



Economic inequalities in adolescents' internalising symptoms: longitudinal evidence from eight countries



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Summary

Background Research, mainly conducted in Europe and North America, has shown an inequitable burden of internalising mental health problems among adolescents from poorer households. We investigated whether these mental health inequalities differ across a diverse range of countries and multiple measures of economic circumstances.

Methods In this longitudinal observational cohort study, we analysed data from studies conducted in eight countries (Australia, Ethiopia, India, Mexico, Peru, South Africa, the UK, and Viet Nam) across five global regions. All studies had self-reported measures of internalising symptoms using a validated scale at two timepoints in adolescence; a measure of household income, household consumption expenditure, or subjective wealth; and data collected between 2000 and 2019. Household income (measured in four countries), consumption expenditure (six countries), and adolescents' subjective assessment of household wealth (five countries) were measured in mid-adolescence (14–17 years). The primary outcome (internalising symptoms, characterised by negative mood, affect, and anxiety) was measured later in adolescence between age 17 and 19 years. Analyses were linear regression models with adjustment. Effect estimates were added to random-effects meta-analyses to aid understanding of cross-country differences.

Findings The overall pooled sample of eight studies featured 18 910 adolescents (9568 [50·6%] female and 9342 [49·4%] male). Household income had a small or null association with adolescents' internalising symptoms. Heterogeneity (I^2 statistic) was 71·04%, falling to 39·71% after adjusting for baseline symptoms. Household consumption expenditure had a stronger association with internalising symptoms (decreases of 0·075 SD in Peru [95% CI –0·136 to –0·013], 0·034 SD in South Africa [–0·061 to –0·006], and 0·141 SD in Viet Nam [–0·202 to –0·081] as household consumption expenditure doubled). The I^2 statistic was 74·24%, remaining similar at 74·83% after adjusting for baseline symptoms. Adolescents' subjective wealth was associated with internalising symptoms in four of the five countries where it was measured. The I^2 statistic was 57·09% and remained similar after adjusting for baseline symptoms (53·25%). We found evidence for cross-country differences in economic inequalities in adolescents' internalising symptoms, most prominently for inequalities according to household consumption expenditure. Subjective wealth explained greater variance in symptoms compared with the objective measures.

Interpretation Our study suggests that economic inequalities in adolescents' mental health are prevalent in many but not all countries and vary by the economic measure considered. Variation in the magnitude of inequalities suggests that the wider context within countries plays an important role in the development of these inequalities.

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Introduction

The world is home to approximately 1·2 billion adolescents, with 90% living in low-income or middle-income countries.¹ Adolescence is a period of heightened risk for internalising disorders, such as anxiety and depression, which are characterised by emotional distress and negative affect.² Global estimates suggest that approximately 13% of adolescents have a mental disorder, with anxiety and depressive disorders the most common.³

Internalising disorders have substantial health, social, and economic consequences in adolescence and later life.⁴ Most adolescents with mental health problems do not have access to treatment or are unaware of what help might be available, even in high-income countries with

the most health-care resources.⁵ A greater understanding of determinants of adolescent mental health problems is essential to design and implement effective prevention strategies and better targeted services,⁶ particularly in low-income and middle-income countries where mental health data are scarce.

Internalising disorders are, to an extent, socially determined, with different social and structural factors interacting to influence individuals' mental health, together with other factors, including genetic risk.⁷ Numerous antecedents of poorer mental health in adolescents have been identified at the family or household level, including whether parents are separated or cohabiting, other family members' physical or mental health,

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Research in context

Evidence before this study

Evidence on adolescent mental health inequalities primarily comes from a small number of high-income countries in Europe and North America. Few studies have investigated whether there is cross-country variation in the magnitude or direction of economic inequalities in adolescents' internalising symptoms. We searched PubMed, MEDLINE (OVID), and Google Scholar using the search terms "internalising" OR "depression" OR "anxiety" AND "income" OR "consumption expenditure" OR "subjective status" OR "wealth" AND "cross-country" OR "cross-national" AND "adolescents", for articles published from database inception to Nov 1, 2023. We found cross-sectional evidence showing that economic inequalities in adolescent mental health vary across countries, but these studies had insufficient confounder adjustment and were primarily conducted in Europe and North America. We found no study that investigated cross-national differences in the longitudinal association between objective or subjective measures of economic circumstances and future internalising symptoms.

