

The Mental Health of US Adolescents Adopted in Infancy

Margaret A. Keyes, PhD; Anu Sharma, PhD; Irene J. Elkins, PhD; William G. Iacono, PhD; Matt McGue, PhD

Objective: To determine whether adopted adolescents are at excess risk for clinically relevant behavioral and emotional problems.

Design: We examined whether adopted and non-adopted adolescents differed on quantitative indicators of mental health and the prevalence of childhood disorders and whether differences exist between internationally and domestically placed adoptees.

Setting: Assessments occurred at the University of Minnesota from December 11, 1998, to June 4, 2004.

Participants: Adolescents adopted in infancy were systematically ascertained from records of 3 large Minnesota adoption agencies; nonadopted adolescents were ascertained from Minnesota birth records. The final sample included these adolescents with their rearing parents.

Main Exposure: The main exposure was adoptive status: nonadopted (n=540), international adoptive placement (n=514), or domestic adoptive placement (n=178).

Outcome Measures: *Diagnostic and Statistical Manual of Mental Disorders* (Fourth Edition) clinical assess-

ments based on child and parent reports of attention-deficit/hyperactivity, oppositional defiant, conduct, major depressive, and separation anxiety disorders; teacher reports of psychological health; and contact with mental health professionals.

Results: Adoptees scored only moderately higher than nonadoptees on quantitative measures of mental health. Nevertheless, being adopted approximately doubled the odds of having contact with a mental health professional (odds ratio [OR], 2.05; 95% confidence interval [CI], 1.48-2.84) and of having a disruptive behavior disorder (OR, 2.34; 95% CI, 1.72-3.19). Relative to international adoptees, domestic adoptees had higher odds of having an externalizing disorder (OR, 2.60; 95% CI, 1.67-4.04).

Conclusions: Moderate mean differences in quantitative indicators of mental health can lead to substantial differences in disorder prevalence. Although most adopted adolescents are psychologically healthy, they may be at elevated risk for some externalizing disorders, especially among those domestically placed.

Arch Pediatr Adolesc Med. 2008;162(5):419-425

Author Affiliations:

Department of Psychology, University of Minnesota, Minneapolis (Drs Keyes, Elkins, Iacono, and McGue); Minnesota Institute of Public Health, Mounds View (Dr Sharma); and Institute of Public Health, University of Southern Denmark, Odense (Dr McGue).

IN THE UNITED STATES, APPROXIMATELY 120 000 children are adopted annually, and adopted individuals constitute about 1.5 million children younger than 18 years.¹ The face of adoption is changing, however, as decreasing domestic adoptions have been accompanied by a sharp increase in the number of international adoptions. Worldwide, approximately 40 000 children per year are moved between more than 100 countries through adoption.² Despite the popularity of adoption, there is a persistent concern that adopted children may be at heightened risk for mental health or adjustment problems.³ Previous research has shown that adopted children with a history of prenatal substance exposure⁴ or preplacement deprivation⁵ and those who were placed

relatively late in their adoptive homes⁶ are at heightened risk of social, intellectual, and emotional problems. Nevertheless, existing research has not resolved the extent to which those adoptees with a good preplacement history and an early age at placement are at increased risk for clinically relevant mental health problems.

Although most adopted individuals are well-adjusted, population-based studies^{7,8} have reported an elevated risk for psychological maladjustment in adopted children compared with representative samples of nonadopted children. In a recent meta-analysis of findings from more than 25 000 adoptees, Juffer and van Ijzendoorn² reported significantly more behavioral problems among adoptees compared with nonadoptees. The effect sizes (ESs) associated with these differences,

however, were small (range, 0.16-0.24). Interestingly, international adoptees evidenced fewer behavioral and emotional problems than domestic adoptees.

Most studies in the meta-analysis, however, were based on questionnaire assessments of behavioral problems (eg, the Child Behavior Checklist) and do not speak to the existence of clinically meaningful differences in diagnoses. This distinction is particularly salient because modest adoptee/nonadoptee differences in questionnaire assessments of population samples contrast with a substantial overrepresentation of adopted children in clinical samples. Estimates of the percentage of adopted children seen in mental health settings fall within the range of 5% to 12%,⁹ or 2.5 to 6.0 times the percentage of adopted children in the general population. Indeed, the same meta-analytic review² that reported modest differences in behavioral problems reported large differences for mental health referral between adopted and nonadopted children. The discrepancy between small adoptee/nonadoptee differences in questionnaire assessments and large differences in mental health referrals may, in part, reflect a lower threshold for referral in adoptive than nonadoptive families. Adoptive parents may be more willing to seek help from a mental health professional for their troubled child because they are better educated or have greater economic resources than many nonadoptive parents or because they have previously interacted with social service providers in the process of adoption.¹⁰ Furthermore, the parent of an adopted child may have a lower threshold than the parent of a nonadopted child for reporting a behavior as problematic. It is important to determine whether differences between adopted and nonadopted adolescents emerge when ratings from multiple sources (eg, teacher, child, and parent reports) are considered.

