

## Professor Frank Kee Centre for Public Health, QUB



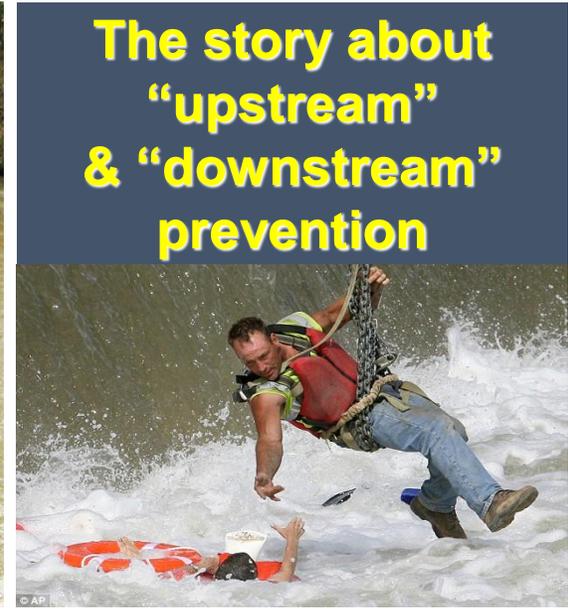
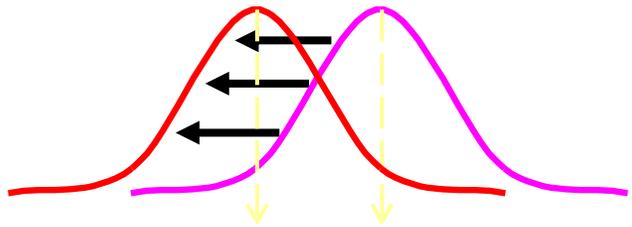
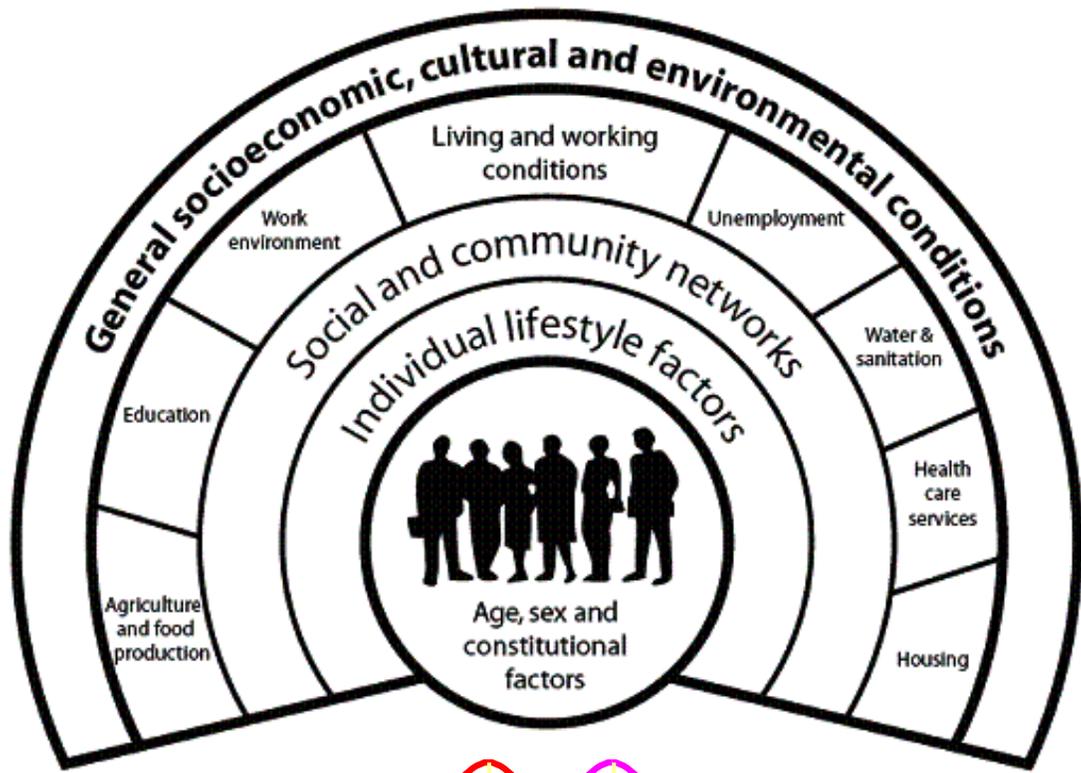
**Smoking,  
friendship networks  
and norms:**

