

University of Vermont

UVM ScholarWorks

Larner College of Medicine Faculty Publications

Larner College of Medicine

12-31-2018

Disparities in Receipt of a 504 Plan by Socioeconomic Status among Children Diagnosed with Attention-Deficit/Hyperactivity Disorder (ADHD) in the United States

Ruveni Gogerly-Moragoda
sgogerly@uvm.edu

Ingrid Camelo

Lynn Zanardi Blevins

Laurin Kasehagen

Follow this and additional works at: <https://scholarworks.uvm.edu/comfac>



Part of the [Public Health Commons](#)

Recommended Citation

Gogerly-Moragoda, Ruveni; Camelo, Ingrid; Zanardi Blevins, Lynn; and Kasehagen, Laurin, "Disparities in Receipt of a 504 Plan by Socioeconomic Status among Children Diagnosed with Attention-Deficit/Hyperactivity Disorder (ADHD) in the United States" (2018). *Larner College of Medicine Faculty Publications*. 4.

<https://scholarworks.uvm.edu/comfac/4>

This Article is brought to you for free and open access by the Larner College of Medicine at UVM ScholarWorks. It has been accepted for inclusion in Larner College of Medicine Faculty Publications by an authorized administrator of UVM ScholarWorks. For more information, please contact scholarworks@uvm.edu.

Disparities in Receipt of a 504 Plan by Socioeconomic Status among Children Diagnosed with Attention-Deficit/Hyperactivity Disorder (ADHD) in the United States

Ruveni Gogerly-Moragoda, MBBS, DFM, MRCPG (Int)

The University of Vermont

Robert Larner, M.D. College of Medicine Public Health Program

Burlington, VT

Ingrid Camelo, MD, FAAP

Boston Medical Center

Boston University, School of Medicine

Boston, MA

Lynn Zanardi Blevins, MD, MPH

Assistant Professor of Medicine

Robert Larner, M.D. College of Medicine Public Health Program

Burlington, VT

Laurin Kasehagen, MA, PhD

Senior MCH Epidemiologist/ CDC Assignee

Vermont Departments of Health and Mental Health

Burlington, VT

Disclaimer: The findings and conclusions in this analysis are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention, the Vermont Department of Health, the Vermont Department of Mental Health, or the University of Vermont Robert Larner, M.D. College of Medicine.

Keywords: Attention-Deficit/Hyperactivity Disorder; school performance; Federal Poverty Level; socioeconomic status; The National Survey of the Diagnosis and Treatment of ADHD and Tourette Syndrome; 504 Plan

Abbreviations

ADHD: Attention-Deficit/Hyperactivity Disorder

CDC: Centers for Disease Control and Prevention

DSM-5: Diagnostic and Statistical Manual, Fifth edition

FAPE: free appropriate public education

FPL: Federal Poverty Level

IDEA: Individuals with Disabilities Education Act

NCBDDD: National Center on Birth Defects and Developmental Disabilities

NCHS: National Center for Health Statistics

NSCH: 2011-2012 National Survey of Children's Health

NS-DATA: 2014 National Survey of the Diagnosis and Treatment of ADHD and Tourette Syndrome

USDE: U.S. Department of Education

The authors have indicated they have no conflicts of interest or financial relationships relevant to this article to disclose.

Corresponding author: Laurin Kasehagen, MA, PhD
Senior CDC MCH Epidemiologist / Assignee
Vermont Department of Health &
Vermont Department of Mental Health
108 Cherry Street, Suite 306
Burlington, Vermont 05401
E-mail: Laurin.Kasehagen@partner.vermont.gov

Disparities in Receipt of a 504 Plan by Socioeconomic Status among Children Diagnosed with Attention-Deficit/Hyperactivity Disorder (ADHD) in the United States

Abstract

Background

We aimed to understand disparities in the receipt of a 504 Plan among US children with Attention-Deficit/Hyperactivity Disorder (ADHD) using the federal poverty level (FPL) as an indicator of socioeconomic status.

