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Maritza Rubio-Stipec · Garrett Fitzmaurice · Jane Murphy · Alexander Walker

The use of multiple informants in identifying the risk factors of depressive and disruptive disorders

Are they interchangeable?

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■ **Abstract** *Objective* The aim of this study was to assess whether children and their parents identify the same risk factors for disruptive and depressive disorders and to analyze whether combining informant data with a rule that classifies the diagnosis as present if confirmed by at least one informant (OR rule) masks distinctive patterns identified in informant-specific analyses. *Method* Bivariate logistic regression equations were estimated using the diagnostic classification, based on DISC 2.1, as the outcome variable and informant (parent or child), characteristics of the youth (gender and age), indicators of the context of the interview (site), and family characteristics (income, parental monitoring, and adverse family environment) as predictors. The same predictors were also analyzed with the combined informant (OR rule) as outcome variable. *Results* Prevalence of all diagnoses varied with informant. Depressive disorders were more prevalent when the informant was the youth and disruptive disorders when the informant was the parent. The effect of age varied with informant. Odds of being classified as having a DISC disorder increased with age when the informant was the youth but the same effect was not observed when the parent was the infor-

mant. When information from parents and youth are combined (with an OR rule) the age effect for disruptive disorders vanishes, and its effect for depressive disorders weakens. *Conclusions* Informants are not interchangeable. Parent- and youth-based estimates of the prevalence of disruptive and depressive disorders were different and showed distinctive age relationships. Combining information from different sources (parents and youths) obscures the apparent effect of age noted in the two informant groups.

■ **Key words** informant effect – childhood disorders – psychiatric epidemiology – diagnostic classification

Introduction

Case ascertainment in psychiatric epidemiology usually requires an interview and is prone to measurement error from various sources. Measurement error in case ascertainment refers to the difference between the true mental health status of the subject and the operational classification given in the study. Information necessary to determine case status is provided by the interviewed subject either to the clinician or a lay person. At times more than one informant is needed. When children are the population of interest, multiple informants (parents, teachers, or children themselves) are considered necessary. The decision about what type of person should be the informant and how many informants are necessary usually depends on the context such as the home or school, or the age of the child, as an indicator of level of maturity. Once the information is gathered, determination of case status is done either by the clinician or a computerized diagnostic algorithm using a standard nosology.

Many studies show that different informants do not agree when reporting symptoms and behaviors about the same child (Achenbach et al. 1987; Andrews et al. 1993; Angold et al. 1987; Edelbrock et al. 1986; Verhulst and Van der Ende 1992; Rubio-Stipec et al. 1992; Jensen

Prof. Maritza Rubio-Stipec, Ph.D. (✉)
Department of Economic
University of Puerto Rico & Behavioral Sciences Research Institute
135 Alheli, Urb. San Francisco
San Juan, Puerto Rico 00927
and
American Psychiatric Institute for Research and Education
Washington DC, USA

G. Fitzmaurice, Sc. D.
Department of Bio-Statistics
Harvard School of Public Health
Boston, MA, USA

J. Murphy, Ph. D. · Alexander Walker, MD, Ph. D.
Department of Epidemiology
Harvard School of Public Health
Boston, MA, USA

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and Rubio-Stipec 1999). Various approaches, such as the “AND” and the “OR” rules, have been used to establish who is a case. These rules classify a child with a disorder if the categorization is confirmed by all informants (AND rule), or by at least one informant (OR rule) and can, therefore, result in potentially conflicting prevalence and incidence estimates (Bird et al. 1992).

When different informants are reporting about the same underlying trait, one might think that if they had the same level of information about the same nosological construct, they would agree. Factors that explain disagreement would be those related to the level of information. Teachers would know more about behaviors at school, youngsters would make better informants on internalizing symptoms, parents might be the informants of choice about disruptive disorders, and agreement between informants would be higher for conditions or behaviors that are more easily observable and understood by all informants. However, most studies report poor agreement between informants, and lack of agreement is not contingent upon the type of behavior, severity of the condition, nor age of the child. Lack of agreement appears not to depend on the level of information available to the respondent (Rubio-Stipec et al. 1994; Jensen and Rubio-Stipec et al. 1999).

Informants in psychiatric epidemiology can be *interchangeable in measures of occurrence* and/or *interchangeable in measures of association*. We define informants as interchangeable in measures of occurrence if they produce identical rates of prevalence and incidence. We define informants as interchangeable in measures of association when they produce identical estimates of risk ratios and related measures in population studies. It is important to note that interchangeability of informants in measures of occurrence and association is not a property of individuals, but of classes of informants (e. g., parents, children, teachers), seen from the perspective of population-based research.