*a tale of two cities*



**Tabaquismo,  
redes de amigos  
y normas:**

*una historia de dos ciudades*



The story about  
 “upstream”  
 & “downstream”  
 prevention

“It is not sufficient to pull drowning individuals out of the water, you need to go upstream, and challenge the people pushing them in”

*Desmond Tutu*

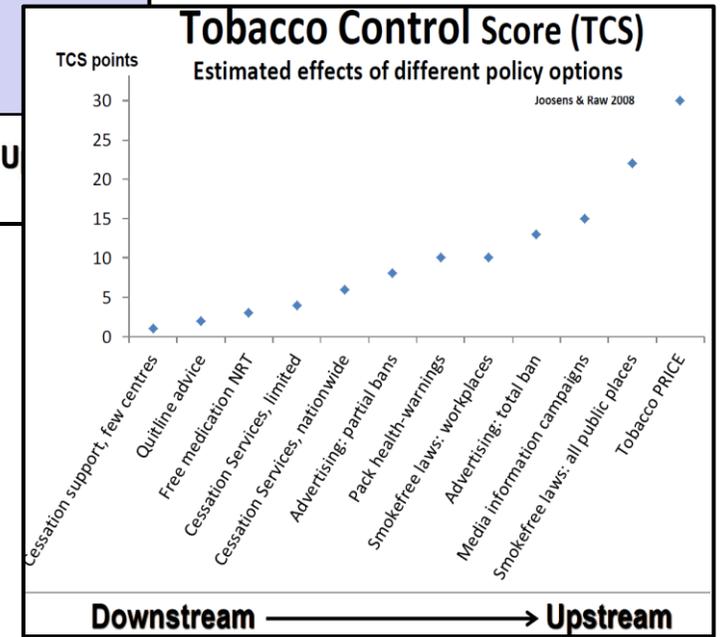
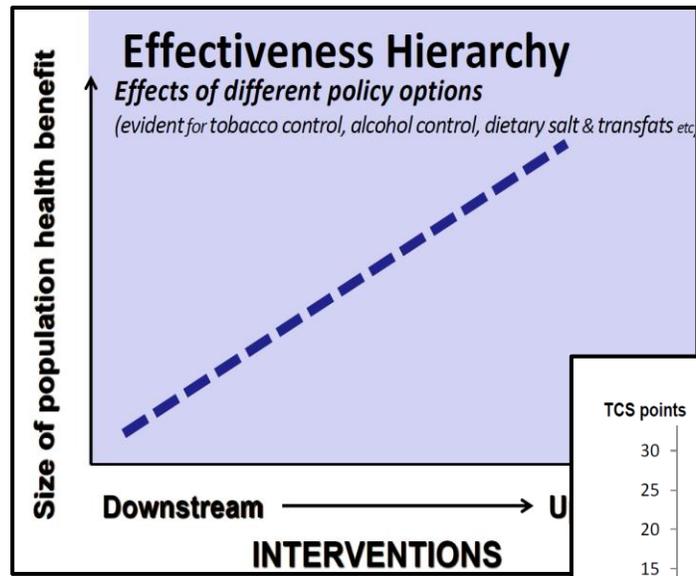
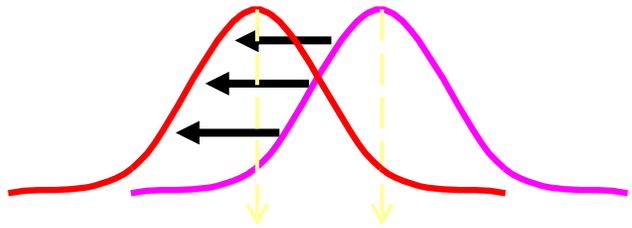
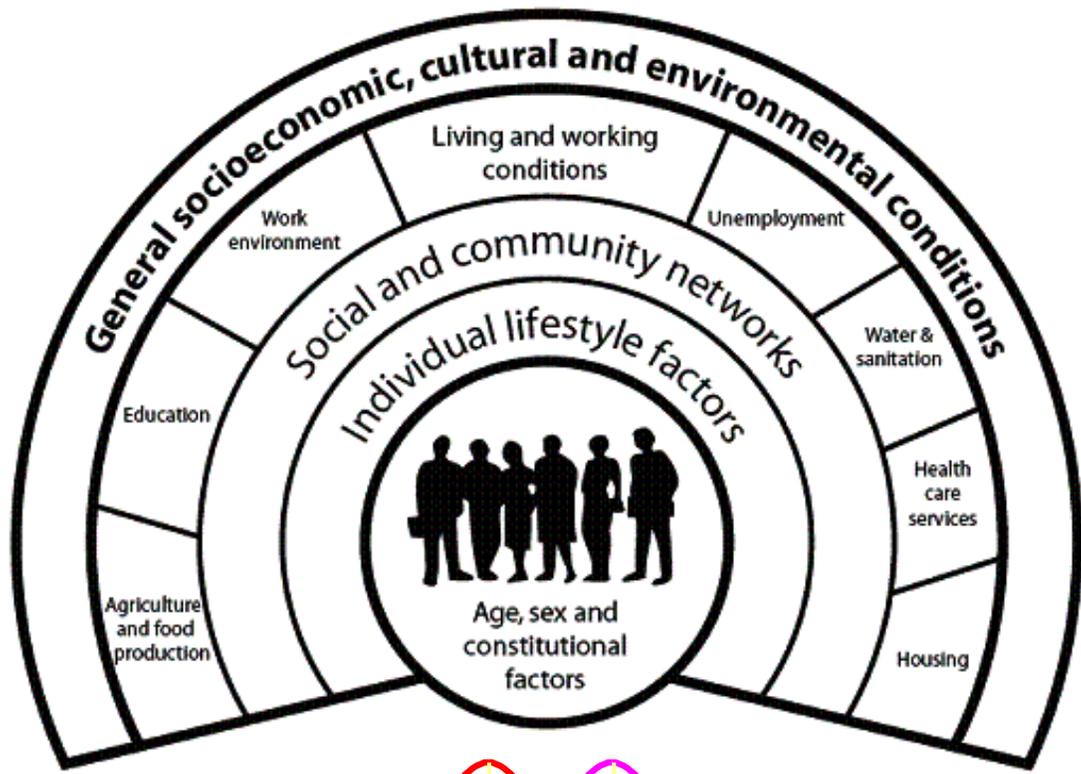
Simulation