Methods

We analyzed a subpopulation of the 2014 National Survey of the Diagnosis and Treatment of ADHD and Tourette Syndrome (n=2282) children aged 8-17 years. Bivariate and multivariable analyses were used to assess the association of the FPL with receipt of a 504 Plan.

Results

A total of 349 (13.6 %) of children received a 504 Plan. Using the FPL category above 400% as the reference, after controlling for age, sex, race/ethnicity, severity of ADHD, medication status, learning disorders, anxiety and/or mood disorders, overall school performance, and an individualized education plan, children in households at $\leq 100\%$ of the FPL had the lowest odds of having a 504 Plan (adjusted odds ratio (AOR) 0.33, 95% CI 0.15-0.71), followed by children in households at 101-200% of the FPL (AOR 0.48, 95% CI 0.24-0.94), and children in households at 201-400% of the FPL (AOR 0.57, 95% CI 0.34-0.97).

Conclusion

Children in the lowest FPL category had the lowest odds of having a 504 Plan. Therefore the 504 Plan may be underutilized in children of lower socioeconomic status.

Disparities in Receipt of a 504 Plan by Socioeconomic Status among Children Diagnosed with Attention Deficit/Hyperactivity Disorder (ADHD) in the United States

Introduction

Attention-Deficit/Hyperactivity Disorder (ADHD) is a multifactorial developmental condition characterized by inappropriate levels of hyperactivity, impulsivity, and inattention affecting cognitive, academic, behavioral, emotional and social functioning (American Psychiatric Association, 2013). ADHD is the most common neurobehavioral disorder diagnosed in children and adolescents (Rubia, 2018). The 2011 National Survey of Children's Health (NSCH) showed 11% of US children 4 to 17 years of age had a diagnosis of ADHD (Visser et al., 2014). Students with ADHD can experience significant academic impairment compared to children without ADHD (Barbarese et al., 2007).

Section 504 of the Rehabilitation Act of 1973 is a civil rights law designed to protect the rights of individuals with disabilities in programs and activities that receive federal financial assistance from the U.S. Department of Education. Section 504 requires schools to provide a "free appropriate public education" (FAPE) to students with a physical or mental impairment that substantially limits one or more major life activities (34 C.F.R. Part 104). Under Section 504, FAPE consists of the provision of regular or special education and related aids and services designed to meet the student's individual educational needs as adequately as the needs of nondisabled students are met (USDE, 1995). Section 504 requires that children with a disability be educated in the general classroom unless the school district demonstrates that it cannot be

accomplished even with the use of supplemental aids. Section 504 does not stipulate a 504 Plan, but it is known to be useful in documenting the process followed to address the need of the eligible student. It does require that the 504 Plan be prepared by a team comprised of a school district representative, a schoolteacher, parents of the student, and other individuals as found fit (USDE, 2016). Children with ADHD are subject to academic and behavioral impairments due to inattention, over activity and impulsive behavior (CDC, 2017). Each 504 Plan is tailored to accommodate the need of the ADHD student (USDE, 2016) with emphasis on academic instruction, behavioral interventions, and classroom accommodations as a successful strategy to educating children with ADHD (USDE, 2008).

Students who are eligible under Section 504 but not under the Individuals with Disabilities Education Act (IDEA) are considered as “504-only”. A racial/ethnic and gender disproportionality in receipt of a 504 Plan was observed in analyses conducted in 2009-2010 and 2011-2012 (Zirkel and Weathers, 2015, 2016). In these analyses, [the authors] observed that white and male students had a higher proportion of 504 Plans compared to Hispanic, black, and asian students, students of two or more races or ethnicities, and female students. (Zirkel and Weathers, 2016). Students K-12 in Title 1 schools (i.e., schools with the largest federally funded educational programs) also had a lower proportion of 504 Plans, compared to non-Title 1 schools (Zirkel and Weathers, 2016). Title 1 provides financial assistance to school districts to assist schools with high numbers of children from low-income families to ensure that all children meet state academic standards. The number of students enrolled in the free and reduced price lunch program determines the number of low-income students.

