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## Functional impairment and mental health functioning among Vietnamese children

Hoang-Minh Dang<sup>1</sup>, Bahr Weiss<sup>2</sup>, and Lam T. Trung<sup>3</sup>

<sup>1</sup>Vietnam National University, Hanoi, Vietnam

<sup>2</sup>Vanderbilt University, Nashville, Tennessee, USA

<sup>3</sup>Danang Psychiatric Hospital, Danang, Vietnam

### Abstract

**Purpose**—Functional impairment is a key indicator of need for mental health services among children and adolescents, often a stronger predictor of service usage than mental health symptoms themselves. Functional impairment may be of particular importance in low and middle income countries (LMIC) because of its potential to focus policy on treatment of child mental health problems which is generally given low priority in LMIC. However, few studies have assessed functional impairment in LMIC. The present study assessed rates of functional impairment among children in Vietnam, as a case example of an LMIC, as well as effects of other risk/protective factors of particular relevance to LMIC (e.g., whether the family lived in an urban or rural area; family structure variables such as grandparents living with the family).

**Methods**—1,314 parents of children 6–16 years old from 10 Vietnamese provinces were interviewed.

**Results**—The overall rate of functional impairment among Vietnamese children was 20%, similar to rates in high income countries such as Germany and the United States, suggesting that LMIC status may not be associated with dramatic increases in functional impairment in children. Functional impairment was significantly greater among mental health cases than non-cases, with increases of over 550% associated with mental health caseness. A number of other risk factors (e.g., marital status) had smaller but significant effects.

**Conclusions**—Mental health problems are a major but not the sole contributor to functional impairment among Vietnamese children. The pragmatic significance of this research lies in its potential to affect public awareness and policy related to child mental health in LMIC.

### Keywords

Functional life impairment; Mental health; Children; LMIC; Vietnam

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Corresponding author Hoang-Minh Dang, Ph.D. Vietnam National University, 144 Xuan Thuy Road, Cau Giay District, Hanoi, Vietnam. minhhdh@vnu.edu.vn.

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## Introduction

Cross-cultural psychiatry is a subdivision of psychiatry concerned with the diversity of cultural contexts within which mental health disorders arise, focused on how to best address global mental health needs while taking into account this cultural diversity and its impact on mental health [1]. This requires a multi-disciplinary approach, integrating various disciplines including psychiatry, epidemiology, social and clinical psychology among other fields [2]. Cross-cultural psychiatry also collaborates with fields such as cross-cultural psychology to balance (a) emic (focused on culturally unique aspects) versus etic (focused on cross-cultural universals) approaches to science and clinical practice [3], and (b) development of rich theories of mental health and illness and their cultural context, versus practical concerns related to assessing mental health needs and providing effective mental health services around the world [2].

In conjunction with the growing interest in cross-cultural psychiatry, over the past decade increasing attention has been directed towards global mental health, with its goal of reducing the substantial mental health disparities that exist between high income countries (HIC), and low and middle income countries (LMIC). Within global mental health, although almost 90% of the world's children live in LMIC, development of global child mental health lags even relative to global mental health in general [4]. Rates of child mental health problems vary significantly cross-nationally. Countries with the highest levels of child mental health problems tend to be low and middle income countries (e.g., Colombia, Brazil) whereas countries with lowest levels tend to be high-income countries (e.g., Japan, Sweden) [5], suggesting substantial global child mental health disparity.

“Mental health”, however, represents more than simply low levels of symptoms but rather the ability to function adaptively within important life domains, and mental health matters in substantial part because of its impact on life functioning [6]. Functional impairment and mental health problems thus conceptually are closely linked, and empirically a range of child mental health problems have been found to serve as risk factors for functional impairment [7–9]. In fact, functional impairment often has been found to be a stronger predictor of service utilization than the mental health symptoms themselves, and ultimately it is an independent construct [10]. This is true in part because other factors (e.g., medical problems) have been found to predict child functional impairment independent of mental health problems, significant functional impairment occurs among children with relatively low levels of mental health symptoms [11,12], and functional impairment predicts other service usage (e.g., special education) in addition to health service usage, independently of mental health problems [6].