Smoking, friendship networks and norms:  
*a tale of two cities*

Tabaquismo, redes de amigos y normas:  
*una historia de dos ciudades*





Simulation

e risk risk



**Smoking, friendship networks and norms: a tale of two cities**

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**Wednesday 24 & Thursday 25 March 2021**  
@ 14:30hrs (UK) / 09:30hrs (Bogota)



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MRC/CSO Social and Public Health Sciences Unit



## Erik O. Kimbrough

On the Stability of Norms and the Propensity to Follow  
Them

(co-authored with Erin Krupka, Rajnish Kumar, Jennifer  
Murray, and Abhijit Ramalingam)



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# What is a “norm”?

**Injunctive norms** are defined by sets of shared beliefs about what one ought (and ought not) do, and they tell us how appropriate/inappropriate some actions are relative to others.

**Norm-following propensity** determines how much influence normative considerations have on my choices

- What does the distribution of normative beliefs look like?
- How stable are those beliefs over time?
- How shared are those beliefs, really?
- How stable is the propensity to follow norms over time?
- When and why do normative beliefs change?



# Norms about How to Distribute Resources

**Dictator games** are simple decision problems in which one person is given a fixed amount of resources (say £10) to divide between themselves and another anonymous person (usually connected via a computer network)

- How *ought* one allocate these resources?

