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Screening for Developmental Disabilities in Developing Countries

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Abstract

Despite waxing international interest in child disability, little information exists about the situation of children with disabilities in developing countries. Using a culture-free screen for child disability from the 2005–2007 Multiple Indicator Cluster Survey, this study reports percentages of children in 16 developing countries who screened positive for cognitive, language, sensory, and motor disabilities, covariation among disabilities, deviation contrasts that compare each country to the overall effect of country (including effects of age and gender and their interactions), and associations of disabilities with the Human Development Index. Developmental disabilities vary by child age and country, and younger children in developing countries with lower standards of living are more likely to screen positive for disabilities. The discussion of these findings revolves around research and policy implications.

Keywords

Child development; Developmental disabilities; Developing countries; Risk factors; Policy making; Human Development Index

Introduction

Early childhood is a critical period in ontogeny, and early physical, cognitive, and socioemotional growth constitute foundations of future development. In consequence, disabilities sustained in early childhood can have lasting effects. In this study, we investigate four domains of developmental disabilities in under-researched and underserved populations in developing countries, paying special attention to their distributions by child age.

Developmental disability

The UN Convention on the Rights of Persons with Disabilities (UN CRPD) defines disabilities as “long-term physical, mental, intellectual or sensory impairments which in interaction with various barriers may hinder [a person’s] full and effective participation in society on an equal basis with others” (United Nations Enable, 2009). Thus, developmental disabilities are impairments to functioning attributable to physical and/or mental delays or deficiencies usually beginning in early life (Leonardi et al., 2006). Moreover, the

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International Classification of Functioning, Disability and Health (ICF) regards disability as an interaction between individual health conditions or abilities and contextual factors, such as national setting and cultural constructions of disability (WHO, 2002). In some developed Western societies like the United States and the United Kingdom, legislation, such as the Americans with Disabilities Act (P.L. 101–336) and the Equality Act 2010, respectively, make it unlawful to discriminate against, and call for community inclusion and self-determination of, people with disabilities. In other developed countries like South Korea, the concept of disability is still emerging (Jung, 2007). From a broader international perspective, disability appears to depend importantly on its social and economic contexts.

International efforts to obtain reliable information and inform policy specific to persons with disabilities were enacted in 2008 with UN CRPD (www.un.org/disabilities). People with developmental disabilities are believed to approximate 1.4% worldwide, with 80% living in the developing world (WHO, 2006). Thus, upwards of 93 million children 0–14 years are estimated to have moderate to severe disabilities, and 200 million children are believed to be cognitively or socioemotionally delayed (WHO, 2011). However, estimates of the prevalence of children with disabilities vary widely depending on definition and measurement standards. Moreover, the prevalence of developmental disabilities is likely to be higher where poverty and deprivation are common (UK Secretary of State for Health, 2001). The prevalence of child disabilities in low- and middle-income countries (LMIC) varies from 0.4% to 12.7% depending on the study and assessment tool (Maulik & Darmstadt, 2007). However, such estimates are founded on scarce and poor quality data. Identifying and characterizing disability in LMIC is challenging due to the lack of cultural and language-specific tools for assessment (Hartley & Newton, 2009), and so accurate data on disability especially in the developing world are lacking (WHO, 2011).

Consequently, most of what is currently known about developmental disabilities comes from studies of children in the developed world, and much of what is known from developing countries comes from studies of small samples in single locales. However, nearly 90% of the world’s children reside in LMIC (UNICEF, 2008). Standardized and population-based multinational data from the developing world are needed to identify countries where children are at greatest risk and which domains of development are broadly susceptible to disabilities in children of different ages in those countries. The results promise to leverage better-informed national and global policies for early childhood disabilities.

Country-level development and developmental disability

Disability is linked to poverty: disability may increase the risk of poverty, and poverty may increase the risk of disability (Sen, 2009). People with disabilities and their families often experience economic and social disadvantage. A study of 56 developing countries reported that the poor generally experience worse health than the non-poor (Gwatkin et al., 2007). The *Young Lives* project, a multi-national longitudinal study of child poverty, revealed that children living in low-resource contexts tend to exhibit high rates of cognitive and socioemotional impairments (Dercon & Krishnan, 2009). Thus, the context within which a developmental disability occurs shapes its attribution and outcome, and a person’s environment impacts the experience and extent of disability. A child with a cognitive disability in one context might have a poor long-term outcome, whereas a child with the same disability in another context might fare better. Although a learning (cognitive) disability constitutes a developmental risk, the significance and meaning of the risk depend on contextual factors (Morrison & Cosden, 1997). The nations investigated in this study all constitute developing countries (UNICEF, 2006), defined with reference to the World Bank’s system of classification of economies based on gross national incomes (GNI) per capita, quality of life (life expectancy, literacy rates), and economic diversification (labor force, consumption).

The Multiple Indicator Cluster Survey, Disabilities Module, and Ten Questions Screen

The World Summit for Children held in 1990 adopted the World Declaration on the Survival, Protection and Development of Children and its Plan of Action. In response, UNICEF developed the Multiple Indicator Cluster Survey (MICS; http://www.childinfo.org/mics3.html), a nationally representative and internationally comparable household survey of standardized methods and questions (among other things) to collect comparable health data on children in LMIC around the world (UNICEF, 2006).

