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Protecting the Mental Health of Future Adults: Disentangling the Determinants of Adolescent Bullying Victimisation [*][†]

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Abstract

Adolescent bullying victimisation and maltreatment have been linked to mental health disorders. Early intervention interrupting victimisation continuity is required since adolescence is a critical period for the formation of adult skills. We investigate the protective factors against youth victimisation at school and domestically. This study uses the youth self-completion questionnaire (preadolescents/adolescents aged 10-15) from the UK Household Longitudinal Study (UKHLS) containing youth

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victimisation questions in waves 1, 3 and 5 spanning 2009-2013. The self-reported victimisation measures include direct aggression (physical, verbal) and indirect bullying by other young people at school/non-domestically and at the household. The investigation employs balanced and unbalanced sample designs, complete case analysis (CCA) and multiple imputation (MI). The most effective protective factor reducing victimisation at school and domestically is the strength of family support as felt by the child (perceived family support). The unobserved factors increasing non-domestic victimisation are related to the latent factors reducing family support. This indicates that victimised adolescents do not always inform their families. The intensity of past period victimisation is a strong predictor of future victimisation. The importance of family support and the quality of the family environment as protective factors necessitates parental involvement in school anti-bullying programmes. The longitudinal persistence of bullying indicates the inability of frequently bullied adolescents to escape victimisation. Anti-bullying policy design should encourage victims to speak up by lowering victimisation stigma and, provide assurances against bully retaliation.

1 Introduction

Bullying is an anti-social behaviour encompassing physical aggression, threats, teasing and, harassment (Olweus, 1993) adversely affecting human capital and lifetime outcomes (Gorman et al., 2019). Adolescent bullying victimisation impacts on internalising mental health disorders leading to symptoms of withdrawal and depression (McDougall and Vaillancourt, 2015; Vaillancourt et al., 2011), as well as, externalising disorders such as

hyperactivity/inattention, aggression and delinquency (e.g. Chrysanthou and Vasilakis, 2019; Currie and Tekin, 2012; Reijntjes et al., 2011). Further, bullying victimisation can impair cognitive abilities conducing to future reductions in productivity and wages (Brown and Taylor, 2008).

This paper studies the determinants and longitudinal evolution of youth victimisation. We employ the youth self-completion questionnaire (preadolescents/adolescents aged 10-15 years) from the Understanding Society (UK Household Longitudinal Study, UKHLS) containing seven measures of youth victimisation in waves 1, 3 and 5 spanning 2009-2013. The seven self-reported victimisation measures include direct aggression forms (physical, verbal) and indirect bullying forms by other young people non-domestically (mainly at school) and at the household levels.

Preadolescence and adolescence are critical periods regarding the formation of adult skills and human capital (Heckman, 2006; Van den Berg et al. 2014). Recent investigations emphasise the importance of early-life mental health and socioeconomic inequality on adult wellbeing (e.g. Layard et al., 2014; Clark and Lee, 2018; Adhvaryu et al., 2019). To identify effective policy guidelines, we investigate the protective factors against youth victimisation at school and domestically. The majority of the extant literature focuses on school victimisation (see Naylor and Cowie, 1999; Smith and Shu, 2000; Naylor et al., 2001) and its impact on prospective outcomes (see Eriksen et al. 2014, Gorman et al., 2019). For instance, Eriksen et al. (2014) investigate school-level bullying (instrumented by the proportion of classroom peers from troubled homes) and educational performance while Gorman et al. (2019) study the impact of school bullying on future labour market and mental health outcomes.

We conclude that the most effective protective factor reducing victimisation at school and domestically is the strength of family support as felt by the child (henceforth

referred to as perceived family support). An extensive systematic review on protective factors by Ttofi et al. (2014) singles out social support from family and friends (and the quality of the family environment) as protective factors conferring emotional resilience against victimisation: warm parents, family support and parental attachment were significant resilience factors against school bullying in several studies surveyed.

To ensure robustness of our results, we undertake a series of sample selection and estimation methodology checks. In particular, we consider balanced and unbalanced samples, complete case analysis (CCA) and multiple imputation (MI) and, explicitly model the potential simultaneous determination of victimisation and family support.

Two channels can render perceived family support and adolescent victimisation jointly determined. On one hand, parents could increase support intensity following a victimisation incident at the expense of their offspring. Empirical evidence, however, suggests that a non-negligible fraction of victimised adolescents do not inform their parents (e.g. Bijttebier and Vertommen, 1998; Naylor and Cowie, 1999; Naylor et al., 2001; Smith and Shu, 2000; Rivers et al., 2018 on LGBT hostile domestic environment). On the other hand, the unobserved individual characteristics determining victimisation propensity may be linked to the latent attributes determining perceived family support. For example, (continuing) victims might be less likely to communicate bullying to their parents/friends due to fear of retaliation determined by unobserved personality and behavioural traits such as lack of dominance and social boldness (see Smith et al., 2004). At the same time these unobserved characteristics make less dominant and socially timid individuals easier targets for bullies.

The unbalanced estimates maximise sample size by not following the same adolescents consecutively and therefore, cannot incorporate dynamics. This renders family support endogenous. The latent individual factors increasing non-domestic/indirect domestic

victimisation are correlated with the unobserved factors reducing perceived family support. Hence, adolescents bullied at school/non-domestically are either less likely to tell their families (e.g. due to stigma or retaliation fear) and/or their families are less likely to observe victimisation. Parents seem to observe direct verbal and physical domestic maltreatment by siblings more effectively. However, balancing the samples by following the same adolescents longitudinally removes simultaneity. The dynamic adjustment of family support in response to previous victimisation is accounted for by past period bullying status and, unobserved effects are parameterised by including initial conditions in the balanced samples. Victimisation displays significant persistence across time with previously victimised adolescents facing higher victimisation risks compared to their unexposed counterparts. The intensity of previous period bullying is a strong predictor of future victimisation. This is an alarming result indicating the inability of frequently bullied adolescents to escape victimisation.

Moreover, boys are more likely to experience direct forms of physical and verbal aggression at school and domestically. Heterogeneity in adolescent play and relational patterns could be plausible causes since, male adolescents develop relationships based on dominance and status (see Crick and Grotpeter, 1995; Bijttebier and Vertommer, 1998; Naylor and Cowie, 1999). The number of close friends is a significant preventive factor particularly against school victimisation (see Hodges et al., 1999; Martin and Huebner, 2007) and parental school interest a strong protective factor regarding all victimisation forms (see Ttofi et al., 2014). Age reduces the probability of adolescent victimisation though our dataset contains no additional information and we cannot establish if this is due to better coping skills or, due to lower willingness to disclose personal experiences when transitioning from preadolescence to adolescence (see Naylor and Cowey, 1999; Smith and Shu, 2000; Naylor et al., 2001). Finally, lower household

income increases the likelihood of non-domestic/school victimisation in line with the literature (see Menacker et al. 1990; Carbone-Lopez et al. 2010; Doidge et al., 2017). Furthermore, household income is a significant predictor of family support and thus, indirectly reduces bullying victimisation (see Ttofi et al., 2014).

