



Child Attention-Deficit Hyperactivity Disorder (ADHD) in Same-Sex Parent Families in the United States: Prevalence and Comorbidities

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Author's contribution

The sole author designed, analyzed and interpreted and prepared the manuscript.

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ABSTRACT

Aims: This paper presents the first population data on attention-deficit hyperactivity disorder (ADHD) among children raised by same-sex parents with the aims 1) to test whether residence with same-sex parents is associated with higher ADHD prevalence, and 2) to observe and assess any clinically significant aggravators or comorbidities.

Methodology: Aggregate data for 1997-2013 from the U.S. National Health Interview Survey yielded a representative sample of children from 207,007 households, including 512 with same-sex parents, permitting inferential comparisons.

Results: ADHD was more than twice (OR 2.4, 95% CL 1.6-3.4) as prevalent among children with same-sex parents than in the general population, after controlling for age, sex, ethnicity and parent SES. Comorbidities with general emotional problems and defiance behavior were standard. ADHD risk with same-sex parents was reduced among adopted children (OR 0.54 95% CL .27-1.1), null in the presence of parent psychological distress, and substantially elevated in the presence of stigmatization (OR 7.3 95% CL 1.4-38.1). In same-sex families, children with ADHD were over seven times (OR 7.5 95% CL 1.2-46.8) more likely to suffer stigmatization due to impaired interpersonal coping skills.

Conclusion: Diagnostic intake for ADHD should include parent sexual orientation, and treatment

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programs should include resources to bolster anti-victimization skills, particularly for children with same-sex parents. Results suggest the presence of shared genetic factors for same-sex attraction and ADHD, though more research is needed to confirm.

Keywords: National health interview survey; same-sex parents; ADHD; attention-deficit hyperactivity disorder; stigmatization.

1. INTRODUCTION

Attention-deficit/hyperactivity disorder (ADHD) is a neurodevelopmental disorder characterized by elevated levels of inattention, hyperactivity/impulsivity or both [1]. It is the most common childhood behavioral complex, affecting about 8-12% of school age children worldwide, [2,3] with males presenting at least three times more often than females [4]. ADHD can profoundly impair a child's academic achievement, well-being and social interaction, [5] and frequently co-exists with other emotional conditions such as morbid anxiety or emotional liability, [6] conduct disorders such as oppositional defiant disorder (ODD), or learning disabilities. Impairment is usually persistent: adolescents with ADHD display cognitive disabilities, lower IQ, and increased involvement in risky behaviors such as illicit drug usage; and for two-thirds of affected children symptoms persist into adulthood [7].

ADHD has a high rate of familial transmission. Overall heritability is about 75%, [8] and is increased by psychosocial features of parental environment or function, including reduced family cohesion and maternal mental disorder [8]. Family demography and structure is influential; ADHD risk is higher in white families and with parents having lower levels of education and income, and is at least twice as high in single parent and step-parent families than when children reside with two biological parents [4,5]. It is not known whether family environmental factors contribute causally to the condition, are associated with genetic causes, or merely aggravate its symptoms. All three influences may occur.

Same-sex attracted persons experience higher rates of emotional distress, [6,7] and same-sex parent families, like single parent and opposite-sex step-parent families, include at most only one biological parent, suggesting higher ADHD risk for children in such families. However, to my knowledge, no population-based data have been published on ADHD among children with same-sex parents. This study tests the hypothesis that

residence with same-sex parents is associated with higher prevalence of ADHD for minor children aged 4-17 independent of multiple confounders. The study also aims to observe and assess any clinically significant correlates of ADHD that distinguish this group from the general population. The investigation uses data from a large population sample of children aggregated from multiple cycles of the U.S. National Health Interview Survey.

Such information may be of value to public health professionals in targeting interventions and to clinicians. Clinicians have been advised that close communication and collaboration with parents is key to diagnosing and treating child ADHD; [8] yet more information is needed to improve patient outcomes, particularly in minority populations.

2. DATA AND METHODS

The National Health Interview Survey (NHIS) has been conducted since 1957 on a US national multi-stage probability sample of households yielding about 35,000 to 40,000 interviews annually. Health and demographic information is collected for all household members, providing data on about 80,000 to 100,000 persons. For families that include children under age 18 supplemental health information is collected for one child chosen at random (the "sample child"). Information on sample design, field operations, Institutional Review Board approval and public release and confidentiality of data has been published; [9] detailed year-specific information may also be found on the NHIS website (<http://www.cdc.gov/nchs/nhis.htm>).

