

The Dynamics and Determinants of Adolescent Bullying Victimization

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- Preadolescence and adolescence are critical developmental periods regarding formation of adult skills and human capital (Heckman, 2006; Van den Berg et al. 2014)
- Bullying adversely affects human capital, socioeconomic outcomes over life course
- Bullying is an anti-social behaviour encompassing physical aggression, threats, teasing, and harassment (Olweus, 1993)

- Adolescent maltreatment impacts on mental health (internalising disorders) leading to withdrawal symptoms, depression (Vaillancourt et al., 2011; McDougall and Vaillancourt, 2015), externalising disorders such as aggression, delinquency (Currie and Tekin, 2012; Reijntjes et al., 2011)
- Bullying can impair cognitive abilities conducing to future reductions in productivity, wages (Brown and Taylor, 2008; Vartia, 2001 Kivimaki et al., 2003; Kaestner and Callison, 2011)
- Chrysanthou and Vasilakis (2018b) study adolescent victimisation impact on life satisfaction, hyperactivity/inattention and emotional symptoms

- Youth self-completion questionnaire (aged 10-15), Understanding Society (UKHLS, UK Household Longitudinal Study), Waves 1-5, 2009-2013
- Longitudinal evolution of 9 types of school/household level bullying during 2009-13
- Youth respondents (aged 10-15) present in 2009 (initial conditions) with no missing values (lagged victimisation status) in any covariates
- Great Britain (England, Scotland and Wales) general population sample, N. Ireland addresses via distinct sample selection mechanism
- Dependent variables (bullying, verbal/physical maltreatment) reported biennially (waves 1,3,5)
- Balanced panels of adolescents consecutively present in 2009, 2011, 2013 (dynamics and initial conditions)

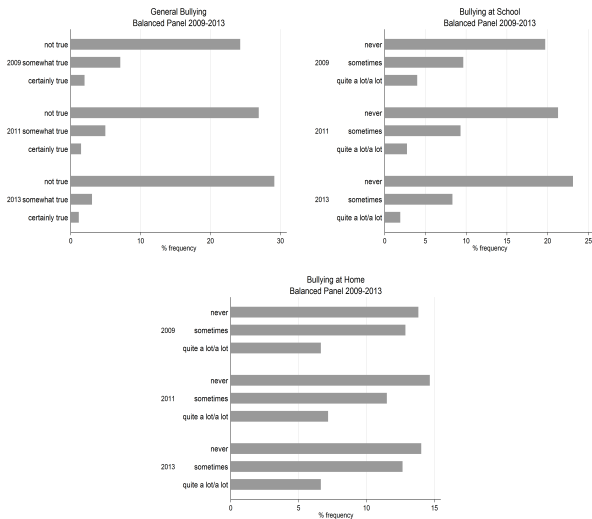
- Matching youth respondents to household level data files: total household net income (without deductions), current household size, number of children in household
- Matching youth respondent files to parental interview files prohibitive in terms of sample attrition
- Family environment: region of residence, parental school interest, perceived family support and, parental conversation/arguing frequency
- Log real household net monthly income: divide total household income by household size. Use ONS CPI (all items) deflator (1988 to 2015: 2005=100)

Measuring Longitudinal Bullying Incidence

- GenBull: Other children/young people pick on me/bully me
- GenHome: Brothers/sisters hit, kick or push you.
Brothers/sisters call you nasty names. Brothers/sisters make fun of you. Brothers/sisters take your belongings
- GenSchool: How often do you get physically bullied at school?
How often do you get bullied in other ways at school?
- 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?

Measuring Longitudinal Bullying Incidence

Figure: Aggregate Bullying Measures



Estimation Methodology, Dynamic Correlated Random Effects (CRE)

- Victimization not optional, reduced-form models

$$y_{it}^* = \mathbf{x}_{it}\boldsymbol{\beta} + \gamma y_{it-1} + \varepsilon_i + \eta_{it}; t = 2, \dots, T; i = 1, \dots, N \quad (1)$$

y_{it}^* latent ordered response of victimisation propensity

$v_{it} = \varepsilon_i + \eta_{it}$, $\eta_{it} \sim N(0, \sigma_\eta^2)$ independently of ε_i .

- Treating ε_i as random drawn with (y_i, \mathbf{x}_i) and assuming $\varepsilon_i | \mathbf{x}_i \sim N(0, \sigma_\varepsilon^2)$ gives consistent estimates only in static models
- y_{it-1} in equation (1) produces initial conditions problem (Heckman 1981a,b)

Estimation Methodology, Dynamic Correlated Random Effects (CRE)

Reported bullying status $y_{it} = j$ for $j \in \{1, \dots, J\}$ observed if latent incidence falls in interval between μ_{j-1} and μ_j :

$$y_{it} = j \quad \text{if} \quad \mu_{j-1} < y_{it}^* \leq \mu_j \quad (2)$$

where $\mu_0 = -\infty$, $\mu_j \leq \mu_{j+1}$ and $\mu_J = \infty$.

Estimation Methodology, Dynamic Correlated Random Effects (CRE)

Under normality of η_{it} , p_{itj} of observing outcome j for y_{it} conditional on $\boldsymbol{\mu} = \{\mu_1, \mu_2, \dots, \mu_{J-1}\}$, \mathbf{x}_{it} , ε_i

$$p_{itj} = Pr(y_{it} = j \mid \boldsymbol{\mu}, \mathbf{x}_{it}, \varepsilon_i) =$$

$$\Phi(\mu_j - \mathbf{x}_{it}\boldsymbol{\beta} - \mathbf{y}_{it-1}\boldsymbol{\gamma} - \varepsilon_i) - \Phi(\mu_{j-1} - \mathbf{x}_{it}\boldsymbol{\beta} - \mathbf{y}_{it-1}\boldsymbol{\gamma} - \varepsilon_i) \quad (3)$$

Cannot disentangle ε_i from individual-specific cutpoint shifts.