An understanding of functional impairment may be particularly important in LMIC, where limited resources increase the importance of each individual's contribution, or conversely burden, to society. Mostly critically, understanding functional impairment is key to understanding consequences of mental health problems, and central to convincing policy makers and the general public regarding the importance of child mental health, which is of particular importance in LMIC given their limited resources and tendency to give child mental health a low priority [13].

As Rapee et al. [6] have noted, the extent to which behaviors or mental health symptoms are impairing may vary as a function of socioeconomic or cultural circumstances. There have been, however, few assessments of child and adolescent functional impairment in low and middle income countries where resources can be highly limited [5,14]. It is possible that rates of functional impairment in LMIC might be higher than found in HIC as a result of increased social stress due to poverty, etc. On the other hand, it is possible that rates might be similar as populations adapt to their environments, or even lower in LMIC due to stronger traditional family support, etc. The present study therefore assessed children's life role functioning and functional impairment in Vietnam, an Asian LMIC, as well as several key risk / protective factors of particular relevance in LMIC.

Vietnam was selected because as a rapidly developing LMIC with the world's 14<sup>th</sup> largest population, it is an important country in its own right but also because it shares many relevant characteristics with other LMIC. For instance, similar to many other LMIC, it has been undergoing rapid, uncontrolled urbanization that has stressed society and social structures yet at the same time it remains predominantly rural (70% of the population live in rural areas). Culturally, similar to China and many other countries in the region, the impact of Confucianism remains strong in Vietnam, with social order defined by Confucian principles and its rituals of deference and obedience often still observed [15]. Even as young adults or in middle age and beyond, children defer to their parents. In contrast to the West, education is seen as one of the most high status occupations, and teachers and education are held in very high esteem. However, the need for flexibility and openness in current developing societies conflicts with Confucianism's conservatism, causing social stress in countries such as Vietnam [16].

There have been several studies assessing the mental health of Vietnamese children. The combined results of these studies indicate that children in Vietnam face substantial mental health challenges. For instance the Young Lives study [17], an international research project focusing on childhood poverty in four countries including Vietnam, found that Vietnamese children selected from provinces with relatively high levels of poverty were exposed to a large number of poverty-related stressors, with 20% of the children in the sample above the cut-off of the study's mental health screening. More recently, in the first nationally representative child mental health epidemiological study in Vietnam, Weiss et al [18] reported a 12% caseness rate. None of these studies, however, reported rates or levels of functional impairment. Researchers have assessed functional impairment in relation to specific disorders in other Asian countries (e.g., ADHD in Taiwan [19]; war-related PTSD in Sri Lanka [20], but not global functional impairment.

## Method

### Sample and Procedures

The sampling frame was structured so as to obtain a nationally representative sample of 6–16 year Vietnamese children, based on the representative selection of provinces, regions within provinces, and neighborhoods within regions. Ten of Vietnam's 63 provinces were chosen so as to be nationally representative based on: (a) economic status, (b) geographical character (e.g., inland vs. coastal), (c) urbanization and (d) ethnic minority population.

Provinces included: (a) Ha Noi (inland northern, and the capital of Vietnam); (b) Hai Phong (Red River Delta, northern); (c) Thai Nguyen (north-eastern mountain region); (d) Hoa Binh (north-western); (e) Ha Tinh (north-central); (f) Da Nang (central); (g) Phu Yen (south-central); (h) Ho Chi Minh City (inland southern, and business capital of the country); (i) Binh Thuan (southern); and (j) Hau Giang (Mekong River Delta, southern). Within each province, families were selected from 3 locales based on governmental designation (urban, urban-fringe, rural) selected to be representative of the province. Within each locale two neighborhoods were randomly selected, for a total of 60 sites. The potential participants were identified and randomly selected from public population lists available in Vietnam. Data were collected from April 2012 to September 2012.