Added value of this study

To our knowledge, our study is the first to compare differences in the magnitude of the longitudinal association between economic circumstances and future internalising symptoms in adolescents across different countries. In countries from across five WHO regions and various income levels, including low-income and middle-income countries, we found cross-country variation in the magnitude of the association between household consumption expenditure and internalising symptoms at follow-up, and, to a lesser extent, household

income and subjective wealth. Economic inequalities in internalising symptoms according to objective economic circumstances appeared to be of greater magnitude in low-income or middle-income countries, particularly Viet Nam, than in high-income countries. Subjective wealth had a greater association with adolescents' internalising symptoms than objective measures of economic circumstances in four of the five countries that had available data on both measures.

Implications of all the available evidence

Economic inequalities in adolescents' internalising symptoms are heterogeneous across countries and, therefore, potentially shaped by societal factors within countries. Previous cross-country research has shown that the association between objective economic circumstances and adolescents' mental health varies across countries. This study additionally shows that this cross-country variation extends to subjective measures of economic circumstances. Subjective measures of economic circumstances appear to have a greater association with internalising symptoms, suggesting that in many countries, psychosocial and comparative processes play an important role in the development of economic inequalities in adolescents' internalising symptoms. The findings highlight the need for greater country-specific knowledge on adolescent mental health inequalities, particularly in low-income and middle-income countries where 90% of the world's adolescents live. Our study provides a basis for further research to identify societal factors that drive economic inequalities in adolescent mental health, which could inform country-specific policies and interventions to reduce these inequalities.

and the household's economic circumstances. A household's level of financial resources can affect adolescents' mental health in various ways, such as by enabling access to goods and services that are important for healthy development (eg, food, housing, education, or health services), and by buffering exposure to stressors (eg, family conflict and peer victimisation or problems).^{8,9} According to a report by the World Bank and UNICEF, more than 120 million adolescents between age 10 and 17 years are living in extreme poverty (defined as having less than US\$2.15 a day to live off), with adverse consequences for health and life chances.¹⁰

Research, primarily in Europe and North America, has documented inequalities in the mental health of adolescents across different measures of economic circumstances. Little research has been done in low-income and middle-income countries.¹¹ Economic inequalities across countries in adolescents' mental health are heterogeneous in both direction and magnitude.^{11,12} This might be a function of cross-study differences in methods, measures, or analysis, or the heterogeneity might indicate that economic inequalities in adolescents' mental health are partly contingent on the wider

societal, cultural, and economic context. For instance, starker economic inequalities in adolescents' mental health have been observed in countries with lower levels of national wealth and higher levels of income inequality;^{13,14} however, findings have not been consistent.¹⁵ Adolescents' personal evaluation of their family's wealth is commonly associated with internalising symptoms,^{16,17} but whether the association between subjective assessments of economic circumstances and adolescents' internalising symptoms varies across different contexts is unknown.

Cross-country research in adolescents has used cross-sectional data only, and observed associations might be driven by reverse causation.^{13,14} A longitudinal study found that higher household income at age 9 years was consistently associated with a greater decrease in child-reported internalising symptoms from age 8 to 10 years across seven countries;¹⁸ however, this has not been explored in older adolescents, for whom the risk of internalising disorders is greater.² Furthermore, cross-country comparisons have tended to focus on comparisons between high-income countries in Europe and North America.^{13,14} Study of a wider range of countries in terms

of geography, culture, and income levels would provide a broader understanding of the similarities and differences in adolescent development across contexts and, importantly, include countries where most adolescents live.

To our knowledge, no study has investigated cross-country differences in the longitudinal association between adolescents' economic circumstances and future internalising symptoms or change in symptoms. Using data from eight countries, spanning a range of continents and income levels, we investigated whether objective and subjective measures of economic circumstances at ages 14–17 years were associated with the severity of internalising symptoms at age 17–19 years, and the change in internalising symptoms from ages 14–17 to 17–19 years.

Methods

Search strategy and selection criteria

In this observational study, we used longitudinal data from eight cohort studies in Australia, Ethiopia, India, Mexico, Peru, South Africa, the UK, and Viet Nam (table 1). Cohorts consisted of two household surveys (Mexico and South Africa), and the cohort member child was the sampling unit of interest in the remaining surveys. Sampling was stratified in all countries, with the goal of recruiting a representative sample of households within each country, or within selected regions within a country as was the case with India. Poorer households were oversampled in Ethiopia, India, Peru, the UK, and Viet Nam. All cohort studies received ethics committee approval in their respective countries, and adolescents, household heads, or parents gave their consent for data collection. Further details of the included countries and cohorts are available in the appendix (p 2).