In psychiatric epidemiology, both forms of interchangeability of informants are of interest. Researchers studying the etiology of the psychiatric disorders would focus on interchangeability in measures of association, i. e., consistency in the identified risk factors associated with the disorder. On the other hand, public health administrators would be more interested in consistent estimates of the extent of the problem and, therefore, would focus on interchangeability of occurrence.

Interchangeability in both measures of association would also be required when psychiatric diagnosis is treated as a potential determinant of another disease of interest or as a determinant of other outcomes such as use of services or impairment. Such studies require that the classification of exposure status does not depend on the informant who is giving the report.

Different approaches to identifying risk factors of disorders have been used in child psychiatric epidemiology when dealing with multiple informants. Some argue that given the low level of agreement between informants it is best to analyze them separately. This position

can be considered as consonant with the belief that informants are not inter-exchangeable. In other words, assorted informants are measuring a different nosological construct that can be associated with different risk factors (Rutter et al. 1975; Verhulst et al. 1992; Offord et al. 1996). With this approach, findings are tied to a specific informant without a formal statistical method that extracts generalizability from the findings.

Others support the idea of combining information from each source with an “OR” rule, classifying the condition as present when reported by at least one informant (Bird et al. 1992). They postulate that symptoms are not socially desirable; therefore, once reported by either informant they should be treated as present. This approach shows concern for false negatives ignoring false positives, and results in prevalence estimates that seem unduly high (Piacentini et al. 1992). This rule is consonant with the belief that informants are not interchangeable in measures of occurrence; as a consistent pattern of underestimation is postulated when only one informant is used.

Interchangeable informants in measures of association have been studied by Offord et al. (1996) and Fitzmaurice et al. (1996). Offord et al. examined consequences for measurement of child psychiatric disorders (conduct and oppositional) of not integrating data on the same individual from different informants (parents and teachers) as contrasted to combining information. The pattern of associated features of disorders was reported to vary markedly in parent-identified compared to teacher-identified disorders. Combining informants had the disadvantage of masking the distinctive patterns of associated features noted in informant-specific reports of disorders.

Fitzmaurice et al. (1996), illustrating a new statistical approach to analyzing risk factor data when the outcome is a binary rating, presented the risk factor pattern identified by parents and teachers for internalizing and externalizing behaviors. A similar pattern was observed for both parents and teachers, although variables related to adverse family environment showed a stronger association with externalizing behaviors when the parent was the informant.

In this paper, we address the issue of interchangeable informants in measures of association studying whether children and their parents identify the same risk factors for disruptive and depressive disorders. We first address informant-specific data to identify associated features of informant-specific disorders, and later join informants using the OR rule to determine whether combining informants has the disadvantage of masking distinctive patterns identified in informant-specific disorders.

This paper builds upon previous work in this area in several ways. First, our outcomes are specific disorders as defined by the established nosology; they are not broadly defined psychopathology, such as internalizing and externalizing behaviors. Second, the outcome is based on the nosological definition of the disorder and not on the cut-off point of an empirically defined scale.

With a scale, findings are contingent upon the selected cut-off point whereas the face validity of our dichotomous classification of the outcome is given by the established nosology. Third, we base our analysis on two different informants, parent and child. This allows us to study a wider spectrum of psychopathology as teachers can only report about behaviors observed at school. Fourth, we contrast findings reached by linking specific informants against those which combine them with a simple combinatorial rule.

Subjects and methods

■ Sample

The Methodological Epidemiology Catchment Area (MECA) was sponsored by the National Institute of Mental Health (NIMH) to study the psychometric properties of the Diagnostic Interview Schedule for Children (DISC) and related measures. Collaborating sites were Georgia, New Haven, New York, and Puerto Rico. Children were randomly selected in their households from specific communities in each site. The same survey and interviewing methods were used in the four sites. Lahey and colleagues (1996) describe these samples and the study's methodology in detail. Children and their primary caretakers were interviewed in their native language, either Spanish or English. In most instances (96%), the children's primary caretakers were biologic or adoptive parents. Although this combined sample is not representative of any existing population, it provides information on four very different communities across many types of disorders. Because the sample size for each site is approximately equal, no population is favored over another.

