady increase" in ADHD diagnoses and stimulant treatment over the past two decades. The guide states the following benefits of stimulants: increased on-task behavior, compliance, accuracy of performance, short-term memory, reaction time, math computation, problem solving, sustained attention and decreases in interrupting, fidgeting and impulsivity.

The AACAP recommends that DSM-IV or ICD-10 be used in the diagnosis of ADHD, and that "only those patients with moderate to severe impairment in two different settings should be considered for stimulant treatment....If the patient is an adolescent, the clinician should be certain that he or she is not using nonprescribed stimulants." Contraindications to the use of stimulants include sensitivity, glaucoma, symptomatic cardiac disease, hypertension, or hyperthyroidism. Stimulants may lower seizure thresholds so seizures should be well controlled prior to stimulant use. Caution is urged whenever there is history of drug abuse, by either the child or other family member.

The AACAP notes the methylphenidate package insert warns against use in children under six years of age, yet mentions eight published studies documenting MPH effectiveness in younger children. It further notes that package inserts for pemoline, dextroamphetamine and mixed salts of amphetamines allow their use down to age three, although there are no published controlled studies of these medications in preschool aged children. Prior to starting stimulant use, baseline assessments of blood pressure, pulse, height, weight and physical examination should be done, along with documentation of prior treatment. The first stimulant to be used may be methylphenidate, amphetamine salts, or dextroamphetamines. Pemoline is not recommended due to risk of hepatotoxicity. Recommended starting dosages for each medication should be used, and an optimal dose should be determined using a consistent titration schedule and regular follow-up assessments.

National Institutes of Health Consensus Development Conference Statement

In November 1998, the National Institutes of Health (NIH) held a consensus development conference on ADHD. Following 31 presentations by field investigators on ADHD and questions and statements from public and conference attendees, the consensus panel produced a draft statement. While consensus statements may not represent the latest findings, they reflect an "educated consensus" by scientists and citizens chosen for their expertise and impartiality. After wide review of the draft, the final ADHD consensus statement was published February 2000 and mailed to 50,000 health professionals (NIH, 2000; Jensen, 2000).

The Consensus Statement indicated that although no independent valid tests exist for ADHD diagnosis, diagnostic interview methods can be used to establish the disorder. The panel noted that the validity of ADHD is supported by "the long-term developmental course of ADHD over time, cross-national studies revealing similar risk factors, familial aggregation of ADHD, and heritability." They acknowledged a likely basis for ADHD in the Central Nervous System. Problems of diagnosis include differentiation from other behavioral disorders and determining "the appropriate boundary between the normal population and those with ADHD " (NIH, 2000).

The Consensus Panel acknowledged the burden resulting from ADHD in terms of academic, social, health and other impaired areas of functioning. The panel described ten areas of future research including etiology of ADHD to help determine prevention strategies.

The ADHD Consensus Statement addressed questions related to stimulant treatment. They reported that short-term trials of both stimulants and psychosocial treatments have established their efficacy in alleviating symptoms of inattention, hyperactivity, impulsivity and aggressiveness. Psychosocial therapies include behavioral strategies such as reward /consequence management, parent training and teacher training. Studies comparing stimulants with psychosocial treatment have found greater efficacy with stimulants. Cognitive-behavioral treatment, as well as alternative treatments such as diet management, biofeedback and perceptual stimulation have not been proven effective.

The Statement indicated that data about long term effects of stimulant use were not available. The Consenus Panel noted that while short term growth may be affected, ultimate height was not impacted. In addition, data were inconclusive on the risk for increased substance abuse.

The Consensus Statement also spoke to concerns about existing diagnostic and treatment practices and barriers to appropriate identification, evaluation and intervention. Wide practice variations in communities and physicians were noted as well as both under and over diagnosis occurring in children. Closer follow-up and collaboration between clinician, family and school personnel is needed. Barriers to care identified include negative media portrayal of ADHD, the lack of specialists to care for children with ADHD, inadequate collaboration between the educational system and the practitioner and insurance coverage that limits reimbursement for mental health treatments.

National Institute of Mental Health Multimodal Treatment Study for Children with Attention-Deficit Hyperactivity Disorder (MTA Study)

In 1992, NIMH and the U.S. Department of Education initiated a nationwide research study of ADHD in response to concerns regarding treatment practices and lack of research on long-term treatment effects. Six university sites conducted 14-month long (with 24-month follow-up), randomized clinical trials, comparing pharmacological, behavioral and combined treatment strategies with a "control" group, which received routine care in a community setting. The Multimodal Treatment Study (MTA) involved 579 children ages 7 to 9.9 years old who were diagnosed as having DSM-IV combined type ADHD (inattention plus hyperactivity/ impulsivity). The study has been hailed as a landmark study--the most elaborate and methodologically rigorous of its kind in children's mental health (Stubbe, 2000; Schachar, 1999; Pelham, 1999; Jensen, 1999).

The medical management (MM) group received medication treatment only. A double-blind placebo control study, along with parent and teacher recordings of daily behavior, was first conducted to identify the child's optimal dose for methylphenidate or another drug. Monthly half-hour follow-up visits were scheduled during which the health care provider would review information about the child's behavior provided by both parents and teachers and adjust medication dosage, if needed.

The behavioral treatment (BT) group received parent training, child-focused treatment and school-based interventions. Parent training involved 27 group sessions and 8 individual sessions per family. The children received a summer treatment program of an 8-week, weekday therapeutic summer camp using intensive behavioral interventions. School-based interventions consisted of 10-16 sessions of teacher training in classroom behavior management strategies and 60 school days of a part-time, behaviorally trained, paraprofessional aide working directly with the child. Throughout the school year, a daily report card of check-listed behaviors was brought home by the child to be reinforced by the parent with home-based rewards.

The combined group received both the MM and BT. The community care group (control group) did not receive any of the study's treatments, but was provided a list of community mental health resources to access on their own. Two-thirds of the children in the community group received medication from their own provider during the 14 months.

All four groups showed marked reductions in ADHD symptoms over time. Therefore, data should not be interpreted as "what worked" versus "what did not work," but rather in degrees of

efficacy (Pelham, 1999). Ultimately, the MTA Cooperative Group concluded, "for ADHD symptoms, our carefully crafted medication management was superior to behavioral treatment and to routine community care that included medication. Our combined treatment did not yield significantly greater benefits than medication management for core ADHD symptoms, but may have provided modest advantages for non-ADHD symptoms and positive functioning outcomes" (MTA, 1999).

However, MTA researchers Pelham and Jensen, as well as other researchers in the field, have cautioned against simplifying the results to medication being better than behavior treatments. Pelham (1999) cautioned against interpreting the results as a "one size fits all" approach to treatment because medication is not always more effective for a particular child, even though it was found to be for the average. While medication appeared superior in controlling core ADHD symptoms, behavioral treatments showed added benefit for other key symptoms such as oppositional symptoms, internalizing symptoms, teacher-rated social skills, parent-child relations and reading achievement. Medication reduced negative peer interactions dramatically, but was less likely to increase positive social behaviors. The "best" responders were in the combined group, but the differences between the groups were statistically insignificant. Jensen warned against confusing significance with equivalence. Parents significantly preferred BT and combined treatments over medication alone, although the noncompliance rate with the BT was much greater, suggesting that parent training was favored by some, yet difficult for others.

Both the MM and BT delivered in this study represented state-of-the art best practice, which is more comprehensive than real-world practice. Further research could help to determine which treatment components are cost effective. Parent training and a simple home-school daily report are thought to be the most essential components of BT and most cost efficient (Pelham, 1999). Jensen asserts that the systematic feedback from teachers and parents was a major factor in success of the MM group. Children in the combined group could be maintained on 20 percent lower average doses of methylphenidate than the MM only group. Children in the community care group received lower average doses of MPH, had a greater likelihood of being treated with multiple medications and a greater likelihood of being treated with antidepressants. Reduction in ADHD symptoms for MM tends to end when medication is stopped. Benefits from BT appeared not to fade as rapidly.

The MTA raised some future research questions such as looking at whether active treatment needs wax and wane as they do for other chronic diseases such as asthma and diabetes. In addition, questions remain about the effects of learning environments and stressors on ADHD (as pollen affects asthma or diet affects diabetes) and if lower dosages will be effective as children learn new behavioral strategies.

Agency for Healthcare Research and Quality (AHRQ) Evidence Report

In 1997, the Agency for Healthcare Research and Quality (AHRQ) of the U.S. Department of Health and Human Services charged the McMaster University Evidence-based Practice Center in Canada with creating an evidence report on the treatment of ADHD. The multidisciplinary team spent two years doing systematic reviews and meta-analyses focusing on the evidence of

effectiveness and safety of pharmacological and nonpharmacological interventions for ADHD and the efficacy of combined versus individual interventions.

While search strategies identified 2,405 studies as randomized controlled trials published in peer-reviewed journals, only 92 reports, representing 78 different studies, met all the rigorous inclusion criteria for evidence-based recommendations. The team reported that multiple systematic reviews and meta-analyses of placebo-controlled trials of stimulant medication had already consistently established the short-term efficacy of stimulants in the treatment of core ADHD symptoms.

They reported that there were few short-term differences in effectiveness among methylphenidate (MPH), dextroamphetamine and pemoline. Studies comparing stimulants to tricyclic antidepressants had limitations and presented conflicting results. In this evaluation of studies examining combination therapies, they noted evidence was lacking to support the superiority of combination therapy over stimulant alone or nondrug intervention alone. A recent large trial (MTA) found that combined treatment offered some benefit over single-component treatments for non-ADHD areas of functioning.

The study also reported that while MPH reduced behavioral disturbances for the duration of therapy, stimulants did not appear to improve academic performance. They found a general trend to improvement regardless of the length of treatment and identified quality of medication supervision to be a factor in maximizing benefit.

Side effects reported in studies appeared to be mild, of short duration and to respond to dose adjustments. They noted the lack of long term studies to examine adverse affects such as potential for abuse of stimulants, liver toxicity due to pemoline, or major arrhythmia with tricyclic antidepressants in patients with ADHD.

The report emphasized that rigorous selection criteria limited the use of many studies. It called for more rigorous research in studying ADHD, including longer term studies, studies determining the added value of nondrug interventions when patients already receive stimulants, studies to determine whether co-morbid factors influence treatment response, more comprehensive studies on adverse effects of treatment, more studies involving females and more studies by consumer groups (funded by sources other than the government or pharmaceuticals). The AHRQ cited the MTA as an example of possible "large-scale, long-term collaboration among researchers" and urged this type of study versus "small, incompletely reported studies with heterogeneous designs" otherwise "research in this area will continue to be abundant but will be of little value to guide most clinically relevant decisions" (AHRQ, 2001).

CURRENT ISSUES IN ADHD DIAGNOSIS AND TREATMENT

Prevalence of ADHD

Several prevalence rates are most often quoted in the literature. The AAP bases its rate of 4-12 percent in the general population of 6 to 12 year olds on a literature review of nine studies in which diagnostic instruments were administered (AAP, 2000; Brown et al, 2001). Using DSM IV criteria, the American Psychiatric Association and NIMH report ADHD prevalence to be 3-5

percent in "school-age children" (AHRQ, 1999). The Centers for Disease Control and Prevention calculates a prevalence rate of 6.8 percent in children ages 6-11 based on the 1997 and 1998 National Health Interview Surveys (NHIS) and reports that about half of these children also have a learning disability (Pastor & Reuben, 2002).

Other estimates of the prevalence of ADHD in the United States vary from 1.7 percent to 16.1 percent (AHRQ, 1999). Part of the variability among prevalence rates relates to which criteria are being used for identification—DSM-IV, DSM-III, DSM-IIIR, ICD-10 or parent report. Not adhering to full DSM-IV criteria such as the requirement of impairment can raise rates by 50 percent (Wolraich et al, 1998; Jensen, Achenback, & Rowland, 2002) and the requirement that symptoms must have been present prior to age seven can increase inattentive subtype rates by 25 percent (Willoughby, 2000). Rates are further affected by the source of the information—parent report, insurance claims, or school reports—and by the type of sample—community, school, or clinical. Prevalence is higher in community samples (10.3 percent) than school samples (6.9 percent) (Brown et al, 2001). Other characteristics, such as age and sex, affect stated rates. Rates for "boys ages 9-10" (when ADHD tends to be at its peak) are greater than for "children ages 5-18." Table 1 shows the prevalence rates determined by various studies using differing criteria that combine an assessment of ADHD and stimulant treatment.