UNICEF recognized that unique efforts would need to be made for children with disabilities in their State of the World's Children Report (UNICEF, 2005). To address this need, UNICEF recommended inclusion of a disabilities module, the Ten Questions Screen (TQS), in the MICS. The TQS was originally developed as part of the International Pilot Study of Severe Childhood Disability (Belmont, 1986) and designed to be applicable across cultural settings (Durkin et al., 1995; Thorburn et al., 1992; Zaman et al., 1990). The TQS is a relatively easy, inexpensive, culture-free screening instrument to provide robust, comparable, and multidomain data on young children with developmental disabilities or delays. The MICS can also be seen as part of the larger effort of the WHO ICF (2002) with disability used as one component for impairment, activity participation, and restrictions. In this framework, a child's disability is seen as an interaction between functioning and contextual factors – a shift from a medical model to a social model of disability. The goal of the TQS was to produce estimates of child disability and their associations with data related to the contextual factors in the ICF framework.

The present study analyzed internationally comparable screening information on children with cognitive, language, sensory, and motor disabilities across 16 developing countries using a standardized metric in a developmental framework that focuses on child age, on disability, and on context. Each country was compared to the overall effect (in a deviation contrast) because we were interested in the relative ordering among countries (rather than individual country contrasts). The Human Development Index was used as a measure of the social and economic status of countries to gain additional insight into associations between the prevalence of developmental disabilities across the developing world and national indicators.

Method

Participants

Approximately 172,000 families in 16 developing countries provided data. (Bosnia did not provide data for one cognitive indicator question.) If there was more than one child between the ages of 2 and 9 years in a family, we randomly selected a target child.

The sample used for analyses comprised 101,250 children, approximately equal numbers of girls and boys, averaging 5 years of age (Table 1). For full details for MICS sampling, training, and household selection (see Bornstein et al., 2012).

The MICS3 and the TQS

This study used the TQS of the Household Questionnaire of the third round of the MICS (2005–2007) which asked about disabilities in children aged 2 to 9 years. The mother (or primary caregiver) of a target child answered *No* (0) or *Yes* (1) to 10 questions about any cognitive (learning and cognition), language (production and comprehension), sensory (vision and hearing), or motor (developmental milestones) impairments in that child's functional abilities relative to peers. A total disability score of 1 was computed if the respondent indicated impairment on any question and 0 if respondent did not indicate any impairment, and composite indices were created for the 4 impairment domains from indicators (for example, if a respondent answered yes to either one or both of the sensory indicators (vision and hearing), the composite score was 1; if no impairment was reported, the score was 0). Composites are indices (not scales) because they comprise conceptually related indicators of a developmental domain but are not necessarily statistically related (Bradley, 2004; Streiner, 2003). For example, the likelihood having a visual impairment may be unrelated to the likelihood of having a hearing impairment, but both indicate sensory impairments.

The TQS has been cited as the most commonly used screening measure of child disabilities in resource-poor countries (Maulik & Dramstadt, 2007), and a number of studies have validated the utility of the TQS in identifying children with moderate to severe disabilities (Durkin et al., 1994; Durkin et al., 1995; Muga, 2003; Thorburn et al., 1992; Zaman et al., 1990). Durkin et al. (1994) conducted a two-stage study of over 22,000 children in Bangladesh, Jamaica, and Pakistan, following up TQS administration with clinical evaluation. The sensitivity of the TQS for serious disabilities was generally high in all countries (range = .82 to .92).

The Human Development Index

Here, disability screening data are related to key country-level indicators in the Human Development Index (HDI), a UN measure of general social and economic status of a country (UNDP, 2009). The HDI has three components: life expectancy, education (adult literacy rate and gross enrollment in primary, secondary, and tertiary school), and gross domestic product. The HDI constitutes a reasonable proxy for national levels of support available for promoting human development and connects to many physical and social aspects of the home environment with known relations to child development. Countries with an HDI ≥.80 are considered high, .50–.79 medium, and ≤.49 low. We use this tripartite division to organize LMIC, and our sample of 16 LMIC adequately represents the full range of the HDI: 5 high, 8 medium, 2 low, and 1 (missing data about gross domestic product) for which the HDI could not be calculated.

Analytic Plan

First, we examined potential covariates. We then computed the means and standard deviations, by country, for children who screened positive for disability for the composite indices and for their individual-item indicators (here we report composites; unless otherwise indicated, the data and analyses for indicators followed the same patterns as composites and are available from the authors). Next, we calculated covariations among composite indices. Afterward, we explored composite indices (and individual indicators) using logistic regression, with country as the predictor and number of children aged 2–9 as a covariate. We used a deviation contrast to compare each country to the overall effect of country (analogous to the grand mean in OLS regression) to investigate the general ordering of the 16 developing countries on a continuum. We compared each country to the overall effect because we did not want to single out a particular country as a reference group, and pairwise comparisons for all countries would be unwieldy (120 comparisons for each model). Instead, the deviation contrast shows whether a particular country is significantly above or below the overall effect.