We selected cohorts with self-reported measures of internalising symptoms using a validated scale at two timepoints in adolescence (at ages 14-17 years and 17-19 years), and a measure of household income, household consumption expenditure, or subjective

wealth. Studies were eligible if data were collected between 2000 and 2019. Studies with sufficiently comparable methods and measures were purposively sampled from a range of diverse geographical regions, particularly those under-represented in mental health research. We prioritised cohorts that were nationally representative where possible.

The time period between baseline and follow-up ranged from 2 to 4 years. For each country, the analytic sample consisted of adolescents (one per household) who attended data collection at baseline and follow-up regardless of whether data on exposures, outcomes, or confounders were available or missing.

Measures

Household income was measured in Australia, Mexico, South Africa, and the UK. Household income was reported by the household head in Mexico and South Africa, and by adolescents' parents in Australia and the UK.

Household consumption expenditure was measured in Ethiopia, India, Mexico, Peru, South Africa, and Viet Nam. In all cases, household consumption expenditure was reported by the household head as defined by the cohort study. We excluded expenditure on food, as some households produce their own food, thereby reducing consumption expenditure but not necessarily due to having fewer financial resources. For all countries, we log-transformed household consumption expenditure and income to improve model fit (appendix p 3).

Subjective wealth was self-reported by adolescents in Ethiopia, India, Peru, South Africa, and Viet Nam using a single item (appendix p 3). In South Africa, adolescents' judgement of their wealth was based on where they perceived they stood on a six-step ladder, with the bottom step representing the poorest in the country and the top step representing the richest. In the other countries, adolescents responded to an item regarding how rich or poor they would describe their household to be, based on six options.

We transformed responses on the subjective wealth items using ridity scores (appendix p 3).¹⁹ Ridity-transformed variables estimate the Slope Index of Inequality (SII), with the coefficient in linear regression models representing the difference in the outcome between individuals with the lowest and highest economic position in a population.¹⁹

We adjusted for potential confounding variables measured in all countries: adolescent sex, whether adolescents lived with their biological parents, and minoritised status. Adolescent sex was reported as sex in all countries, except for South Africa where it was reported as gender. In all countries, only male or female response options were available. Minoritised status was defined by ethnicity in Australia, Ethiopia, South Africa, Peru, Viet Nam, and the UK, by caste in India, and by indigenous status in Mexico. For South Africa, we also

See Online for appendix

| Cohort | | Baseline timepoint | | Follow-up timepoint | |
|--|---|------------------------------|------------|------------------------------|------------|
| | | Year | Age, years | Year | Age, years |
| Australia | Longitudinal Study of Australian Children | 2016 | 16–17 | 2018 | 18–19 |
| Ethiopia | Young Lives | 2009 | 15 | 2013 | 19 |
| India (states of Andhra Pradesh and Telangana) | Young Lives | 2009 | 15 | 2013 | 19 |
| Mexico | Mexican Family Life Survey | 2002 | 15–16 | 2005–06 | 18–19 |
| Peru | Young Lives | 2009 | 15 | 2013 | 19 |
| South Africa | National Income Dynamics Study | 2008, 2010, 2012, or 2014–15 | 15–16 | 2010, 2012, 2014, or 2016–17 | 17–18 |
| UK | Millennium Cohort Study | 2015 | 14 | 2018 | 17 |
| Viet Nam | Young Lives | 2009 | 15 | 2013 | 19 |

Table 1: Cohort profiles

adjusted for the wave in which adolescents entered the analytic sample.

Outcomes

Internalising symptoms at follow-up were measured with four different measures across countries (appendix p 4): the Center for Epidemiologic Studies Depression Scale,²⁰ the Cuestionario Clinico para el Diagnostico del Síndrome Depresivo,²¹ the Kessler Psychological Distress Scale,²² and the emotional symptom subscale of the Strengths and Difficulties Questionnaire.²³ The measure of internalising symptoms at baseline was the same as the measure used at follow-up for all countries except for Australia and the UK, where the baseline measure was the Short Mood and Feelings Questionnaire,²⁴ and the follow-up measures were the Kessler Psychological Distress Scale in Australia and the Strengths and Difficulties Questionnaire in the UK. Further details on the outcome measures are in the appendix (p 4).