Table 1. Prevalence Rates Determined by Various Studies Combining an Assessment of Both ADHD and Stimulant Treatment

Investigators	School or Community Study	Teacher, Parent, Physician Identification	Age Range	DSM	Prevalence Of ADD/ADHD	% on Stimulants At Present	% on Stimulants Lifetime Prevalence	Study Period	Rating Or Interview
Bosco & Robin, 1990	S	T, P, Ph	6-14	II	2.9	24	73	1977	R
Lambert et al, 1981	S	T, P, Ph	6-11	II	6.1	-	86	1974	R
Szatmari et al, 1989b	C	T, P	6-14	II	6.2	6	-	1981-2	R
Wolraich et al, 1996	S	T	5-11	IV	11.4	26	-	1993-4	R
Wolraich et al, 1998	S	T	5-11	IV	6.8	15	-	1994-5	R
LeFever et al, 2002	S	P	Elem. Sch	--	17	74	84	1997-8	Parent Survey
Jensen et al, 1999	C	P, T	9-17	III-R	5.1	12	-	1992	I
Angold et al, 2000	C	P	9-16	III-R	6.1	-	72	1992-6	I

(Adapted from Safer, 2000)

Treatment Services for ADHD

Using data from the federally sponsored National Ambulatory Medical Care Survey (NACMS) several researchers have documented ADHD treatment trends. Youth visits to physicians' offices for ADHD as a percentage of total youth physician visits increased from 1.9 percent in 1989 to 3.6 percent in 1996 (Zito et al, 1999). The frequency of which physicians mentioned Central Nervous System (CNS) drugs during office visits rose 327% between 1985 and 1999 (from 1.1 to 4.5 mentions per 100 physician visits) for children under 15 years of age (Burt, 2002). Hoagwood et al (2000b) found this survey showed prescriptions for stimulants increased from 54.8 percent to 75.4 percent while prescriptions of other psychotropics decreased by 50 percent.

Medication type varied by physician type. Three-quarters of psychiatrists and pediatricians prescribed stimulants while 95 percent of family practitioners did. Psychiatrists provided significantly more mental health counseling and psychotherapy while pediatricians and family practitioners provided more "other counseling." The study did not examine the reasons for these

differences, which may include case mix severity and ability to bill for specialty services. Diagnostic services, mental health counseling, and other health related counseling also increased during this time period while psychotherapy decreased (Table 2).

Table 2. Trends in Types of Services for Children with Attentional Problems

Types of Services	1989*	1991*	1993*	1995*	1996*
Medication management					
Stimulants	54.8	77.8	76.3	74.8	75.4
Other psychotropics	15.3	3.5	5.6	4.0	7.5
Other drugs	6.5	2.5	2.6	6.3	4.3
No drugs	23.4	16.2	15.5	14.9	12.8
Diagnostic services	22.3	76.6	43.1	60.6	62.1
Mental health counseling	24.3	59.4	34.3	44.2	39.3
Other counseling	3.5	29.7	4.3	29.9	35.2
Psychotherapy	40.1	38.3	5.6	21.3	35.2
Follow-up services	91.0	84.5	75.5	83.4	75.1

*Values given in percentages from the NAMCS 1989-1996 (Hoagwood, 2000b)

Increases in Stimulant Use

Other data sources reflect stimulant use increases during the 1990s. U.S. DEA production quotas for stimulants, which are Schedule II drugs, demonstrated a 6-fold rise in methylphenidate quotas and a 10-fold rise in amphetamine quotas over the past decade. While the methylphenidate quota production remains higher, the amphetamine production quota is approaching it (Table 3).

Table 3. Rise in Production Quota for Methylphenidate and Amphetamine, United States

	1990 DEA production quota	2000 DEA production quota
Methylphenidate	1,768 kg	14,957 kg
Amphetamine	417 kg	9,007 kg

(Source: GAO Report 01-1011, 2001 Note: kg = kilogarms)

Safer used data from four studies to calculate that MPH treatment in ADD youth increased an average of 2.5-fold from 1990 to 1995 (Safer et al, 1996). Increases have been attributed to youth staying on medication into their teen years, youth with inattentive type beginning to receive stimulants, increased numbers of females receiving ADHD medication and wider acceptance of medication use.

During the second half of the 1990s, the IMS Health National Prescription Audit showed that the number of MPH prescriptions held steady while prescriptions for Adderall (a formulation of dextroamphetamine and amphetamine salts) quadrupled (Shatin & Drinkard, 2002; DEA, 2001). Total stimulant use for these two drugs combined increased 5-fold during the 1990s.

Prescription drug use by people under 19 represents the fastest growing age segment of use. (Health Medco, 2002). Increases have been observed in children for many medication types. Drugs for neurological and psychological disorders were used by 5.3% of people under 19 in 2001 up from 5% in 1997. Nearly half (48.9%) of children took at least one prescription medication in 2001 (Health Medco, 2002).

CNS-Stimulant use was found to rise 26% between 1995 and 1999 in one longitudinal study utilizing data from six United Health affiliated plans with nearly 750,000 members across the US, including one Southeastern site. The rate increased from 23.8 to 30.0 per 1,000 children under age 20. The combined use rate of CNS-Stimulant and Selective Serotonin Reuptake Inhibitors (SSRI) (antidepressants) increased from 1.4 to 2.6 per 1,000 children under age 20 during that time. The Southeast plan experienced rate increases for CNS-Stimulants from 22.2 (1995) to 27.1 (1997) to 30.9 (1999) per 1,000 children (Shatin and Drinkard, 2002).

Only two studies examining children and ADHD treatment have used rigorous diagnostic procedures and community-based epidemiological sampling methods (Jensen, 2000). Both suggest that many children with ADHD are not being treated while many children who do not meet the full criteria for ADHD are being treated with medication. In the Methods for the Epidemiology of Child and Adolescent Mental Disorders (MECA) study of four U.S. communities, Jensen and other researchers (1999) found that only 12 percent of children meeting DSM-IIIR criteria received stimulants. In the Great Smoky Mountain Study, Angold and associates (2000) studied a largely rural population and found 3.4 percent met the full DSM-III R criteria. However, 7.3 percent of the children received stimulant medications, twice the proportion with ADHD, and many of these were reported not to have ADHD symptoms.

When treatment medication is chosen for a child with ADHD, clinical practice guidelines recommend stimulant medication as first line treatment (AAP, 2000; ACAP, 2001; AHRQ, 1999). No significant differences in efficacy have been found among stimulants available (AHRQ, 1999). During the past three years, several long-acting formulations of stimulants have been approved for use (Table 4). These long-acting forms have quickly gained popularity and are forecast to become market dominant because of their once daily dosing (Dreyfus et al, 2002).

Table 4. Comparison of Stimulants Used in the Treatment of ADHD

Drug	Pharmacokinetics	Comments
Amphetamine Mixtures		
Adderall	T1/2*=4-6 hrs DBE**=4-6 hrs	May require multiple dosing.
Adderall XR	T1/2=9-11 hrs DBE=12 hrs	Once daily.
Dextroamphetamine		
Dexedrine tablet	T1/2=4-6 hrs DBE=4-6 hrs	Inexpensive. May require multiple dosing. Greater abuse potential
Dexedrine Spansule	T1/2=12 hrs DBE 6-8 hrs	Slow onset.
Methylphenidates		
Concerta	T1/2=3-4 hrs DBE=12 hrs	Once daily. Quick onset; long duration.
Metadate CD	T1/2=6-8 hrs DBE=9 hrs	Once daily. Quick onset.
Ritalin	T1/2=2-3 hrs DBE=3-5 hrs	Requires multiple daily dosing.
Ritalin SR	T1/2=3-4 hrs DBE=8 hrs	May require multiple dosing.

*T ½= Half Life; ** DBE= Duration of Behavioral Effect (Adapted from Hamer, 2002)

Concerns about ADHD and Preschool Children

Few guidelines exist for treating preschoolers with ADHD. Ambiguity surrounds what constitutes activity within the bounds of normal development and the need for treatment even if activity is found to be outside these boundaries. Several studies have found the use of psychotropic medication to be increasing among very young children (Zito et al, 2000; Rappley et al, 1999; Rappley et al, 2002). In one study, almost half of the children under age three who were medicated did not have opportunities for monitoring as often as every three months even though more than half of them received medication for at least six months (Rappley et al, 2002). In addition to limited published experience and guidelines for this group, the developing young brain may be vulnerable to medication-induced changes, and the expression of side effects may be more pronounced. Determining safe doses is problematic due to developmental differences in hepatic and other metabolic pathways used in the distribution and clearance of medications. However, frequently these children demonstrate significant comorbid disorders and safety may be compromised if they are not treated (Rappley et al, 2002). The Preschool ADHD Treatment (PATS) study is being conducted at 6 sites for 165 children between ages 3 to 5.5 to examine off label drug usage and the safety and efficacy of MPH for this age group. All children will receive 10 weeks of family training in behavioral therapy. Those not sufficiently improving will go on to the medication treatment study phase (Brown University Psychopharmacology Update, 2002).

Abuse and Diversion of Stimulants

Some newer ADHD medications may have less risk for abuse and diversion. Crushing and intranasal abuse of MPH has been reported in the past (Garland, 1998). Attempts to snort Concerta, on the market since 2000, have been unsuccessful according to one researcher's observations (Jaffe 2002). The methylphenidate in Concerta is almost impossible to extract because it contains a high molecular polymer mixed with the methylphenidate. If a crushed tablet is mixed with water, the tablet forms a gel and must be diluted with a large volume of water for several hours before the contents can be separated from the polymer (Ciccone, 2002).

Several new medication treatments for ADHD, which may have lower risks, are in the process of obtaining FDA approval. Atomoxetine, trade name Strattera, inhibits the presynaptic norepinephrine transport system. It has no apparent effect on dopaminergic systems and has been labeled a nonstimulant. After demonstrated effectiveness in placebo-controlled studies, the FDA issued an "approvable letter" for atomoxetine in August 2002, but has asked for additional data to support the manufacturer's assertion that the drug has no potential for abuse and should not be a controlled substance (Kratochvil et al, 2002; Michelson et al, 2001; Boyles, 2002; Mechcatie, 2002; Sherman, 2002). The FDA has accepted a new drug application for a once-daily MethyPatch from Noven Pharmaceuticals. Although not a new medication, the modified transdermal delivery system (patch) may decrease abuse potential.

A U.S. General Accounting Office study found that 96 percent of medication was kept locked at schools and that three-quarters of the states have written statutes or mandatory policies addressing administration. Eight percent of high school and middle school principals reported any instances of diversion or abuse of stimulant medications at their schools, which was usually just one instance (GAO –01-1011, 2001).

Individuals with ADHD may have an increased risk of developing substance use disorders (SUD). Some researchers have reported increased alcohol and substance abuse and increased driving violations (Barkley et al, 1996 and Barkley, 1998 cited in Rowland et. al, 2002). Some have postulated that use of stimulant medication in these youth could lead to prescription drug abuse or serve as a conduit to other illegal drug use. Biederman et al (1999), however, found that adolescents with ADHD not treated with stimulant medication were significantly more likely to develop a substance use disorder than those treated with a stimulant medication. Biederman theorizes that SUD in adolescents may arise from an attempt at self-medication and that receiving medication for ADHD decreases that risk "by controlling the core features of ADHD and promoting adaptive behavior and academic success." More research is needed in this area.

Additional Health Concerns Related to ADHD

Children with ADHD require more medical and mental health services. Some studies have shown that children with ADHD are more likely to require emergency services for self inflicted wounds or other serious injuries. A recent analysis on medical costs found that ADHD added $479 to annual average medical costs (Chan et. al, 2002). Another study documented that over half (54 percent) of all youths active in one or more of five social service sectors (substance use, child welfare, juvenile justice, mental health or public school care for emotional disturbances) met criteria for one psychiatric disorder and half of these met the criteria for ADHD (Garland et al. in Rowland et al., 2002).

Etiology of ADHD

One area of ADHD study that is consistently identified as needing further research is exploring the etiology and epidemiology of ADHD. Numerous studies show possible genetic links and structural neurological differences in many individuals with ADHD, but no study has been able to identify a consistent etiology or structural anomaly (Stubbe, 2000). NIH Epidemiologist Andrew Rowland hypothesizes that pre-term delivery and exposure to other environmental toxicants such as cigarette smoke, alcohol and lead are important etiologic risk factors (Jensen, Achenback and Rowland, 2002). In a meta-analysis of 227 studies, Bhutta and others (2002) note that children born preterm have a 2.64-fold risk for developing ADHD.

Collaborative Efforts in Diagnosing and Treating ADHD

Sponsored by AAP, the National Initiative for Children's Healthcare Quality (NICHQ) has developed a tool kit for the diagnosis of ADHD. The tool kit provides "real world" tools for primary care providers to implement AAP diagnosis and treatment guidelines for ADHD. The kit contains parent and teacher symptom rating scales (Vanderbilt scales), primary care evaluation tools, scoring instructions, medication comparison chart, parenting tips and a daily behavior report card. The Vanderbilt scale is also promoted in Bright Futures Mental Health, a federally sponsored set of clinical care guidelines formally adopted by VDH. The NICHQ initiative is designed to promote collaboration between schools, parents and providers with the outcome of improving care for ADHD children. In Lee's Corner Elementary School in Fairfax, Virginia, the AAP is initiating a pilot project with this emphasis. The tool kit and model projects may help collaborative efforts to better diagnose, treat and manage ADHD.

