



Original article

Anxiety and Depression Signs Among Adolescents in 26 Low- and Middle-Income Countries: Prevalence and Association With Functional Difficulties

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A B S T R A C T

Purpose: The aim of this study is to describe the occurrence of signs of depression and anxiety among adolescents from 26 low- and middle-income countries and explore the extent to which these are associated with difficulties across other functional domains.

Methods: We analyzed randomly selected, nationally representative data from 26 countries with a total sample size of 123,975 adolescents aged 10–17 years. Data on functional difficulties, including signs of depression and anxiety, were collected by the Child Functioning Module, an instrument validated to identify the population of children with disabilities through household surveys. We estimated percentages and 95% confidence intervals of adolescents with difficulties across 11 domains of functioning, and of signs of depression and/or anxiety. We used multinomial regressions to estimate the association between difficulties in the different domains and having signs of depression only, signs of anxiety only, and signs of both depression and anxiety, relative to not presenting signs of depression or anxiety.

Results: In total, 5.5% of adolescents were reported to have had signs of anxiety, 3.1% signs of depression, and 2.3% co-occurring signs of anxiety and depression. Compared to adolescents without functional difficulties, those with difficulties in one or more domains were three times more likely to have signs of depression and anxiety. The likelihood of presenting signs of depression only or signs of both depression and anxiety was significantly higher across all domains, and the highest among adolescent with difficulties to self-care and communicating. The likelihood of presenting signs of anxiety only was significantly higher across all domains except seeing and hearing, and the highest among adolescent with difficulties communicating and accepting changes.

Discussion: Adolescents with functional difficulties in all domains analyzed, across different contexts, are more likely to experience depression and anxiety signs than those without such difficulties. Increasing the availability of population-level data on adolescent functional difficulties,

IMPLICATIONS AND CONTRIBUTION

Standardized, population-level instruments to quantify functional difficulties, including those related to mental health, are needed. This study illustrates how a short set of questions was used to address this need and provides evidence of the association between functional difficulties and the experience of daily signs of emotional distress in adolescents.

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including those related to depression and anxiety, is important in promoting inclusivity, participation, and the right of children to equal opportunities.

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Depression and anxiety are major public health issues, with pervasive and lifelong implications [1]. Unaddressed mental health disorders can limit the attainment of important educational and interpersonal milestones and the acquisition of skills needed for an optimal transition into adulthood [2]. Depression and anxiety during adolescence are also related to a higher likelihood of substance abuse and suicide [3]. Additionally, depression and anxiety symptoms tend to co-occur and compound the effects of many physical, cognitive, and psychosocial difficulties. Although mental disorders often have an early presentation, most remain undetected and untreated until later in life [4]. Despite the evidence on the impacts of depression and anxiety, adolescent mental health has been overlooked in global and country-level programming and tends to be one of the areas of health that receives less investment in terms of public expenditure [5], especially in low- and middle-income countries [6].

The inclusion of mental health in the Sustainable Development Goals represents an opportunity to enhance the global response to this issue in light of the rights of persons with disabilities [7]. With a growing number of countries navigating the different priorities around mental health, the need for data that support evidence-informed mental health policy has also increased [8].

Different constraints limit the capacity of low- and middle-income countries in undertaking population-level monitoring of mental health [9] and disability [10]. In many of these countries, household surveys remain the principle, and sometimes sole, source of information for key indicators. However, the lack of standardized population-level data collection methodologies complicates the task of monitoring the extent disabling functional difficulties among children and adolescents [11]. As a result, evidence about the prevalence of functional difficulties, including those related to depression and anxiety in children and adolescents has been scarce. Addressing this gap requires efforts to increase countries' data collection capabilities to produce the information needed for policy development. Increasing the availability of standardized tools that streamline large-scale data collection at the population level is an important step.

In response, United Nations Children's Fund (UNICEF) and the Washington Group on Disability Statistics developed the Child Functioning Module (CFM). Its aim is to facilitate data collection on a core set of functional difficulties, including signs of depression and anxiety [12].

Using household survey data based on the CFM, this paper describes the occurrence of signs of depression and anxiety among adolescents with and without functional difficulties in other domains. It aims to address two interrelated research questions:

- To what extent do signs of depression and/or anxiety occur among adolescents with different background characteristics?
- How are these signs related to difficulties in the domains of seeing, hearing, walking, self-care, learning, remembering,

concentrating, making friends, accepting change, and behavioral control?

Methods

Data sources and preparation

Data were derived from Multiple Indicator Cluster Surveys (MICS), a global program of household surveys carried out by governments with technical and financial support from UNICEF [13]. MICS survey design follows a probabilistic, clustered, stratified, and multistaged sampling strategy to collect national representative data on a large number of indicators for children, adults, and households. Our cross-sectional analyses rely on representative samples of adolescents aged 10–17 years selected in households across 26 countries. The total sample size is 123,975. All adolescents aged 10–17 years living in each sampled household were considered eligible with enumerators randomly selecting one adolescent to be included in the survey. Sampling in MICS is implemented without replacement. Therefore, nonresponse (i.e., failure to obtain information from a sampled household or sampled individual) is adjusted using the final sample weights which account for selection stages, selection probabilities, and nonresponse. For the sample pooling responses from all countries, the proportion of nonresponse for adolescents was 3.8%. Adolescent girls made up 49% of this pooled sample, and the proportion of adolescents living in urban areas ranged from 20% in Bangladesh to 73% in Mexico.