The NHIS interview constructs a family roster which pairs household members who are spouses or cohabiting partners. Same-sex couples were identified from those persons whose reported spouse or cohabiting partner was of the same sex as themselves. The investigation examines combined 1997-2013 NHIS data consisting of information on 195,240 sample children, including 512 children with same-sex parents. Household response rates

ranged from 75.7% to 91.8% over these seventeen years.

Child ADHD is assessed by parent response ("Yes" or "No) to the question, "Has a doctor or health professional ever told you that [fill: Sample Child name] had...Attention Deficit Hyperactivity Disorder (ADHD) or Attention Deficit Disorder (ADD)?" (From 1997 to 1999 the question referred only to "Attention Deficit Disorder (ADD)".) For three survey years (2000, 2001 and 2003) parents also completed the Hyperactivity/Inattention scale of the Strength and Difficulties Questionnaire (SDQ), which has been used as a clinical indicator of ADHD or potential ADHD. Item reliability (Cronbach's Alpha) for the ADHD question above with the five items comprising the Hyperactivity/Inattention scale is .80.

Table 1 reports the distribution of all the independent variables in the analysis. Results are controlled or elaborated by selected demographic, family, parent and child characteristics as indicated for each analysis. Parent characteristics include education and psychological distress. Education, measured as less than B.A. versus B.A. or higher degree, reports the more educated parent, and serves as a general indicator of SES; in preliminary modeling income was non-significant in the presence of education. Parent psychological distress is screened by the Kessler 6-question Scale for Psychological Distress (K6), an extensively validated and widely used instrument developed by Harvard Medical School "to identify persons with a high likelihood of having a diagnosable mental illness and associated functional limitations" [10] in epidemiological populations. A score of 13 or higher on the 24-point scale is positive for non-specific Serious Psychological Distress (SPD) [11].

Family variables include family structure and biological parentage. Biological parentage indicates the degree of biological relationship of the child to her or his parents, with three categories: it is coded zero if both biological parents are present in the home; one if only one biological parent is present, as in a single parent or step-parent family; and two if neither biological parent is present in the home, as is the case with adopted children.

Child demographics include sex, age in years, and ethnicity (white, black, Hispanic, other). Stigmatization reports the percentage of parent

informants responding "somewhat true" or "certainly true" (as opposed to "not true") to the item, "During the past six months [the sample child] is picked on or bullied by other children". Comorbidities include measures of defiance and general emotional difficulties. Defiance reports the percentage responding "not true" on the same response set for the item, "During the past six months [the sample child] is generally well behaved, usually does what adults request". High SDQ reports the percent of children with a high score on the parent-reported Strengths and Difficulties Questionnaire, a common and well-validated instrument for assessing non-specific emotional or psychological difficulties among children in population data [12,13]. A score of 6 or greater on the 10-point scale used on NHIS indicates "a significantly increased probability of meeting criteria for a DSM-IV disorder" [14]. Due to data sparseness the standard is relaxed to 4 or greater for the present study.

Population risk ratios were estimated using bivariate logistic regression models. All analyses were performed using the STATA software package, with techniques that incorporated sampling weights and design features of the survey.

3. RESULTS

Overall 6.7% (95% CL 6.6-6.9%) of U.S. children were reported with ADHD during the period observed (1997-2013), increasing monotonically from 5.4% (95% CL 5.1-5.7%) in 1997-1999 to 8.4% (95% CL 8.1-8.8%) during 2011-2013. Table 2 presents the proportion by socio-demographic variables. ADHD prevalence was higher among adolescents, males, and white children, and for children with parents who had less than a B.A. degree, serious psychological distress (SPD) on the Kessler scale, and less biological relation to the child. Child conditions that co-occurred with ADHD were elevated levels of general emotional difficulties, attitudinal defiance, and being bullied.