We table main effects of country, age, and gender as well as their 2-way interactions. When an interaction emerged for age or gender with country, we repeated the tests for each country to assess the main effect of age or gender within countries.

We report Cox and Snell's and Nagelkerke's pseudo-R^2 values as estimates of the percentages of variance accounted for by country; Wald estimates for significance of the logistic regression coefficients (which correspond to significance testing of b coefficients in OLS regression); and odds ratios (OR) for effect sizes For the deviation contrast, the OR indicates the size of the deviation from the overall effect. Hence, an OR of 2.0 means that the country's probability of having a particular disability is twice that of the overall effect when all countries are considered together. We did not impute missing data because the sample size was large and fewer than 1% of data points were missing for all variables except for intellectual impairment, which was missing only 2.8% of data points (Bosnia did not ask this question).

Last, we examine associations of composite indices with the HDI and its components. The primary measures used in this study are dichotomous, and appropriate nonparametric analyses and pairwise and listwise statistics are used *passim.*

Results

Covariates

Table 1 shows descriptive statistics by country for child age and gender. Number of children in the family aged 2–9 was used as a covariate because it varied across country, $F(15) = 950.88$, $p < .001$, $\eta^2_p = .12$, and point-biserial correlations between number of children 2–9 and the disability composites ranged from $r_{pb} = -.005 – .061$.

Descriptive Statistics

Figure 1 and Table 2 show the proportions of children, overall and by country grouped according to HDI, respectively, who screened positive for the composite indices and their indicators. Although considerable variability characterized index, indicator, and country, more language disabilities were reported than motor, more motor than cognitive, and more cognitive than sensory.

Covariation among Disabilities

Supplementary Table 1 displays relations between composites by country. All relations were negative, large, and significant. Children identified as having one type of disability (e.g., language) were unlikely to be identified as concurrently having a different disability (e.g., cognitive).

Total Disabilities: Deviation from the Overall Effect

Overall, the proportions of children who screened positive for at least one disability ranged from 3.1% (Uzbekistan) to 45.2% (Central African Republic). Across all countries, 20.4% of children screened positive for at least one impairment. There was an overall main effect of Country, Wald χ^2 (15, $N = 98670$) = 4300.20, $p < .001$, and a Country x Age interaction, Wald χ^2 (15, $N = 98670$) = 162.32, $p < .001$. The model explained between 6.4% (Cox & Snell R^2) and 10.0% (Nagelkerke R^2) of the variance. Eight of 15 countries showed significant effects of age (Table 3): Younger children in medium- and low-HDI countries and in Iraq were more likely to screen positive for some impairment.

Cognitive Composite and Indicators: Deviation from the Overall Effect

Cognitive composite—Across all countries, 5.0% of children screened positive (Table 2) for a cognitive impairment. There was a overall main effect of Country, Wald χ^2 (14, N = 98415) = 1188.49, $p < .001$, and a Country x Age interaction, Wald χ^2 (14, N = 98415) = 94.66, $p < .001$. Eight of 15 countries showed significant effects of age (Table 3): Older children in high-HDI countries were more likely to screen positive for a cognitive impairment; age results were mixed in medium-HDI countries; and younger children in low-HDI countries were more likely to screen positive.

Cognitive indicator: Learning impairment—Across all countries, 3.0% of children screened positive. There was an overall main effect of Country, Wald χ^2 (15, N = 101207) = 768.04, $p < .001$, and a Country x Age interaction, Wald χ^2 (15, N = 101207) = 88.82, $p < .001$. The model explained between 1.2% (Cox & Snell R^2) and 5.0% (Nagelkerke R^2) of the variance. Six of 16 countries showed significant effects of age: Older children in high-HDI countries were more likely to screen positive for a learning impairment, and younger children in medium- and low-HDI countries were more likely to do so.

Cognitive indicator: Intellectual impairment—Across all countries, 2.5% of children screened positive. There were overall main effects of Country, Wald χ^2 (14, N = 98429) = 587.50, $p < .001$, and gender, Wald χ^2 (14, N = 98429) = 3.84, $p < .05$, and a Country x Age interaction, Wald χ^2 (14, N = 98429) = 54.32, $p < .001$. The model explained between 0.8% (Cox & Snell R^2) and 3.9% (Nagelkerke R^2) of the variance. For gender, males were more likely than females to screen positive for an intellectual impairment in Bangladesh. Six of 15 countries showed significant effects of age: Results were mixed in high- and medium-HDI countries; and younger children in low-HDI countries were more likely to screen positive for an intellectual impairment.

Language Composite and Indicators: Deviation from the Overall Effect

Language composite—Across all countries, 12.7% of children screened positive for a language impairment. There were overall main effects of Country, Wald χ^2 (15, N = 101100) = 5332.92, $p < .001$, age, Wald χ^2 (15, N = 101100) = 132.24, $p < .001$, and gender, Wald χ^2 (1, N = 101100) = 4.71, $p < .05$. There were also Country x Age, Wald χ^2 (15, N = 101100) = 94.66, $p < .001$, and Country by Gender interactions, Wald χ^2 (1, N = 101100) = 25.08, $p < .05$. The model explained between 6.5% (Cox & Snell R^2) and 12.3% (Nagelkerke R^2) of the variance. Nine of 16 countries showed significant effects of age (Table 3): Younger children in high-, medium-, and low-HDI countries and Iraq were more likely to screen positive for a language impairment. Analysis of the effects of gender for each country showed males more likely than females to screen positive for a language impairment in Yemen and Bangladesh.