■ Instruments and measures

Version 2.3 of the NIMH Diagnostic Interview Schedule for Children (DISC) was used by all sites as the lay-administered structured diagnostic interview (Shaffer et al. 1996). The DISC 2.3 inquires about psychopathology in the last 6 months. The second component of the interview (Service Utilization and Risk Factors Interview; SURF) gathered information about demographic factors, functional impairment, and potential risk and protective factors including family environment (APGAR scale), parental monitoring, and family income. Details of potential risk factors appear in Goodman et al. (1998). Table 1 shows the distribution of these variables in our sample.

■ Statistical analysis

We base our analyses on methods proposed by Fitzmaurice et al. (1995) where data from two informants are linked into a single analysis. Multivariate modeling and simultaneous logistic regressions are conducted for outcomes based on each informant. This is a new approach that has the advantage of retaining complete information about case status for each informant; it permits assessment of informant-risk factor interactions as well as overall risk factors, provides measures of association between multiple informants, and adjusts for the association between responses in the analysis. It also admits the use of subsets of respondents with missing data in a straightforward way, thus permitting all subjects with at least one informant to be used in the analyses (Fitzmaurice et al. 1995).

To analyze the informant effect, bivariate logistic regression models were estimated with the diagnostic classification as the outcome variable and informant, characteristics of the youth (gender and age), indicators of context of the interview (site), and characteristics of the family (family income, parental monitoring, and adverse family environment) as predictors. Bivariate logistic regression was used because two variables were available to measure the outcome, the diagnoses

Table 1 Sample description

Characteristics	N	Percent
Site		
Atlanta	306	23.4
New Haven	322	24.6
New York	360	27.5
Puerto Rico	319	24.4
Gender		
Males	681	53.0
Females	604	47.0
Ages		
9–12	593	46.2
13–17	692	53.8
Annual household income		
< \$10,000	195	15
\$10,000 – \$24,000	224	0
\$25,000 – \$64,000	533	42
\$65,000 – \$99,000	219	17
> 100,000	98	8
Family environment	Mean	sd
Adverse family environment	6.59	2.08
Parental monitoring	3.65	0.45
Child's adaptive functioning		
CGAS	85	12

based on the parent's and on the youth's report of symptoms. We aimed at determining whether the effect of each of these factors varies with the informant. Characteristics of the youth, and site were "informant-free" variables, while the family information always came from the parent. Thus, each paired record for a child contained the same information for all the predictors; they only differed in the outcome variable (parent- vs. youth-identified disorder).

Estimates of the logistic regression parameters were obtained using with Proc Genmod in SAS (SAS 1996). We had more than one observation (parent, and youth) report on each subject. Recognizing that observations were not independent, the pairwise correlation among parent and youth reports was estimated. All "clusters" in the regression were either of size one (data on only one informant were available) or two (data on both informants were available). There were few missing clusters in all regressions. For specific diagnoses the missing clusters were approximately 3% of the total number of clusters available for analysis (1,300). For higher rank diagnoses of depressive and disruptive disorders only 1% of the clusters were missing.

First, interchangeability of informants in measures of association were determined by examining the regression coefficients associated with the interaction between risk factors and type of informant. A test of the null hypothesis of no interaction provided a formal mean for assessing interchangeability between informants (showing that we do not need any knowledge about the informant to estimate the effect of the risk factor). Finally, to test whether informants were interchangeable in measures of occurrence we examined the magnitude of the regression coefficient associated with type of informant in a different set of bivariate regression equations where, as before, the outcome was the diagnostic classification but the only predictor was the informant (Table 2).

Our first set of analyses considered the main effects and interactions with informant for all predictors. Aiming at a more parsimonious model, we dropped all non-significant interactions ($\alpha = 0.05$) and the model parameters were re-estimated. We present results for the final model only. Furthermore, to contrast our findings based on linking informant data with those based on combining informant data with the OR rule, a model using the same predictors was estimated with the diagnosis present if confirmed by at least one informant.

Table 2 Percent of youths with a DISC diagnosis classified by type of informant

DISC Diagnoses	Parent as informant		Youth as informant	
	N	%	N	%
Depression	40	3.1	62	4.9
Dysthymia	26	2.0	28	2.7
ADHD	58	4.5	28	2.2
Conduct	18	1.4	56	4.4
Oppositional defiant	56	4.3	28	2.2
Any disruptive	104	8.0	91	7.1
Any depressive	52	4.0	77	6.1

Results

In this sample, prevalence of all diagnoses varied with the informant. In general, depressive disorders were more prevalent when the informant was the youth and disruptive disorders were more prevalent when the informant was the parent. Based on the youth's report, for this age group, the most prevalent disorders were conduct and major depression. While based on the parent the most prevalent disorders were ADHD and oppositional defiant (Table 2).

