

College of Medicine

Understanding factors that moderate the relationship between family poverty and depression among adolescents aged 10 to 16 years in rural districts of Balaka, Mchinji and Rumphi.

By

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DECLARATION

I Edmond Munthali hereby declare that this dissertation is my original work and has not been presented for any other awards at the University of Malawi or any other University.

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Date 18th March 2022

CERTIFICATE OF APPROVAL

The dissertation of Edmond Munthali is approved by the Dissertation Examination Committee

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ABSTRACT

Adolescence is a critical stage in human development where physical, cognitive, and psychosocial growth takes place. Poverty is linked to adolescent depression. In Malawi, it is estimated that depression affects 16.9% of adolescents aged 10 to 16 years old.

The objectives of the study were to assess the relationship between wealth index status and depression among adolescents and determine if this relationship is moderated by Adverse Childhood Experiences (ACEs) in the districts of Rumphi, Balaka and Mchinji.

This study used cross-sectional secondary data collected in 2017 by Malawi Longitudinal Study of Families and Health-ACE (MLFSH-ACE). Logistic regression model was used to assess the relationship between wealth status and depression among adolescents. Odds ratios were generated to measure the association between wealth status and depression. ACEs factors were added to the model to test for moderation.

The mean age in years was 13.2(±1.70) and 51% of the sample was female, 49% Male. School attendance among adolescents was at 91%. Adolescents from high wealth index households had lower odds of depression compared with adolescents from low wealth index households (aOR= 0.73, 95% CI: 0.56-0.95).

Adolescents from a lower wealth index households have high odds of depression compared to adolescents from low wealth index households. In Developing countries, wealth index data can be used in identifying high risk households for adolescent's depression and formulate appropriate interventions.

LIST OF ABBREVIATIONS

ACE	Adverse Childhood Experience
BDI	Beck Depression Inventory
COMREC	College of Medicine Research Ethics Committee
DALY	Disability-Adjusted Life Years
DHS	Demographic Health Survey
ESCOM	Electricity Supply Commission of Malawi
HWI	Household Wealth Index
MLSFH	Malawi Longitudinal Study of Families and Health
IRB	International Regulatory
MICS	Multiple Indicator Cluster Surveys
NCDs	Non-Communicable Diseases
NHSRC	National Health Science Research Committee in Malawi
PCA	Principal Component Analysis
WHO	World Health Organization
YLD	Years Lost to Disability (YLD)

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CHAPTER 1: INTRODUCTION

1.1 Background information and introduction

Adolescence is a critical stage in human development where physical, cognitive, and psychosocial growth happens. Developments that take place during adolescence influence an individual for the rest of their life [1, 2]. Furthermore, health conditions that affect developmental processes during adolescence have long term health consequences [1, 3]. Evidence shows that mental health disorders begin to make significant appearance in a human being during adolescence phase [1].

Depression is one of the categories of mental health disorders and it is characterized by recurrent sadness, loss of interest or pleasure, feelings of guilt or low self-worth, disturbed sleep or appetite, feelings of tiredness, and poor concentration [4]. An estimated 10–20% of adolescents globally experience mental health disorders, yet these remain underdiagnosed and undertreated [5]. Specifically, depressive disorders are among the top three leading causes of Disability-Adjusted Life Years (DALYs) among adolescents in the world [5].

The World Health Organization (WHO) projects that by 2030 depression alone is likely to be the single highest contributor to the burden of disease in the world, more so than heart disease, stroke, road traffic accidents, and HIV and AIDS [6].

In Malawi, the proportion of deaths attributable to HIV/AIDS is declining while the proportion attributable to non-communicable (NCDs) is rising steadily, comprising 29% of all deaths, and mental health disorders accounts for 12% of all NCDs burden [7]. The 2017 WHO report estimated that the prevalence of depression in Malawi was 4.1% [4].

Adolescents aged 10 to 16 years make up an estimated 19% of Malawi's population [8]. The 2017 Global Disease Burden study revealed that mental health disorders including depression in Malawi were the fifth highest contributor to disease burden and second highest contributor to non-fatal health loss of Years Lost to Disability (YLD) in children and adolescents aged 5 to 14 years [9]. Furthermore, a study in 2019 found that the prevalence of depression among adolescents aged 10 to 16 years in Malawi was estimated at 16.9% [10].

Globally, exposure to poverty is a key determinant of poor health outcomes including mental health [3]. Across the world, family poverty has been found to be a key determinant of depression among adolescents [11–14]. However, most adolescent mental health studies have been conducted in higher income countries where family poverty is measured by household current income or expenditures [15, 16]. On the contrary, in less developed countries like Malawi, income and expenditure data is not readily available and it is extremely challenging to collect for several reasons such as people not knowing their income, people hiding their income to interviewers and for most households, income varies daily, weekly, and seasonally [17].

Therefore, in less developed countries like Malawi, alternative tools are preferred in measuring household economic status and a good example is household wealth index (HWI) [17, 18]. HWI is a composite measure of a household's cumulative living standard, and it is calculated using easy-to-collect data on household's ownership of selected assets such as television, bicycles, and sanitation materials [17]. In Malawi, household wealth index has been used in Demographic Health Surveys (DHS) and Multiple Indicator Cluster Surveys (MICS) to measure how household economic status affects health outcomes [19, 20]. It is to this background that the association between poverty and depression in adolescence in Malawi needs to be assessed and compare the results with studies conducted in developed countries.

Additionally, studies across the globe have linked development of poor health outcomes and risky health behaviour to exposure to Adverse Childhood Experiences (ACEs) [21]. ACEs is the expression used to describe all types of abuse, neglect and other traumatic experiences that occur to individuals under the age of 18 and examples are, physical abuse, sexual abuse, emotional abuse, alcoholism in the family, drug abuse in the family, depression or any other mental illness in the family, incarceration of a family member, parent separation or death, psychological neglect, physical neglect, bullying, involvement in a physical fight, community violence, collective violence[22]. A study conducted in 2017 found that childhood adversity is common in Malawi with almost 72% reporting 4 or more adversities [10]. Most importantly, in Malawi, exposure to ACEs has an influence on adolescence

depression [10]. A study in United States of America (USA) found that an accumulation of ACEs did not significantly moderate the relationship between income and adolescent depression [23]. Even though the effect of ACEs and income on adolescent depression is known, it is not clear individual ACE factors moderate the relationship of household wealth index and adolescents' depression.

The conceptual framework below illustrates how ACEs moderate the relationship of household wealth on adolescents' depression. This study has hypothesized that household wealth index is associated with depression and this relationship is moderated by ACEs.