Language indicator: Say words—Across all countries, 4.0% of children screened positive. There were overall main effects of country, Wald χ^2 (15, N = 101218) = 1077.56, $p < .001$, and age, Wald χ^2 (15, N = 101218) = 80.96, $p < .001$, and a Country x Age interaction, Wald χ^2 (15, N = 101218) = 278.95, $p < .001$. The model explained between 2.5% (Cox & Snell R^2) and 8.6% (Nagelkerke R^2) of the variance. Eleven of 16 countries showed significant effects of age: Results were mixed in high-HDI countries; and younger children in medium- and low-HDI countries were more likely to screen positive for not being able to speak or say recognizable words.

Language indicator: Speech different—Across all countries, 7.8% of children screened positive. There were overall main effects of country, Wald χ^2 (15, N = 88446) = 4965.42, $p < .001$, and age, Wald χ^2 (15, N = 88446) = 38.28, $p < .001$, and a Country x Age interaction, Wald χ^2 (15, N = 88446) =26.82, $p < .05$. The model explained between 6.2% (Cox & Snell R^2) and 14.6% (Nagelkerke R^2) of the variance. Ten of 16 countries showed significant effects of age: Younger children in high-, medium-, and low-HDI countries and Iraq were more likely to screen positive for speech different from normal.

Language indicator: Name object—Across all countries, 14.2% of children screened positive. There was an overall main effect of country, Wald χ^2 (15, N = 12643) = 346.28, $p < .001$. The model explained between 3.3% (Cox & Snell R^2) and 5.9% (Nagelkerke R^2) of the variance. Eleven of 16 countries showed significant effects of country: Children in high-HDI countries were less likely to screen positive for not being able to name at least one object; results were mixed in medium-HDI countries; and children in low-HDI countries and Iraq were more likely to screen positive.

Language indicator: Speech comprehension—Across all countries, 2.7% of children screened positive. There were overall main effects of Country, Wald χ^2 (15, N = 101231) = 677.96, $p < .001$, and gender, Wald χ^2 (1, N = 101231) = 5.31, $p < .05$, and a Country x Age interaction, Wald χ^2 (15, N = 101231) = 79.56, $p < .001$. The model explained between 1.1% (Cox & Snell R^2) and 5.2% (Nagelkerke R^2) of the variance. For gender, males were more likely than females in Yemen, Bangladesh, and the Central African Republic, and females were more likely than males in Macedonia, to screen positive for not understanding their caregiver's speech when their caregiver asked them to do something. Five of 16 countries showed significant effects of age: Older children in high-HDI countries (Albania) were more likely to screen positive for not understanding; and younger children in medium- and low-HDI countries and Iraq were more likely to do so.

Sensory Composite and Indicators: Deviation from the Overall Effect

Sensory composite—Across all countries, 2.9% of children screened positive for a sensory impairment. There were overall main effects of country, Wald χ^2 (15, N = 101226) = 830.99, $p < .001$, and age, Wald χ^2 (15, N = 101226) = 53.15, $p < .001$, and a Country x Age interaction, Wald χ^2 (15, N = 101226) = 51.14, $p < .001$. The model explained between 1.2% (Cox & Snell R^2) and 5.2% (Nagelkerke R^2) of the variance. Nine of 16 countries showed significant effects of age (Table 3): Older children in most countries were more likely to screen positive for a sensory impairment.

Sensory indicator: Vision—Across all countries, 1.4% of children screened positive. There were overall main effects of country, Wald χ^2 (15, N = 101235) =582.32, $p < .001$, and age, Wald χ^2 (15, N = 101235) =37.27, $p < .001$, and a Country x Age interaction, Wald χ^2 (15, N = 101235) = 38.20, $p < .001$. The model explained between 0.8% (Cox & Snell R^2) and 5.5% (Nagelkerke R^2) of the variance. Seven of 16 countries showed significant effects of age: Older children in high- and medium-HDI countries and Iraq were more likely to screen positive for a vision impairment.

Sensory indicator: Hearing—Across all countries, 1.9% of children screened positive. There was an overall main effect of country, Wald χ^2 (15, N = 101231) = 649.34, $p < .001$, and a Country x Age interaction, Wald χ^2 (15, N = 101231) = 40.35, $p < .001$. The model explained between 1.0% (Cox & Snell R^2) and 6.1% (Nagelkerke R^2) of the variance. Four of 16 countries showed significant effects of age: Older children in medium- and low-HDI countries were more likely to screen positive for a hearing impairment.

