The Consequences of Bullying Victimization on Health and Psychosocial Outcomes in Young Children

Duc Thanh Nguyen*

June 10, 2024

Abstract

This paper uses a structural model combined with an instrumental variable strategy to deal with the endogeneity and measurement error issues of bullying to study the consequences of peer victimization on a range of health and psychosocial indicators. The findings indicate that peer victimization has strong effects on subjective well-being, alcohol consumption and emotional and mental distress of children. These results are consistent with evidence from both developed and developing countries that bullying has substantial consequences on health risks and psychosocial outcomes. I do not find evidence of associations between bullying victimization and self-rated health.

Keywords: Bullying, peer victimization, health, health risks, psychosocial outcomes.

*Department of Economics, Concordia University, e-mail: *ducthanhht@gmail.com*

1 Introduction

Bullying victimization is a very common experience among adolescents and a global phenomenon. Evidence shows that one in three children is a victim of peer bullying (Due and Holstein, 2008; UNESCO, 2019). Being bullied has not only intermediate negative impacts but also long-lasting effects on physical and mental health, health and social behaviors, psychological well-being and earnings (Olweus, 1997; Lereya et al., 2015; Brown et al., 2008; Takizawa et al., 2014; Smith and Brain, 2000). While most research on this phenomenon has been conducted in high-income countries, far less is known about bullying victimization and its consequences on health and psychosocial outcomes in low and middle-income countries due to data limits.

I use a rich set of data on diversified aspects of adolescents, their families, and communities from the Older cohort of the Young Lives study in Vietnam to examine the consequences of bullying victimization on health and psychosocial outcomes including alcohol consumption, self-rated health, subjective well-being or life satisfaction and distress.

My contributions are threefold. First, I examine the heterogeneous effects of bullying. Previous studies have typically used simple observed measures of bullying. I use structural estimations of underlying, true or latent bullying rather than measured indicators. This approach aims to identify unobserved heterogeneity to more accurately capture the richness of the variation in the type and frequency of bullying and correct potential measurement errors in the self-reported bullying measures. Second, I deal with the endogeneity of bullying arising from selection in terms of unobservable and observable factors and reserve causality in the various forms of bullying by using an instrumental variable approach. I use the number of a child's friends being physically bullied and the percentage of children in the Young Lives survey clusters being physically punished by their parents as instruments for bullying and structural model. Third, this study contributes to the very limited evidence about the impacts of a variety of types of bullying on various health and psychosocial outcomes in a developing country setting because of data scarcity.

The rest of the chapter is structured as follows. Section 2 discusses the literature. Section 3 introduces data, definitions and measures used in this chapter. Section 4 uses conventional

regression methods to produce key findings usually reported in the previous literature and discusses problems with this approach. Section 5 discusses the empirical strategy. Section 6 presents the key results, and section 7 concludes.

2 Literature Review

Bullying victimization has been paid attention to in education, psychology, and sociology. The literature examining bullying and its impacts in these fields can be found in Boulton and Underwood (1993), Ouellet-Morin et al. (2011), Ladd et al. (2017), Arseneault et al. (2010), Smith et al. (2004), among others. However, economics research examining bullying victimization is scarce, especially in developing countries due to the lack of data about bullying and there is little research on bullying addressing the endogeneity and non-random selection issues in bullying victimization.

Evidence shows that bullying victimization negatively affects children's health and psychosocial well-being (Olweus, 1996; Lereya et al., 2015; Hawker and Boulton, 2000; Nguyen et al., 2016). There are some studies examining bullying victimization and child health, risk behaviors and psychosocial problems in developing countries. Crookston et al. (2014), Lister et al. (2015b), and Lister et al. (2015a) consider independently the consequences of some experiences of bullying victimization in Peru and their findings suggest the association between victimization and health as well as risky behaviors and psychosocial problems. Crookston et al. (2014) indicate that children experiencing bullying at both ages 8 and 15 were 1.58 times more likely to smoke cigarettes, 1.57 times more likely to drink alcohol, and 2.17 times more likely to have ever had a sexual relationship compared with all other children. Malhi et al. (2014) show that victimized children likely have a lower self-concept and a higher risk of emotional difficulties than non-victimized youth.

Although the above studies are informative, they provide limited quantitative evidence about the relationships between bullying victimization and poor health, risky behaviors and psychosocial problems. First, these studies do not consider selection and endogeneity issues either through reverse causality or uncontrolled confounding variables and measurement error problems. Bullying victims are not randomly selected in some observable and

unobservable factors that confound the consequences of bullying, and bullying and outcomes of interest are jointly determined (Eriksen et al., 2014; Sarzosa and Urzúa, 2021; also see the Summary Statistics in Section 3 below). The obvious solutions for this problem are by using instrumental variables and structural models. Second, these studies used observable measures independently that are imperfect proxies for unobservable heterogeneity and face measurement error problems in measuring bullying.

Eriksen et al. (2014) use instrumental variables to address the endogeneity issue of victimization. Using Danish data, they instrument bullying with the proportion of children in the class whose parents have a criminal conviction. They confirm the detrimental impact of being bullied on 9th-grade GPA. However, they do not deal appropriately with measurement errors and unobservable heterogeneity.

Sarzosa and Urzúa (2021) use Korean data of 14-18 year old children to examine the effects of bullying on mental and physical health and risky behaviors. They estimate a structural model to deal with the endogeneity that rises from the observable and intrinsic unobservable characteristics that determine bullying and also influence the outcomes of interest. The authors control for unobserved heterogeneity in the form of cognitive and noncognitive skills. They define children as bullying victims if they are severely teased, threatened, collectively harassed, severely beaten, or robbed, but bullying victimization is ultimately defined as a single binary variable. They show that bullying victims at age 15 increases sickness, mental health issues and stress caused by friendships by 6.5%, 7.9% and 23.5% of a standard deviation, respectively, at age 18.

I aim to extend the existing literature by combining both approaches of instrumental variables and structural modeling to address the endogeneity of bullying victimization, correct measurement errors and control for unobserved heterogeneity in the form of bullying victimization. Victimization is self-reported and subjective; it is likely to suffer from measurement errors that might cause effects to be attenuated. Therefore, I directly correct the measurement errors of bullying reports and use a latent bullying victimization factor as a source of unobserved heterogeneity (Hu and Schennach, 2008; Cunha and Heckman, 2008; Schennach, 2004; Sarzosa and Urzúa, 2021). I instrument victimization with the number of children's friends being physically bullied and the percentage of children in the Young Lives survey

clusters being physically punished by their parents. Although the literature focuses more on physical victimization, evidence shows that other types of bullying behaviors, including verbal, relational and property victimization, have as adverse effects as physical bullying on physical and mental health and psychosocial well-being, if not greater (Carbone-Lopez et al., 2010; Rivers and Smith, 1994). In addition, relational or indirect victimization is less easily detected since children are less likely to tell an adult if they are relationally abused (Rivers and Smith, 1994). I consider different types of bullying and my methodology allows me to combine these types of victimization into a single and composite factor that reflects the true, latent and unobservable measure of bullying victimization.

3 Data, Definition and Measures

I use data from the Young Lives study - a longitudinal study of childhood poverty that tracks two cohorts of children from four developing countries: Ethiopia, India, Peru and Viet Nam. In each country, the younger cohort follows 2,000 children every 4 years from age 1 until age 15 and the older cohort tracks 1,000 children every 4 years from age 8 to 22. The detailed data on adolescent peer bully victimization are only available for the Older Cohort in Round 3 when the children are 15 years of age. Round 3 of the survey also provides detailed measures of physical and mental health, health and social behaviors and psychological well-being. Hence, this research focuses on data from the older cohort for Vietnam in Round 3 when kids are 15 years old. The focus of the research on 15-years-old children is not only because data is available, but more importantly this is a critical developmental period of children in which they are susceptible to bullying, risky behaviors and psychosocial adjustments that initiate behaviors and outcomes later in life.

3.1 Measures of Peer Bullying Victimization

Bullying victimization is defined as repeated and intentional exposure to hostile actions that cause harm or discomfort over time by others (Rigby, 2002; Olweus, 1993). The definition of bullying typically has three features: intentional acts of aggression, repetition and an imbalance of power (Olweus, 1993; Olweus, 1997). Aggression may be direct or indirect.