	Extremely Inappropriate	Very Inappropriate	Somewhat Inappropriate	Somewhat Appropriate	Very Appropriate	Extremely Appropriate
Keeping all the money for yourself...		X				
Giving some of the money to the other person...				X		



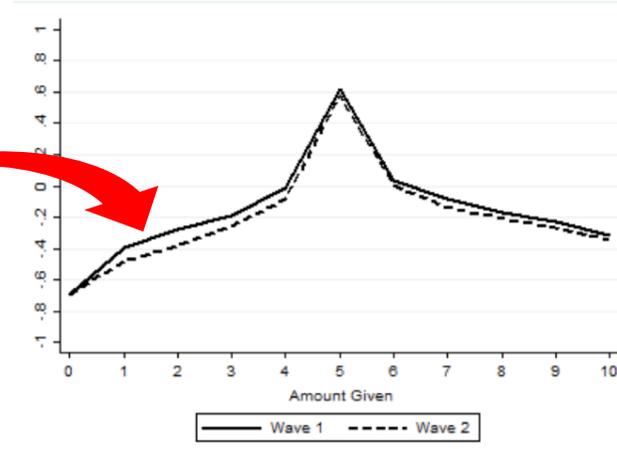
# NEW #5 Taking answers, turning them into a measure of the norm

	Extremely Inappropriate	Very Inappropriate	Somewhat Inappropriate	Somewhat Appropriate	Very Appropriate	Extremely Appropriate
Keeping all the money for yourself...		X				
Giving some of the money to the other person...				X		
Keeping all the money for yourself...		X				
Giving some of the money to the other person...				X		

Graph the average response

Take the average in each category

The Dictator Game Results



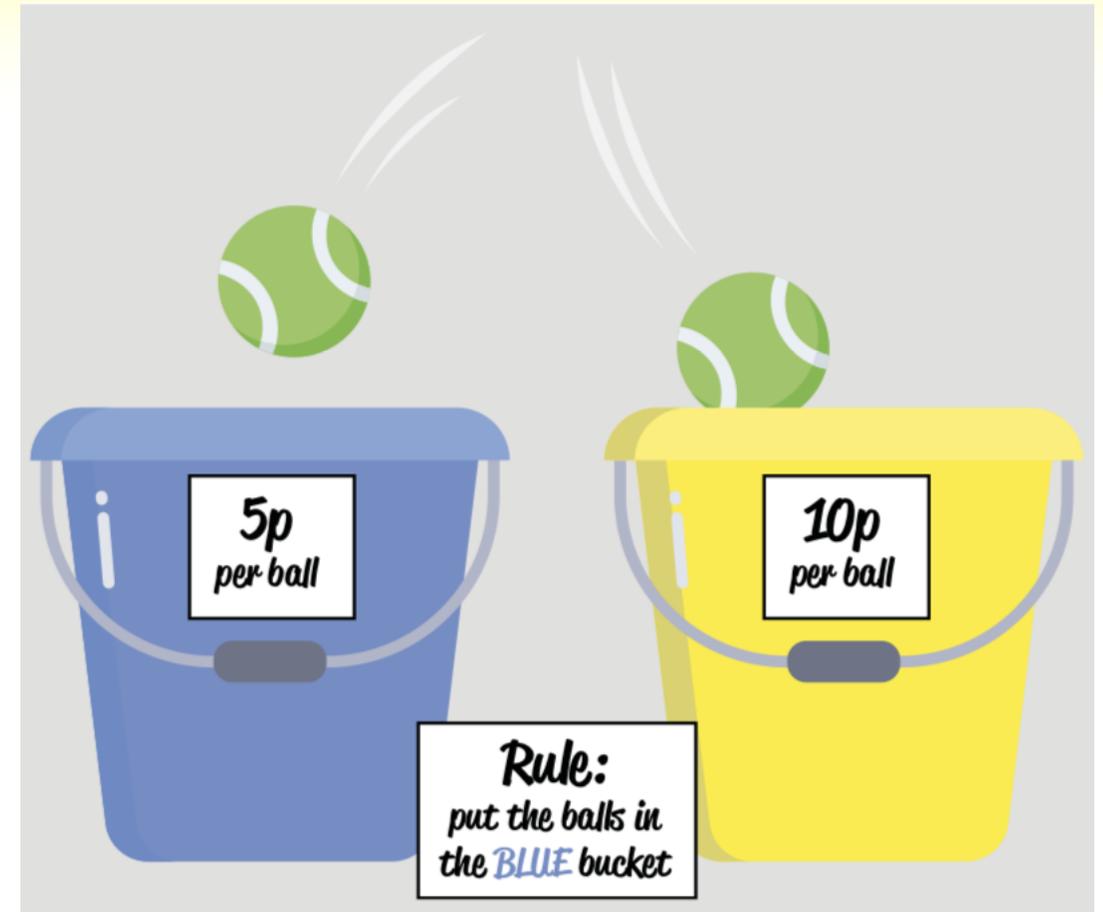
**Can take the average of these ratings and graph it.** Graphing the average responses, give us a *profile* that shows us what is most appropriate and how bad it is to take actions other than the most appropriate.