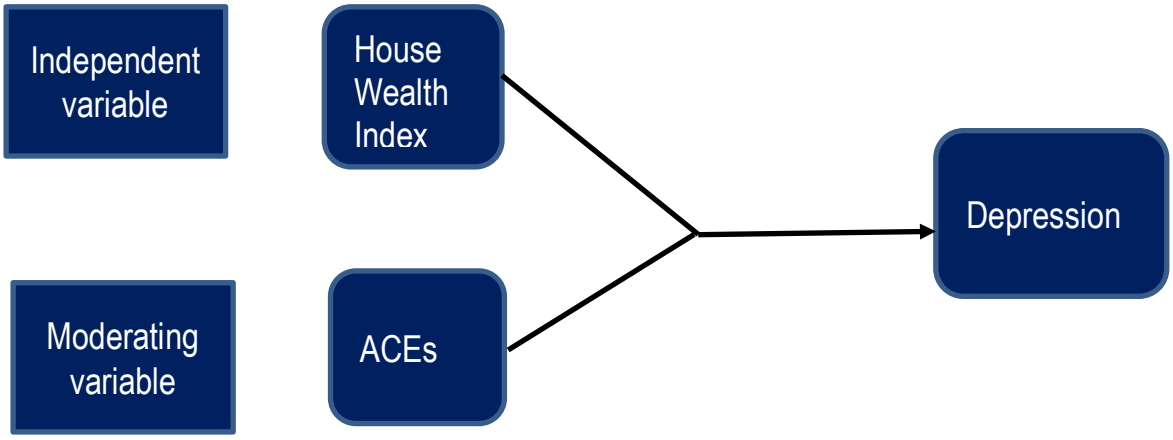


Figure 1: Moderating term influencing the outcome variable

1.2 Justification of the study

The present study provides additional evidence that, just like family income data, household wealth index data can be used to predict depression in adolescents. This is vital to policy makers and program planner from developing countries where family income data is difficult to collect and is not readily available [17]. Policy makers and program planners can use wealth index data and identify high risk households for adolescent depression and design targeted preventative interventions. Additionally, results on the combined effect of ACEs and household wealth index on depression will help programmers to design targeted interventions that can prevent childhood adversities at household and community level with the aim of reducing depression levels among adolescents.

1.3 Objectives

1.3.1 Broad Objectives

To assess the relationship between family poverty and depression in adolescents aged 10 to 16 years and assess if Adverse Child Events moderates this relationship in Mchinji, Balaka and Rumphi districts.

1.3.2 Specific Objectives

1. To assess the relationship between household wealth index status and depression in adolescents aged 10 to 16 years in Mchinji, Balaka and Rumphi districts.

2. To determine if individual Adverse Child Events moderate the relationship of household wealth index on depression among adolescents ages 10 to 16 years in Mchinji, Balaka and Rumphi districts.

CHAPTER 2: METHODOLOGY

2.1 The type of research study

This study was a cross sectional study and it used secondary data from Malawi Longitudinal Study for Families and Health- Adverse Childhood Experiences (MLSFH-ACE) study collected in 2017. The MLSFH-ACE study is part of the bigger MLSFH which was initially established in 1998 to study social network influences on fertility behaviours and HIV risk perceptions, and over time the focus of the study expanded to include health, sexual behaviours, intergenerational relations and family/household dynamics [24]. Adolescents who were enrolled in MLSFH-ACE study are children who were listed in the household roster in data collection rounds of 2008 and 2010 and are estimated to be between 10 to 16 years old in 2017[24].

2.2 Study Place

Data which was used in this study was collected from the Malawi rural districts of Rumphi, Balaka and Mchinji. Rumphi, Mchinji and Balaka are in the northern, central, and southern regions of Malawi, respectively. The three districts are predominantly rural with Yao being a predominant tribe in Balaka, Chewa being a predominant tribe in Mchinji and Tumbuka being predominant tribe in Rumphi. In all the three districts education levels among the population is very low and majority earn a living through subsistence farming [8].

2.3 Study Population

The study population included adolescents aged 10 to 16 and their parents or caregivers. In 2008 and 2010 MLSFH respondents completed a household roster which included all children living in their households. The children who were estimated to be 10 to 17 years old in 2017 were selected to participate in the MLSFH-ACE study [24]. Caregivers of the adolescents were also interviewed to collect data on assets owned.

2.4 Study Period

MLSFH-ACE study was conducted in year 2017. For this study secondary data analysis was conducted from April to July 2021.

2.5 Sample size and power calculation

This study sought to assess the association between household wealth index status and depression in adolescents, using the MLSFH-ACE database (n=1800). Of the total, 698 adolescents came from high wealth index status (wealth index score above the mean) while 1102 adolescents came from lower wealth index status (wealth index score below the mean) representing a 1.578796562 sample size ratio. Using a range of odds ratio values, we assessed the statistical power of this database to detect significant associations at 5% significance level. As shown in Table 1, this database has at least 89% statistical power to detect at least 1.5 odds ratio of significant association between wealth index status and depression. The power calculations were conducted in stata 16 using the STATA command; **power twoproportions .16, test(chi2) oratio(1.2(0.1)2) n(1800) nratio(1.578796562) continuity.** Table 1 below shows the STATA output.

Table 1: Estimated statistical power for detecting significant odds ratios using the MLSFH-ACE database (n=1800)

Sample size (Total)	Sample size (Low wealth index status)	Sample size (High wealth index status	Prevalence in cases (high wealth index status)	Odds Ratio (High vs Low Wealth index Status)	Estimated power
1800	1102	698	0.16	1.2	0.268
1800	1102	698	0.16	1.3	0.512
1800	1102	698	0.16	1.4	0.742
1800	1102	698	0.16	1.5	0.893
1800	1102	698	0.16	1.6	0.964
1800	1102	698	0.16	1.7	0.991
1800	1102	698	0.16	1.8	0.998
1800	1102	698	0.16	1.9	0.9996
1800	1102	698	0.16	2	0.9999

2.6 Data Collection

The 2017-2018 MLSFH-ACE study data was collected by MLSFH local partner, Investing in Knowledge (IKI) using well trained research assistants. All survey questionnaires and related tools were translated into local languages of chiChewa, chiTumbuka and chiYao. This study extracted data on the following variables from MLSFH database; depression, age of the adolescent, sex of the adolescent, household

wealth index and ACEs (physical, sexual, and emotional abuse and neglect by parents or caregivers, peer violence, witnessing community violence).

