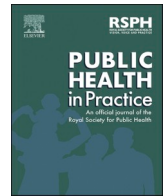




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# The evolution of young people's mental health during COVID-19 and the role of food insecurity: Evidence from a four low-and-middle-income-country cohort study

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## ABSTRACT

**Objectives:** Provide evidence on how young people's mental health has evolved in Low-and-Middle-Income-Countries (LMICs) during the progression of the COVID-19 pandemic. Identify particularly vulnerable groups who report high and/or continuously high rates of mental health issues.

**Study design:** Longitudinal, observational.

**Methods:** Two consecutive phone-surveys (August–October and November–December 2020) in Ethiopia, India, Peru and Vietnam interviewed around 9000 participants of a 20-year cohort study who grew up in poverty, now aged 19 and 26. Rates of at least mild anxiety/depression measured by GAD-7/PHQ-8 were each compared across countries; between males/females, and food secure/food insecure households.

**Results:** Overall, rates of at least mild anxiety and mild depression significantly decreased between mid and end-2020 in all countries but Ethiopia as COVID-19 infection rates fell. Females report higher rates of anxiety and depression in all countries but Ethiopia, however the gender gap is closing. Young people in food insecure households have not shown consistent improvements in their rates of anxiety and depression. Food insecure households are poorer, and have significantly more children ( $p < 0.05$ ) except in Ethiopia.

**Conclusion:** Food insecurity is negatively associated with young people's mental health and urgent support targeted towards the most vulnerable should be a priority. Further research into increasing rates of mental health issues in Ethiopia is needed.

The COVID-19 outbreak has impacted physical and mental health across the globe. While young people are relatively less vulnerable to the virus, their education, work and social lives have been interrupted [1], their futures are uncertain, and their mental health has been relatively more impacted than older groups [2]. Pre-pandemic research shows that 75% of mental health conditions develop by early adulthood [3], and that food insecurity is associated with poorer mental health [4]. Monitoring the mental health of young people during the pandemic is therefore critical to prevention, especially in Low-and-Middle-Income-Countries (LMICs), where they represent one fifth of the total population, and mental health support is limited. This study outlines how young people's mental health has evolved in four LMICs during the pandemic, provides preliminary descriptive evidence of the association between food insecurity and mental health, and briefly

describes the characteristics of the food insecure.

We analyse longitudinal data from two phone surveys conducted in Ethiopia, India (Andhra Pradesh and Telangana), Peru, and Vietnam during August–October and November–December 2020. Our sample contains participants aged 18–19 and 25–26, including 4702 males (51%) and 4493 females (49%) from the Young Lives study, a poverty-focused cohort study, established in 2002. 10,599 individuals were contacted, 9195 participated in both surveys, and non-response to mental health questions was rare. The main cause of attrition was the communication shutdown in Ethiopia's Tigray region from November 2020 due to civil unrest. The surveys were approved by the institutional research ethics committees at the University of Oxford (UK, Ref No: CUREC 1A/ ODID CIA-20-034, March 15, 2020), and research ethics committees in each study country. Participants were asked for their

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**Table 1**

Comparison of rates of at least mild anxiety and depression across survey periods.

