

Targeting victims of school bullying: A hierarchical age-period-cohort analysis of bullying victimization in the United States, 1991-2010

Qiang Fu

Department of Sociology, Duke University, Durham, NC, 27708, USA

Kenneth C. Land

Department of Sociology, Duke University, Durham, NC, 27708, USA

Vicki L. Lamb

Department of Sociology, North Carolina Central University, Durham, NC, 27707, USA

Abstract

By retrieving 20 waves of MTF (*Monitoring the Future*) datasets from 1991 to 2010, this research employed a hierarchical-age-period-cohort (HAPC) analysis to study the prevalence of bullying victimization of 8th, 10th and 12th graders (N=158,240) in the United States. When period and cohort effects are included, both HAPC analysis and a partial analysis of variance (ANOVA) point to the significance of sex, types of families and school performance in shaping the bullying epidemic in the United States. With regard to age, period and cohort effects of bullying victimization, monotonic decreases in victimization prevalence were observed from 8th to 12th graders, whereas a recent increase in bullying victimization was observed for both period and cohort effects.

Data

This research is based on a nationally representative annual survey of youth in the United States, the *Monitoring the Future: A Continuing Study of the Lifestyle and Values of Youth* (MTF) study (<http://monitoringthefuture.org/>). Since 1991, thousands of 8th, 10th and 12th graders from approximately 130 high schools nationwide participate in this survey and respond to a series of questions on values, behaviors, and characteristics of American adolescents. Instructed by MTF research staff, students participate in this annual survey by completing self-administered and machine-readable questionnaires at school. Because students who were targets of school bullying might feel uncomfortable in describing their traumatic experience to interviewers, the information on bullying victimization is collected by the MTF in a self-report fashion, which is regarded as one of the best methods for collecting data on school bullying (Ahmad and Smith 1990). Information of 8th, 10th and 12th graders (N=158,240) interviewed was retrieved from MTF datasets from 1991 to 2010 for the analysis.

Measures

Since 1991, information of four forms of bullying victimization at school (inside or outside or in a school-bus) – being threatened without injury, being threatened with a weapon, being injured without using a weapon and being injured with a weapon – during the last twelve months have been consistently included in the MTF. Respondents who reported any of these four events were regarded as being bullied at school. Moreover, a series of demographic, socioeconomic and behavioral covariates are included in the HAPC analyses: sex (male=1 and female=0), race (white=1 and black=0), types of families (single families=1 and intact families=0), mother's employment (a mother was employed all or nearly all of the time during the time a student was growing up=1 and otherwise=0), parental college education (either or both of the parents completed college), residential location (city=1 and otherwise=0), school performance (GPA), religious attendance (about once a week or more=1 and otherwise=0), religious orientation (religion is very important in a student's life=1 and otherwise=0).

Method

Hierarchical age-period-cohort models are employed to study the prevalence of bullying victimization in the US from 1991 to 2010. The level-1 (within-unit) fixed-effect part of the HAPC model can be expressed as follows:

$$\log \frac{p_{ijk}^{bullied}}{1-p_{ijk}^{bullied}} = \alpha_{ijk} + \beta_{ijk8} grade8 + \beta_{ijk10} grade10 + \sum_{p=1}^P \beta_p X_p + e_{ijk} \quad (1)$$

where $p_{ijk}^{bullied}$ represents the probability of being bullied at school for the i^{th} individual in the j^{th} period of observation and the k^{th} birth cohort. The age (grade) effect is measured by two dummy variables (8th and 10th graders) with the reference category of 12th graders. A series of demographic, socio-economic and behavioral covariates are denoted as X_p .

The level-2 (between-unit) random-effect part of the HAPC model for estimation of period and cohort effects is:

$$\alpha_{ijk} = \tau_0 + t_{0j} + c_{0k} \quad (2)$$

where π_0 is the mean averaged over all periods and cohorts when all level-1 variables (age and its square and cubic terms) are zero; the t_{0j} s are residual random effects of period j averaged over all birth cohorts, which are assumed to be normally distributed with variance τ_{0j} ; and the C_{0k} s are residual random effects of cohort k averaged over all periods of observation, which are assumed to be normally distributed with variance τ_{0k} (Raudenbush and Bryk 2002; Yang and Land 2006). A χ^2 test is conducted to compare whether a model with random period and cohort effects significantly fits data better than a corresponding reduced model without random effects. The HAPC models are estimated by SAS PROC GLIMMIX (Littell et al. 2006). Both birth cohorts and survey years are classified by every two years.