The remaining paper is organised as follows. Section 2 describes the data and sample selection; Section 3 introduces the estimation methods. Section 4 analyses the results and, Section 5 concludes.

2   The Data and Sample Selection Mechanisms

This study uses the first five waves of the UKHLS spanning the period 2009-2013. Understanding Society is a longitudinal survey addressed to the members of around 40,000 households (at the first wave) in the UK on a yearly basis. Household members aged 10-15 years are asked to complete a short self-completion youth questionnaire. The first half of the age range corresponds to preadolescence and the other to adolescence noting that developmental periods vary across individuals. Bullying and the remaining verbal and physical maltreatment measures in the UKHLS youth sample are only reported biennially starting in 2009. Therefore, our analysis employs three waves (wave 1: year 2009, wave 3: year 2011, wave 5: year 2013) and is a pseudo-cohort of youth respondents aged 10-15 with a common survey entry point (2009) but, different dates of birth.

The UKHLS youth sample design is such that, youth respondents aged over 15 subsequently drop out of the survey. To study the longitudinal evolution and persistence of victimisation, we consider youth respondents aged 10-15 years from the UKHLS general population samples for Great Britain (England, Scotland and Wales) present in

2009 (to include initial period victimisation incidence) that have no missing values in any of the covariates (to allow for past period victimisation status). Hence, we construct balanced panels for the adolescents that consecutively participate in the survey in 2009, 2011 and 2013.

Selecting a balanced sample from the UKHLS youth data files produces substantial sample attrition. We additionally consider unbalanced panel estimation consisting of all youth respondents completing questionnaires in any of the three UKHLS waves (2009, 2011, 2013) containing the adolescent victimisation variables. Balanced sample attrition is illustrated in Table 1 depicting the number of youth respondents replying to the main bullying question in the survey (other youth pick on me/or bully me) by age and number of waves of sample membership. Selecting a balanced panel of youth respondents to this question in all three waves (1, 3 and 5) of the UKHLS, gives a total of 1,128 observations. This corresponds to 376 individuals per wave giving the effective estimation sample of 752 observations (two observation points per individual due to the inclusion of lagged bullying status). Removing the requirement of sample membership across all three waves analysed, provides an unbalanced panel sample of 7,656 observations.

Table 1: **Longitudinal Attrition in the UKHLS Youth Samples (Waves 1: 2009, 3: 2011, 5: 2013)**

Age from Date of Birth	10	11	12	13	14	15	Total
Number of Waves in the Sample							
1	562	638	407	378	690	703	3,378
2	411	444	711	729	447	408	3,150
3	203	169	202	181	192	181	1,128
Total	1,176	1,251	1,320	1,288	1,329	1,292	7,656

Notes: Source: University of Essex, ISER, UKHLS: Waves 1, 3, 5. Youth (aged 10-15) responding to question "Other children or young people pick on me or bully me" included in the estimations (see column 1, Tables 3 and 4).

We initially perform complete case analysis (CCA) and estimate models using balanced and unbalanced panel sample designs. CCA involves selecting individuals responding to the respective bullying victimisation measure (dependent variable) and, having no missing values in any of the explanatory variables. Longitudinal estimation using CCA leads to less efficient estimates and consistency relies on the missing completely at random (MCAR) assumption (see Nguyen et al., 2018; Sidi and Harel, 2018). To ensure robustness of our estimates we additionally perform multiple imputation estimation by chained equations (MICE) using balanced and unbalanced samples.

2.1   Measuring Longitudinal Bullying Incidence

We use the seven self-reported victimisation questions available in the UKHLS youth samples. The first youth victimisation variable reported in the UKHLS is a general bullying measure, henceforth referred to as (GenBull). Genbull indicates self-reported

bullying inflicted by other children/young people and, is a three-point scale categorical variable increasing in victimisation intensity taking the values (not true=1, somewhat true=2, certainly true=3). The other six youth victimisation questions in the UKHLS, correspond to household physical maltreatment by siblings (PhysHome), school physical bullying (PhysSchool), household verbal abuse by siblings (VerbalHome), household fun and teasing by siblings (FunTeaseHome), household stealing by siblings (StealHome) and, other ways of school bullying victimisation (OthSchool). The latter six self-reported victimisation questions are four-point scale categorical variables increasing in victimisation intensity. They take the values (never, sometimes: 1-3 times in the last 6 months, quite a lot: more than 4 times in the last 6 months, a lot: a few times every week) and were collapsed into three-point scales [never=1, sometimes=2, (quite a lot/a lot)=3] by combining the last two categories to ensure that the less frequent highest victimisation intensity category contains a sufficient number of observations for identification purposes.

Physical aggression at home/school, verbal home abuse and general bullying are considered direct forms of aggression, whereas, fun and teasing/stealing at home and other forms of school bullying are labelled indirect aggression types (see Bijttebier and Vertommen, 1998; Naylor et al., 2001; Carbone-Lopez et al., 2010).

Pairwise correlations among the seven self-reported victimisation measures in the UKHLS are provided in Table 2 (using unbalanced panel samples). The general setting question does not specify the victimisation location (see GenBull, bottom of Table 2). General bullying (GenBull) can therefore indicate bullying anywhere other than school or the household (e.g. cyberbullying or, street bullying by youth gang members in disadvantaged communities and neighbourhoods) noting that, its highest correlation occurs with the two school-related bullying questions (PhysSchool and OthSchool). The four domestic victimisation measures indicate moderate to strong intra-household

correlation. As expected, the two school bullying forms share their highest correlations.

In addition to the previous seven measures, we construct two additional victimisation measures by combining all forms of household maltreatment (physical, verbal, fun and teasing, stealing by siblings) and school bullying (physical and other ways). The internal consistency of the constructed aggregate school and household measures has been tested using Cronbach's (1951) reliability coefficient which was above the 0.7 threshold (0.72 and 0.78, correspondingly).

The aggregate domestic (GenHome = PhysHome + VerbalHome + FunTeaseHome+ StealHome) and school (GenSchool = PhysSchool + OthSchool) maltreatment measures were collapsed into three-point scale variables increasing in victimisation intensity as follows. GenHome=1 if GenHome≤ 6, GenHome=2 if GenHome$\in [7,9]$, GenHome=3 if GenHome $\geqslant 10$ and, GenSchool=1 if GenSchool=2, GenSchool=2 if GenSchool$\in [3,4]$, GenSchool=3 if GenSchool>4.

In summary, overall we employ nine measures of adolescent victimisation at the household and school levels. Finally note that, the UKHLS youth sample questions for the school context explicitly ask about bullying. The corresponding items for the family context, however, do not explicitly refer to bullying (see bottom of Table 2 for the respective UKHLS victimisation question wording). Therefore, strictly speaking, aggressive behaviours assessed in the family context should be labelled as maltreatment instead of bullying.