Motor Composite and Indicators: Deviation from the Overall Effect

Motor composite—Across all countries, 6.2% of children screened positive for a motor impairment. The overall effect of country was significant, Wald χ^2 (15, N = 101,227) =

1,633.83, $p < .001$. Country explained between 2.5% (Cox & Snell R^2) and 6.8% (Nagelkerke R^2) of the variance. All countries (except Jamaica) differed from the overall effect of country (Table 3): Children in high-HDI countries were less likely to screen positive for a motor impairment; results were mixed for children in medium-HDI countries; and children in low-HDI countries and Iraq were more likely to screen positive.

Motor indicator: Motor delay—Across all countries, 4.9% of children screened positive. There was an overall main effect of country, Wald χ^2 (15, $N = 101241$) = 1240.41, $p < .001$, and a Country x Age interaction, Wald χ^2 (15, $N = 101241$) = 25.57, $p < .05$. The model explained between 2.3% (Cox & Snell R^2) and 7.3% (Nagelkerke R^2) of the variance. Three of 16 countries showed significant effects of age: Younger children in medium- and low-HDI countries and Iraq were more likely to screen positive for a motor delay.

Motor indicator: Motor difficulty—Across all countries, 2.2% of children screened positive. There was an overall main effect of country, Wald χ^2 (15, $N = 101234$) = 392.95, $p < .001$, and a Country x Age interaction, Wald χ^2 (15, $N = 101234$) =38.47, $p < .001$. The model explained between 0.7% (Cox & Snell R^2) and 3.5% (Nagelkerke R^2) of the variance. Two of 16 countries showed significant effects of age: Younger children in the Central African Republic and Iraq were more likely to screen positive for a motor difficulty.

Relations between Disabilities and the Human Development Index

For each country, we computed the average of the disability composites and individual indicators. This procedure reduced the unit of analysis from approximately 101,250 families to 14–16 countries. Therefore, the power for the following tests is low and should be interpreted accordingly. Country averages were correlated with the country HDI and its 3 constituent indices (life expectancy, education, and GDP). The HDI is multi-dimensional and its components relate to one another; it is possible, however, that HDI components still relate in different ways to different child disabilities. Table 4 shows relations between total disabilities and the HDI and its components. The language composite was negatively related to education and literacy; the lower the national literacy rate, the more prevalent was language disability. The motor composite was negatively related to the HDI, education, literacy, schooling, and GDP; the lower the national HDI, the more prevalent was motor disability.

Discussion

Variability emerged by disability type, by child age, and by country in the proportions of mother (or caregiver) reports of cognitive, language, sensory, and motor disabilities and their individual components in children 2 to 9 years of age in 16 developing counties. Significantly, 1 in 5 children was identified by their primary caregiver to screen positive for a cognitive, language, sensory, or motor disability. Language disability was most prevalent, and sensory least. Younger children were reported to have more (especially language) disabilities. Developmental disabilities tended to be independent of one another. In some countries as few as 3% of children screened positive for a disability, whereas in others as many as 45% did. Disability type also varied with country standards of living, and low-HDI countries tended to report more positive screens and younger children were more likely to be screened as having some type of impairment. Notably, educational level was associated with fewer language and motor disabilities. No systematic difference in disabilities emerged with child gender.

Causes of Developmental Disabilities

There are many physical, social, and environmental causes of developmental disabilities. Children residing in developing countries tend to have worse physical health (Grantham-McGregor et al., 2007) that constitutes a risk factor for childhood disabilities (Biritwum et al., 2001; Gottlieb et al., 2009; McPherson & Swart, 1997). Our cross-national findings augment individual field studies that have been conducted in a number of countries in which the TQS was implemented. For example, in our data Ghana reported above-average likelihoods of screening positive for naming and sensory impairments, and a study conducted by Biritwum et al. (2001) reported that most common types of disabilities in Ghana were speech and hearing problems with a common cause being inadequate immunization for diseases such as rubella and measles. Our study points to an above-average likelihood of screening positive for hearing problems in Sierra Leone, where McPherson and Swart (1997) conducted school-based surveys to assess the causes of hearing loss and learned that the most common etiologies included meningitis, measles, and maternal rubella. Additionally, our study showed that children in Thailand had an above-average likelihood of screening positive for cognitive impairment, and Pongprapai et al. (1996) found that, of those Thai children positively diagnosed with intellectual disabilities, almost half had not received assessment or medical care due to inaccessibility, cost, and traditional beliefs and practices.

Covariation and Consequence of Developmental Disabilities

One health condition may be related to other coexisting conditions. However, our data suggest possible dissociations among disabilities. In accord with conceptual models that treat disabilities as essentially modular, we found that the likelihood of screening positive for one kind of disability was unrelated or negatively related to the likelihood of screening positive for a second kind. A primary goal of clinical practice is to describe the individual child’s developmental needs and determine how they can best be met; therefore, an implication of our findings is that, in the absence of confirmatory diagnostic testing and with limited resources, treatment and rehabilitative services might confirm and concentrate on one disability in a child at a time (for detailed information on policy, funding, and rehabilitation, see the World Health Report on Disabilities; WHO, 2011).