We used standardised scores of the outcome within each country, referenced to the population distribution of the measure, which enabled cross-country comparisons of standardised effect estimates. As a sensitivity analysis, we constructed harmonised measures featuring items that were sufficiently similar across the different outcome measures. Harmonisation was aided using Harmony, a natural language processor that assigns scores based on how well different items match one another semantically.²⁵ The harmonised measures featured one item assessing low mood and another assessing anxiety (appendix p 5).

Statistical analysis

Multiple imputation using chained equations was used to impute missing data, creating 50 imputed datasets per country. We included auxiliary variables associated

with the outcome and outcome missingness in the imputation models where available.

We used linear regression models to estimate the association between each measure of economic circumstances and internalising symptoms at follow-up for each country, adjusting for confounders (appendix p 4). For the analyses of change in internalising symptoms, we additionally adjusted for internalising symptoms at baseline. We applied sampling weights where they were available.

We converted effect estimates so they represented a change in standardised internalising symptoms per doubling of household income or consumption expenditure (ie, $b \times \ln[2]$). The resulting coefficients and the SII were added to separate random-effects meta-analyses to aid comparison of effect estimates across countries and to explore the level of cross-country heterogeneity (as reported by the I^2 statistic and Q test).

We calculated the difference in adjusted R^2 between the final models including the economic circumstances measure of interest and all confounders, and between the final models without the economic circumstances measure of interest. This enabled us to identify how much variance of the outcome was explained by economic circumstances, independent of the variance explained by the confounders.

As a sensitivity analysis, we used equalised values of household income and consumption expenditure to model household economic circumstances more accurately. Equalisation involved dividing income and consumption expenditure by the square root of the household size, before log transformation (appendix p 3). We also reran the primary analyses using the harmonised measures, and without adjusting for confounders (appendix pp 6–7). Finally, we reran the linear regression models stratified by sex. Analyses were carried out in Stata version 17.

| | Cohort sample size at first wave of cohort study* | Attended baseline timepoint | Attended follow-up timepoint | Analytical sample | Baseline mental health measure (scale range) | Mean (SE) | Follow-up mental health measure (scale range) | Mean (SE) |
|--------------|---|---|--|-------------------|--|--------------|---|--------------|
| Australia | 4983 | 2813 | 2708 | 2422 | SMFQ (0–26) | 7.69 (0.19) | K10 (10–50) | 19.68 (0.20) |
| Ethiopia | 1000 | 973 | 908 | 905 | SDQ-E (0–10) | 2.82 (0.17) | SDQ-E (0–15) | 6.86 (0.15) |
| India | 1008 | 976 | 952 | 951 | SDQ-E (0–10) | 3.56 (0.16) | SDQ-E (0–15) | 6.51 (0.12) |
| Mexico | 8441 households | 1337 | 1035 | 898 | CCDSD (20–80) | 26.14 (0.35) | CCDSD (20–80) | 24.71 (0.48) |
| Peru | 714 | 678 | 635 | 631 | SDQ-E (0–10) | 4.29 (0.10) | SDQ-E (0–10) | 4.44 (0.14) |
| South Africa | 7296 households | 1093 (wave 1), 840 (wave 2), 682 (wave 3), 732 (wave 4)† | 935 (wave 1), 878 (wave 2), 657 (wave 3), 685 (wave 4)‡ | 2920 | CES-D (0–30) | 5.90 (0.12) | CES-D (0–30) | 5.79 (0.12) |
| UK | 18 818 | 11 717 | 10 238 | 9310 | SMFQ (0–26) | 5.61 (0.11) | SDQ-E (0–10) | 3.49 (0.04) |
| Viet Nam | 1000 | 966 | 887 | 873 | SDQ-E (0–10) | 3.61 (0.08) | SDQ-E (0–15) | 7.13 (0.16) |

SMFQ=Short Mood and Feelings Questionnaire. K10=Kessler Psychological Distress Scale. SDQ-E=emotional symptom subscale of the Strengths and Difficulties Questionnaire. CCDSD=Cuestionario Clinico para el Diagnostico del Síndrome Depresivo. CES-D=Center for Epidemiologic Studies Depression Scale. *Number of adolescents unless stated. †Number of adolescents at each wave aged 15–16 years, with no other adolescent from their household from earlier waves already included in the analytic sample. ‡Number of adolescents at each wave aged 17–18 years, with no other adolescent from their household from earlier waves already included in the analytic sample.

Table 2: Analytical samples and mean internalising symptoms across each country

Role of the funding source

The funder had no role in study design, data collection, data analysis, data interpretation, or writing of the report.