Table 2: **UKHLS Youth Victimisation Measures Cross-correlation (Unbalanced Panels, Waves 1: 2009, 3: 2011, 5: 2013)**

Variables	GenBull	PhysHome	PhysSchool	VerbalHome	FunTeaseHome	StealHome	OthSchool
GenBull	1.0000						
PhysHome	0.1273	1.0000					
PhysSchool	0.5343	0.1289	1.0000				
VerbalHome	0.1338	0.5922	0.1084	1.0000			
FunTeaseHome	0.1295	0.4808	0.1010	0.6742	1.0000		
StealHome	0.0953	0.4241	0.0861	0.4165	0.3858	1.0000	
OthSchool	0.6014	0.1444	0.5823	0.1678	0.1635	0.1304	1.0000

Notes: Source: University of Essex, ISER, UKHLS: Waves 1, 3, 5. **GenBull**: Other children or young people pick on me or bully me.

PhysHome: Brothers/sisters hit, kick or push you. **PhysSchool**: How often do you get physically bullied at school? **VerbalHome**:

Brothers/sisters call you nasty names. **FunTeaseHome**: Brothers/sisters make fun of you. **StealHome**: Brothers/sisters take your

belongings. **OthSchool**: How often do you get bullied in other ways at school?

2.2   Control Variables

Matching individual youth respondents to the household level data files, we obtain the total household net income, current household size and the number of children in household (aged 15 or below) variables. The log of real household net monthly income is obtained dividing total household income by household size and using the CPI (all items index) deflator, from the Office of National Statistics (Consumer Price Indices - CPI indices: 1988 to 2015: 2005=100).

Matching the merged youth respondent and household files to their corresponding parental individual interview files is prohibitive in terms of sample attrition if one wishes to undertake a longitudinal analysis. Nevertheless, our set of explanatory variables controls for the family environment by including region of residence, parental school interest, perceived family support and, parental conversation/arguing frequency.

Perceived family support is derived from the question "Do you feel supported by your family, that is the people who live with you?". The resulting binary variable takes the value of one if the individual responded "I feel supported by my family in most or all the things I do" (as opposed to "I feel supported in some of the things I do"/"I do not feel supported").

Parental school interest is a binary variable obtained from the question "My parents are interested in how I do at school" and takes the value of one if the individual answered "always/nearly always" and zero otherwise (sometimes, hardly ever, never). Conversation frequencies (Not talking to Mum/Dad) are derived from questions "How often do you talk to your mother/father, about things that matter to you?" and arguing frequencies (Not arguing with Mum/Dad) use questions "How often do you quarrel with your mother/father?". The last four variables take the value of one if the response

was "hardly ever, don't have a mother/father" and zero otherwise (most days, more than once a week, less than once a week).

The regional control aggregates the wealthiest English regions in terms of GVA per capita "London, S.East, S.West and the East of England". The remaining variables used are self-explanatory.

3   Estimation Methodology

Self-reported victimisation incidence is modelled using dynamic correlated random effects (CRE) ordered probit models. Incorporating dynamics by including previous period victimisation incidence introduces the initial conditions problem (Heckman 1981a,b). Considering otherwise identical adolescents, those victimised in the past can amend their behaviour which in turn determines future victimisation propensity (a behavioural effect). Alternatively, adolescents may differ in specific unobservables (e.g. personality/behavioural traits, genetics, attractiveness) affecting victimisation propensity, while not being influenced by previous victimisation experience. We deal with the initial conditions problem using Wooldridge's (2005) estimator.

Estimations of single equation victimisation models using CCA/MICE and employing balanced/unbalanced samples reveal that perceived family support is the most prominent deterrent of adolescent victimisation with statistically significant effects across all nine victimisation measures (available upon request). To investigate potential simultaneous determination of adolescent victimisation and family support, we perform joint maximum likelihood estimation (MLE) of both outcomes. The model is formed as a binary system of latent responses where y_{it}^* is a latent ordered response variable for victimisation and,

s_{it}^* is a latent binary response variable for perceived family support:

$$y_{it}^* = \mathbf{x_{it}}\boldsymbol{\beta} + \boldsymbol{y_{it-1}}\boldsymbol{\gamma} + \tau s_{it} + \mathbf{y_{i1}}\boldsymbol{\vartheta_1} + \overline{\mathbf{x}}_{\mathbf{i}}\boldsymbol{a} + \lambda\zeta_i + \eta_{it}; \; i = 1, ..., N; t = 2, ..., T \quad (1)$$

reported victimisation status $y_{it} = j$ for victimisation intensity $j \in \{1, ..., J\}$ is observed if latent victimisation incidence falls in an interval between μ_{j-1} and μ_j:

$$y_{it} = j \quad if \quad \mu_{j-1} < y_{it}^* \le \mu_j, \mu_0 = -\infty, \; \mu_j \le \mu_{j+1}, \; \mu_J = \infty$$

$\mathbf{y_{it-1}}$ and $\mathbf{y_{i1}}$ denote respectively the vectors of the $J-1$ lagged, $\mathbf{1}\,[y_{it-1} = j]$, and initial period victimisation set of indicators, $\mathbf{1}\,[\mathbf{y_{i1}} = j]$, $j = 2, ..., J$. The vectors of contemporaneous explanatory variables in the two equations of the system correspond to $(\mathbf{x_{it}}, \mathbf{z_{it}})$. Perceived family support is determined by:

$$s_{it}^* = \mathbf{z_{it}}\boldsymbol{\pi} + \theta_0 + \overline{\mathbf{z}}_{\mathbf{i}}\boldsymbol{\psi} + \zeta_i + \omega_{it}, s_{it} = \mathbf{1}\,[s_{it}^* > 0]; \; i = 1, ..., N; t = 2, ..., T. \quad (2)$$

The vectors $(\boldsymbol{\beta}, \boldsymbol{\gamma}, \boldsymbol{\vartheta_1}, \boldsymbol{a}, \boldsymbol{\pi}, \boldsymbol{\psi})$ and scalars (τ, θ_0) represent the unknown parameters to be estimated, ζ_i is a shared random effect inducing dependence between the composite errors $u_{1it} = \lambda\zeta_i + \eta_{it}$, $u_{2it} = \zeta_i + \omega_{it}$ and, λ is a factor loading (free parameter)- see Miranda and Rabe-Hesketh (2006). The structural equation for victimisation incidence incorporates Wooldridge's (2005) estimator specifying the distribution of unobserved heterogeneity conditional on the initial condition (and the exogenous variables). To induce a correlation between the unobserved heterogeneity and the individual-specific averages of the time-varying covariates we add within means $(\overline{\mathbf{x}}_{\mathbf{i}}, \overline{\mathbf{z}}_{\mathbf{i}})$- see Rabe-Hesketh and Skrondal, (2013). Due to minimal within variation, the models cannot include individual-specific time means of the regional control. Note that the within means of

household income, number of children, parental school interest and family support are not included as they are outcomes of parental socioeconomic attributes and behaviour.