Ethics statement

This paper consists of secondary analyses of publicly available datasets downloaded from the MICS website (<http://mics.unicef.org/>). Ethics approval for data collection was obtained from relevant institutional ethics review committees at the country level. Respondents provided written or verbal consent. Because data were anonymized before being released, information cannot be linked back to participants.

Data collection instruments and variables

Functional difficulties including signs of depression and anxiety were quantified by the CFM, which was validated for use in household surveys with mothers or primary caregivers as proxy respondents. The module is based on the World Health Organization International Classification of Functioning and the biopsychosocial model of disability and aims to identify “children that are at greater risk than other children of the same age of experiencing limited participation due to functional limitations.” The CFM includes two sets of questions—one for children aged 2–4 years and another for children aged 5–17 years—to collect information on multiple domains of functioning such as hearing, seeing, walking, and communicating that are common and

Table 1

Unweighted sample sizes and weighted percentage of adolescents with depression and anxiety signs and of co-existing signs of depression and anxiety, according to an adolescent's background characteristics and for each country

	Unweighted sample size n	Weighted percentage							
		No anxiety and no depression signs		Daily depression signs		Daily anxiety signs		Daily depression and anxiety signs	
		%	CI	%	CI	%	CI	%	CI
Pooled sample	123,975	93.7	[93.4–94.0]	3.1	[3.0–3.3]	5.5	[5.3–5.8]	2.3	[2.2–2.4]
Sex									
Boys	63,623	93.7	[93.3–94.0]	3.1	[2.9–3.3]	5.6	[5.2–5.9]	2.3	[2.1–2.5]
Girls	60,352	93.8	[93.4–94.1]	3.2	[2.9–3.4]	5.4	[5.1–5.7]	2.3	[2.1–2.5]
Age group									
10–14 years	79,321	93.8	[93.4–94.1]	3.0	[2.8–3.3]	5.4	[5.1–5.7]	2.2	[2.0–2.4]
15–17 years	44,654	93.6	[93.2–94.0]	3.3	[3.0–3.6]	5.6	[5.2–6.0]	2.5	[2.2–2.8]
Area of residence									
Urban	47,113	92.8	[92.3–93.3]	2.9	[2.6–3.2]	6.5	[6.0–6.9]	2.1	[1.9–2.4]
Rural	76,862	94.4	[94.1–94.7]	3.3	[3.1–3.5]	4.8	[4.5–5.0]	2.5	[2.3–2.6]
Wealth index quintile									
Poorest	30,338	93.4	[92.8–93.9]	3.3	[3.0–3.7]	5.6	[5.1–6.1]	2.3	[2.1–2.6]
Second	27,254	93.4	[92.7–94.0]	3.2	[2.9–3.6]	5.7	[5.2–6.3]	2.4	[2.1–2.7]
Middle	25,218	92.9	[92.2–93.5]	3.5	[3.1–4.0]	6.3	[5.7–6.9]	2.7	[2.4–3.1]
Fourth	22,309	94.1	[93.6–94.6]	2.9	[2.6–3.3]	5.1	[4.6–5.5]	2.1	[1.9–2.5]
Richest	18,856	94.8	[94.3–95.4]	2.5	[2.2–2.8]	4.5	[4.0–5.1]	1.9	[1.6–2.2]
Country									
Kyrgyzstan	2,119	94.3	[93.0–95.4]	1.1	[0.6–2.0]	4.8	[3.9–6.0]	0.2	[0.1–0.7]
Lesotho	2,985	98.6	[97.8–99.1]	0.6	[0.3–1.0]	1.2	[0.7–2.1]	0.4	[0.2–0.9]
Serbia	884	97.8	[96.5–98.6]	0.9	[0.4–2.1]	1.8	[1.1–3.1]	0.5	[0.1–2.0]
Mongolia	3,763	97.4	[96.4–98.1]	1.2	[0.8–1.9]	2.0	[1.4–2.9]	0.6	[0.3–1.1]
Gambia	2,873	97.0	[95.9–97.8]	1.4	[1.0–2.0]	2.2	[1.5–3.2]	0.6	[0.3–1.0]
Zimbabwe	3,743	96.6	[95.8–97.2]	1.7	[1.2–2.3]	2.6	[2.1–3.3]	0.9	[0.6–1.3]
Kosovo	1,506	93.8	[92.0–95.2]	1.6	[1.0–2.4]	5.5	[4.2–7.2]	0.9	[0.5–1.6]
Mexico	6,561	94.6	[93.7–95.4]	1.6	[1.2–2.1]	4.9	[4.2–5.7]	1.1	[0.8–1.5]
Georgia	2,052	95.1	[93.5–96.3]	1.9	[1.3–2.9]	4.3	[3.1–5.8]	1.2	[0.7–2.1]
Costa Rica	2,210	90.8	[89.0–92.3]	2.4	[1.7–3.5]	8.2	[6.8–9.9]	1.4	[0.8–2.4]
Kiribati	1,163	88.5	[85.8–90.8]	4.8	[3.3–6.8]	8.2	[6.4–10.4]	1.5	[0.8–2.7]
Suriname	2,119	95.5	[94.1–96.6]	2.2	[1.5–3.4]	3.8	[2.8–5.1]	1.5	[0.9–2.6]
Nepal	4,444	89.8	[88.5–90.9]	2.1	[1.6–2.8]	9.8	[8.7–11.1]	1.7	[1.3–2.3]
Montenegro	632	94.0	[91.4–95.9]	2.2	[1.3–3.9]	5.5	[3.7–8.1]	1.8	[0.9–3.4]
North Macedonia	721	89.7	[84.6–93.3]	2.1	[0.7–6.1]	10.0	[6.4–15.2]	1.8	[0.5–6.0]
Madagascar	6,647	94.6	[93.8–95.3]	3.3	[2.7–4.0]	4.0	[3.4–4.7]	1.9	[1.5–2.4]
Tonga	948	92.4	[89.6–94.5]	4.6	[2.8–7.4]	5.1	[3.6–7.4]	2.1	[1.1–3.8]
Pakistan (Punjab)	19,617	95.6	[95.2–95.9]	2.9	[2.6–3.2]	3.8	[3.5–4.2]	2.3	[2.1–2.6]
Ghana	5,107	95.0	[93.8–96.0]	3.1	[2.3–4.2]	4.3	[3.4–5.5]	2.5	[1.7–3.5]
Bangladesh	24,240	96.0	[95.6–96.3]	3.4	[3.1–3.7]	3.2	[2.9–3.6]	2.6	[2.3–2.9]
Tunisia	2,851	82.0	[80.2–83.7]	4.7	[3.8–5.7]	17.2	[15.6–19.0]	3.9	[3.1–4.9]
Togo	2,697	90.7	[89.0–92.3]	5.1	[3.8–6.7]	8.1	[6.7–9.7]	3.9	[2.8–5.3]
Guinea-Bissau	3,070	85.4	[83.4–87.2]	4.6	[3.5–6.0]	14.0	[12.2–16.0]	4.0	[2.9–5.3]
Iraq	8,569	83.3	[81.5–85.0]	6.6	[5.7–7.7]	14.5	[13.0–16.2]	4.5	[3.8–5.3]
Democratic Republic of the Congo	6,917	87.7	[85.9–89.4]	6.7	[5.5–8.0]	11.3	[9.7–13.1]	5.7	[4.6–7.0]
Sierra Leone	5,537	85.0	[83.3–86.5]	9.0	[7.7–10.4]	12.4	[11.1–13.9]	6.3	[5.3–7.6]