Direct aggression may include physical and verbal attacks and attacks on property and indirect aggression involves actions aimed at social isolation, exclusion and manipulation and it is usually referred to as social or relational bullying (Mynard and Joseph, 2000). This research focuses on being bullied and these four forms of bullying exposure, given the data availability in the Young Lives study.

Bullying and victimization in the Young Lives study are assessed based on the 9-item self-administered questionnaires. These nine items use the 9-item Social and Health Assessment Peer Victimization Scale (Ruchkin et al., 2004), an adapted version of the longer Multidimensional Peer Victimization Scale (Mynard and Joseph, 2000). The scale has been used and validated in multiple studies in multiple countries, usually in school environments (Crookston et al., 2014; Cluver and Orkin, 2009; Karlsson et al., 2014; Stadler et al., 2010; Boyes et al., 2014). The scale was piloted before being applied to the Young Lives survey. The questionnaires asked children whether other young people had bullied them and, if so, how frequently they had experienced each bullying behavior during the past year: never, once, two or three times, or four or more times. The questions addressed exposure to 9 forms (9 items) of bullying corresponding to 4 types of bullying: physical (punched, kicked, or beaten up; hurt physically in some other way), verbal (called names or sworn at; made fun of for some reason), relational (tried to cause trouble with the youth's friends, refused to talk to youth, made youth uncomfortable by staring), and property victimization (broke or damaged property; took something without permission or stole something). 9 items and the corresponding 4 types of bullying victimization are listed in Table 1.

In line with the definition of bullying as repetitive actions, I exclude random, one-off incidents of victimization, and individuals are considered being bullied if they experienced each behavior of being bullied twice or more times.

Table 2 shows the percentage of youth who experienced different forms of bullying. Prevalence for repeated experience of bullying range from 3.9% to 21.0%. Based on the types of bullying, the experience of these types ranges from 6.9% to 27.1%. In total, 37.9% of children reported being victims of bullying over the last year. The proportion of boys suffering physical victimization is much higher than that of girls, while girls tend to be more likely to experience relational and property victimization.

Table 1: Measures of Bullying Victimization

9 items of victimization	
Children were asked the questions: during the last 12 months, I want to know whether other young people did the following bullying behaviors. Response options are Never, Once, 2-3 times, 4 or more times. In this study, the response options are recoded as a binary variable equal to 1 if the options are '2–3 times' or '4 or more times' or children experienced these bullying behaviors at least twice and 0 otherwise.	
1. punched, kicked or beat you up	
2. hurt you physically in some other way	
3. made fun of you for some reason	
4. called you names or swore at you	
5. refused to talk to you or made other people not talk to you	
6. tried to get you into trouble with your friends	
7. made you uncomfortable by staring at you for a long time	
8. took something without permission or stole things from you	
9. tried to break or damaged something of yours	
Overall victimization	Indicates whether a child has been victimized of any types above. It equals 1 if the child experienced any of the above victimizing behaviors twice or more and zero otherwise.
Types of bullying	
Physical victimization	Indicates whether a child has been physically victimized. It takes a value of 1 if any of items 1 and 2 is 1 and 0 otherwise.
Verbal victimization	Indicates whether a child has been verbally victimized. It takes a value of 1 if any of items 3 and 4 is 1 and 0 otherwise.
Relational victimization	Indicates whether a child has been relationally victimized. It takes a value of 1 if any of items 5,6 and 7 is 1 and 0 otherwise.
Attacks on property	Indicates whether a child has been victimized by property attacks. It takes a value of 1 if any of items 8 and 9 is 1 and 0 otherwise.

Table 2: Percentage of Children Experiencing Different Forms of Bullying Two or More Times (%)

	Full	Male	Female
Physical victimization	***6.9***	***9.0***	***4.9***
Punched, kicked or beaten up	5.3	7.6	3.1
Hurt physically	3.9	4.0	3.7
Verbal victimization	***20.1***	***20.2***	***20.0***
Made fun of	17.7	17.4	17.9
Called or swore	7.2	8.0	6.4
Relational victimization	***27.1***	***25.8***	***28.3***
Refused to talk	5.0	4.5	5.6
Friend trouble	8.9	8.5	9.2
stared at	21.0	20.1	21.9
Attacks on property	***8.9***	***7.7***	***10.0***
Theft	6.1	4.9	7.2
Property damage	5.1	4.9	5.3
Victimization	***37.9***	***35.8***	***39.9***
Observations	971	480	491

3.2 Measures of Outcomes

The literature section shows that bullying victimization is associated with different outcomes. I examine the consequences of being bullied on physical health directly and indirectly measured by self-rated health and alcohol use; mental health measured by distress and sub-

jective well-being.

Self-rated health. Health status is a crucial factor of well-being. Many indicators, such as nutritional status and mental illness, can be used to measure health. Self-rated health is considered as incorporating physical, social, emotional, and mental aspects of well-being and is distinct from measures of well-being such as life satisfaction (Fosse and Haas, 2009; Joffer et al., 2016). Evidence has shown that victimization is associated with self-perceived health (Abada et al., 2008; Boynton-Jarrett et al., 2008; Gobina et al., 2008). Self-rated health in the Young Live survey is assessed based on an international health question that is extensively used to assess health in cross-national studies. The question asked the youth to rate their general health on a 5-point Likert scale, with which 1 indicates very poor and 5 very good health status. The response is then dichotomized as 0 indicating poor health status and 1 denoting good health based on the mean value of the response. The mean value of self-perceived health is 3.36; hence health status take 0 if the child reported their health between 0 to 3 and take 1 if the child reported their health between 4 to 5.

Subjective well-being. Subjective well-being is defined as a good quality of life and a state of satisfaction with life that people evaluate their own lives and reflect their affective reactions to experiences (OECD, 2013; Bourdillon and Boyden, 2014). It is distinct from objective well-being which refers to facts about their lives. Subjective well-being can refer to life satisfaction. Young Lives uses Cantril's ladder of life to assess subjective well-being (Cantril et al., 1965). Individuals were asked the question 'where on the ladder do you feel you personally stand at present time?' and the responses ranged from 1-9, higher scores indicated better subjective well-being. The responses are further recoded as 0 indicating low subjective well-being and 1 denoting high subjective well-being based on the mean value of the response. The mean value of the response is 5.59, then the values of responses between 1 and 5 are recoded as 0 and the values between 6 and 9 are recoded as 1.

Alcohol consumption. Alcohol consumption is a health risk behavior that often begins in youth and affects other risky behaviors, health, social, and economic problems (WHO, 2019; Crookston et al., 2014). The initiation of drinking alcohol at a young age is a predictor of substance use problems later in life. Alcohol consumption in this study is assessed based on the youth's response to the question in the self-administered questionnaire: 'How often do

you usually drink alcohol?'. Alcohol consumption is defined as a dummy variable equal to 1 for those who reported alcohol use at least once a month.

Emotional and mental distress. Young Lives uses the five-item Emotional Difficulties subscale of the Strengths and Difficulties Questionnaire (SDQ) to assess distress (Goodman and Scott, 1999). The questions are in the self-administered questionnaire in which individuals were read statements and asked whether they strongly disagreed, disagreed, agreed or strongly agreed with the statement. The statements include 'I worry a lot'; 'I get a lot of headaches, stomach aches, or sickness'; 'I am often unhappy, downhearted, or tearful'; 'I am nervous in new situations', and 'I have many fears or am easily scared'. The scale is the average of these items.

3.3 Summary Statistics

Table 3 shows the summary statistics by victimization status. Adolescents who reported victimization are slightly more likely to be girls, from the Kinh Ethic group and smaller households.[1] There tends to be no difference between victimized and non-victimized children by socio-economic status including household wealth index, mother's and father's education levels and child age. However, there appear to be significant differences in their outcomes between victimized and non-victimized children. Children who faced bullying victimization tend to have worse health, use more alcohol and experience more emotional and mental distresses than their non-victimized counterparts. This suggests that victims are not randomly selected in terms of observable and unobservable factors.

4 Conventional Regressions and Endogeneity Issue

This section presents traditional ordinary least squares (OLS) and logistic regressions to provide preliminary evidence and discuss problems of measurement errors and endogeneity in this approach that motivate my approach.