The reduced form for perceived family support, does not include dynamics since the lagged and initial values of family support were statistically insignificant in the joint binary system estimates. To estimate the error correlation, we assume a bivariate normal distribution for the composite error terms in the structural and reduced form models. Perceived family support is exogenous if the correlation among the unobserved factors in the two equations is local to zero and statistically insignificant. Under the normality assumption the structural equation for victimisation is a random effects ordered probit and the reduced form for family support is a random effects binary probit. The joint-MLE models were estimated in Stata using the gsem command. For a full exposition of the estimation methodology see Chrysanthou and Vasilakis, (2018).

Balancing the panels gives three consecutive observations permitting inclusion of both dynamics and initial conditions. The alternative unbalanced panel design uses all available years an individual is present in the sample without requiring consecutive observations. Since the unbalanced panels include individuals present in the samples for one, two or three consecutive time periods this precludes including lagged, initial condition indicators and, within means (as these controls require a minimum of two consecutive time periods). On the other hand, age controls (base group is age 10) can only be included in the unbalanced estimates since they are not collinear with the time dummies as occurs in the balanced case where individuals age together: 10-11, 12-13 and 14-15 in waves 1, 3 and 5, respectively.

Before embarking on the estimation results analysis, note that the domestic victimisation questions concern sibling-inflicted maltreatment and as these were not asked to those without siblings, the respective sample sizes in the domestic victimisation models are

reduced (see Tables 3 and 4). Self-reported domestic maltreatment incidence is notably higher regarding all measures (PhysHome, VerbalHome, FunTeaseHome, StealHome)- see bottom of Tables 3 and 4 where "Bullied" denotes the number of individuals reporting victimisation (sometimes or quite a lot/a lot) during the period analysed.

4 Estimation Results

4.1 Balanced Panel Samples

The balanced sample joint-ML estimates indicate that perceived family support reduces the victimisation probability significantly across all bullying and maltreatment measures (except physical school bullying and domestic fun/teasing). Family support corresponds to the most prominent victimisation determinant following past bullying incidence (see Table 3). This is in agreement with studies such as Henningsen (2009) and Eriksen et al. (2014). Family support, particularly the quality of the supportive relationship, confers emotional resilience against victimisation acting as a buffer against decreasing levels of self-esteem (Ttofi et al., 2014).

The error correlation among the shared random effects of the structural and reduced form equations is statistically insignificant across all joint-ML balanced estimates (see bottom of Table 3). Conclusively, the unobserved factors underlying victimisation are unrelated to the individual-specific latent factors determining perceived family support.

The dynamic changes in victimisation status and, initial period victimisation are explicitly accounted for in the balanced sample models. This reduces the impact of the latent factors and produces the exogeneity of perceived family support in the structural

equation in Table 3. The initial condition is a parameterisation of the unobserved individual heterogeneity underlying victimisation propensity and, explicitly including previous victimisation occurrence partials out the prospective potential response of parental support.

To provide a structural interpretation, and not merely achieve functional identification, the victimisation models contain perceived family support while the entire family interaction environment (talk/argument frequencies) enters explicitly only in the reduced form models of family support determination. The reduced form estimates provide insight into the mechanisms through which suboptimal family interaction affects support feelings: not talking to mum/dad and persistently arguing with mum significantly diminish perceived family support in turn, indirectly augmenting victimisation occurrence (see bottom part of Table 3).

The structural identification assumption is that the family interaction environment is a direct determinant of family support and does not directly affect victimisation incidence. We estimated single equation victimisation models including perceived family support and all of the family interaction environment variables. The respective results (available upon request) reinforce our argument since they indicate that family support significantly reduces victimisation while the addition of the family interaction environment variables does not have an impact.

The balanced samples estimates (in Table 3) reveal that, even after controlling for the unobserved effect, the most powerful predictor of adolescent victimisation (in terms of coefficient magnitude) is high past victimisation incidence. There is a gradient across the estimated effects of past victimisation status increasing in bullying intensity. Hence, bullying intensity is inversely related to the likelihood of escaping victimisation. This is an alarming result highlighting the inability of frequently bullied adolescents

to escape victimisation. Concerning aggregate school/other forms of school bullying and verbal domestic maltreatment, initial period victimisation status has a significant impact. It is plausible that unobserved behavioural and physical traits precondition these victimisation forms.

4.2   Unbalanced Panel Samples

We perform joint-ML estimations using both complete case analysis (CCA) and multiple imputation (MI). The CCA estimated parameters are similar to the MI estimates though, statistical significance is improved due to the larger corresponding sample sizes (see bottom of Table 4). The low variability between the CCA and MI estimated joint-ML parameters establishes the robustness of our estimations and, signifies that missingness is ignorable (see Sidi and Harel, 2018). We additionally estimate balanced sample joint-ML multiple imputation (MI) models giving equivalent results to the CCA balanced sample estimates in Table 3. Imputation of incomplete cases in the balanced case produces small sample increases and, therefore we concentrate on the MI unbalanced joint-ML estimates.

The MI joint-ML estimates use 200 imputations to impute missing values of the explanatory variables coming from the youth respondent data files indicated at the bottom of Table 4. The corresponding unbalanced sample sizes prior to imputing missing cases and after imputation are given at the bottom of Table 4. The fraction of missing information is not substantial and the estimates using 50, 100 or 200 multiple imputations are similar (see von Hippel, 2018). All additional estimates mentioned in this Section are available upon request.

Unlike the balanced models (in Table 3), the unbalanced estimations reveal strongly

statistically significant error correlations among the shared random effects (see bottom of Table 4). This signifies that the unobserved individual factors underlying adolescent victimisation tend to occur with the unobserved factors determining perceived family support. Consequently, family support is endogenous and failing to account for this biases its estimated impact negatively/positively when the correlation is positive/negative. Notably the error correlation is negative regarding non-domestic victimisation (columns 1, 3, 5, 9, bottom of Table 4) and indirect domestic victimisation (columns 7, 8, bottom of Table 4) while, it is positive in the case of direct domestic victimisation - (see columns 2, 4, 6, bottom of Table 4).

Intuitively the unobserved factors increasing non-domestic victimisation/indirect domestic victimisation likelihood, are related to the latent factors reducing perceived family support. This indicates that individuals victimised at school/non-domestically are either less likely to tell their parents/families (e.g. due to fear of retaliation/shame and stigmatisation) and/or their parents are less likely to detect victimisation. On the other hand it seems that parents can observe direct domestic victimisation more effectively, unlike the less obvious indirect maltreatment by siblings. Adjusting for the fact the latent factors driving non-domestic (and indirect domestic) victimisation are related to the unobservables reducing family support, produces the corresponding reduction in the perceived family support coefficients in Table 4 (columns 1, 3, 5, 7, 8, 9) compared to single equation victimisation models ignoring simultaneity. Hence, accounting for the joint determination of the two outcomes, reduces the role of family support as a protective factor against non-domestic victimisation and indirect domestic victimisation.

Finally, the family interaction environment (not talking/arguing to/with mum/dad) has a more prominent impact in the reduced form for family support in Table 4 (as

opposed to Table 3) enhancing structural identification and, indicating the importance of the quality of the family relationship (see Ttofi et al., 2014). For a recent analysis of the work-family interface in shaping child health outcomes see Vahedi et al., (2018).