		No. (%) <sup>b</sup> , 95% CI	No. at least mild anxiety (% <sup>c</sup> ; 95% CI)		p-value	No. at least mild depression (% <sup>c</sup> ; 95% CI)		p-value
			Aug–Oct	Nov–Dec		Aug–Oct	Nov–Dec	
Ethiopia	Total	2065	405 (19.61; 17.9–21.33)	465 (22.52; 20.72–24.32)	0.004	364 (17.63; 15.98–19.27)	400 (19.37; 17.66–21.08)	0.072
	Male	1095 (53.03; 50.85–55.20)	208 (19.00; 16.67–21.32)	258 (23.56; 21.04–26.08)	0.001	185 (16.89; 14.67–19.12)	208 (19.00; 16.67–21.32)	0.110
	Female	970 (46.97; 44.80–49.15)	197 (20.31; 17.77–22.85)	207 (21.34; 18.76–23.92)	0.488	179 (18.45; 16.01–20.9)	192 (19.79; 17.28–22.31)	0.350
	Not FI <sup>a</sup>	1493 (72.30; 70.32–74.22)	240 (16.08; 14.21–17.94)	248 (16.61; 14.72–18.5)	0.629	221 (14.80; 13–16.61)	217 (14.53; 12.74–16.32)	0.806
	FI	572 (27.70; 25.78–29.68)	165 (28.85; 25.12–32.57)	217 (37.94; 33.95–41.93)	0.000	143 (25.00; 21.44–28.56)	183 (31.99; 28.16–35.83)	0.001
India	Total	2735	309 (11.30; 10.11–12.49)	228 (8.34; 7.30–9.37)	0.000	274 (10.02; 8.89–11.14)	239 (8.74; 7.68–9.80)	0.054
	Male	1421 (51.96; 50.06–53.84)	134 (9.43; 7.91–10.95)	95 (6.69; 5.39–7.99)	0.002	138 (9.71; 8.17–11.25)	109 (7.67; 6.29–9.06)	0.019
	Female	1314 (48.04; 46.16–49.94)	175 (13.32; 11.48–15.16)	133 (10.12; 8.49–11.75)	0.002	136 (10.35; 8.70–12)	130 (9.89; 8.27–11.51)	0.651
	Not FI	2216 (81.02; 79.50–82.48)	229 (10.33; 9.07–11.6)	163 (7.36; 6.27–8.44)	0.000	210 (9.48; 8.26–10.70)	181 (8.17; 7.03–9.31)	0.073
	FI	519 (18.98; 17.52–20.50)	80 (15.41; 12.3–18.53)	65 (12.52; 9.67–15.38)	0.128	64 (12.33; 9.49–15.17)	58 (11.18; 8.46–13.89)	0.467
Peru	Total	1911	775 (40.55; 38.35–42.76)	602 (31.5; 29.42–33.59)	0.000	599 (31.34; 29.26–33.43)	509 (26.64; 24.65–28.62)	0.000
	Male	963 (50.39; 48.13–52.66)	319 (33.13; 30.15–36.1)	222 (23.05; 20.39–25.72)	0.000	260 (27; 24.19–29.81)	204 (21.18; 18.6–23.77)	0.000
	Female	948 (49.61; 47.34–51.87)	456 (48.1; 44.91–51.29)	380 (40.08; 36.96–43.21)	0.000	339 (35.76; 32.7–38.82)	305 (32.17; 29.19–35.15)	0.024
	Not FI	1458 (76.3; 74.32–78.19)	524 (35.94; 33.47–38.41)	393 (26.95; 24.67–29.24)	0.000	399 (27.37; 25.08–29.66)	333 (22.84; 20.68–25)	0.000
	FI	453 (23.70; 21.81–25.68)	251 (55.41; 50.81–60.00)	209 (46.14; 41.53–50.74)	0.000	200 (44.15; 39.56–48.74)	176 (38.85; 34.35–43.36)	0.034
Vietnam	Total	2484	229 (9.22; 8.08–10.36)	119 (4.79; 3.95–5.63)	0.000	233 (9.38; 8.23–10.53)	155 (6.24; 5.29–7.19)	0.000
	Male	1223 (49.24; 47.25–51.22)	94 (7.69; 6.19–9.18)	55 (4.5; 3.33–5.66)	0.000	93 (7.60; 6.12–9.09)	60 (4.91; 3.69–6.12)	0.001
	Female	1261 (50.76; 48.78–52.75)	135 (10.71; 9–12.41)	64 (5.08; 3.86–6.29)	0.000	140 (11.10; 9.370–12.84)	95 (7.53; 6.07–8.99)	0.000
	Not FI	2310 (93.00; 91.92–93.97)	178 (7.71; 6.62–8.79)	90 (3.90; 3.11–4.69)	0.000	185 (8.01; 6.9–9.12)	113 (4.89; 4.01–5.77)	0.000
	FI	174 (7.00; 6.03–8.08)	51 (29.31; 22.48–36.14)	29 (16.67; 11.07–22.26)	0.001	48 (27.59; 20.88–34.29)	42 (24.14; 17.72–30.56)	0.305

Notes: FI<sup>a</sup> = Food Insecure; In this analysis, we define food insecurity as a binary variable equal to one if the respondent reports its household having run out of food at least once between the outbreak of the COVID-19 pandemic and Nov/Dec (second phone survey).