Tables 3 and 4 show the estimated regression coefficients and standard errors for all disruptive and depressive disorders studied. They are the estimated parameters of the reduced model after all non-significant interactions with informant were dropped from the analyses.

■ Site

Site showed a consistent main effect for oppositional defiant disorder, where all of the US sites had higher relative odds than Puerto Rico. The New Haven sample also had higher relative odds than Puerto Rico for all disorders studied. There were no significant interactions between site and informant, thus showing that the effect of the context (site) does not vary with informant. The final model includes the main effect of site but not the interaction with informant.

Table 3 Bivariate logistic regression coefficients and standard errors of risk factors on disruptive disorders

Risk factor	Disruptive psychiatric disorders			
	ADHD	Conduct	Oppositional	Any disruptive odds
Intercept	-2.941 ± 1.304	-3.008 ± 1.677	-0.904 ± 1.328	0.0207 ± 0.972
Atlanta	1.761 ± 0.458	0.398 ± 0.436	1.222 ± 0.444	1.268 ± 0.288
New Haven	1.212 ± 0.474	1.019 ± 0.397	1.421 ± 0.427	1.089 ± 0.284
New York	0.726 ± 0.538	0.347 ± 0.458	1.043 ± 0.452	0.605 ± 0.330
Gender (girls)	-0.583 ± 0.253	-1.151 ± 0.310	-0.518 ± 0.261	-0.702 ± 0.180
Family income	-0.008 ± 0.014	-0.012 ± 0.015	-0.021 ± 0.017	0.0043 ± 0.012
Family environment	0.187 ± 0.044	0.171 ± 0.049	0.243 ± 0.041	0.192 ± 0.032
Parental monitoring	-0.216 ± 0.233	-0.908 ± 0.231	-0.735 ± 0.228	-0.773 ± 0.174
Informant (child)	-4.637 ± 1.193	-1.222 ± 1.442	-4.012 ± 1.185	-4.150 ± 0.790
Age	-0.134 ± 0.058	-0.056 ± 0.090	-0.144 ± 0.056	-0.136 ± 0.044
Age *informant	0.297 ± 0.086	0.178 ± 0.102	0.252 ± 0.087	0.303 ± 0.058

Table 4 Bivariate logistic regression coefficients and standard errors of risk factors on depressive disorders

Risk factor	Depressive psychiatric disorders		
	Major depression	Dysthymia	Any depressive
Intercept	-5.826 ± 1.307	-3.4032 ± 1.641	-4.241 ± 1.150
Atlanta	0.413 ± 0.406	0.046 ± 0.437	0.424 ± 0.321
New Haven	0.902 ± 0.384	0.526 ± 0.410	0.800 ± 0.321
New York	0.538 ± 0.390	-0.158 ± 0.468	0.3575 ± 0.335
Gender (girls)	0.704 ± 0.226	0.721 ± 0.278	0.691 ± 0.200
Family income	-0.020 ± 0.016	-0.013 ± 0.017	-0.020 ± 0.013
Family environment	0.241 ± 0.038	-0.233 ± 0.047	0.239 ± 0.036
Parental monitoring	0.586 ± 0.304	-0.744 ± 0.243	-0.516 ± 0.183
Informant (child)	-0.711 ± 1.115	1.120 ± 1.344	-1.842 ± 0.976
Age	0.121 ± 0.046	0.0103 ± 0.079	0.052 ± 0.054
Age *informant	0.067 ± 0.079	0.113 ± 0.098	0.165 ± 0.069

■ Gender

Youth's gender showed a significant main effect for all disorders. Disruptive disorders were more prevalent in boys and depressive disorders in girls. There were no significant interactions between gender and informant, i. e., the role of gender did not vary with informant. The final model includes the main effect of gender but not the interaction with informant.

■ Income

Income was not significantly associated with most of the disorders studied (neither its main effect nor its interaction with informant). Only ADHD was negatively associated with income. The coefficients of other terms in the regression equations were not changed when income was added to the models. We report the regressions with income as main effect to facilitate comparisons with the work of others.

■ Family environment

Adverse family environment was associated with all disorders studied. As family environment becomes more adverse (higher levels in the APGAR scale) the odds of every disorder increase. The coefficient associated with the interaction between family environment and informant was significantly different from zero when the outcome was conduct disorder. When the informant about diagnostic symptoms was the parent, the role of adverse family environment in predicting presence of a disorder is greater. Parental monitoring was an important predictor for most disorders. More parental monitoring reduces the odds of having a disorder. Once more, when the informant was the parent the effect of parental monitoring on the odds of having a disorder were higher.