STUDY METHODOLOGY

To assess the impact of national trends and use of ADHD medication in Virginia, VDH examined existing multiple data sets, which included national and state data. Medicaid fee for service (FFS) outpatient claims and all hospital inpatient admissions for children ages 19 and under in the Commonwealth were reviewed. Verispan, a national research firm, was contracted to provide data on prescriptions filled for children in the Commonwealth. Five Virginia Association of Health Plan members voluntarily provided aggregate data on children who were insured by their plans and diagnosed with ADHD and treated with stimulant medications. Data on other groups such as VDH Child Development Clinic patients and Virginia Department of Juvenile Justice (DJJ) admissions were reviewed and included. Data sources are outlined below:

National Prevalence Data

VDH utilized data from the following national sources:

-American Academy of Pediatrics	General estimates
-Centers for Disease Control and Prevention	(National Center for Health Statistics)
National Health Interview Survey	Published data
National Ambulatory Care Survey	Published data
Medical Expenditure Panel Survey	Published data
National Hospital Discharge Dataset	Primary data review
-Drug Enforcement Agency	Automated Reports Consolidated Orders System
-National Institute of Mental Health	General estimates

Verispan Pharmaceutical Data

Data for 2001 were purchased for ADHD medication (Table 5) prescriptions filled in Virginia for children ages 19 and under. Verispan, the firm providing data, classified unique patients as those receiving stimulant only; antidepressant only; clonidine only; stimulant and antidepressant; stimulant and clonidine; antidepressant and clonidine; stimulant and clonidine and antidepressant; or any other medication. Data were provided on 398,149 unique child prescription recipients by age group, gender and county/city where a prescription was filled. Data were also classified by medication types: short acting methylphenidates, intermediate/long acting methylphenidates, short acting stimulants, intermediate/long acting stimulants, clonidine, antidepressants and other. Data were provided on both numbers of scripts and unique patients. A total of 29,945 unique patients were identified with any drug of interest (DOI) and 26,058 were identified with a stimulant DOI. Pharmacy data originated from a variety of sources, primarily chain stores, retail stores, grocery stores, independent pharmacies and other clinics. Data include all payor types including self-pay. Verispan has rights to data for one-third of pharmacy claims in the U.S.

A second data run matched patients with known ADHD from a smaller outpatient medical claims database with those purchasing a prescription in the pharmacy database. This yielded information on 2,304 patients of which 94% had a pharmacy claim that was for a DOI. The other 6% had a pharmacy claim for another medication, but patients in that group could have received ADHD medication treatment at a pharmacy not in the data set, or received a medication not selected under the DOI list.

Table 5: ADHD Medication Drugs of Interest (DOI) Studied for HJ 122

Drugs of Interest (DOI) for Analysis for HJ 122		
Methylphenidates	Short Acting	Ritalin (Trade Name)
		Methylin (Trade Name)
		Methylphenidate HCl
	Intermediate Acting	Ritalin SR (Trade Name)
		Metadate ER (Trade Name)
		Methylin ER (Trade Name)
	Long Acting	Concerta (Trade Name)
		Metadate CD (Trade Name)
		Ritalin LA (Trade Name)
Amphetamines	Short Acting	Dexedrine (Trade Name)
		Dextrostat (Trade Name)
		Dextroamphetamine
	Intermediate Acting	Adderall (Trade name)
		Dexedrine Spansule (Trade Name)
	Long Acting	Adderall XR (Trade name)
Antidepressants	Tricyclics	Tofranil (Trade name)
		Imipramine
		Norpramin (Trade name)
		Desipramine
		Pamelor (Trade name)
		Nortrypteline HCl
	Bupropion	Wellbutrin (Trade name)
		Wellbutrin SR (Trade name)
		Bupropion
	Tri/SSRI	Effexor (Trade name)
		Venlafaxine
Pemoline	Cylert	Cylert (Trade name)
		Pemoline
Central Adrenergic Agonists	Clonidine	Catapres (Trade name)
		Clonidine

These data do not include all prescriptions filled in the Commonwealth and the exact market share for Verispan was not known. Verispan provided data on 131 communities ranging from 4 to 61,598 local prescription patients with an average of 3,314 child prescription patients per community. Prescription data are based on the place the prescription was filled, which is not necessarily the residence of the patient. The data do not include Virginia residents obtaining medications out of state and may include some out of state residents purchasing drugs in Virginia. Because of potential issues regarding travel to care and location of pharmacies, data are presented by Health Planning Region (HPR) to minimize mischaracterizing areas. Data analyzed using local data do contain some duplicate unique patients across communities within HPRs and to a lesser extent across HPRs. While there is probably some limited crossover particularly on border communities, it is less likely that a child would be the resident of one HPR, yet receive a prescription in another HPR. The denominator of these data is the number of

children receiving any prescription within the Verispan dataset, and not the total number of children in Virginia. It cannot be stated to what extent these data represent all children in the Commonwealth receiving prescription medications. These are factors considered when analyzing the data.

Data from Verispan are likely to be most representative because they contain Medicaid, private insurance and uninsured children from across the state. Provided in aggregate form, these data were the largest sample examined. These data likely contain crossover from some data reported by the Virginia Association of Health Plans.

Virginia Association of Health Plans

Five health plans agreed to review their claims databases and provide de-identified member data where possible for HJ 122. Plans were requested to provide data on child members under age 20 residing in Virginia (identified by a list of 3 digit zip codes) who had a diagnosis of ADHD using the ICD-9 codes of 314.00 (Primarily inattentive), 314.01 (Primarily hyperactive/impulsive and combined), and 314.9 (Unspecified). Plans were also requested to search for any members under 314.0 or 314.1. Identified patients were classified as under 6 years, 6-10 years and 11-19 years.

Plans were also asked to identify members taking stimulant medications for ADHD. A list of National Drug Codes (NDC) was provided. In addition, data for certain antidepressants and clonidine were requested where feasible (Table 5). Plans provided data on co-morbidities often found with ADHD (where possible), including depressive disorders, bipolar disorders, conduct disorders and oppositional defiant disorder.

All plans provided data that covered 2001. One plan conducted its study during the time period from January 2000 through July 2002. Three plans extracted data from outpatient claims using ICD-9 codes and then scanned for medication use. One plan pulled its data strictly from the NDC codes. One plan retrieved data from two separate data claims databases, for outpatient services and pharmacy services. All plans provided data on stimulant use and three plans provided data on use of other medications. Three plans extracted data on co-morbidities with ADHD. One plan provided data on child members through age 18 and provided additional data on child members with any mental diseases and disorders.

These plans combined insure 2.2 million Virginians of all ages. Complete numbers of covered children could not be determined for all five plans. Because not every plan could provide the number of child members under age 19, the market share of insured children could not be reported and conclusions are not applicable to the entire state, only to those plans studied. While most areas of the state had at least one plan providing information, statewide coverage was not obtained which could further affect rates and possible regional variances. A few variations existed between methodologies and available databases, an important factor in analysis.

Virginia Department of Medical Assistance Services

The Virginia Department of Medical Assistance Services (DMAS) provided outpatient claim data for Medicaid fee for service (FFS) clients ages 20 and under with an ADHD diagnosis using ICD-9 codes 314.00, 314.01 and 314.9 (314.1 and 314.0 were also checked). Date of birth, fiscal

year of diagnosis, race, gender and county FIPS code were provided for individual records for 51,480 persons for fiscal years 1999-2002. Age was determined for the patient on the last day of the fiscal year. Because annual data likely contain duplicate patients, demographics on FY 02 patients are presented.

These data represent only fee for service claims with an ADHD diagnosis. Approximately 80 percent of children covered by Medicaid are now in a managed care plan. Data on children in one Medicaid managed care plan were provided through one Virginia Association of Health Plans member, but similar data on other children in Medicaid managed care plans were not systematically available through DMAS. Southwest Virginia and a few other localities, such as Lynchburg and Winchester, do not have managed care coverage. A total of 32 communities remain under fee for service Medicaid.

Certain populations, however, are not eligible to be placed under managed care. These include children who are in foster care, children under a community-based waiver and children who are institutionalized in a mental health facility, including residential treatment. These patients are more likely to have claims for behavioral health conditions such as ADHD.

While managed care plans are required to cover outpatient mental health services, such as diagnostic exams, Community Mental Health Rehabilitation Services provided through local community service boards (CSBs) are under a behavioral health carve out. Managed care providers do not cover mental health services delivered in this system. This means that fee for service claims for ADHD patients may be for children normally under a managed care plan, who are receiving behavioral health services at a local CSB.

Of the 81,547 FFS outpatient claims containing an ADHD diagnosis in FY 01, 41.8 percent originated from a CSB. These claims may be for children with straight fee for service or for children in managed care who are receiving CSB services under a carve out. Less than one percent of claims with ADHD diagnoses were for foster care children, children hospitalized for mental health services and children under community based waivers—which are groups ineligible to be placed under managed care. Because claims on children receiving other services under managed care could not be distinguished, ADHD prevalence from all Medicaid fee for service claims could not be determined.

A FY 00 ADHD prevalence rate for fee for service communities as of April 2000 was determined using child Medicaid populations from medically indigent, Temporary Assistance for Needy Families (TANF), medically needy and categorically needy categories. A total of 46 communities in Eastern and Central Virginia were not included in the prevalence rate due to the existence of managed care in those areas and the data issues described above.

Other High Risk Populations

Virginia Health Information: VDH, licensed to use the Virginia inpatient hospitalization database, extracted records on admissions for resident children under age 20 who were hospitalized in 2001 at a Virginia hospital for a primary or secondary diagnosis under ICD-9 codes for ADHD. Data on age, race, county/city of residence, all diagnoses, Major Diagnostic

Category (MDC), Diagnostic Related Group (DRG), referral source, severity of admission, cost of stay, length of stay and payor source were examined. This dataset is based on admissions, not unique patients. Patients who are readmitted within the same year will show as two admissions.

Data from the National Hospital Discharge Survey public use files for 2000, the most recent year available, were accessed through the Centers for Disease Control and Prevention website to provide comparable data for the South as a region, which extends to Texas, and the United States.

Virginia Department of Juvenile Justice: Aggregate data on youth admitted to the Bon Air Reception and Diagnostic Center between July 1992 and June 2001 were voluntarily provided as previously tabulated for prior use by the Virginia Department of Juvenile Justice (DJJ). Data were for 13,469 admissions representing 10,816 individual youth. Aggregate data on medication use and evaluation were part of DJJ's work, which was provided to VDH to add to the base of data on children and certain groups with greater incidence of behavioral health concerns.

Virginia Department of Health-Child Development Clinic Patients: Data on children evaluated through one of the 11 Child Development Clinics (CDC) sites operated by Virginia Department of Health were accessed through pre-set reports for the CDC Automated Information System. Aggregate data for referral reasons, diagnostic codes and payor sources were examined by site and for the state as a whole. Data were examined for FY 97- FY 02. Special runs were not available for these data due to programming limitations. These are data only on children evaluated for behavioral and learning disorders and do not reflect subsequent treatment patterns. These children represent a very small fraction of those in the Commonwealth with behavioral and learning disorders and the data are representative only of CDC patients.

FINDINGS ON THE PREVALENCE OF METHYLPHENIDATE AND AMPHETAMINE PRESCRIPTIONS IN THE COMMONWEALTH:

National to State Estimates

To work from a reference point of how many children in the Commonwealth may have a diagnosis of ADHD if the state prevalence were to fall within national ranges, crude estimates were calculated. Many ranges of estimates of ADHD prevalence exist and one of the most frequently cited is 3-5 percent of all school age children. Five prevalence rates were calculated using populations from the 2000 U.S. Census Bureau decennial census counts since those population estimates are available on a single year basis. Estimates are not directly comparable because they are given for various age groups and several estimates are ranges. Depending on the age of the population and the source of the estimate, between 28,026 and 84,079 children in Virginia may be expected to have ADHD (Table 6). These numbers should not be construed to be the estimated number but they represent the estimated range should the prevalence of ADHD in Virginia children fall within national norms.

Table 6: Possible Number of Children in Virginia with ADHD Based on National Prevalence

Estimate	Age Group	Population in Virginia (2000 Census)	Possible # in Virginia with ADHD	Source of Estimate
4.1%	9-17	884,549	36,266	National Institutes of Mental Health
6.8%	6-11	601,987	40,935	Centers for Disease Control (NHIS)
3.5%	5-20	1,576,650	55,183	Medical Expenditure Panel Survey
3-5%	School age	1,475,104 (ages 5-19)	44,253 to 73,755	American Psychiatric Association National Institutes of Mental Health
4-12%	6-12	700,657	28,026 to 84,079	American Academy of Pediatrics

In examining children taking ADHD medications in Virginia, the potential range based on national studies is not quite as varied as prevalence estimates. Several studies give a 3-5 percent range, but again the estimates are dependent on the age group studied. Two of the data sets are based on HMO populations, which are not necessarily reflective of the entire population. Medicaid populations are likely to have higher use rates, in some studies double that of other populations and uninsured children are likely to have less use (Chan et. al, 2002). Virginia may have 15,070 to 59,856 children on ADHD medications varying by age group if the trend statewide falls within national estimates (Table 7). Some of the published prevalence rates are older than five years and with increases in stimulant use over short periods of time, these numbers are likely to be higher for current use. These numbers should not be construed to be the estimated number but they represent the estimated range should the prevalence of ADHD medication treatment for Virginia children fall within national norms. In addition, there are unknown numbers of children with ADHD not taking medication and there are children taking medication without a documented ADHD diagnosis, which these numbers do not address.