4.3   Other Results

Reporting victimisation and strong family support are negatively associated with age in the unbalanced estimates (Table 4). There is evidence that the tendency to hide bullying victimisation and feelings, becomes more pronounced with age which could rationalise both effects (see Naylor and Cowey, 1999; Smith and Shu, 2000; Naylor et al., 2001). An alternative explanation could be that individual coping strategies against victimisation improve with age. Unlike Naylor et al. (2001) and Smith and Shu (2000) we do not observe whether adolescents in our dataset report to someone (family, teacher, friend) that they have been bullied nor do we have information on bullying coping strategies (as in Naylor et al., 2001) and thus, we cannot explore further this effect. Finally, the meta-analysis by Pouwels et al. (2016) found a larger increase in adolescent victimisation persistence with age for peer-reports than for self-reports. While this aligns with the negative age impact in our study (which uses self-reports instead of peer nominations), it should be born in mind that peers may rely on past established reputations than actual victimisation incidents (see Scholte et al., 2013; Pouwels, 2016).

Parental school interest has a strong impact (augmenting family support and reducing victimisation likelihood) in both equations of the unbalanced sample joint-MLE in Table 4 and, the reduced form only regarding the balanced joint-MLE in Table 3. This aligns with the literature on protective factors against bullying (see Ttofi, 2014). In all

respects, the estimated effect of parental school interest is of lower magnitude compared to family support in reduced form CCA/MI unbalanced estimations not accounting for the endogeneity of family support (available upon request).

Low household income increases the likelihood of non-domestic victimisation in the cases of physical school and general bullying (GenBull), recalling the relatively strong correlation of the latter with school bullying forms- (see Tables 3 and 4). It is likely that lower income students attend schools in economically disadvantaged areas with less resources and higher bullying incidence (see Carbone-Lopez et al., 2010; Eriksen et al., 2014). Using the UKHLS question "How often do other pupils at school misbehave or cause trouble in your classes" we find that a higher proportion of peer misbehaviour at school augments all victimisation forms, being this impact stronger in the case of non-domestic victimisation (estimates available upon request). Peer school misbehaviour judgement is likely to be simultaneously determined with bullying incidence and since its inclusion does not alter our conclusions we omitted it from the set of controls.

Finally note that, the reduced form unbalanced sample estimates (bottom of Table 4) reveal that household income is a significant predictor of family support indicating that family poverty can indirectly augment victimisation propensity by reducing the protective role of the family. Economic disadvantage can affect child victimisation via a range of mechanisms including poor parental monitoring and skills, increased parental stress and lower parental incentives to invest time and money in child-rearing (see Ttofi et al., 2014; Doidge et al., 2017). The number of children in the household increases domestic maltreatment as expected, particularly in the unbalanced estimates in Table 4. The number of close friends, on the other hand, significantly reduces non-domestic/school-level victimisation in both Tables 3 and 4 (see Hodges et al., 1999;

Martin and Huebner, 2007 regarding the protective role of friendship).

Prominent gender effects are evident notably in the unbalanced estimates in Table 4. Male adolescents are significantly more likely to suffer all direct forms of victimisation, while girls face a higher risk of having their belongings stolen at home. This aligns with empirical findings that boys are more likely to suffer overt physical/verbal aggression by their peers while girls are more likely to suffer indirect aggression (and be relationally aggressive)- refer to Crick and Grotpeter (1995), Bijttebier and Vertommer (1998) and Carbone-Lopez et al. (2010).

