School bullying contributes to lower PISA achievement among Filipino students

Who gets bullied? Why does it matter?

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Bullying matters

International literature shows that bullied children…

- Suffer from poorer mental health
- More likely to suffer from psychosomatic conditions
- Have worse academic outcomes
- Lower labor force participation, employment rate, income and wealth

Similar story in the Philippines with some exception

- Higher risk of suicidal ideation and attempt (Chiu and Vargo, 2022)
- Strong negative association with average scores (Orbeta, et al., 2020)
- Some protective effects against low science achievement (Bernardo, et al., 2023)

This study

- What does bullying look like?
- Does bullying matter?
- Who gets bullied?
- Where is bullying risk highest?

Methodology

Data

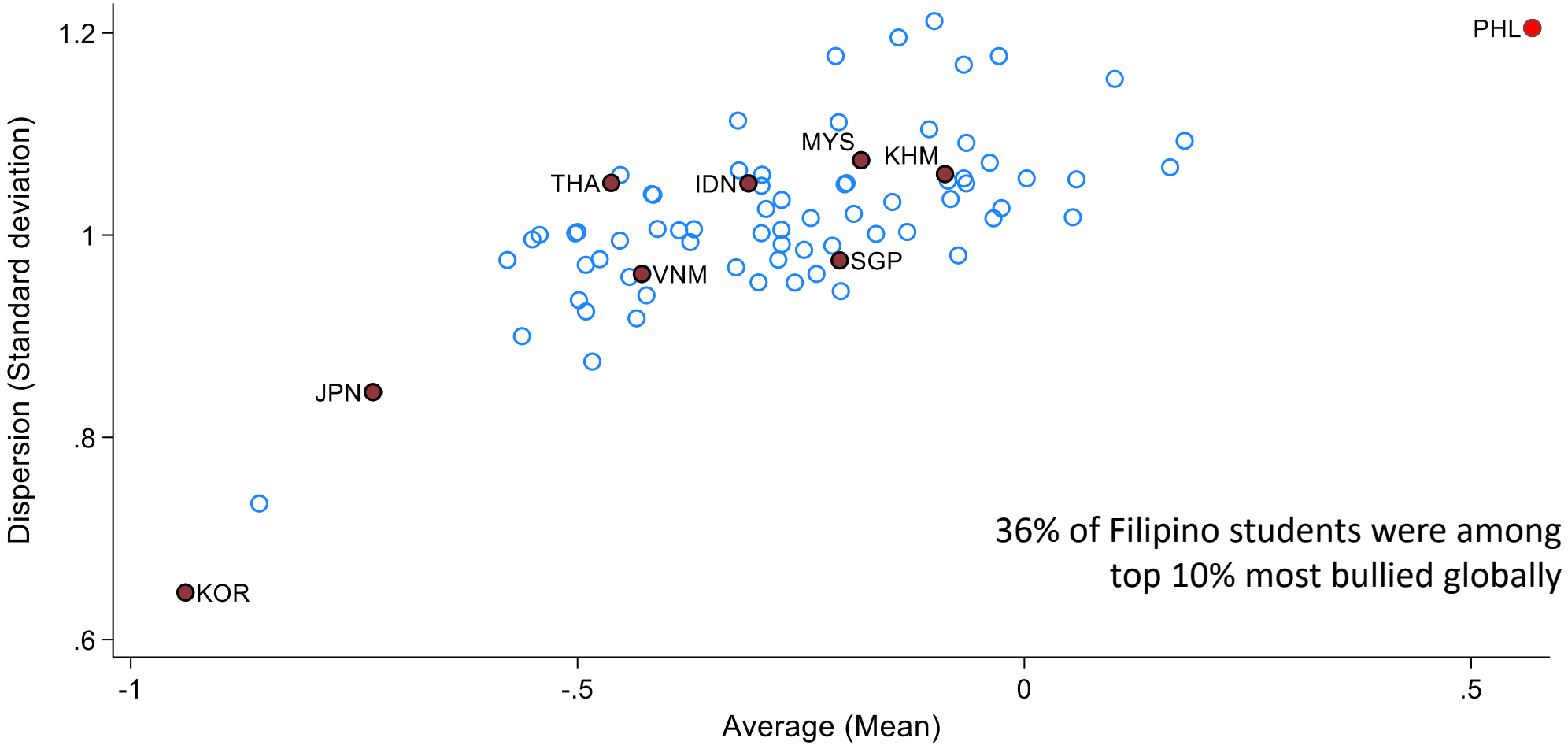
- PISA 2022 (OECD): ILSA based on representative sample of 15-year-old students
- School characteristics from PISA and DepEd's Basic Education Information System
- Community level characteristics from 2020 Census of Population and Housing, Uppsala Conflict Data Program, Earth Observation Group

Estimation

- Oaxaca-Blinder decomposition
- Classical and ML classification models
- Small-area estimation

What does bullying look like?

Philippines stands out on bullying



What does bullying look like?

	At least once in past 12 months		Once a week or more in past 12 months	
	All students	Most bullied	All students	Most bullied
Other students left me out of things on purpose.	34.8	62.1	7	17.1
Other students made fun of me.	62	90.9	16.3	35.7
I was threatened by other students.	41.2	79.1	8.9	23.1
Other students took away or destroyed things that belonged to me.	32.8	67.8	6.7	18.1
I got hit or pushed around by other students.	38.2	71.7	7.5	19.7
Other students spread nasty rumors about me.	33.7	66.7	7	18.2
I was on a physical fight on school property.	27	55.1	5.3	13.6
I stayed home because I felt unsafe.	26.9	56.2	6.5	15.7
I gave money to someone at school because they threatened me.	25.2	56.8	7	17.7
Experienced at least one of listed activities	76.6	100	34.5	75.5
Experienced all listed activities	3.9	10.8	0.6	1.6

Does bullying matter?