This study was conducted by Vietnam National University (VNU), and approved by their U.S. FWA IRB committee (#00018223). For each participating region, VNU officials contacted the primary governmental educational agency or the local population committee requesting their approval and support; all agencies agreed to participate. The provincial agency identified local staff who accompanied the research project interviewer to the family's house. The staff person introduced the study and interviewer and then left. The interviewer described the project in detail, answered questions about the study, obtained informed consent from families and informed assent from children interested in participating, and scheduled a time for the interview convenient to the family. Families were paid based on the economic level of their locale, ranging from about US \$4 to US \$10. A total of 1,320 families were selected for recruitment, with six declining participation, for a final sample of 1,314 parents/guardians reporting on their child (see Table 1 for demographic characteristics).

## Measures

**Demographics**—A demographic questionnaire (completed by the adult caregiver, as were all other measures reported in this paper) assessed basic information as well as potential risk and protective factors including: (a) child age and gender; (b) presence of grandparents in the home, which in LMIC may be the norm and could function as a protective (e.g., through more adult attention) or risk factor (e.g., through inter-generational disagreement regarding child rearing); (c) number of siblings; (d) average amount of time per week parents spent talking with the child; and (e) family income and parent education. Mother and father education were assessed separately but combined into a single variable because they were highly correlated ( $r = 0.73$ ).

**Child Psychopathology**—To assess child mental health problems, parents completed the Vietnamese version of the Child Behavior Checklist (CBCL) [21]. The CBCL produces two broadband scales, Internalizing (emotional) Problems and Externalizing (behavioral) Problems, which were used in the present study. The CBCL is widely used and validated internationally, including in Vietnam [22].

**Child Functional Impairment**—The Brief Impairment Scale (BIS) was used to assess functional impairment [23]. The BIS was selected because in addition to impairment in overall functioning, it assesses functioning in three subdomains central to children and

adolescents in both HIC as well as LMIC such as Vietnam: (a) Interpersonal functioning; (b) School functioning (academic performance, behavior, etc.), and (c) Self-care (self-hygiene, etc.). The BIS was translated, culturally adapted, and back translated by a bilingual team of psychiatrists and psychologists in Vietnam and the U.S. using standard procedures to maintain the semantic, content, technical, and conceptual content of the measure [24]. The primary cultural modification involved re-ordering of the Interpersonal Functioning domain items so that item clustering was linked to the social role of the relationship (e.g., family vs. friends) rather than the structure of the impairment (e.g., having conflict vs. social withdrawal). In this process, we followed the recommendations of van-de-Vijver & Hambleton (1996) and others who use a consensus approach to translation rather than strict translation-back translation. In strict translation-back translations, translators often make literal translations of items that back translate well to the original wording but may fail to capture critical nuanced meanings in both translations. This failure may not be identified in the back translation, since the translation and back-translation are similar literal translations.

### Statistical analyses

To determine whether a child was showing significant functional impairment, we used Bird et al.'s BIS [23] caseness misclassification-balanced (i.e., yields approximately equal numbers of false positives and false negatives) cut points, which provide for an unbiased estimate of population rates. For mental health caseness, we used standard CBCL caseness cut-points [22]. With one exception all inferential analyses were conducted with SAS 9.4 Proc Glimmix; the one exception was for repeated measures analyses with continuous predictors (e.g., age) wherein SAS Proc Mixed was used, because Proc Glimmix does not allow for continuous r-side random factors. To control for clustering of variance, Province was included as a random factor. For post-hoc sub-group comparisons within significant effects, Tukey-Kramer pairwise comparisons were used.