Results

We analysed data of 18 910 adolescents (9568 [50.6%] female and 9342 [49.4%] male) across eight studies each in a different country. Sample sizes ranged from 631 in Peru to 9310 in the UK (table 2).

In countries where household income was measured, the coefficients for internalising symptoms at follow-up were small or null (figure 1). As household income doubled, internalising symptoms at follow-up decreased by 0.04 SD in South Africa (95% CI -0.08 to 0.00) and in the UK (-0.07 to -0.01). There was no evidence for an association with internalising symptoms at follow-up in Australia or Mexico. The I^2 statistic was 71.04%. The Q test found evidence for heterogeneity between countries ($p=0.0066$).

After adjusting for baseline symptoms, the association with household income attenuated towards the null for South Africa and the UK (figure 1). Subsequently, there was little cross-country variability in the association with change in symptoms. The I^2 statistic was 39.71%, and the Q test did not indicate cross-country heterogeneity ($p=0.20$).

We found evidence that household consumption expenditure was associated with fewer internalising symptoms at follow-up, with a decrease of 0.07 SD in

Peru (95% CI -0.14 to -0.01), 0.03 SD in South Africa (-0.06 to -0.01), and 0.14 SD in Viet Nam (-0.20 to -0.08) as household consumption expenditure doubled. There was no evidence of an association in Ethiopia or India, but the coefficients were of similar magnitude to those observed for South Africa and Peru (figure 2). The coefficient for Mexico was close to the null. The I^2 statistic was 74.24%, and the Q test found evidence for heterogeneity between countries ($p=0.0033$).

The coefficients after adjusting for baseline symptoms were similar, and cross-country variability was observed in the association between household consumption expenditure and change in internalising symptoms (figure 2). The I^2 statistic was similar (74.83%), and the Q test found evidence for heterogeneity between countries ($p=0.0027$).

With regard to subjective wealth, the SII was greatest in Viet Nam, indicating that adolescents from the richest households had 0.73 SD fewer internalising symptoms compared with the poorest adolescents (95% CI -1.11 to -0.34; figure 3). The SII was minimal in South Africa (-0.26 [95% CI -0.44 to -0.07]) and in India (-0.07 [-0.39 to 0.24]), where the direction of the association was unclear. The 95% CIs were large and there was considerable overlap between countries. The I^2 statistic was 57.09%, but no evidence was found for cross-country heterogeneity by the Q test ($p=0.062$).

After adjusting for baseline symptoms, all SIIs were smaller and closer to the null (figure 3). The SII remained greatest in Viet Nam and smallest in India. The I^2 statistic remained similar (53.25%) and no evidence was found for cross-country heterogeneity by the Q test ($p=0.074$).

The variance explained by the measures of economic circumstances were typically small (all less than 2.5%; figure 4, appendix p 7). Household consumption expenditure explained a greater proportion of the variance than did household income, except for in Mexico. In the four countries where household income was measured, the variance explained by household income was less than 0.5%. Within countries where subjective wealth and at least one objective measure were measured, subjective wealth explained greater variance of internalising symptoms than any objective measure, except for in India. Adding household income led to a poorer fit of the data in Australia, and adding subjective wealth led to a poorer fit of the data in India, compared with the regression models that contained the confounders only. After adjusting for baseline symptoms, the measures of economic circumstances explained less variance. Findings were consistent with the analyses not adjusting for baseline symptoms (figure 4).

Effect estimates in the analyses using equivalised household income and consumption expenditure were similar to those for the non-equivalised values (appendix p 8). The use of harmonised measures reduced

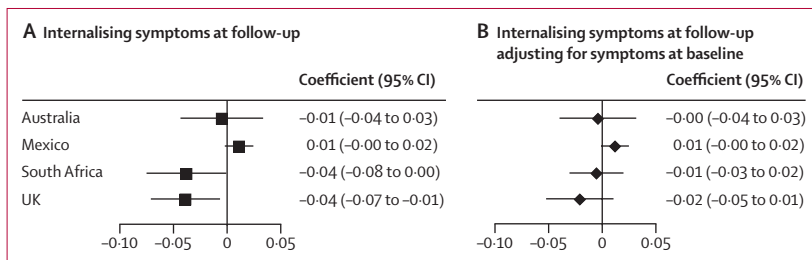


Figure 1: Association between log-transformed household income and internalising symptoms
Internalising symptoms at follow-up (A), and at follow-up adjusting for symptoms at baseline (B). Coefficients represent the change in standardised internalising symptoms per doubling of household income.