Comparing children by parent sexual orientation in Table 3, children with same-sex parents were 2.4 times (CL 1.6-3.4) more likely to have ADHD than were children with opposite-sex parents, after controlling for age, sex, ethnicity and parent education. This ratio persisted robustly in most categories of the controls, with the exception of non-white children. The increased risk of ADHD with same-sex parents was highest for white children (OR 2.9 CL 1.9-4.5); risk was also

Table 1. Distribution (95% CL) of independent variables by parent sexual orientation: NHIS 1997–2013

Variable	OS	95% CL	SS	95% CL	P: χ^2 (OS=SS)
N (maximum)	207,007		512		
Age					
4-11	44.6	44.3-44.9	41.6	36.4-46.9	.26
12-17	33.5	33.2-33.8	35.0	30.0-40.3	.58
Sex					
Male	51.1	44.3-44.9	49.8	44.4-55.3	.64
Female	48.9	48.6-49.2	50.2	44.7-55.6	.64
Ethnicity					
White	50.3	49.7-50.9	48.1	42.7-53.5	.42
Black	12.7	12.4-13.2	19.7	15.4-24.9	.004
Hispanic	19.7	19.2-20.3	21.9	17.9-26.5	.33
Other/Unknown	17.3	16.9-17.6	10.4	7.7-13.8	.00
Parent education					
< B.A	66.4	65.8-66.9	64.8	59.5-69.8	.55
≥ B.A.	33.6	33.1-34.2	35.2	30.2-40.5	.55
Parentage type					
Two biological parents (natural)	63.9	63.5-64.4	0	0-0	.00
One biological parent (step or single)	34.3	33.9-34.7	76.4	70.7-81.2	.00
No biological parents (adoptive)	1.8	1.7-1.9	23.6	18.8-29.3	.00
Parent psychological distress (K6)					
Little/No distress	96.6	96.4-96.7	93.9	87.8-97.0	.22
Serious distress	3.4	3.3-3.6	6.1	3.0-12.2	.22
Child emotional problems (SDQ)					
Low	95.8	95.6-96.0	91.8	87.0-94.9	.04
High	4.2	4.1-4.4	8.2	5.1-13.0	.04
Defiance					
Obedient	74.5	74.1-74.8	64.4	58.0-70.3	.001
Defiant	25.6	25.2-25.9	35.6	29.7-42.0	.001
Stigmatization					
Not bullied	80.8	80.2-81.4	84.9	74.1-91.7	.36
Bullied	19.2	18.6-19.8	15.1	8.3-26.0	.36

NHIS, National Health Interview Survey; CL, confidence limit; OS, opposite sex; SS, same sex; K6, Kessler --, no cases. Total N varies by category due to missing values. Tests for Same-Sex Parents = Opposite-Sex Parents: $2 n \chi^2 P < 0.05$; $2 n \chi^2 P < 0.01$; $2 n \chi^2 P < 0.001$

elevated for black and Hispanic children with same-sex parents, but did not attain significance in these sparse data. Lower parental education, male sex and younger age may be associated with higher ADHD risk due to having same-sex parents, although these differences do not attain statistical significance (not shown).

Table 4 elaborates ADHD risk by parent sexual orientation for two parental and three child characteristics of interest. The well-documented co-occurrence of ADHD with general emotional problems and attitudinal defiance appears to be affect children with same-sex parents at about the same rate as those with opposite-sex parents, with odds ratios (2.0 to 2.2) little different than the overall odds ratio (2.4). Among

children with serious emotional problems ADHD risk is not significantly different by parent sexual orientation; this is likely an artifact of data sparseness, since (unlike the effects presented in the next paragraph) the overall risk pattern pertains to this group, and the risk approaches significance (P = .13).

3.1 Adopted Children and Parent Psychological Distress

In what may be a masking effect, the observed risk pattern reverses for children who are adopted (OR .54 CL .27-1.1) or whose parent(s) experience serious psychological distress (OR .89 CL .11-7.3). Overall, 3.4% (95% CL 3.3-3.6) of parenting adults on NHIS had SPD (not

shown, see Table 1)), diverging to 6.1% (95% CL 3-12) of same-sex parents compared to 3.4% (95% CL 3.3-3.6%) of opposite-sex parents. These conditions, which increase ADHD risk substantially among children with opposite-sex parents, do not increase risk, and may actually lower it somewhat, among children with same-sex parents, with the result that for adopted children ADHD risk is significantly lower with same-sex parents, and among children with psychologically distressed parents ADHD risk is not affected by parent sexual orientation.