CI = confidence interval.

expected in all cultures. Our results are based on the set of questions for the older age group, which comprise 24 items to measure the presence and severity of functional difficulties.

UNICEF and the Washington Group in Disability Statistics led the module design, testing, and validation in collaboration with representatives of Organizations of Persons with Disabilities, academic institutions, international organizations, and national statistical offices in several countries. To ensure questions were suitable to be used across different countries, contexts, and cultures, testing in United States, India, Oman, Belize, and Montenegro assessed whether the questions captured the same constructs across subgroups of respondents, namely, those in different countries, who speak different languages, or with different types or levels of disability [14]. Further testing conducted in Samoa, El Salvador, Serbia, and Mexico provided the

data to evaluate the psychometric properties of the module and establish the cut-scores to identify children with functional difficulties [15]. Independent studies on the use of the CFM in the context of household surveys have reported overall good reliability and validity of the measure [16].

For this paper, we restricted the analyses to children aged 10–17 years (henceforth referred to as adolescents). Variables were operationalized as follows:

Functional difficulties other than signs of depression or anxiety. For the domains of seeing, hearing, walking, self-care, being understood, learning, remembering, concentrating, controlling behavior, accepting changes, and making friends, the presence and severity of functional difficulties is captured by a response scale covering four categories including “no difficulty,” “some

Table 2

Percentage of adolescents with depression and anxiety signs according to a adolescent's functional difficulties in various domains