Thus, a more general understanding of the extent to which adopted individuals are at increased risk for clinically relevant mental health problems relies on research using multiple raters that compares the prevalence of *Diagnostic and Statistical Manual of Mental Disorders* (Fourth Edition) (*DSM-IV*) disorders in population-based samples of adoptees and nonadoptees. Using a sample of 692 adopted and 540 nonadopted adolescents, the present study addressed the following questions: (1) Are common *DSM-IV* childhood disorders more prevalent in adoptees than nonadoptees? (2) Are differences between adoptees and nonadoptees found across raters? and (3) Do domestic adoptees have significantly more mental health problems than international adoptees?

METHODS

PARTICIPANTS

Participants were drawn from the Sibling Interaction and Behavior Study, a study of 409 adoptive and 208 nonadoptive families, each consisting of an adolescent sibling pair and 1 or both rearing parents. Adoptive families were systematically ascertained from infant placements made by 3 large private adoption agencies in Minnesota. Although parents provided information on the country of birth and ethnicity of participating adolescents, this information was not used in the recruitment process. We have no additional information on the biological

parents or birth circumstances of the adoptees. Nonadoptive families were ascertained through Minnesota state birth records by identifying sequential births to the same mother and father (ie, full biological siblings). To ensure comparability across samples, offspring in nonadoptive families were selected to have distributions of sex and birth year similar to those in adoptive families.

Eligibility requirements for adoptive families included having the following: (1) an adopted adolescent who had been placed permanently in the adoptive home before the age of 2 years and (2) a second adolescent sibling in the home who was not biologically related to the adopted adolescent but who could be biologically related to the rearing parents. Among the 409 adoptive families were 124 in which 1 member of the sibling pair was a biological child of the adoptive parents; these adolescents were included in the analyses and classified as nonadoptees. Nonadoptive families were required to have a pair of full biological adolescent siblings. All adolescents were required to be aged between 11 and 21 years. Additional requirements for both types of families included living within driving distance of our laboratories, neither adolescent having any handicap that would preclude completing our in-person assessment, and participating siblings being no more than 5 years apart in age.

Among eligible families, the percentage participating was slightly, but not significantly ($P = .06$), higher among adoptive (63.2%) compared with nonadoptive (57.3%) families. Sample representativeness was assessed by conducting a brief telephone interview with 73% of eligible but nonparticipating families. Participating and nonparticipating families did not differ significantly on father's education level, mother's and father's occupational status, percentage of original parents who remained married, or number of parent-reported behavioral disorders in their children. In nonadoptive families, more participating mothers were college educated (43.8%) than nonparticipating mothers (28.6%) ($P < .01$). A comparison to integrated public use microdata series for Census 2000¹¹ indicates that the percentage of nonadoptive fathers who graduated from college is similar to that in the population of families with at least 2 children residing in the Minneapolis-St Paul metropolitan area (47% in the integrated public use microdata series sample and 44% in the nonadoptive families). Similar to our analysis of nonparticipants, there seems to be a slight positive selection for college education in the nonadoptive mothers (39% in the integrated public use microdata series sample and 44% in the nonadoptive families). A complete description of the Sibling Interaction and Behavior Study recruitment process, including an analysis of nonparticipants, can be found in the study by McGue et al.¹²

Two adopted adolescents were ruled ineligible after participation, resulting in a sample of 1232 adolescents, including 540 nonadoptees, 514 adoptees born outside the United States, and 178 adoptees born in the United States. These groups are subsequently referred to as nonadopted adolescents, international adoptees, and domestic adoptees, respectively. The sample of international adoptees reflects the ethnic diversity and female preponderance of adopted infants placed in Minnesota during the relevant years: 60.3% are female and 89.7% were adopted from South Korea. The domestic adoptees are 41.0% female and 78.7% white. Consistent with Minnesota demographics, 95.6% of the nonadopted adolescents are white and 54.1% are female.

PROCEDURE

The research protocol was approved by the University of Minnesota institutional review board. On arriving at the laboratory, a complete description of the study was followed by written

informed consent from parents and assent from minor offspring. Adolescents and their parents were interviewed simultaneously, each in a separate room, by a different interviewer. Interviewers had a master's or bachelor's degree in psychology (or a related field), participated in intensive training in clinical diagnostic interviewing, passed written examinations, and satisfied proficiency criteria. Finally, for each adolescent still in grade or high school, we obtained teacher ratings from up to 3 recent teachers.

MEASURES

Family Socioeconomic Status

Each parent's level of education was coded on a 5-point scale (1 indicates less than high school; 2, high school or general equivalency diploma; 3, some college; 4, college degree; and 5, professional degree). For all parents employed full-time, occupational status was coded on a 6-point reflected Hollingshead scale (1 indicates manual labor; and 6, professional or managerial). We standardized the educational and occupational status scores for each parent using the mean (SD) from the distribution of scores for the nonadoptive families. We then summed these standardized scores for the parents in each family to form a composite socioeconomic status (SES) indicator (mean, 0.35; SD, 1.00).