Table 7: Possible Number of Children in Virginia Taking ADHD Medications Based on Published Estimates

Estimate	Year	Age Group	Population in Virginia (2000 Census)	Possible # in Virginia taking medications	Source of Estimate
2.8%	1995	5-18	1,373,549	38,459	Safer et al 1996
3-5%	1996	Elem age (6-10)	502,344	15,070 to 25,117	Gadow 1997
2.5%	1996	Under 20 in HMO	1,937,086	48,427*	Zito 2000
3.1%	1999	Under 20 in Health Plan	1,937,086	59,856*	Shatin and Drinkard 2002

*These are based on HMO populations. Other populations such as Medicaid (higher) and uninsured (lower) have different patterns of use. Given the trends in medication increases, current numbers are likely to be higher.

Demographics from recently published data by the Centers for Disease Control and Prevention (CDC) analyzing 1997-98 National Health Interview Survey (NHIS) data provide an additional benchmark for state to national comparison purposes (Pastor and Reuben, 2002). CDC calculated 1.6 million or 6.8 percent of children ages 6-11 whose parents reported that they had been told by a doctor or health professional that their child had Attention Deficit Disorder

(ADD). Of this group, 3.3 percent had ADD only and the other 3.5 percent had ADD and a reported learning disability (LD). ADD was significantly more prevalent among boys, 9-11 year olds, White non-Hispanic children and children with public or private health insurance. Boys were three times more likely to be diagnosed with 9.6 percent prevalence versus girls with 3.7 percent prevalence. Boys represented 72.6 percent of all children with ADD. Children with Medicaid represented 14 percent of the sample and this group had the highest prevalence rate of ADHD at 12.1 percent. Over three-quarters of children (77.1 percent) had private insurance and 6 percent of this group had an ADHD diagnosis.

Of those with ADD, 11.7 percent used special education services if they did not have a learning disability as well. For those with both ADD and LD, the use rate equaled 64.7 percent. One-third (33.9 percent) of the ADD-only patients had contact with a mental health professional in the past year. That proportion rose to slightly more than half (51.1 percent) for those with ADD only. NHIS asks if any medication has been used regularly for three months of the preceding year. Estimates were somewhat lower than the three-quarters often observed. Slightly over half (53.6 percent) of the ADD only group had medication use reported. That proportion rose to 61.4 percent for both ADD and LD. While these are slightly lower than other estimates for the percentage of ADHD children using medication, the definition of using medication regularly in the last three months may impact that finding.

Previously Published Virginia Data on ADHD Medication Treatment

There are some published data for Virginia for ADHD medication treatment. In 2001, the Virginia DOE surveyed public schools to ascertain ADHD medication use. With 129 school divisions reporting (a 95 percent response rate), DOE identified 1.5 percent of the school population taking ADHD medications at school, as discussed earlier. While this may seem low given national estimates, DOE did not have data on students taking medications outside of school nor did they have data on other populations such as privately schooled and home-schooled children. With the increased popularity of intermediate and long acting medications, the proportion of children taking ADHD medication who would not be captured in this type of survey is increased. If 50 percent of children take ADHD medication at home, then the total prevalence among public school students may be 3 percent. If 75 percent of children now take medications at home, then the total prevalence may be 6 percent among public school students.

Researchers at the Center for Pediatric Research (CPR) in the Tidewater area published prevalence rates of 8 and 10 percent of elementary school children taking ADHD medications in two Southeastern Virginia schools based on a survey of school nurses (LeFever, 1999). Prevalence rates of medication treatment in this study reached 17-18 percent among white males. In other research conducted among three Tidewater elementary schools in 1997 and 1998, 17 percent of children had an ADHD diagnosis and the majority (84 percent) were receiving medication treatment according to a parent survey administered by the researchers (LeFever, 2002).

The U.S. DEA publishes annual data from the Automated Reports Consolidated Orders System (ARCOS). While the DEA began annual reporting over 20 years ago, a distinct change in reporting occurred in 1997, making data prior to that year difficult to compare although the

trends remain unchanged. Virginia has been shown to be in the top ten states for per capita methylphenidate and amphetamine use for several years. In 2000, according to calculations by VDH using DEA data, Virginia's ranks have remained relatively unchanged as have most other states. Table 8 shows 2000 per capita rates with 1999 rankings in parentheses.

Virginia has shown a decline in its methylphenidate per capita rate. Between 1997 and 2000, the MPH per capita rate decreased 26 percent from 4,877 to 3,893 grams per 100,000 persons. Virginia's rate of decrease was larger than the U.S. rate of decrease (6 percent) during the same time period. The amphetamine per capita rate in Virginia rose 172 percent from 646 to 1,763 grams per 100,000 persons and the U.S rate rose 102 percent from 524 to 1,060 grams per person over this time period. The net effect for Virginia was a 2 percent increase in the combined stimulant per capita rate between 1997 and 2000 versus a 17 percent increase for the U.S. as a whole over the same time period. Virginia's per capita rate for combined stimulant use, however remained 30 percent higher overall than the nation according to DEA data.

DEA data do not take into account age distribution among states and the rates do not distinguish between adults and children taking medications. States with more adults being treated with for ADHD with stimulants would have higher rates. Over half of the states in the top ten ranks have relatively small populations, which may be subject to wider variances in rates. These data are based on tonnage and not individual persons receiving medications. Dosage per person and length of medication use are factors which may contribute to these rates and may explain some state differences.

Table 8: Methylphenidate and Amphetamine Use per 100,000 Persons, 2000

RANK (2000)	METHYLPHENIDATE		AMPHETAMINE	
	STATE	GRAMS PER 100K	STATE	GRAMS PER 100K
1	New Hampshire (1)	5,476	Delaware (1)	3,072
2	Vermont (2)	4,833	Rhode Island (2)	2,472
3	Michigan (3)	4,779	South Carolina (3)	2,272
4	Delaware (5)	4, 550	Wisconsin (4)	2,052
5	Iowa (4)	4,511	Missouri (6)	1,887
6	Massachusetts (6)	4,492	Alaska (5)	1,832
7	Rhode Island	4,235	Arkansas (7)	1,815
8	Ohio	3,923	Alabama	1,790
9	**Virginia (8)**	**3,893**	New Hampshire	1,785
10	Maine	3,767	**Virginia (10)**	**1,763**

(U. S. = 2,990 methylphenidate grams per 100,000 persons
1,345 amphetamine grams per 100,000 persons)
Data Source: US DEA ARCOS, 2000 calculations by VDH

Prescription Data in Virginia

Data on 398,149 unique persons under the age of 20 who received a prescription in Virginia in 2001 were assessed for use of a drug of interest (DOI) as previously noted in Table 5, page 24. Of these patients, 29,945 unique patients were identified as receiving a DOI and 26,058 received a stimulant DOI in 2001. Of all children getting a prescription filled, 7.5 percent were for a DOI and 6.5 percent were for a stimulant DOI. With the knowledge that 48.9 percent of children get at least one prescription filled annually, VDH estimates that 3 percent of children under age 20 received a stimulant DOI (See Appendix B for calculations). Three to four percent of children under age 20 in Virginia are estimated to have a prescription for any DOI. These figures appear to be consistent with national figures and the most recent figure for a Southeastern United Health affiliate plan, which demonstrated 3 percent of members under age 20 on stimulant medications.

Estimates assume that the other portion of the population for which data were not obtained match the sample studied. Numbers could change if market data showed an increase or decrease in the number of Virginia children filling at least one prescription per year. These data, while consistent with national estimates, do not describe the magnitude of increases that likely occurred in the 1990s. They do, however, provide a baseline to initiate trend surveillance.

Based on age distributions of all prescription patients in the Verispan database (36.2 percent under age 6, 23.3 percent ages 6-10 and 40.6 percent ages 11-19) rough estimates were calculated for age groups. In Virginia, VDH estimates that less than one percent of children under age 6, 5 to 6 percent of children ages 6-10 and 4 to 5 percent of children ages 11-19 are taking medications used to frequently treat ADHD.

A total of 1,748,914 prescriptions were examined and 136,992 were for a DOI, which equaled 4.6 prescriptions per patient. The DOI represented 7.3 percent of all prescriptions, essentially the same as the proportion of unique patients.

Stimulants were the most common medication treatment for ADHD and 22,808 children received a stimulant for the treatment of ADHD (Table 9). This was followed by stimulant and another type of medication (either clonidine or an antidepressant DOI).

Table 9: Type and Combination of Medication Treatment Identified in Virginia, 2001

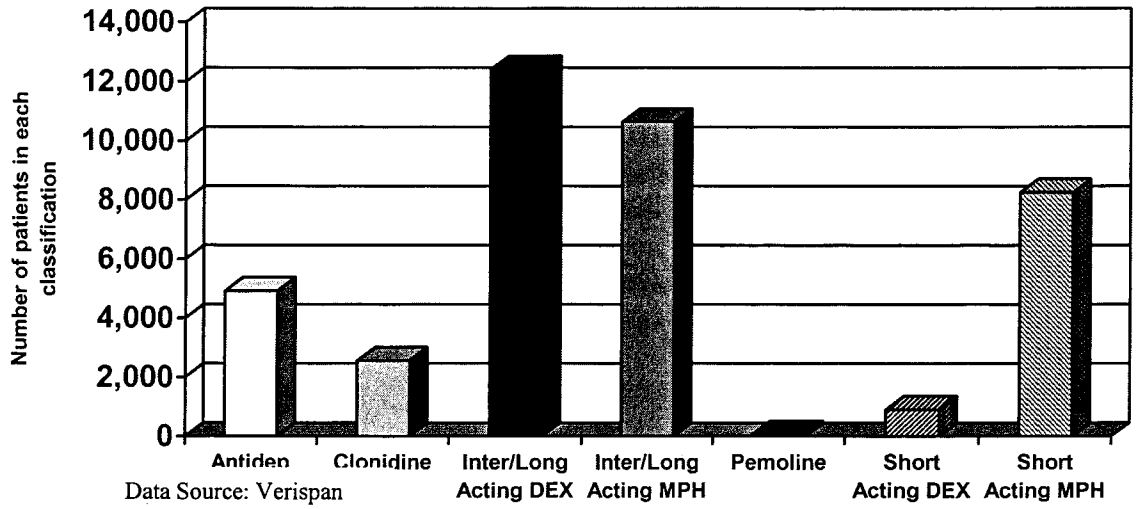
Type	Number of Patients	Percent
Stimulant Only	22,808	76.2%
Stimulant + Other	3,250	10.9%
Clonidine Only	659	2.2%
Antidepressant + Clonidine	98	0.3%
Antidepressant Only	3130	10.5%
	29,945	

Data Source: Verispan

Intermediate and long acting agents were found as the most popular prescriptions (Chart 1). Patients in these counts may be across more than one category if they received two types of medications. Intermediate and long acting amphetamines (DEX) were the most commonly found

prescriptions with 12,406 unique patients, representing over one-third of ADHD medication patients. This is consistent with national trends showing Adderall to now be the most common medication prescribed for ADHD. Among patients taking any stimulant, 47.6% had at least one prescription for an intermediate or long acting amphetamine and 40.8% had at least one prescription for an intermediate or long acting methylphenidate. Less than a half of a percent of patients had received pemoline, a drug once, but not currently, recommended.

Chart 1: Medication Type Taken for ADHD



Data Source: Verispan

Nearly nine out of ten (87 percent) of DOI patients had stimulant treatment. Among stimulant patients, 87.5 percent took a stimulant medication alone. The other stimulant patients were also taking clonidine (6 percent), antidepressants (5.6 percent), or all three medications (0.9 percent). Of all unique prescription patients, 16.4 percent were taking any antidepressant. Antidepressant users were more likely to be taking a combination of drug therapies (36.4 percent) and 29.6 percent were taking both a stimulant and an antidepressant.

The percentage of male prescription patients taking a DOI (10.6 percent) was double that found among females (4.5 percent). As expected, the majority (69.5 percent) of the DOIs were prescribed to males (Table 10, next page). This was found across all drug classes except for antidepressants where females comprised 43.4 percent of those patients. Females were most prevalent in the youngest and oldest age categories. Among 11-19 year olds taking an antidepressant DOI, nearly half (47.1 percent) were female.

The age groups of DOI users were similar to patterns found in the health plans. Less than five percent (4.8 percent) of patients receiving a DOI were under age 6, 39.6 percent were ages 6-10 and 55.6 percent were 11-19 years old. These data are consistent with other patterns and probably reflect the growing percentage of ADHD patients who are remaining on medication into adolescence. The proportion of females in each age group increased with each age group and the highest proportion of females (32.6 percent) was found in the 11-19 year old group. Females were less likely to be on stimulants only (70.5 percent) versus males (76.1 percent). These data suggest that females may be getting diagnosed later in childhood than males, and that perhaps they are more likely to be treated for more than one condition.