That said, this study focused on the early years of life. A systems view of normal development suggests that functioning in one domain tends to affect functioning in others. For example, achieving locomotion alters a child’s social, cognitive, and emotional development. It is possible that a motor disability in the early years may be unrelated to other disabilities in the short-term but still have cascading long-term effects for children in other developmental domains. Thus, children with a sensory disability may not necessarily have a motor disability but still be at risk for poor social competence (Guralnick, 1999). This suggestion underscores the need for longitudinal study; with developmental disorders, relatively minor deviations and inefficiencies at earlier times (if not addressed adequately) might become manifest more broadly later. Children not diagnosed with a severe disability may screen positive for a mild disability or health issue which could potentially lead to a disability if left untreated, as exemplified in ear infections (Bastos et al., 1995; McPherson & Swart, 1997), malnutrition and/or stunting (Chen & Simeonsson, 1993; Gottlieb et al., 2009), and immunizations (Biritwum et al., 2001). A review of the literature on child disabilities in LMIC (Maulik & Darmstad, 2007) reported that 68% of cases of confirmed disabilities were avoidable with standard immunizations, prompt medical attention, prenatal and delivery care, adequate nutrition, and the like. Thus, as a screening tool, the TQS allows scarce diagnostic, rehabilitative, and other resources to be directed toward those at greater risk.

Limitations

A disadvantage of the MICS is its cross-sectional design that restricts inferences about direction of effects; however, the multivariate nature of the MICS presents the opportunity to assess associations between specific disabilities and other variables. Disability is also a complex multidimensional construct, whereas the TQS only classifies disabilities nominally, using one set of indicators, and so does not permit nuanced insights into levels of developmental disability. The MICS domains of disabilities are broadly defined which may lead to underestimation of some developmental delays (e.g., fine versus gross motor skills, visual acuity). Other factors likely influence the comparability of disability prevalence data at national and international levels such as differences in data collection methods (prevalence may differ between self-reported and measured disability), choice of impairments, and inclusion of institutionalized populations (Andresen et al., 2000; Me & Mbogoni, 2006). Research with children (as here) engenders further complexities. Parents or caregivers – the natural proxy responders in surveys – may not accurately represent the experiences of the child for a number of reasons, including lack of knowledge, subjectivity, and influence of cultural and social differences (Chamie, 1994). That said, the TQS asks about general functional abilities and developmental milestones in a culturally unbiased format, and the TQS brings a degree of standardization to cross-national assessments. The associations observed between HDI and the composite indices must also be viewed with caution as they are based on a small *N*; however, comparative analyses show clear trends of children in higher-HDI countries less likely to screen positive and those in lower-HDI countries more likely to screen positive for an impairment. Older children in high-HDI countries were also more likely to screen positive for an impairment. These data offer some direction on future efforts both in terms of allocating resources to conduct confirmatory diagnoses, and interventions as well as educating parents, teachers, and professionals to recognize early signs of impairment.

Children screening positive on the TQS are considered at increased risk of a disability. However, the TQS is not diagnostic; it is a screening instrument to be followed up by clinical testing and diagnoses. The usefulness of the TQS is in identifying children at increased risk of disability and children most likely to benefit from referral for professional assessment and rehabilitation. Unfortunately, many LMIC lack the resources or infrastructure to conduct medical evaluations or provide rehabilitative services. Thus, findings such as ours may help to identify country-level priorities for the most needed services and resources.

Finally, we did not use sample weights in this analysis. First, analyses of the sampling weights were incorrect for several countries (i.e., sample means less than 1.00) and some country *N*s changed dramatically when weights were applied, indicating a problem with the distribution of weights within the country. Second, due to the rounding procedures to the nearest integer of many statistical packages, 22% of the cases in this study would have been excluded due to sampling weights below 0.5. We therefore gave equal weight to each case in the sample. This statistical decision may skew the representativeness of the sample slightly, but each country was asked to recruit a representative sample from all areas of the country. We have no reason to believe that the prevalence of disabilities would significantly differ across over- or undersampled subpopulations.

Conclusion

Discrete disabilities in children can be reliably measured for purposes of identification and intervention. However, developmental disabilities are also systemic in nature. Society's response should be to remediate disabilities and also forecast and thus prevent or arrest developmental progressions so that they do not lead to more widespread and significant maladaptive outcomes. Interventions need to be oriented toward discrete disabilities as well as any potential developmental cascade originating from them and they need to be tailored for their context.

With increased vulnerability comes the mandate for increased protection (Engle et al., 2007). Clinicians, educators, and policymakers need to be aware of the complex needs of families with children with disabilities and their emotional and economic stresses. Providing family-centered resources for children with developmental disabilities holds the promise to improve the lives of children with disabilities (Wei & Yu, 2010). Article 7 of the UN CRPD draws attention to the rising profile of childhood disability and the need "to ensure the full enjoyment by children with disabilities of all human rights and fundamental freedoms on an equal basis with other children" (UN Enable, 2009). The UN CRPD established a comprehensive framework to protect and promote the rights of persons with disabilities, adopted a model to recognize the contextual, cultural, and social contributors as well as medical issues confronted by people with disabilities, and called for action to acquire data to facilitate implementation of its policies (Ferri, 2011). Research on the prevalence of developmental disabilities in young children in developing countries is vital to mounting appropriate policies for prevention, allocation of resources, and improving the quality of life of children with disabilities.