### Results

Model-based estimated rates of impairment were (a) 5% for overall functioning, (b) 12% for interpersonal functioning, (c) 7% for school functioning, and (d) 5% for self-care; the rate for overall functioning impairment is less than the mean for the functioning subdomains because impairment in overall functioning requires a higher standard than impairment in any one specific area [14]. The rate for impairment in overall functioning and/or any subdomain was 20%. Rates of impairment varied significantly across the three subdomains ( $\chi^2[2]=67.27$ ,  $p<0.0001$ ). Functional impairment was significantly higher in interpersonal functioning than in school functioning ( $\chi^2[1]=37.03$ ,  $p<0.0001$ ) and self-care ( $\chi^2[1]=52.69$ ,  $p<0.0001$ ); self-care and school functioning did not differ significantly. To determine if functional impairment rates were consistent across the country, we tested whether there was significant variability in BIS overall functional impairment caseness across the ten provinces using a logistic regression model, for all four scales. The effect of Province was significant for interpersonal functioning impairment ( $\chi^2[9]=67.48$ ,  $p<0.0001$ ), but non-significant for overall, and school and self-care impairment.

We next assessed the extent to which BIS overall functioning impairment rates varied as a function of mental health caseness (CBCL Total Problems), using a logistic regression model. Among mental health non-cases when adjusting for Province, the rate of overall functional impairment was .04 whereas among mental health cases the rate increased over 550% to .26 ( $\chi^2[1]=70.92, p<0.0001$ ). We conducted similar caseness analyses for the (a) 3 BIS subscales with the (b) 2 CBCL broadband subscales (Internalizing Problems, Externalizing Problems). For all six analyses, functional impairment rates were significantly greater among mental health cases than non-cases (see Table 2), with increases ranging from 126% (BIS Interpersonal Functioning, CBCL Internalizing Problems) to 344% (BIS Self-Care, CBCL Externalizing Problems). The rate of impairment in overall functioning or any subdomain was 51% among CBCL Total Problems cases.

To avoid loss of information associated with dichotomization, in risk and protective factor analyses we analyzed the three BIS subscales as continuous measures assessing the main effect of each predictor and its interaction with BIS Domain. In these analyses, the main effect (e.g., Grandparents) thus represented the extent to which the predictor was related to BIS impairment overall whereas the interaction between the predictor (Grandparents) and BIS Domain represented the extent to which the predictor was differentially related to the BIS subscales (Interpersonal, School, Self-Care). Statistics ( $F, R^2$ , etc.) for significant effects are reported in Table 3.

The first potential risk factor analyzed was Site (urban, urban-fringe, rural). The interaction with BIS Domain but not the main effect was significant. The interaction effect reflected the fact that only the BIS School Functioning scale showed a significant effect for Site ( $R^2 = 0.02$ ), with urban-fringe samples significantly higher on school impairment than the urban and rural samples, who did not differ significantly from each other; i.e., the urban-fringe samples showed more school functioning impairment than urban and rural samples.

The main effects for Grandparents and for Number of Siblings and their interactions with BIS Domain were non-significant, indicating that functional impairment did not vary significantly as a function of the whether grandparents lived with the family, nor with the number of children in the family. The main effect for Time Spent Talking with Child was significant, with  $r = -0.14$  (derived from the mixed model including Province); i.e., the more time the parent spent talking with the child, the lower the child's level of total functional impairment. The Time Spent Talking with Child x BIS Domain interaction was significant. Underlying this interaction, there were significant relations between Time Spent Talking with the Child, and School Impairment ( $r = -0.12$ ) and Self-Care Impairment ( $r = -0.15$ ) but not Interpersonal Impairment.

The main effect for Family Income was significant with  $r = -0.08$ ; i.e., the higher the family income the lower the child's level of total functioning impairment, although the effect was small. The interaction between Family Income and BIS Domain was non-significant. Conversely, the main effect for Parent Education was non-significant but the interaction with BIS Domain was significant. Underlying this interaction was the fact that parent education was related only to School Impairment ( $r = -0.08$ ) indicating a small effect wherein the higher the parent education the lower the school impairment. The main effect



for Marital Status was significant, with children of married parents showing significantly less impairment than non-married parents ( $R^2=0.03$ ). The marital status interaction was non-significant.