	No depression and anxiety symptoms		Daily depression symptoms		Daily anxiety symptoms		Daily depression and anxiety symptoms	
	%	95% CI	%	95% CI	%	95% CI	%	95% CI
No functional difficulties other than depression and anxiety	94.4	[94.2–94.7]	2.7	[2.5–2.9]	4.8	[4.6–5.1]	2.0	[1.8–2.1]
Any functional difficulties other than depression and anxiety	85.5	[84.2–86.7]	8.0	[7.2–8.9]	12.6	[11.5–13.9]	6.2	[5.4–7.0]
Difficulties hearing	82.2	[77.1–86.4]	13.5	[9.9–18.1]	15.3	[11.4–20.2]	11.0	[7.8–15.3]
Difficulties with self-care	68.5	[62.1–74.3]	26.4	[20.8–32.9]	27.9	[22.2–34.3]	22.8	[17.4–29.3]
Difficulties seeing	85.7	[80.3–89.9]	9.5	[5.9–14.9]	11.6	[7.8–17.0]	6.8	[3.6–12.5]
Difficulties communicating	67.7	[60.4–74.3]	19.0	[15.3–23.4]	28.3	[21.8–35.9]	15.1	[11.8–19.0]
Difficulties walking	78.1	[74.1–81.6]	15.8	[12.6–19.6]	19.8	[16.3–23.7]	13.7	[10.6–17.5]
Difficulties concentrating	75.2	[70.9–79.0]	15.8	[12.6–19.6]	21.8	[18.2–25.9]	14.4	[11.5–17.9]
Difficulties making friends	75	[70.9–78.7]	18.0	[14.8–21.8]	22.5	[19.0–26.6]	15.6	[12.5–19.3]
Difficulties remembering	77.3	[74.2–80.1]	15.8	[13.5–18.6]	19.5	[16.8–22.5]	12.6	[10.4–15.2]
Difficulties learning	78	[75.2–80.6]	14.2	[12.3–16.5]	19.1	[16.6–21.8]	11.3	[9.6–13.4]
Difficulties accepting change	76.9	[73.8–79.6]	13.6	[11.5–16.1]	20.6	[17.9–23.5]	11.1	[9.1–13.4]
Difficulties controlling behavior	84.9	[83.2–86.5]	9.6	[8.3–11.2]	13.4	[11.9–15.1]	8.0	[6.7–9.5]

CI = confidence interval.

difficulty,” “a lot of difficulty,” or “cannot do at all.” Adolescents are considered to have functional difficulties if the mother/primary caregiver reports that the child has “a lot of difficulty” or “cannot do at all.” Thus defined, we generated 11 binary variables to identify adolescents with difficulties in each of these functional domains. To capture the coexistence of functional difficulties across the different domains, we generated an ordinal variable counting the number of domains with reported difficulties.

Signs of depression or anxiety. Two questions in the CFM capture information about signs of depression (*How often does child seem very sad or depressed?*) and anxiety (*How often does child seem very anxious, nervous, or worried?*). Following the approach used in the other questions in the CFM, information is collected on both the presence and the extent of signs of depression and anxiety, by using a frequency scale: “daily,” “weekly,” “monthly,” “a few times a year,” and “never.” Daily signs of anxiety and daily signs of depression were used as cut-scores for these domains.

We generated binary variables based on the anxiety and depression indicators noted above. One capturing daily signs of anxiety (irrespective of reported depression signs); a second capturing daily signs of depression (irrespective of reported anxiety signs), and a third identifying adolescents with co-existing daily signs of both anxiety and depression (these variables are used in Tables 1 and 2). Finally, for the models presented in Table 3, we generated a categorical variable identifying adolescents with the following: (1) no signs of depression or anxiety; (2) signs of depression only; (3) signs of anxiety only; and (4) both signs of depression and anxiety. To explore and account for the association of sociodemographic factors with the outcome variables we included adolescent's sex, age (in our models age was entered in years, after examination of the linearity of the association.), and area of residence (urban or rural), and dummy-coded country variables, as covariates to the final models.

We also considered household wealth quintiles, which are generated at the country level using a standardized approach on the basis of a household's assets, characteristics, and infrastructure.

Statistical analysis

We estimated weighted percentages and 95% confidence intervals (CI) of adolescents with daily signs of depression and/or anxiety, using the country and pooled samples and stratified by background characteristics. We reported the percentage of adolescents with functional difficulties in the pooled sample and estimated bivariable associations between functional difficulties and daily signs of depression, anxiety, or both.

We used multinomial models to estimate the association between difficulties in functional domains and signs of depression only, signs of anxiety only, and signs of depression and anxiety compared to not having signs of depression or anxiety. The strength of association was expressed by risk ratios (RRs) with 95% CI. We then estimated the association between the number of co-existing functional domains with daily signs of depression only, anxiety only, and both depression and anxiety, using the variable on the number of functional difficulties as an ordinal independent variable, which was modeled using the category of no functional difficulties as the reference category. All models were adjusted for the adolescent's age, sex, area of residence, household wealth, and country.

All analyses followed a design-based approach, which accounted for the stratified two-stage cluster sample design for both parameter estimates and standard errors by using procedures for complex survey designs (svy suite; Stata 16.0, StataCorp. 2019. *Stata Statistical Software: Release 16*. College Station, TX: StataCorp LLC). Country-level results used country-specific sample weights that account for selection probabilities and nonresponse. Analyses of pooled samples used an adjusted weight that takes into account the country-level sample design and the proportional weight of each country's sample relative to the size of the population.