Oaxaca-Blinder decomposition

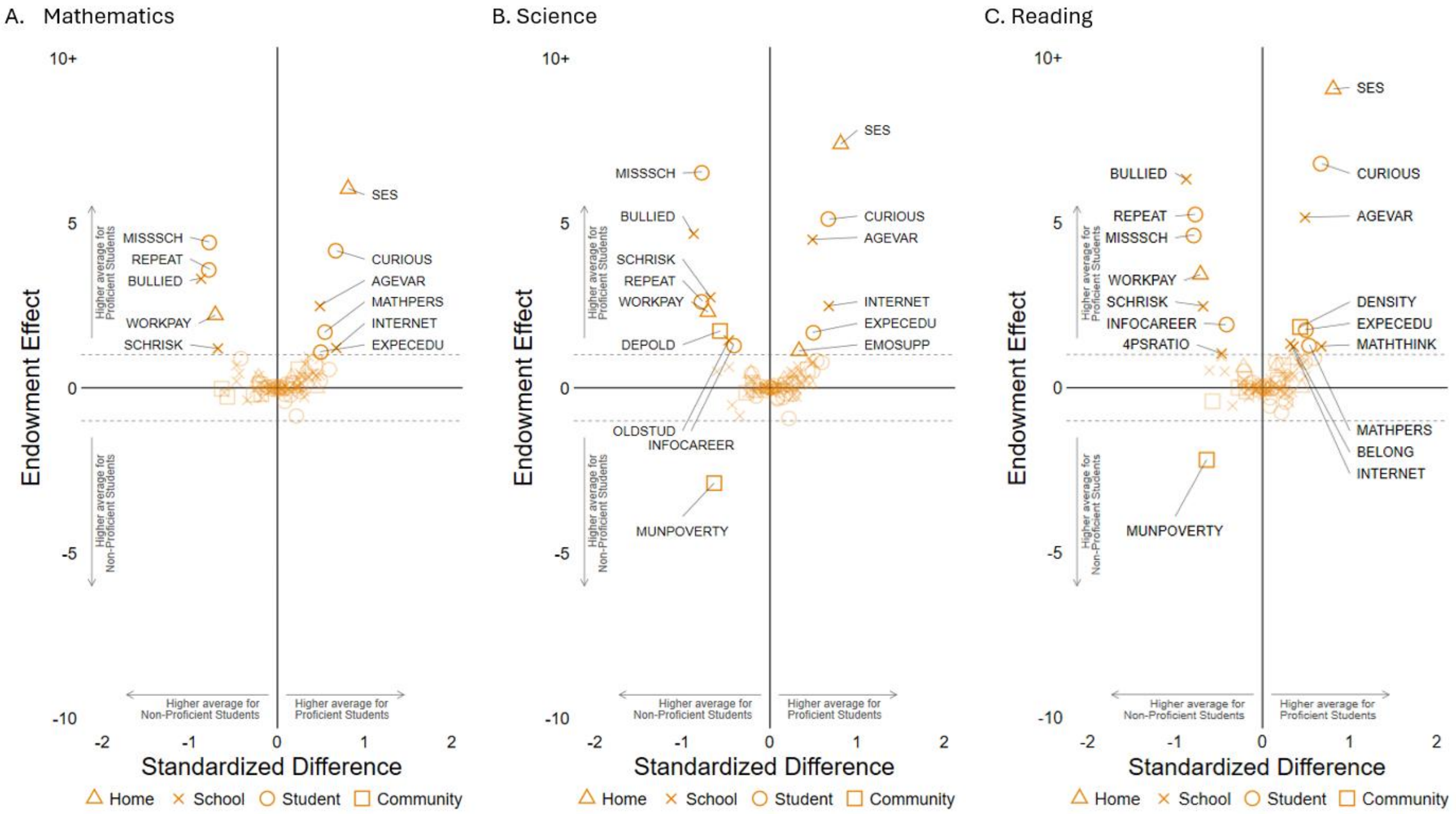
Starts with a (linear) learning achievement production function

$$\underbrace{y_{aihsc}}_{\substack{PISA\\score}} = b_0 + b_1 \underbrace{Z_i'}_{\substack{individual\\factors}} + b_2 \underbrace{Z_i'}_{\substack{household\\factors}} + b_3 \underbrace{Z_s'}_{\substack{school\\factors}} + b_4 \underbrace{Z_i'}_{\substack{community\\factors}} + \underbrace{e_{aihsc}}_{\substack{stochastic\\error}}$$