The 16 developing countries reported in this study vary widely in terms of history and ideology, social and economic situations, beliefs and values, as well as other sociodemographic factors thought to influence child development and, more specifically, children at-risk for developmental disabilities. As children in different national contexts experience widely varying situations, context can be expected to influence children's physical, social, emotional, and cognitive development (Bornstein, 2010). Thus, comparative multinational studies (such as this one) contribute a first step to identifying, distinguishing, and explaining patterns of development in children with disabilities.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Research Highlights

- This study reports on children in 16 developing countries who screened most at-risk in 4 broad domains of child development.
- Overall, the percentages of children who screened positive for at least one disability was 20.4%, *range* = 3.1% – 45.2%.
- Variability emerged by disability type, child age, and country, with relations between prevalence and standard of living.
- More language disabilities were reported than motor, more motor than cognitive, and more cognitive than sensory.
- Younger children and countries with lower living standards were more likely to be screened as having some type of impairment.

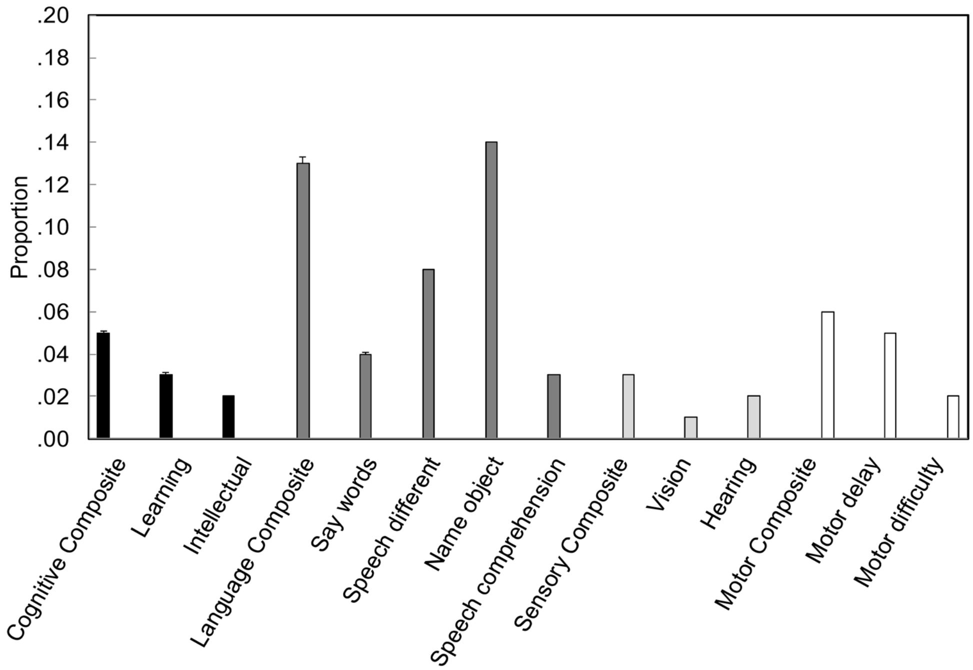

Figure 1.
Proportions of children screening positive for disability composites and individual indicators

Table 1

Descriptive Statistics for Sample Characteristics

Country		Child age (years)		Child gender
	n	***M***	***SD***	**% female**
High HDI				
Montenegro	940	5.11	2.22	46.1
Serbia	3065	4.87	2.22	48.3
Macedonia	3266	4.49	1.93	50.5
Albania	1636	5.93	2.24	45.8
Bosnia and Herzegovina	2526	4.56	2.20	49.5
Medium HDI				
Thailand	12911	5.75	2.30	48.3
Belize	830	5.60	2.23	50.5
Jamaica	1630	5.64	2.29	47.8
Mongolia	3478	5.19	2.28	48.0
Uzbekistan	4933	5.62	2.32	48.3
Yemen	2512	5.43	2.27	48.6
Ghana	3240	5.53	2.24	48.5
Bangladesh	36987	5.50	2.25	48.6
Low HDI				
Central African Republic	6825	5.21	2.20	50.5
Sierra Leone	5308	5.46	2.17	49.6
HDI N/A				
Iraq	11163	5.45	2.32	48.0
TOTAL	101250	5.43	2.27	48.7

Note. High HDI = .80–1.00, Medium HDI = .50–.79, and low HDI = .00–.50.

N/A = not available.