Results

Table 1 shows sample sizes and the percentage of adolescents with depression and anxiety signs. The overall pooled percentage for daily signs of anxiety and depression was 5.5% (95% CI 5.3–5.8) and 3.1% (3.0–3.3%), respectively. The percentage of children with anxiety is significantly higher in urban areas as well as

Table 3

Association between type and number of co-existing functional difficulties and signs of depression, anxiety, and co-existing depression and anxiety signs, controlling for sex, age, area of residence, household assets and country

Model 1 ^a	No signs of depression and no signs of anxiety	Signs of depression only	Signs of anxiety only	Signs of depression and anxiety
	RR [lb,ub]	RR [lb,ub]	RR [lb,ub]	RR [lb,ub]
Any functional difficulties	1	3.15*** [2.48–4.00]	2.82*** [2.29–3.46]	3.7*** [3.12–4.39]
Girls versus boys	1	1.20 [0.97–1.48]	0.95	1.04 [0.92–1.17]
Age	1	0.98 [0.94–1.02]	0.99 [0.97–1.02]	1.04*** [1.02–1.07]
Rural versus urban	1	0.89 [0.66–1.22]	0.84* [0.72–0.98]	0.99 [0.85–1.16]
Wealth index				
Quintile 1	1	1	1	1
Quintile 2	1	0.83 [0.62–1.11]	1.05 [0.85–1.29]	1.01 [0.84–1.21]
Quintile 3	1	0.81 [0.58–1.13]	1.08 [0.89–1.31]	1.17 [0.97–1.4]
Quintile 4	1	0.71 [0.48–1.05]	0.86 [0.71–1.03]	0.88 [0.72–1.08]
Quintile 5	1	0.55** [0.37–0.81]	0.75* [0.6–0.94]	0.77* [0.62–0.97]
Model 2 ^a	No signs of depression and no signs of anxiety	Signs of depression only	Signs of anxiety only	Signs of depression and anxiety
	RR [lb,ub]	RR [lb,ub]	RR [lb,ub]	RR [lb,ub]
Number of co-existent functional difficulties				
0	1	1	1	1
1	1	2.14*** [1.56–2.93]	2.21*** [1.67–2.94]	2.15*** [1.68–2.75]
2	1	4.24*** [2.77–6.48]	3.87*** [2.83–5.28]	2.92*** [2.14–4.0]
3	1	4.77*** [2.74–8.31]	4.38*** [2.93–6.54]	5.69*** [3.71–8.72]
4 or more	1	9.14*** [5.78–14.45]	5.56*** [3.66–8.46]	19.7*** [14.64–26.51]
Girls versus boys	1	1.21 [0.98–1.49]	0.96 [0.84–1.08]	1.05 [0.93–1.18]
Age	1	0.98 [0.94–1.02]	0.99 [0.97–1.02]	1.04*** [1.02–1.07]
Rural versus urban	1	0.89 [0.66–1.22]	0.84* [0.72–0.98]	1.0 [0.85–1.16]
Wealth index				
Quintile 1	1	1	1	1
Quintile 2	1	0.83 [0.62–1.11]	1.05 [0.85–1.29]	1.01 [0.84–1.22]
Quintile 3	1	0.81 [0.58–1.13]	1.08 [0.89–1.31]	1.18 [0.98–1.41]
Quintile 4	1	0.71 [0.48–1.06]	0.86 [0.71–1.04]	0.9 [0.74–1.09]
Quintile 5	1	0.56** [0.38–0.83]	0.75* [0.6–0.95]	0.81 [0.65–1.01]
Model 3 ^b	No signs of depression and no signs of anxiety	Signs of depression only	Signs of anxiety only	Signs of depression and anxiety
	RR [lb,ub]	RR [lb,ub]	RR [lb,ub]	RR [lb,ub]
Difficulties seeing	1	3.35*** [1.8–6.2]	1.2 [0.72–2.0]	3.43*** [1.75–6.7]
Difficulties hearing	1	3.48*** [1.8–6.74]	1.76 [0.94–3.3]	5.69*** [3.83–8.45]
Difficulties communicating	1	7.83*** [4.76–12.89]	6.45*** [3.23–12.88]	10.53*** [7.86–14.11]
Difficulties walking	1	3.04*** [1.93–4.78]	2.3*** [1.6–3.3]	7.2*** [5.29–9.79]
Difficulties with self-care	1	5.95*** [3.37–10.49]	2.29** [1.38–3.78]	14.28*** [10.27–19.85]
Difficulties learning	1	4.6*** [3.22–6.57]	3.84*** [2.86–5.15]	6.93*** [5.56–8.63]
Difficulties remembering	1	4.89*** [3.33–7.18]	3.45*** [2.51–4.78]	7.55*** [5.94–9.59]
Difficulties concentrating	1	4.85*** [3.16–7.46]	3.41*** [2.33–4.99]	9.15*** [6.94–12.06]
Difficulties controlling behavior	1	3.17*** [2.33–4.3]	2.65*** [2.14–3.29]	4.77*** [3.81–5.97]
Difficulties accepting change	1	4.16*** [2.9–5.97]	4.09*** [3.1–5.41]	6.5*** [5.17–8.17]
Difficulties making friends	1	4.25*** [2.66–6.79]	2.81*** [1.99–3.96]	10.06*** [7.56–13.4]

lb = lower bound of the 95% confidence interval; RR = risk ratio; ub = upper bound of the 95% confidence interval.

**p* < .05.

***p* < .01.

****p* < .001.

^a Model was also adjusted for country, but these results are not shown.