Diagnostic Assessment

Adolescents 15 years or younger at assessment were interviewed with the revised version of the Diagnostic Interview for Children and Adolescents,^{13,14} modified to ensure complete coverage of *DSM-IV* childhood disorders. All questions asked of the child were also asked of the mother as they pertained to the child. Responses were written in the interview booklet, and the interview was audiotaped. Childhood disorders assessed over the lifetime included oppositional defiant (ODD), attention-deficit/hyperactivity (ADHD), conduct (CD), major depressive (MDD), and separation anxiety (SAD) disorders. Oppositional defiant disorder was assessed without regard for the presence of CD. Adolescents 16 years or older and their mothers were also administered the modified Diagnostic Interview for Children and Adolescents to assess the childhood disorders previously listed. Major depressive disorder was assessed with the Structured Clinical Interview for *Diagnostic and Statistical Manual of Mental Disorders* (Third Edition Revised),¹⁵ updated to cover *DSM-IV* criteria.

Every interview was reviewed by at least 2 individuals with advanced clinical training (supervised by a doctoral-level clinical psychologist) who examined the interview booklet and listened to audiotapes as necessary. This information was used to code, by consensus, every *DSM-IV* symptom and diagnostic criterion. Consensus staff were blind to the diagnoses of other family members. For each of the 5 assessed disorders, for each rater (mother and child), we created a count of the number of positive symptoms and counts of the total number of externalizing (ADHD, CD, plus ODD) and internalizing (MDD plus SAD) symptoms. Diagnoses were assigned by computer programs that implemented *DSM-IV* algorithms. Our software enabled us to combine information across adolescents and their mothers to yield best-estimate diagnoses, which were considered positive if all *DSM-IV* criteria were met.¹⁶ Formal studies of more than 500 participants have determined the reliability (κ coefficients) of our clinical assessments: 0.73 (ODD), 0.77 (ADHD), 0.80 (CD), 0.86 (MDD), and 0.88 (SAD). Composite externalizing (any of ODD, ADHD, or CD) and internalizing (either MDD or SAD) diagnoses were also computed.

Teacher Reports

The teacher rating form included items adapted from the Conners' Teacher Rating Scale,¹⁷ the Rutter Child Scale B,¹⁸ and personality trait ratings. The teacher rating scales (along with internal consistency and interteacher reliability estimates) included in this study are as follows: Oppositional (reliabilities, 0.96 and 0.77, respectively), Hyperactive (reliabilities, 0.95 and 0.74, respectively), Inattentive (reliabilities, 0.96 and 0.74, respectively), Anxious (reliabilities, 0.80 and 0.52, respectively), and Withdrawn (reliabilities, 0.77 and 0.50, respectively). Teacher rating data were returned for 77.8% of eligible adolescents. Neither sex nor adoption status was related to percentage returned.

Contact With a Mental Health Professional

As part of a life history interview, each parent was asked, "Has your child ever seen anyone for emotional concerns?" Adolescents were coded as having contact with a mental health professional if this question was answered yes by either their mother or their father. Parent agreement was assessed using the κ coefficient (κ , 0.53).

STATISTICAL ANALYSES

The effect of adoption status (nonadopted adolescent, domestic adoptee, or international adoptee) was investigated using analysis of variance for quantitative outcomes and logistic regression for categorical outcomes. The clustered nature of the family data was taken into account with hierarchical linear models, as incorporated into 2 programs (PROC MIXED [for quantitative outcomes] and PROC GENMOD [for categorical outcomes]) in SAS statistical software.¹⁹ All quantitative measures were log-transformed before analysis. Overall analyses were followed by planned pairwise comparisons of (1) all adopted with all nonadopted adolescents, (2) domestic adoptees with all nonadopted adolescents, (3) international adoptees with all nonadopted adolescents, and (4) domestic with international adoptees. Covariates included age at assessment, sex, and family SES for all comparisons between adopted and nonadopted adolescents. An additional covariate, age at placement, was included for comparisons between domestic and international adoptees. Effect sizes (for quantitative outcomes), odds ratios (ORs) (for categorical outcomes), and confidence intervals (CIs) are reported for pairwise comparisons. Effect sizes were estimated by dividing the difference in the covariate-adjusted means by the residual standard deviation.

RESULTS

Because domestic adoptees were significantly more likely to be male than nonadopted adolescents ($P < .01$) or international adoptees ($P < .001$), **Table 1** gives means (SDs) for quantitative variables separately by sex and adoption status, including age at placement, age at assessment, family SES, teacher rating scale scores, and mother- and child-rated symptom counts for the individual disorders and for externalizing (ODD, ADHD, and CD) and internalizing (MDD and SAD) disorders combined. Table 1 also gives the lifetime prevalence for *DSM-IV* diagnoses of ODD, ADHD, CD, MDD, and SAD; any externalizing disorder; any internalizing disorder; and contact with mental health professionals.