- How *ought* one allocate these resources?

# Norm-following Propensity

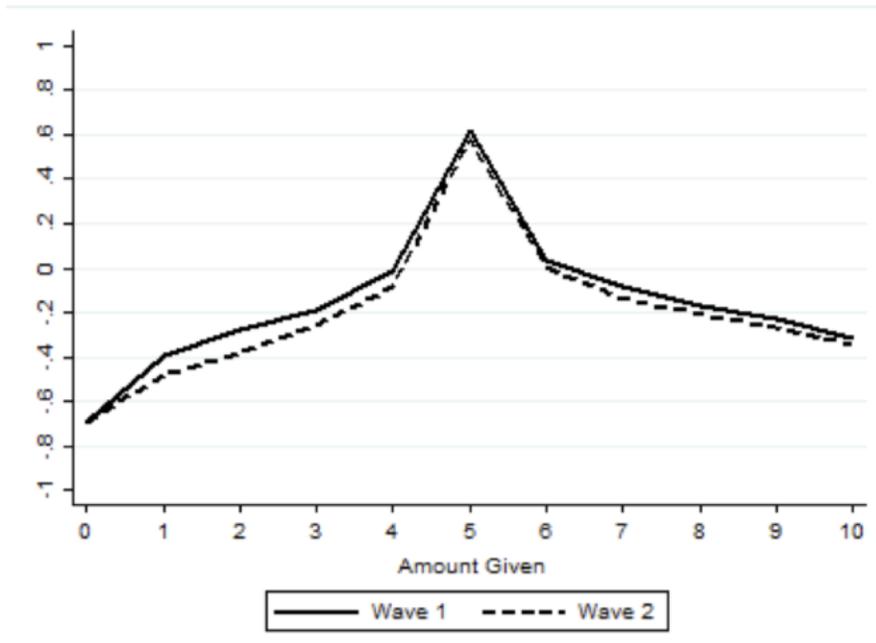
The rule-following task asks people to follow an arbitrary rule at some cost to themselves.

- What is the distribution of the propensity to follow rules?
- How stable is this propensity?