^b Each model was adjusted for an adolescent's sex, age, area of residence, household wealth, and country; however, these results are not shown.

in the poorest households. No differences are observed between boys and girls, or across the two age groups explored. The percentage of adolescents with anxiety signs ranged from 1.2% (0.7%–2.1%) in Lesotho to 17.2% (15.6%–19.0%) in Tunisia. The percentage of adolescents with depression signs ranged from 0.6% (0.3%–1.6%) in Lesotho to 9.0 (7.7%–10.4%) in Sierra Leone. In addition, 2.3% (2.2%–2.4%) of adolescents in the pooled

samples had signs of both anxiety and depression. The proportion of adolescents with both depression and anxiety signs ranged from 0.2% (0.04%–0.7%) in Kyrgyzstan to 6.3% (5.3%–7.5%) in Sierra Leone.

Table 2 shows the percentage of adolescents in the pooled sample with depression and anxiety signs according to a adolescent's difficulties in each of the functional domains. Around 8%

(7.9%–8.5%) of adolescents were reported to have at least one functional difficulty, other than depression or anxiety signs. Co-existing functional difficulties in any domains, other than depression and anxiety, were reported for 2.7% (2.5%–2.8%) of adolescents (results not shown).

Depression or anxiety signs, and signs of both depression and anxiety, were at least two times and up to three times more prevalent among adolescents with functional difficulties in any other domain compared to those without such difficulties. Daily signs of depression were reported by 2.7% (2.5%–2.9%) of adolescents without functional difficulties and by 8.0% (7.2%–8.9%) of adolescents with functional difficulties in any of the other domains. Daily signs of anxiety were reported by 4.8% (4.6%–5.1%) of adolescents without functional difficulties, compared to nearly 13% (11.5%–13.9%) of adolescents with functional difficulties in any of the other domains. Daily signs of both depression and anxiety were reported by 2.0% of adolescents without functional difficulties compared to up to 6.1% (5.4%–7.0%) of adolescents with functional difficulties. Adolescents with difficulties in the self-care domain consistently showed the highest percentage for daily depression, anxiety, and co-existing depression and anxiety signs (26.4%, 27.9%, and 22.8%, respectively).

Table 3 presents a series of models that estimate the association between functional difficulties and reported the following: (1) signs of depression only; (2) signs of anxiety only; and (3) signs of depression and anxiety compared to reporting no signs of depression or anxiety, controlling for sociodemographic characteristics including the country of origin. Models 1 and 2 indicate that, independent of functional difficulties, adolescents in rural areas were less likely to experience signs of anxiety, compared to those living in urban areas (RR = 0.84, 95% CI 0.72–0.98, $p = .022$). In both models, girls were somewhat more likely to have signs of depression compared to boys, but this result did not reach statistical significance (RR = 1.20, 95% CI 0.98–1.49, $p = .080$). Adolescents living in wealthier households were less likely than those in the poorer households to have signs of depression and anxiety; however, this association is only statistically significant for those in the highest quintile of household wealth compared to the lowest.

Results from Model 1 show that adolescents with functional difficulties in any domain were significantly more likely to have signs of either depression only or anxiety only, or combined signs of depression and anxiety, independent of their sex, age, area of residence, wealth, and country of origin.

Results from Model 2 indicate that when adolescents experienced difficulties in more than one domain the likelihood for any of the analyzed outcomes also increased. For example, compared with adolescents without functional difficulties, adolescents with difficulties in three domains were 5.7 times more likely (RR = 5.7, $p < .001$) to present signs of both depression and anxiety.

Significant associations are reported between each of the functional domains and signs of depression only, and co-existing signs of depression and anxiety. However, the model estimating RRs for signs of anxiety only shows significant results for all domains except seeing and hearing. In the three models, adolescents with difficulties communicating and in self-care yielded the highest relative risks for signs of depression and/or anxiety. For example, compared to adolescents without difficulties in self-care, adolescents with such difficulties had 5.9 times higher risk of having daily signs of depression only, 2.3 times higher risk

of daily signs of anxiety only, and 14.3 times higher risk of co-existing daily signs of depression and anxiety.

Discussion

Representative data on adolescents from 26 countries, collected under standardized conditions, provide evidence that adolescents with difficulties across various functional domains are at increased risk for presenting daily signs of depression and anxiety as well as for co-existing depression and anxiety signs. It also shows that when adolescents experience difficulties in more than one functional domain, they face an exacerbated risk for daily depression and anxiety signs.