Sample log likelihood, integrating out $\varepsilon_i \sim N(0, \sigma_\varepsilon^2)$

$$\ln L(\boldsymbol{\beta}, \boldsymbol{\mu}, \sigma_\varepsilon^2) = \sum_{i=1}^N \ln \int_{-\infty}^{+\infty} \frac{\exp(-\frac{\varepsilon_i^2}{2\sigma_\varepsilon^2})}{\sqrt{2\pi}\sigma_\varepsilon} \left\{ \prod_{t=1}^T Pr(y_{it} = j \mid \boldsymbol{\mu}, \mathbf{x}_{it}, \varepsilon_i) \right\} d\varepsilon_i \quad (4)$$

Initial Conditions in Dynamic CRE

- Behavioural effect: behaviour amendment due to victimisation experience
- Spurious state dependence: temporally correlated unobservables (not past victimisation experience)
- Wooldridge's (2005) initial condition solution incorporating Mundlak (1978)-Chamberlain (1984) specification $\varepsilon_i = \bar{\mathbf{x}}_i \mathbf{a} + \xi_i$, $\xi_i \sim iidN(0, \sigma_\xi^2)$ and is independent of $(\mathbf{x}_{it}, \eta_{it})$ for all (i, t) in (3)
- Under normality

$$\xi_i | y_{i0}, \mathbf{x}_i \sim N(\vartheta_0 + \vartheta_1 y_{i1}, \sigma_\zeta^2) \quad (5)$$

$\xi_i = \vartheta_0 + \vartheta_1 y_{i1} + \zeta_i$ and $\zeta_i | (y_{i1}, \mathbf{x}_i) \sim N(0, \sigma_\zeta^2)$ cannot separately identify ϑ_0 from the cutpoints (μ) . Usual normalisation, $\vartheta_0 = 0$.

Initial Conditions in Dynamic CRE

- Log likelihood function in (4) modified $\mathbf{q}_{it} \equiv (\mathbf{x}_{it}, \mathbf{y}_{it-1}, \mathbf{y}_{i1}, \bar{\mathbf{x}}_i)$
- $\mathbf{y}_{it-1}, \mathbf{y}_{i1}$ denote $J - 1$ lagged, $\mathbf{1}[\mathbf{y}_{it-1} = j]$, initial conditions set of indicators, $\mathbf{1}[\mathbf{y}_{i1} = j], j = 1, \dots, J, \bar{\mathbf{x}}_i = (T - 1)^{-1} \sum_{t=2}^T \mathbf{x}_{it}$

Binary System of Latent Responses

y_{it}^* (victimisation), s_{it}^* (perceived family support)

$$y_{it}^* = \mathbf{x}_{it}\boldsymbol{\beta} + \mathbf{y}_{it-1}\boldsymbol{\gamma} + \tau s_{it} + \mathbf{y}_{i1}\boldsymbol{\vartheta}_1 + \bar{\mathbf{x}}_i\mathbf{a} + \lambda\zeta_i + \eta_{it}; t = 2, \dots, T; i = 1, \dots, N \quad (6)$$

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

$$s_{it}^* = \mathbf{z}_{it}\boldsymbol{\pi} + \theta_0 + \bar{\mathbf{z}}_i\boldsymbol{\psi} + \zeta_i + \omega_{it}; t = 2, \dots, T; i = 1, \dots, N \quad (7)$$

$$s_{it} = \mathbf{1} [s_{it}^* > 0]; t = 2, \dots, T; i = 1, \dots, N$$

$$BIVN(u_{1it} = \lambda\zeta_i + \eta_{it}, u_{2it} = \zeta_i + \omega_{it}), (\zeta_i, \eta_{it}, \omega_{it}) \text{ iid}N(0, 1)$$

$$\Omega \equiv \text{Cov} [(u_{1it}, u_{2it})'] = \begin{pmatrix} \lambda^2 + 1 & \lambda \\ \lambda & 2 \end{pmatrix} \quad (8)$$

$$\rho = \frac{\lambda}{\sqrt{2(\lambda^2 + 1)}}. \quad (9)$$

Joint log-likelihood function

$$\begin{aligned} \ln L = & \sum_{i=1}^N \sum_{t=2}^T \ln [Pr(y_{it} = j \mid \boldsymbol{\mu}, \mathbf{x}_{it}, \mathbf{y}_{it-1}, s_{it}, \mathbf{y}_{i1}, \bar{\mathbf{x}}_i, \zeta_i)] \\ & + \sum_{i=1}^N \sum_{t=2}^T (2s_{it} - 1) \ln [\Phi \{(2s_{it} - 1)(\mathbf{z}_{it}\boldsymbol{\pi} + \theta_0 + \bar{\mathbf{z}}_i\boldsymbol{\psi} + \zeta_i)\}] \end{aligned} \quad (10)$$

where $Pr(y_{it} = j \mid \boldsymbol{\mu}, \mathbf{x}_{it}, \mathbf{y}_{it-1}, s_{it}, \bar{\mathbf{x}}_i, \mathbf{y}_{i1}, \zeta_i)$ denotes probability of observing outcome j for response y_{it} , conditional on $\boldsymbol{\mu} = \{\mu_1, \mu_2, \dots, \mu_{J-1}\}$, $(\mathbf{x}_{it}, \mathbf{y}_{it-1}, s_{it}, \bar{\mathbf{x}}_i, \mathbf{y}_{i1})$ and ζ_i .

FE CMLE with Heterogeneous Thresholds

- FE leaves conditional distribution of ε_i unrestricted but inconsistent MLE (incidental parameters, Heckman (1981b))
- Carro (2007), Carro and Traferri (2012) FE MMLE for dynamic binary/ordered-choice but effective bias reduction requires $T \geq 8$
- CML FE logit, $\sum_{t=1}^T y_{itj}$, to eliminate ε_i , discarding if $0 < \sum_{t=1}^T y_{itj} < T$ does not hold
- CML FE logit (Chamberlain, 1980) for each of $J - 1$ thresholds into which dependent variable can be dichotomised

FE CMLE with Heterogeneous Thresholds

- Jones and Schurer (2011), threshold-specific time-invariant heterogeneity allowing individual cutpoints to differ across individual-specific, but time-invariant attributes
- $\mu_{ij} = \mu_{ij-1} + \tilde{\mu}_{ij}$ where $\tilde{\mu}_{ij}$ individual threshold-specific effect, $\tilde{\mu}_{ij} > 0, \forall i$
- Defining $\alpha_{ij} = \mu_{ij} - \varepsilon_i$ where μ_{ij} is an individual specific threshold assumed to be increasing in categories ($\mu_{ij-1} < \mu_{ij} \forall i, j$)

$$y_{it} = j \quad \text{if} \quad \mu_{ij-1} < y_{it}^* \leq \mu_{ij} \quad (11)$$

where $\mu_{i0} = -\infty, \mu_{ij} \leq \mu_{ij+1}$ and $\mu_{iJ} = \infty$ for $j \in \{1, \dots, J\}$.