2.6.1 Depression data

MLSFH study collected depression data using Beck Depression Inventory (BDI) [25]. BDI is a 21-item self-administered survey scored on a scale of 0 to 3. This inventory assesses sadness, pessimism, past failure, loss of pleasure, guilty feeling, punishment feeling, self-dislike, self-criticism, suicidal thoughts, loss of interest, indecisiveness, worthlessness, loss of energy, changes in sleeping pattern, irritability, change in appetite, concentrating difficulty, tiredness, and loss of interest in sex [25]. MLSH-ACE study data depression on depression was collected by asking adolescents if in the past two weeks including on the day of the study, they have ever had a feeling or experiences indicated in the BDI inventory. The present study extracted data on the 21 items that were collected using Beck Depression Inventory and used it to calculate BDI score for each adolescent.

2.6.2 Household wealth index data

MLSFH-ACE study collected data on household living standard by asking adolescents' caregivers if they owned any of the following assets: bed with mattress, sofa set, table and chair(s), paraffin glass lump, television, radio, cellphone, mosquito net, solar electricity panel, bicycle, motorcycle, oxcart, pit latrine, sanplat latrine, ESCOM electricity or generator, metal roof, beer brewing drum, computer/tablet, cooker/stove/hotplate, and refrigerator. The present study extracted asset ownership

data from MLSFH database and use it calculate a composite household wealth index score.

2.6.3 ACE data

MLSFH collected data on the following ACEs: emotional neglect, emotional abuse, physical neglect, physical abuse and sexual abuse; substance abuser in the household, someone in the household with mental issues, incarcerated household member, domestic violence, parent dead or divorced, being bullied, community violence and collective violence was collected using a standardized WHO questionnaire [26]. MLSFH-ACE study collected data on ACE by asking adolescents if they have ever experienced any ACEs when growing up. The present study extracted ACE data from the MSFH-ACE study database to generate individual ACE data for each for each adolescent.

2.6.3 Other co-variates

Data on sex and education of an adolescent was collected using adolescents survey questionnaire.

2.7 Data Management and Analysis

2.7.1 Data Management

Data management and processing was done using STATA 16.

2.7.1.1 Outcome Variable: Depression

In this study depression was categorized as a binary variable. BDI scores for each adolescent were summed up from the 21 items. In the present study, adolescents with a BDI score ranging from 0 to 17 were categorized as not having depressive

symptoms and those who had BDI score of at least 18 were categorized as having depressive symptoms [25].

2.7.1.2 Main exposure Variable: Wealth Status

The main exposure variable, wealth status was categorized as a binary variable. Using STATA, a Principal Component Analysis (PCA) was used to create a composite household wealth index score. To create a binary variable, adolescents with household wealth index score below average were categorized as being in lower wealth status category. Likewise, adolescents who had a household wealth index score of above average were categorized as being in high wealth status category.

Household with missing values on any asset was excluded in creation of household wealth index, likewise, any asset owned by at least 95% or less than 5% of the sample was removed from the list of assets used to create household wealth index as this may not help to distinguish between richer and poorer household [18].

2.7.1.3 Moderating variable: ACE

In the present study, ACE were grouped in four domains namely, individual abuse, family dysfunction and peer violence. Each ACE within the domain was a moderating variable.

- **Individual abuse domain**: This domain comprised of the following: emotional neglect, emotional abuse, physical neglect, physical abuse, and sexual abuse. All these ACEs were binary variables and all

adolescent who answered yes to at least one question were coded as Yes and rest were coded as No.

- **Family dysfunction domain**: This domain comprised of the following: substance abuser in the household, someone in the household with mental issues, incarcerated household member, domestic violence, parent dead or divorced and domestic violence. All these ACEs were binary variables and all adolescent who answered yes to at least one question were coded as Yes and rest were coded as No.
- **Violence domain**: This domain comprised of the following: Being bullied, community violence and physical fight. All these ACEs were binary variables and all adolescent who answered yes to at least one question were coded as Yes and rest were coded as No.

2.7.1.4 Other covariate

In this study, sex and education of an adolescent were all binary variables.

2.7.2 Data analysis

Data analysis was done using STATA version 16. The analyses described below was used to assess objectives one and two.

2.7.2.1 Objective one

To measure objective one, a univariate logistic regression model was used to assess the relationship between wealth index status and depression among adolescents aged 10 to 16 years. Additionally, a multivariate logistic model adjusting for gender of

adolescent, education of adolescents was generated. Odds ratios were generated to measure the association between wealth status and depression. Two tailed p-values of 0.05 or less was considered to indicate significance of the association. Equation below illustrates the model.

$$Depression = b_0 + b_1 WIS + + b_2 Age + b_3 gender + b_4 EduA + e$$

2.7.2.2 Objective two

To test the hypothesis that ACEs moderate the relationship between wealth index status and adolescent depression, each of the individual ACE factor from the three domains were added to the regression model. The p-values of 0.05 or less for the interacting variable was considered to indicate the presence of the interaction effect. Additionally, the interaction effect of ACEs on the relationship of wealth status and depression was further analysed using marginsplots command in STATA. Equation below illustrates the model.

$$Depression = b_0 + b_1 WIS + b_2 WISxACEs + e$$

2.8 Ethical Considerations

For this study ethical approval was obtained from College of Medicine Research Ethics Committee (COMREC), ethical approval number P.O5/21/3315. Additionally, for data used for this study, MLSFH obtained ethical approval from International Regulatory Board (IRB) approval was obtained from Stony Brook University and the National Health Science Research Committee in Malawi (NHSRC).

CHAPTER 3: RESULTS

3.1 Characteristics of study respondents

This study analysed a total sample 1800 adolescents of which 51% were males and 49% were females. The mean age (standard deviation) of the analysed sample was 13.2(±1.70). Furthermore, school attendance among adolescents was at 91%. Table 2 below describes the characteristics of adolescents. Additionally, 61% of adolescents were from lower wealth status household and 39% were from higher wealth status households.