Looking first at demographic variables, age at assessment did not vary by adoption status. Although all

Table 1. Descriptive Statistics by Sex and Adoption Status

Variable ^a	Male Sample ^b			Female Sample ^b		
	Nonadopted Adolescents (n=248)	Domestic Adoptees (n=105)	International Adoptees (n=204)	Nonadopted Adolescents (n=292)	Domestic Adoptees (n=73)	International Adoptees (n=310)
Demographics						
Placement age, mo	NA	3.00 (3.8)	5.54 (3.2)	NA	1.88 (1.7)	5.28 (3.2)
Assessment age, y	14.85 (1.8)	14.93 (2.1)	14.82 (1.5)	14.93 (2.0)	15.04 (2.1)	15.03 (2.1)
Family SES	0.09 (1.1)	0.34 (0.9)	0.66 (0.8)	0.08 (1.0)	0.39 (0.9)	0.60 (0.9)
Quantitative outcomes						
Teacher reports						
Oppositional	34.40 (8.9)	39.11 (10.8)	35.81 (9.1)	31.43 (5.7)	35.85 (10.3)	31.95 (7.0)
Hyperactive	11.79 (4.5)	13.39 (4.6)	12.29 (4.4)	10.09 (2.4)	11.17 (2.9)	10.48 (3.0)
Inattentive	15.43 (6.2)	19.35 (7.2)	16.26 (6.4)	12.52 (4.2)	14.23 (4.8)	12.62 (4.4)
Anxious	9.27 (2.3)	10.45 (2.8)	10.56 (3.0)	9.75 (2.3)	10.91 (3.4)	10.23 (3.0)
Withdrawn	5.85 (2.1)	6.36 (2.4)	6.21 (2.1)	5.69 (1.9)	5.78 (2.1)	5.63 (1.9)
Parent reports, No. of symptoms						
ODD	0.83 (1.4)	1.48 (1.9)	1.19 (1.7)	0.66 (1.2)	1.41 (1.8)	0.99 (1.5)
ADHD	1.11 (2.4)	3.12 (4.0)	2.30 (3.7)	0.81 (2.5)	1.55 (3.2)	0.86 (2.4)
CD	0.23 (0.6)	0.72 (1.4)	0.48 (1.2)	0.17 (0.5)	0.32 (0.7)	0.21 (0.6)
Externalizing	2.17 (3.2)	5.34 (5.7)	4.00 (5.5)	1.64 (3.2)	3.27 (4.6)	2.05 (3.5)
MDD	0.27 (1.0)	0.33 (1.4)	0.46 (1.3)	0.46 (1.4)	0.60 (1.5)	0.72 (1.8)
SAD	0.21 (0.6)	0.19 (0.5)	0.43 (0.9)	0.27 (0.6)	0.32 (0.7)	0.40 (0.9)
Internalizing	0.48 (1.1)	0.52 (1.5)	0.88 (1.8)	0.73 (1.5)	0.92 (1.9)	1.12 (2.2)
Child reports, No. of symptoms						
ODD	0.49 (1.0)	1.09 (1.6)	0.71 (1.4)	0.46 (1.0)	0.85 (1.2)	0.63 (1.2)
ADHD	1.40 (2.5)	1.99 (3.4)	1.77 (3.0)	0.73 (2.0)	1.45 (2.6)	1.01 (2.3)
CD	0.74 (1.4)	0.86 (1.3)	0.43 (0.8)	0.22 (0.7)	0.26 (0.6)	0.25 (0.7)
Externalizing	2.63 (4.0)	3.96 (4.9)	2.91 (4.2)	1.36 (2.8)	2.56 (3.3)	1.90 (3.5)
MDD	0.35 (1.4)	0.43 (1.5)	0.36 (1.3)	0.53 (1.6)	0.51 (1.5)	0.77 (2.0)
SAD	0.19 (0.5)	0.21 (0.6)	0.21 (0.5)	0.30 (0.8)	0.25 (0.5)	0.28 (0.7)
Internalizing	0.53 (1.4)	0.64 (1.7)	0.58 (1.4)	0.82 (1.9)	0.75 (1.5)	1.05 (2.3)
Categorical outcomes (lifetime prevalence), %						
Clinical disorders						
ODD	11.7	25.2	20.2	8.6	19.2	15.8
ADHD	8.5	28.8	19.2	5.2	16.4	6.5
CD	6.5	14.6	8.4	2.4	2.7	2.6
MDD	5.3	4.9	5.5	7.6	8.2	12.6
SAD	2.0	2.9	6.0	3.5	2.7	5.8
Any externalizing disorder	20.6	47.6	33.0	12.7	30.1	18.7
Any internalizing disorder	7.3	7.8	10.5	10.7	11.0	17.4
Contact with mental health professional	15.7	32.4	29.4	15.4	20.5	27.4

Abbreviations: ADHD, attention-deficit/hyperactivity disorder; CD, conduct disorder; MDD, major depressive disorder; NA, data not applicable; ODD, oppositional defiant disorder; SAD, separation anxiety disorder; SES, socioeconomic status.

^aExternalizing symptoms were aggregated across ODD, ADHD, and CD; and internalizing symptoms were aggregated across MDD and SAD. Any externalizing disorder includes ODD, ADHD, and CD; and any internalizing disorder includes MDD and SAD. Diagnoses are based on the *Diagnostic and Statistical Manual of Mental Disorders* (Fourth Edition), are lifetime, and are generated using a best-estimate algorithm.

^bData are given as mean (SD) unless otherwise indicated.

adoptees were placed as infants, domestic adoptees were placed significantly earlier than international adoptees ($P < .001$). Family SES was significantly higher for all adopted adolescents ($P < .001$), and domestic ($P < .01$) and international adoptees ($P < .001$) separately, compared with nonadopted adolescents. In addition, family SES was significantly higher for international adoptees compared with domestic adoptees ($P < .05$).