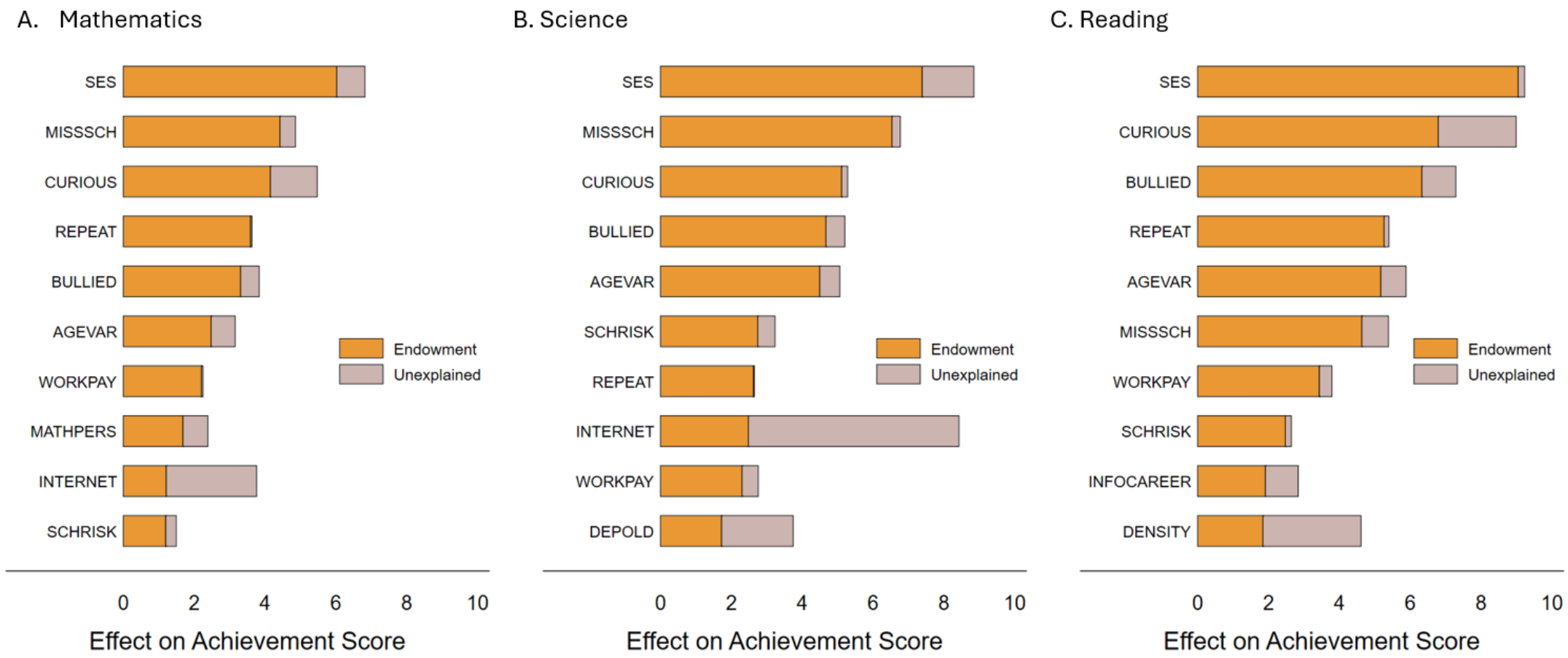
Decompose difference in average scores of proficient and non-proficient students as

$$E(y|P=1) - E(y|P=0) = \underbrace{b \cdot [E(Z|P=1) - E(Z|P=0)]'}_{endowment\ effect} + \underbrace{E(Z) \cdot (b^{P=1} - b^{P=1})'}_{coefficient\ effect} + \underbrace{[E(Z|P=1) - E(Z|P=0)] \cdot (b^{P=1} - b^{P=1})'}_{interaction\ effect}$$

where b and Z are stacked (conformable) vectors, and $P = \{0,1\}$ is proficiency level


A. Mathematics
B. Science
C. Reading
10+
5
0
-5
-10
Endowment Effect
Higher average for Proficient Students
Higher average for Non-Proficient Students
MISSSCH
REPEAT
BULLIED
WORKPAY
SCHRISK
SES
CURIOUS
AGEVAR
MATHPERS
INTERNET
EXPECEDU
DEPOLD
OLDSTUD
INFOCAREER
MUNPOVERTY
EMOSUPP
BELONG
DENSITY
MATHTHINK
4PSRATIO
-2
-1
0
1
2
Standardized Difference
Higher average for Non-Proficient Students
Higher average for Proficient Students
Home
School
Student
Community

Bullying is among top contributor



Back-of-envelope calculation

What is long-run effect of bullying?

- Idea: Bullying → School achievement → … → GDP
- Use 1.74 factor from Hanushek and Woessman's (2010) study linking GDP and PISA score