- Probability of victimisation status $y_{it} = j$

$$Pr(y_{it} = j \mid \mathbf{x}_{it}, \alpha_{ij}) = \Lambda(\alpha_{ij} - \mathbf{x}_{it}\boldsymbol{\beta}) - \Lambda(\alpha_{ij-1} - \mathbf{x}_{it}\boldsymbol{\beta}), \alpha_{ij} = \mu_{ij} - \varepsilon_i \quad (12)$$

assuming $\eta_{it} \sim \Lambda(0, \frac{\pi^2}{3})$, Λ logistic *cdf*

Average Partial Effects (APEs)

- CRE ordered probit models: expected value of (13) with respect to distribution of $(\mathbf{y}_{i1}, \bar{\mathbf{x}}_i)$
- Calculate first differences of expected value of (13) for discrete variables in \mathbf{x}_{it} , \mathbf{y}_{it-1} or derivatives for continuous variables in \mathbf{x}_{it}

$$\Phi(\mu_j - \mathbf{x}_{it}\beta - \mathbf{y}_{it-1}\gamma - \mathbf{y}_{i1}\vartheta_1 - \bar{\mathbf{x}}_i\mathbf{a}) -$$

$$\Phi(\mu_{j-1} - \mathbf{x}_{it}\beta - \mathbf{y}_{it-1}\gamma - \mathbf{y}_{i1}\vartheta_1 - \bar{\mathbf{x}}_i\mathbf{a}) \quad (13)$$

- CRE partial effects averaged over distribution of unobserved heterogeneity, calculated using population averaged parameters $\mathbf{b}_\xi = \mathbf{b} / \sqrt{(1 + \sigma_\xi^2)}$, \mathbf{b} vector of estimated parameters (see Wooldridge, 2005).

Average Partial Effects(APEs)

- FE CMLE models APEs of discrete, continuous variables in \mathbf{x}_{it} obtained taking first differences of (14) or derivatives
- As Jones and Schurer (2011) we approximate $\hat{\alpha}_{ij}$ using the analytical expression in (14) and also report homogeneous threshold partial effects assuming $\hat{\alpha}_{ij} = 0$

$$\Lambda\left(\hat{\alpha}_{ij} + \mathbf{x}_{it}\hat{\beta}\right), \hat{\alpha}_{ij} \simeq \Lambda^{-1}\left(\bar{y}_i\right) - \bar{\mathbf{x}}_i\hat{\beta} \quad (14)$$

- APEs functions of estimated parameters, sampling variability. Bootstrapped standard errors, 1,500 replications resampling with replacement accounting for individual-level clustering.

Table: CRE Ordered Probits

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	GenBull	GenHome	GenSchool	PhysHome	PhysSchool	VerbalHome	FunTeaseHome	StealHome	OthSchool
Bullied:Quite a lot/a lot(t-1)	1.5544*** (0.3809)	1.0121*** (0.3317)	0.5843 (0.4004)	0.5798** (0.2947)	1.5666*** (0.3521)	0.6788** (0.3268)	0.8566*** (0.2737)	0.8133*** (0.2908)	0.3875 (0.3665)
Bullied:Sometimes(t-1)	0.8723*** (0.2429)	0.2789 (0.2233)	0.0754 (0.2497)	0.0920 (0.2000)	0.7858*** (0.2837)	0.3367 (0.2120)	0.4999*** (0.1714)	0.4774*** (0.1848)	0.3454 (0.2365)
Bullied:Quite a lot/a lot(2009)	0.2813 (0.4217)	0.2704 (0.3309)	1.3204*** (0.4878)	0.6656** (0.3053)	0.2161 (0.4382)	0.5112 (0.3432)	0.2242 (0.2729)	0.3143 (0.2662)	1.0909*** (0.4231)
Bullied:Sometimes(2009)	0.3719 (0.2959)	0.3216 (0.1969)	0.9490*** (0.3052)	0.3594* (0.2039)	0.3506 (0.3028)	0.4031* (0.2169)	0.0458 (0.1675)	0.0092 (0.1763)	0.5179* (0.2727)
Male	0.0024 (0.1337)	-0.0703 (0.1054)	0.0757 (0.1350)	0.0416 (0.1143)	0.3437*** (0.1278)	0.0080 (0.0982)	-0.0682 (0.0990)	-0.3208*** (0.1102)	-0.0146 (0.1238)
Ln(Real House Net Monthly Income p.capita)	-0.2895* (0.1727)	0.1172 (0.1222)	0.0126 (0.1446)	-0.0734 (0.1319)	0.0771 (0.1620)	-0.0584 (0.1128)	0.2451** (0.1196)	0.1882* (0.1128)	-0.0716 (0.1346)
Belong to Social Website	0.0669 (0.3317)	-0.1235 (0.3065)	-0.0128 (0.3574)	0.0017 (0.2622)	0.3267 (0.3121)	-0.1983 (0.2880)	0.0427 (0.3027)	0.6712** (0.3069)	-0.0522 (0.3612)
Close Friends Number	-0.0323* (0.0178)	-0.0174 (0.0130)	-0.0337** (0.0165)	-0.0129 (0.0143)	-0.0548*** (0.0187)	-0.0102 (0.0126)	-0.0272** (0.0128)	-0.0036 (0.0145)	-0.0200 (0.0161)
Number of Children in Household	0.0512 (0.0723)	0.1343** (0.0547)	0.1026 (0.0710)	0.2510*** (0.0642)	0.1114* (0.0619)	0.0722 (0.0565)	0.0486 (0.0566)	0.1878*** (0.0525)	0.0578 (0.0642)
London, S.East, S.West, East England	-0.2539** (0.1277)	-0.0492 (0.1028)	-0.2030 (0.1295)	-0.1122 (0.1141)	-0.2999** (0.1255)	-0.0899 (0.0965)	-0.0119 (0.0953)	0.0667 (0.1052)	-0.1809 (0.1203)
Parental School Interest	-0.0620 (0.1583)	-0.2420* (0.1433)	-0.0085 (0.1630)	-0.0703 (0.1466)	-0.1293 (0.1621)	-0.1338 (0.1318)	-0.2394* (0.1337)	-0.2846** (0.1396)	-0.0469 (0.1578)
Perceived Family Support	-0.4914*** (0.1541)	-0.4195*** (0.1247)	-0.5465*** (0.1679)	-0.2562* (0.1395)	-0.3000** (0.1517)	-0.4516*** (0.1213)	-0.2925** (0.1192)	-0.2771** (0.1341)	-0.4952*** (0.1609)
Log Likelihood	-333.233	-596.078	-541.165	-648.378	-346.197	-642.468	-663.988	-580.970	-568.658
Sample Size	808	632	802	684	810	652	666	648	810
Wald (Global Significance)	188.448	123.913	110.813	125.848	162.714	121.847	122.316	108.940	116.882
Intra-Class Correlation	0.128	0.092	0.374	0.243	0.139	0.032	0.049	0.096	0.296
Intra-Class Correlation (p-value)	0.245	0.299	0.012	0.052	0.233	0.427	0.377	0.271	0.040