Analysis of variance results, including ES estimates and CIs for all planned comparisons of the quantitative outcome measures, are given in **Table 2**. After statistically adjusting for age at assessment, sex, and family SES, the adoption effect was statistically significant for every quantitative indicator of externalizing problems, except the child-reported symptoms of CD. Overall, adoptees had

more externalizing problems than nonadoptees, as reported by teacher, parent, and child, with the significant ESs ranging from modest to moderate (ie, 0.18-0.46). Compared with nonadoptees, adoptees were rated as being significantly more anxious by their teachers, although adoptees did not have significantly more MDD or SAD symptoms by either parent or child report. Thus, adoption is associated with a modest to moderate elevation in externalizing problems and weaker effects on internalizing problems.

The subsample of domestic adoptees scored significantly higher than nonadoptees on all quantitative measures of externalizing behavior by all raters. They were also rated by their teachers as being more anxious. Relative to nonadoptees, the subsample of international adopt-

Table 2. Standardized Effect Size Estimates From ANOVA of Quantitative Outcomes by Adoption Status

Variable ^a	Adopted vs Nonadopted Adolescents ^{b,c}	Domestic Adoptees vs Nonadopted Adolescents ^{b,c}	International Adoptees vs Nonadopted Adolescents ^{b,c}	Domestic vs International Adoptees ^{b,d}
Teacher reports				
Oppositional	0.43 (0.26 to 0.59) ^e	0.67 (0.44 to 0.90) ^e	0.18 (0.02 to 0.34) ^e	0.63 (0.39 to 0.88) ^e
Hyperactive	0.35 (0.19 to 0.51) ^e	0.52 (0.29 to 0.75) ^e	0.17 (0.01 to 0.34) ^e	0.45 (0.20 to 0.69) ^e
Inattentive	0.38 (0.21 to 0.55) ^e	0.63 (0.39 to 0.87) ^e	0.13 (-0.04 to 0.30)	0.62 (0.39 to 0.86) ^e
Anxious	0.39 (0.23 to 0.55) ^e	0.46 (0.23 to 0.68) ^e	0.32 (0.17 to 0.48) ^e	0.25 (0.01 to 0.50) ^e
Withdrawn	0.09 (-0.07 to 0.25)	0.12 (-0.11 to 0.34)	0.06 (-0.09 to 0.22)	0.07 (-0.17 to 0.32)
Parent reports of symptoms				
ODD	0.36 (0.22 to 0.50) ^e	0.49 (0.29 to 0.68) ^e	0.23 (0.09 to 0.37) ^e	0.35 (0.13 to 0.56) ^e
ADHD	0.36 (0.23 to 0.50) ^e	0.56 (0.37 to 0.74) ^e	0.17 (0.04 to 0.31) ^e	0.37 (0.18 to 0.56) ^e
CD	0.33 (0.17 to 0.48) ^e	0.49 (0.28 to 0.70) ^e	0.16 (0.01 to 0.32) ^e	0.37 (0.14 to 0.59) ^e
Externalizing	0.46 (0.32 to 0.60) ^e	0.68 (0.49 to 0.88) ^e	0.24 (0.09 to 0.38) ^e	0.50 (0.29 to 0.71) ^e
MDD	0.11 (-0.03 to 0.24)	0.04 (-0.15 to 0.24)	0.18 (0.04 to 0.31) ^e	-0.07 (-0.28 to 0.14)
SAD	0.09 (-0.06 to 0.23)	-0.01 (-0.20 to 0.19)	0.18 (0.04 to 0.33) ^e	-0.23 (-0.45 to -0.01) ^e
Internalizing	0.10 (-0.04 to 0.24)	0.00 (-0.20 to 0.21)	0.20 (0.05 to 0.34) ^e	-0.16 (-0.38 to 0.06)
Child reports of symptoms				
ODD	0.32 (0.19 to 0.45) ^e	0.47 (0.29 to 0.66) ^e	0.17 (0.04 to 0.30) ^e	0.39 (0.19 to 0.60) ^e
ADHD	0.18 (0.05 to 0.30) ^e	0.23 (0.06 to 0.41) ^e	0.13 (-0.01 to 0.26)	0.16 (-0.05 to 0.37)
CD	0.06 (-0.08 to 0.20)	0.20 (0.02 to 0.38) ^e	-0.08 (-0.21 to 0.06)	0.44 (0.22 to 0.67) ^e
Externalizing	0.30 (0.17 to 0.43) ^e	0.45 (0.27 to 0.63) ^e	0.15 (0.01 to 0.29) ^e	0.39 (0.18 to 0.60) ^e
MDD	0.07 (-0.06 to 0.21)	0.03 (-0.16 to 0.22)	0.12 (-0.02 to 0.26)	-0.05 (-0.26 to 0.16)
SAD	-0.01 (-0.13 to 0.12)	-0.03 (-0.21 to 0.15)	0.02 (-0.10 to 0.15)	-0.11 (-0.31 to 0.08)
Internalizing	0.06 (-0.08 to 0.20)	0.02 (-0.17 to 0.21)	0.11 (-0.03 to 0.25)	-0.10 (-0.31 to 0.12)

Abbreviations: ADHD, attention-deficit/hyperactivity disorder; ANOVA, analysis of variance; CD, conduct disorder; MDD, major depressive disorder; ODD, oppositional defiant disorder; SAD, separation anxiety disorder.