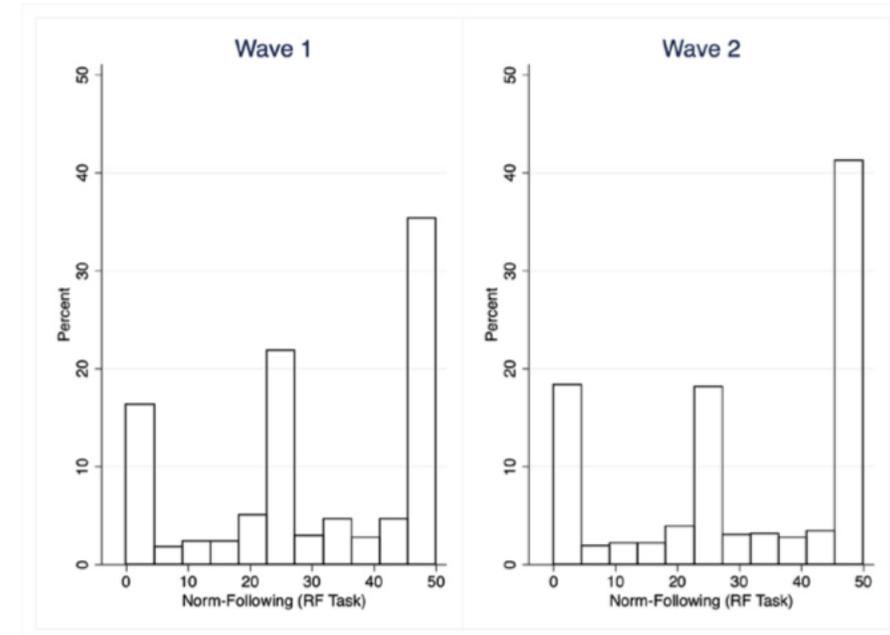


# Norms and Norm-Following Are Stable, On Average

## The Dictator Game Results



## Ball Game Results



# Individual beliefs are also less stable than population beliefs

Normative change is caused, in part, by the existence of mismatched beliefs among peers.

The more similar you are to your...

**FRIENDS...**

**CLASSROOM PEERS...**

**SCHOOL-YEAR GROUP...**

the less likely you are to change your normative beliefs.

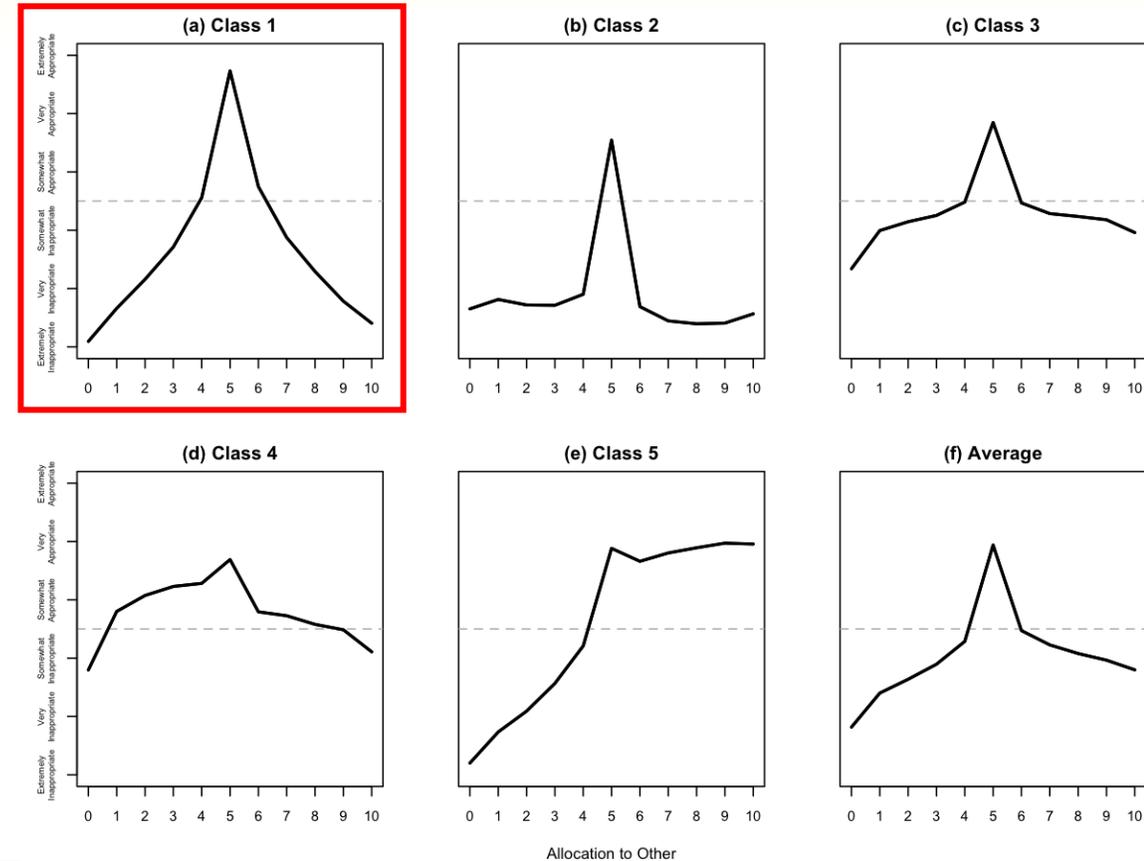
	Friend	Classroom	School
% in Same Latent Class at T1	-0.20***	-0.50***	-0.64***
	(0.07)	(0.11)	(0.14)
Constant	0.59***	0.66***	0.69***
	(0.02)	(0.03)	(0.04)
N	1115	1121	1121