Both the main and interaction effects of Child Gender were significant, with males showing significantly more impairment overall than females ( $R^2=0.01$ ). In regards to the interaction, males and females did not differ on impairment in the interpersonal domain but did for the school and self-care domains, with males showing significantly higher impairment than females in both domain. The main effect of Child Age was non-significant but the interaction was. Underlying this interaction, the relation between interpersonal functioning and child age was non-significant whereas increasing age was associated with a small but significant increase in school impairment ( $r=0.06$ ) but a small decrease in self-care impairment ( $r = -0.08$ ).

We also assessed mental health problems as risk factors using the CBCL as a continuous measure, with CBCL Total, Internalizing (Emotional), and Externalizing (Behavior) problem scales as predictors. All three scales showed significant main effects with the BIS, with large effects ranging from  $R^2=0.13$  (CBCL Internalizing) to  $R^2=0.26$  (CBCL Total), with higher levels of mental health problems associated with higher levels of functional impairment (see Table 3). The BIS Domain X CBCL interaction was significant in two of three instances, with the CBCL effect slightly stronger for BIS Self-Care impairment. Finally, we tested whether the relation between BIS Total and CBCL differed as a function of CBCL domain (internalizing vs. externalizing problems). The BIS X CBCL Domain effect was significant ( $F[1,2613]=12.98, p<0.0003$ ) indicating that the relation between BIS Overall Functioning impairment and CBCL Externalizing Problems was significantly greater than between BIS Overall Functioning impairment and CBCL Internalizing Problems.

### Summary of main results

The strongest risk factor for functional impairment was mental health caseness, in particular CBCL Total Problems caseness. There were a number of other significant but smaller risk / protective factors. Living in an urban-fringe district (as compared to an urban or rural district) was associated with increased school functioning impairment. Increased time spent talking with the child was associated with reduced functional impairment, in particular in the school and self-care domains. Children of married parents showed significantly less impairment than children of non-married parents, and females showed less impairment than males in the school and self-care domains. There were small protective effects associated with family income and parent education, with higher levels of family income and parent education associated with lower levels of total functioning impairment and school impairment, respectively. Neither the presence of grandparents in the house nor the number of siblings was related to impairment.

### Discussion

The present study, among the first in an LMIC to assess overall functional impairment in a population-based sample of children, found that in our nationally representative sample of

Vietnamese children the overall rate of functional impairment was 20% (equal to 4.4 million Vietnamese children). Previous studies of child functional impairment in high income countries have produced similar rates of functional impairment, suggesting that LMIC status may not be associated with dramatic increases in child life functioning impairment. For instance, in the Bella study [25] in Germany the rate of child functional impairment was 18% whereas in the Great Smoky Mountains Study [11] in the United States the rate was 22%.

Rates of impairment did vary significantly across subdomains, with (a) 12% of the sample showing impairment in interpersonal relationship functioning, (b) 7% in school / academic functioning, and (c) 5% in self-care functioning. The mean rate of impairment in the functioning sub-domains was higher than impairment in overall functioning (5%) in part because impairment in overall functioning requires a higher standard than impairment in any one specific area [23]. The variability across the subdomains highlights the importance of considering impairment in specific life functioning domains, as identification of impairment in functioning subdomains will be important for identifying specific and precise targets for policy as well as treatment planning purposes.