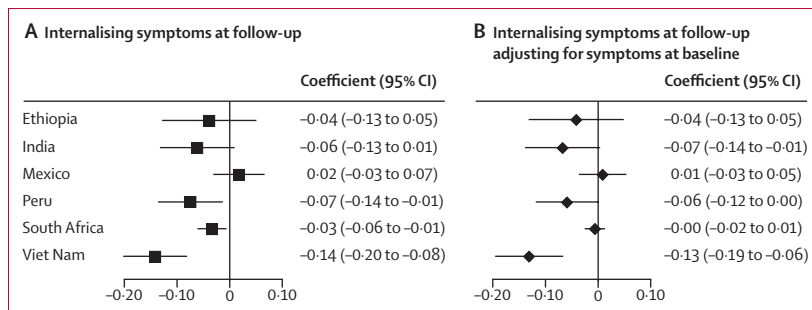


Figure 2: Association between log-transformed household consumption expenditure and internalising symptoms
Internalising symptoms at follow-up (A), and at follow-up adjusting for symptoms at baseline (B). Coefficients represent the change in standardised internalising symptoms per doubling of household consumption expenditure.

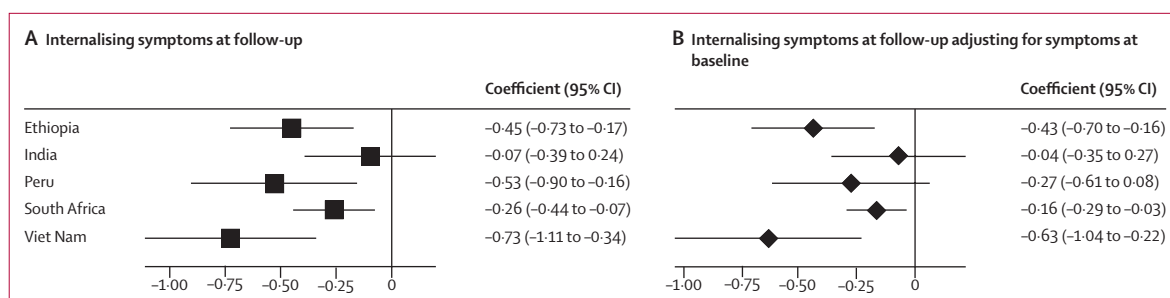


Figure 3: Slope Index of Inequality according to adolescents' subjective wealth for internalising symptoms

Internalising symptoms at follow-up (A), and at follow-up adjusting for symptoms at baseline (B). Coefficients represent the difference in standardised internalising symptoms between adolescents with the highest and lowest subjective wealth in their country sample.

cross-country variation in the association between internalising symptoms at follow-up and the change in symptoms with household income and subjective wealth (appendix pp 8–9). For household consumption expenditure, the use of the harmonised measures had almost no effect on the coefficients of any countries, except for South Africa where the association was weaker (appendix pp 8–9). Cross-country variability in the association was still observed. Within countries, there was no evidence of a difference between sexes in the strength of the association between any measure of economic circumstances and internalising symptoms (appendix p 10).

Discussion

We analysed longitudinal data from eight countries and found that inequalities in adolescents' internalising symptoms varied according to country and measure of economic circumstances. For household consumption expenditure, the magnitude of the association varied and was greatest in Viet Nam. In Mexico and South Africa, the association was close to the null. The SIIs for subjective wealth appeared to vary in magnitude; however, the wide SEs restrict the ability to draw conclusions about cross-country differences. Subjective wealth explained a greater proportion of the variance of internalising symptoms within countries, compared with any objective measure in most countries where both were measured, but not in India.

For household income, cross-country variability was much smaller and minimal in the analyses using the harmonised measures, suggesting that cross-country differences could be due to the different outcome measures across countries. Measures with fewer items typically capture less variance of the construct they are measuring than do measures with more items and therefore a wider range of possible scores. The brevity of the harmonised measures of internalising symptoms might, therefore, reduce the precision and magnitude of the effect estimates in comparison with the original measures, potentially explaining the smaller coefficients and reduced variability between countries with the harmonised measures.

