Predictors of bullying behavior and victimization at school: a network approach

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Abstract

Bullying is a very serious problem that previous literature has shown affects a large fraction of students in compulsory schooling. We use a novel social networks approach to study victimization and perpetration of bullying at schools. We use a large database of students from high school students in Spain and collect data from their friendships, as well as individual characteristics. We show that their social network characteristics are strongly predictive of both victimization and perpetration of bullying.

JEL Classification: I21, D91, C91, D85.
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1 Introduction

Schools are important for the creation of human capital, but they are also one of the main generators of social interaction for humans in a phase where they are forming their personalities. They learn to interact and establish friendships that often last a lifetime. But not all relationships at school are positive. Some of them become abusive, and they are often referred with the term "bullying." This behavior can take many forms, from insults, and physical violence, to exclusion from group activities or being the object of malicious rumors.

This is not a minor concern. There is a large body of evidence showing (see e.g. Swearer et al. (2014)) that mental health suffers strong negative impacts by being a victim, perpetrator or even a spectator of bullying. This has prompted a flurry of legislation around the world (Limber and Small (2003), Greene (2006)) to address the problem, as well as the design of interventions (Cantone et al. (2015), Menesini and Salmivalli (2017)).

But laws and interventions might not always work to prevent bullying, and in any case even prevention would benefit from knowing who are the victims, or potential victims. In this context, good predictors of victimhood are very useful for teachers, parents and school administrators. There is already a large literature identifying some of those predictors (Cook et al. (2010),Álvarez-García et al. (2015),Moyano and del Mar Sanchez-Fuentes (2020)). That literature tends to concentrate on personal, family, and school characteristics, in the social, economic and psychological domains. Occasionally, it also uses data on social relationships (Barboza et al. (2009), but in that case it is usually the number of friends.

In this paper, we develop a novel set of predictors of bullying behavior that are based on structural properties of the social network of our experimental participants. Social networks have been used to explain educational performance (Calvó-Armengol et al. (2009)) obesity (Zhang et al. (2018)), crime (Drury et al. (2022)), and drug use (De et al. (2007)). But social networks have been used quite seldom, and in relatively selected samples (De et al. (2007), Huitsing and Veenstra (2012)). We have a large sample, of about three thousand students, from 12 schools in the four years of Secondary Compulsory Education (ESO in its Spanish acronym). We collected observations of their "signed" neighbors (friends and enemies) as well as a large battery of socio-demographic variables, and school performance. In addition, we collected the Cognitive Reflection Test (Brañas-Garza et al. (2019)) and measures of economics preferences, like risk aversion and time preferences.

For each student we also measure, whether they are perceived by others and/or themselves to be victims of bullying. We concentrate our analysis on the individuals who are perceived by others to suffer bullying, but they do not report to be victims. This is because the ones who own to be victims are likely to report it to parents and teachers, and are more likely to be protected. The ones on which we focus are in more serious danger.

The main result is that in terms of network structure, the main predictors for being a victim are a low number of people who declare to be their friend and a high number who declare to be their enemies. Interestingly, there is homophily in victimhood. Having a friend who is a victim increases in a very significant way the likelihood that the person is a victim herself.

There are other variables that show significance for predicting victimhood. Males are more likely to be victims. Having a low value in the cognitive reflection test (that measures impulsivity and correlates negatively with IQ) is a predictor for victimhood, but only in males. Also, a high score in the financial knowledge question is a predictor for being a victim. More surprising, given previous literature, is the fact that having good grades, being an immigrant show no correlation with victimhood. Also, patience shows no relationship with being a victim.

2 Data description

Figure 1 reports the number of observations from each school for which we collected data, by school year (grade). The students in school number 12 did not complete correctly the network data, and they are not used in the analysis.

	Grade				
School	1	2	3	4	Total
1	**118**	**130**	**0**	**0**	**248**
2	**122**	**158**	**125**	**134**	**539**
3	**83**	**88**	**0**	**0**	**171**
4	**30**	**29**	**29**	**28**	**116**
5	**0**	**63**	**58**	**56**	**177**
6	**119**	**117**	**80**	**82**	**398**
9	**0**	**103**	**83**	**93**	**279**
10	**103**	**105**	**108**	**103**	**419**
11	**40**	**50**	**34**	**43**	**167**
12	**53**	**67**	**64**	**54**	**238**
13	**114**	**117**	**117**	**115**	**463**
Total	**782**	**1,027**	**698**	**708**	**3,215**

Figure 1: Number of observations per school and grade

The dependent variable in our analysis is the victim status of the students. They are all asked whether they know any case of a person who is a victim of bullying and they are allowed to mention any person, including themselves.