[1] Although boys are much more likely to be physically abused, girls tend to be more likely to suffer relational victimization and attacks on their property. Therefore, in terms of general victimization, girls are slightly more likely to suffer victimization than boys (See Table 2).

Table 3: Summary Statistics by Victimization Status

Variables	Full sample (1)	Non-victimized (2)	Victimized[a] (3)	Difference (2) - (3)
Female	0.506	0.489	0.533	-0.043*
	(0.500)	(0.500)	(0.500)	
Urban	0.198	0.186	0.217	-0.032
	(0.398)	(0.389)	(0.413)	
Ethnic	0.870	0.854	0.897	-0.043**
	(0.336)	(0.353)	(0.305)	
Child age (in years)	15.052	15.046	15.063	-0.017
	(0.321)	(0.324)	(0.315)	
Wealth index	0.623	0.618	0.631	-0.014
	(0.185)	(0.187)	(0.181)	
Mother's education	6.143	6.123	6.177	-0.054
	(3.900)	(3.996)	(3.741)	
Father's education	6.715	6.675	6.780	-0.105
	(4.104)	(4.106)	(4.105)	
Household size	4.541	4.609	4.429	0.179**
	(1.356)	(1.338)	(1.379)	
Birth order	2.202	2.189	2.223	-0.034
	(1.334)	(1.307)	(1.379)	
Mother or father alive	0.933	0.941	0.922	0.019
	(0.249)	(0.237)	(0.269)	
Outcome variables:[b]				
Subjective well-being	0.397	0.393	0.405	-0.012
	(0.490)	(0.489)	(0.492)	
Self-rated health	0.502	0.528	0.458	0.070**
	(0.500)	(0.500)	(0.499)	
Alcohol drinking	0.281	0.223	0.375	-0.152***
	(0.450)	(0.417)	(0.485)	
Emotional distress	1.727	1.636	1.873	-0.236***
	(0.431)	(0.422)	(0.406)	
Observations	971	603	368	971

Note: Standard errors in parentheses based on 100 bootstrap replications of the entire estimation process. ***, ** and * indicate significance at the 1%, 5% and 10% level respectively from a means t-test between non-victimized and victimized children.

[a] The construction of the victimization variable is detailed in Section 3.1 and Appendix Table A.1.

[b] Definitions, statements and computation of outcomes are discussed in Section 3.2 and Appendix A.1.

I regress the effects of bullying (B) on the outcomes of interest (Y_m) by standard OLS and logistic methods. Our outcomes of interest include subjective well-being or life satisfaction, self-perceived health, alcohol consumption and distress. Bullying variables in childhood include the overall bullying victimization status and the four types of bullying: physical victimization, verbal victimization, relational victimization and attacks on property. I want to examine the effects of being bullied (B) on these outcomes, the model, therefore, takes the form:

$$Y_m = \alpha X_m + \beta B + u_{Y_m} \tag{1}$$

Where X_m is a vector of observed controls. B are the overall victimization indicator and indicators of the four types of bullying victims. u_{Y_m} is an error term. Table 4 shows the estimation results with the overall bullying victimization variable and the result suggests that bullying victimization is negatively associated with health and positively correlated with the likelihood of drinking and distress, while there seems to be no significant association between victimization and subjective well-being. Table 5 presents the impacts of four different types of victimization and shows interesting features of the conventional approach: only six out of sixteen results for four types of victimization show significant correlations with the outcomes of interest.

Although these results are very informative, this approach ignores two fundamental issues that can confound the results. First, it is strongly convinced that victimization is endogenous. There is likely reverse causality between Y_m and B, and they are jointly determined by observable and unobservable confounding variables. Additionally, victimization is not randomly selected; victims of bullying may be systematically different from non-victims in some unobservable and observable factors that can affect outcomes. Therefore, these factors can confound the consequence of victimization. Second, this approach ignores measurement error issues in terms of bullying victimization by using imperfect proxies (different observable bullying variables) for bullying victimization. Victimization is self-reported and subjective, it is likely to suffer from measurement errors. Different observed measures are not good proxies for true bullying. Measurement errors in B can be correlated with the error terms, u_{Y_D}, in Equation 1. Therefore, the evidence provided by this approach is limited. The al-

ternative way to address these problems is using instrumental variables, structural models and latent factors for bullying instead of their observed measures. My approach uses instrumental variables and a structural model with factor analysis to overcome these challenges. In particular, bullying victimization is measured with errors, and I deal with this issue by latent factor models. Bullying victimization can be endogenously determined by individual observable and unobservable characteristics and I use an instrumental variable approach that is adapted to the latent factor structure of the model to address this issue.

5 Empirical Strategy

This section introduces a model with a latent factor structure and endogenous victimization. The approach adapts Heckman et al. (2006) and Cunha et al. (2010) to the analysis of victimization.

5.1 Identification of Factors

Following the approach of Heckman et al. (2006) and Cunha et al. (2010), I assume that bullying victimization is a latent or true factor instead of their observed measures that, in turn, determine outcomes. Besides the bullying victimization factor, I capture children's family background characteristics by an unobservable latent factor referred as the family factor. There are two types of observable measures, continuous and binary.

For the victimization measures, let $\mathcal{B}_i$ be a latent bullying factor estimated from the observable measures of bullying victimization that impact the observable measures and B_{ij}, j = {P, V, R, A} denote a 4x1 vectors of the observable victimization measures for individual i including physical victimization (P), verbal victimization (V), relational victimization (R) and attacks on property (A). Bullying victimization measures are binary and we only observe the measure $B_{ij} = 1$ if $B^*_{ij} > 0$ and $B_{ij} = 0$ otherwise and it is defined as follows:

$$B^*_{ij} = \alpha_j + \beta_j \mathcal{B}_i + u_{ij} \tag{2}$$

Where α_j are intercepts, β_j are factor loadings and u_{ij} are measurement error terms.

Table 4: Conventional Regressions: Association between Overall Victimization Indicator and Outcomes

	Subjective well-being	Health	Drinking	Distress
Intercept	1.821	-1.858	-2.259	0.254
	(2.516)	(2.398)	(3.164)	(0.450)
Female	0.270**	0.006	-0.963***	0.148***
	(0.120)	(0.113)	(0.124)	(0.021)
Urban	-0.528***	-0.038	-0.573***	-0.099***
	(0.168)	(0.168)	(0.214)	(0.028)
Ethnic group	0.498**	-0.106	-0.274	0.125***
	(0.231)	(0.194)	(0.195)	(0.041)
Child age (in years)	-0.350**	0.121	0.093	0.091***
	(0.173)	(0.160)	(0.213)	(0.030)
Wealth index	2.610***	0.799**	0.061	-0.041
	(0.445)	(0.399)	(0.573)	(0.083)
Mother's education	0.025	-0.035*	-0.018	-0.011***
	(0.022)	(0.019)	(0.025)	(0.004)
Father's education	0.068***	0.010	0.063***	0.000
	(0.021)	(0.017)	(0.021)	(0.003)
Household size	-0.030	0.017	-0.058	-0.001
	(0.052)	(0.045)	(0.054)	(0.009)
Birth order	-0.036	-0.124***	0.091*	0.009
	(0.045)	(0.040)	(0.047)	(0.008)
Mother or father alive	0.554*	0.107	0.052	-0.081
	(0.291)	(0.217)	(0.233)	(0.050)
Bullying victimization	-0.035	-0.284**	0.813***	0.221***
	(0.116)	(0.119)	(0.123)	(0.021)
No. of obs.	895	895	887	887

Note: Standard errors in parentheses based on 100 bootstrap replications of the entire estimation process; *** p<0.01, ** p<0.05, * p<0.1.