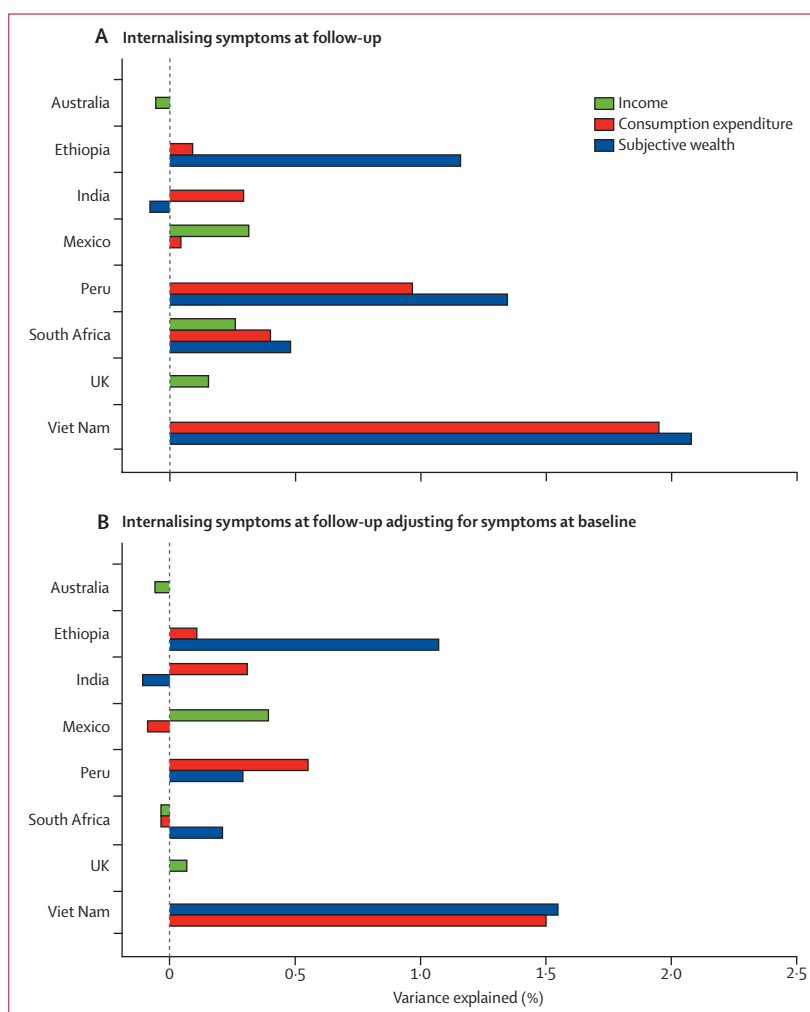


Figure 4: Additional variance explained by household income, household consumption expenditure, and subjective wealth across countries

The variance explained by the measures of economic circumstances represents the difference in the variance explained in regression models including the economic circumstances measure of interest and all confounders, and in regression models with all confounders but without the economic circumstances measure of interest.

Our study highlights the potential role of societal context within countries in shaping economic inequalities in adolescents' internalising symptoms. Variation

in the magnitude of inequalities might also reflect differences in protective factors in response to economic disadvantage across countries. Across the objective measures, inequalities were of the smallest magnitude in the countries with the highest gross domestic product per capita (Australia, Mexico, South Africa, and the UK). In higher-income countries, particularly Australia and the UK, welfare policies and greater accessibility of health care might help buffer the negative effects of having fewer financial resources, therefore leading to less stark economic inequalities in internalising symptoms. Specific customs or cultural factors might also influence the extent to which internalising symptoms in adolescents could develop in response to economic stress. For example, in Mexico, where the association with internalising symptoms was close to null across all analyses, possible explanations include the effect of close family ties and high levels of social support that could buffer the stress of poorer economic circumstances.²⁶ Ultimately, there are likely to be differences across countries in the mechanisms through which poorer socioeconomic circumstances could lead to greater levels of internalising symptoms and the protective factors that might buffer any effect, which warrants further investigation to help inform country-specific prevention strategies.

Our findings suggest that economic inequalities in adolescents' internalising symptoms according to objective measures of economic circumstances are of greater magnitude in lower-income countries than in high-income countries such as Australia or the UK.²⁷ Rates of absolute poverty are higher in low-income countries, with consequences for adolescents including leaving education early to work, increased risk of food insecurity, and restricted access to essential services.²⁷ Accordingly, adolescents in lower-income countries are not only more likely to live in poverty, but might also be more likely to experience poorer mental health as a result of financial disadvantage. Cross-country differences in the magnitude of inequalities might be due to the use of different measures to capture economic circumstances across settings: household income or household consumption expenditure. However, in Mexico and South Africa, the coefficients were almost identical across income and consumption expenditure, despite the measures being only moderately correlated with each other. Our findings highlight the need for a greater understanding of the economic antecedents of mental health problems in low-income and middle-income countries, where 90% of the world's adolescents live, to inform effective country-specific policies to prevent internalising disorders in poorer adolescents. Potential policies and interventions include efforts to lift families out of poverty or build economic resilience, which can lead to better mental health outcomes in adolescents.²⁸