Table 2 Characteristics of study participants (n=1800)

Characteristic	**N (%)**
Sex	
Male	914(51%)
Female	886(49)
Wealth status	
Low wealth index status	1102(61%)
High wealth index status	698(39%)
School attendance	
Attending school	1642(91%)
Not attending school	158(9%)

3.2 Factors associated with depression among adolescents

In this study the prevalence of depression among adolescents was 16.7%. The prevalence of depression was higher among adolescents from low wealth index status households than in those with high wealth index status households. Specifically, the prevalence was 18% in adolescents from low wealth index status and 14% in adolescents from high wealth index status

Unadjusted results showed that the odds of depression were reduced by 30% lower in adolescents with high wealth index status compared with adolescents from low wealth index status [Odds Ratio (OR):0.70; 95% Confidence Interval (CI): 0.54-0.91; P-value: 0.007]. These results are statistically significant (p-value less than 5%) (Table 3). Adjusting gender, school attendance and age, the odds of depression were 27% lower in adolescents with high wealth index status compared with adolescents from low wealth index status [aOR:0.73; 95% CI: 0.56-0.95; P-value: 0.02]. These results are statistically significant (p-value less than 5%). (Table 3).

Furthermore, adjusting gender, age and wealth index status, the odds of depression were 46% lower in adolescents who were attending school compared with adolescents who were not attending school [aOR: 0.54; 95% CI: 0.37-0.80; P-value: 0.002]. These results are statistically significant (p-value less than 5%) (Table 3).

Similarly, adjusting for school attendance, age and wealth index status, the odds of depression were 24% lower in female adolescents compared with male adolescents

[aOR: 0.76; 95% CI: 0.59-0.98; P-value: 0.035]. These results are statistically significant (p-value less than 5%). (Table 3)

On the contrary, after adjusting for school attendance, gender and wealth index status, an increase of age by one year among adolescents increased the odds of depression by 1.0% [aOR: 1.01; 95% CI: 0.94-1.09; P-value: 0.74] (Table 3). However, these results are not statistically significant (p-value greater than 5%).

Table 3: Predictors of depression among adolescents in univariate and multivariate analysis

	Unadjusted Odd Ratios				Adjusted Odds ratios			
Depression	OR	95% Conf. Interval		p-value	aOR	95% Conf.		P-value
Low Wealth Status (ref†)	1				1			
High wealth Status	0.7	0.54	0.91	0.007	0.73	0.56	0.95	0.02
Not Attending school (ref†)	1				1			
Attending school	0.52	0.35	0.75	0.001	0.54	0.37	0.8	0.002
Male (ref†)	1				1			
Female	0.77	0.6	0.99	0.042	0.76	0.59	0.98	0.035
Age	1.03	0.96	1.11	0.403	1.01	0.94	1.09	0.74

ref†= reference category

3.3 The interaction effect of ACEs on the relationship of wealth status and depression

To test the hypothesis that ACEs moderate the relationship between wealth status and adolescent depression, ACE factors were added to the regression model. The results

showed that, at p-value of less than 5%, only physical abuse significantly moderated the relationship of household wealth index and depression among adolescents [OR: 0.32; 95% CI: 0.11-0.96; P-value: 0.043] (Table 4).

Table 4: ACE factors interacting with wealth index status

Domain	Depression	OR	95% CI Interval		P-value
Individual abuse	Wealth index status	2	0.7	5.81	0.19
	Physical abuse	1.6	0.81	3	0.18
	Wealth index status x physical abuse*	0.3	0.11	0.96	0.043
	Wealth index status	0.9	0.45	1.63	0.64
	Sexual abuse	1	0.67	1.38	0.83
	Wealth index status x sexual abuse*	0.8	0.39	1.6	0.51
	Wealth index status	1	0.4	2.3	0.93
	Physical neglect	1.7	1.03	2.78	0.037
	Wealth index status x physical neglect*	0.7	0.28	1.73	0.43
	Wealth index status	0.7	0.13	3.67	0.67
	Emotional abuse	2.6	1.1	6.06	0.028
	Wealth index status x emotional abuse*	1	0.18	5.27	0.99
	Wealth index status	1	0.25	3.58	0.95
	Emotional neglect	0.3	0.13	0.63	0.002
	Wealth index status x neglect*	0.7	0.19	2.78	0.634
Family dysfunction	Wealth index status	0.7	0.47	1.04	0.078
	Divorced/seperated/died	1.5	1.12	2.1	0.007
	Wealth index status x Divorced/seperated/died*	1.1	0.64	1.87	738
	Wealth index status	0.7	0.53	0.98	0.037
	Substance abuser	1.7	1.22	2.42	0.002
	Wealth index status x substance abuser*	0.9	0.5	1.66	0.76
	Wealth index status	0.7	0.49	0.86	0.003
	Mentally ill	1.7	0.98	2.93	0.061
	Wealth index status x mentally ill*	1.6	0.66	3.67	0.31
	Wealth index status	0.7	0.5	0.9	0.007
	Incarcerated household member	1.9	1.26	2.76	0.002
	Wealth index status x incarcerated household member*	1.5	0.73	2.91	0.28
Violence	Wealth index status	0.8	0.24	2.45	0.654
	Bullied	2.1	1.16	3.67	0.014
	Wealth index status x bullied*	0.9	0.27	2.9	0.83
	Wealth index status	0.4	0.08	1.88	0.242
	Domestic voilence	1.4	0.73	2.74	0.292
	Wealth index status x domestic violence*	1.8	0.37	8.77	0.472
	Wealth index status	1.3	0.51	3.48	0.56
	Physical fight	0.7	0.35	1.22	0.183
	Wealth index status x physical fight*	0.5	0.18	1.35	0.174

* = interacting variable

CHAPTER 4: DISCUSSION

This study assessed if household health status is a risk factor of depression among adolescents. The study found that adolescents from high wealth index families had lower odds of depression compared with adolescents from low wealth index families. These findings are consistent with studies conducted in United States of America [12], Australia [13], and China [14] which used household income data as a measure of household poverty.

Additionally, this study also assessed if ACE factors moderate the relationship between wealth status and depression among adolescents. The study found that among the ACEs factors, physical abuse was the only ACE that significantly moderated the relationship between wealth status and depression. Emotional neglect, emotional abuse, physical neglect, physical abuse, and sexual abuse, having a household member with mental illness, having an incarcerated household member, being exposed to domestic violence, having a dead or divorced parent, being bullied, exposed to community violence and being involved in a physical fight did not significantly moderate the relationship between wealth index status and depression is adolescents. Studies on moderation effect of ACEs on the relationship between wealth index status and adolescent depression are very rare. However, one study in United States of America (USA) found that accumulation ACE score of the following ACEs, food or housing, divorce or separation of a parent or guardian, death of a parent or guardian, incarceration of a parent or guardian, seeing or hearing parents or adults slap, hit, kick punch one another in the home, being a victim of violence or witnessing

violence in their neighbourhood, living with anyone who was mentally ill, suicidal, or severely depressed, ever living with anyone who had an alcohol or drug problem, and being treated or judged unfairly because of racial or ethnic identity, do not moderate the relationship between income inequality and adolescent mental health problems[23]. Even though the USA study did not examine the effect of individual ACE factors, its findings were similar to the findings of the present study for all ACE factors except for physical abuse which was found to significantly interact with wealth index status.