Table: Joint MLE, Structural Form

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	GenBull	GenHome	GenSchool	PhysHome	PhysSchool	VerbalHome	FunTeaseHome	StealHome	OthSchool
Bullied: Random Effects Ordered Probit									
Bullied:Quite a lot/a lot(t-1)	1.5570*** (0.3255)	1.2006*** (0.1998)	1.1746*** (0.2124)	1.0226*** (0.1861)	1.6542*** (0.3012)	0.6925*** (0.1766)	0.9303*** (0.1661)	0.8937*** (0.1942)	0.7732*** (0.1980)
Bullied:Sometimes(t-1)	0.9095*** (0.2161)	0.3281** (0.1402)	0.4661*** (0.1372)	0.2814* (0.1469)	0.9105*** (0.1999)	0.3174** (0.1511)	0.5568*** (0.1401)	0.4873*** (0.1344)	0.6199*** (0.1461)
Bullied:Quite a lot/a lot(2009)	0.1280 (0.3251)	0.1144 (0.1856)	0.4522** (0.2010)	0.2278 (0.1702)	-0.0084 (0.2932)	0.4713*** (0.1726)	0.1732 (0.1682)	0.1868 (0.1749)	0.5358*** (0.1867)
Bullied:Sometimes(2009)	0.2082 (0.2324)	0.2229 (0.1363)	0.5048*** (0.1381)	0.1164 (0.1494)	0.2043 (0.1967)	0.3534** (0.1464)	-0.0165 (0.1337)	0.0114 (0.1370)	0.2568* (0.1486)
Male	0.0013 (0.1346)	-0.0524 (0.1001)	0.0909 (0.1069)	0.0770 (0.0997)	0.3036** (0.1231)	-0.0230 (0.1013)	-0.0584 (0.0988)	-0.2763*** (0.0997)	0.0135 (0.1056)
Ln(Real House Net Monthly Income p.capita)	-0.2649 (0.1657)	0.1670 (0.1160)	0.0186 (0.1165)	-0.0018 (0.1110)	0.0854 (0.1490)	-0.0341 (0.1147)	0.2572** (0.1201)	0.2032* (0.1066)	-0.0576 (0.1155)
Belong to Social Website	-0.0831 (0.3124)	-0.1113 (0.3263)	-0.0270 (0.3034)	0.0090 (0.2550)	0.3272 (0.3003)	-0.2115 (0.2967)	0.0280 (0.3188)	0.6268** (0.3196)	-0.0903 (0.3323)
Close Friends Number	-0.0276 (0.0209)	-0.0185 (0.0131)	-0.0267* (0.0148)	-0.0161 (0.0142)	-0.0473** (0.0185)	-0.0112 (0.0129)	-0.0283** (0.0124)	-0.0022 (0.0142)	-0.0158 (0.0147)
Number of Children in Household	0.0044 (0.0663)	0.1373*** (0.0518)	0.0761 (0.0521)	0.2017*** (0.0522)	0.1004* (0.0562)	0.0785 (0.0556)	0.0341 (0.0561)	0.1941*** (0.0509)	0.0458 (0.0519)
London, S.East, S.West, East England	-0.2481** (0.1209)	-0.0368 (0.0988)	-0.1769* (0.0985)	-0.0669 (0.0967)	-0.2548** (0.1185)	-0.0888 (0.0975)	0.0079 (0.0949)	0.0660 (0.0980)	-0.1801* (0.0982)
Parental School Interest	-0.0110 (0.1804)	-0.2197 (0.1478)	-0.0449 (0.1405)	-0.0317 (0.1425)	-0.2117 (0.1599)	-0.1520 (0.1422)	-0.2158 (0.1437)	-0.2343 (0.1465)	-0.0290 (0.1480)
Perceived Family Support	-0.5946** (0.3024)	-0.5085*** (0.1899)	-0.4866* (0.2858)	-0.3938* (0.2254)	-0.1458 (0.2592)	-0.3513* (0.2132)	-0.2975 (0.2015)	-0.4309** (0.2013)	-0.4806* (0.2749)
λ	0.0731 (0.2789)	0.0314 (0.1152)	0.0777 (0.2539)	0.0954 (0.1478)	-0.1486 (0.2271)	-0.1259 (0.1556)	-0.0233 (0.1348)	0.0702 (0.1187)	0.0265 (0.2371)
var(ζ)	0.7183** (0.3054)	1.0617** (0.4600)	0.7827** (0.3258)	1.1346** (0.4646)	0.8013** (0.3296)	1.1442** (0.4744)	1.0747** (0.4456)	1.0250** (0.4427)	0.7970** (0.3251)