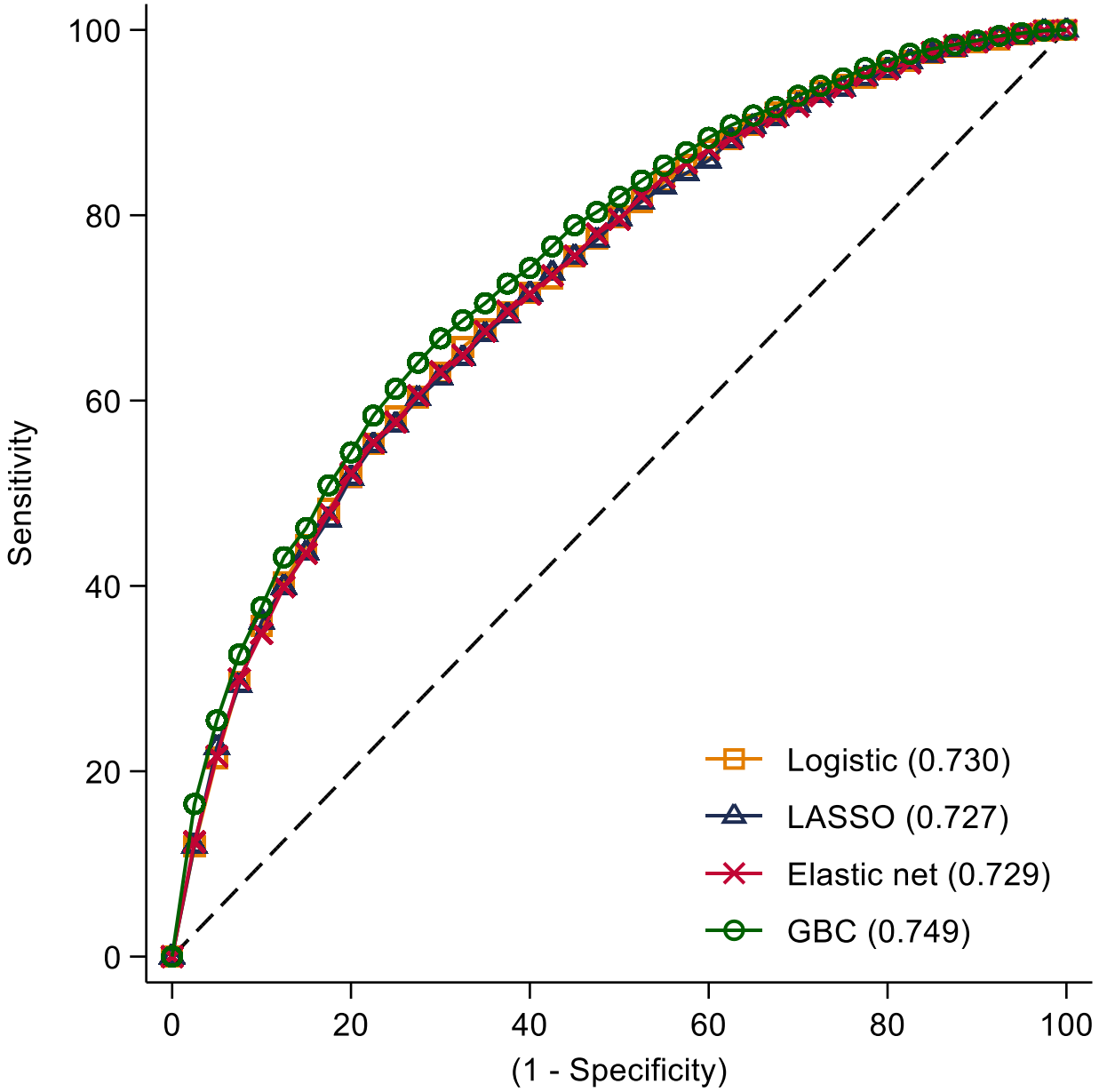
Bullying could depress long-run GDP by 0.05-0.08% points

- Appears small, but translates to PHP10-20 billion with our recent GDP
- To put into perspective, this approximates 2024 DepEd budget budget for textbooks (PHP12B) and computerization program (PHP8B)

Who gets bullied?

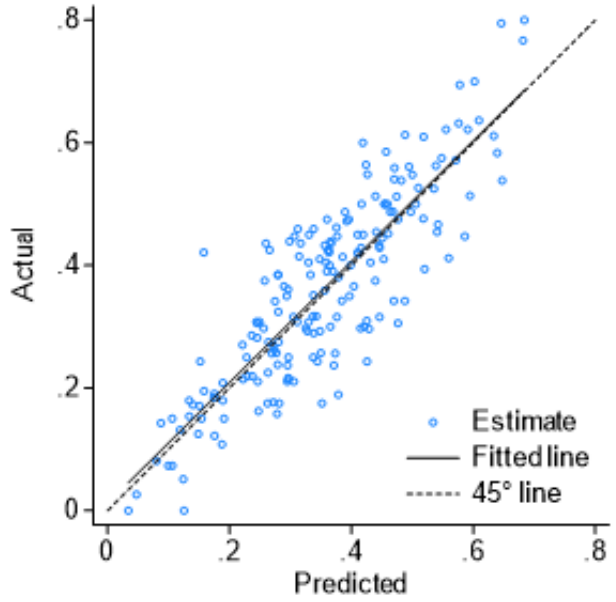
We brought the big guns

- Classic logistic regression
- LASSO regression
- Elastic net regression
- Gradient-boosted classifier

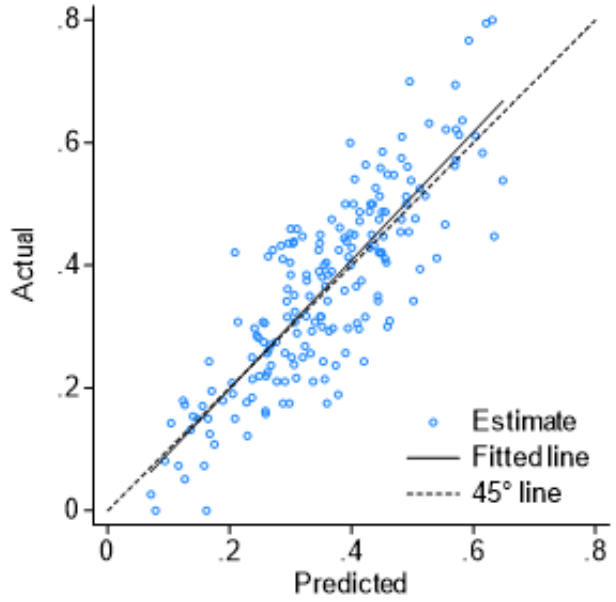


Receiver operating curve (ROC) and area under ROC are comparable across classifiers – ML is not necessarily better