3.2 Stigmatization

Children who are bullied and who have same-sex parents are over seven times (OR 7.3 CL 1.4-

38.1) more likely to have ADHD than are bullied children with opposite-sex parents, an effect that is three times as large as the overall odds ratio. Logistic regression analysis, shown in Table 5, confirmed that the effects of being bullied and of same-sex parentage were independent and additive. Put differently, children with ADHD are over three times (OR 3.2 95% CL 2.8-3.6) more likely to be stigmatized or bullied (than are those without ADHD) among those with opposite-sex parents, and over seven times (OR 7.5 95% CL 1.2-46.8) more likely to be bullied among those with same-sex parents (not shown).

Table 2. Prevalence of child ADHD: NHIS 1997–2013

Variable	N	Percent	95% CL	$\chi^2 P$
Total	182,214	6.7	6.6-6.9	
Age				
4-11	86,000	6.1	5.9-6.3	Ref
12-17	71,969	9.6 ^{***}	9.3-9.8	.000
Sex				
Male	88,485	9.5	9.2-9.7	Ref
Female	88,488	3.9 ^{***}	3.7-4.0	.000
Ethnicity				
White	71,008	8.3 ^{***}	8.1-8.6	Ref
Black	24,115	7.2 ^{***}	6.8-7.6	.000
Hispanic	51,381	4.1 ^{***}	3.9-4.3	.000
Other/Unknown	40,683	5.3 ^{***}	5.0-5.5	.000
Parent education				
< B.A	126,622	7.4	7.2-7.6	Ref
≥ B.A.	54,401	5.6 ^{***}	5.4-5.8	.000
Parentage type				
Two biological parents (natural)	89,824	4.4	4.3-4.6	Ref
One biological parent (step or single)	58,859	9.4 ^{***}	9.1-9.7	.000
No biological parents (adoptive)	2,966	21.8 ^{***}	19.7-23.9	.000
Parent psychological distress (Kessler 6)				
Little/No distress	84,183	6.3	6.1-6.6	Ref
Serious psychological distress	3,162	15.0	13.6-16.6	.000
Child emotional problems (SDQ)				
Low	95,488	6.6	6.4-6.8	Ref
High	4,140	39.4 ^{***}	37.5-41.3	.000
Defiance				
Obedient	74,040	4.9	4.7-5.1	Ref
Defiant	25,540	17.1 ^{***}	16.5-17.7	.000
Stigmatization				
Not bullied	22,626	5.3	5.1-5.5	Ref
Bullied	5,539	15.7 ^{***}	14.6-16.9	.000

*Adhd, Attention Deficit Hyperactivity Disorder; Nhis, National Health Interview Survey; Cl, Confidence Limit; K6, Kessler Scale Of Psychological Distress. Total N Does Not Include Missing Values. Tests For Difference From Reference Category: * 2 N X² P <0.05; ** 2 N X² P <0.01; *** 2 N X² P <0.001*

Table 3. Percentages (95% CL), unadjusted odds ratios (95% CL) and adjusted odds ratios (95% CL) of ADHD in children with opposite-sex parents compared to those with same-sex parents by demographic control variables: NHIS 1997–2013

Variable	N	OS parents	95% CL	SS parents	95% CL	OR (SS:OS)	95% CL	P, χ^2 (OS=SS)	AdjOR (SS:OS)	95% CL	P, χ^2 (OS=SS)
Total	195,240	6.8	6.7-7.0	14.0 ^{***}	10.2-18.8	2.21	1.55-3.15	.000	2.36	1.64-3.40	.000
Age											
4-11	81,197	6.2	6.0-6.4	14.4 ^{***}	9.2-21.8	2.54	1.53-4.21	.000	2.67	1.60-4.46	.000
12-17	68,002	9.7	9.5-10.0	18.6 ^{**}	12.6-26.6	2.13	1.34-3.37	.001	2.21	1.40-3.50	.000
Sex											
Male	88,485	9.6	9.4-9.8	20.5 ^{***}	14.6-28.0	2.43	1.61-3.66	.000	2.53	1.66-3.86	.000
Female	83,544	3.9	3.8-4.1	7.8 [*]	4.1-14.2	2.05	1.04-4.03	.033	2.09	1.05-4.13	.035
Ethnicity											
White	70,959	8.3	8.1-8.6	19.6 ^{***}	13.9-26.9	2.70	1.78-4.06	.000	2.88	1.86-4.46	.000
Black	24,090	7.2	6.8-7.6	12.2	5.0-27.0	1.80	0.68-4.78	.23	1.99	.74-5.36	.17
Hispanic	48,749	4.1	3.9-4.4	6.7	3.1-13.8	1.67	0.75-3.74	.20	1.72	.78-3.76	.18
Other/Unknown	1045	5.3	5.0-5.6	6.6	1.6-23.3	1.25	0.29-5.45	.76	1.28	.32-5.16	.73
Parent education											
< B.A.	119,579	7.5	7.3-7.7	15.3 ^{***}	10.4-21.9	2.23	1.43-3.46	.000	2.39	1.52-3.76	.000
≥ B.A.	51,483	5.6	5.4-5.9	11.5 ^{**}	7.7-18.3	2.18	1.27-3.75	.004	2.27	1.31-3.93	.004