Table 3: Balanced Panels, Bullying, 2009-2013, CCA Joint MLE

	(1) GenBull	(2) GenHome	(3) GenSchool	(4) PhysHome	(5) PhysSchool	(6) VerbalHome	(7) FunTeaseHome	(8) StealHome	(9) OthSchool
Bullied: Random Effects Ordered Probit									
Bullied:Quite a lot/a lot(t-1)	1.5570***	1.2006***	1.1746***	1.0226***	1.6542***	0.6925***	0.9303***	0.8937***	0.7732***
	(0.3163)	(0.1838)	(0.2133)	(0.1664)	(0.3063)	(0.1701)	(0.1628)	(0.1802)	(0.1858)
Bullied:Sometimes(t-1)	0.9095***	0.3281**	0.4661***	0.2814*	0.9105***	0.3174**	0.5568***	0.4873***	0.6199***
	(0.2049)	(0.1310)	(0.1404)	(0.1439)	(0.1894)	(0.1451)	(0.1342)	(0.1385)	(0.1483)
Bullied:Quite a lot/a lot(1)	0.1280	0.1144	0.4522**	0.2278	-0.0084	0.4713***	0.1732	0.1868	0.5358***
	(0.3148)	(0.1819)	(0.2010)	(0.1619)	(0.2957)	(0.1689)	(0.1636)	(0.1728)	(0.1765)
Bullied:Sometimes(1)	0.2082	0.2229*	0.5048***	0.1164	0.2043	0.3534**	-0.0165	0.0114	0.2568*
	(0.2048)	(0.1306)	(0.1437)	(0.1459)	(0.1882)	(0.1451)	(0.1337)	(0.1420)	(0.1535)
Male	0.0013	-0.0524	0.0909	0.0770	0.3036**	-0.0230	-0.0584	-0.2763***	0.0135
	(0.1298)	(0.0995)	(0.1000)	(0.0971)	(0.1249)	(0.0988)	(0.0965)	(0.1000)	(0.0996)
Ln Real House Net Monthly Income p.capita	-0.2649*	0.1670	0.0186	-0.0018	0.0854	-0.0341	0.2572**	0.2032*	-0.0576
	(0.1470)	(0.1193)	(0.1167)	(0.1133)	(0.1480)	(0.1182)	(0.1164)	(0.1199)	(0.1162)
Belong to Social Website	-0.0831	-0.1113	-0.0270	0.0090	0.3272	-0.2115	0.0280	0.6268*	-0.0903
	(0.3595)	(0.3151)	(0.2962)	(0.3041)	(0.3947)	(0.2996)	(0.2947)	(0.3332)	(0.2924)
Close Friends Number	-0.0276	-0.0185	-0.0267*	-0.0161	-0.0473***	-0.0112	-0.0283**	-0.0022	-0.0158
	(0.0216)	(0.0130)	(0.0140)	(0.0126)	(0.0177)	(0.0129)	(0.0130)	(0.0129)	(0.0146)
Number of Children in Household	0.0044	0.1373**	0.0761	0.2017***	0.1004	0.0785	0.0341	0.1941***	0.0458
	(0.0659)	(0.0550)	(0.0525)	(0.0538)	(0.0623)	(0.0538)	(0.0537)	(0.0549)	(0.0523)
London, S.East, S.West, East England	-0.2481*	-0.0368	-0.1769*	-0.0669	-0.2548**	-0.0888	0.0079	0.0660	-0.1801*
	(0.1278)	(0.0982)	(0.0980)	(0.0954)	(0.1227)	(0.0970)	(0.0942)	(0.0992)	(0.0979)
Parental School Interest	-0.0110	-0.2197	-0.0449	-0.0317	-0.2117	-0.1520	-0.2158	-0.2343*	-0.0290
	(0.1719)	(0.1381)	(0.1337)	(0.1367)	(0.1597)	(0.1384)	(0.1348)	(0.1399)	(0.1320)
Perceived Family Support	-0.5946*	-0.5085***	-0.4866**	-0.3938*	-0.1458	-0.3513*	-0.2975	-0.4309**	-0.4806**
	(0.2585)	(0.1931)	(0.2152)	(0.2018)	(0.2255)	(0.2009)	(0.1880)	(0.1921)	(0.2025)
var(ζ_i)	0.7183**	1.0617**	0.7827**	1.1346**	0.8013**	1.1442**	1.0747**	1.0250**	0.7970**
	(0.2921)	(0.4437)	(0.3162)	(0.4493)	(0.3195)	(0.4587)	(0.4336)	(0.4278)	(0.3129)
Perceived Family Support: Random Effects Binary Probit									
Male	0.3546**	0.2912	0.4024**	0.3822*	0.3903**	0.3069	0.2734	0.3139	0.3734**
	(0.1739)	(0.2197)	(0.1804)	(0.2149)	(0.1811)	(0.2191)	(0.2128)	(0.2154)	(0.1785)
Ln(Real House Net Monthly Income p.capita)	0.0764	0.0030	0.1337	-0.0166	0.1051	0.0310	0.0346	-0.0085	0.0997
	(0.1920)	(0.2403)	(0.2008)	(0.2319)	(0.2002)	(0.2411)	(0.2371)	(0.2372)	(0.1989)
Belong to Social Website	-0.2848	0.1117	-0.3329	0.0569	-0.3260	0.0545	-0.3346	0.0943	-0.3072
	(0.4863)	(0.6103)	(0.4945)	(0.5789)	(0.4982)	(0.6059)	(0.5603)	(0.6074)	(0.4923)
Close Friends Number	0.0122	0.0265	0.0146	0.0194	0.0151	0.0227	0.0198	0.0270	0.0120
	(0.0194)	(0.0228)	(0.0197)	(0.0215)	(0.0199)	(0.0224)	(0.0218)	(0.0227)	(0.0195)
Number of children in Household	-0.1400	-0.0789	-0.1328	-0.0959	-0.1352	-0.0738	-0.0756	-0.0823	-0.1420
	(0.0880)	(0.1104)	(0.0913)	(0.1077)	(0.0911)	(0.1096)	(0.1082)	(0.1086)	(0.0911)
London, S.East, S.West, East England	0.0392	-0.1585	-0.0518	-0.0732	-0.0339	-0.1367	-0.1213	-0.1363	-0.0198
	(0.1688)	(0.2131)	(0.1745)	(0.2069)	(0.1750)	(0.2124)	(0.2061)	(0.2081)	(0.1733)
Parental School Interest	1.2640***	1.5026***	1.2740***	1.5041***	1.2661***	1.4716***	1.4764***	1.5312***	1.2333***
	(0.1840)	(0.2347)	(0.1904)	(0.2309)	(0.1913)	(0.2325)	(0.2271)	(0.2330)	(0.1859)
Not Talking to Mum	-0.5889**	-1.1742***	-0.6071**	-1.1641***	-0.6210**	-1.1693***	-1.1724***	-1.1979***	-0.6096**
	(0.2967)	(0.3877)	(0.3006)	(0.3790)	(0.3008)	(0.3863)	(0.3790)	(0.3823)	(0.2997)
m(Not Talking to Mum)	0.2945	1.0556**	0.3474	0.9777*	0.3370	0.9128*	0.9581*	1.0880**	0.3299
	(0.4157)	(0.5355)	(0.4255)	(0.5220)	(0.4263)	(0.5317)	(0.5216)	(0.5290)	(0.4239)
Not Talking to Dad	-0.5570**	-0.7161**	-0.5867**	-0.7546**	-0.5806**	-0.7664**	-0.7207**	-0.6736**	-0.5746**
	(0.2815)	(0.3531)	(0.2840)	(0.3417)	(0.2826)	(0.3438)	(0.3370)	(0.3481)	(0.2824)
m(Not Talking to Dad)	-0.0378	-0.1407	-0.0150	0.0156	-0.0247	-0.0223	-0.0501	-0.1678	-0.0019
	(0.3590)	(0.4438)	(0.3649)	(0.4322)	(0.3644)	(0.4378)	(0.4272)	(0.4365)	(0.3641)
Not Arguing with Mum	0.1307	0.1884	0.1923	0.1271	0.1901	0.1686	0.0078	0.1417	0.1895
	(0.2581)	(0.3068)	(0.2643)	(0.2983)	(0.2649)	(0.3058)	(0.2934)	(0.3014)	(0.2634)
m(Not Arguing with Mum)	0.9720***	1.1615**	0.9379**	1.0957**	0.9048**	1.1011**	1.2365***	1.1928***	0.9499**
	(0.3597)	(0.4513)	(0.3727)	(0.4374)	(0.3693)	(0.4448)	(0.4349)	(0.4442)	(0.3738)
Not Arguing with Dad	0.3428	0.1249	0.2809	0.2697	0.2843	0.1962	0.4082	0.1761	0.2766
	(0.2828)	(0.3526)	(0.2847)	(0.3351)	(0.2856)	(0.3462)	(0.3325)	(0.3460)	(0.2833)
m(Not Arguing with Dad)	-0.5145	-0.4444	-0.5635	-0.4523	-0.5687	-0.5071	-0.6345	-0.4249	-0.4974
	(0.3628)	(0.4551)	(0.3706)	(0.4382)	(0.3717)	(0.4516)	(0.4338)	(0.4440)	(0.3673)
Log Likelihood	-597.831	-780.484	-800.420	-854.256	-614.628	-846.098	-867.729	-778.373	-829.146
Sample Size	752	594	746	642	752	614	626	610	754
Bullied	115	340	251	377	124	366	378	290	236
Error Correlation	0.052	0.022	0.055	0.067	-0.104	-0.088	-0.016	0.049	0.019

Notes: ***, **, and * indicate statistical significance at the 1%, 5% and 10% levels respectively. Standard errors in parentheses. Complete Case Analysis, Generalised Structural Equation Modeling. Both equations include within means for T>2009 of (Belong to Social Website, Close Friends), a 2013 time dummy and, a factor loading. m(Not Arguing with Mum/Dad), m(Not Talking to Mum/Dad) denote within means for T>2009. The structural equation includes two threshold cutpoints and, the reduced form a constant.