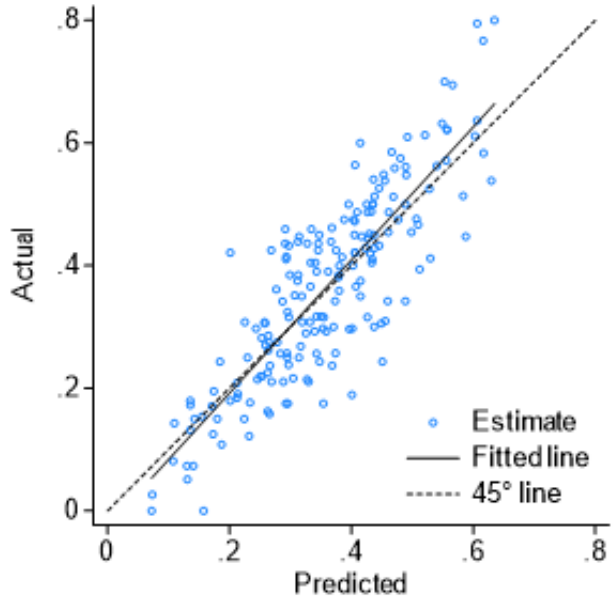
A. Simple logistic regression



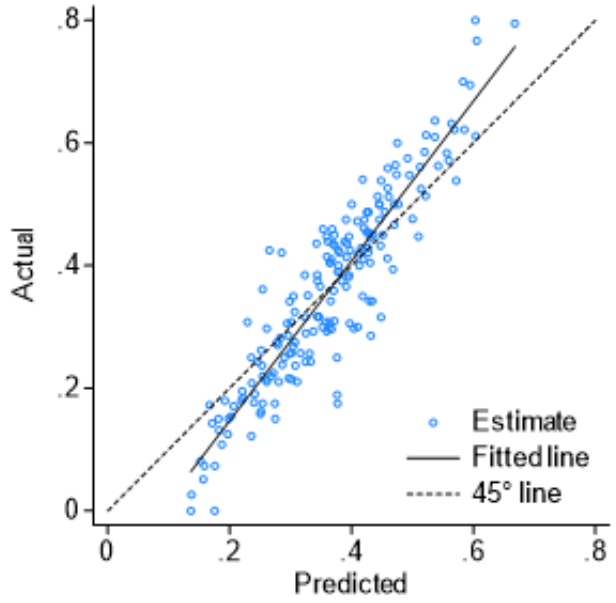
B. LASSO logistic regression



C. Elastic net logistic regression



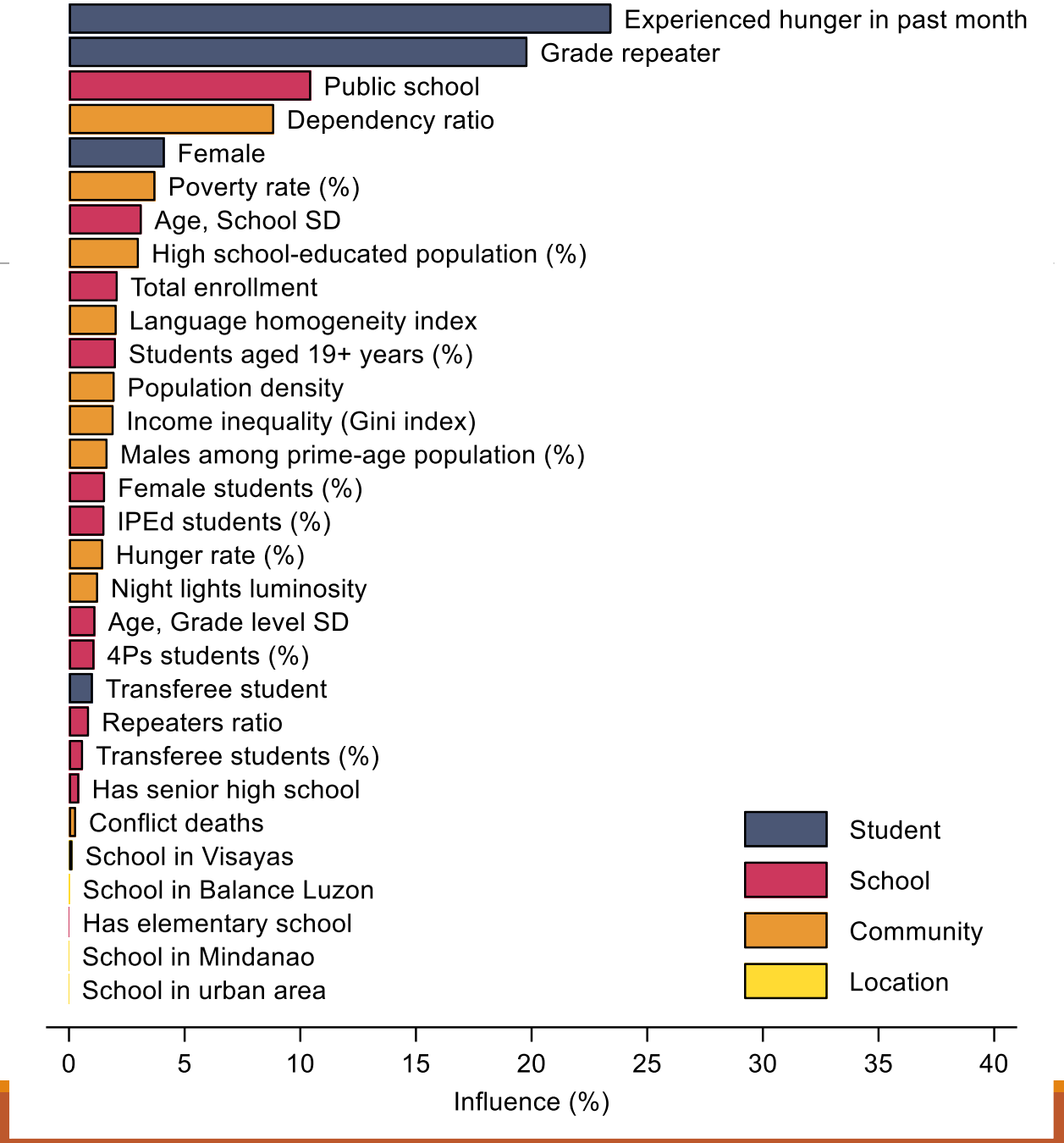
C. Gradient-boosted classifier



Predicted v. actual school-level shares of “most bullied” show drift when using GBC; classic logistic model provides better fit

Which features are important?