Among age groups, 6-10 year olds were most likely to be getting a prescription filled for a DOI when compared to other age groups. One percent of all prescription patients under age 6 were receiving a DOI medication. That proportion rose to 12.8 percent of 6-10 year olds and fell slightly to 10.3 percent for 11-19 year olds (Table 10).

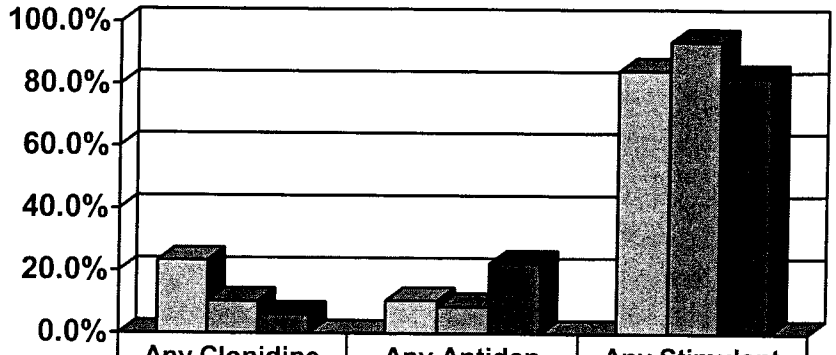
Younger patients were most likely to have non-stimulant medication and/or multiple medications. Only 68.3 percent of DOI patients under age 6 had a stimulant only medication, while 82.2 percent of 6-10 year olds were taking stimulant only medication. In addition,16.6 percent of patients under age 6 had multiple medications versus 9.0 percent in the 6-10 year old group. The youngest age group was the most likely to have any clonidine (23.3 percent). Adolescents were most likely to have any antidepressant (22.5 percent) (Chart 2). These data suggest that the younger patients may have more severe presenting symptoms and/or co-morbidities. This is also the age group where the least research and guidance are available for medication management. This trend of multiple medications being prescribed for younger cohorts has been documented in other research.

Table 10: Age and Gender of Prescription Patients

All Prescription Patients	Ages 0-5	Ages 6-10	Ages 11-19
Male	74,335	48,477	73,856
Female	69,667	44,180	87,634
Total	144,002	92,657	161,490
Drug of Interest Prescription Patients			
Male	1,019	8,600	5,439
Female	409	3,271	11,207
Total	1,428	11,871	16,646
Percent of Patients with Drug of Interest			
Male	1.4 %	17.7 %	6.2 %
Female	0.6 %	7.4 %	15.2 %
Total	1.0 %	12.8 %	10.3 %

Data Source: Verispan

Chart 2: Percentage of DOI Patients by Type of Medication



	Any Clonidine	Any Antidep	Any Stimulant
Under 6	23.3%	10.5%	84.5%
6 - 10	10.3%	8.6%	93.8%
11 - 19	6.0%	22.5%	82.4%

Data Source: Verispan (Note: Percentages add up to over 100 since patients may be in more than one category)

Regional differences did emerge in the prescription data. Across all age and gender groups, HPR 5, the Tidewater area, demonstrated the highest percentages of prescription patients receiving a DOI. Among all patients, HPR 5 experienced 9.4 percent of prescription patients having a DOI prescription (Table 11). The lowest proportion was found in HPR 2, the Northern Virginia area, at 6.1 percent. In 6-10 year olds higher proportions were found at 12.9 percent statewide with a range between 8.5 to 17.2 percent among HPRs (Map 1, next page). Proportions of DOI patients were highest among 6-10 year old males. Statewide 17.7 percent of patients receiving a prescription captured in the Verispan dataset had a prescription for a DOI. Regional differences demonstrated a wide range from a low of 11.9 percent in HPR 2 to a high of 23.2 percent in HPR 5 among males ages 6-10. The Tidewater HPR accounted for the second highest percent of all prescription patients in the database (23.2 percent), yet this area had the highest proportion of all DOI patients (29.3 percent). These data would appear to support previous research suggesting higher prescribing patterns for ADHD medications in this area. However, since the Verispan database is based on prescriptions, not population, prescribing patterns of other medications, such as those for asthma, could impact these results.

Table 11: Percent of Prescription Patients Receiving an ADHD Drug of Interest by Health Planning Region, Age and Gender

Total Number of Patients by HPR	Percent of Prescription Patients Receiving a DOI									
	Ages 0-5			Ages 6-10			Ages 11-19			All ages
HPR:	Total	Male	Female	Total	Male	Female	Total	Male	Female	
1 (n =79,161)	0.9%	1.3%	0.5%	12.0%	16.9%	6.7%	8.6%	13.0%	5.0%	6.7%
2 (n =118,556)	0.5%	0.7%	0.3%	8.5%	11.9%	4.8%	10.7%	14.9%	7.0%	6.1%
3 (n =69,566)	1.1%	1.5%	0.7%	13.4%	19.0%	7.3%	8.4%	12.5%	5.1%	7.1%
4 (n =63,929)	1.4%	1.8%	0.8%	14.8%	20.3%	8.6%	9.9%	15.8%	5.4%	7.9%
5 (n =100,624)	1.4%	1.9%	0.8%	17.2%	23.2%	10.4%	12.1%	18.5%	6.9%	9.4%
State of Virginia	1.0%	1.4%	0.6%	12.8%	17.7%	7.4%	10.3%	15.2%	6.2%	7.5%

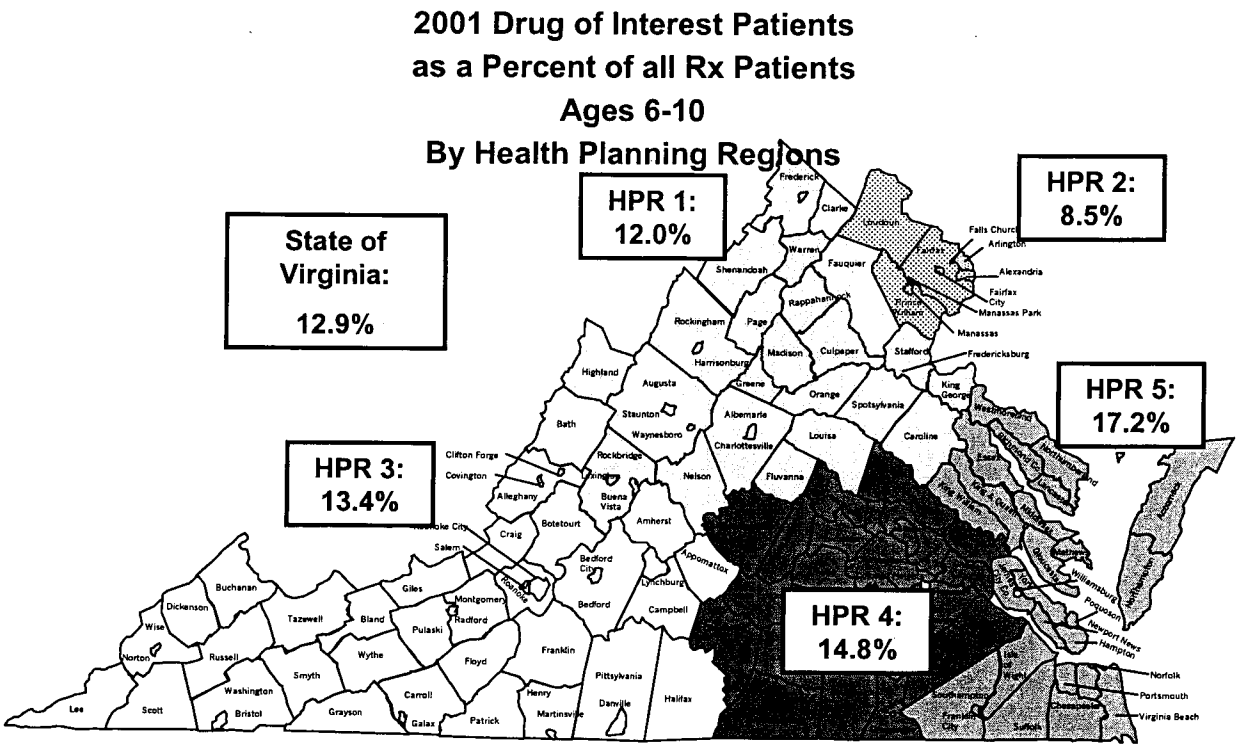
Data Source: Verispan (Note: HPR 1 = Northern, HPR 2 = Northwestern, HPR 3 = Southwestern, HPR 4 = Central, and HPR 5 = Eastern or Tidewater areas of Virginia)

HPR 2 tended to have the greatest variance from the other areas in age distribution of DOI patients. In Northern Virginia, 31.8 percent of DOI patients were ages 6-10. In the other four HPRs, higher proportions of DOI patients, between 40.1 to 44.1 percent, were ages 6-10. Conversely, HPR 2 had the highest percentage of adolescent DOI patients.

Other prescribing pattern variances were observed as well. DOI patients in HPR 3 had the highest percentage of any antidepressant use (20 percent) while HPR 4 , the Central Virginia area, had the highest percentage of DOI patient clonidine use (11.9 percent) and the lowest DOI patient antidepressant use (13.8 percent). DOI patients in HPR 5 were most likely to have any stimulant use (90.7 percent). DOI patients in HPR 5 were most likely to get two or more types of medication (14.2 percent) while HPR 2 patients were least likely (9 percent). Based on data showing that 48.9 percent of children receive at least one prescription per year, regional variance

may suggest that as low as three percent (HPR 2) to as high as five percent (HPR 5) of children under age 20 may be taking a DOI with the above referenced variances observed.

Map 1: Drug of Interest Patients by Health Planning Region, 2001



Data Source: Verispan

In examining data for patients with both a known diagnosis for ADHD and a prescription filled for an ADHD DOI in the prescription data set (n = 2,301), demographics largely remained the same. The majority of these patients (93.6 percent) had a prescription filled for a DOI. The others may have gotten an ADHD medication not selected for the DOI, an ADHD medication at a pharmacy not in the Verispan dataset, or they may be untreated for ADHD. These patients showed similar patterns although some of the demographics suggest the first data set (prescriptions) may contain some females who may be receiving treatment for depression. The percent of known ADHD patients taking an antidepressant was 9.3 percent compared to 16.4 percent in the prescription only data set. In addition, the proportion of females was slightly lower in all age groups and there were no gender differences between stimulant and antidepressant patients as seen in the entire prescription set.

This finding would not change estimates other than to lower the percentage of DOI used to treat ADHD. The data do illuminate the difficulties in conducting surveillance as the number of medications increase. With frequent co-morbidities and multiple medications it can be challenging to distinguish which medications are being prescribed for ADHD versus other co-morbidities, which are frequently found in children with ADHD.

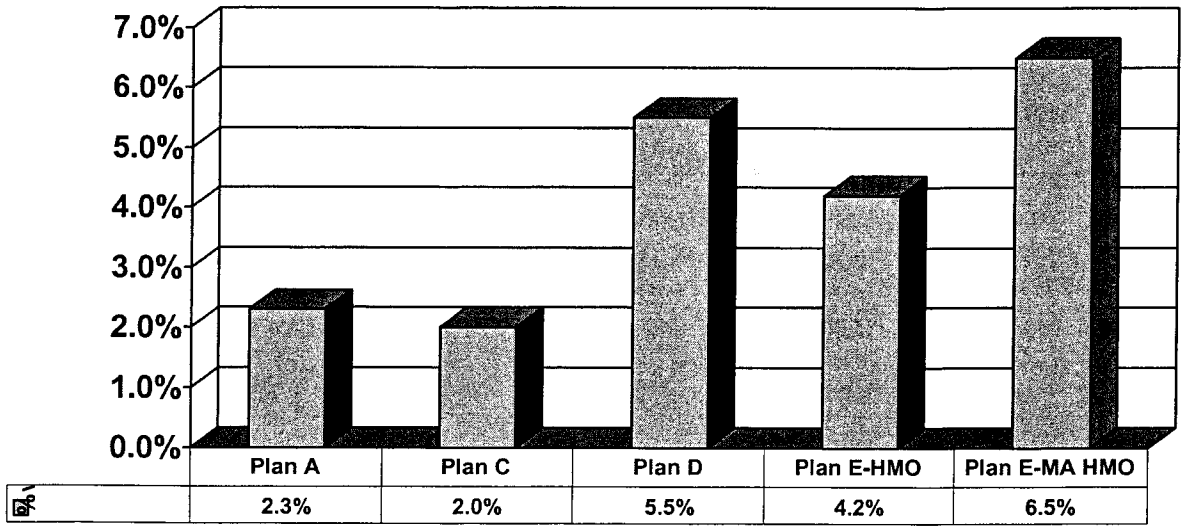
The prescription data from Verispan show Virginia to exhibit prevalence rates consistent with other areas of the country. Trends among younger age groups, such as use of multiple medications, are similar to those in other study populations. Age and gender distributions are also similar to other published studies. Males ages 6-10 have the highest percentage of DOI prescriptions. Regional variances do exist within the state, with HPR 5 having the highest proportions.