It must be acknowledged that the present study had limitation and among them was that temporality between wealth status and depression could not be established because our study used cross-sectional secondary data. Additionally, data on asset ownership, depression and ACEs was prone to data collection bias caused by interviewers and respondents. Furthermore, the study is limited by the fact that a few confounders were included in the statistical model.

Most importantly, the present study provides additional evidence that, just like family income data, household wealth index data can be used to predict depression in adolescents. This is vital to policy makers and program planner from developing countries where family income data is difficult to collect and is not readily available [17]. Policy makers and program planners can use wealth index data and identify high risk households for adolescence depression and design targeted preventative interventions.

Furthermore, the present study has added to the few existing knowledge on moderation effect of ACEs on the relationship between wealth index status and adolescence depression. These results help program planners in developing strategies of preventing physical abuse within households as it impacts on adolescent depression levels.

CHAPTER 5: CONCLUSION AND RECOMMENDATIONS

The aim of this study was to understand if ACEs moderates the relationship between wealth status and depression in adolescents. Specifically, this study concluded that adolescents from low wealth status households are at high risk of depression compared with adolescents from high wealth status and ACEs moderates this relationship. Policy makers and program planners may use wealth index data in identifying high risk households for adolescent's depression and formulate appropriate interventions. Future research should focus on conducting prospective study in order to establish temporality between wealth status and depression in adolescents. Additionally, more research should try and understand if ACEs mediate the relationship between wealth index status and adolescence depression.

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Appendices

Appendix 1: Adolescent extraction tool

Participant ID [_____] **Version number: 1.0**

You are now going to be asked about your experiences while you were growing up. The questions are very personal and may be hard to answer; please try to answer them openly. PLEASE REMEMBER ALL ANSWERS ARE CONFIDENTIAL. If you need to take a break at any time, that's ok. Just let me know. Thank you in advance for sharing such details.

Section 1: Background

When you were growing up…		
1	What is your gender	0=Male 1=Female
2	How old were you at your last birthday?	[ ] age in years
3	Are you currently attending school?	0=No 1=Yes

Section 2: Childhood experience

Domain	Q #	Adverse Childhood experience (ACE)	
	1	**Physical abuse**	
	1A 1b	Did a parent, guardian or other household member spank, slap, kick, punch or beat you up? OR Did a parent, guardian or other household member hit or cut you with an object, such as a stick (or cane), bottle, club, knife, whip etc?	0=No 1=Yes
	2	**Emotional abuse**	
	2A 2B	Did a parent, guardian or other household member yell, scream or swear at you, insult or humiliate you? OR Did a parent, guardian or other household	0=No 1=Yes

		member threaten to, or actually, abandon you or throw you out of the house?	
Individual abuse	3	**Sexual abuse**	
	3A 3B 3C 3D	Did someone touch or fondle you in a sexual way when you did not want them to? OR Did someone make you touch their body in a sexual way when you did not want them to? OR Did someone attempt oral, anal, or vaginal intercourse with you when you did not want them to? OR Did someone actually have oral, anal, or	0=No 1=Yes

		vaginal intercourse with you when you did not want them to?	
	4	**Physical neglect**	
	4A OR 4B OR 4C	Did your parents/guardians not give you enough food even when they could easily have done so? Were your parents/guardians too drunk or intoxicated by drugs to take care of you? Did your parents/guardians not send you to school even when it was available?	0=No 1=Yes
	5	**Emotional neglect**	
	5A OR	Did your parents/guardians understand your problems and worries?	0=No 1=Yes

	5B	Did your parents/guardians really know what you were doing with your free time when you were not at school or work?	
Family dysfunction	6	**Alcohol and/or drug abuser in the household**	
	6A	Did you live with a household member who was a problem drinker or alcoholic, or misused street or prescription drugs?	0=No 1=Yes
	7	**Incarcerated household member**	
	7A	Did you live with a household member who was ever sent to jail or prison?	0=No 1=Yes
	8	**Someone chronically depressed, mentally ill, institutionalized or suicidal**	
	8A	Did you live with a household member who was depressed, mentally ill or suicidal?	0=No 1=Yes
	9	**Household member treated violently**	
	9A	Did you see or hear a parent or household member in your home being yelled at, screamed at, sworn at, insulted or humiliated? OR	0=No 1=Yes

	9B OR 9C	Did you see or hear a parent or household member in your home being slapped, kicked, punched or beaten up? Did you see or hear a parent or household member in your home being	
	10	**One or no parents, parental separation or divorce**	
	10A OR 10B	Were your parents ever separated or divorced? Did your mother, father or guardian die?	0=No 1=Yes
Peer violence	11	**Bullying**	
	11A	Were you bullied?	0=No 1=Yes

Community violence	12	**Community violence**	
	12A	Did you see or hear someone being beaten up in real life?	0=No 1=Yes
		OR	
	12B	Did you see or hear someone being stabbed or shot in real life?	
		OR	
	12C	Did you see or hear someone being threatened with a knife or gun in real life?	

Section 3: Mental Health

I am going to read a list of feelings and experiences that people sometimes have. I will read groups of statements. Please pick the one statement in each group that best describes the ways you have been feeling during THE LAST 2 WEEKS, including today.	
Sadness (read options)	0 = I do not feel sad. 1 = I feel sad much of the time. 2 = I am sad all of the time. 3 = I am so sad or unhappy that I can't stand it.
Pessimism (read options)	0 = I am not discouraged about my future. 1 = I feel more discouraged about my future than I used to be. 2 = I do not expect things to work out for me. 3 = I feel my fortune is hopeless and will get only worse.
Past Failure (read options)	0 = I do not feel like a failure. 1 = I have failed more than I should have. 2 = As I look back I see a lot of failures.

	3 = I feel I am a total failure as a person
Loss of Pleasure (read options)	0= I get as much pleasure as I ever did from the things I enjoy. 1 = I don't enjoy things as much as I used to. 2 = I get very little pleasure from the things I used to enjoy. 3 = I can't get any pleasure from the things I used to enjoy.
Guilty Feelings (read options)	0 = I don't feel particularly guilty. 1 = I feel guilty over many things I have done or should have done. 2 = I feel quite guilty most of the time. 3 = I feel guilty most of the time.
Punishment Feelings (read options)	0 = I don't feel particularly guilty. 1 = I feel guilty over many things I have done or should have done. 2 = I feel quite guilty most of the time. 3 = I feel guilty most of the time.
Self-Dislike (read options)	0 = I don't feel I am being punished. 1 = I feel I may be punished. 2 = I expect to be punished.

