REVIEW

Economic Impact of Childhood and Adult Attention-Deficit/Hyperactivity Disorder in the United States

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Objective: Attention-deficit/hyperactivity disorder (ADHD) is one of the most prevalent mental disorders in children in the United States and often persists into adulthood with associated symptomatology and impairments. This article comprehensively reviews studies reporting ADHD-related incremental (excess) costs for children/adolescents and adults and presents estimates of annual national incremental costs of ADHD. **Method:** A systematic search for primary United States-based studies published from January 1, 1990 through June 30, 2011 on costs of children/adolescents and adults with ADHD and their family members was conducted. Only studies in which mean annual incremental costs per individual with ADHD above non-ADHD controls were reported or could be derived were included. Per-person incremental costs were adjusted to 2010 U.S. dollars and converted to annual national incremental costs of ADHD based on 2010 U.S. Census population estimates, ADHD prevalence rates, number of household members, and employment rates by age group. **Results:** Nineteen studies met the inclusion criteria. Overall national annual incremental costs of ADHD ranged from $143 to $266 billion (B). Most of these costs were incurred by adults ($105B−$194B) compared with children/adolescents ($38B−$72B). For adults, the largest cost category was productivity and income losses ($87B−$138B). For children, the largest cost categories were health care ($21B−$44B) and education ($15B−$25B). Spillover costs borne by the family members of individuals with ADHD were also substantial ($33B−$43B). **Conclusion:** Despite a wide range in the magnitude of the cost estimates, this study indicates that ADHD has a substantial economic impact in the United States. Implications of these findings and future directions for research are discussed. J. Am. Acad. Child Adolesc. Psychiatry, 2012;51(10):990–1002. **Key Words:** ADHD, cost of illness, societal costs, children, adults

Attention-deficit/hyperactivity disorder (ADHD) is defined by the *DSM-IV-TR* as a persistent set of inattentive, hyperactive, and impulsive symptoms that impairs function in at least two settings (e.g., home, work, and/or school).[1] It has been reported to be one of the most prevalent mental disorders in children in the United States,[2] with a current prevalence rate of 5.5% to 9.3%[3] in children and adolescents 4 to 17 years old. Children and adolescents with this disorder experience educational difficulties,[4] problems with self-esteem,[5] significantly impaired family and peer relationships,[6] and an overall decrease in quality of life.[7]

Although traditionally thought of as a condition of childhood, ADHD often persists into adulthood with associated symptomatology and impairments. Prevalence rates in U.S. adults 18 to 44 years old are reported to be 4.4%[8] and highlight the chronicity of this disorder. ADHD-related impairments may underlie subsequent problems in adulthood such as occupational dif-

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ficulties, criminal activity, substance abuse problems, and traffic accidents and citations.[9] Moreover, the difficulties faced by children and adults with ADHD may have spillover effects and can negatively affect the health and work productivity of family members.[10]

Although hundreds of studies have reported on the negative outcomes of ADHD in childhood and adulthood in areas such as health, education, occupation, and antisocial behavior, few have monetized these outcomes to provide an estimate of the economic impact of ADHD in the different sectors of society. For instance, the two most recent systematic reviews of the economic costs of ADHD found only 12 to 13 original research studies addressing this topic[11,12] compared with 351 original research studies found in a recent review of long-term outcomes of ADHD.[9] A comprehensive understanding of the incremental costs of ADHD (i.e., excess costs over and above those of individuals without ADHD) from a societal perspective is important to inform, plan, and justify policies and interventions to help alleviate the numerous negative consequences associated with this disorder. In addition to being dated, prior systematic reviews of the economic impact of ADHD have been limited in scope, examining a restricted population or a few sectors of the economy.[11-13] Pelham et al.[12] (2007) only reviewed costs in children and adolescents with ADHD. Leibson and Long[13] (2003) considered only health care costs. Matza et al.[11] (2005) examined children and adults and additional cost sectors besides health care, but studies of education costs were not available. Furthermore, results reported across the reviewed studies were not consolidated to present an overall estimate of incremental costs of individuals with ADHD at the national level.

The present study uses a societal perspective, comprehensively reviews studies reporting ADHD-related incremental costs for children/adolescents and adults, and computes estimates of overall annual national incremental costs of ADHD in the United States. Estimates are also stratified by age group, cost sectors, and patient versus family member.

METHOD

A systematic review was conducted using guidelines from the Cochrane Handbook for Systematic Reviews of Interventions.[14] Four large databases (MEDLINE, EMBASE, ERIC, and PsycINFO) were searched for articles published from January 1, 1990 through June 30, 2011 using the following abstracted search strategy: (*terms describing ADHD*) AND ((*terms describing cost analysis or economic impact*) OR (*terms describing areas of cost due to ADHD*)). An extensive list of terms describing cost areas of interest was used to identify studies on health care resource use, productivity losses, accidents, education, substance abuse, and criminal behavior (Table S1, available online). Studies were also identified by examining the reference lists of prior publications and by follow-up directly with the study authors. This identification method deviated from strict Cochrane guidelines but was in line with international systematic review guidelines.[15]

A primary screen retained all articles published in English and classified as original research studies of human participants conducted in the United States that included a study group of participants with ADHD and monetized ADHD-related outcomes. In a final screen, the full text of the articles were reviewed to exclude studies in which mean annual incremental costs of individuals with ADHD compared with a control group of patients without ADHD were not reported (or could not be derived).[16-18] Studies using specific disease groups (e.g., asthma or depression) as the only control group were excluded.[19,20] Studies not reporting mean costs (e.g., only median costs reported[21]) and studies from which it was not possible to separately estimate contributions from different cost categories (e.g., combined costs of health care and productivity losses[22]) were also excluded.

Study characteristics and cost measurements were extracted and tabulated for the included studies. For one study,[23] numeric data underlying the published graphs were obtained from the study author. A few calculations and adjustments were made on the data reported in the studies. Per-person annual costs were computed by dividing the aggregate annual national costs by the estimated size of the population in one study.[24] Weighted average estimates for the overall population were calculated for two studies that reported only cost estimates stratified by patient gender.[10,25] Costs were annualized for three studies estimating costs over 1 month or multiple years.[23,26,27] All cost estimates across the included studies were inflated to 2010 U.S. dollars using the consumer price index from the U.S. Bureau of Labor Statistics.[28] The medical care component of the consumer price index was used to inflate reported health care cost estimates.

For the national incremental cost calculations, the studies were compiled by age group (children/adolescents versus adults) and cost category (health care, productivity and income losses, education, and justice system). The health care and productivity cost categories were separated into subcategories of costs incurred by patients with ADHD versus those by family members of patients with ADHD. Except for the minimal requirements that each study had to meet for inclusion