		Reported by peers	
		Yes	No
Self-reported	Yes	36	42
	No	254	2,645

Table 1: Description of outcome variable

As a function of whether they are mentioned as victims by others, or whether they acknowledge being victims, we consider four types of students.

- **Type I**: Others mark the student as a victim and the student acknowledges being one (intersection).
- **Type II**: Others do not mark the student as a victim but the student acknowledges being one.
- **Type III**: Others mark the student as a victim and the student does not acknowledges being one.
- **Type IV**: Others doe not mark the student as a victim and the student does not acknowledge being one.

Bullying	Male	Female	Total	%
Type I	16	20	36	1.21
Type II	19	23	42	1.41
Type III	175	79	254	8.53
Type IV	1,298	1,347	2,645	88.85
Total	1,508	1,469	2,977	100

Variable description

1. *CRT* Cognitive Reflection Test.
2. *fin* Three basic questions on financial literacy.
3. *SAT* The students are asked how many A's and B's they had in their four main subjects. An A counts 2 points and a B counts 1 point. The total is divided by 8.
4. *patience* A test of time preference.
5. *risky* A test of risk aversion.

6. *happy* The students are asked whether they are happy with their life.

7. *migrant* The students are asked whether they or their parents are born abroad.

8. *grade* The year within the ESO of the student.

9. *indegreef* How many friends the students report they have.

10. *outdegree* How many other students report to be friends of a student.

11. *eigenvectorf* Eigenvector centrality of a students in the friendship network.

12. *outdegreee* How many enemies the students report they have.

13. *indegreee* How many other students report to be enemies of a student.

14. *eigenvectore* Eigenvector centrality of a students in the enmity network.

15. *bullhomof* Percentage of friends who mention that they are also victims (homophily of victimhood in friends).

16. *bullhomoe* Percentage of enemies who mention that they are also victims (homophily of victimhood in enemies).

3 Results

We report logistic regressions of type III victimhood status, with standard errors clustered at the school/classroom level. As can been seen in table 2 for what respects the network structure, the main predictors for being a victim are a low number of people who declare to be their friend and a high number who declare to be their enemies. Interestingly, there is homophily in victimhood. Having a friend who is a victim increases in a very significant way the likelihood that the person is a victim herself.

There are other variables that show significance for predicting victimhood. Males are more likely to be victims. Having a low value in the cognitive reflection test (that measures impulsivity and correlates negatively with IQ) is a predictor for victimhood, but only in males (see table 3). Also, a high score in the financial knowledge question is a predictor for being a victim. More surprising, given previous literature, is the fact that having good grades, being an immigrant show no correlation with victimhood. Also, patience shows no relationship with being a victim. With the exception of the CRT variable, the signs and sizes of all the other coefficients are very similar in males and females (see table 3).

	III vs All	III vs IV	III vs I
female	-1.081***	-1.123***	-0.891
	(0.164)	(0.164)	(0.553)
CRT	-0.687***	-0.730***	1.809**
	(0.257)	(0.261)	(0.891)
fin	0.658***	0.643***	1.249
	(0.227)	(0.229)	(1.079)
SAT	-0.662	-0.603	-0.973
	(0.423)	(0.418)	(1.591)
patience	0.014	0.023	-0.137
	(0.038)	(0.038)	(0.129)
risky	0.089	0.095	0.364
	(0.070)	(0.071)	(0.265)
happy	-0.003	-0.033	0.560***
	(0.034)	(0.034)	(0.084)
migrant	0.004	0.007	-0.024*
	(0.009)	(0.010)	(0.015)
grade	-0.113	-0.142	0.490*
	(0.086)	(0.088)	(0.266)
outdegreef	0.006	0.007	-0.052**
	(0.008)	(0.008)	(0.021)
indegreef	-0.101***	-0.105***	0.034
	(0.020)	(0.020)	(0.057)
eigenvectorf	0.083	0.052	5.031
	(1.526)	(1.537)	(3.111)
outdegreee	-0.000	0.002	-0.010
	(0.009)	(0.008)	(0.014)
indegreee	0.126***	0.131***	-0.072
	(0.016)	(0.016)	(0.053)
eigenvectore	0.658	0.628	-
	(0.874)	(0.847)	-
bullhomof	2.024***	2.069***	1.499
	(0.404)	(0.381)	(1.652)
bullhomoe	-0.249	-0.339	1.701**
	(0.263)	(0.274)	(0.819)
Constant	-1.563***	-1.224**	-4.613***
	(0.590)	(0.593)	(1.487)
Observations	2,773	2,695	259
Pseudo R-squared	0.155	0.166	0.360