The prevalence of ADHD has increased between 2005 and 2014 (Davidovitch et al., 2017). ADHD is more prevalent in children from lower socioeconomic (SES) households (Choi et al., 2017). However, children from higher SES households are more likely to receive treatment for ADHD (Eisenberg, 2012). Because of the professional attention, these children may stand a better chance of being recommended for a 504 Plan. The objective of this study is to assess if there is a socioeconomic disparity among children with ADHD who receive a 504 Plan

DRAFT

Methods

We used data from the 2014 National Survey of the Diagnosis and Treatment of Attention Deficit Hyperactivity Disorder and Tourette Syndrome (NS-DATA) sponsored by the Centers for Disease Control and Prevention's (CDC) National Center on Birth Defects and Developmental Disabilities (NCBDDD) and the National Center for Health Statistics (NCHS) (SLAITS, 2014). The NS-DATA is a follow-up survey of households with children 2 to 15 years of age when responding to the 2011-2012 National Survey of Children's Health (NSCH) (SLAITS, 2013), a random-digit-dial cross-sectional telephone survey on the health, wellbeing, and healthcare access of children. Children were eligible for the NS-DATA if they were less than 18 years of age at the time of interview, continued to live in the contacted household, and were ever diagnosed with ADHD and/or Tourette syndrome by a doctor or healthcare provider. Our study utilizes data from the publicly available NS-DATA ADHD module, which was conducted in both English and Spanish.

The data was weighted by NCHS to adjust for multiple factors including non-response to the NS-DATA, households that could not be contacted, children who did not satisfy the eligibility criteria at the time of the NS-DATA interview, and to make the sample generalizable to the U.S. ADHD. To avoid the risk of inadvertent disclosure of confidential information obtained during data collection, some variables were either suppressed or collapsed by NCHS.

We limited our study sample to a subpopulation of children aged 8-17 years old with a current diagnosis of ADHD and for whom there was complete information on Federal Poverty Level (FPL) and receipt of a 504 Plan. Children younger than 8 years were excluded due to a small

sample size. The outcome of interest is receipt of a 504 Plan. The primary predictor, FPL, an indicator of socioeconomic status (SES), was categorized as $\leq 100\%$ of the FPL, 101-200% of the FPL, 201-400% of the FPL, and $>400\%$ of the FPL.

We included the following variables in our analysis: age (8-11 years, 12-13 years, and 14-17 years, based on the structure of early, middle and high school grades); sex (male, female); race/ethnicity (Hispanic, non-White non-Hispanic, and White non-Hispanic); severity of child's ADHD (mild, moderate, and severe); current medication use for ADHD (yes, no); learning disorder (yes, no); anxiety and/or mood disorder (yes, if either an anxiety or mood disorder or both and no, if neither anxiety nor a mood disorder), overall school performance (problematic or somewhat problematic, average, and above average or excellent) and, receipt of an Individualized Education Program (IEP) (yes, no).

We conducted descriptive analyses, calculated crude odds and performed a multivariate analysis to assess the association between FPL and the receipt of a 504 Plan, adjusting for age, sex, race/ethnicity, severity of ADHD, medication status, learning disorders, anxiety and/or mood disorders, overall school performance, and an IEP. Analyses were conducted using SAS version 9.4 and SAS-callable SUDAAN version 10 to properly weight and account for the complex sampling frame.

Results

Table 1 describes the overall study population and the characteristics of 349 children (13.6%) who had a 504 Plan and 1933 children (86.4%) without a 504 Plan. Of these children, 327 (27%) lived in households $\leq 100\%$ of the FPL, 435 (21.9 %) lived in households between 101-200% of the FPL, 712 (27.9 %) lived in households between 201-400% of the FPL, and 808 (23.3%) lived in households $>400\%$ of the FPL. The poverty level distribution differed among those with and without a 504 Plan ($p = 0.0158$).