In addition, a partial analysis of variance (ANOVA) is included to complement HAPC analyses. To determine the relative contribution of each covariate to the prevalence of bullying victimization at school, GPA, religious attendance and religious enter the ANOVA using the original coding in the survey, which include nine (ranging from D and C+ to A- and A), four (never, rarely, once or twice a month and about once a week or more) and four (not important, a little important, pretty important and very important) categories, respectively.

Results

- When both random period and cohort effects are included in HAPC analyses, boys, whites, and students from single-parent families or living in cities were significantly associated with higher odds of being bullied, whereas students with a college-educated parent, showing better school performance, regarding religion as very important and attending religious services regularly were associated with significantly lower odds of being bullied, net of other effects.
- Given the fairly large sample size (158,240), standard errors reported in HAPC analyses might not be the sole criterion to determine each covariate's significance in influencing bullying victimization. When grades, birth cohorts and years of survey were taken into account, a partial analysis of variance further demonstrated that a substantial share of explained sum of squares could be attributed to three socio-demographic covariates: sex (male), types of families (single-parent families versus intact families) and school performance (GPA).

Based on results from both HAPC and ANOVA analyses, the age, period and cohort effects of the prevalence of being bullied at school across different socio-demographic groups are predicted using HAPC models.

- Age effects: Monotonic decreases in victimization prevalence were observed from 8th to 12th graders.
- Period effects: There were downward trends from the early 1990s to mid-2000s, when a spike took place.
- Cohort effects: The trends of cohort effects are relatively flat over the period of study, although a mild increase in the prevalence of bullying victimization happened in more recent cohorts.
- As compared with their counterparts, male, students from single-parent families or students showing poorer academic performance have much higher prevalence of bullying victimization with regard to age, period and cohort effects.

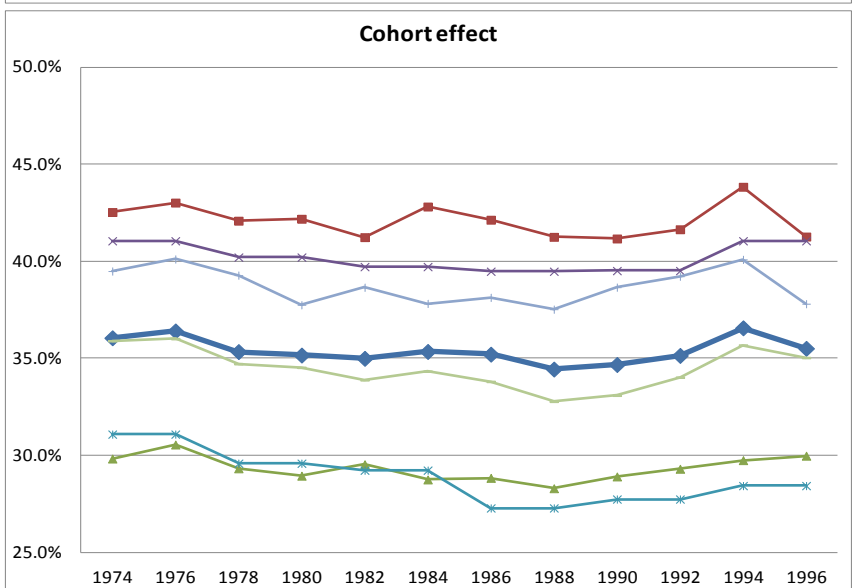
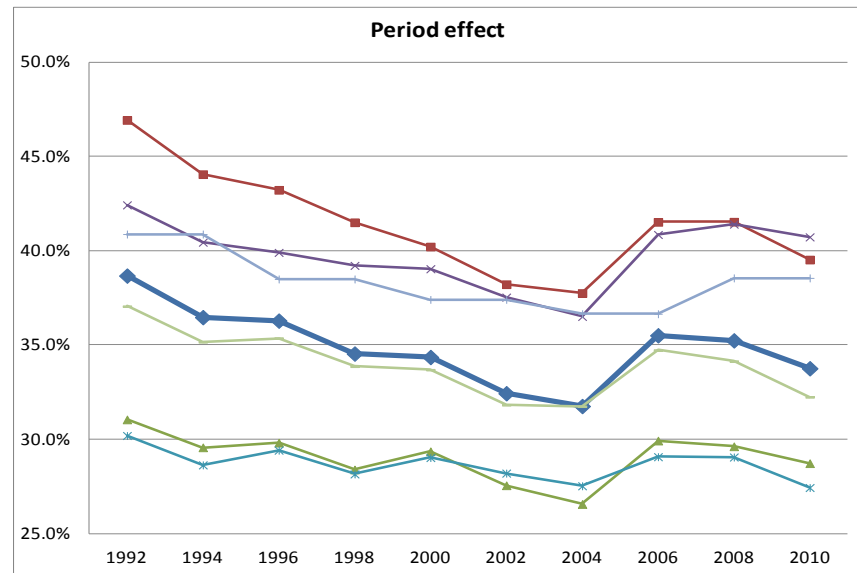
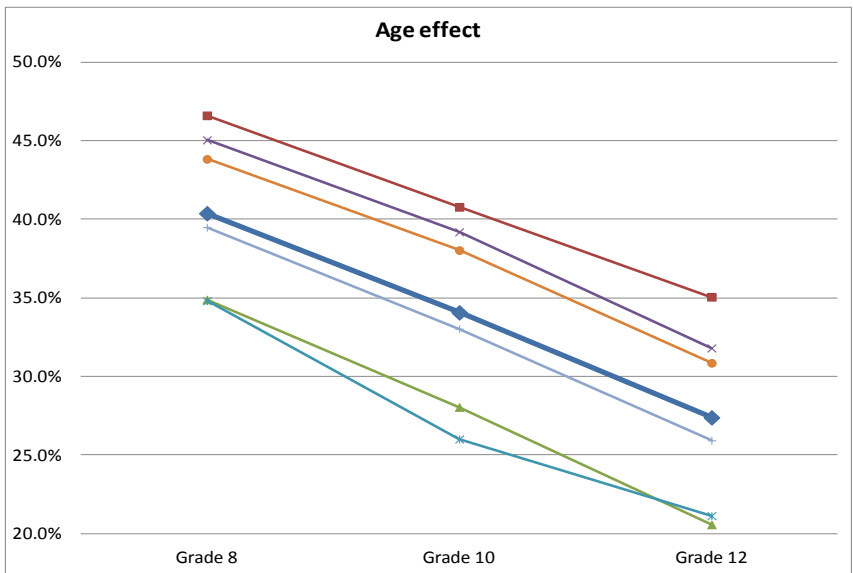
Table 1 A hierarchical age-period-cohort analysis of bullying victimization in the US, 1991-2010: demographic, socio-economic and behavioral characteristics