The relatively low rate of impairment in self-care (5%) may in part reflect the fact that historically in Vietnam (as well as many other LMIC) children have been trained and expected to care for themselves and assist in the household or farm to support the family from a relatively early age [15]. Even as Vietnam has been urbanizing, this practice appears to have retained its adaptive value [26]. In regards to the relatively low rates of impairment in school functioning, as other research in Vietnam such the Young Lives study has noted, Vietnamese families place a high value on education and are willing to pay for extra classes for their children as well as provide academic support in other ways [26]. The relatively low rates of school/academic impairment (7%) we found may reflect this investment and effort that parents put into their children's education [27,26].

In contrast, impairment in interpersonal functioning was relatively high. Because of their central importance for child life functioning, the BIS Interpersonal Functioning scale focuses on relationships with adults (e.g., parents, teachers). Other research in Vietnam suggests that the relatively high level of impairment in interpersonal functioning (12%) found in this study probably is not a result of a lack of parental concern about adult relationships. In a study of Vietnamese parents' concerns about child functioning, Dang et al. [28] found that "talking back to adults" (an adult interpersonal relationship issue) was one of the most concerning behavioral or mental health issues for Vietnamese parents. One possible explanation for the relatively high rates of impairment in interpersonal functioning is that as the Vietnamese economy has rapidly expanded, parents often are even busier than historically and thus may not have time to "train" their children in the complex interpersonal functioning appropriate for current society. Although the same might be said about the academic and self-care subdomains in regards to parental time limitations, in academics parents can provide extra tutoring, etc. for their children with little time cost to themselves. In addition, as society rapidly changes and relationships become more complex (e.g., teachers may no longer be seen as absolute authorities who are always inevitably correct), approaches for developing adaptive interpersonal functioning may be more complex, and



traditional approaches less effective. In contrast, self-care (e.g., being neat in one's physical appearance) involves relatively simple behaviors that may require less parental time [15].

Another possible explanation for the lower rates of school impairment relative to interpersonal impairment rates is that parents (our informants) were less aware of school functioning than functioning in the home, and thus reported fewer school-related problems. However, rates for self-care impairment, which could be easily observed by parents, were lowest of all which suggests that differences in rates of impairment across domains are due to more than simply awareness of functioning. In addition, given the high value placed on education by parents and Vietnamese society, parents generally are informed of their children's problems at school. This does suggest, however, that it may be useful for future research to include teacher informants.

### **Risk and protective factors for functional impairment**

Several non-mental health factors had significant effects on functioning, although most effects were relatively small. In urban-fringe samples rates of school impairment were higher than in urban and rural samples, although this effect was small. These urban-fringe sites are not "suburban" in the Western sense but rather reflect new developing areas, on the outskirts of established urban centers, that are in transition from rural to urban. As in many LMIC, in Vietnam these areas often are less stable communities with inter-provincial migrants or temporary residents working in new industrial zones. These urban-fringe sites are characterized by two features: (a) they are newly organized, socially unstable areas, and (b) relative to urban centers are relatively low-income, populated by individuals primarily focused on making money [29]. According to UNICEF [30] and Vietnam's housing census [31] this migration results in less developed schools often staffed by under-qualified teachers [29], and less family commitment to children's education. Our results suggest that these factors ultimately are associated with higher levels of school impairment for the students. It thus will be important that these urban-fringe areas receive particular attention when considering national and regional educational policy.

We found that higher parent education was a risk factor for interpersonal impairment but a protective factor for school impairment and self-care impairment. One explanation is that parents' education influences child achievement through parents' attitudes, expectation and behaviors toward children's education, especially in Asian families [32], with parents with higher education providing more support and resources for their children to succeed at school. In contrast, because parents with higher education may spend more time involved in their careers, they may have less time to directly interact with their children to facilitate their social development. This interpretation parallels our interpretation regarding why rates of impairment in interpersonal functioning were higher than in the other two functioning subdomains.