■ Age

The effect of age varied with informant for all diagnoses. In general, odds of having a DISC disorder decreased with age when the parent was the informant and increased with age when the informant was the youth. At younger ages, odds were higher based on parent's report as compared to youth's. The informant effect of age on the odds is stronger for disruptive disorders than for depressive disorders.

The regression coefficients associated with age appear at the end of Table 3 for disruptive disorders and at the end of Table 4 for depressive disorders. Because in the case of age we conclude the informant-age interaction is significant, the effect of age must be calculated as the sum of the main and interaction effects.

For example, the last column of Table 3 shows the regression coefficients for disruptive disorder and the last two rows refer to the age effect. Remembering that we coded informant as 1 for the child, and as zero for the parent, we calculate that the odds associated with age for the parent report as the antilog of -0.136 , and the odds

for the youth report as the antilog of 0.167 ($-0.136 + 0.303 = 0.167$). Hence, according to the parent report, with each year increase in age odds of disruptive disorders decrease by approximately 14%, and based on the child report they increase by approximately 18%.

Odds of having a disruptive disorder increased with the child's age when the informant was the youth and decreased with age when the informant was the parent (Table 3). They were approximately equal at 14. This is the age at which the value of age multiplied times the age* informant interaction term (14×0.0303) balances the informant main effect (4.15), so that the net effect of informant is zero.

There were differences within disruptive disorders: ADHD and oppositional defiant were mainly reported by the parents and decreased with age. Youth's report remained stable with age at very low levels. The informant effect can be explained by a large drop with age in the parent's report not observed in the youth's. On the other hand, the odds for conduct disorders remained stable with age when the informant was the parent but sharply increased with age when the informant was the youth. Fig. 1 shows how the effect of age varies with informant for disruptive disorders. The odds were estimated using the regression coefficients shown in Table 3 for boys, from New Haven, of families with a mean yearly income of \$10,000, and the total mean values that appear in Table 1 for family environment (APGAR = 6.59; parental monitoring scale = 3.65).

Odds of having a depressive diagnosis increased with age when the informant was the youth and stayed basically stable (with a small increase) when the informant was the parent (Table 4). Once more, because the effect of age varies with informant for depressive disorders it must be estimated as the sum of the two coefficients associated with age. For the parent the relative odds increase by approximately 0.05 for each additional year and by approximately 0.22 based on the youth. They were approximately equal at age 11, estimated the same way as described above for disruptive disorders. This is the age at which age multiplied by the age* informant in-

Fig. 1 Odds of Disruptive Disorders by Age and Informant

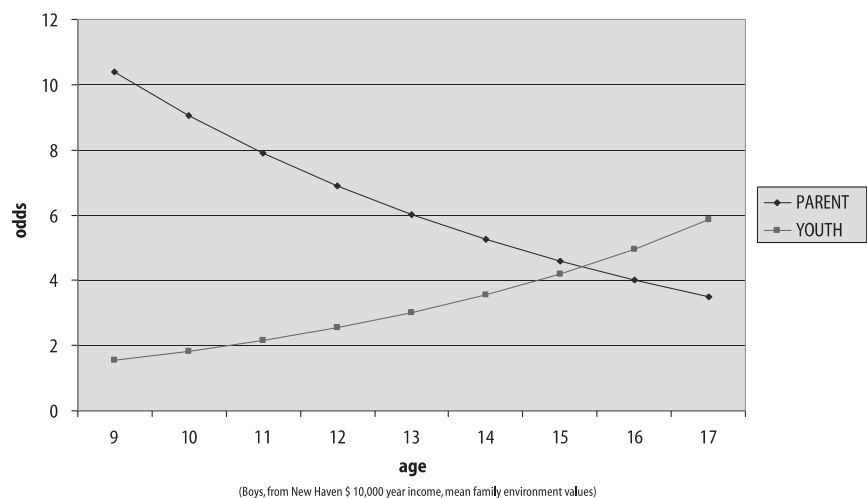
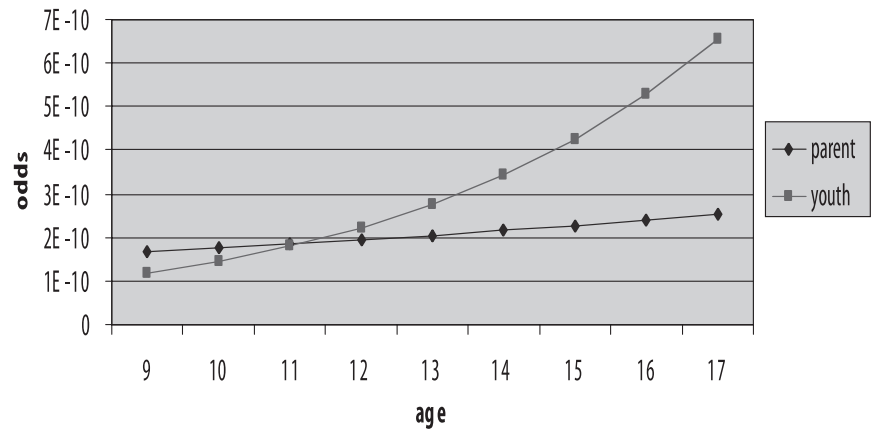