Virginia Association of Health Plans

Five members of the Virginia Association of Health Plans responded voluntarily to an inquiry to provide data for this study. Data were obtained for five Commercial Health Maintenance Organizations (HMOs), one Medicaid (MA) HMO and one Preferred Provider Organization (PPO). From this data, 23,994 children were identified with an ADHD diagnosis. This figure does not include estimates for uninsured children or for other insured children for which data were not available. The total number of children in all plans was not available from all participants and estimates of the proportion of children in Virginia these data represent were not made.

Prevalence of ADHD among child members in HMOs ranged from 2.0 percent to 6.5 percent (Chart 3). Older children (11-19 year olds) were most likely to have an ADHD diagnosis while the youngest group studied (under age 6) were least likely to have the diagnosis. In one plan less than one percent (0.5 percent) of children under six had an ADHD diagnosis. Among 6-10 year olds, the proportion of children with ADHD varied by plan from 6.1 percent to 7.2 percent. This is consistent with the CDC NHIS findings of 6.8 percent among 6-11 year olds.

Chart 3: Percent of Children in Health Plans Diagnosed with ADHD



Data Source: Virginia Association of Health Plans

The number of children identified as receiving a medication for ADHD totaled 24,894. This number exceeds the number diagnosed for some plans, which may be from duplicates,

difficulties in separating out children taking more than one medication, and challenges with matching separate medication and outpatient databases. Plans ranged from 1 percent to 7.9 percent of children on ADHD medication. Among children with a known ADHD diagnosis, medication treatment rates ranged between 59.9 percent to 77.6 percent. The percentage of children being medicated for ADHD rose by age group in one plan that reviewed over two years of data on over 35,000 child members. Among those under age 6, less than half (44.7 percent) were medicated. In the 6-10 year old group, 68.3 received medication and that figure rose to 82.1 percent among 11-19 year olds for that plan.

Age distributions for both children with ADHD and children taking ADHD medication ranged within plans and those under age 6 accounted for the smallest proportions of ADHD diagnosed or treated populations. The Medicaid HMO demonstrated the highest proportions of children under age 6 with diagnosis (8.3 percent) and treatment (7.3 percent) (Table 12).

Distribution of the type of stimulant was nearly evenly split between amphetamines (49.7 percent) and methylphenidates (50.2 percent). This likely reflects changing patterns seen nationally with an increase in amphetamine use and a decrease in methylphenidate use. Within several plans, Adderall was the most frequently mentioned name brand. At least one prescription for an intermediate or long acting agent was found for members taking amphetamines (80.2 percent) and methylphenidates (89.8 percent) in one plan that reported the series of medications per unique patient. Patients had an average of 1.4 medications over the year in that plan.

Table 12: Age Distribution of Insured Children Taking ADHD Medication

Health Plan	0-5	%	6-10	%	11-19	%
Plan A	2	1.7%	41	34.7%	75	63.6%
Plan B	3	0.8%	105	28.3%	263	70.9%
Plan C	0		10	35.7%	18	64.3%
Plan D	17	1.1%	369	24.2%	1140	74.7%
Plan E-PPO*	504	2.6%	7,489	39.3%	11,074	58.1%
Plan E-HMO*	223	3.3%	2,966	44.0%	3,551	52.7%
Plan E-MA HMO*	354	7.3%	2,393	49.6%	2,073	43.0%

* = up through age 18
Data Sources: Virginia Association of Health Plans and Virginia Department of Medical Assistance Services

For three plans reporting on co-morbidities, the largest plan found 26.2 percent of ADHD patients also had another co-morbidity. Two other plans had smaller percentages at 16.4 percent and 5.6 percent. This demonstrates the variability observed when examining claims data and attempting to determine co-morbidities with ADHD.

Additional data were provided through an analysis done on all child members with mental diseases and disorders, Major Diagnostic Category (MDC) 19 for one plan having both a commercial and Medicaid HMO product. Data showed that children diagnosed with any mental disease or disorder had an average of 5.7 to 6.0 visits per member. In addition, within the

Medicaid HMO, 41.7 percent of all outpatient claims for MDC 19 were related to ADHD. In another commercial HMO, 25.7 percent of MDC 19 visits were ADHD related. In one HMO, an equivalent of 513,415 drug days were prescribed to treat ADHD, which represented 63.9 percent of drug days prescribed. Other data on inpatient admissions for mental diseases and disorders showed the rate among Medicaid HMO patients to be twice that of other Commercial HMO patients. Percentages of hospitalizations due to ADHD were relatively low (4 and 8 percent, respectively).

Medicaid Fee for Service

The number of unduplicated Medicaid FFS patients with an outpatient diagnosis of ADHD ranged from 13,681 in FY 99 to 12,365 in FY 02 according to data provided by DMAS. In FY 02, the mean age was 11.3 years for those diagnosed with ADHD. Three quarters (76.9 percent) of those diagnosed with ADHD had predominantly hyperactive /impulsive type and 19.3 percent had predominantly inattentive. Boys accounted for 73.9 percent of all diagnoses. One quarter (25.4 percent) of female diagnoses for ADHD were for predominantly inattentive type versus 18.2 percent among males. Medicaid FFS ADHD patients were 62.7 percent white, 35.1 percent black and 1.5 percent hispanic. The largest number (n = 5,482) representing 44.3 percent of all Medicaid fee for service patients with ADHD were in Health Planning Region 3 (HPR) which covers Southwest Virginia, the largest area of the state lacking managed care. The second highest number (n = 2,449) or 19.8 percent of Medicaid FFS patients was found in HPR 5, the Tidewater region.

A complete prevalence rate for the Medicaid FFS population could not be calculated due to complexities in FFS claims populations, including cross over from managed care populations receiving CSB services under the Community Mental Health Rehabilitation Services carve out. The ADHD prevalence rate for the FFS population using FY 00 data and April 2000 Medicaid child populations, excluding 46 communities having managed care at that time, was 7.4 percent.

Other High Risk Populations: Children's Inpatient Hospitalizations

Using Virginia Health Information (VHI) inpatient data, hospitalizations related to ADHD were examined for 2001. In 2001, 7,815 hospitalizations occurred in Virginia to resident children ages 19 and under for all mental diseases and disorders, Major Diagnostic Category (MDC) 19. These hospitalizations are the second highest MDC (15.2 percent of all hospitalizations to children) behind pregnancy and childbirth (19.6 percent of all hospitalizations to children).

A total of 266 admissions were for primary ADHD and 98 percent (n = 260) of these were to Virginia residents ages 1-19. In addition, 2,770 admissions had ADHD as a secondary diagnosis and 78 percent (n= 2,158) of these were to Virginia residents ages 1-19. Out of state residents and adults were excluded from the analysis.

Demographics observed in primary admissions due to ADHD resembled patterns reported in other studies. Eight out of ten admissions were to males and six out of ten were to white children. Less than five percent (3.5 percent) were to children under six, 54.2 percent were to children 6-10 years of age and 42.3 percent were to 11-19 year olds. The mean age at admission

was 10.5 years. Length of stays ranged from 0-173 days with an average of 8.0 days. The total charges for these hospitalizations were $2,128,817 with an average cost of $ 8,188 per admission. Eighty percent of these hospitalizations were urgent, 15 percent were emergency and 5 percent were elective. While the majority of referrals were from a physician, 8.8 percent were from court/law enforcement. Three out of ten (31.5 percent) of admissions for primary ADHD were covered under Medicaid and slightly over half (51.9 percent) were covered under commercial health insurance.

Most of the primary ADHD admissions (96 percent) were for predominantly hyperactive/ impulsive type. The majority (84.0 percent) of ADHD admissions had a secondary diagnosis. Over one third (35.2 percent) had a diagnosis of a childhood emotional disturbance (such as oppositional defiant disorder) and 22.0 percent had an affective psychoses, such as major depression and bi-polar disorder.

The state rate for primary ADHD admissions translated to 14.1 admissions per 100,000 children ages 1-19. Primary ADHD admission rates varied greatly by region ranging from 3.4 per 100,000 children ages 1-19 in HPR 2 (Northern Virginia) to 38.6 in HPR 4 (Central Virginia) . The wide range may be influenced by relatively small numbers and possible interstate hospitalizations for which data are not available. The hospitalization rate for Virginia was slightly lower than rates for the South (16.5 per 100,000) and the US (19.7 per 100,000) for 2000. Newborns were excluded from rate calculation by VDH.

Demographics for secondary admissions followed the same patterns, yet reflected an increased proportion of females (29.7 percent) and adolescents (66.0 percent). The mean age was 12.1 years for children ages 1-19 admitted with a secondary diagnoses of ADHD. The average length of stay was longer at 12.0 days with a total of 25,822 days. The average charge was $ 9,777 for these admissions with total costs equaling $21,098,284. Insurance patterns were similar to primary cases with 31 percent admitted under Medicaid. One quarter of these cases were emergency referrals.

Three quarters of admissions containing an ADHD diagnosis occurred under a MDC 19 category. Another 3.8 percent of admissions with ADHD (secondary diagnosis) were for a primary diagnosis under diseases and disorders of the nervous system and 3.7 percent of admissions were under diseases and disorders of the digestive system. Less than two percent were admitted under other MDCs.

Nearly one quarter of all patients (23.9 percent) admitted for a mental disease or disorder had either a primary (3.3 percent) or secondary (20.6 percent) diagnosis of ADHD (Table 13). These data are similar to those observed among U.S. hospital admissions under MDC 19 (5.8 percent primary and 19.5 percent secondary) for 2000.

Higher rates of ADHD were also observed for Alcohol/Drug Use and Alcohol/Drug induced organic mental disorders (11.7 percent) admissions. The prevalence rate among admissions for injuries, poisonings and toxic effects of drugs was 5.9 percent. ADHD rates among all other admissions fell within frequently cited national overall prevalence ranges.

Table 13: Prevalence of ADHD by Major Diagnostic Category

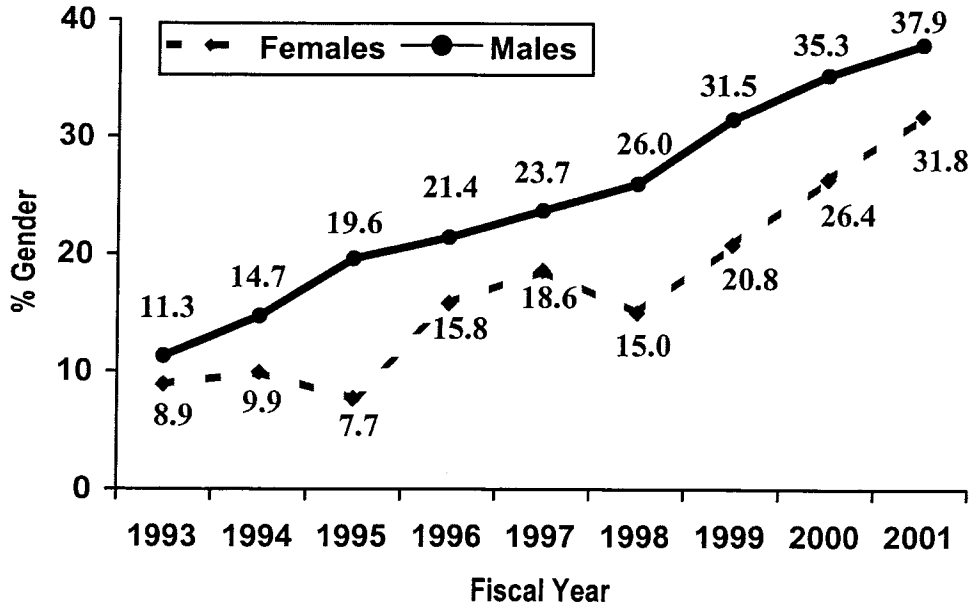
Selected Major Diagnostic Categories	Number	% in MDC w/ ADHD
Mental Diseases and Disorders	1871 (260 primary) (1,611 secondary)	23.9% (3.3%) (20.6%)
Alcohol/Drug Use and Alcohol/Drug Induced Organic Mental Disorders	27	11.7 %
Injuries, Poisonings and Toxic Effects of Drugs	76	5.9 %
Burns	8	4.9 %
Diseases of the Nervous System	82	3.0 %
Total in All Major Diagnostic Categories	2,418	4.7%

Data Source: Virginia Hospital Information, inpatient hospitalization database for Virginia hospitals calculated by VDH. Includes primary and secondary ADHD diagnoses for Virginia residents ages 1-19.

Virginia Department of Juvenile Justice Admissions

The Virginia Department of Juvenile Justice (DJJ) furnished previously aggregated data on patient admissions to Bon Air Reception and Diagnostic Center for the time period July 1992 and June 2001. During that time there were 13,469 admissions to 10,816 individual youth. This high-risk population demonstrated much higher prevalence rates of stimulant medication use and meeting DSM III criteria for ADHD diagnoses. History of stimulant medication use tripled in both males and females over the time period studied. History of male stimulant medication use rose from 11.3 percent in 1993 to 37.9 percent in 2001. Female stimulant medication use history also tripled from 8.9 percent to 31.8 percent (Chart 4). Similar patterns were observed in history of antidepressant use with over half of females (54.5 percent) demonstrating a history of use by 2001 up from 12.0 percent in 1993. Males showed increases, not quite as steep as those seen with females, from 9.3 percent history of use in 1993 to 29.2 percent over the same time period.