No. = Number 95%; CI = 95% confidence interval.

p-values represent significance of *t*-test of equality between phone survey mental health rates between rounds among the full sample (Total), males/females, and those who did not run out of food (Not FI)/ food those who did (FI).

<sup>b</sup> Mean in % in reference to the total sample.

<sup>c</sup> Mean in % in reference to the respective subgroup sample.

verbal informed consent before the study and assured of confidentiality.

Symptoms of anxiety and depression were measured in both calls using the Generalized Anxiety Disorder-7 (GAD-7) scale and the Patient Health Questionnaire depression scale-8 (PHQ-8) with a cut-off of a score  $\geq 5$  representing (at least) mild anxiety [5] (depression) [6]. If any GAD-7 (PHQ-8) items were unanswered, the whole score was omitted. We define food insecurity as the participant's household having reported running out of food at least once since the beginning of the pandemic. We characterise food insecure households according to their dwelling attributes, location, and the number of children aged 17 or under. We use *t*-tests for the difference in mean outcomes between calls, within groups, and consider a 2-sided *p*-value  $< 0.05$  as significant. Analysis is performed using Stata 14.2.

After reaching relatively high rates of anxiety and depression symptoms in mid-2020, we find that mental health improved significantly between mid- and end-2020, in all countries except Ethiopia. Improvements in mental health are potentially associated with the decline in COVID-19 infection/mortality rates [7] and the easing of lockdown measures. In Ethiopia, the increase in rates is possibly due to civil unrest in the Tigray region. Rates of anxiety/depression symptoms are highest in Peru and lowest in Vietnam, mirroring COVID-19

mortality rates (based on COVID-19 cases/deaths per capita) [7]. Among the four countries, Peru still had the highest rates of anxiety/depression (32% (95% CI, 29.42–33.59)/27% (95% CI, 24.65–28.62)); Vietnam the lowest (5% (95% CI, 3.95–5.63)/6% (95% CI, 5.29–7.19)) (Table 1). Except for Ethiopia (and for depression in India), both males and females show significant improvements between calls. Females still report comparatively higher rates everywhere except Ethiopia, but the gender gap is closing as the pandemic progressed (Table 1). We note that the Ethiopian National Health Survey shows no significant differences between males and females. Substantial pre-pandemic evidence indicates that women report worse mental health than men [8] and one study observes a widening gender gap early in the pandemic, among university students in Poland [9].

Previous Young Lives research shows food insecurity increased during the pandemic, except in Vietnam [1] and that pandemic-related stressors worsened mental health in mid-2020 [10]. The proportion of households running out of food during the pandemic ranges between 7% (95% CI, 6.03–8.08) in Vietnam and 28% (95% CI, 25.78–29.68) in Ethiopia (Supplementary appendix Table S1). Complementing this evidence, we find that individuals living in food insecure households had higher rates of anxiety and depression than the food secure, across calls

and in all countries. Furthermore, mental health among the food insecure has not necessarily improved between mid-and end-2020, while among the food secure mental health either significantly improved, or did not significantly change (Ethiopia). In Peru, 46% (95% CI, 41.53–50.74) (39% (95% CI, 34.35–43.36)) of the food insecure report anxiety (depression) symptoms by end-2020. Even in Vietnam, the rates of anxiety/depression (17% (95% CI, 11.07–22.26)/24% (95% CI, 17.72–30.56)) among the food insecure are four times the average by end-2020 (Table 1). Across countries, the food insecure are poorer and less able to protect themselves from COVID-19. In all countries except Ethiopia households with children were more vulnerable; in India, rural households (Supplementary appendix Table S1).

The main limitation of this study is the lack of causal inference, given the potential bidirectional relationship between food insecurity and mental health. However, many of our respondents are not the main income earner of the household, which alleviates this concern. Further, we only capture one dimension of food insecurity, but this a multidimensional phenomenon.

The world's food insecure have been severely affected by the COVID-19 pandemic which still continues. Timely interventions such as Cash Transfer Programs with integrated mental health support are needed to address food insecurity among vulnerable young people, and help break the vicious cycle between mental health disorders and poverty. More research is also needed into factors which contribute to mental health resilience during the pandemic and non-COVID-19 stressors in Ethiopia.