Estimations, Joint MLE, Reduced, 2009-13

Table: Joint MLE, Reduced Form

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	GenBull	GenHome	GenSchool	PhysHome	PhysSchool	VerbalHome	FunTeaseHome	StealHome	OthSchool
Perceived Family Support: Random Effects Binary Probit									
Male	0.3546** (0.1715)	0.2912 (0.2165)	0.4024** (0.1795)	0.3822* (0.2136)	0.3903** (0.1799)	0.3069 (0.2151)	0.2734 (0.2073)	0.3139 (0.2116)	0.3734** (0.1758)
Ln(Real House Net Monthly Income p.capita)	0.0764 (0.1841)	0.0030 (0.2419)	0.1337 (0.1914)	-0.0166 (0.2234)	0.1051 (0.1907)	0.0310 (0.2422)	0.0346 (0.2361)	-0.0085 (0.2375)	0.0997 (0.1883)
Belong to Social Website	-0.2848 (0.3989)	0.1117 (0.4166)	-0.3329 (0.4067)	0.0569 (0.3870)	-0.3260 (0.4142)	0.0545 (0.4079)	-0.3346 (0.4857)	0.0943 (0.4179)	-0.3072 (0.4063)
Close Friends Number	0.0122 (0.0192)	0.0265 (0.0217)	0.0146 (0.0191)	0.0194 (0.0213)	0.0151 (0.0195)	0.0227 (0.0217)	0.0198 (0.0212)	0.0270 (0.0219)	0.0120 (0.0192)
Number of Children in Household	-0.1400 (0.0904)	-0.0789 (0.1145)	-0.1328 (0.0920)	-0.0959 (0.1103)	-0.1352 (0.0916)	-0.0738 (0.1136)	-0.0756 (0.1130)	-0.0823 (0.1126)	-0.1420 (0.0919)
London, S.East, S.West, East England	0.0392 (0.1664)	-0.1585 (0.2145)	-0.0518 (0.1730)	-0.0732 (0.2086)	-0.0339 (0.1731)	-0.1367 (0.2142)	-0.1213 (0.2074)	-0.1363 (0.2089)	-0.0198 (0.1715)
Parental School Interest	1.2640*** (0.1990)	1.5026*** (0.2587)	1.2740*** (0.2042)	1.5041*** (0.2521)	1.2661*** (0.2023)	1.4716*** (0.2532)	1.4764*** (0.2439)	1.5312*** (0.2563)	1.2333*** (0.2023)
Not Talking to Mum	-0.5889* (0.3438)	-1.1742*** (0.4048)	-0.6071* (0.3566)	-1.1641*** (0.3854)	-0.6210* (0.3547)	-1.1693*** (0.3979)	-1.1724*** (0.3799)	-1.1979*** (0.3949)	-0.6096* (0.3521)
m(Not Talking to Mum)	0.2945 (0.4561)	1.0556* (0.5689)	0.3474 (0.4793)	0.9777* (0.5386)	0.3370 (0.4833)	0.9128 (0.5571)	0.9581* (0.5386)	1.0880** (0.5535)	0.3299 (0.4727)
Not Talking to Dad	-0.5570* (0.2875)	-0.7161* (0.3736)	-0.5867** (0.2935)	-0.7546** (0.3612)	-0.5806** (0.2907)	-0.7664** (0.3622)	-0.7207** (0.3517)	-0.6736* (0.3656)	-0.5746** (0.2896)
m(Not Talking to Dad)	-0.0378 (0.3603)	-0.1407 (0.4521)	-0.0150 (0.3688)	0.0156 (0.4366)	-0.0247 (0.3692)	-0.0223 (0.4416)	-0.0501 (0.4288)	-0.1678 (0.4445)	-0.0019 (0.3649)
Not Arguing with Mum	0.1307 (0.2469)	0.1884 (0.2842)	0.1923 (0.2557)	0.1271 (0.2734)	0.1901 (0.2571)	0.1686 (0.2869)	0.0078 (0.2878)	0.1417 (0.2768)	0.1895 (0.2532)
m(Not Arguing with Mum)	0.9720*** (0.3399)	1.1615*** (0.4243)	0.9379** (0.3710)	1.0957** (0.4267)	0.9048** (0.3559)	1.1011*** (0.4199)	1.2365*** (0.4205)	1.1928*** (0.4151)	0.9499** (0.3756)
Not Arguing with Dad	0.3428 (0.2794)	0.1249 (0.3414)	0.2809 (0.2788)	0.2697 (0.3160)	0.2843 (0.2819)	0.1962 (0.3399)	0.4082 (0.3336)	0.1761 (0.3302)	0.2766 (0.2753)
m(Not Arguing with Dad)	-0.5145 (0.3463)	-0.4444 (0.4361)	-0.5635 (0.3589)	-0.4523 (0.4173)	-0.5687 (0.3616)	-0.5071 (0.4319)	-0.6345 (0.4188)	-0.4249 (0.4255)	-0.4974 (0.3547)
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
Error Correlation	0.052	0.022	0.055	0.067	-0.104	-0.088	-0.016	0.049	0.019