Using the $>400\%$ FPL category as a reference, children in households at $\leq 100\%$ of the FPL had the lowest odds of having a 504 Plan (crude odds ratio (OR) 0.38, 95% confidence interval (CI) 0.20- 0.73) followed by children at 101-200% of the FPL (OR 0.54, 95% CI 0.30-0.97) and children at 201-400% of the FPL (OR 0.76, 95% CI 0.46-1.24) (Table 2). After controlling for age, sex, race/ethnicity, severity of ADHD, medication status, learning disorders, anxiety and/or mood disorders, overall school performance, and an IEP, children at $\leq 100\%$ of the FPL continued to have the lowest odds of having a 504 Plan (adjusted odds ratio (AOR) 0.33, 95% CI 0.15-0.71) followed by children at 101-200% of the FPL (AOR 0.48, 95% CI 0.24-0.94) and children at 201-400% of the FPL (AOR 0.57, 95% CI 0.34-0.97).

Discussion

Very few studies have been published on 504 Plan among children with ADHD. There is an increasing trend in the prevalence of ADHD in all SES categories, which is more pronounced in lower SES categories (Eisenberg, 2012). In our study, 27% of children with ADHD are from the lowest socioeconomic category ($\leq 100\%$ of the FPL). These children have the lowest chance of receiving a 504 Plan when compared with those in all other FPL categories. A similar disparity was seen in a study of children with ADHD in K–12 where a lower percentage of students in Title 1 schools received a 504 Plan, compared to students in non-Title 1 schools (Zirkel and Weathers, 2016). However, a prior study by Holler and Zirkel (2008) failed to demonstrate such a relationship, but lack of statistical significance could have been due to the sampling methods used (Zirkel and Weathers, 2016).

ADHD has a significant negative impact on a child's ability to learn and his/her educational performance (Murray et al., 2014). One of the many interventions used to help improve academic performance of children with inattention and/or hyperactivity/impulsivity is classroom accommodations. Classroom accommodations in 504 Plans include physical accommodations such as preferential seating, instructional accommodations such as keeping directions simple and behavioral accommodations such as positive feedback.

The underutilization of 504 Plan could be due to lack of resources in the school or the family, or a lack of awareness by the parents of what is available. This could explain why children in a higher FPL are more likely to be assigned one.

Limitations

The primary limitation of our study corresponds to the simultaneous assessment of exposure and outcome, preventing the possibility of assigning any temporal relationship between them. Other studies have been trying to elucidate the intricate association between ADHD and socioeconomic disadvantage (Russell, 2015).

Collection of data was by telephone interviews. If parents were unable to differentiate between the types of services their children were receiving, 504 Plan services could have been reported in error. Inaccurate responses from participants and misclassification could have resulted from recall bias. Inaccurate income data could have contributed to children being placed in a different FPL category. In our study, poverty was measured based on the poverty guidelines, widely known as the federal poverty level. However, this is an administrative definition rather than the actual poverty thresholds, which gives a more accurate indication of the SES. Even though the poverty guidelines are approximately equal to the poverty thresholds, there could be a mismatch in classification based on the measure used to classify family income.

This study gave us the opportunity to compare different population groups at one point in time in regards to the services they were receiving, related to their diagnosis of ADHD and their socioeconomic status. Since our results show a possible relationship between the FPL and the receipt of a 504 Plan in children with ADHD, they can be used to support further research in this area.

Conclusion

This study shows that children of lower socioeconomic status have a lower chance of receiving a 504 Plan. We recommend that further studies be done to confirm this finding of a disparity in receipt of a 504 Plan among children with ADHD. Further analysis is required to investigate the reasons for this disparity, to effect changes in policies used to determine eligibility.

DRAFT

References

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Washington, DC: American Psychiatric Association.

Barbarese, W. J., Katusic, S. K., Colligan, R. C., Weaver, A. L., & Jacobsen, S. J. (2007). Long-term school outcomes for children with attention-deficit/hyperactivity disorder: a population-based perspective. *J Dev Behav Pediatr*, *28*(4), 265-273.

doi:10.1097/DBP.0b013e31811ff87d

Centers for Disease Control and Prevention (CDC). (2017). *Attention-Deficit/Hyperactivity Disorder*. Retrieved from <https://www.cdc.gov/ncbddd/adhd/facts.html>.

Choi, Y., Shin, J., Cho, K. H., & Park, E.-C. (2017). Change in household income and risk for attention deficit hyperactivity disorder during childhood: A nationwide population-based cohort study. *Journal of Epidemiology*, *27*(2), 56–62.