Chart 4: History of Stimulant Medication Use



Data Source: Virginia Department of Juvenile Justice

History of any psychotropic medication use doubled among both males and females. In FY 01, 64.5 percent of females and 50.9 percent of males had a history of taking any psychotropic medication. Three out of ten (29.4 percent) of clients also had a history of prior psychiatric hospitalization.

Roughly one out of four youth met DSM IV criteria for ADHD based upon admitting evaluations with 25.6 percent meeting criteria among females and 23.9 percent meeting criteria among males. A large proportion of those admitted also met DSM-IV criteria for conduct disorder (66.8 percent of males, 50.5 percent of females) and oppositional defiant disorder (24.2 percent of females and 34.9 percent of males). ADHD and these conditions frequently occur together. Prevalence rates for these populations are quite similar to the rate found among children hospitalized for mental diseases and disorders.

At Risk Populations: Virginia Department of Health Child Development Clinic Patients

VDH operates 11 Child Development Clinics (CDCs) around the state, which provide diagnostic assessment and care planning, follow up care coordination and referral for children and adolescents suspected of having developmental or behavioral disorders. Evaluation for ADHD has been one of the most common reasons for referral to a CDC. ADHD was the most frequent diagnosis at CDCs for every year examined from FY 97 to FY 02 (Table 14). The numbers of children evaluated and diagnosed for ADHD has dropped. Between FY 97 and FY 02 referrals for ADHD evaluations fell from 1,427 to 509. A significant part of this decrease can be attributed to Kluge Children's Rehabilitation Center in Charlottesville leaving the CDC network during this time.

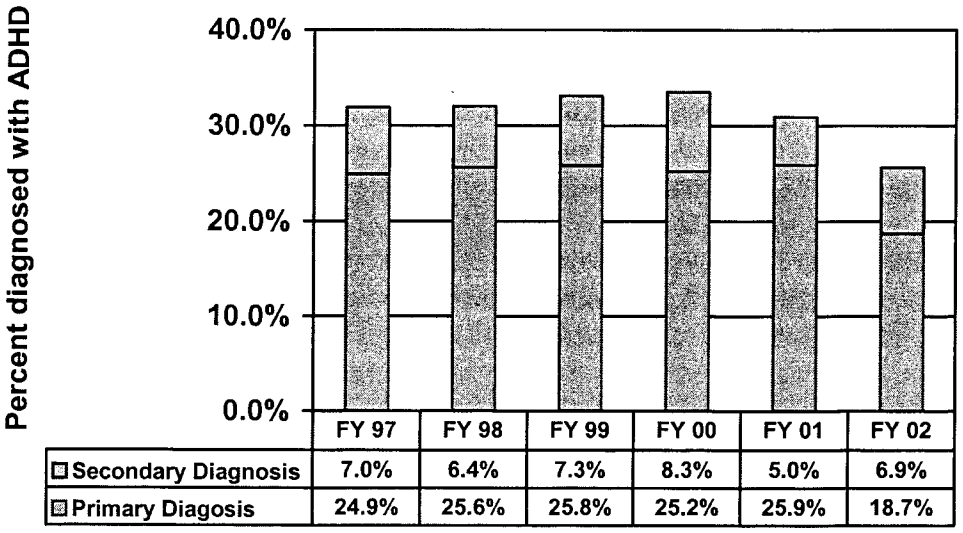
Table 14: Number of ADHD Diagnoses at Child Development Clinics

	FY 97	FY 98	FY 99	FY 00	FY 01	FY 02
Primary Diagnosis	542	622	629	467	420	300
Secondary Diagnosis	136	121	150	138	70	80
Other Diagnosis	39	40	30	31	9	25
Total Diagnosis	717	783	809	636	499	405

Data Source: Virginia Department of Health

The prevalence of ADHD in CDC patients has remained steady despite the fluctuations in the number of referrals and evaluations. Roughly a quarter of CDC patients each year have a primary diagnosis of ADHD. In FY 02 that percentage dropped for the first time to 18.7 percent. In addition, another 5 to 8 percent have a secondary diagnosis of ADHD (Chart 5).

Chart 5: Prevalence of ADHD at VDH Child Development Clinics



Data Source: Virginia Department of Health

Patients served at CDCs are largely Medicaid (56.1 percent) or full pay (33.7 percent). With the large Medicaid population, the prevalence patterns appear to be consistent with other high-risk patients that are referred or enter into some part of the state system for behavioral, emotional, and/or social problems (Table 15). The CDC patients, however, represent the smallest data set reviewed and represent only a small fraction of children in the Commonwealth referred and evaluated by providers for ADHD.

Table 15: Comparison of High-Risk Groups and Prevalence of ADHD

	Child hospitalization admissions for mental diseases and disorders 2001	Department of Juvenile Justice Admissions 1993-2001	Department of Health Child Development Clinic Patients FY 02
Percent of children with ADHD	23.7%	25.6 % Females 23.9 % Males	25.6 %

Data Sources: DMAS, VDH, VHI inpatient hospitalization database, DJJ

CONCLUSIONS

HJ 660 initiated an examination of the prevalence of ADHD in the Commonwealth and patterns of medication stimulant treatment among children. In 2001, DOE conducted a statewide survey to determine the use of medication for ADHD in public schools, which found 1.5 percent of public school children taking ADHD medication in school. Originating from a recommendation in HJ 660, HJ 122 was agreed to in the 2002 General Assembly and VDH continued work to

examine the prevalence of methylphenidate and amphetamine prescriptions in the Commonwealth.

A complex issue challenging researchers nationwide, establishing the prevalence of ADHD is an involved task requiring observations in multiple settings and the presence not only of symptoms but also functional impairment prior to age seven. The issue is further complicated by the absence of definitive physiological testing. A few extensive and strong studies have utilized retrospective interviews and assessments, sometimes with conflicting results. Evidence has been found for both the under diagnosis and over treatment of ADHD.

As more medical information becomes available through electronic data collection and transmission, progress has been made to capture prevalence of methylphenidate and amphetamine prescriptions most commonly used to treat ADHD. Data from nearly every source available reflect increases in prescription medication in all populations, in children, in multiple Central Nervous System (CNS) drug classes for children, and in stimulant medication use for children. One team of researchers studying three-quarters of a million children found that in four years that CNS-Stimulant drug use had risen 26 percent. Current data from one Southeastern insurance group shows 3.1 percent of children under 20 using stimulant medications.

Other researchers at the Centers for Disease Control and Prevention analyzed data from the National Health Interview Survey and found that the prevalence of ADHD is nearly 7 percent in children ages 6-11, the age group most frequently diagnosed with this condition. In addition, half of those with ADD also had a diagnosed learning disability.

Using available resources, VDH investigated several existing data sets to further assess Virginia prevalence of ADHD medication treatment and how the Commonwealth may compare to national trends.

Longitudinal data for Virginia are not widely available except from the DEA ARCOS reports. These data show a decrease in per capita methylphenidate use and an increase in amphetamine use. According to these data, Virginia continues to be in the top ten states for per capita use. These data, however do not adjust for age. Several states with high per capita rates have small populations which are more subject to rate variations. It may also be possible that Virginia does not have higher numbers of people taking medication but rather those on medication may be taking higher dosages and/or for longer periods of time which could affect per capita rates. Virginia may also have a higher proportion of adults on these medications. Further prescription data examined by VDH from Verispan did not suggest higher than average stimulant use by children under age 20 in Virginia, although there were variations by region, age and gender.

With volunteer assistance from five Virginia Association of Health Plan members, VDH received and reviewed data on ADHD diagnosis and treatment in child members.
Over 24,000 children were identified with ADHD. Prevalence rates of ADHD ranged from 2.3 percent to 5.5 percent in non-Medicaid Virginia populations—which falls within the range of frequently given national prevalence estimates. Medicaid populations had higher rates for ADHD diagnoses and treatment. In one Medicaid HMO, 6.5 percent had an ADHD diagnosis.

DMAS data identified over 12,000 fee for service Medicaid patients with ADHD. Prevalence in this group was difficult to completely assess due to complexities with behavioral health carve out populations. In addition, several types of Medicaid recipients, such as those in foster care, under the community-based waiver and residents of mental health facilities cannot be placed in managed care. These populations are more likely to have diagnoses related to mental diseases and disorders. For Medicaid children living in communities without managed care as of April 2000 (n =89), an ADHD prevalence rate of 7.4 percent was found.

Medicaid populations in both the HMO population and fee for service population did show higher rates than other insured groups. Further data showed that thirty percent of children hospitalized in Virginia with ADHD, primary or secondary diagnosis, were under Medicaid coverage while the proportion of all children in Virginia with Medicaid is roughly half of that. Higher prevalence rates among Medicaid populations have been found nationally as well, which underscores the need for access to care, early diagnosis and adequate treatment.

Prevalence of ADHD and medication treatment for ADHD are two different measures. While some overlap exists, not all patients with ADHD receive medication treatment and some taking medication may not meet the full criteria for ADHD.

The range of treatment rates were broader than prevalence rates. Health plans identified nearly 25,000 children taking medication treatment for ADHD and these represent only data from those plans. Statewide conclusions cannot be drawn from these numbers. In one of the larger plans reporting, data on over 35,000 records were reviewed for a two and a half year period, which yielded a 4.3 percent ADHD medication treatment rate for all child members. While higher than the one Southeastern insurance plan figure available, these data still appear to fall within a close range and may be impacted by the longer time period selected for review. In addition, within this plan, 77.6 percent of patients with an ADHD diagnosis were treated with medication—another finding consistent with the literature.

Prescription data on 398,149 unique patients receiving a prescription in Virginia revealed 6.5 percent taking a stimulant medication and 7.5 percent taking any type of medication frequently used to treat ADHD. Based on research indicating that 48.9 percent of children get a prescription filled per year, VDH estimates that 3 percent of children under age 20 in the Commonwealth are taking stimulant medication and between 3 to 4 percent under age 20 are taking any medication used to treat ADHD. These estimates could change if more or less children are receiving at least one medication per year. For example, if only 40 percent of children had received a medication over the year, the Verispan data would then translate to three percent, yet if 60 percent of children received at least one medication, then the percentage might rise to five percent.

Based on age distributions of all prescription patients in the Verispan database, rough estimates were calculated for age groups. In Virginia, VDH estimates that less than one percent of children under age 6, 5 to 6 percent of children ages 6-10 and 4 to 5 percent of children ages 11-19 are taking medications used to frequently treat ADHD. These findings would be consistent with the DOE survey if 75 percent of children now take medication for ADHD at home.

The proportion of children taking ADHD medication was highest among males 6-10 years old. In this group, 17 percent of medication patients were receiving a medication often used to treat ADHD. These data are consistent with national trends showing higher use in this age group. More data and continued monitoring may help determine prevalence rates for groups such as these that are more likely to use ADHD medications. Certain groups such as males ages 6-10 may be found with higher than expected prevalence treatment rates.

Prescription data from Verispan showed that younger children were more likely to receive multiple medications and to use clonidine more frequently. This may indicate a population presenting with severe symptoms not responding to first line treatment. Concerns over use in preschool populations have been noted as there are few guidelines and long-term effects have not been established. Concerns have been noted about the lack of information about medication effects on brain development. Use of medication in preschoolers presents an area which may need closer monitoring. Dissemination of clinical research findings to professionals working with this age group would be helpful (as they become available from large scale studies such as the PATS study currently underway). One Virginia health plan has undertaken a systematic medical review of these patients and made contact with providers to investigate use in this age group. This may represent a potential model for other providers.

Older age groups were more likely to be taking antidepressants. The prescription data sample may have contained some patients being treated for other conditions with antidepressants although the percentage would not be large enough to change conclusions. The evidence of combination drug use and an increasing number of available drugs highlighted the difficulties in establishing ADHD treatment versus medication treatment for co-morbidities. This issue is likely to continue to grow in complexity and will affect further research efforts.

Demographics of children in the Commonwealth taking medication did not appear to differ greatly from national norms. The majority of patients taking medications for ADHD were male. The prescription dataset supported national trends of more females being diagnosed with ADHD, as the older age groups contained increasingly higher proportions of females.

Data from the health plans and the Verispan prescription data set demonstrated widespread use of intermediate and long acting medications. The majority of children on stimulant medication, up to 90 percent in one plan, have had at least one intermediate or long acting medication. As the use of these medications increases, which is projected to occur, the percentage of students taking these medications at school will drop. This finding will continue to impact data gathering efforts conducted through schools. If 50 to 75 percent of children take ADHD medication at home, then perhaps 3 to 6 percent of school age children are taking these medications based on 2001 DOE survey data. This is largely consistent with VDH's estimates as well.