ADHD, Attention Deficit Hyperactivity Disorder; NHIS, National Health Interview Survey; CL, confidence limit; --, no cases. Total N varies by category due to missing values. Adjusted odd ratios are adjusted for all other variables in the table. Age is adjusted for single years, not for the categories shown. Tests for Same-Sex Parents – Opposite-Sex Parents: * $2 n \chi^2 P < 0.05$; ** $2 n \chi^2 P < 0.01$; *** $2 n \chi^2 P < 0.001$

Table 4. Percentages (95% CI), unadjusted and adjusted odds ratios (95% CI) of adhd in children with opposite-sex parents compared to those with same-sex parents by variables of interest: nhis 1997–2013

	N	OS parents	95% CL	SS parents	95% CL	OR (SS:OS)	95% CL	P, χ^2 (OS=SS)	AdjOR (SS:OS)	95% CL	P, χ^2 (OS=SS)
Total	195,240	6.8	6.7-7.0	14.0 ^{***}	10.2-18.8	2.21	1.55-3.15	.000	2.36	1.64-3.40	.000
Parentage type											
Two biological parents (natural)	89,809	4.4	4.3-4.6	--	--	--	--	--	--	--	--
One biological parent (step)	58,848	9.4	9.1-9.7	14.8 [*]	9.9-21.5	1.7	1.07-2.6	.02	1.95	1.23-3.07	.004
No biological parents (adoptive)	2,962	22.0	19.9-24.2	14.7	8.0-25.3	.61	.31-1.21	.15	.54	.27-1.10	.09
Parent psychological distress (K6)											
Little/No distress	75,307	6.5	6.3-6.8	21.4 ^{***}	13.9-31.6	3.91	2.31-6.63	.000	4.36	2.54-7.48	.000
Serious Psychological Distress	2,891	15.2	13.7-16.9	15.8	2.6-56.9	1.05	.15-7.43	.96	.89	.11-7.29	.91
Child emotional problems (SDQ)											
Less than serious	95,177	6.6	6.4-6.8	12.5 ^{**}	8.1-18.8	2.02	1.25-3.28	.004	2.17	1.33-3.57	.002
Serious problems	4,136	39.3	37.5-41.3	54.6	29.9-77.3	1.86	0.66-5.24	.23	2.10	.80-5.48	.13
Defiance											
Obedient	73,801	4.9	4.7-5.1	8.9 [*]	5.1-15.2	1.91	1.04-3.50	.03	2.03	1.06-3.88	.03
Defiant	25,460	17.1	16.5-17.7	28.8 ^{**}	19.4-40.3	1.96	1.17-3.29	.009	2.21	1.34-3.64	.002
Stigmatization											
Not bullied	22,537	5.2	4.9-5.6	12.5 [*]	6.0-24.4	2.60	1.15-5.87	.018	2.80	1.26-6.24	.012
Bullied	5,527	15.7	14.6-16.8	58.9 ^{***}	28.3-83.8	7.70	2.14-27.64	.000	7.25	1.38-38.12	.02

ADHD, Attention Deficit Hyperactivity Disorder; NHIS, National Health Interview Survey; CL, confidence limit; --, no cases. Total N varies by category due to missing values. Adjusted odd ratios are adjusted for child age, sex, and ethnicity and parent education. Tests for Same-Sex Parents – Opposite-Sex Parents: * 2 n χ^2 P <0.05; ** 2 n χ^2 P <0.01; *** 2 n χ^2 P <0.001