<http://doi.org/10.1016/J.JE.2016.09.004>

Davidovitch, M., Koren, G., Fund, N., Shrem, M., & Porath, A. (2017). Challenges in defining the rates of ADHD diagnosis and treatment: trends over the last decade. *BMC Pediatrics*, *17*, 218. <http://doi.org/10.1186/s12887-017-0971-0>

Eisenberg, John M. (2012). Attention Deficit Hyperactivity Disorder in Children and Adolescents. *Comparative Effectiveness Review Summary Guides for Clinicians*.

Retrieved from <https://www.ncbi.nlm.nih.gov/books/NBK99165/>

Elementary and Secondary Education Act of 1965 Title 1, Part A; 20 U.S.C. 6301-6339, 6571-6578. Retrieved from <https://www2.ed.gov/programs/titleiparta/legislation.html>

Holler, R. A., & Zirkel, P. A. (2008). Section 504 and Public Schools: A National Survey Concerning “Section 504-Only” Students. *NASSP Bulletin*, 92(1), 19–43.

<http://doi.org/10.1177/0192636508314106>

Murray, D. W., Molina, B. S. G., Glew, K., Houck, P., Greiner, A., Fong, D., ... Jensen, P. S. (2014). Prevalence and Characteristics of School Services for High School Students with Attention-Deficit/Hyperactivity Disorder. *School Mental Health*, 6(4).

<http://doi.org/10.1007/s12310-014-9128-6>

Nondiscrimination on the basis of handicap in programs or activities receiving federal financial assistance. 34 C.F.R Part 104 §§ 104.1 – 104.61. Retrieved from <https://www2.ed.gov/policy/rights/reg/ocr/34cfr104.pdf>

Rubia, K. (2018). Cognitive Neuroscience of Attention Deficit Hyperactivity Disorder (ADHD) and Its Clinical Translation. *Front Hum Neurosci*, 12, 100.

doi:10.3389/fnhum.2018.00100

Russell, A. E., Ford, T., & Russell, G. (2015). Socioeconomic Associations with ADHD:

Findings from a Mediation Analysis. *PLoS One*, *10*(6), e0128248.

doi:10.1371/journal.pone.0128248

State and Local Area Integrated Telephone Survey (SLAITS). (2013). *2011/12 National Survey of Children's Health*. Retrieved from http://www.childhealthdata.org/docs/nsch-docs/sas-codebook_-2011-2012-nsch-v1_05-10-13.pdf

State and Local Area Integrated Telephone Survey (SLAITS). (2014). *National Survey of the Diagnosis and Treatment of ADHD and Tourette Syndrome*. Retrieved from https://www.cdc.gov/nchs/slait/ns_data.htm

U.S. Department of Education (USDE), Office of Civil Rights. (1995). *The Civil Rights of Students with Hidden Disabilities Under Section 504 of the Rehabilitation Act of 1973*. Retrieved from <https://www2.ed.gov/about/offices/list/ocr/docs/hq5269.html>.

U.S. Department of Education (USDE), Office for Civil Rights. (2016). *Students with ADHD and Section 504: A Resource Guide*. Retrieved from <https://www2.ed.gov/about/offices/list/ocr/letters/colleague-201607-504-adhd.pdf>

U.S. Department of Education (USDE), Office of Special Education and Rehabilitative Services, Office of Special Education Programs. (2008). *Teaching Children with Attention Deficit Hyperactivity Disorder: Instructional Strategies and Practices*. Retrieved from <https://www2.ed.gov/rschstat/research/pubs/adhd/adhd-teaching-2008.pdf>

Visser, S. N., Danielson, M. L., Bitsko, R. H., Holbrook, J. R., Kogan, M. D., Ghandour, R. M., . . . Blumberg, S. J. (2014). Trends in the parent-report of health care provider-diagnosed and medicated attention-deficit/hyperactivity disorder: United States, 2003-2011. *J Am Acad Child Adolesc Psychiatry*, *53*(1), 34-46 e32. doi:10.1016/j.jaac.2013.09.001