The overall pooled percentage of adolescents in our sample who are reported to have daily depression and anxiety signs is highly consistent with available global prevalence estimates for depression and anxiety disorder based on representative community samples and standardized assessments aligned with the Diagnostic and Statistical Manual of Mental Disorders or the International Classification of Diseases. A recent meta-analysis of the prevalence of mental disorders affecting children and adolescents across 27 countries reported a pooled prevalence of 2.6% (1.7%–3.9%) for any depression disorder and 6.5% (5.7%–9.1%) for anxiety disorder [17]. This same study identified sample representativeness, sample frame, and diagnostic interview as significant moderators of prevalence estimates, which supports the idea that using standardized methodologies is fundamental to estimating prevalence of mental health related disabilities at the population level. In our results, the countries with the highest percentage of adolescents with signs of anxiety or depression were Tunisia (18.0%, 16.3%–19.8%) and Iraq (16.7%, 15.0%–18.5%), and the countries with the lowest prevalence were Lesotho (1.4%, 0.9%–2.2%) and Serbia (2.2%, 1.4%–3.5%). Although the result for Lesotho is unexpected, the other estimates are consistent with what has been reported in previous studies. For example, a population-based study of anxiety across 82 countries reported that the highest pooled prevalence was observed in Eastern Mediterranean Region (17.0%, 16.0%–17.0%) and the lowest in the European Region (4.0%, 4.0%–5.0%) [18]. The estimates of signs of depression and, especially, anxiety were highly variable for some countries within a same region which might reflect issues with measurement invariance across countries and nonsampling errors which might have differential effects depending on the context. Previous studies have reported even wider ranges in anxiety estimates, from below 1% to above 30%, which were attributed to heterogeneity in measurement methodological approaches [19], different exposures to risk and protective factors and contextual influences [18]. Comparing results from cross-national and multilingual surveys can be further complicated if nonsampling measurement errors are present in different magnitudes across data from different countries. The CFM underwent extensive testing to ensure that the questions elicit the intended responses, and that the resulting data possess adequate psychometric properties. In addition, implementation of the CFM in the countries in which our data were collected, followed quality assurance procedures that include strict guidelines for translation of the module into different languages, and customization of some specific wording to match contextual aspects. Despite these efforts, linguistic differences, and cultural attitudes and stigma can still affect the way questions are interpreted in some contexts.

Our results indicate that more than half of the adolescents reporting signs of anxiety and/or depression reported anxiety signs only. In contrast, the majority of adolescents with depression signs were also reported to have anxiety signs. The co-occurrence of anxiety and depression signs suggests that a broader approach to depression and anxiety and symptomatology, rather than based on single presentation of signs of depression or anxiety only, may be valuable for studying associations with difficulties across other functional domains. In particular, our results are consistent with the literature showing that the co-occurrence of depressive and anxiety disorders is common in both clinical and community samples [20–22], and that this high degree of comorbidity does not appear to be symmetrical, with single presentation of anxiety being more frequent than that of depression [23].

Occurrence of anxiety signs in our sample varied by the sociodemographic characteristics investigated: the percentage of adolescents with signs of anxiety was significantly higher in urban areas. The association between urbanicity and anxiety has been established for both adult [19,24] and adolescent populations [25] and has been attributed to an increased risk for mental disorders in contexts of concentrated poverty, low social capital, social segregation, and other adversities that occur more frequently in cities [26]. In our results, household wealth was associated with lower risk for signs of depression or anxiety; however, the inspection of the linearity of this association revealed that this result was only significant for adolescents living in the richest households. We have also only identified marginally significant differences between adolescent boys and girls, which may reflect the fact that our sample does not include a large enough number of older adolescents, for whom sex differences are more likely to be observed, that would be needed to estimate the interaction between sex, age and signs of depression and anxiety. There is evidence from some studies that boys and girls have similar risk for depression during childhood, but girls begin to have higher risk when they reach adolescence and that the incidence of depression among girls begins to exceed that among boys between the ages of 13 and 15 years [27].

In our sample, signs of either depression or anxiety among adolescents with functional difficulties in other domains were almost three times more frequent (14.5%, 13.3%–15.8%) than among adolescents without functional difficulties other than the reported anxiety and depression signs (5.6%, 5.3%–5.8%). In the multivariable model controlled for sociodemographic characteristics, difficulties in all functional domains were associated with daily signs of depression only, anxiety only, and co-existing depression and anxiety, with the strongest relationship occurring among adolescents with difficulties communicating and in self-care. Daily signs of depression only, anxiety only, and co-existing depression and anxiety signs were significantly associated with increasing numbers of co-existing functional difficulties, especially among adolescents living in urban areas after adjustment for the adolescent's sex, age, area of residence, household wealth, and country. Adolescents with disabilities comprise a highly diverse population group and the functional difficulties they experience also have different causes and implications. It includes those who were born with a genetic condition that affects their physical, mental, or social development; those who may have sustained a serious injury, nutritional deficiency, or infection that contributed to long-term functional difficulties; or those exposed to environmental toxins that may have impaired their cognitive development. A significant

proportion of adolescents in our sample presented with difficulties in more than one functional domain, which in turn increased the likelihood of also presenting signs of depression or anxiety. Different mechanisms can explain why difficulties in one domain can lead to difficulties in other domains, and why adolescents with different type or severity of disability are more likely to experience signs of depression and anxiety. Many children and adults who have lifelong developmental disorders also have co-occurring mental illness and behavioral difficulties [28]. While determining the underlying cause of such difficulties or their developmental trajectory can be highly challenging, and is outside the scope of this paper, some of this variability is likely to be due to shared causes. The increased vulnerability of children and adolescents with disabilities to psychosocial distress has also been widely reported. For example, anxiety disorders have been found to be common among children with developmental and cognitive disabilities [29]. Children with depression often experience difficulties building and maintaining social relationships, have problems with anxiety, and emotional and cognitive challenges [30]. Increased exposure to stigma, discrimination, exclusion, and other negative environmental factors can severely affect self-esteem and lead to further isolation. In some instances, the relationships between different functional difficulties can be causal. For example, hearing loss can impair children's ability to communicate, learn, build interpersonal connections, or control behavior, which, in turn, can harm their psychosocial well-being and cause a reduction in quality of life [31]. Children with physical impairments can feel excluded or lonely [32], and children with memory and concentration problems can experience challenges in self-care, learning, and interpersonal relationships [33–35]. These vulnerabilities can be compounded by the limited availability and barriers in accessing quality mental health services and psychosocial support, which in turn can create additional functional difficulties. Outdated health-care models and poor understanding of the needs of children and adolescents with different types of difficulties can also prevent the timely delivery of adequate interventions.