Table: APEs, CRE Ordered Probits, No Bullying Incidence

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	GenBull	GenHome	GenSchool	PhysHome	PhysSchool	VerbalHome	FunTeaseHome	StealHome	OthSchool
No Bullying Incidence, Bullying=1									
Bullied:Quite a lot/a lot(t-1)	-0.4100*** (0.1285)	-0.3161*** (0.0824)	-0.1546 (0.1241)	-0.1750* (0.0955)	-0.4267*** (0.1325)	-0.2272*** (0.0765)	-0.2751*** (0.0697)	-0.2732*** (0.0855)	-0.1055 (0.1109)
Bullied:Sometimes(t-1)	-0.1883*** (0.0678)	-0.0916 (0.0606)	-0.0184 (0.0635)	-0.0271 (0.0594)	-0.1714** (0.0783)	-0.1121** (0.0563)	-0.1648*** (0.0508)	-0.1593*** (0.0580)	-0.0913 (0.0692)
Male	-0.0004 (0.0234)	0.0231 (0.0353)	-0.0183 (0.0335)	-0.0123 (0.0348)	-0.0614*** (0.0227)	-0.0027 (0.0331)	0.0230 (0.0330)	0.1074*** (0.0363)	0.0037 (0.0305)
Ln(Real House Net Monthly Income p.capita)	0.0494 (0.0307)	-0.0385 (0.0408)	-0.0030 (0.0351)	0.0217 (0.0390)	-0.0136 (0.0287)	0.0196 (0.0383)	-0.0827** (0.0400)	-0.0624 (0.0386)	0.0181 (0.0352)
Belong to Social Website	-0.0112 (0.0592)	0.0402 (0.0949)	0.0031 (0.0874)	-0.0005 (0.0763)	-0.0520 (0.0582)	0.0651 (0.0884)	-0.0144 (0.1034)	-0.2126** (0.0846)	0.0133 (0.0922)
Close Friends Number	0.0055 (0.0035)	0.0057 (0.0044)	0.0082* (0.0043)	0.0038 (0.0045)	0.0097*** (0.0036)	0.0034 (0.0044)	0.0092** (0.0045)	0.0012 (0.0050)	0.0051 (0.0045)
Number of Children in Household	-0.0088 (0.0132)	-0.0442** (0.0183)	-0.0248 (0.0163)	-0.0741*** (0.0181)	-0.0197* (0.0107)	-0.0242 (0.0187)	-0.0164 (0.0192)	-0.0623*** (0.0178)	-0.0146 (0.0155)
London, S.East, S.West, East England	0.0429** (0.0218)	0.0162 (0.0339)	0.0490 (0.0322)	0.0332 (0.0338)	0.0524** (0.0222)	0.0302 (0.0317)	0.0040 (0.0346)	-0.0221 (0.0346)	0.0456 (0.0297)
Parental School Interest	0.0107 (0.0279)	0.0795* (0.0474)	0.0021 (0.0389)	0.0207 (0.0440)	0.0236 (0.0325)	0.0447 (0.0454)	0.0798* (0.0447)	0.0955** (0.0485)	0.0119 (0.0406)
Perceived Family Support	0.0940*** (0.0316)	0.1373*** (0.0403)	0.1403*** (0.0403)	0.0750* (0.0406)	0.0571* (0.0299)	0.1489*** (0.0383)	0.0975** (0.0397)	0.0931** (0.0457)	0.1335*** (0.0436)

Table: APEs, CRE Ordered Probits, Intermediate Bullying Incidence

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	GenBull	GenHome	GenSchool	PhysHome	PhysSchool	VerbalHome	FunTeaseHome	StealHome	OthSchool
Intermediate Bullying Incidence, Bullying \in (1,2]									
Bullied:Quite a lot/a lot(t-1)	0.2123*** (0.0442)	0.0244 (0.0212)	0.0938 (0.0643)	0.0272** (0.0126)	0.2254*** (0.0470)	0.0106 (0.0095)	-0.0072 (0.0169)	0.0632*** (0.0154)	0.0516 (0.0478)
Bullied:Sometimes(t-1)	0.1263*** (0.0434)	0.0263 (0.0181)	0.0120 (0.0416)	0.0055 (0.0121)	0.1141** (0.0495)	0.0136* (0.0078)	0.0172** (0.0078)	0.0539*** (0.0189)	0.0459 (0.0340)
Male	0.0003 (0.0155)	-0.0068 (0.0107)	0.0120 (0.0219)	0.0025 (0.0073)	0.0417** (0.0166)	0.0004 (0.0048)	-0.0033 (0.0052)	-0.0410*** (0.0146)	-0.0019 (0.0157)
Ln(Real House Net Monthly Income p.capita)	-0.0326 (0.0202)	0.0113 (0.0123)	0.0020 (0.0228)	-0.0045 (0.0081)	0.0092 (0.0194)	-0.0027 (0.0056)	0.0117* (0.0066)	0.0231 (0.0147)	-0.0093 (0.0180)
Belong to Social Website	0.0074 (0.0383)	-0.0105 (0.0250)	-0.0020 (0.0552)	0.0001 (0.0175)	0.0360 (0.0351)	-0.0057 (0.0113)	0.0022 (0.0207)	0.1034** (0.0482)	-0.0068 (0.0452)
Close Friends Number	-0.0036 (0.0023)	-0.0017 (0.0013)	-0.0053* (0.0028)	-0.0008 (0.0010)	-0.0065*** (0.0024)	-0.0005 (0.0007)	-0.0013 (0.0008)	-0.0004 (0.0019)	-0.0026 (0.0023)
Number of Children in Household	0.0058 (0.0087)	0.0129** (0.0056)	0.0162 (0.0107)	0.0154*** (0.0049)	0.0133* (0.0071)	0.0034 (0.0028)	0.0023 (0.0029)	0.0231*** (0.0071)	0.0075 (0.0080)
London, S.East, S.West, East England	-0.0286* (0.0148)	-0.0048 (0.0101)	-0.0321 (0.0212)	-0.0070 (0.0074)	-0.0355** (0.0154)	-0.0043 (0.0050)	-0.0006 (0.0052)	0.0082 (0.0128)	-0.0237 (0.0156)
Parental School Interest	-0.0071 (0.0183)	-0.0199* (0.0110)	-0.0013 (0.0254)	-0.0041 (0.0086)	-0.0158 (0.0217)	-0.0051 (0.0053)	-0.0074 (0.0049)	-0.0318** (0.0146)	-0.0061 (0.0208)
Perceived Family Support	-0.0613*** (0.0212)	-0.0306*** (0.0092)	-0.0874*** (0.0242)	-0.0126** (0.0064)	-0.0381* (0.0200)	-0.0086 (0.0067)	-0.0084 (0.0051)	-0.0315** (0.0149)	-0.0648*** (0.0201)