## Ethical approval

The surveys were approved by the institutional research ethics committees at the University of Oxford (UK, Ref No: CUREC 1A/ ODID CIA-20-034, March 15, 2020), the University of Addis Ababa (Ethiopia), the Centre for Economic and Social Studies in Hyderabad (India), the Instituto de Investigación Nutricional (Peru) and the Hanoi University of Public Health (Vietnam). Participants were asked for their verbal informed consent before the study commenced and were assured of confidentiality. A consultation guide was provided to all participants with resources for support in issues raised by the questionnaire, including mental health.

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## Competing interests

MF, AH, CP, DS, and AS report grants from the Foreign, Commonwealth and Development Office (FCDO, grant number 200245), during the conduct of the study.

## Author contributions

CP, AH, and MF conceived the study. CP, MF, DS, and AS designed the study. MF and AS led piloting of instruments and data collection. AH and CP did the statistical analyses. CP and AH wrote the first draft of the Article. MF, DS, and AS provided comments and input to the several

drafts of the manuscript. MF, DS, and AS verified the underlying data. All authors critically reviewed the manuscript and approved the final draft. As the corresponding author, MF attests that all listed authors meet authorship criteria and that no others meeting the criteria have been omitted.

## Data sharing statement

The entire individual participant data collected during the phone survey and previous in-person rounds, after de-identification, is available including data dictionaries. Furthermore, the questionnaire, attrition reports and the field work manual are available at <https://www.younglives.org.uk/>. The data is available, with no end date to anyone who wishes to access the data for any purpose, via the UK Data Archive (study number 8678, DOI: 10.5255/UKDA-SN-8678-3).

## Declaration of interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.puhip.2022.100232>.

## References

- [1] M. Favara, R. Freund, C. Porter, A. Sánchez, D. Scott, Young lives, interrupted: short-term effects of the COVID-19 pandemic on adolescents in low- and middle-income countries, *Covid Econ.* 67 (2021) 172–198.
- [2] R. Jia, K. Ayling, T. Chalder, A. Massey, E. Broadbent, J.R. Morling, et al., Young people, mental health and COVID-19 infection: the canaries we put in the coal mine, *Publ. Health* 189 (2020) 158–161.
- [3] V. Patel, S. Saxena, C. Lund, G. Thornicroft, F. Baingana, P. Bolton, et al., The Lancet Commission on global mental health and sustainable development, *Lancet* 392 (2018) 1553–1598.
- [4] A.D. Jones, Food insecurity and mental health status: a global analysis of 149 countries, *Am. J. Prev. Med.* 53 (2017) 264–273.
- [5] R.L. Spitzer, K. Kroenke, J.B. Williams, B. Lowe, A brief measure for assessing generalized anxiety disorder: the GAD-7, *Arch. Intern. Med.* 166 (2006) 1092–1097.
- [6] K. Kroenke, T.W. Strine, R.L. Spitzer, J.B. Williams, J.T. Berry, A.H. Mokdad, The PHQ-8 as a measure of current depression in the general population, *J. Affect. Disord.* 114 (2009) 163–173.
- [7] H. Ritchie, E. Ortiz-Ospina, D. Beltekian, E. Mathieu, J. Hasell, B. Macdonald, et al., Coronavirus pandemic data explorer. In: OurWorldInData.org, in: Oxford Martin School, University of Oxford, 2020.
- [8] R.H. Salk, J.S. Hyde, L.Y. Abramson, Gender differences in depression in representative national samples: meta-analyses of diagnoses and symptoms, *Psychol. Bull.* 143 (2017) 783–822.
- [9] A. Debowska, B. Horeczy, D. Boduszek, D. Dolinski, A repeated cross-sectional survey assessing university students' stress, depression, anxiety, and suicidality in the early stages of the COVID-19 pandemic in Poland, *Psychol. Med.* (2020) 1–4.
- [10] C. Porter, M. Favara, A. Hittmeyer, D. Scott, A. Sánchez Jiménez, R. Ellanki, et al., Impact of the COVID-19 pandemic on anxiety and depression symptoms of young people in the global south: evidence from a four-country cohort study, *BMJ Open* (2021) 11.