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 2: Results

	III vs All		III vs IV		III vs I	
	(1)	(2)	(3)	(4)	(5)	(6)
	Male	Female	Male	Female	Male	Female
CRT	-0.738**	-0.585	-0.780**	-0.641	1.579	3.620**
	(0.336)	(0.394)	(0.333)	(0.398)	(1.788)	(1.733)
fin	0.598**	0.785*	0.578*	0.740*	2.416	0.299
	(0.292)	(0.411)	(0.297)	(0.404)	(1.532)	(2.213)
SAT	-0.758	-0.609	-0.673	-0.568	-0.177	-3.016
	(0.519)	(0.666)	(0.518)	(0.636)	(3.574)	(2.297)
patience	-0.002	0.034	0.009	0.043	-0.221	-0.332
	(0.047)	(0.062)	(0.047)	(0.064)	(0.306)	(0.205)
risky	0.095	0.084	0.096	0.093	0.123	0.943
	(0.093)	(0.108)	(0.097)	(0.106)	(0.371)	(0.852)
happy	0.020	-0.006	-0.012	-0.028	0.712***	1.171***
	(0.051)	(0.059)	(0.052)	(0.061)	(0.152)	(0.393)
migrant	0.006	-0.011	0.009	-0.006	0.021	-0.094
	(0.011)	(0.009)	(0.012)	(0.010)	(0.038)	(0.061)
grade	-0.059	-0.205	-0.094	-0.214	0.456	1.179**
	(0.108)	(0.151)	(0.109)	(0.151)	(0.462)	(0.528)
outdegreef	0.004	0.000	0.005	-0.000	-0.071*	-0.052
	(0.009)	(0.015)	(0.009)	(0.016)	(0.042)	(0.042)
indegreef	-0.107***	-0.077**	-0.110***	-0.081**	0.000	0.075
	(0.024)	(0.033)	(0.024)	(0.034)	(0.104)	(0.098)
eigenvectorf	0.834	-8.692**	0.820	-9.211**	6.106	236.289***
	(1.473)	(3.910)	(1.470)	(3.949)	(4.335)	(24.751)
outdegreee	-0.000	0.001	0.001	0.006	0.005	-0.025
	(0.010)	(0.016)	(0.010)	(0.016)	(0.019)	(0.035)
indegreee	0.149***	0.112***	0.157***	0.115***	-0.025	-0.276*
	(0.026)	(0.022)	(0.026)	(0.022)	(0.087)	(0.164)
eigenvectore	-1.603*	2.464*	-1.650*	2.441*	-	-
	(0.917)	(1.404)	(0.887)	(1.455)	-	-
bullhomof	1.998***	2.110***	1.940***	2.311***	0.993	2.740
	(0.467)	(0.762)	(0.480)	(0.721)	(1.563)	(4.030)
bullhomoe	-0.431	0.217	-0.519	0.119	3.705**	3.045*
	(0.393)	(0.441)	(0.404)	(0.456)	(1.602)	(1.639)
Constant	-1.810**	-2.685***	-1.446	-2.463***	-3.985*	-12.459**
	(0.916)	(0.868)	(0.929)	(0.886)	(2.184)	(5.511)
Observations	1,404	1,369	1,369	1,326	151	72
Pseudo R-squared	0.152	0.134	0.164	0.144	0.437	0.430

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3: Results by gender

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