Table 5: Conventional Regressions: Association between Different Types of Victimization and Outcomes

	Subjective well-being	Health	Drinking	Distress
Intercept	2.052	-1.450	-3.248	0.016
	(2.604)	(2.409)	(3.174)	(0.462)
Female	0.254**	-0.003	-0.924***	0.154***
	(0.119)	(0.117)	(0.126)	(0.022)
Urban	-0.518***	-0.032	-0.590***	-0.103***
	(0.167)	(0.171)	(0.210)	(0.027)
Ethnic group	0.503**	-0.112	-0.252	0.126***
	(0.230)	(0.198)	(0.200)	(0.040)
Child age (in years)	-0.361**	0.099	0.144	0.103***
	(0.178)	(0.161)	(0.212)	(0.030)
Wealth index	2.575***	0.762*	0.313	0.014
	(0.450)	(0.404)	(0.551)	(0.080)
Mother's education	0.025	-0.036*	-0.020	-0.011***
	(0.023)	(0.019)	(0.026)	(0.003)
Father's education	0.071***	0.012	0.061***	-0.000
	(0.022)	(0.017)	(0.022)	(0.003)
Household size	-0.034	0.017	-0.057	-0.001
	(0.051)	(0.045)	(0.055)	(0.009)
Birth order	-0.035	-0.119***	0.085*	0.007
	(0.046)	(0.041)	(0.048)	(0.008)
Mother or father alive	0.531*	0.065	0.174	-0.056
	(0.294)	(0.217)	(0.246)	(0.048)
Physical victimization	-0.275	-0.165	0.708***	0.145***
	(0.280)	(0.241)	(0.264)	(0.049)
Verbal victimization	-0.170	-0.088	0.152	0.044
	(0.154)	(0.169)	(0.201)	(0.027)
Relational victimization	-0.023	-0.379***	0.607***	0.199***
	(0.144)	(0.129)	(0.167)	(0.026)
Attacks on property	0.167	0.079	0.280	0.144***
	(0.208)	(0.200)	(0.220)	(0.039)
No. of obs.	895	895	887	887

Note: Standard errors in parentheses based on 100 bootstrap replications of the entire estimation process; *** p<0.01, ** p<0.05, * p<0.1.

The observable measures B_{ij} can be viewed as error-ridden indicators of the underlying latent bullying victimization factor and these measures are imperfect proxies for the latent factor. $\mathcal{B}$ is the bullying victimization factor that can be considered as an error-free measure. Measurement errors u_j in this equation reflect that the observable measures are imperfect proxies for the underlying factors.

u_{ij} are assumed to be independent across the measures and all the other errors in the model and logistically distributed, the probability of observing these measures conditional on the unobserved factors is

$$Pr(B_{ij}|\mathcal{B}_i) = \frac{exp(\alpha_j + \beta_j \mathcal{B}_i)^{B_i}}{1 + exp(\alpha_j + \beta_j \mathcal{B}_i)} \tag{3}$$

Similarly, for the family background characteristics measures, let $\mathcal{P}_i$ be the family factor and P_{ik} be the observable measures of family background characteristics including wealth index, mother's education, father's education, household size, birth order and whether either parent are alive or not. If observable measures are continuous, then these measures are modelled as a linear function of the factor:

$$P_{ik} = \alpha_k + \beta_k \mathcal{P}_i + v_{ik} \tag{4}$$

Where P_{ik} are the continuous observable measures, $\mathcal{P}_i$ is the family factor. v_{ik} is an error term that is not explained by the family factor and is independent across the measures and all the other errors in the model. v_{ik} is assumed to have a normal distributions with mean zero and variance σ_k^2, then the probability of the continuous measures is

$$Pr(P_{ik}|\mathcal{P}_i) = \frac{1}{\sqrt{2\sigma_k^2 \pi}} exp\left(-\frac{(P_{ik} - \alpha_k - \beta_k \mathcal{P}_i)^2}{2\sigma_k^2}\right) \tag{5}$$

If observable measures are binary, the family factor is extracted from the following equation:

$$P_{ik}^* = \alpha_k + \beta_k \mathcal{P}_i + v_{ik} \tag{6}$$

The binary observable measures $P_{ijk} = 1$ if $P_{ik}^* > 0$ and $B_{ij} = 0$ otherwise. $u_i j$ are inde-

pendent across the family background characteristics measures and all the other errors in the model and logistically distributed. Conditional on the unobservable factor, the probability of these measures is:

$$Pr(P_{ik}|\mathcal{P}_i) = \frac{(exp(\alpha_j + \beta_j \mathcal{P}_i))^{P_{ij}}}{1 + exp(\alpha_j + \beta_j \mathcal{P}_i)} \tag{7}$$

From Equations 3, 5 and 7, the likelihood of all the observed measures conditional on $\mathcal{B}_i$ and $\mathcal{P}_i$ is

$$L(B_i, P_i|\mathcal{B}_i, \mathcal{P}_i) = \prod_{j=1}^{J} Pr(B_{ij}|\mathcal{B}_\rangle) \prod_{k=1}^{K} Pr(P_{ij}|\mathcal{P}_i) \tag{8}$$

For simplicity, let $\theta_i = \{\mathcal{B}_i, \mathcal{P}_i\}$, then Equation 8 can be rewitten as:

$$L(B_i, P_i|\theta_i) = \prod_{j=1}^{J} Pr(B_{ij}|\theta_i) \prod_{k=1}^{K} Pr(P_{ij}|\theta_i) \tag{9}$$

The log-likelihood function is:

$$\begin{aligned} \mathcal{L} &= \sum_{i=1}^{n} lnL(B_i, P_i) \\ &= \sum_{i=1}^{n} ln\left(\int L(B_i, P_i|\theta) dF(\theta)\right) \\ &= \sum_{i=1}^{n} ln\left(\int L(B_i, P_i|\theta) f(\theta) d\theta\right) \end{aligned} \tag{10}$$

Because of the unobservable nature of the factors, the log-likelihood function is constructed by integrating over the distributions of the unobservable factors. I do not impose normality on the latent factors. Instead, I assume that the joint distribution of the latent factors follows a mixture of normals. This assumption is to guarantee enough flexibility for the underlying distribution and it imposes few assumptions on the distributions. I allow for a mixture of C = 8 normals. Therefore, the estimated parameters include the parameters of the normals with mean μ and covariance Ω and mixture probability τ. Then, the probability density function of the factor is $f(\theta) = \sum_{c=1}^{8} \tau_c f(\theta|\mu_c, \Omega_c)$.

The core of a factor model is that each observable measure is a function of a latent/true variable(s) and a measurement error. Each observable measure includes the amount of each

common, unobservable factor it loads onto and its measurement error.

I use a latent factor model developed by Cunha et al. (2010) to extract the true, unobservable latent factors from the observable measures and remove the measurement errors. They show that we can non-parametrically identify the factor distributions for the nonlinear measurement system. I follow their framework to identify the latent factors from the observable measures. Identification requires at least $2k + 1$ measures for k factors. I use four dedicated measures loading only onto the bullying factor and six measures loading only onto the family factor in our measurement system. Further requirements for identification are to set the scale and location for the measures. I set the loading for the physical victimization and wealth index for the bullying and family factors respectively equal to one and the remaining coefficients are interpreted in proportion to the normalized coefficients. The constants for these measures are equal to zero.

5.2 Outcomes

I am interested in explaining the effects of being bullied on health and psychosocial outcomes. The outcome of interest m for m = 1, 2, . . , M of person i, Y_i^*, is determined by the bullying victimization factor $\mathcal{B}_i$, family factor $\mathcal{P}_i$ and a set of observable variables X_i that impact the outcome:

$$Y_{im}^* = \beta_{xm} X_{im} + \beta_{\mathcal{B}m} \mathcal{B}_i + \beta_{\mathcal{P}m} \mathcal{P}_i + u_{Y_{im}} \tag{11}$$

Outcomes Y_{im}^* include subjective well-being or life satisfaction, self-rated health, alcohol consumption and distress. There are two types of outcomes, continuous and binary.