- Use GBC influence characteristic
- Top five factors capture about 2/3 of GBC log-likelihood



Aside: Public schools only model

Having a principal (instead of head teacher) as school head, or a guidance counselor has limited contribution in predicting who gets bullied – contrary to claimed importance in literature

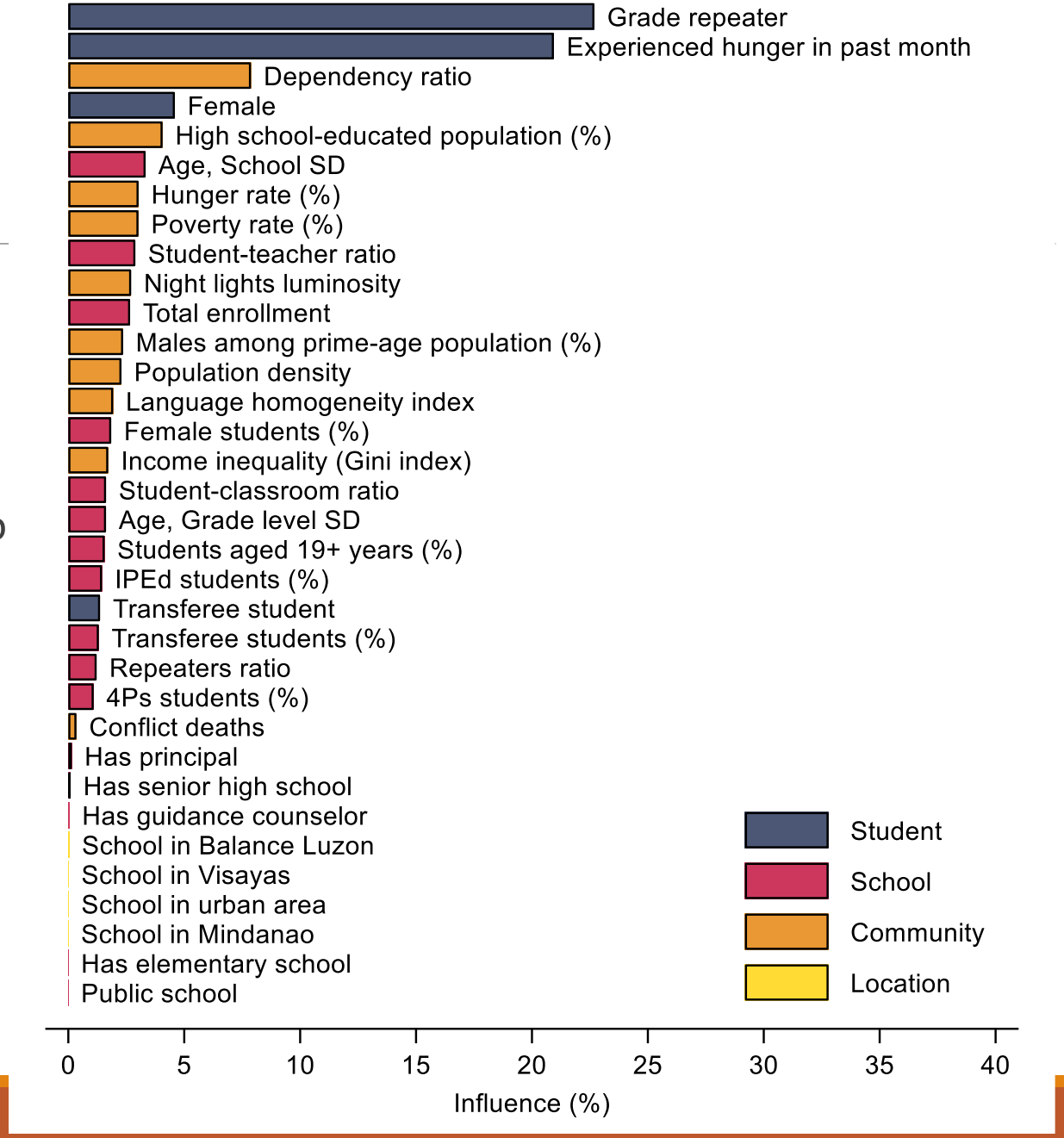


Table 2. Log-odds of being among world's "most bullied" students

	(1)	(2)	(3)	(4)
Grade repeater (=1)	0.960***	0.848***	0.812***	0.812***
	(0.073)	(0.072)	(0.073)	(0.073)
Female (=1)	-0.376***	-0.380***	-0.387***	-0.387***
	(0.055)	(0.053)	(0.053)	(0.053)
Transferee student (=1)	0.299***	0.201***	0.189***	0.186***
	(0.067)	(0.066)	(0.067)	(0.067)
Experienced hunger in past month (=1)	0.887***	0.835***	0.820***	0.820***
	(0.058)	(0.058)	(0.058)	(0.059)
Public school (=1)		0.730***	0.744***	0.746***
		(0.150)	(0.136)	(0.132)
Total enrollment, ln		-0.165***	-0.065	-0.053
		(0.042)	(0.045)	(0.047)
Share of females in enrolled, G10		-1.133**	-1.682***	-1.722***
		(0.555)	(0.579)	(0.565)

- Disadvantaged children (repeater, experienced hunger) are more likely bullied – 2x more likely bullied than non-repeater or not experiencing hunger
- Being female and studying in private school provides some protective effects against bullying

Where is bullying risk highest?