### **Mental health and functional impairment**

The central finding of the study was that mental health was by far the largest risk factor for life functioning impairment. Mental health caseness (defined by CBCL Total Problems) was associated with a more than 550% increase in risk for overall functional impairment. Given

estimated base rates found in this study for mental health caseness in Vietnam (0.115), this translates to an increase from approximately 750,000 to 1,400,000 school-aged Vietnamese children with significant impairment in overall life functioning. The large magnitude of this and similar effects likely reflect the direct effect that emotional and behavioral child mental health problems have on life functioning. For instance, child behavioral problems reduce the quality of parent-child and other adult relationships at least in part by virtue of their aversive nature for parents [33], and child emotional problems can interfere directly with school success through their reduction of the child's ability to concentrate on academic material [34]. The highest conditional probability for functional impairment (in total functioning and / or any BIS subdomain) was .51, among CBCL Total Problem cases (see Table 2). Although this rate is high, particularly in comparison to the .16 rate among non-CBCL cases, it is important to note that it indicates that mental health problems are not the only risk factor for life functioning impairment.

### Study limitations

A primary limitation of the study is that, as with most studies of child functional impairment, it was cross-sectional and thus does not permit causal inferences. In addition, the study was based on a single informant (parents), selected because the BIS was developed for use with an adult caregiver [35,23]. Teachers and the children themselves might have provided a useful complementary perspective but our general population sample included children not in school, and the lower age range of children in our sample was six years, so use of these informants would have had their own limitations.

### Study implications

It is generally recognized that behavioral mental health treatments such as psychotherapy found effective in high income countries in the West cannot assumed to be effective in LMIC but must be evaluated under LMIC conditions [36]. The strong relation we found between mental health problems and impairment among Vietnamese children suggests that when evaluating such treatments in LMIC it will be important also to assess the treatments' effects on child life functioning. Study results also have important policy implications for Vietnam and other LMIC. It sometimes can be difficult to convince policy makers and the general public of the importance of mental health, in particular in relation to children, given the many other challenges that such societies face. In many LMIC such as Vietnam, mental health is sometimes viewed as an "expendable luxury", particularly for children [37]. However, the close link we found between mental health and functional impairment provides evidence that it is not, and such evidence of this can be useful for modifying policy in LMIC [38]. It may be especially important for policy makers to consider the new urban areas, in relation to child academic functioning.

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**Table 1**

## Sample demographic characteristics

<b>Characteristic</b>	<b>Level</b>	
Child		
Gender, male: percent (n)	50% (657)	
Age, years: mean (s.d.)	11.2 (3.2)	
Family		
Income, US\$: median annual family	\$1227	
Grandparents living in home: percent (n)	27% (346)	
Number children in household: mean (s.d.)	3.17 (0.93)	
Parental marital status		
Married: percent (n)	93% (1214)	
Divorced: percent (n)	2% (32)	
Widowed: percent (n)	3% (36)	
Parents		
	<b>Father</b>	<b>Mother</b>
Informant: percent (n)	24% (305)	74% (927)
Age, years: mean (s.d.)	42.3 (6.3)	38.8 (6.0)
High school graduate: percent (n)	38% (484)	36% (472)
Occupation		
Farmer: percent (n)	27% (342)	25% (330)
Fisherman: percent (n)	2% (25)	0% (3)
Factory worker: percent (n)	13% (164)	10% (131)
Vendor: percent (n)	12% (148)	22% (285)
Office worker: percent (n)	18% (224)	18% (239)
Homemaker: percent (n)	0% (0)	9% (114)
Retired: percent (n)	2% (21)	1% (7)