3.3 Parent and Step-Parent Families

Since no same-sex couples are joint biological parents, and most (76%, 95% CL 71-81) of their children live with a parent and step-parent, comparison restricted to similarly situated opposite-sex parents permits, as best possible, the isolation of differences due to parent sexual orientation from those due to family structure. Table 6 reports the results. The data are too sparse in most categories for firm conclusions, and for a similar comparison among adopted children, however a few tentative observations can be made. When only parent and step-parent families are compared, overall ADHD risk due to same-sex parents is reduced by 17%, from 2.4 (95% CL 1.6-3.4) to 2.0 (95% CL 1.2-3.1), and risk by sex and for all three comorbidities examined (general emotional problems, defiance and stigmatization) is similarly moderated. All the reduction is among younger children, and is concentrated among white or Hispanic children with more highly educated parents—demographic categories where opposite-sex children are much more likely to reside with two biological parents. ADHD risk due to same-sex parents among children with psychologically distressed parents is substantially increased, almost tripling from .9 to 2.4.

3.4 Gay versus Lesbian Families

Table 7 compares ADHD prevalence among children with male same-sex (gay) parents and with female same-sex (lesbian) parents. Overall prevalence is almost identical for the two groups (14% for gay parents and 13.9% for lesbian parents), and does not differ significantly by sex or race, or with parents who are not psychologically distressed ($P > .41$ for these categories). Excluding adopted children, 18% (17.5%, 95% CL 12-24) of children with lesbian parents have ADHD, compared with 9% (8.6%, 95% CL 4-17) of children with gay parents. Higher parental education is associated with reduced prevalence for children with lesbian parents (7%, 95% CL 3-11) but much higher prevalence for children with gay male parents (26%, 95% CL 12-40). For children with low emotional problems, ADHD prevalence is also twice as high with gay male parents (18.9%, 95% CL 10-28) as with lesbian parents (9.4%, 95% CL 13-30). As the wide confidence intervals attest, these findings comparing gay and lesbian parents, while statistically significant, still have a high degree of uncertainty, and should only be

considered suggestive until confirmed or rebutted by better data.

4. DISCUSSION

ADHD and same-sex parenting share a history of denial, stigma and recently improved acceptance. In this national sample of American children aged 4-17 years, child ADHD risk was positively associated with residence with same-sex parents. The association persisted robustly in the presence of multiple confounders, with similar patterns of variation for children with opposite-sex parents and with same-sex parents. Excepting nonwhite ethnicities and the category of serious emotional problems, odds ratios for controls and comorbidities were significant and varied from 2.1 to 2.9. The strongest finding was that stigmatization (or perceived stigmatization) was associated with substantially increased risk of ADHD, which independently added to the risk due to having same-sex parents. Children with same-sex parents are not bullied more often than those with opposite-sex parents (OS = 19.2%, CL 19-20; SS = 15.1%, CL 8-26), but the bullying they experience is much more likely (OR 3.6 CL 2-7) to be associated with ADHD. Almost six in ten (59%, 95% CL 28-84) children in same-sex families who are bullied have been diagnosed with ADHD.

This finding conjoins separate bodies of research which have found peer stigmatization such as bullying to be associated with ADHD [15] and also with general emotional trauma for children with same-sex parents. Application of Barkley's theory that ADHD results from a deficit in inhibition that impairs executive functions, [16] undermining academic and social skills, [17] to bully victimization has suggested that higher victimization among children with ADHD results from an "impaired interpersonal coping style" [18] that invites abuse. Maladaptive or dysfunctional coping skills included passive avoidance, obsessive focus on the conflict, resignation, and inappropriate aggression. Children with same-sex parents may experience further aggravation in the development of adaptive peer coping skills, an intensification of the effects of stigmatization, or both. Family interventions to bolster anti-victimization skills are needed as part of a comprehensive treatment or preventive strategy for children diagnosed with ADHD, particularly for children with same-sex parents. To my knowledge, this is the first reported study of ADHD and children with same-sex parents in a total population. A better understanding of the

effect of parent sexual orientation and family structure on ADHD prevalence, incidence, and likely response to intervention may aid in developing more effective diagnosis and treatment for children at risk of ADHD.