Fixed effects	Model 1	Model 2	Model 3	Model 4
Intercept	-1.3961***	-0.6404	0.1037	-0.7068***
Grade (grade 12 as reference)				
Grade 8	0.6158***			0.6173***
Grade 10	0.3381***			0.2959***
Male	0.5656***			0.5126***
White	0.05916***			0.1044***
Single-parent family	0.2456***			0.1613***
Mother employment		-0.02986		0.002198
Parental college education		-0.1189***		-0.03333**
Living in cities		0.03775**		0.04236**
GPA			-0.1183***	-0.1037***
Regular religious attendance			-0.05411***	-0.03573**
Religious importance			-0.1167***	-0.08366***
Random effects-variance component				
Period effect	0.09200***	0.9112***	0.9425***	0.07872***
Cohort effect	0.03951**	1.0142***	1.0750***	0.03438**
χ^2 ^a	342.39***	1290.78***	1625.57***	225.30***

^a The likelihood ratio χ^2 test compares the full model with random effects for period and cohort with a reduced model omitting random effects. *p<.05; **p<.01; ***p<.001 (two-tailed tests).

Table 2 Significance of demographic, socio-economic and behavioral factors in determining the prevalence of bullying victimization through a partial analysis of variance

	Partial sum of squares	Degrees of freedom	Mean of squares	P value
Explanatory variables				
Grade	137.5	2	68.77	0.0000
Years of survey	21.25	19	1.118	0.0000
Birth cohorts	8.200	21	0.391	0.0150
Male	491.5	1	491.5	0.0000
White	8.009	1	8.009	0.0000
Single-parent families	31.02	1	31.02	0.0000
Mother employment	0.012	1	0.012	0.8155
Parental college education	1.922	1	1.922	0.0031
Living in cities	2.027	1	2.027	0.0024
GPA	354.6	8	44.32	0.0000
Religious attendance	1.671	3	0.557	0.0543
Religious importance	10.05	3	3.352	0.0000
Model	1581.2	62	25.50	0.0000
Residual	34645.1	158177	0.219	
Total	36226.3	158239	0.229	



- ◆ Overall
- Male
- ▲ Female
- ✕ GPA: B and below
- ✕ GPA: A- and above
- + Single-parent families
- Intact families

Figure 1 Estimated age, period and cohort effects for selective demographic and behavioral groups: sex, types of families and GPA: MTF, 1991-2010