^aExternalizing symptoms were aggregated across ODD, ADHD, and CD; and internalizing symptoms were aggregated across MDD and SAD.

^bData are given as effect sizes (95% confidence intervals). Standardized effect sizes were computed as follows: (mean of first named group - mean of second named group)/residual standard deviation.

^cCovariates for adopted vs nonadopted adolescents, domestic adoptees vs nonadopted adolescents, and international adoptees vs nonadopted adolescents include age at assessment, sex, and parental socioeconomic status.

^dCovariates for domestic vs international adoptees include age at placement, age at assessment, sex, and parental socioeconomic status.

^eThese were significant effects.

ees was also seen as having higher levels of externalizing behavior, although differences were not always significant and the ESs were more modest than those observed with domestic adoptees. Focusing on internalizing problems, teachers reported that international adoptees were significantly more anxious than nonadopted adolescents and their parents reported significantly more symptoms of internalizing disorders, specifically MDD and SAD.

For comparisons between international and domestic adoptees, age of placement was added as a covariate. Results show that domestic adoptees are consistently more extreme than international adoptees on every quantitative indicator of externalizing behavioral problems, except for child-reported ADHD symptoms; ESs ranged from small to moderate (ie, 0.25-0.63). In terms of internalizing problems, domestic and international adoptees did not differ consistently. For example, teachers reported that domestic adoptees were significantly more anxious than international adoptees; however, parents reported significantly fewer symptoms of SAD in domestic than international adoptees.

Logistic regression results, along with associated ORs and CIs for *DSM-IV* diagnoses, are given in **Table 3**. The odds of being diagnosed as having an externalizing disorder (specifically, ADHD and ODD), but not an internalizing disorder, were approximately twice as high in all adopted adolescents compared with nonadopted ado-

lescents. Similar findings were observed when samples of domestic and international adoptees were each compared with nonadopted adolescents. Domestic adoptees also had higher odds of having CD compared with nonadopted adolescents. Adding age at placement as a covariate, ORs were consistently higher for domestic compared with international adoptees for externalizing disorders, specifically ADHD. Finally, all adopted adolescents, and domestic and international adoptees separately, were significantly more likely to have had contact with a mental health professional compared with nonadopted adolescents. There was no significant difference between domestic and international adoptees in likelihood of contact.

COMMENT

Consistent with recent meta-analyses, adopted adolescents scored significantly higher on quantitative measures of behavioral and emotional problems. Effect sizes were typically in the small to moderate range, higher for indicators of externalizing than internalizing disorders, and generally robust across raters (parent vs teacher vs child). More important, we found the odds of help seeking to be approximately twice as high in adopted adolescents. This overrepresentation mirrors higher levels of clinically significant problems in adopted adolescents.

Table 3. Data From Logistic Regression of Categorical Outcomes by Adoption Status

Variable ^a	Adopted vs Nonadopted Adolescents ^{b,c}	Domestic Adoptees vs Nonadopted Adolescents ^{b,c}	International Adoptees vs Nonadopted Adolescents ^{b,c}	Domestic vs International Adoptees ^{b,d}
Clinical disorders				
ODD	2.24 (1.57-3.20) ^e	2.51 (1.58-4.00) ^e	1.99 (1.38-2.88) ^e	1.52 (0.95-2.43)
ADHD	2.67 (1.78-4.02) ^e	3.95 (2.42-6.44) ^e	1.81 (1.16-2.82) ^e	2.61 (1.55-4.37) ^e
CD	1.64 (0.95-2.83)	2.10 (1.04-4.24) ^e	1.29 (0.71-2.34)	2.03 (0.94-4.36)
Any externalizing disorder	2.34 (1.72-3.19) ^e	3.25 (2.16-4.89) ^e	1.69 (1.22-2.32) ^e	2.60 (1.67-4.04) ^e
MDD	1.27 (0.77-2.09)	1.05 (0.52-2.12)	1.55 (0.95-2.52)	0.79 (0.38-1.66)
SAD	1.49 (0.75-2.94)	1.06 (0.39-2.88)	2.08 (1.09-3.99) ^e	0.47 (0.16-1.34)
Any internalizing disorder	1.34 (0.88-2.05)	1.09 (0.60-2.01)	1.64 (1.08-2.50) ^e	0.73 (0.38-1.41)
Contact with a mental health professional	2.05 (1.48-2.84) ^e	2.04 (1.33-3.13) ^e	2.05 (1.47-2.86) ^e	1.19 (0.76-1.86)

Abbreviations: See Table 2.

^a Any externalizing disorder includes ODD, ADHD, and CD; and any internalizing disorder includes MDD and SAD. Diagnoses are based on the *Diagnostic and Statistical Manual of Mental Disorders* (Fourth Edition), are lifetime, and are generated using a best-estimate algorithm.

^b Data are given as odds ratios (95% confidence intervals). The odds ratios reflect the increase in the odds of having the indicated disorder in the first named group relative to the second named group.

^c Covariates for adopted vs nonadopted adolescents, domestic adoptees vs nonadopted adolescents, and international adoptees vs nonadopted adolescents include age at assessment, sex, and parental socioeconomic status.