Table 5. Adjusted odds ratios (95% CI) for ADHD among children aged 4–17 years showing combined effect of same-sex parents and stigmatization: NHIS 2001, 2003, 2004

	Model 9.1	Model 9.2	Model 9.3
Same-sex Parents	3.39 (1.8 – 6.4)		3.63 (1.9-7.0)
Stigmatized		3.42 (3.1 – 3.8)	3.43 (3.1 – 3.8)
N	28,059	28,099	28,059
McFadden's Pseudo-R ²	.056	.094	.095
Model Fit F (p)	.00	.34	0.19

ADHD, Attention-deficit hyperactivity disorder; NHIS, National Health Interview Survey. All odds ratios shown are significantly different from their reference category, P < .001. Model fit reports the Archer-Hosmer-Lemeshow goodness of fit statistic. All models are controlled for sex, age in years, ethnicity, and parent education (not shown)

Table 6. Adjusted odds ratios (95% CL) of ADHD for children in step-parent families with same-sex parents compared to those with opposite-sex parents: NHIS 1997–2013

	All		Step-parent families only	
	AdjOR (SS:OS)	95% CL	AdjOR (SS:OS)	95% CL
Total	2.36***	1.64-3.40	1.96**	1.24-3.12
Age				
4-11	2.67***	1.60-4.46	1.67	.82-3.39
12-17	2.21***	1.40-3.50	2.26**	1.29-3.96
Sex				
Male	2.53***	1.66-3.86	2.10**	1.22-3.62
Female	2.09*	1.05-4.13	1.75	.79-3.84
Ethnic				
White	2.88***	1.86-4.46	1.94*	1.13-3.32
Black	1.99	.74-5.36	2.84	.88-9.14
Hispanic	1.72	.78-3.76	1.28	.51-3.22
Other	1.28	.32-5.16	1.83	.46-7.36
Parent education				
< B.A.	2.39***	1.52-3.76	2.41**	1.42-4.09
≥ B.A.	2.27**	1.31-3.93	1.03	.48-2.24
Parent psychological distress (Kessler 6)				
Little/No distress (12 or less)	4.36***	2.54-7.48	4.08***	2.03-8.21
Serious distress (13 or more)	.89	.10-7.29	2.41	.38-15.2
Child emotional problems (SDQ)				
Low	2.17**	1.33-3.57	1.46	.74-2.88
High	2.10	.80-5.48	2.15	.65-7.08
Defiance				
Obedient (0)	2.03*	1.06-3.88	1.35	.57-3.23
Defiant (1 or 2)	2.21**	1.34-3.64	1.75	.92-3.32
Stigmatization				
Not bullied	2.80*	1.26-6.24	1.90	.77-4.69
Bullied	7.25*	1.38-38.12	4.00	.71-22.6

*Reference category for all contrasts is different-sex parents. ADHD, Attention Deficit Hyperactivity Disorder; NHIS, National Health Interview Survey; CL, confidence limit. Odd ratios are adjusted for child age, sex, and ethnicity and parent education. * 2 n χ² P < 0.05; ** 2 n χ² P < 0.01; *** 2 n χ² P < 0.001*

Table 7. Percent of children with ADHD in same-sex parent families by sex of parents: NHIS 1997–2013

	N	Male Parents (Gay)	90% CL	Female Parents (Lesbian)	90% CL	P, Wald (Gay = Lesbian)
Total	512	14.0	7.8-23.8	13.9	10.2-18.7	.99
Sex						
Male	231	18.3	10.8-29.2	21.8	15.3-30.0	.63
Female	227	7.8	3.0-18.8	7.8	4.2-14.1	.99
Ethnic						
White	198	20.6	12.2-32.7	19.1	13.3-26.6	.84
Non-white	260	5.4	1.7-15.6	9.8	5.5-16.8	.41
Parentage Type						
One bio parent (stepfamily)	289	8.6	4.3-16.8	17.5 [*]	12.3-24.3	.07
No bio parent (adoptive)	86	--	--	--	--	--
Parent Education						
Less than B.A	290	9.2	2.7-15.7	18.2 [*]	12.1-24.2	.09
B.A. Degree or More	167	26.0	12.1-40.0	7.0 ^{**}	3.0-11.1	.03
Parent Psychological Distress (K6)						
Not Distressed	171	20.9	7.5-34.3	21.6	13.4-29.9	.93
Distressed	10	--	--	--	--	--
Child Emotional Problems (SDQ)						
Low	277	18.9	10.2-27.6	9.4 [*]	4.8-14.0	.09
High	22	--	--	--	--	--
Defiance						
Obedient (0)	191	11.2	2.9-19.6	7.8	3.2-12.3	.54
Defiant (1 or 2)	108	37.4	20.6-54.2	25.4	14.9-35.9	.32