Table: APEs, CRE Ordered Probits, High Bullying Incidence

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	GenBull	GenHome	GenSchool	PhysHome	PhysSchool	VerbalHome	FunTeaseHome	StealHome	OthSchool
High Bullying Incidence, Bullying >2									
Bullied:Quite a lot/a lot(t-1)	0.1978** (0.0937)	0.2917*** (0.0942)	0.0607 (0.0624)	0.1478* (0.0872)	0.2013** (0.0969)	0.2165*** (0.0773)	0.2823*** (0.0814)	0.2100*** (0.0795)	0.0539 (0.0643)
Bullied:Sometimes(t-1)	0.0620** (0.0267)	0.0653 (0.0434)	0.0064 (0.0221)	0.0216 (0.0478)	0.0573* (0.0309)	0.0985** (0.0502)	0.1476*** (0.0477)	0.1055*** (0.0409)	0.0455 (0.0358)
Male	0.0001 (0.0080)	-0.0163 (0.0249)	0.0064 (0.0118)	0.0097 (0.0277)	0.0197*** (0.0071)	0.0023 (0.0285)	-0.0197 (0.0282)	-0.0663*** (0.0229)	-0.0018 (0.0149)
Ln(Real House Net Monthly Income p.capita)	-0.0168 (0.0110)	0.0273 (0.0289)	0.0011 (0.0124)	-0.0172 (0.0311)	0.0045 (0.0095)	-0.0169 (0.0330)	0.0709** (0.0347)	0.0392 (0.0243)	-0.0088 (0.0173)
Belong to Social Website	0.0038 (0.0213)	-0.0297 (0.0742)	-0.0011 (0.0332)	0.0004 (0.0608)	0.0160 (0.0332)	-0.0594 (0.0852)	0.0122 (0.0874)	0.1092*** (0.0383)	-0.0065 (0.0477)
Close Friends Number	-0.0019 (0.0012)	-0.0041 (0.0032)	-0.0028* (0.0016)	-0.0030 (0.0036)	-0.0032** (0.0013)	-0.0029 (0.0038)	-0.0079** (0.0038)	-0.0008 (0.0032)	-0.0025 (0.0022)
Number of Children in Household	0.0030 (0.0046)	0.0312** (0.0133)	0.0086 (0.0058)	0.0587*** (0.0147)	0.0064* (0.0038)	0.0209 (0.0162)	0.0141 (0.0165)	0.0392*** (0.0115)	0.0071 (0.0076)
London, S.East, S.West, East England	-0.0143* (0.0074)	-0.0114 (0.0239)	-0.0169 (0.0113)	-0.0262 (0.0267)	-0.0169** (0.0076)	-0.0259 (0.0270)	-0.0034 (0.0296)	0.0140 (0.0220)	-0.0220 (0.0144)
Parental School Interest	-0.0037 (0.0097)	-0.0595 (0.0377)	-0.0007 (0.0137)	-0.0166 (0.0358)	-0.0078 (0.0110)	-0.0396 (0.0411)	-0.0724* (0.0430)	-0.0637* (0.0350)	-0.0058 (0.0199)
Perceived Family Support	-0.0327*** (0.0117)	-0.1067*** (0.0352)	-0.0529*** (0.0179)	-0.0624* (0.0356)	-0.0190* (0.0106)	-0.1404*** (0.0397)	-0.0891** (0.0388)	-0.0616* (0.0316)	-0.0687*** (0.0250)
Sample Size	808	632	802	684	810	652	666	648	810

Table: CMLE, APE, FE Logit, Heterogeneous Thresholds, Bullying > 1: Intermediate/High Bullying Incidence

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	GenBull	GenHome	GenSchool	PhysHome	PhysSchool	VerbalHome	FunTeaseHome	StealHome	OthSchool
Ln(Real House Net Monthly Income p.capita)	-0.1498 (0.1003)	-0.0035 (0.0842)	0.0371 (0.0768)	-0.0545 (0.0689)	0.0674 (0.0997)	0.0766 (0.0785)	-0.0246 (0.0753)	-0.0372 (0.0857)	-0.0032 (0.0736)
Belong to Social Website	-0.1963*** (0.0717)	0.0111 (0.0575)	-0.0197 (0.0522)	-0.0402 (0.0528)	-0.1062* (0.0597)	-0.0321 (0.0550)	0.0250 (0.0510)	0.0700 (0.0538)	0.0171 (0.0518)
Close Friends Number	-0.0108 (0.0074)	-0.0084* (0.0047)	-0.0089** (0.0036)	-0.0042 (0.0047)	-0.0045 (0.0045)	-0.0057 (0.0043)	-0.0121*** (0.0042)	-0.0029 (0.0039)	-0.0097** (0.0039)
Number of Children in Household	0.0942 (0.0696)	0.0798 (0.0508)	0.1095* (0.0611)	0.1306** (0.0548)	0.0402 (0.0639)	0.0463 (0.0588)	0.0576 (0.0565)	-0.0061 (0.0521)	0.1034 (0.0640)
Parental School Interest	-0.1059 (0.0777)	-0.0044 (0.0632)	-0.0633 (0.0669)	0.0208 (0.0746)	-0.0119 (0.0714)	0.0018 (0.0709)	-0.0064 (0.0660)	-0.0935 (0.0613)	-0.0591 (0.0645)
Perceived Family Support	-0.1236* (0.0714)	-0.1040 (0.0678)	-0.0882 (0.0693)	0.0231 (0.0736)	0.0380 (0.0661)	-0.1995*** (0.0635)	-0.1372** (0.0610)	-0.0880 (0.0601)	-0.1169* (0.0687)
Sample Size	375	498	534	540	384	495	528	537	534

Table: CMLE, APE, FE Logit, Heterogeneous Thresholds, Bullying > 2: High Bullying Incidence