Table 2

Descriptive Statistics for Cognitive, Language, Sensory, and Motor Disability Composites

	Cognitive		Language		Sensory		Motor	
Country	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
High HDI								
Montenegro	.02	.15	.11	.32	.01	.12	.01	.08
Serbia	.06	.23	.14	.34	.02	.15	.01	.11
Macedonia	.06	.23	.17	.38	.02	.14	.02	.15
Albania	.05	.23	.14	.34	.02	.14	.02	.13
Bosnia and Herzegovina	n/a	n/a	.07	.25	.02	.13	.02	.15
Medium HDI								
Thailand	.08	.28	.08	.27	.01	.10	.01	.11
Belize	.09	.29	.33	.47	.10	.30	.10	.30
Jamaica	.06	.24	.17	.37	.04	.19	.03	.16
Mongolia	.07	.25	.18	.38	.05	.21	.05	.21
Uzbekistan	.00	.07	.02	.15	.00	.07	.01	.08
Yemen	.07	.26	.18	.38	.06	.25	.11	.32
Ghana	.05	.22	.12	.32	.04	.20	.05	.22
Bangladesh	.03	.16	.07	.26	.03	.16	.10	.29
Low HDI								
Central African Republic	.08	.28	.36	.48	.07	.25	.08	.28
Sierra Leone	.10	.29	.27	.44	.03	.18	.06	.23
HDI N/A								
Iraq	.04	.20	.15	.35	.03	.17	.07	.25
Total	.05	.22	.13	.33	.03	.17	.06	.24

Note. M (*SD*) proportion.

n/a = not available.

Table 3

Parameter Estimates and Odds Ratios for Age Effects within Countries for Total, Cognitive, Language, Sensory, and Motor Composites and Country Deviation from the Overall Effect

	Total Disabilities			Cognitive			Language			Sensory			Motor		
	N	Wald χ^2	OR[1]	*N*	Wald χ^2	OR[1]	*N*	Wald χ^2	OR[1]	*N*	Wald χ^2	OR[1]	*N*	Wald χ^2	OR[2]
High HDI															
Montenegro	918	.001	.98 *ns*	929	.79	.91 *ns*	924	.76	.96 *ns*	940	4.50	1.32*	940	18.64	.19***
Serbia	3018	.92	1.02 *ns*	3044	4.87	1.08*	3023	.26	.99 *ns*	3061	20.36	1.28***	3060	39.32	.38***
Macedonia	3266	1.23	1.03 *ns*	3266	.16	1.02 *ns*	3266	.000	1.00 *ns*	3266	2.97	1.11 *ns*	3266	9.76	.70**
Albania	1636	1.63	1.04 *ns*	1636	11.08	1.19***	1636	1.29	1.04 *ns*	1636	.78	1.07 *ns*	1636	14.98	.49***
Bosnia and Herzegovina	n/a	n/a	n/a	n/a	n/a	n/a	2523	7.78	.90**	2526	1.90	1.09 *ns*	2526	10.77	.65***
Medium HDI															
Thailand	12911	33.85	.94**	121911	2.03	1.02 *ns*	12911	79.05	.88***	12911	5.90	1.10*	12911	139.24	.38***
Belize	826	.004	1.00 *ns*	827	.02	.99 *ns*	825	.30	.98 *ns*	830	1.51	1.07 *ns*	830	100.36	3.21***
Jamaica	1577	.38	1.02 *ns*	1587	3.05	1.08 *ns*	1612	.75	.98 *ns*	1629	14.62	1.28***	1630	1.98	.81 *ns*
Mongolia	3478	.35	1.01 *ns*	3478	6.37	1.08*	3478	2.82	.97 *ns*	3478	26.71	1.20***	3478	20.93	1.46***
Uzbekistan	4933	7.31	.91**	4933	8.21	.76**	4933	6.87	.90**	4933	.40	1.06 *ns*	4933	93.57	.19***
Yemen	2498	38.13	.89***	2508	10.72	.89***	2500	60.50	.83***	2510	6.12	1.09*	2510	399.50	4.09***
Ghana	3266	5.81	.95*	3227	.53	1.03 *ns*	3236	12.75	.92***	3238	.02	.99 *ns*	3239	34.80	1.66***
Bangladesh	36968	150.31	.93***	36972	7.15	.96**	36976	295.19	.86***	36981	114.43	1.17***	36979	750.20	3.09***
Low HDI															
Central African Republic	6692	15.36	.96***	6627	12.41	.93***	6787	22.06	.95***	6816	4.92	1.05*	6818	326.23	2.75***
Sierra Leone	5308	119.78	.86***	5308	35.72	.88***	5308	147.47	.84***	5308	3.15	1.07 *ns*	5308	74.44	1.79***
HDI N/A															
Iraq	11162	128.49	.89***	11162	3.22	.96 *ns*	11162	200.55	.84***	11163	9.68	1.08**	11163	224.84	2.20***

Notes. n/a = data not available.

[1]Odds ratios > 1.00 indicate that older children were more likely to screen for a disability, < 1.00 indicate that younger children were more likely to screen for a disability.

[2]Odds ratios > 1.00 indicate more likely and < 1.00 a less likely to have a motor disability, as compared to overall effect of all countries.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

Table 4

Correlations of Disabilities Composites with the Human Development Index and its Components

Disability	HDI	Life Expectancy Index	Education Index	Literacy	Schooling	GDP Index
Total disabilities	−.06	−.02	−.12	−.10	−.16	.01
Cognitive	−.28	−.29	−.33	−.37	−.19	−.11
Language	−.45	−.44	−.50*	−.51*	−.42	−.30
Sensory	−.33	−.23	−.43	−.48	−.26	−.26
Motor	−.61*	−.47	−.73***	−.77***	−.55*	−.56*

Note. N = 14–16 countries.

* $p < .05$,

*** $p < .001$.