If outcome Y_{im} is continuous, then $Y_{im} = Y_{im}^*$, where Y_{im} is the observed continuous outcome of person i and $u_{Y_{im}}$ follow a normal distribution with mean zero and variance σ_m^2, then the probability of this continuous outcome is

$$Pr(Y_{im}|X_{im}, \mathcal{B}_i, \mathcal{P}_i) = \frac{1}{\sqrt{2\sigma_m^2 \pi}} exp\left(-\frac{(Y_{im} - \beta_{xm} X_{im} - \beta_{\mathcal{B}m} \mathcal{B}_i - \beta_{\mathcal{P}m} \mathcal{P}_i}{2\sigma_m^2}\right) \tag{12}$$

If outcome Y_{im} is binary, then Y_i^* is a latent variable and the observable outcome variable

Y_i can be considered as an indicator with $Y_i = 1$ only if $Y_i^* > 0$ and $Y_i = 0$ otherwise. $u_{Y_{im}}$ is assumed to be distributed according to a logistic distribution, then the probability of this binary outcome is:

$$Pr(Y_{im}|X_{im}, \mathcal{B}_i, \mathcal{P}_i) = \frac{[exp(\beta_{xm}X_{im} + \beta_{\mathcal{B}m}\mathcal{B}_i + \beta_{\mathcal{P}m}\mathcal{P}_i)]^{Y_{im}}}{1 + exp(\beta_{im}X_{im} + \beta_{\mathcal{B}m}\mathcal{B}_i + \beta_{\mathcal{P}m}\mathcal{P}_i)} \tag{13}$$

The likelihood of all the observed outcomes is then:

$$L(Y_i|X_i, \mathcal{B}_i, \mathcal{P}_i) = \prod_{m=1}^{M} Pr(Y_{im}|X_{im}, \mathcal{B}_i, \mathcal{P}_i) \tag{14}$$

And the log-likelihood function is

$$\begin{aligned} \mathcal{L}_{\substack{Outcomes\ without \\ instruments}} &= \sum_{i=1}^{n} ln \left(\int \int L(Y_i|X_i, \mathcal{B}_i, \mathcal{P}_i) f(\mathcal{B}) f(\mathcal{P}) d(\mathcal{B}) d(\mathcal{P}) \right) \\ &= \sum_{i=1}^{n} ln \int L(Y_i|X_i, \theta) f(\theta) d\theta \end{aligned} \tag{15}$$

5.3 Instrumental Variables

The challenge for identifying Equation 11 is that victimization is endogenous in terms of individual observable and unobservable characteristics. As discussed in the Literature Review (Section 2) and Summary Statistics (Section 3), victimization is not randomly selected in terms of observable and unobservable factors. To address the possible endogeneity of victimization, I use an instrumental variable approach adapted in a latent factor model by instrumenting victimization with the number of the child's friends being physical bullied and the percentage of children in the Young Lives survey clusters being physically punished by their parents. To be a valid instrument, it requires relevance and exogeneity. It must affect victimization but not directly affect the outcomes of interest. My instruments are inspired by Carrell and Hoekstra (2010) and Eriksen et al. (2014) that domestic violence influences children and their peers, and the number of a child's friends being physically bullied would increase the likelihood of that child being bullied. The first instrument affects bullying victimization as it accounts for the supply of bullying in school environment. The second one relates family emotional trauma with troubled behaviors in school and captures the fact

that children from troubled family are more likely to have behavioral challenges (Wolfe et al., 2003; Eriksen et al., 2014). It is reasonable to assume that the two instrumental variables affect the outcomes of interest through their effects on bullying victimization. I discuss more about the relevance in the result section.

I implement a two-stage instrument variable estimation as follows:

The first stage:

$$\mathcal{B}_i = \beta_x X_i + \beta_p Troubledfamily_i + \beta_f Troubledfriend_i + u_{\mathcal{B}_i} \tag{16}$$

Where $Troubledfamily_i$ is the percentage of children in the Young Lives survey clusters being physically punished by their parents, $Troubledfriends_i$ is the number of the child's friends being physically bullied and $u_{\mathcal{B}_i}$ is an error term.

Where $u_{\mathcal{B}_i}$ follows a normal distribution with mean zero and variance $\sigma^2_{\mathcal{B}}$, then

$$\begin{aligned} &L(\mathcal{B}_i|X_i, prbeat_i, frbeat_i) = \\ &\frac{1}{\sqrt{2\sigma^2_{\mathcal{B}}\pi}} exp\left(-\frac{(\mathcal{B}_i - \beta_x X_i - \beta_p Troubledfamily_i - \beta_f Troubledfriends_i)^2}{2\sigma^2_{\mathcal{B}}}\right) \end{aligned} \tag{17}$$

Second-stage:

$$Y^*_{im} = \beta_{xm} X_{im} + \beta_{\mathcal{B}m}\widehat{\mathcal{B}}_i + \beta_{\mathcal{P}m}\mathcal{P}_i + u_{Y_{im}} \tag{18}$$

Applying the same procedure as in Section 5.2 with the likelihood function 17 for the endogenous victimization and the new outcome equation 18, the log-likelihood with instrumental variables is

$$\mathcal{L}_{\substack{Outcomes\ with \\ instruments}} = \sum_{i=1}^{n} ln\left(\int\int L(Y_i|X_i, \widehat{\mathcal{B}}_i, \mathcal{P}_i) L(\mathcal{B}_i|X_i, prbeat_i, frbeat_i) f(\mathcal{B}) f(\mathcal{P}) d\mathcal{B} d\mathcal{P}\right) \tag{19}$$

5.4 Estimation

I first estimate the system of Equations 2, 4 and 6 with the log-likelihood function 10 by maximum likelihood method. I implement the estimation using the minorization-maximization algorithm described in Chapter 1 to maximize Equation 10.

Once the parameters of the measurement system and distribution of the factors, $f(\mathcal{B})$ $f(\mathcal{P})$ or $f(\theta)$, are identified, I can estimate the outcome models 11, 16 and 18 by maximizing the log-likelihood function 15 and 19 . I draws R values of θ from the conditional distributions of θ, then the log-likelihood of the outcome Equations 15 and 19 become:

$$\begin{aligned} \mathcal{L}_{\substack{Outcomes\ without \\ instruments}} &= \sum_{i=1}^{n} \frac{1}{R} \sum_{r=1}^{R} ln(L(Y_i|X_i, \mathcal{B}_i, \mathcal{P}_i)) \\ &= \sum_{i=1}^{n} \frac{1}{R} \sum_{r=1}^{R} ln(L(Y_i|X_i, \theta)) \end{aligned} \tag{20}$$

and

$$\mathcal{L}_{\substack{Outcomes\ with \\ instruments}} = \sum_{i=1}^{n} \frac{1}{R} \sum_{r=1}^{R} ln(L(Y_i|X_i, \widehat{\mathcal{B}}_i, \mathcal{P}_i) L(\mathcal{B}_i|X_i, prbeat_i, frbeat_i)) \tag{21}$$

Since $\mathcal{B}$, $\mathcal{P}$ or θ are treated as observable data, outcome Equations 11, 16 and 18 can be estimated by standard OLS and logistic regression methods.

6 Model Results

In this section, I first present and discuss the characteristics of the measurement system. This system identify the distributions of the latent factors (bullying victimization and family factors) and the estimated parameter of the measurement system. I then present the determinants of bullying victimization. Lastly, I present and discuss the consequences of victimization on health and psychosocial outcomes.

6.1 Measurement System

Table 6 shows the estimates of the measurement system. Besides the loadings, I also calculate and report the average marginal effects (AME) of one standard deviation increase in the factors. The results show that the loadings that explain the contributions of the factors to the measures are large and statistically different from zero at the 1% significance level. The latent bullying victimization factor is more likely associated with verbal bullying and

property attack, while the latent family factor is more likely related to parental education. The negative signs show the negative impacts of the factors on corresponding variables. In particular, a one standard deviation increase in the bullying victimization factor would, on average, increase the probability of having physical, verbal, relational and property attack bullying by 22.1%, 22.6%, 15.6% and 33.8% respectively. Increasing the family factor by a one standard deviation is associated with an average increase in wealth index, mother's education and father's education by 0.22, 3.16, 3.12 units respectively, while this factor is negatively correlated with the number of household members and birth order.

Table 6: Estimated Parameters of Measurement System[a]

Factor	Measures	Data type	Intercepts	Loadings	AME[b]	Signal
Bullying Victimization	Physical	Binary	0	1	0.221***	–
					(0.006)	
	Verbal	Binary	5.347***	7.727***	0.226***	–
			(0.117)	(0.024)	(0.012)	
	Relational	Binary	5.456***	6.900***	0.156***	–
			(0.128)	(0.030)	(0.012)	
	Property	Binary	1.929***	4.753***	0.338***	–
			(0.133)	(0.030)	(0.013)	
Family	Wealth index	Continuous	0	1	0.122***	0.430***
					(0.004)	(0.017)
	Mother's education	Continuous	-9.978***	25.989***	3.164***	0.659***
			(0.571)	(0.919)	(0.094)	(0.029)
	Father's education	Continuous	-9.160***	25.592***	3.116***	0.577***
			(0.517)	(0.794)	(0.100)	(0.029)
	Hosuehold size	Continuous	5.793***	-2.018***	-0.246***	0.033***
			(0.261)	(0.404)	(0.049)	(0.012)
	Birth order	Continuous	4.298***	-3.379***	-0.411***	0.095***
			(0.233)	(0.349)	(0.042)	(0.017)
	Mother and/or father alive	Binary	1.231***	2.307***	0.016***	–
			(0.457)	(0.768)	(0.005)	

Note: Standard errors in parentheses based on 100 bootstrap replications of the entire estimation process; *** p<0.01, ** p<0.05, * p<0.1.