Fig. 2 Girls, New Haven, \$10,000 family income mean family environment values



teraction (11 x 0.13) exactly balances the main effect of informant (1.483). Fig. 2 shows how the effect of age varies with informant for depressive disorders. The odds were estimated using the regression coefficients shown in Table 4 for girls, from New Haven, of families with a mean yearly income of \$10,000, and the total mean values that appear in Table 1 for family environment (APGAR = 6.59; parental monitoring scale = 3.65).

The OR rule

When information from parent and youth are combined with an OR rule, no age effect is identified for disruptive disorders (Table 5). Contrary to disruptive disorders, for depressive disorders an age effect is identified with the OR rule (Table 6). Older children are at higher risk of depressive disorders. However, the use of the OR rule weakens the effect of age as compared to the effect identified linking informant specific-information. Contrary to the effect of age, the same associations with other risk factors in our model (gender, family environment, parental monitoring, and income) were identified with both methods (linking informants vs. OR rule).

Discussion

Our findings reflect that the prevalence of disorders varies with informant. Thus, estimates of the extent of

Table 6 Regression coefficients and standard errors of risk factors on depressive disorders parent OR youth

Risk Factor	Depressive psychiatric disorders		
	Major depression	Dysthymia	Any depressive
Intercept	-0.065±0.082	-0.068±0.065	-0.032±0.089
Atlanta	0.017±0.406	0.003±0.017	0.025±0.023
New Haven	0.041±0.021	0.022±0.017	0.047±0.023
New York	0.032±0.021	-0.031±0.017	0.022±0.023
Age	0.010±0.003	0.003±0.002	0.011±0.003
Gender (girls)	0.039±0.014	0.023±0.011	0.691±0.200
Family income	-0.001±0.001	-0.001±0.001	-0.001±0.001
Family environment	0.024±0.004	-0.015±0.003	0.027±0.004
Parental monitoring	-0.049±0.017	-0.045±0.013	-0.063±0.018

the problem and the relative importance of specific disorders depend on the informant. Youths and their parents are not interchangeable informants in measures of occurrence.

In this age group, the most prevalent disorders based on the youth's report are depressive and conduct disorders, while based on the parent's report the most prevalent are ADHD and oppositional defiant. Based on the parent's report, disruptive disorders are twice as frequent as depressive disorders whereas, based on the youth's report, depression and disruptive disorders are similar in occurrence. This difference can be explained by youths identifying more depressive disorders than their parents. This could be explained by the internaliz-

Table 5 Regression of risk factors on disruptive disorders parent OR youth

Risk factor	Disruptive psychiatric disorders			
	ADHD	Conduct	Oppositional	Any disruptive
Intercept	-0.056±0.080	-0.199±0.075	-0.273±0.0812	0.437±0.105
Atlanta	0.089±0.020	0.019±0.019	0.063±0.021	0.140±0.027
New Haven	0.051±0.020	0.056±0.019	0.072±0.021	0.103±0.027
New York	0.012±0.020	0.013±0.019	0.039±0.021	0.048±0.027
Age	-0.003±0.003	0.007±0.003	-0.004±0.003	-0.003±0.004
Gender (girls)	-0.032±0.014	-0.041±0.013	-0.013±0.014	-0.070±0.018
Family income	-0.001±0.001	-0.0002±0.001	-0.001±0.001	-0.0003±0.001
Family environment	0.015±0.003	0.011±0.003	0.021±0.004	0.026±0.005
Parental monitoring	-0.023±0.016	-0.083±0.015	-0.087±0.016	0.130±0.021

ing versus externalizing nature of the disorder. A finding consistent with that reported by Purra et al.

Informants are not interchangeable on the effect of age on the odds of psychiatric disorders. Based on the parent, we would expect the odds of the disorder to decrease or remain stable with age while, based on the youth, we would expect odds to increase with age. This pattern of the odds of the disorder increasing with age when youth is the informant and decreasing with age when the parent is the informant results in similar odds for most disorders at early adolescence (11–14 years old).