Inequalities in adolescents' internalising symptoms according to household consumption expenditure and

subjective wealth were greatest in Viet Nam. Since 1990, Viet Nam has had one of the highest rates of economic growth and poverty reduction in the world.²⁹ However, progress has not been equitable, with growing disparities in poverty rates within regions and between ethnic groups.²⁹ The psychological impacts of poverty might be exacerbated in this context, as poorer individuals might feel further disenfranchised and marginalised as the wealth and living standards of others increase faster.

Notably, we found no country where there was evidence for a greater level of internalising symptoms in wealthier adolescents, yet there is evidence of higher rates of mental health problems in wealthier adolescents in some countries.³⁰

Surprisingly, economic inequalities in internalising symptoms were less pronounced in the countries with the highest levels of income inequality (Mexico and South Africa). This contrasts with research in high-income countries^{13,14} but is consistent with a recent cross-national study of inequalities in suicide according to food security status in low-income and middle-income countries.¹² Accordingly, the proposed impact of country-level income inequality on mental health inequalities in high-income settings might not extend unilaterally to low-income and middle-income settings. Our findings for South Africa and Mexico are consistent with a cross-sectional study that found that young people (age 11–25 years) in the poorest household income quartile had only slightly more severe depressive symptoms in South Africa compared with all other adolescents, and that there was no association in Mexico.³¹

This study has several limitations. The cohorts had some methodological similarities but there were differences regarding the study designs, sampling procedures, measures of economic circumstances and internalising symptoms, ages of adolescents, and years in which the cohorts were studied. Hence, some of the cross-country variability in inequalities is likely to be an artefact of different study methods or measures. The cohorts in our study aimed to be nationally representative; however, they are unlikely to capture all population groups within their samples. All sampling was carried out at the household level for each cohort, and therefore the samples might not include adolescents experiencing homelessness or living without stable housing at the time of study enrolment. Except for Mexico, where the sample was drawn from the first wave of the study, all cohorts would have been subject to attrition before the data were analysed. Study attrition is typically greater in vulnerable populations,³² and therefore the samples analysed might not be representative of adolescents from all economic backgrounds. The research did not involve additional people with lived experience in the study design or implementation. We modelled income and consumption expenditure at only one timepoint, necessitated by data availability, which might not accurately capture long-term economic circumstances. Studies in

Australia and the UK that modelled income using quantiles or categories indicating poverty status or exposure to low income over a longer time period have reported larger effect sizes.^{33,34} All measures of economic circumstances were measured in only one country, hampering our ability to make full comparisons of inequalities in internalising symptoms according to all economic measures within and between countries. Our study highlights the differences in economic measures collected in different countries, potentially reflecting the measures' different perceived importance and suitability for capturing economic circumstances in these countries.³⁵ The observed differences in the variability of mental health inequalities across the different measures of economic circumstances will be affected by considering different countries across each measure.

To our knowledge, this is the first study to use longitudinal data to investigate differences in economic inequalities in adolescents' mental health across countries. We examined multiple economic measures and compared their association with adolescents' mental health and its variation within and between countries, highlighting differences in the magnitude of inequalities observed dependent on the measure of economic circumstances. Inequalities in adolescents' internalising symptoms across levels of household consumption expenditure and, to an extent, household income and subjective wealth varied across countries. Our findings suggest that wider societal contexts play a role in shaping these inequalities. The results caution against using findings from one country to infer about another, and they highlight that researchers should be explicit about the economic measure and specific population to which their research findings relate.

Contributors

TS and PP conceptualised the study. All authors designed the methodology. TS performed formal analysis and visualisation, and wrote the original draft. All authors reviewed and edited the manuscript. SE-L, GL, PP, and KR-C supervised the study. TS and PP accessed and verified the data, and had full access to all the data in the study. All authors had final responsibility for the decision to submit for publication.

Declaration of interests

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Data sharing

The data used in this study are available through the Australian Data Archive (LSAC), the websites of the Mexican Family Life Survey and the National Income Dynamics Study, and the UK Data Service (MCS and Young Lives: Ethiopia, India, Peru, and Viet Nam).

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