Although statewide data appeared to fall within most norms, regional differences were apparent in the Verispan pharmaceutical data. These data showed higher proportions of all prescribed children in the Tidewater area, regardless of age or gender, to be receiving ADHD medications. Among males ages 6-10 year of age, nearly one out of four prescription patients had received an ADHD drug studied. These data cannot directly compare to prevalence rates published by researchers at the Center for Pediatric Research showing up to 17 percent of children in three

elementary schools with an ADHD diagnosis. The data do support assertions that medication rates are higher in that area. The data examined by VDH do not and cannot answer concerns of whether children are being over diagnosed and/or over treated.

Examination of selected higher risk populations did reveal much higher rates of ADHD prevalence; these populations include children receiving Medicaid, children hospitalized for mental diseases and disorders, children referred for evaluations for behavioral problems and children in the juvenile justice system. Rates ranged from approximately 10 to 25 percent. These data are not inconsistent with published research showing that approximately one quarter of youths active in one or more of five social service sectors (substance abuse, child welfare, juvenile justice, mental health or public school care for emotional disturbances) met diagnostic criteria for ADHD (Garland et. al 2001). Much overlap likely exists within the high risk groups studied in Virginia as evidenced by thirty percent Medicaid coverage for children hospitalized who had ADHD as a primary or secondary diagnosis. Data supported other national findings that these groups account for a disproportionate amount of both outpatient and inpatient mental health services, as demonstrated by one health plan and hospitalization data. Data from the juvenile justice system and inpatient hospitalizations highlighted the pervasiveness of co-morbidities and their devastating effects. Access to adequate mental and behavioral health care and treatment are critical needs to for these populations. Untreated mental health needs pose a considerable social and financial burden to many systems.

While the focus of HJ 122 was on medication treatment for ADHD, effective behavioral treatments presented as a need among study collaborators and other interested parties offering potential recommendations. The MTA supports that parents experience greater levels of satisfaction when receiving assistance in managing behaviors. Behavior questions are often the primary concerns that parents desire health care providers to address at office visits. A recent VDH sponsored study of child care providers found that while the majority had received training on handling behavioral issues, the majority also most frequently named handling behavior issues as an additional training need. Even though the state appears to fall within expected medication treatment ranges, interested parties conveyed concerns regarding the need for ADHD treatment to encompass a broader spectrum including the need for further developing behavior management skills through parent and teacher training.

VDH gathered existing data offering a snapshot of current diagnosis and treatment patterns regarding ADHD and children in the Commonwealth. Much less can be inferred about longitudinal trends other than Virginia has likely followed national patterns.

Data presented cannot address the questions surrounding increased use. Many reasons have been given for increased use including better ability to diagnose ADHD, different criteria for diagnosis, increased diagnosis in females and younger children, more medications available for treatment, direct marketing and advertising to consumers, wider acceptance of medication, use of medications into adolescence and increased access to health services and prescription drug coverage. Several national studies do show an increase in the percentage of children with ADHD who receive medication treatment.

Questions remain about measurements of successful treatment, measuring reduction in symptoms and measuring other increases in targeted outcomes, as ADHD is now viewed by many as a chronic condition. Questions about appropriateness of treatment and the prevalence of under and over diagnosis cannot be answered with the type and level of data collection VDH could perform for this study.

Current efforts such as those sponsored by the AAP at Lee's Corner Elementary School in Fairfax represents a model to help foster school and physician collaboration and promote consistency in diagnostic assessment tools. VDH has adopted Bright Futures as the model for health supervision of children, which is a funded product of the U.S. Department of Health and Human Services. It is endorsed by the AAP as well as the American School Health Association, National Association of School Nurses and the National Parent Teacher Association. DOE and DMAS have also adopted its use by clinical care providers. The Bright Futures Mental Health Tool Kit provides a standardized scale, the Vanderbilt ADHD Diagnostic Teacher rating scale, to assist with clear and consistent evaluations of children. The Lee's Corner model will provide training to classroom teachers about ADHD and the Bright Futures Tool Kit. This project was also designed to help facilitate compliance with Virginia legislation passed in 2001, which prohibits school staff from recommending medications, but allows for school personnel to recommend the need for further evaluation by a medical or other appropriate practitioner.

Future data describing the prevalence of ADHD diagnosis and treatment will be important to monitor trends among children in Virginia. VDH has identified potential private and public data sources which may continue to be monitored if adequate resources exist. VDH may incorporate several questions related to ADHD into existing surveys to gain more knowledge. Community based studies and additional purchases of prescription data could yield more in depth and longitudinal information. Private researchers and groups might continue taking leadership in these areas. Resources will likely limit the scope of data collection efforts in any state agency. Monitoring of ADHD diagnosis and treatment is one area of need, yet needs to be broadly considered with other frequent co-morbidities to understand the true impact and burden in mental health surveillance.

RECOMMENDATIONS

Recommendation 1: Continue surveillance efforts, as resources allow, to monitor ADHD prevalence and medication treatment among children in Virginia through mechanisms such as the Behavioral Risk Factor Surveillance System.

Recommendation 2: Continue to support the requirement that persons seeking licensure to teach in Virginia complete study in attention deficit disorder (§ 22.1-298).

Recommendation 3: Continue to support Department of Education State Special Education Advisory Committee efforts to improve joint training of parents and school personnel and continue support of local parent resource centers, which offer information and may also offer training sessions on ADHD.

Recommendation 4: Monitor community-based pilot efforts such as the Fairfax County Medical Society and Lee's Corner collaborative project between schools, parents and providers; the Virginia Beach Public School system efforts to provide parent training on ADHD and behavior modification; and the Center for Pediatric Research's community-based ADHD study, which will provide further data on prevalence, risk factors, outcomes and possible management tools which could be replicated in other areas of the state.

Recommendation 5: Provide training on the Bright Futures Mental Health Tool Kit, including the National Initiative for Children's Healthcare Quality ADHD tool kit, for school personnel, primary care providers and mental and behavioral health providers. Training would be provided under collaboration between DOE, VDH, VDMHMRSAS and the Virginia Chapter of the American Academy of Pediatrics as funding and resources allow.

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APPENDIX A: COPY OF STUDY RESOLUTION

HOUSE JOINT RESOLUTION NO. 122

Requesting the State Department of Health to collect data to determine the prevalence of methylphenidate and amphetamine prescriptions in the Commonwealth.

Agreed to by the House of Delegates, March 6, 2002
Agreed to by the Senate, March 5, 2002

WHEREAS, the United States Surgeon General's National Action Agenda, released in early 2001, estimated that fewer than one in five children receive the treatment needed for mental illness, including Attention Deficit Hyperactivity Disorder (ADHD); and

WHEREAS, the National Institute of Mental Health (NIMH) estimates that ADHD affects three to five percent of all school-age children; and

WHEREAS, in March 2001, the American Academy of Pediatricians issued guidelines providing recommendations for the assessment and diagnosis of school-aged children with ADHD; and

WHEREAS, NIMH is sponsoring the Multimodal Treatment Study of Children with Attention Deficit Hyperactivity Disorder with 18 nationally recognized authorities at six major university centers, and although the research is not yet complete, available data show that the most effective treatment for ADHD involves a combination of medication and psychosocial-behavioral treatment; and

WHEREAS, a brand name for methylphenidate hydrochloride, Ritalin, is only one of many medications used to treat ADHD; and

WHEREAS, methylphenidate, also marketed as Concerta, Metadate, Methylin, and other generic equivalents and amphetamines and other amphetamine-like agents, including Adderall and Dexedrine, may treat ADHD, as well as Cylert and certain antidepressant medications; and

WHEREAS, Ritalin use varies throughout the United States, with children in parts of the Northeast and Midwest being three times as likely to use the medication as children in the Southwest, and experts have attributed these variations in prescribing frequency to differing attitudes toward medications, insurance coverage, physician preferences, and other factors; and

WHEREAS, Virginia ranked in the highest quartile in the nation for Ritalin prescriptions in 1999 with higher concentrations being reported in Tidewater, Richmond, and Northern Virginia; and

WHEREAS, while limited, basic data on prescriptions filled at Virginia pharmacies during 2000 and 2001 are available through private research firms such as IMS Health; and

WHEREAS, according to a 2001 study conducted by the Center for Pediatric Research in Norfolk, 8 to 10 percent of elementary school students in the Portsmouth and Virginia Beach school divisions are receiving Ritalin at school, a rate two to three times higher than national

estimates, and black girls are the least likely to be diagnosed and treated while white boys are the most likely to be diagnosed and treated; and

WHEREAS, while most pharmaceuticals dispensed in public schools target mental health disorders, with half of these medications prescribed for ADHD; and

WHEREAS, in response to inquiries by the House Joint Resolution No. 660 (2001) Joint Subcommittee to Investigate the Improper Prescription and Illegal Use and Diversion of Ritalin and OxyContin and to Study the Effects of Attention Deficit Disorder and Attention Deficit Hyperactivity Disorder on Student Performance, the Department of Education surveyed Virginia school divisions in September 2001 to determine the number of students receiving medication at school for ADHD; and

WHEREAS, responses from 129 school divisions, representing 94.5 percent of Virginia's public school population and a 95.5 percent survey response rate, indicated that 16,521 students, or 1.52 percent of the student population, received ADHD medication at school during the 2000-2001 school year, and that, of these students, 55 percent receive Ritalin; and 45 percent are receiving another ADHD medication, such as Adderall, Catapres, Cylert, Dexedrine, Norpramin, Pamelor, Tofranil, or Wellbutrin; and

WHEREAS, although these data are helpful in estimating methylphenidate use in Virginia public schools, they are not clearly indicative of all children in the Commonwealth who may be taking Ritalin or other medications given to treat ADHD; and

WHEREAS, some experts contend that ADHD is over-diagnosed and over-treated in parts of Virginia and perhaps in as many as 36 other states; and

WHEREAS, also evidencing possible premature diagnoses is the fact that more than half of the students in the Center for Pediatric Research study were diagnosed by the first grade, and that 28 percent of the Portsmouth and Virginia Beach elementary school students receive two or more psychotropic drugs; and

WHEREAS, a review of epidemiological studies conducted across the country indicates that estimates regarding the prevalence of ADHD vary greatly due to diagnostic criteria, issues related to community versus school-based sampling, and methods of data collection such as choice of informant and gender; and

WHEREAS, in a four-year epidemiological study published in January 2002, Duke University researchers found that 7.3 percent of children in its sample were receiving stimulant treatment, although only 3.4 percent met the full diagnostic criteria for ADHD, and 75 percent of the children meeting the diagnostic criteria for ADHD were not receiving medication therapy, indicating possible over-treatment or under-treatment of the disorder; and

WHEREAS, further examination of the prescription of methylphenidate and other psychotropic medications is necessary to supplement the work of the House Joint Resolution No. 660 (2001)

joint subcommittee and to more accurately determine the prevalence of such prescriptions among Virginia's children; now, therefore, be it

RESOLVED by the House of Delegates, the Senate concurring, That the State Department of Health be requested to collect data to determine the prevalence of methylphenidate and amphetamine prescriptions in the Commonwealth.

In collecting the data, the Department shall confer with the Department of Mental Health, Mental Retardation and Substance Abuse Services, the Department of Education, the Board of Pharmacy, the Board of Medicine, and the Virginia Chapter of the American Academy of Pediatricians. The Department shall review existing health and prescription databases, obtain information accessible pursuant to the Virginia Freedom of Information Act (§ 2.2-3700 et seq.) and federal laws and regulations, and may contract for services with appropriate private research organizations for services to facilitate the collection of necessary data.

All agencies of the Commonwealth shall provide assistance to the Department, upon request.

The State Department of Health shall submit a copy of its findings regarding data collected on the prevalence of methylphenidate and amphetamine prescriptions in the Commonwealth, pursuant to this resolution, with the Division of Legislative Services, no later than November 30, 2003.

APPENDIX B: CALCULATION OF VDH ESTIMATES

Calculations of Prevalence Estimates:

Number of children under age 20 in Virginia:	1,937,086	(US Census 2000)
Percent of children under age 20 who get at least one prescription filled per year (Based on 65 million claims)	48.9%	(Medco Health 2002)
Number of unique children under age 20 who had a prescription filled in 2001 in Virginia identified by Verispan	398,149	(Verispan)
Number of unique children under age 20 who had a prescription filled for any DOI in 2001 in Virginia identified by Verispan	29,945	(Verispan)
Number of unique children under age 20 who had a prescription filled for stimulant DOI in 2001 in Virginia identified by Verispan	26,058	(Verispan)

If 49.1% of children (residents) had a prescription filled in Virginia then we expect a total of 947,235 prescriptions for unique patients (assuming there is no crossover between states)

Verispan provided data for 398,149 or 42% of the expected total.

$$\frac{29{,}945}{42\%} \quad \frac{X}{100\%}$$

Then X =71,298 (total # of estimated DOI prescriptions)

71, 298/1,937,086 = 3.7% of all children ages 20 and under in Virginia had a prescription filled for any DOI . VDH reports this as 3 to 4 percent.

$$\frac{26{,}058}{42\%} \quad \frac{X}{100\%}$$

Then X =62,043 (total # of estimated DOI prescriptions)

62,043/1,937,086 = 3.2% of all children ages 20 and under in Virginia had a prescription filled for a stimulant DOI. VDH reports this as 3 percent.