^d Covariates for domestic vs international adoptees include age at placement, age at assessment, sex, and parental socioeconomic status.

^e These were significant effects.

Although Tieman and colleagues²⁰ have investigated the prevalence of *DSM-IV* disorders in adopted adults, ours is the first study, to our knowledge, to investigate the prevalence of common *DSM-IV* childhood disorders in a population-based sample of adopted adolescents. We found that the odds of being diagnosed as having ADHD and ODD were approximately twice as high in adoptees compared with nonadoptees; the prevalence of CD, MDD, and SAD was not significantly associated with adoption status. Our finding of moderate mean differences on quantitative measures of adjustment coupled with a 2-fold increase in odds for specific externalizing disorders implies that, whereas most adopted adolescents are psychologically well-adjusted, some may be at elevated risk for clinically significant problems.

This finding of minimal mean differences but 2-fold differences in odds may seem inconsistent; however, a small shift in the mean of a distribution can have a dramatic effect in the tail of that distribution.^{9,21} For example, the distributions of best-estimate ODD symptoms for adopted and nonadopted adolescents have a modest mean separation of 0.31 SD. Using a diagnostic threshold of 4 or more symptoms, we capture only 10.0% of the nonadoptees while capturing 19.0% of the adoptees, almost a 2-fold difference. Thus, moderate mean differences can easily lead to substantial differences in disorder prevalence.

Because our sample included domestic and international adoptees, we were able to directly compare outcomes for these 2 groups. Consistent with a recent meta-analysis,² we found that international adoptees had consistently fewer externalizing behavioral problems than domestic adoptees: ESs were small to moderate. Some have speculated that international adoptees would be at increased risk for mental health problems because they are more likely to have been placed in the adoptive home at a late age, experienced preplacement adversity, and been exposed to postplacement discrimination.²² However, Juffer and van Ijzendoorn² hypothesize that 2 factors might

account for the better adjustment of international vs domestic adoptees. First, they suggest that the adoptive parents of international adoptees may be better prepared to rear an adopted child than the adoptive parents of domestic adoptees. In our sample, families of international adoptees did have higher SES scores when compared with families of domestic adoptees; however, statistically adjusting for SES did not eliminate, or even reduce, the differences between these 2 groups. Of course, parents of international and domestic adoptees may differ in ways not captured by SES (eg, parenting style or attitudes toward adoption). Juffer and van Ijzendoorn also suggest that domestic adoptees may experience greater prenatal exposure to teratogenic substances or carry a greater genetic risk for mental health problems than international adoptees. It will be important in future research to explore these possibilities.

It is important to interpret our findings in the context of several research limitations. Our samples of adolescents were ascertained to be representative of the populations from which they were derived and are constrained by time and place. For example, results are limited to mental health outcomes appropriate to assess in adolescence. Furthermore, our sample of nonadopted adolescents was drawn from Minnesota birth records and does not reflect the full ethnic diversity that exists within the United States. Thus, we are reassured that the prevalence of *DSM-IV* disorders in this sample generally agrees with those published in other epidemiological research.^{23,24} Our sample of adopted adolescents was ascertained to be representative of placements made by the 3 largest Minnesota adoption agencies and is missing representation of adolescents whose adoption was arranged privately. In addition, the nature of international placements has changed in recent years so that most internationally placed infants no longer come from South Korea.²⁵ It will be important to explore the adjustment of international adoptees from a broader range of countries. Finally, adoptees in our sample were all placed be-

fore the age of 2 years and results may not generalize to adoptees placed at a later age.

There are multiple implications of our results. First, most individuals adopted as infants are well-adjusted and psychologically healthy. Nevertheless, there exists a subset of adoptees who may be at increased risk for externalizing problems and disorders. The odds of being diagnosed as having ADHD and ODD were approximately twice as high in adoptees compared with nonadoptees. This excess of clinically meaningful behavioral problems in adopted adolescents has significance for researchers who examine the effect adoption has on individual functioning, for adoption agencies and their workers who counsel and advise members of the adoption triad, and for physicians who are dealing with an overrepresentation of adoptees in their clinical practices.

Accepted for Publication: September 6, 2007.

Correspondence: Margaret A. Keyes, PhD, Department of Psychology, University of Minnesota, 75 E River Rd, Minneapolis, MN 55455 (mkeyes@tfs.psych.umn.edu).

Author Contributions: All authors had full access to all the data. Dr Keyes takes responsibility for the integrity of the data and the accuracy of the data analyses. *Study concept and design:* Keyes, Sharma, Iacono, and McGue. *Acquisition of data:* Keyes, Sharma, Elkins, and McGue. *Analysis and interpretation of data:* Keyes, Sharma, Elkins, Iacono, and McGue. *Drafting of the manuscript:* Keyes, Sharma, Elkins, Iacono, and McGue. *Critical revision of the manuscript for important intellectual content:* Keyes, Sharma, Elkins, and McGue. *Statistical analysis:* Keyes, Sharma, Elkins, and McGue. *Obtained funding:* Sharma, Iacono, and McGue. *Study supervision:* McGue.

Financial Disclosure: None reported.