**Table 2**

Rates of functional impairment, as a function of BIS subdomain and CBCL caseness

Dependent variable (Functional impairment)	Independent variable (Mental health)	BIS Functional Impairment rate (given $CBCL\ caseness = 0, CBCL\ caseness = 1$ ) <sup>1</sup>	$\chi^2$ significance test
BIS Total	CBCL Total	0.04, 0.26	$\chi^2[1] = 70.92$ ****
BIS Total and / or any Subdomain	CBCL Total	0.16, 0.51	$\chi^2[1] = 79.50$ ****
BIS Interpersonal	CBCL Int	0.10, 0.23	$\chi^2[1] = 26.58$ ****
	CBCL Ext	0.11, 0.31	$\chi^2[1] = 24.51$ ****
BIS School	CBCL Int	0.05, 0.15	$\chi^2[1] = 30.39$ ****
	CBCL Ext	0.06, 0.21	$\chi^2[1] = 24.42$ ****
BIS Self-care	CBCL Int	0.04, 0.14	$\chi^2[1] = 32.35$ ****
	CBCL Ext	0.04, 0.20	$\chi^2[1] = 30.15$ ****

\*\*\*\*  
=  $p < 0.0001$ .

CBCL Total=CBCL Total Problems; CBCL Int=CBCL Internalizing (emotional) Problems; CBCL Ext=CBCL Externalizing (behavior) Problems.

<sup>1</sup> First proportion is for CBCL non-cases, second proportion is for CBCL cases.



**Table 3**

Significant risk / protective factors for BIS impairment, as a function of BIS subscale

Risk / protective factor	BIS factor	F	R <sup>2</sup>	X, $\beta$
Area (Urban, Near-urban, Rural)	BIS Domain	6.21[4,3938]****	0.01	
	BIS-School	10.27[2,1307]****	0.02	UF > U $\approx$ R <sup>l</sup>
Time Parent Talking with Child	BIS	24.27[1,1293]****	0.02	-0.14
	BIS Domain	9.62[2,3896]****	<0.01	
	BIS-School	19.97[1,1293]****	0.02	-0.12
	BIS-Self	31.01[1,1292]****	0.02	-0.15
Parent Income	BIS	8.54[1,1305]**	0.01	-0.08
Parent Education	BIS Domain	9.01[2,3929]****	<0.01	
	BIS-School	7.73[1,1304]**	0.01	-0.08
Parent Marital Status	BIS	44.09[1,1246]****	0.03	UnMa > Ma <sup>2</sup>
Child Gender	BIS	10.25[1,1304]**	0.01	M > F <sup>3</sup>
	BIS Domain	9.08[2,3929]****	<0.01	
	BIS-School	14.62[1,1304]****	0.01	M > F <sup>3</sup>
	BIS-Self	12.61[1,1303]****	0.01	M > F <sup>3</sup>
Child Age	BIS Domain	9.86[2,3941]****	<0.01	
	BIS-School	5.15[1,1308]*	<0.01	0.06
	BIS-Self	7.56[1,1307]**	0.01	-0.08
CBCL Total	BIS	452.32[1,1302]****	0.26	0.51
	BIS Domain	13.59[2,3923]****	0.01	
	BIS-InterPer	206.89[1,1302]****	0.14	0.37
	BIS-School	213.03[1,1302]****	0.14	0.37
	BIS-Self	245.15[1,1301]****	0.16	0.40
CBCL Emotional	BIS	190.27[1,1302]****	0.13	0.36
CBCL Behavioral	BIS	424.16[1,1302]****	0.25	0.50
	BIS Domain	16.27[2,3923]****	0.01	
	BIS-InterPer	204.30[1,1302]****	0.14	0.37
	BIS-School	169.40 [1,1302]****	0.12	0.34
	BIS-Self	248.17[1,1301]****	0.16	0.40

\* &lt;0.05,

\*\*  
<0.01,

\*\*\*  
<0.001,

\*\*\*\*  
<0.0001.

BIS Domain = BIS Domain (Interpersonal, School, Self-care) X predictor interaction; UF = urban fringe; U = urban; R = rural. UnMa=unmarried; Ma = married; M = male; F = female.

<sup>1</sup> Significant Tukey-Kramer pairwise comparisons were: UF - U:  $t[1307] = 3.24, p < 0.0035$ ; UF - R:  $t[1307] = 4.36, p < 0.0001$ .

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