[a] The factor moments, including factor means, factor standard deviations, correlation and mixture component means, are provided in Appendix B.

[b] Average Marginal Effects of Factors.

6.2 The Determinants of Victimization and its Consequences on Outcomes

Table 7 presents the first-stage results. The number of the child's friends being physical bullied and the percentage of children being physically punished by their parents have a positive and significant effect on being bullied. One unit change in the number of a child's friends being physical bullied would induce an increase in victimization by 0.55 standard deviations and one percent change in the percentage of children being physically punished by their parents would increase bullying victimization by 0.2 standard deviations.

Table 7: Determinants of Bullying Victimization

Variables	Bullied
Intercept	-2.923***
	(0.890)
Female	0.105**
	(0.042)
Urban	0.082
	(0.054)
Ethnic group	0.126*
	(0.066)
Child age (in years)	0.049
	(0.060)
Troubled family	0.553***
	(0.198)
Troubled friends	0.200***
	(0.016)
First Stage F-Statistics	244
No. of obs.	971

Note: Standard errors in parentheses based on 100 bootstrap replications of the entire estimation process; *** p<0.01, ** p<0.05, * p<0.1.

Table 8 presents the second-stage estimates for the consequences of bully victimization on the different outcomes. Besides reporting the estimated coefficients, the average marginal effects of one standard deviation increase in bullying victimization and family factors, holding the other variable constant are also reported. The results show that while bullying

victimization does not affect self-rated health, it have statistically significant effects on life satisfaction, alcohol use and distress. My findings indicate that increasing the bullying factor by one standard deviation would reduce the probability of having a good life on average by 8.7 percentage points, which represent an substantial decrease of about 21.75% over the baseline probability. In the same way, a one standard deviation increase in the bullying victimization factor would increase the incidence of drinking alcohol by 13.5 percentage points, a significant increase of 45.6%. A one standard deviation increase in the bullying victimization factor would increase the distress index by 0.284, equivalent an increase of 16.4% relative to the baseline value. Although estimation approaches are different, these results are aligned with Sarzosa and Urzúa (2021) and are similar in magnitude.

These findings differ from the results found in the reduced form regressions in Section 4 which ignore the endogeneity and the measurement errors for bullying victimization reports and show that no more than two types of victimization affect the outcomes. Appendix C presents the results for the specification that corrects measurement errors, but without the instruments. The results indicate that the consequences of bullying victimization on the outcomes are weaker and it shows endogeneity biases and the importance of instrumental variables.

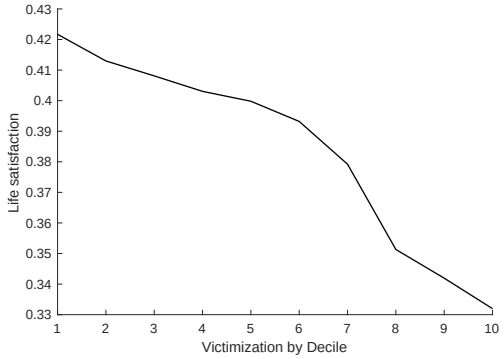
As discussed in the literature, previous studies show negative effect of victimization on health and psychosocial outcomes, but provided limited evidence since they ignore the endogeneity and measurement error issues that cause different forms of bias. Studies considering these issues are rare. It makes comparisons between findings difficult. Our findings contribute substantially to the literature on peer victimization and health and psychosocial outcomes in this regard.

To understand the size and significance of consequence of the bullying victimization, the model needs to be simulated from the estimated results above. In this sense, the bullying victimization and family factors are randomly drawn from the estimated distributions of these factors in the first steps, these draws are paired with individuals and their controls, and estimated parameters are used to get expected outcomes as a function of the victimization factor in terms of deciles of its distribution. This way, we can see the consequences of victimization on the outcomes of interest. Figure 1 presents the results of theses exercises.

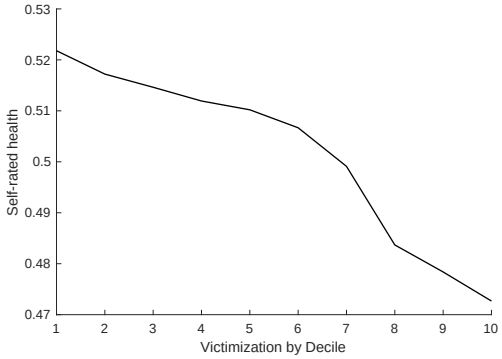
It shows negative gradients between victimization and positive outcomes (life satisfaction and health) and positive gradients between being bullied and adverse outcomes (alcohol use and distress). Figure 1a shows that the probability of being satisfied with life moves from 42% to 33% across the deciles of victimization. Likewise, although I did not find significant consequences of being bullied on health, Figure 1b demonstrates that probability of having a good health changes from 52% in the first decile of victimization to 47% with highly-victimised children. Figure 1c shows that the incidence of drinking alcohol increase from 23% to 34% across the distribution of victimization. Similarly, the distress index moves from 1.63 in the first decile to 1.87 in the last decile of victimization (Figure 1d).

Figure 1: Outcomes by Deciles of the Victimization Factor Distribution

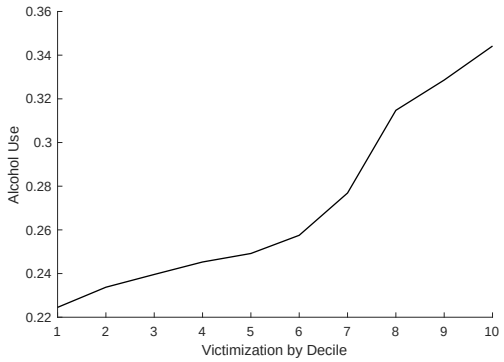
(a) Life satisfaction



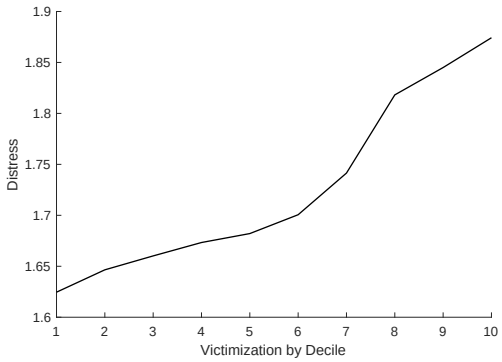
(b) Self-rated health



(c) Alcohol Use



(d) Distress



7 Conclusion

I use a structural model combined with an instrumental variable strategy to deal with the endogeneity and measurement error issues of bullying to examine the consequences of peer victimization on a range of health, risky behavior and well-being indicators. The findings indicate that peer victimization strongly affects subjective well-being, alcohol consumption, and emotional and mental distress of children. My results are consistent with evidence from both developed and developing countries that bullying has strong consequences on health risks and psychosocial outcomes. I do not find evidence of associations between bullying victimization and self-rated health.

Adolescence is a critical period of development in which youth is extremely sensitive to bullying acts, stress, risky behaviors, physical and mental health, and well-being indicators that can affect the developmental trajectories of individuals. Bullying victims suffer long-lasting consequences in terms of health and psychosocial development over the life course. My research provides scarce evidence about the effects of victimization on various health and psychosocial outcomes, especially in low-resource settings. My results about solid and consistent associations between peer victimization and health risky behaviors and well-being of children highlight the need to increase awareness of, identify and recognize different types of bullying as a serious issue and have interventions to prevent these modifiable behaviors. It is also critical to mobilize protective resources and efforts and develop adequate education policies to curb school victimization, especially in developing countries.

References

Abada, T., F. Hou, and B. Ram (2008). The effects of harassment and victimization on self-rated health and mental health among Canadian adolescents. *Social Science & Medicine 67*(4), 557–567.