The role of age can probably be explained by two factors: cognitive maturity of the youth and “closeness” to the home. Apparently, at earlier ages children are less aware of their symptoms, or have more difficulty understanding the question and endorsing the symptom. Furthermore, parents of older children identify fewer symptoms, probably because they are less aware of their children’s behaviors and symptoms as they grow older and engage in activities away from home.

Understanding the true effect of age on the odds of having a disorder is of major importance. For example, oppositional disorder is a psychiatric disorder identified by parents of young children. This is consistent with the description of the disorder. Children are oppositional to their parents’ rules. They argue with their parents, defy, or refuse to comply with parents’ requests. Few children identify this behavior. Further research with longitudinal studies can clarify the outcome of this disorder. Do children outgrow it? Or is the disorder a precursor of conduct disorder at later ages, where instead of parental rules major societal rules and the rights of others are violated? If children outgrow it, we could consider these behaviors as part of the natural process in the child’s development. On the other hand, if it is a precursor of other disorders, screening for oppositional disorders at young ages could help us identify children at risk of disorders.

With the exception of the effect of age data derived from youths and their parents point to the same risk factors for the psychiatric disorders studied. In our analyses, there is a tendency for parents to place a more important role on family context as a predictor of presence of psychiatric disorders, but that is to be expected when both family descriptors and presence of disorder are reported by the parent. Youths were not asked about their family context. A larger role for family context in predicting odds of a parent-identified disorder was an expected finding since family-related variables were solely reported by the parent. A standing explanation could be that errors in parental report of diagnostic information and in parental report of family environment are correlated. There is no evidence in our data of the presence of an informant effect regarding gender or site, but there is an effect regarding age.

Offord et al. (1996), using varied measures of psychopathology and different statistical analyses, described different correlate patterns for parents and teachers. They reported children identified by their par-

ents as having a conduct disorder as more likely to have a depressed parent and live in a dysfunctional family. By contrast, children identified by their teachers were more likely to be boys and growing up in poor families. We did not test the role of parental diagnoses on conduct disorders but did find similar associations with adverse family environment. Similar to ours, Offord’s information about dysfunctional family was based solely on the parent’s report. The best indicator of family dysfunction for the teacher could be family income. Thus, their findings could also be interpreted as stating that parents and teachers identify the same correlate pattern for conduct disorder and family dysfunction.

Fitzmaurice et al. (1996) reported similar findings for the role of adverse family environment in predicting the odds of externalizing behaviors; the effect was stronger for parent- than for teacher-identified behaviors. However, these were also variables solely reported by the parent. Once more, we cannot rule out that these associations reflect more characteristics of the report than characteristics of the construct. Their findings do not provide evidence that parents and teachers identify a different role to family environment when predicting the odds of externalizing behaviors.

Given our results, prevalence estimates for depressive and disruptive disorders should be accompanied with a description of the children’s ages and the informant on whom the estimate was based. Knowledge about the course of the disorder as the child grows older is dependent on who is the informant. In this paper we do not have longitudinal data and, therefore, cannot address directly the issue of course of the disorder. However, for the disorders we have studied, we would expect odds to decrease with age when the parent is the informant and increase when based on the youth report.

Aggregating informants with the OR rule (present based on the parent’s report or the youth’s report) results in a reduced estimate of the effect of age on depressive disorders and no age effect on the odds of disruptive disorders. Linking informants and combining them using the OR rule, we would still conclude that odds of disruptive and depressive disorders vary with gender and are higher for those with adverse family environment. However, our estimates of the effect of age would have been different.

Incidence estimates should also be tagged to the informant. Once more, longitudinal data are necessary but our findings point to larger incidence rates when based on the youth’s report than when based on the parent’s. In case-control studies, requirement that cases and controls are of the same age range and have the diagnostic status based on the same informant should be the norm. Estimations of statistical power, when analyzing the effect of a drug or treatment, would also depend on the informant. When the natural course of the disorder varies with informant, the change that can be attributed to the effect of treatment can also vary. Ways of analyzing data from multiple informants should be a major area of study in child psychiatric epidemiology. We cannot con-

clude what the true prevalence of disorders is and how these prevalence estimates vary with age unless more research is placed in this area using longitudinal data.