Small-area estimation

Used classical logistic regression model to predict average risk at school-level

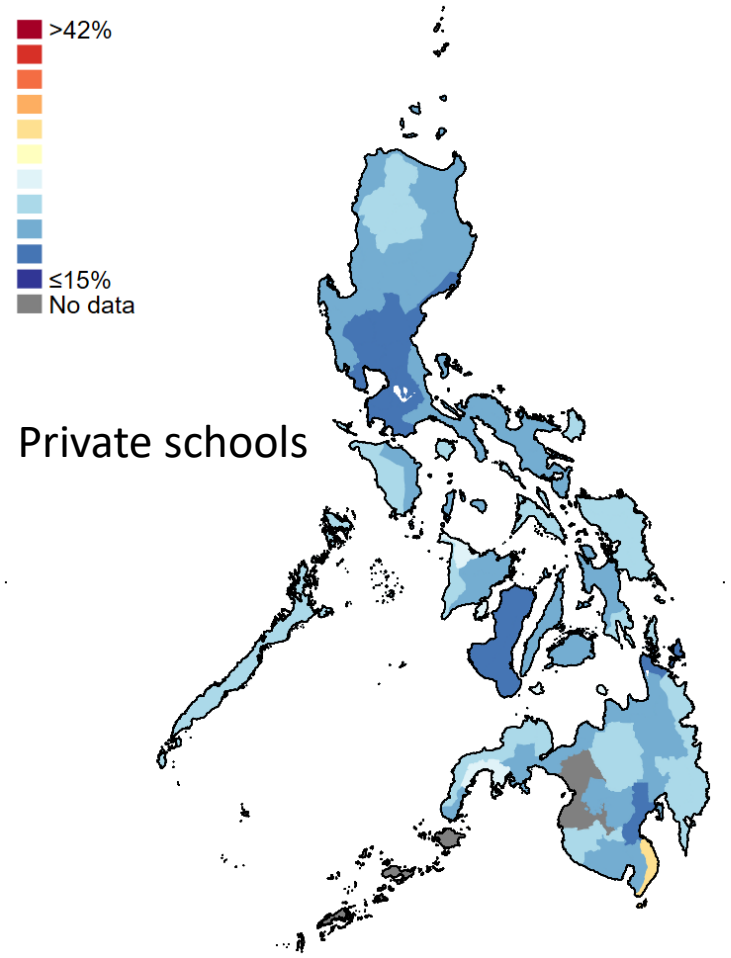
Individual-level characteristics are replaced with school/community-level analogs

- Female indicator → share of females (school level, BEIS)
- Repeater indicator → share of repeaters (school level, BEIS)
- Transferee indicator → share of transferees (school level, BEIS)
- Experienced hunger → share experienced hunger (province level, NNS)

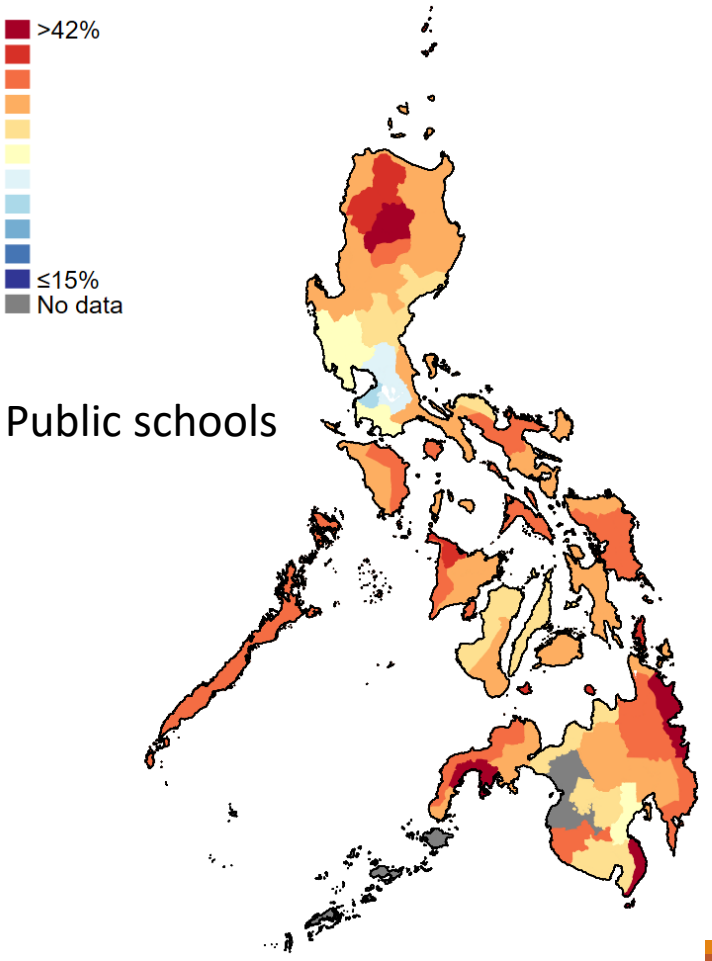
Aggregated to 5-digit PSGC (province, highly urbanized cities) weighted by enrollment size