Arseneault, L., L. Bowes, and S. Shakoor (2010). Bullying victimization in youths and mental health problems:'much ado about nothing'? *Psychological medicine 40*(5), 717–729.

Boulton, M. J. and K. Underwood (1993). Bully/victim problems among middle school children. *European Education 25*(3), 18–37.

Bourdillon, M. and J. Boyden (2014). *Growing up in poverty: findings from Young Lives*. Springer.

Boyes, M. E., L. Bowes, L. D. Cluver, C. L. Ward, and N. A. Badcock (2014). Bullying victimisation, internalising symptoms, and conduct problems in south african children and adolescents: A longitudinal investigation. *Journal of abnormal child psychology 42*(8), 1313–1324.

Boynton-Jarrett, R., L. M. Ryan, L. F. Berkman, and R. J. Wright (2008). Cumulative violence exposure and self-rated health: longitudinal study of adolescents in the united states. *Pediatrics 122*(5), 961–970.

Brown, D. W., L. Riley, A. Butchart, and L. Kann (2008). Bullying among youth from eight african countries and associations with adverse health behaviors.

Cantril, H. et al. (1965). Pattern of human concerns.

Carbone-Lopez, K., F.-A. Esbensen, and B. T. Brick (2010). Correlates and consequences of peer victimization: Gender differences in direct and indirect forms of bullying. *Youth violence and juvenile justice 8*(4), 332–350.

Carrell, S. E. and M. L. Hoekstra (2010). Externalities in the classroom: How children exposed to domestic violence affect everyone's kids. *American Economic Journal: Applied Economics 2*(1), 211–28.

Cluver, L. and M. Orkin (2009). Cumulative risk and aids-orphanhood: Interactions of stigma, bullying and poverty on child mental health in south africa. *Social science & medicine 69*(8), 1186–1193.

Crookston, B. T., R. M. Merrill, S. Hedges, C. Lister, J. H. West, and P. C. Hall (2014). Victimization of Peruvian adolescents and health risk behaviors: young lives cohort. *BMC public health 14*(1), 1–7.

Cunha, F. and J. J. Heckman (2008). Formulating, identifying and estimating the technology of cognitive and noncognitive skill formation. *The Journal of Human Resources 43*(4), 738–782.

Cunha, F., J. J. Heckman, and S. M. Schennach (2010). Estimating the technology of cognitive and noncognitive skill formation. *Econometrica 78*(3), 883–931.

Due, P. and B. E. Holstein (2008). Bullying victimization among 13 to 15 year old school children: Results from two comparative studies in 66 countries and regions. *International journal of adolescent medicine and health 20*(2), 209–222.

Eriksen, T. L. M., H. S. Nielsen, and M. Simonsen (2014). Bullying in elementary school. *Journal of Human Resources 49*(4), 839–871.

Fosse, N. E. and S. A. Haas (2009). Validity and stability of self-reported health among adolescents in a longitudinal, nationally representative survey. *Pediatrics 123*(3), e496–e501.

Gobina, I., A. Zaborskis, I. Pudule, I. Kalnins, and A. Villerusa (2008). Bullying and subjective health among adolescents at schools in Latvia and Lithuania. *International journal of public health 53*(5), 272–276.

Goodman, R. and S. Scott (1999). Comparing the strengths and difficulties questionnaire and the child behavior checklist: Is small beautiful? *Journal of abnormal child psychology 27*(1), 17–24.

Hawker, D. S. and M. J. Boulton (2000). Twenty years' research on peer victimization and psychosocial maladjustment: A meta-analytic review of cross-sectional studies. *The Journal of Child Psychology and Psychiatry and Allied Disciplines 41*(4), 441–455.

Heckman, J. J., J. Stixrud, and S. Urzúa (2006). The effects of cognitive and noncognitive abilities on labor market outcomes and social behavior. *Journal of Labor Economics 24*(3), 411–482.

Hu, Y. and S. M. Schennach (2008). Instrumental variable treatment of nonclassical measurement error models. *Econometrica 76*(1), 195–216.

Joffer, J., L. Jerdén, A. Öhman, and R. Flacking (2016). Exploring self-rated health among adolescents: a think-aloud study. *BMC public health 16*(1), 1–10.

Karlsson, E., A. Stickley, F. Lindblad, M. Schwab-Stone, and V. Ruchkin (2014). Risk and protective factors for peer victimization: a 1-year follow-up study of urban american students. *European child & adolescent psychiatry 23*(9), 773–781.

Ladd, G. W., I. Ettekal, and B. Kochenderfer-Ladd (2017). Peer victimization trajectories from kindergarten through high school: Differential pathways for children's school engagement and achievement? *Journal of Educational Psychology 109*(6), 826.

Lereya, S. T., W. E. Copeland, E. J. Costello, and D. Wolke (2015). Adult mental health consequences of peer bullying and maltreatment in childhood: two cohorts in two countries. *The Lancet Psychiatry 2*(6), 524–531.

Lister, C., R. M. Merrill, D. Vance, J. H. West, P. C. Hall, and B. T. Crookston (2015a). Predictors of peer victimization among peruvian adolescents in the young lives cohort. *International journal of adolescent medicine and health 27*(1), 85–91.

Lister, C. E., R. M. Merrill, D. L. Vance, J. H. West, P. C. Hall, and B. T. Crookston (2015b). Victimization among Peruvian adolescents: Insights into mental/emotional health from the young lives study. *Journal of school health 85*(7), 433–440.

Malhi, P., B. Bharti, and M. Sidhu (2014). Aggression in schools: Psychosocial outcomes of bullying among Indian adolescents. *The Indian Journal of Pediatrics 81*(11), 1171–1176.

Mynard, H. and S. Joseph (2000). Development of the multidimensional peer-victimization scale. *Aggressive Behavior: Official Journal of the International Society for Research on Aggression 26*(2), 169–178.

Nguyen, A. J. et al. (2016). A latent class approach to understanding experiences of bullying victimization among youth in four low-resource settings.

OECD (2013). *OECD guidelines on measuring subjective well-being*. OECD Publishing, Paris.

Olweus, D. (1993). Bullying at school: What we know and what we can do. *Malden, MA: Blackwell Publishing*.

Olweus, D. (1996). Bully/victim problems in school. *Prospects 26*(2), 331–359.

Olweus, D. (1997, 12). Bully/victim problems in school: Facts and intervention. *European Journal of Psychology of Education 12*, 495–510.

Ouellet-Morin, I., C. L. Odgers, A. Danese, L. Bowes, S. Shakoor, A. S. Papadopoulos, A. Caspi, T. E. Moffitt, and L. Arseneault (2011). Blunted cortisol responses to stress signal social and behavioral problems among maltreated/bullied 12-year-old children. *Biological psychiatry 70*(11), 1016–1023.

Rigby, K. (2002). *New perspectives on bullying*. Jessica Kingsley Publishers.

Rivers, I. and P. K. Smith (1994). Types of bullying behaviour and their correlates. *Aggressive behavior 20*(5), 359–368.

Ruchkin, V., M. Schwab-Stone, and R. Vermeiren (2004). Social and health assessment (saha): psychometric development summary. *New Haven: Yale University*.

Sarzosa, M. and S. Urzúa (2021). Bullying among adolescents: The role of skills. *Quantitative Economics 12*(3), 945–980.

Schennach, S. M. (2004). Estimation of nonlinear models with measurement error. *Econometrica 72*(1), 33–75.

Smith, P. K. and P. Brain (2000). Bullying in schools: Lessons from two decades of research. *Aggressive Behavior: Official Journal of the International Society for Research on Aggression 26*(1), 1–9.

Smith, P. K., L. Talamelli, H. Cowie, P. Naylor, and P. Chauhan (2004). Profiles of non-victims, escaped victims, continuing victims and new victims of school bullying. *British journal of educational psychology 74*(4), 565–581.

Stadler, C., J. Feifel, S. Rohrmann, R. Vermeiren, and F. Poustka (2010). Peer-victimization and mental health problems in adolescents: are parental and school support protective? *Child Psychiatry & Human Development 41*(4), 371–386.

Takizawa, R., B. Maughan, and L. Arseneault (2014). Adult health outcomes of childhood bullying victimization: evidence from a five-decade longitudinal british birth cohort. *American journal of psychiatry 171*(7), 777–784.