	3 = I feel I am being punished.
Self-Criticisms (read options)	0= I don't criticize or blame myself more than usual. 1 = I am more critical of myself than I used to be. 2 = I criticize myself for all of my faults. 3 = I blame myself for everything bad that happens
Suicidal Thoughts or Wishes (read options)	0 = I don't have any thoughts of killing myself. 1 = I have thoughts of killing myself, but I would not carry them out. 2 = I would like to kill myself. 3 = I would kill myself if I had the chance
Crying (read options)	0 = I don't cry any more than I used to. 1 = I cry more than I used to. 2 = I cry over every little thing. 3 = I feel like crying, but I can't
Agitation (read options)	0 = I am no more restless or would up than usual. 1 = I feel more restless or would up than usual.

	2 = I am so restless or agitated that it's hard to stay still. 3 = I am so restless that I have to keep moving or doing something
Loss of Interest (read options)	0 = I have not lost interest in other people or activities. 1 = I am less interested in other people or things than before. 2 = I have lost most of my interest in other people or things. 3 = It's hard to get interested in anything
Indecisiveness (read options)	0 = I make decisions about as well as ever. 1 = I find it more difficult to make decisions than usual. 2 = I have much greater difficulty in making decisions than usual. 3 = I have trouble making any decision
Worthlessness (read options)	0 = I do not feel I am worthless. 1 = I don't consider myself as worthwhile and useful as I used to. 2 = I feel more worthless as compared to

	other people. 3 = I feel utterly worthless
Loss of Energy (read options)	0 = I have as much energy as ever. 1 = I have less energy than I used to have. 2 = I don't have enough energy to do very much. 3 = I don't have enough energy to do anything.
Changes in Sleeping Patterns (read options)	0 = I have not experienced any change in my sleeping pattern. 1 = I sleep somewhat more/less than usual. 2 = I sleep a lot more/less than usual. 3 = I sleep most of the day. Or I wake up 1-2 hours early and can't get back to sleep.
Irritability (read options)	0 = I am no more irritable than usual. 1 = I am more irritable than usual. 2 = I am much more irritable than usual. 3 = I am irritable all the time.
Changes in Appetite (read options)	0 = I have not experienced any change in my appetite. 1 = My appetite is somewhat

	greater/lesser than usual. 2 = My appetite is much greater/lesser than usual. 3 = I crave food all the time or I have no appetite at all
Concentration Difficulty (read options)	0 = I can concentrate as well as ever. 1 = I can't concentrate as well as usual. 2 = It's hard to keep my mind on anything for very long. 3 = I find I can't concentrate on anything
Tiredness or Fatigue (read options)	0 = I am no more tired or fatigued than usual. 1 = I get more tired or fatigued more easily than usual. 2 = I am too tired or fatigued to do a lot of the things I used to do. 3 = I am too tired or fatigued to do most of the things I used to do
Loss of Interest in Sex (read options)	0 =I have not noticed any recent change in my interest in sex. 1 = I am less interested in sex than I used to be. 2 = I am much less interested in sex now. 3 = I have lost interest in sex completely.

Appendix 2: Caregiver extraction tool

Caregiver ID[_____] Adolescent ID[_____] Version number: 1.0

Section 1: Social economic status

I would like to ask you some questions about the economic situation of your household.

Does your household own any of the following?		
1	BED WITH MATTRESS	0 = No 1 = Yes
2	SOFA SET MPANDO	0 = No 1 = Yes
3	TABLE AND CHAIR(S)	0 = No 1 = Yes
4	PARAFFIN GLASS LAMP	0 = No 1 = Yes
5	TELEVISION	0 = No 1 = Yes
6	RADIO	0 = No 1 = Yes
7	CELLPHONE	0 = No 1 = Yes
8	MOSQUITO NET	0 = No 1 = Yes
9	SOLAR ELECTRICITY PANELS	0 = No 1 = Yes
10	BICYCLE NJINGA	0 = No 1 = Yes
11	MOTORCYCLE NJINGA YAMOTO	0 = No 1 = Yes
12	OXCART NGOLO	0 = No 1 = Yes
13	PIT LATRINE	0 = No 1 = Yes
14	SANPLAT LATRINE	0 = No 1 = Yes

15	ESCOM ELECTRICITY OR GENERATOR	0 = No 1 = Yes
16	METAL ROOF	0 = No 1 = Yes
17	BEER BREWING DRUM	0 = No 1 = Yes
18	COMPUTER / TABLET	0 = No 1 = Yes
19	COOKER/STOVE/HOTPLATE	0 = No 1 = Yes
20	REFRIDGERATOR	0 = No 1 = Yes

Appendix 3: Study Period

Activity	**January 2020**	**February 2021**	**March 2021**	**April 2021**	**May 2021**	**June 2021**	**July 2021**	**August 2021**
Proposal preparation								
Submission to COMREC for approval								
Data Analysis and report writing								
Presentation of research finding								
Submission of final report								

Appendix 4: Ethical approval certificate



UNIVERSITY OF MALAWI

CERTIFICATE OF ETHICS APPROVAL

This is to certify that the College of Medicine Research and Ethics Committee (COMREC) has reviewed and approved a study entitled:

P.05/21/3315 - Understanding factors that moderate the relationship between family poverty and depression among adolescents aged 10 to 16 years in rural Malawi by Edmond Munthali

On 16-Jun-21

As you proceed with the implementation of your study, we would like you to adhere to international ethical guidelines, national guidelines and all requirements by COMREC some of which are indicated on the next page for your study

16-Jun-21

Prof. E. Umar -Chairperson (COMREC) — Date

Approved by College of Medicine
16-Jun-2021
(COMREC)
Research and Ethics Committee

Appendix 5: Manuscript

Poverty as risk factor for adolescence depression aged 10 to 16 years in Malawi

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Abstract
Introduction
In Malawi, it is estimated that depression affects 16.9% of adolescents aged 10 to 16 years old. Exposure to poverty has been associated with adolescence depression.

Methods
This study used cross-sectional secondary data collected in 2017 by Malawi Longitudinal Study of Families and Health-ACE (MLFSH-ACE). Logistic regression model was used to assess the relationship between wealth status and depression.