Zirkel, P. A., & Weathers, J. M. (2015). Section 504-Only Students: National Incidence Data. *Journal of Disability Policy Studies*, *26*(3), 184–193.
<http://doi.org/10.1177/1044207314543560>

Zirkel, P. A., & Weathers, J. M. (2016). K–12 Students Eligible Solely Under Section 504: Updated National Incidence Data. *Journal of Disability Policy Studies*, *27*(2), 67–75.
<http://doi.org/10.1177/1044207315626115>

Tables

Characteristics		Number in Study Population (n=2282) n (weighted%)	Has a 504 Plan (n=349) n (weighted%)	Does Not Have a 504 Plan (n=1933) n (weighted%)	Chi-Square <i>p</i> value
Federal Poverty Level (FPL)	≤ 100% of FPL	327 (27.0)	32 (2.3)	295 (24.7)	0.0158
	101 - 200% of FPL	435 (21.9)	56 (2.5)	379 (19.4)	
	201 - 400% of FPL	712 (27.9)	97 (4.3)	615 (23.6)	
	> 400% of FPL	808 (23.3)	164 (4.5)	644 (18.7)	
Age (years)	8 to 11	641 (30.3)	101 (3.8)	540 (26.5)	0.8795
	12 to 13	521 (23.9)	79 (3.3)	442 (20.6)	
	14 to 17	1120 (45.8)	169 (6.5)	951 (39.3)	
Sex	Male	1604 (70.0)	244 (9.4)	1360 (60.6)	0.8105
	Female	678 (30.0)	105 (4.2)	573 (25.8)	
Race/Ethnicity	Hispanic	196 (16.1)	35 (1.6)	161 (14.5)	0.4450
	Non-White Non-Hispanic	404 (21.2)	50 (2.7)	354 (18.5)	
	White Non-Hispanic	1677 (62.7)	261 (9.2)	1416 (53.5)	
Severity of ADHD	Severe	370 (19.6)	61 (2.9)	309 (16.6)	0.8558
	Moderate	1138 (49.9)	187 (6.6)	951 (43.2)	
	Mild	758 (30.5)	100 (4.0)	658 (26.5)	
Takes Medication for ADHD	Yes	1593 (66.4)	259 (9.3)	1334 (57.1)	0.6665
	No	689 (33.6)	90 (4.3)	599 (29.3)	
Learning Disorders	Yes	676 (32.7)	79 (3.7)	597 (29.0)	0.2117
	No	1575 (67.3)	264 (9.8)	1311 (57.5)	
Anxiety and/or Mood Disorders	Yes	580 (25.4)	92 (2.6)	488 (22.8)	0.0743
	No	1678 (74.6)	252 (10.8)	1426 (63.8)	
Overall School Performance	Problematic / Somewhat Problematic	1060 (49.9)	172 (6.9)	888 (43.0)	0.8840
	Average	633 (27.2)	84 (3.4)	549 (23.8)	
	Above Average / Excellent	539 (22.9)	81 (3.1)	458 (19.9)	
Individualized Education Plan	Yes	955 (40.6)	40 (1.8)	915 (38.8)	<0.0001
	No	1327 (59.4)	309 (11.8)	1018 (47.6)	

Table 2. Odds of 504 Plan receipt among children 8-17 years with ADHD, 2014 National Survey of the Diagnosis and Treatment of Attention-Deficit/Hyperactivity and Tourette Syndrome

	Model 1 ^b : Crude Odds		Model 2 ^c : Adjusted Odds	
	Crude OR	95% CI	Adjusted OR	95% CI
≤ 100% of FPL ^a	0.38	0.20 - 0.73	0.33	0.15 - 0.71
101 - 200% of FPL	0.54	0.30 - 0.97	0.48	0.24 - 0.94
201 - 400% of FPL	0.76	0.46 - 1.24	0.57	0.34 - 0.97
> 400% of FPL	reference		reference	

^aFPL = Federal Poverty Level

^bmodel not adjusted for potentially confounding variables

^cmodel adjusted for age, sex, race/ethnicity, severity of ADHD, medication status, learning disorders, anxiety and/or mood disorders, overall school performance, and an Individualized Education Plan

DRAFT