UNESCO (2019). *Behind the numbers: Ending school violence and bullying*. United Nations Educational, Scientific and Cultural Organization.

WHO (2019). *Global status report on alcohol and health 2018*. World Health Organization.

Wolfe, D. A., C. V. Crooks, V. Lee, A. McIntyre-Smith, and P. G. Jaffe (2003). The effects of children's exposure to domestic violence: A meta-analysis and critique. *Clinical child and family psychology review 6*(3), 171–187.

Table 8: Consequences of Bullying Victimization on Health and Psychosocial Outcomes

Variables	Life satisfaction	Self-rated health	Alcohol use	Distress
Intercept	-0.846	-2.164	-1.702	0.774
	(2.441)	(2.253)	(3.002)	(0.474)
Female	0.306***	0.045	-0.956***	0.129***
	(0.112)	(0.106)	(0.113)	(0.022)
Urban	-0.074	0.065	-0.492***	-0.088***
	(0.137)	(0.148)	(0.171)	(0.023)
Ethnic group	0.840***	-0.034	-0.220	0.106***
	(0.225)	(0.168)	(0.170)	(0.039)
Child age (in years)	-0.255	0.097	0.150	0.103***
	(0.160)	(0.147)	(0.194)	(0.031)
Bully	-0.226**	-0.116	0.354***	0.149***
	(0.096)	(0.083)	(0.103)	(0.019)
Family	4.343***	0.587	0.389	-0.493***
	(0.503)	(0.401)	(0.540)	(0.082)
Bully AME	-0.087***	-0.054	0.135***	0.284***
	(0.033)	(0.038)	(0.035)	(0.036)
Family AME	0.114***	0.018	0.009	-0.060***
	(0.012)	(0.012)	(0.012)	(0.010)
Baseline Probability/average value	0.400	0.502	0.296	1.728
No. of obs.	969	969	960	961

Note: Standard errors in parentheses based on 100 bootstrap replications of the entire estimation process; *** p<0.01, ** p<0.05, * p<0.1.

Appendix A: Variable Description

Table A.1: Description of Variables

Variables	**Description**
Covariates	
Female	Binary variable equal to 1 for girls and 0 for boys
Urban	Binary variable equal to 1 if the child's household resides in urban areas and 0 otherwise
Ethnic group	Binary variable equal to 1 for Kinh ethic group and 0 for the other ethic groups
Child age	Child age in years
Troubled family	The percentage of children in the Young Lives survey clusters being physically punished by their parents in the last 12 months
Troubled friend	The number of a child's best friends being physical bullied
Overall victimization	Binary variable equal to 1 if a child has been victimized of any kinds in the 9-item Social and Health Assessment Peer Victimization Scale. See Section 3.1 and Table 1
Bullying victimization factor	
Physical victimization	Binary variable equal to 1 if a child has experienced the following bullying acts at least two times: 1) punched, kicked or beat up; 2) hurt physically in some other way and 0 otherwise.
Verbal victimization	Binary variable equal to 1 if a child has experienced the following bullying acts at least two times: 1) made fun of for some reason; 2) called names or swore at and 0 otherwise.

Continued on the next page

Table A.1 – Description of Variables *Continued*

Variables	**Description**
Relational victimization	Binary variable equal to 1 if a child has experienced the following bullying acts at least two times: 1) refused to talk to you or made other people not talk to you; 2) cried to get you into trouble with your friends; 3) made you uncomfortable by staring at you for a long time and 0 otherwise.
Attacks on Property	Binary variable equal to 1 if a child has experienced the following bullying acts at least two times: 1) took something without permission or stole things from you; 2) tried to break or damaged something of yours and 0 otherwise.
Family factor	
Wealth Index	The wealth index is a composite measure of living standards, it is the average of the three sub-indexes: consumer durable, housing quality and access to service indexes. It takes values from 0 to 1, a higher value reflect a wealthier household.
Mother's education	Mother's years of education
Father's education	Father's years of education
Household size	Number of household members living in the household of the child
Border	Birth order of the child in the family
Momdadlive	Indicate whether both mother and father live in the householde or not. It equals 1 if both parents live in the child's household and 0 otherwise.
Outcomes	

Continued on the next page

Table A.1 – Description of Variables *Continued*

Variables	**Description**
Self-rated health	This variable is based on interviewer-administered question asking youth to rate their general health on a 5-point Likert scale with which 1 indicates very poor and 5 very good health status. The response is then dichotomized as 0 indicating poor health status if youth reported their health below the mean value of 3.36 and 1 denoting good health the reported response value above the mean value.
Subjective well-being	This variable is based on the question 'where on the ladder do you feel you personally stand at present time?' and Responses range from 1-9, higher scores indicated better subjective well-being. The responses are further recoded as 0 indicating low subjective well-being and 1 denoting high subjective well-being based on the mean value of the response: 5.59.
Alcohol consumption	Dummy variable equal to 1 for those who reported alcohol use at least once a month and 0 otherwise. This variable is based on youth's response to the question in the self-administered questionnaire: 'How often do you usually drink alcohol?'.
Emotional and mental distress	Distress index is the average of the five items of the Emotional Difficulties subscale of the Strengths and Difficulties Questionnaire (SDQ) in the self-administered questionnaire: 'I worry a lot'; 'I get a lot of headaches, stomach aches, or sickness'; 'I am often unhappy, downhearted, or tearful'; 'I am nervous in new situations', and 'I have many fears or are easily scared'.

Appendix B: Factor Distribution

Table B.1: Factor Means, Standard Deviations and Correlation

	Bully	Family
Factore means	-2.862	0.620
	(0.067)	(0.005)
Factor Standard Deviations	1.910	0.122
	(0.029)	(0.004)
Factor Correlation:		
Bully	1	–
Family	0.033	1
	(0.032)	

Note: Standard errors in parentheses based on 100 bootstrap replications of the entire estimation process.

Table B.2: Mixture Component Means

	Bully	Family	Type share
Type 1	-4.491	0.616	0.572
	(0.057)	(0.006)	(0.014)
Type 2	-0.719	0.677	0.035
	(0.007)	(0.009)	(0.003)
Type 3	-0.730	0.648	0.208
	(0.005)	(0.007)	(0.010)
Type 4	0.833	0.607	0.009
	(0.469)	(0.003)	(0.004)
Type 5	-0.693	0.841	0.033
	(0.014)	(0.015)	(0.006)
Type 6	-0.657	0.440	0.071
	(0.019)	(0.004)	(0.011)
Type 7	-0.733	0.633	0.028
	(0.006)	(0.009)	(0.002)
Type 8	-0.727	0.617	0.045
	(0.008)	(0.007)	(0.003)

Note: Standard errors in parentheses based on 100 bootstrap replications of the entire estimation process.

Appendix C: Model Estimates without Endogenous Bullying Victimization

Table c.1: Consequences of Bullying Victimization on Health and Psychosocial Outcomes without Instrumental Variables

	Life satisfaction	Self-rated health	Alcohol use	Distress
Intercept	0.466	-1.927	-2.578	0.274
	(2.413)	(2.191)	(2.950)	(0.440)
Female	0.268**	0.037	-0.952***	0.144***
	(0.107)	(0.107)	(0.118)	(0.020)
Urban	-0.102	0.060	-0.482***	-0.076***
	(0.136)	(0.149)	(0.173)	(0.022)
Ethnic group	0.771***	-0.047	-0.195	0.134***
	(0.220)	(0.166)	(0.161)	(0.035)
Child age (in years)	-0.292*	0.093	0.172	0.115***
	(0.160)	(0.147)	(0.193)	(0.029)
Bully	0.001	-0.068***	0.205***	0.054***
	(0.024)	(0.024)	(0.027)	(0.005)
Family	4.326***	0.567	0.478	-0.478***
	(0.502)	(0.404)	(0.538)	(0.080)
Bully AME	0.000	-0.032***	0.078***	0.104***
	(0.010)	(0.011)	(0.010)	(0.009)
Family AME	0.118***	0.017	0.011	-0.058***
	(0.013)	(0.012)	(0.012)	(0.009)
Baseline Probability/Average Value	0.397	0.502	0.281	1.727
No. of obs.	969	969	960	961

Note: Standard errors in parentheses based on 100 bootstrap replications of the entire estimation process; *** p<0.01, ** p<0.05, * p<0.1.