Separate estimates for public and private schools

“Most bullied” bullying risk



Private schools

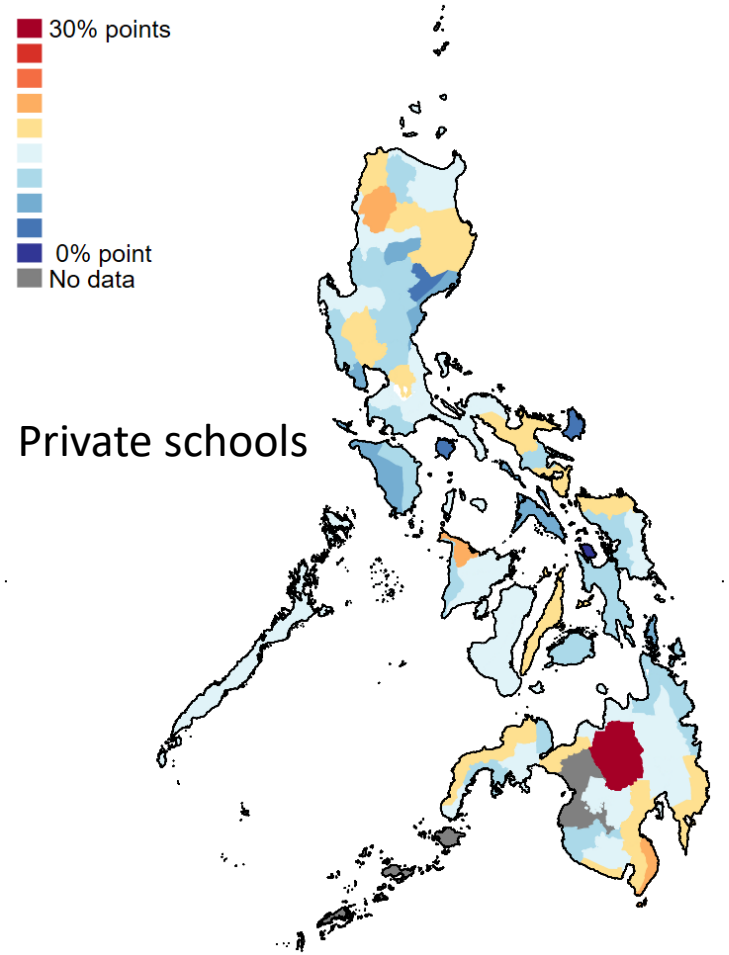


Public schools

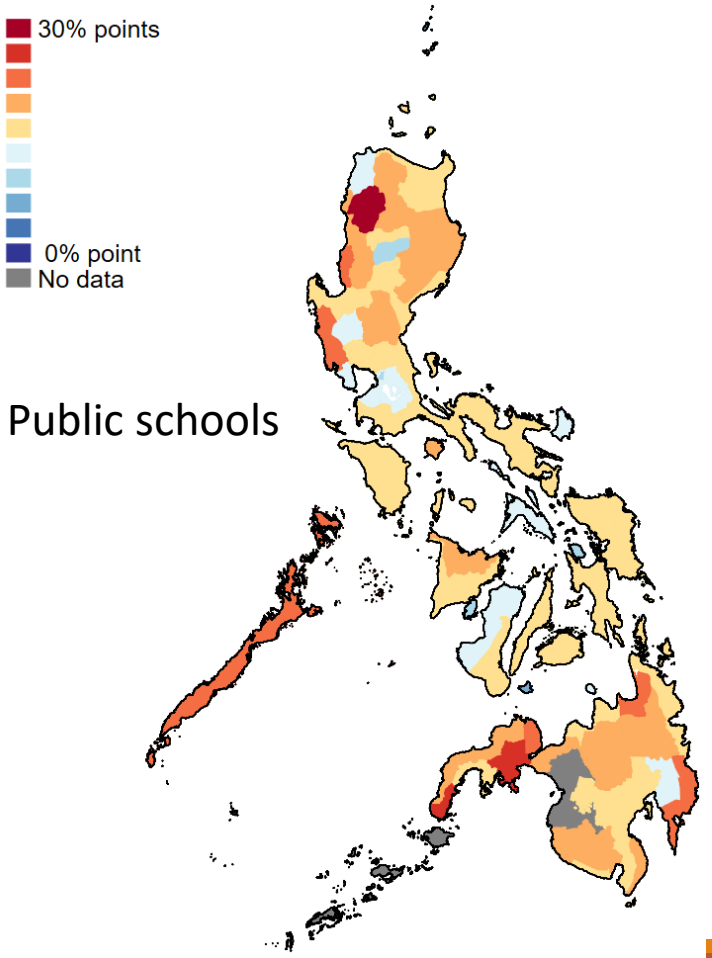
Private schools have lower average bullying risks

Richer areas have lower bullying risks even among public schools

“Most bullied” bullying risk range



Private schools



Public schools

Wide disparity in bullying risks within provinces/HUC even if with similar average bullying risk: Abra v. Ifugao

Within-province disparity in bullying risk tends to increase with average bullying risk

Summary and some implications

School bullying is concerning

- Non-trivial proportion of students are at risk of school bullying
- Difference in bullying experience captures significant portion of difference in average score between proficient and non-proficient students – that may lead to substantial economic losses

Bullying is a modifiable risk factor of learning losses

- Unlike socioeconomic status which may take some time to change
- International evidence of successful programs; need to identify what works for the Philippines

Study provides some guidance of who to watch out for support

- Public school students, females, already disadvantaged (poor, grade repeater)
- Areas with high average bullying risk but low dispersion

Need to capacitate school personnel and community

- Supportive v. punitive actions; Preventive v. rehabilitative programs
- School head and guidance counselors have important roles