Results
The mean age in years was 13.2(±1.70) and 51% of the sample was female. School attendance among adolescents was at 91%. Adolescents from high wealth index households had lower odds of depression compared with adolescents from low wealth index households (aOR= 0.73, 95% CI: 0.56-0.95).

Conclusion
Adolescents from a lower wealth index households have high odds of depression compared to adolescents from low wealth index households. In Developing countries, wealth index data can be used in identifying high risk households for adolescent's depression and formulated appropriate interventions.

Keywords: Poverty, Depression, Adolescent, Malawi

Introduction

Adolescence is a critical stage in human development where physical, cognitive and psychosocial growth happens. Developments that take place during adolescence influence an individual for the rest of their life [1, 2]. Furthermore, health conditions that affect developmental processes during adolescence have long term health consequences [1, 3]. Evidence shows that mental health disorders begin to make significant appearance in a human being during adolescence phase [1].

Depression is one of the categories of mental health disorders and it is characterized by recurrent sadness, loss of interest or pleasure, feelings of guilt or low self-worth, disturbed sleep or appetite, feelings of tiredness, and poor concentration [4]. An estimated 10–20% of adolescents globally experience mental health disorders, yet these remain underdiagnosed and undertreated [5]. Specifically, depressive disorders are among the top three leading causes of Disability-Adjusted Life Years (DALYs) among adolescents in the world [5].

The World Health Organization (WHO) projects that by 2030 depression alone is likely to be the single highest contributor to the burden of disease in the world, more so than heart disease, stroke, road traffic accidents, and HIV and AIDS [6].

In Malawi, the proportion of deaths attributable to HIV/AIDS is declining while the proportion attributable to non-communicable (NCDs) is rising steadily, comprising 29% of all deaths, and mental health disorders accounts for 12% of all NCDs burden

[7]. The 2017 WHO report estimated that the prevalence of depression in Malawi was 4.1% [4].

Adolescents aged 10 to 16 years make up an estimated 19%-of Malawi's population [8]. The 2017 Global Disease Burden study revealed that mental health disorders including depression in Malawi were the fifth highest contributor to disease burden and second highest contributor to non-fatal health loss of Years Lost to Disability (YLD) in children and adolescents aged 5 to 14 years [9]. Furthermore, a study in 2019 found that the prevalence of depression among adolescents aged 10 to 16 years in Malawi was estimated at 16.9% [10].

Globally, exposure to poverty is a key determinant of poor health outcomes including mental health [3]. Across the world, family poverty has been found to be a key determinant of depression among adolescents [11–14]. However, most adolescent mental health studies have been conducted in higher income countries where family poverty is measured by household current income or expenditures [15, 16]. On the contrary, in less developed countries like Malawi, income and expenditure data is not readily available and it is extremely challenging to collect for several reasons such as people not knowing their income, people hiding their income to interviewers and for most households, income varies daily, weekly, and seasonally [17].

Therefore, in less developed countries like Malawi, alternative tools are preferred in measuring household economic status and a good example is household wealth index

(HWI) [17, 18]. HWI is a composite measure of a household's cumulative living standard, and it is calculated using easy-to-collect data on household's ownership of selected assets such as television, bicycles, and sanitation materials [17]. In Malawi, household wealth index has been used in Demographic Health Surveys (DHS) and Multiple Indicator Cluster Surveys (MICS) to measure how household economic status affects health outcomes [19, 20]. The study aimed at assessing if wealth status is a risk factor of depression among adolescents aged 10 to 16 years in Balaka, Rumphi and Mchinji.

Methods

Study Design

This study was a cross sectional study and it used secondary data from Malawi Longitudinal Study for Families and Health- Adverse Childhood Experiences (MLSFH-ACE) study collected in 2017. The MLSFH-ACE study is part of the bigger MLSFH which was initially established in 1998 to study social network influences on fertility behaviours and HIV risk perceptions, and over time the focus of the study expanded to include health, sexual behaviours, intergenerational relations and family/household dynamics [21]. Adolescents who were enrolled in MLSFH-ACE study are children who were listed in the household roster in data collection rounds of 2008 and 2010 and are estimated to be between 10 to 16 years old in 2017[21].

Study Setting

Data which was used in this study was collected from the Malawi rural districts of Rumphi, Balaka and Mchinji. Rumphi, Mchinji and Balaka are in the northern, central

and southern regions of Malawi, respectively. The three districts are predominantly rural with Yao being a predominant tribe in Balaka, Chewa being a predominant tribe in Mchinji and Tumbuka being predominant tribe in Rumphi. In all the three districts education levels among the population is very low and majority earn a living through subsistence farming [8].

Study Population

The study population included adolescents aged 10 to 16 and their parents or caregivers. In 2008 and 2010 MLSFH respondents completed a household roster which included all children living in their households. The children who were estimated to be 10 to 17 years old in 2017 were selected to participate in the MLSFH-ACE study [24]. Caregivers of the adolescents were also interviewed in order to collect data on assets owned.

Study period

MLSFH-ACE study was conducted in year 2017. For this study secondary data analysis was conducted from April to July 2021.

Sample size and power calculation

This study sought to assess the association between household wealth index status and depression in adolescents, using the MLSFH-ACE database (n=1800). Of the total, 698 adolescents came from high wealth index status (wealth index score above the mean) while 1102 adolescents came from lower wealth index status (wealth index score below the mean) representing a 1.578796562 sample size ratio. Using a range of

odds ratio values, we assessed the statistical power of this database to detect significant associations at 5% significance level. As shown in Table 1, this database has at least 89% statistical power to detect at least 1.5 odds ratio of significant association between wealth index status and depression. The power calculations were conducted in stata 16 using the STATA command; **power twoproportions .16, test(chi2) oratio(1.2(0.1)2) n(1800) nratio(1.578796562) continuity.**

Data collection instruments

The 2017-2018 MLSFH-ACE study data was collected by MLSFH local partner, Investing in Knowledge (IKI) using well trained research assistants. All survey questionnaires and related tools were translated into local languages of chiChewa, chiTumbuka and chiYao. This study extracted data on the following variables from MLSFH database; depression, age of the adolescent, sex of the adolescent, household wealth index and ACEs (physical, sexual, and emotional abuse and neglect by parents or caregivers, peer violence, witnessing community violence).