Table 4: Unbalanced Panels, Bullying, 2009-2013, Multiple Imputation, Joint MLE

	(1) GenBull	(2) GenHome	(3) GenSchool	(4) PhysHome	(5) PhysSchool	(6) VerbalHome	(7) FunTeaseHome	(8) StealHome	(9) OthSchool
Bullied: Random Effects Ordered Probit									
Male	0.1750***	0.0350	0.1517***	0.1613***	0.4379***	0.0907**	0.0287	-0.1787***	0.0208
	(0.0521)	(0.0392)	(0.0422)	(0.0400)	(0.0476)	(0.0417)	(0.0380)	(0.0387)	(0.0415)
Ln(Real House Net Monthly Income p.capita)	-0.1564***	0.0884**	-0.0060	0.1236***	-0.1109**	0.0862**	0.0991**	0.0335	-0.0098
	(0.0514)	(0.0400)	(0.0412)	(0.0401)	(0.0460)	(0.0417)	(0.0389)	(0.0397)	(0.0411)
Belong to Social Website	-0.0797	0.0870*	0.0401	0.0289	0.0287	0.0641	0.0326	0.1462***	0.0665
	(0.0568)	(0.0456)	(0.0474)	(0.0457)	(0.0530)	(0.0447)	(0.0461)	(0.0461)	(0.0476)
Close Friends Number	-0.0241***	0.0008	-0.0209***	0.0013	-0.0153***	-0.0013	-0.0033	0.0044*	-0.0225***
	(0.0039)	(0.0026)	(0.0030)	(0.0026)	(0.0033)	(0.0027)	(0.0026)	(0.0026)	(0.0031)
Number of Children in Household	0.0104	0.2284***	0.0072	0.2997***	0.0057	0.1843***	0.1032***	0.2047***	0.0085
	(0.0259)	(0.0209)	(0.0213)	(0.0215)	(0.0232)	(0.0219)	(0.0200)	(0.0203)	(0.0210)
London, S.East, S.West, East England	0.0118	-0.0284	0.0056	-0.0477	0.0333	-0.0043	0.0166	-0.0729*	-0.0014
	(0.0524)	(0.0397)	(0.0426)	(0.0404)	(0.0464)	(0.0421)	(0.0384)	(0.0391)	(0.0421)
Parental School Interest	-0.2497***	-0.2042***	-0.2508***	-0.2103***	-0.2227***	-0.2501***	-0.1832***	-0.2466***	-0.2232***
	(0.0626)	(0.0483)	(0.0516)	(0.0512)	(0.0577)	(0.0503)	(0.0500)	(0.0506)	(0.0511)
Perceived Family Support	-0.1884**	-0.8638***	-0.1970***	-0.5378***	-0.0474	-0.6590***	-0.4237***	-0.2809***	-0.1548**
	(0.0886)	(0.0513)	(0.0716)	(0.0773)	(0.0796)	(0.0488)	(0.0794)	(0.0802)	(0.0706)
Age 11	-0.1885**	-0.0467	-0.2084***	-0.1235**	-0.2145***	0.0265	0.1238**	-0.1575**	-0.2010***
	(0.0740)	(0.0613)	(0.0630)	(0.0613)	(0.0682)	(0.0637)	(0.0604)	(0.0612)	(0.0629)
Age 12	-0.3661***	-0.0911	-0.2426***	-0.2177***	-0.3696***	-0.0402	0.1208**	-0.0766	-0.1888***
	(0.0694)	(0.0570)	(0.0579)	(0.0567)	(0.0655)	(0.0586)	(0.0568)	(0.0572)	(0.0580)
Age 13	-0.4636***	-0.1740***	-0.3340***	-0.3908***	-0.4208***	-0.1468**	0.0740	-0.1529**	-0.2823***
	(0.0795)	(0.0628)	(0.0654)	(0.0634)	(0.0725)	(0.0654)	(0.0619)	(0.0626)	(0.0651)
Age 14	-0.7151***	-0.2359***	-0.5382***	-0.5624***	-0.6334***	-0.1644**	0.1437**	-0.1151*	-0.4479***
	(0.0816)	(0.0626)	(0.0657)	(0.0637)	(0.0746)	(0.0647)	(0.0616)	(0.0622)	(0.0652)
Age 15	-0.8256***	-0.3452***	-0.7011***	-0.8325***	-0.8198***	-0.2468***	0.1130*	-0.1427**	-0.6046***
	(0.0884)	(0.0659)	(0.0707)	(0.0683)	(0.0813)	(0.0686)	(0.0643)	(0.0651)	(0.0701)
var(ζ_i)	0.0162	0.0314***	0.0384**	0.0006	0.0700***	0.0006***	0.0093	0.0158	0.0471**
	(0.0111)	(0.0028)	(0.0159)	(0.0022)	(0.0267)	(0.0001)	(0.0104)	(0.0141)	(0.0183)
Perceived Family Support: Random Effects Binary Probit									
Male	-0.0043	-0.0179	0.0007	-0.0152	-0.0027	-0.0150	-0.0112	-0.0274	0.0028
	(0.0342)	(0.0375)	(0.0348)	(0.0363)	(0.0354)	(0.0364)	(0.0367)	(0.0369)	(0.0349)
Ln(Real House Net Monthly Income p.capita)	0.1085***	0.1032**	0.1149***	0.0950**	0.1197***	0.1004**	0.1011**	0.1011**	0.1163***
	(0.0364)	(0.0403)	(0.0366)	(0.0390)	(0.0372)	(0.0392)	(0.0395)	(0.0397)	(0.0367)
Belong to Social Website	-0.0708	-0.0537	-0.0765	-0.0641	-0.0776	-0.0642	-0.0613	-0.0675	-0.0777*
	(0.0458)	(0.0502)	(0.0465)	(0.0488)	(0.0472)	(0.0492)	(0.0493)	(0.0496)	(0.0466)
Close Friends Number	0.0043*	0.0034	0.0039	0.0036	0.0041	0.0039	0.0034	0.0038	0.0038
	(0.0025)	(0.0027)	(0.0025)	(0.0027)	(0.0026)	(0.0027)	(0.0027)	(0.0027)	(0.0025)
Number of Children in Household	-0.0046	0.0068	-0.0057	0.0093	-0.0061	0.0016	0.0025	0.0039	-0.0057
	(0.0176)	(0.0197)	(0.0179)	(0.0191)	(0.0181)	(0.0192)	(0.0194)	(0.0196)	(0.0179)
London, S.East, S.West, East England	-0.1313***	-0.1197***	-0.1269***	-0.1123***	-0.1298***	-0.1183***	-0.1170***	-0.1134***	-0.1305***
	(0.0341)	(0.0373)	(0.0346)	(0.0362)	(0.0352)	(0.0363)	(0.0365)	(0.0367)	(0.0347)
Parental School Interest	0.7910***	0.8376***	0.8011***	0.8148***	0.8093***	0.8118***	0.8319***	0.8257***	0.8010***
	(0.0403)	(0.0437)	(0.0408)	(0.0426)	(0.0419)	(0.0427)	(0.0431)	(0.0435)	(0.0410)
Not Talking to Mum	-0.4100***	-0.3842***	-0.4173***	-0.3842***	-0.4115***	-0.3842***	-0.3916***	-0.3943***	-0.4273***
	(0.0432)	(0.0472)	(0.0438)	(0.0460)	(0.0442)	(0.0461)	(0.0463)	(0.0466)	(0.0440)
Not Talking to Dad	-0.3118***	-0.3398***	-0.3078***	-0.3308***	-0.3159***	-0.3279***	-0.3108***	-0.3143***	-0.3072***
	(0.0378)	(0.0414)	(0.0382)	(0.0406)	(0.0387)	(0.0405)	(0.0408)	(0.0410)	(0.0383)
Not Arguing with Mum	0.3122***	0.3805***	0.3104***	0.3240***	0.3184***	0.3341***	0.3214***	0.3175***	0.3086***
	(0.0377)	(0.0412)	(0.0380)	(0.0409)	(0.0385)	(0.0402)	(0.0410)	(0.0412)	(0.0381)
Not Arguing with Dad	0.1979***	0.2195***	0.1893***	0.2136***	0.1884***	0.2053***	0.2012***	0.1916***	0.1903***
	(0.0379)	(0.0414)	(0.0383)	(0.0406)	(0.0388)	(0.0404)	(0.0407)	(0.0408)	(0.0384)
Age 11	0.0961	0.0864	0.1236*	0.0762	0.1163*	0.0762	0.0953	0.0889	0.1160*
	(0.0635)	(0.0693)	(0.0643)	(0.0674)	(0.0651)	(0.0675)	(0.0679)	(0.0682)	(0.0643)
Age 12	-0.1228**	-0.1413**	-0.1153*	-0.1485**	-0.1252**	-0.1476**	-0.1330**	-0.1351**	-0.1140*
	(0.0612)	(0.0663)	(0.0615)	(0.0647)	(0.0622)	(0.0649)	(0.0651)	(0.0656)	(0.0616)
Age 13	-0.0933	-0.0573	-0.0837	-0.0724	-0.0952	-0.0655	-0.0640	-0.0617	-0.0796
	(0.0627)	(0.0684)	(0.0631)	(0.0666)	(0.0640)	(0.0667)	(0.0670)	(0.0674)	(0.0633)
Age 14	-0.1302**	-0.1378**	-0.1257**	-0.1517**	-0.1298**	-0.1418**	-0.1270*	-0.1405**	-0.1301**
	(0.0627)	(0.0683)	(0.0631)	(0.0665)	(0.0640)	(0.0667)	(0.0671)	(0.0673)	(0.0632)
Age 15	-0.1675***	-0.1297*	-0.1552**	-0.1489**	-0.1689***	-0.1461**	-0.1329**	-0.1411**	-0.1516**
	(0.0631)	(0.0692)	(0.0635)	(0.0672)	(0.0645)	(0.0674)	(0.0678)	(0.0680)	(0.0637)
Sample Size	8,480	7,186	8,479	7,352	8,499	7,287	7,303	7,267	8,502
Sample Size before imputation	7,656	6,519	7,655	6,656	7,670	6,602	6,611	6,585	7,673
Bullied	1,519	3,591	2,779	4,134	1,440	3,838	3,614	2,979	2,502
Error Correlation	-0.703***	0.693***	-0.694***	0.707***	-0.680***	0.707***	-0.702***	-0.699***	-0.690***