ADHD, Attention Deficit Hyperactivity Disorder; NHIS, National Health Interview Survey; CL, confidence limit; --, insufficient cases for analysis; K6, Kessler Scale of Psychological Distress; SDQ, Strengths and Difficulties Questionnaire. Effective N varies by category due to missing values. Tests for Gay Parents – Lesbian Parents = 0: ^{*}1n Wald P <0.10; ^{**}1n Wald P <0.05; ^{***}1n Wald P <0.01; ^{****}1n Wald P <0.001

ADHD is believed to be caused by a combination of genetic and environmental factors, with genetic factors predominant [19,20]. The same can be said, interestingly, of the aetiology of same-sex attraction [21,22]. Regarding the association of parent psychopathy with child ADHD, Margari and colleagues suggest that “the presence of executive cognitive functions deficit in parents leads to a lower management of the behavioral problems of ADHD children, aggravating the clinical picture and the general functioning of children”. However it is not known whether parent psychopathy is “connected to biological underpinnings of this disorder or impaired parenting in the management of their children” [23]. Similarly, we could ask whether higher ADHD risk for children with same-sex parents results from impaired parenting or a direct biological link. The findings of the present study that ADHD prevalence in same-sex families was lower than in opposite-sex families with psychologically distressed parents and among adopted children, suggest that genetic rather than environmental factors influence child ADHD with same-sex parents, perhaps through a direct association, that is, a correlation between same-sex attraction and parent ADHD. On the

other hand, the presence of at most one biological parent and the corresponding existence of an absent, most likely heterosexual, parent for all or almost all children residing with same-sex parents complicates the transmission of any genetic influence, such as a possible affinity for ADHD, associated with same-sex attraction. Further research is needed to clarify the nature of the link between same-sex parents and child ADHD.

4.1 Strengths and Limitations

The greatest strength and limitation of this study is the size of the sample of same-sex persons, at 512 cases. This is a large number relative to other studies of same-sex persons, but a small number relative to most population studies. NHIS employs comprehensive post-stratification weighting, which improves representativeness somewhat over simple random sampling, but statistical power is nonetheless insufficient to determine many distinctions of interest regarding this population. The necessity of aggregating seventeen years of data may increase measurement error or conflate nonlinear trends. The representativeness of the sample and the

use of sample weights provides generalizability of the results to United States household population. However, results may not be applicable to countries where the social situation of same-sex parents differs markedly from the US, e.g. many African or Asian nations. As with all observational studies, causal inference is not possible. Child measures are based on parent reports, which may be subject to social desirability bias and therefore inflated, however it is unlikely that such bias would operate differentially on the two groups of parents involved.

4.2 Future Research

The most pressing need for future research is an oversample of same-sex parents in population surveys, to enable the collection of samples of this sparse group that have greater statistical power. None of the further suggestions made in this paragraph are feasible in the absence of such an effort. In light of the association of ADHD with higher peer rejection due to lower interpersonal coping skills [18], future research to explore interactions of ADHD and having same-sex parents with the differential effects of perceived stigma would be helpful. The differences observed between children with gay and lesbian parents also suggest that further research elaborating this distinction by child sex may advance understanding both of sexual orientation and sex-role development in general. Finally, research on the question of nature versus nurture for both ADHD and same-sex attraction may shed light on the high joint prevalence and on the aetiology of both conditions, in particular on whether there is a genetic affinity between same-sex attraction and ADHD.

5. CONCLUSION

Children with same-sex parents in the United States were more than twice as likely to suffer ADHD than were children with opposite-sex parents. Risk with same-sex parents was null among adopted children and psychologically distressed parents, and elevated in the presence of peer stigmatization or bullying. Almost six in ten children with same-sex parents who were bullied suffered ADHD; impaired interpersonal coping skills may aggravate bully victimization for these children. Associations suggest the presence of shared genetic factors between ADHD and same-sex attraction, though more research is needed to confirm. Diagnosis and

treatment of ADHD should be aware of parent sexual orientation and include resources for anti-victimization skills for children, particularly those with same-sex parents.

CONSENT

Not applicable.

ETHICAL APPROVAL

Not applicable.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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