Data collection

Depression data

MLSFH study collected depression data using Beck Depression Inventory (BDI)[25]. BDI is a 21-item self-administered survey scored on a scale of 0 to 3. This inventory assesses sadness, pessimism, past failure, loss of pleasure, guilty feeling, punishment feeling, self-dislike, self-criticism, suicidal thoughts, loss of interest, indecisiveness,

worthlessness, loss of energy, changes in sleeping pattern, irritability, change in appetite, concentrating difficulty, tiredness, and loss of interest in sex [22].

The present study extracted data on the 21 items that were collected using Beck Depression Inventory and used it to calculate BDI score for each adolescent.

Wealth index data

MLSFH-ACE study collected data on household living standard by asking adolescents' caregivers if they owned any of the following assets: bed with mattress, sofa set, table and chair(s), paraffin glass lump, television, radio, cellphone, mosquito net, solar electricity panel, bicycle, motorcycle, oxcart, pit latrine, sanplat latrine, ESCOM electricity or generator, metal roof, beer brewing drum, computer/tablet, cooker/stove/hotplate, and refrigerator. The present study extracted asset ownership data from MLSFH database and use it calculate a composite household wealth index score.

Data Management

Depression data

In this study depression was categorized as a binary variable. BDI scores for each adolescent were summed up from the 21 items. In the present study, adolescents with a BDI score ranging from 0 to 17 were categorized as not having depressive symptoms and those who had BDI score of at least 18 were categorized as having depressive symptoms [25].

Wealth index data

The main exposure variable, wealth status was categorized as a binary variable. Using STATA, a Principal Component Analysis (PCA) was used to create a composite household wealth index score. To create a binary variable, adolescents with household wealth index score below average were categorized as being in lower wealth status category. Likewise, adolescents who had a household wealth index score of above average were categorized as being in high wealth status category.

Data Analysis

A univariate logistic regression model was used to assess the relationship between wealth index status and depression among adolescents aged 10 to 16 years. Additionally, a multivariate logistic model adjusting for gender of adolescent, education of adolescents was generated. Odds ratios were generated to measure the association between wealth status and depression. Two tailed p-values of 0.05 or less was considered to indicate significance of the association.

Ethical Approval

For this study ethical approval was obtained from College of Medicine Research Ethics Committee (COMREC), ethical approval number P.O5/21/3315. Additionally, for data used for this study, MLSFH obtained ethical approval from International Regulatory Board (IRB) approval was obtained from Stony Brook University and the National Health Science Research Committee in Malawi (NHSRC).

Results

Characteristics of study respondents

This study analysed a total sample 1800 adolescents of which 51% were males and 49% were females. The mean age (standard deviation) of the analysed sample was 13.2(±1.70). Furthermore, school attendance among adolescents was at 91%. Table 1 below describes the characteristics of adolescents. Additionally, 61% of adolescents were from lower wealth status household and 39% were from higher wealth status households.

Table 1 Characteristics of study participants (n=1800)

Characteristic	**N (%)**
Sex	
Male	914(51%)
Female	886(49)
Wealth status	
Low wealth index status	1102(61%)
High wealth index status	698(39%)
School attendance	
Attending school	1642(91%)
Not attending school	158(9%)

Factors associated with depression among adolescents

In this study the prevalence of depression among adolescents was 16.7%. The prevalence of depression was higher among adolescents from low wealth index status households than in those with high wealth index status households. Specifically, the prevalence was 18% in adolescents from low wealth index status and 14% in adolescents from high wealth index status

Unadjusted results showed that the odds of depression were reduced by 30% lower in adolescents with high wealth index status than those with low wealth index status [Odds Ratio (OR):0.70; 95% Confidence Interval (CI): 0.54-0.91; P-value: 0.007]. These results are statistically significant (p-value less than 5%) (Table 2). Adjusting gender, school attendance and age, the odds of depression were 27% lower in adolescents with high wealth index status than those with low wealth index status [aOR:0.73; 95% CI: 0.56-0.95; P-value: 0.02]. These results are statistically significant (p-value less than 5%). (Table 2).

Furthermore, adjusting gender, age and wealth index status, the odds of depression were 46% lower in adolescents who were attending school than those who were not attending school [aOR: 0.54; 95% CI: 0.37-0.80; P-value: 0.002]. These results are statistically significant (p-value less than 5%) (Table 2).

Similarly, adjusting for school attendance, age and wealth index status, the odds of depression were 24% lower in female adolescents than in male adolescents [aOR: 0.76; 95% CI: 0.59-0.98; P-value: 0.035]. These results are statistically significant (p-value less than 5%). (Table 2)

On the contrary, after adjusting for school attendance, gender and wealth index status, an increase of age by one year among adolescents increased the odds of depression by 1.0% [aOR: 1.01; 95% CI: 0.94-1.09; P-value: 0.74] (Table 2). However, these results are not statistically significant (p-value greater than 5%). (Table 2)

Table 3: Predictors of depression among adolescents in univariate and multivariate analysis

	Unadjusted Odd Ratios				Adjusted Odds ratios			
Depression	OR	95% Conf. Interval		p-value	aOR	95% Conf.		P-value
Low Wealth Status (ref†)	1				1			
High wealth Status	0.7	0.54	0.91	0.007	0.73	0.56	0.95	0.02
Not Attending school (ref†)	1				1			
Attending school	0.52	0.35	0.75	0.001	0.54	0.37	0.8	0.002
Male (ref†)	1				1			
Female	0.77	0.6	0.99	0.042	0.76	0.59	0.98	0.035
Age	1.03	0.96	1.11	0.403	1.01	0.94	1.09	0.74

ref†= reference category

Discussion

This study assessed if household health status is a risk factor of depression among adolescents. The study found that adolescents from high wealth index families were less likely to have depression than those from low wealth index families. These findings are consistent with studies conducted in United States of America [12], Australia [13], and China [14] which used house hold income data as a measure of household poverty.

Most importantly, the present study provides additional evidence that, just like family income data, household wealth index data can be used to predict depression in

adolescents. This is vital to policy makers and program planner from developing countries where family income data is difficult to collect and is not readily available [17]. Policy makers and program planners can use wealth index data and identify high risk households for adolescence depression and design targeted preventative interventions.

It must be acknowledged that the present study had limitation and among them was that temporality between wealth status and depression could not be established because our study used cross-sectional secondary data. Data on asset ownership, depression and ACEs was prone to data collection bias caused by interviewers and respondents. It must also be acknowledged that a few confounders were included in the model.

Conclusion

Adolescents from low wealth status households were associated with high levels of depression. Policy maker and program planners may use wealth index data in identifying high risk households for adolescent's depression and formulate appropriate interventions.

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