One strength of this study is that it relies on internationally comparable data collected through a previously validated instrument, the CFM, to obtain information on children's manifestation of anxiety and depression, and the functional difficulties they experience across several domains. The data were collected as part of MICS that were implemented in a standardized and consistent way, which makes it possible to do cross-country comparisons.

Our study covers a large number of countries with sufficient sample size to support the analysis. However, the cross-sectional nature of the data makes it impossible to establish causation between the variables studied, and the direction of the effects cannot be determined for the reported associations. This might be especially relevant when interpreting some of the reported associations for the domains related to cognitive functioning (learning, concentrating, remembering) and behavioral control, as difficulties in these domains can be caused, worsened, or reciprocally influenced by both depression and anxiety [35,36].

Results presented in this study should only be considered as an indication of common and relevant signs of depression and anxiety among adolescents, rather than as a proxy for a clinical diagnosis. The results are based on two questions that identify children and adolescents with difficulties managing emotions as manifested by worry, sadness, or anxiety that are frequent and at a level of intensity that places them at a higher risk for negative

mental health outcomes. Such signs are reported by mothers (or primary caregivers). Cognitive testing of both questions indicated that mothers were able to match the questions into perceived problems of pronounced nature, rather than transitory or less salient emotional manifestations [14]. Further testing on the cut-score used for these questions also indicated that the “daily” response performed better at identifying these children with better precision and led to fewer false positive answers compared to the “weekly” response option [15]. These two questions, however, do not cover the range of possible manifestations of depression or anxiety. For example, irritability, psychosomatic and sleep disorders, as well as fatigue and anhedonia are important manifestations of depression and anxiety in young persons, which are not identified by the two questions in the CFM. A further limitation in this respect is that, like the other questions in the module, the two questions on depression and anxiety intend to measure signs and symptoms that can occur across a broad age group covering both childhood as well as early and late adolescence. This may limit the ability of the measure to capture some signs that may be more prevalent at certain ages [36]. Likewise, the use of two single questions may also be insufficient to measure certain signs that present variation by sex [37], which may explain why we have only identified marginally significant differences between adolescent boys and girls. This type of limitations is common in large-scale multitopic surveys where inevitable trade-offs between aspects of sample coverage and content coverage have implications in terms of the number of indicators that can be measured and the level of detail and granularity in the information collected.

The CFM relies on mothers/primary caregivers to provide answers rather than asking children directly. This approach is in part justified by logistical considerations of large-scale household surveys, where mothers/primary caregivers tend to be used as informants to multiple indicators covering very broad age groups. Even when older children might be able to answer by themselves, information on younger children would still require parental report and the resulting indicators would mix data from two different informants, which is not recommended. Likewise, parental report is needed to ensure data are collected about all children in the household, including those who may not be able to answer questions due to an impairment or to consent to the interview process due to their young age. Despite this, collecting information from caregivers has certain limitations which are similar to those of other studies that use proxy respondents. Parents or caregivers may be unaware of the difficulties experienced by the adolescent, or there might be disagreement in relation to the severity of existing difficulties. Disagreement between parental and child report of mental health issues can be associated with the respondents’ characteristics, nature of the reported disorder, including its etiology, parent-child relationship aspects, and overall sociocultural setting [38]. That said, the CFM was designed to overcome some of the limitations related to asking questions on disability and reduce some potential biases by focusing on the ability to perform basic activities and manifestations of certain behaviors that can be observed in day-to-day life. The questions were extensively tested with respondents in different countries and from diverse socio-demographic and cultural backgrounds, and wording was adjusted to elicit responses that accurately reflect the experiences of the child. Questions have also been tested for agreement between parental and child report, and while agreement tends to be higher for the domains of physical functioning [39], little

variation was reported in the overall interpretation of both questions on signs of depression and anxiety, by teenagers and parents [40].

In conclusion, this study illustrates how the use of a short set of questions that was validated to measure functional difficulties in the context of large-scale household surveys can be used to generate a reasonable approximation of the number of children with difficulties across different domains, including those related to depression and anxiety. Mental health and psychosocial difficulties, such as those manifested by depression and anxiety signs prevent young persons from fully engaging and participating in their communities. Our results provide evidence on the proportion of adolescents who have functional difficulties in different domains, and their increased likelihood to experience daily signs of emotional distress. Both can be tied to structural factors such as poverty, social inequality, and marginalization, which can place young persons at exacerbated risk for negative outcomes throughout their lives. Importantly, the results indicate that, while more detailed assessments are needed to provide more complete and nuanced evidence on mental health disabling difficulties, the use of single questions on relevant signs is a promising approach to responding to the need for population-level data at the global level, especially in resource-constrained settings.

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