Funding/Support: This study was supported by grant AA11886 from the National Institute on Alcohol Abuse and Alcoholism and grant MH066140 from the National Institute of Mental Health.

Role of the Sponsor: The funding bodies had no role in the design and conduct of the study; in the collection, analysis, and interpretation of the data; or in the preparation, review, or approval of the manuscript.

REFERENCES

1. Nickman SL, Rosenfeld AA, Fine P, et al. Children in adoptive families: overview and update. *J Am Acad Child Adolesc Psychiatry.* 2005;44(10):987-995.
2. Juffer F, van Ijzendoorn MH. Behavior problems and mental health referrals of international adoptees: a meta-analysis. *JAMA.* 2005;293(20):2501-2515.
3. Mather M. Intercountry adoption. *Arch Dis Child.* 2007;92(6):479-482.
4. Nulman I, Rovet J, Greenbaum R, et al. Neurodevelopment of adopted children exposed in utero to cocaine: the Toronto Adoption Study. *Clin Invest Med.* 2001;24(3):129-137.
5. Beckett C, Maughan B, Rutter M, et al. Do the effects of early severe deprivation on cognition persist into early adolescence? findings from the English and Romanian adoptees study. *Child Dev.* 2006;77(3):696-711.
6. Sharma AR, McGue M, Benson P. The emotional and behavioral adjustment of United States adopted adolescents, part II: age at placement. *Child Youth Serv Rev.* 1996;18(1-2):101-114.
7. Wierzbicki M. Psychological adjustment of adoptees: a meta-analysis. *J Clin Child Psychol.* 1993;22(4):447-454.
8. Verhulst FC, Althaus MS, Bieman HJ. Problem behavior in international adoptees. I: an epidemiological study. *J Am Acad Child Adolesc Psychiatry.* 1990;29(1):94-103.
9. Haugaard JJ. Is adoption a risk factor for the development of adjustment problems? *Clin Psychol Rev.* 1998;18(1):47-69.
10. Warren SB. Lower threshold for referral for psychiatric treatment for adopted adolescents. *J Am Acad Child Adolesc Psychiatry.* 1992;31(3):512-517.
11. Ruggles S, Sobek M, Alexander T, et al. *Integrated Public Use Microdata Series: Version 3.0.* Minneapolis: University of Minnesota Population Center; 2004.
12. McGue M, Keyes M, Sharma A, et al. The environments of adopted and non-adopted youth: evidence on range restriction from the Sibling Interaction and Behavior Study (SIBS). *Behav Genet.* 2007;37(3):449-462.
13. Reich W. Diagnostic Interview for Children and Adolescents (DICA). *J Am Acad Child Adolesc Psychiatry.* 2000;39(1):59-66.
14. Welner Z, Reich W, Herjanic B, Jung KG, Amado H. Reliability, validity, and parent-child agreement studies of the Diagnostic Interview for Children and Adolescents (DICA). *J Am Acad Child Adolesc Psychiatry.* 1987;26(5):649-653.
15. Spitzer RL, Williams JBW, Gibbon M, First MB. *Structured Clinical Interview for DSM-III-R Personality Disorders (SCID-II).* New York: Biometrics Research, New York State Psychiatric Institute; 1987.
16. Leckman JF, Scholomskas D, Thompson W, Belanger A, Weisman M. Best-estimate of lifetime psychiatric diagnosis: a methodological study. *Arch Gen Psychiatry.* 1982;39(8):879-883.
17. Conners CK. *Conners' Teacher Rating Scale.* Iowa City: University of Iowa; 1969.
18. Rutter M. A children's behavior questionnaire for completion by teachers: preliminary findings. *J Child Psychol Psychiatry.* 1967;8(1):1-11.
19. Littell RC, Milliken GA, Stroup WW, Wolfinger RD. *SAS System for Mixed Models.* Cary, NC: SAS Institute Inc; 1996.
20. Tieman W, van der Ende J, Verhulst FC. Psychiatric disorders in young adult intercountry adoptees: an epidemiological study. *Am J Psychiatry.* 2005;162(3):592-598.
21. Sharma AR, McGue MK, Benson PL. The psychological adjustment of United States adopted adolescents and their nonadopted siblings. *Child Dev.* 1998;69(3):791-802.
22. Hjern A, Lindblad F, Vinnerljung B. Suicide, psychiatric illness, and social maladjustment in intercountry adoptees in Sweden: a cohort study. *Lancet.* 2002;360(9331):443-448.
23. Costello EJ, Foley DL, Angold A. 10-year research update review: the epidemiology of child and adolescent psychiatric disorders, II: developmental epidemiology. *J Am Acad Child Adolesc Psychiatry.* 2006;45(1):8-25.
24. Kessler RC, Berglund P, Demler O, Jin R, Merikangas KR, Walters EE. Lifetime prevalence and age-of-onset distributions of DSM-IV disorders in the national comorbidity survey replication [published correction appears in *Arch Gen Psychiatry.* 2005;62(7):768]. *Arch Gen Psychiatry.* 2005;62(6):593-602.
25. Lee RM, Grotevant HD, Hellerstedt WL, Gunnar MR. Cultural socialization in families with internationally adopted children. *J Fam Psychol.* 2006;20(4):571-580.