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	GenBull	GenHome	GenSchool	PhysHome	PhysSchool	VerbalHome	FunTeaseHome	StealHome	OthSchool
Ln(Real House Net Monthly Income p.capita)	-0.0860 (0.1645)	-0.1624 (0.1280)	-0.0079 (0.1203)	-0.2459*** (0.0944)	0.2050 (0.2395)	-0.1382 (0.1014)	0.0328 (0.0986)	0.0003 (0.1005)	-0.0525 (0.1119)
Belong to Social Website	-0.1346 (0.1192)	-0.0389 (0.0643)	-0.1965** (0.0865)	-0.0919 (0.0589)	-0.2551** (0.1179)	-0.0219 (0.0642)	-0.0284 (0.0550)	-0.0064 (0.0730)	-0.1707** (0.0814)
Close Friends Number	-0.0043 (0.0145)	-0.0023 (0.0046)	-0.0055 (0.0086)	0.0006 (0.0046)	-0.0121 (0.0099)	-0.0015 (0.0047)	0.0013 (0.0045)	0.0028 (0.0059)	-0.0054 (0.0086)
Number of Children in Household	0.0040 (0.1347)	0.0663 (0.0616)	0.1490 (0.0985)	0.1029** (0.0518)	0.2266 (0.2923)	0.0890 (0.0633)	0.1302** (0.0557)	-0.0020 (0.0778)	0.0638 (0.0914)
Parental School Interest	-0.0599 (0.1543)	-0.0851 (0.0749)	0.1154 (0.0872)	-0.0812 (0.0642)	0.1612 (0.1447)	-0.0080 (0.0605)	-0.0630 (0.0640)	-0.1721** (0.0749)	0.0403 (0.0786)
Perceived Family Support	0.0046 (0.1337)	-0.2309*** (0.0731)	-0.0225 (0.0926)	-0.1709*** (0.0593)	0.0304 (0.1335)	-0.1638*** (0.0618)	-0.1348** (0.0625)	-0.0801 (0.0741)	-0.0295 (0.0953)
Sample Size	129	357	237	480	138	441	456	318	261

Table: CMLE, APE, FE Logit, Homogeneous Thresholds, Bullying > 1: Intermediate/High Bullying Incidence

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	GenBull	GenHome	GenSchool	PhysHome	PhysSchool	VerbalHome	FunTeaseHome	StealHome	OthSchool
Ln(Real House Net Monthly Income p.capita)	-0.0598 (0.0386)	-0.0037 (0.0690)	0.0390 (0.0619)	-0.0544 (0.0597)	0.0721 (0.0725)	0.0833 (0.0652)	-0.0261 (0.0625)	-0.0338 (0.0553)	-0.0034 (0.0599)
Belong to Social Website	-0.0841 (0.0630)	0.0120 (0.0543)	-0.0207 (0.0484)	-0.0400 (0.0495)	-0.1121* (0.0577)	-0.0350 (0.0524)	0.0264 (0.0481)	0.0614 (0.0484)	0.0180 (0.0475)
Close Friends Number	-0.0043 (0.0044)	-0.0091* (0.0047)	-0.0093*** (0.0036)	-0.0042 (0.0043)	-0.0048 (0.0041)	-0.0063 (0.0041)	-0.0128*** (0.0043)	-0.0026 (0.0033)	-0.0103*** (0.0039)
Number of Children in Household	0.0376 (0.0490)	0.0863** (0.0437)	0.1153** (0.0510)	0.1304*** (0.0420)	0.0430 (0.0510)	0.0504 (0.0498)	0.0612 (0.0507)	-0.0055 (0.0381)	0.1094* (0.0568)
Parental School Interest	-0.0477 (0.0435)	-0.0047 (0.0598)	-0.0661 (0.0637)	0.0209 (0.0675)	-0.0127 (0.0635)	0.0019 (0.0672)	-0.0068 (0.0621)	-0.0907 (0.0587)	-0.0630 (0.0617)
Perceived Family Support	-0.0536 (0.0497)	-0.1119* (0.0662)	-0.0920 (0.0677)	0.0232 (0.0678)	0.0412 (0.0621)	-0.2195*** (0.0737)	-0.1521** (0.0649)	-0.0844 (0.0581)	-0.1253* (0.0669)
Sample Size	375	498	534	540	384	495	528	537	534

Table: CMLE, APE, FE Logit, Homogeneous Thresholds, Bullying > 2: High Bullying Incidence

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	GenBull	GenHome	GenSchool	PhysHome	PhysSchool	VerbalHome	FunTeaseHome	StealHome	OthSchool
Ln(Real House Net Monthly Income p.capita)	-0.0583 (0.0733)	-0.0849* (0.0499)	-0.0073 (0.0733)	-0.1032** (0.0422)	0.0340 (0.0534)	-0.1219** (0.0596)	0.0282 (0.0632)	0.0003 (0.0724)	-0.0521 (0.0695)
Belong to Social Website	-0.0961 (0.0875)	-0.0209 (0.0404)	-0.1670* (0.0885)	-0.0409 (0.0371)	-0.0284 (0.0813)	-0.0194 (0.0523)	-0.0241 (0.0448)	-0.0060 (0.0587)	-0.1740** (0.0756)
Close Friends Number	-0.0029 (0.0091)	-0.0012 (0.0029)	-0.0050 (0.0067)	0.0003 (0.0024)	-0.0020 (0.0058)	-0.0013 (0.0038)	0.0011 (0.0035)	0.0026 (0.0049)	-0.0054 (0.0067)
Number of Children in Household	0.0027 (0.0697)	0.0347 (0.0478)	0.1375** (0.0622)	0.0432 (0.0473)	0.0376 (0.0587)	0.0786 (0.0586)	0.1118*** (0.0402)	-0.0019 (0.0576)	0.0632 (0.0686)
Parental School Interest	-0.0421 (0.1074)	-0.0468 (0.0510)	0.1157 (0.0812)	-0.0366 (0.0395)	0.0359 (0.0767)	-0.0071 (0.0499)	-0.0519 (0.0545)	-0.1741** (0.0796)	0.0396 (0.0665)
Perceived Family Support	0.0031 (0.0951)	-0.1397 (0.0878)	-0.0205 (0.0717)	-0.0810 (0.0560)	0.0052 (0.0595)	-0.1564** (0.0632)	-0.1067* (0.0604)	-0.0780 (0.0632)	-0.0293 (0.0772)
Sample Size	129	357	237	480	138	441	456	318	261

Concluding Remarks

- Family support, most effective protective factor (domestic/non-domestic victimisation); economic disadvantage (low family income/regional income per capita) important risk factor
- Family income reduces non-domestic bullying/direct domestic aggression, increases indirect domestic victimisation
- Adolescents attending schools in economically disadvantaged regions face higher risk of victimisation
- Bullying cannot be ignored, high past incidence leads to sustained victimisation (probability to escape/suffer victimisation inversely/positively related to previous period bullying intensity)
- Prevention: address parental skills deficits, school-level interventions at economically disadvantaged regions.