Notes: ***, **, and * indicate statistical significance at the 1%, 5% and 10% levels respectively. Standard errors in parentheses. Estimates using 200 Multiple Imputations. Generalised Structural Equation Modeling. Imputed variables by chained equations: Belong to Social Website, Close Friends Number, regional control, Parental School Interest, Not Talking to Mum/Dad, Not Arguing with Mum/Dad. Both equations include 2011 and 2013 time dummies and, a factor loading. The structural equation includes two threshold cutpoints and, the reduced form a constant.

5 Conclusions

We investigate the dynamics and determinants of adolescent victimisation using the youth (aged 10-15) samples from the UKHLS dataset. We analyse the longitudinal evolution of nine measures of school bullying and domestic maltreatment by siblings during 2009-2013 (waves 1, 3 and 5 of the UKHLS). We find that the most powerful protective factor against adolescent victimisation is family support. The quality of the family environment is important while economic disadvantage is a risk factor.

The UKHLS youth sample bullying questions are self-reported which is a potential source of measurement error and a limitation of our study. Cohort datasets used for example by Eriksen et al., (2014) and Gorman et al., (2019) contain parental/teacher and parental/child victimisation questions, respectively. Pouwels et al., (2016) and studies such as Lohre et al., (2011) and Scholte et al., (2013) underlie the importance of informant type (self, peer, parent and teacher reports). Unfortunately, the UKHLS is a household and not a school based survey. The UKHLS child data files, containing information about adult respondents' children, include only one question on whether a child is bullied at school in waves 3, 4 and 5 (but not in wave 1). However, parental responses are unlikely to be a better measure than individual responses concerning school victimisation (the same holds for teacher reports as what occurs in adolescent peer groups takes place outside of their view). Our investigation highlights the need of addressing adolescent victimisation questions to multiple informants in household surveys such as the UKHLS.

Bullying and domestic maltreatment by siblings cannot be ignored since victimisation conduces to internalising and externalising mental health disorders (see Chrysanthou and Vasilakis, 2019). As noted by Heckman (2012) "health economists should consider

the costs and benefits of preventing rather than treating" and our study offers clear guidance for anti-bullying policy design. Prevention efforts should address parental skills deficits, raise public awareness concerning the importance of family support as a protective factor against both domestic and non-domestic victimisation and, intensify school-level interventions at economically disadvantaged areas.

Bullying and maltreatment display persistence across time, notably in the case of high intensity past period victimisation. This is an alarming outcome highlighting the inability of frequently bullied adolescents to escape victimisation. Anti-bullying policy design should encourage victimised adolescents to speak up, lower the stigma of victimisation and provide assurances against retaliation by bullies. Pouwels et al., (2016) also conclude that the average persistence of adolescent peer victimisation without intervention is significantly large to establish the need for prevention and intervention. Prompt interventions are necessary before victimisation becomes resistant to change (see Rueger et al., 2011). Further future research and richer datasets combining individual, peer and school environment information is required in order to promptly identify adolescents at risk.

The importance of family support and the quality of the family environment (parental school interest, talking/arguing frequencies) as buffers against school bullying, obviates the need to involve parents in school anti-bullying programmes (caregiving grandparents should also be involved- see Sadruddin et al., 2019). This is crucial since our study indicates that adolescents victimised non-domestically/at school are less likely to inform their parents/families (e.g. owing to stigmatisation or retaliation fear) and/or their parents are less likely to observe victimisation. In the UK, Section 89 of the Education and Inspections Act 2006 states that maintained schools must have measures to encourage good behaviour and prevent all student bullying forms. Engaging parents/carers is

still a challenge for schools (e.g. some working parents or, those disengaged with their children's education). The DFE-RR751 Case Study offers examples of practices to engage parents including termly parental/carer forums structured as coffee mornings and consultations (see Department for Education, 2018). As these cannot be lawfully enforced and remain at the discretion of schools, alternatives should be explored by the Department for Education: e.g. engaging with psychologists to produce domestic good child-parental communication guides and, parental bullying-tackling leaflets.

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