References

- Achenbach TM, Edelbrock CS (1987) Manual for the youth self-report and profile. University of Vermont, Department of Psychiatry, Burlington, VT
- Angold A, Weissman MM, John K, Merikangas KR, Prusoff BA, Wickramaratne P, Gammon GD, Warner V (1987) Parent and child reports of depressive symptoms in children at low and high risk of depression. *J Child Psychol Psychiatry* 28:901
- Andrews VC, Garrison CZ, Jackson KL, Addy CI, McKeown RE (1993) Mother-adolescent agreement on symptoms and diagnoses of adolescent depression and conduct disorders. *J Am Acad Child Adolesc Psychiatry* 32:731
- Bird HR, Gould MS, Staghezza B (1992) Aggregating data from multiple informants in child psychiatry epidemiologic research. *J Am Acad Child Adolesc Psychiatry* 31:78
- Edelbrock C, Costello AJ, Dulcan MK, Calabro-Conover N, Kala R (1986) Parent-child agreement on child psychiatric symptoms assessed via structured interview. *J Child Psychol Psychiatry* 27:181
- Fitzmaurice G, Laird N, Gwendolyn Z, Daskalakis C (1995) Bivariate logistic regression analysis of childhood psychopathology ratings using multiple informants. *Am J Epidemiol* 142:1194
- Fitzmaurice G, Laird N, Gwendolyn Z (1996) Multivariate logistic models for incomplete binary responses. *J Am Statistical* 91:443
- Goodman SH, Hoven CW, Narrow WE, Cohen P, Fielding B, Alegria M, Leaf PJ, Kandel D, Horwitz SM, Bravo M, Moore R, Dulcan MK (1998) Measurement of risk for mental disorders and competence in a psychiatric epidemiologic community survey: the National Institute of Mental Health Methods for the Epidemiology of Child and Adolescent Mental Disorders (MECA) study. *Soc Psychiatry Epidemiol* 33:162
- Jensen P, Rubio-Stipec M, Canino G, Bird H, Dulcan M, Schwab-Stone M, Lahey B (1999) Parent and child contributions to child psychiatric diagnosis: are both informants always necessary? *J Am Acad Child Adolesc Psychiatry* 38:1569
- Lahey BB, Flagg EW, Bird HR, Schwab-Stone M, Canino G, Dulcan MK, Leaf PJ, Davies M, Brogan D, Bourdon K, Horwitz SM, Rubio-Stipec M, Freeman DH, Lichtman J, Shaffer D, Goodman SH, Narrow WE, Weissman MM, Kandel DB, Jensen PS, Richters JE, Regier DA (1996) The NIMH Methods for the Epidemiology of Child and Adolescent Mental Disorder (MECA) study: background and methodology. *J Am Acad Child Adolesc Psychiatry* 35: 855
- Offord DR, Boyle MH, Racine Y, Szaatmari P, Fleming JE, Sanford M, Lipman EL (1996) Integrating assessment data from multiple informants. *J Am Acad Child Adolesc Psychiatry* 35:1078
- Piacentini JC, Cohen P, Cohen J (1992) Combining discrepant diagnostic information from multiple sources: are complex algorithms better than simple ones? *J Abnormal Child Psychol* 20:51
- Puura K, et al. (1998) Children with symptoms of depression – what do the adults see? *JCPP*, Vol 39, pp. 577–585
- Rubio-Stipec M, Freeman D, Robins L, Shrout PE, Canino G, Bravo M (1992) Response error and the estimation of lifetime prevalence and incidence of alcoholism: experience in a community survey. *Intern J Methods Psychiatric Research* 2:217
- Rubio-Stipec M, Canino G, Shrout P, Dulcan M, Freeman D, Bravo M (1994) Psychometric properties of parents and children as informants in child psychiatry epidemiology with the Spanish Diagnostic Interview Schedule for Children (DISC.2). *J Abnormal Child Psychol* 22:1
- Rutter CA, Tupling C (1975) Attainment and adjustment in two geographical areas I. The prevalence of psychiatric disorder. *Br J Psychiatry* 126:493
- SAS Institute: SAS/STA Software (1996) Changes and enhancements for Release 6.12. SAS Institute Inc, Cary, NC
- Shaffer D, Fisher P, Dulcan M, Davis D, Piacentini J, Schwab-Stone M, Lahey B, Bourdon K, Jensen P, Bird H, Canino G, Regier D (1996) The NIMH Diagnostic Interview Schedule for Children (DISC 2.3): description, acceptability, prevalence, and performance in the MECA study. *J Am Acad Child Adolesc Psychiatry* 35:865
- Verhulst FC, Van der Ende J (1992) Six-year developmental course of internalizing and externalizing problem behaviors. *J Am Acad Child Adolesc Psychiatry* 31:924