# But this conceals underlying heterogeneity...

Our data suggest that there are as many as 5 different norms which our participants apply to the dictator game

- 1) Egalitarian, consequentialist
- 2) Egalitarian, deontological
- 3) Weakly egalitarian, consequentialist
- 4) Egoistic
- 5) Generosity

Beliefs are stable, on average, but there is far less agreement than one might expect based on the averages!

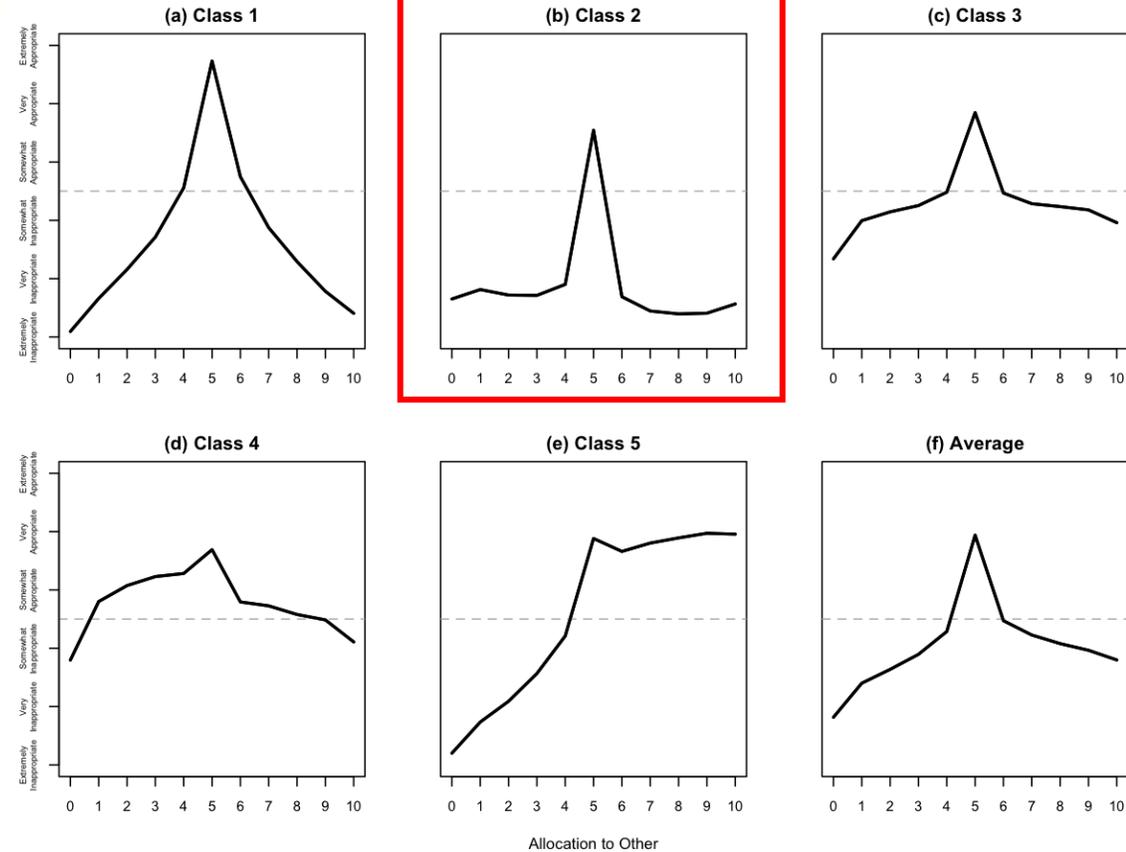


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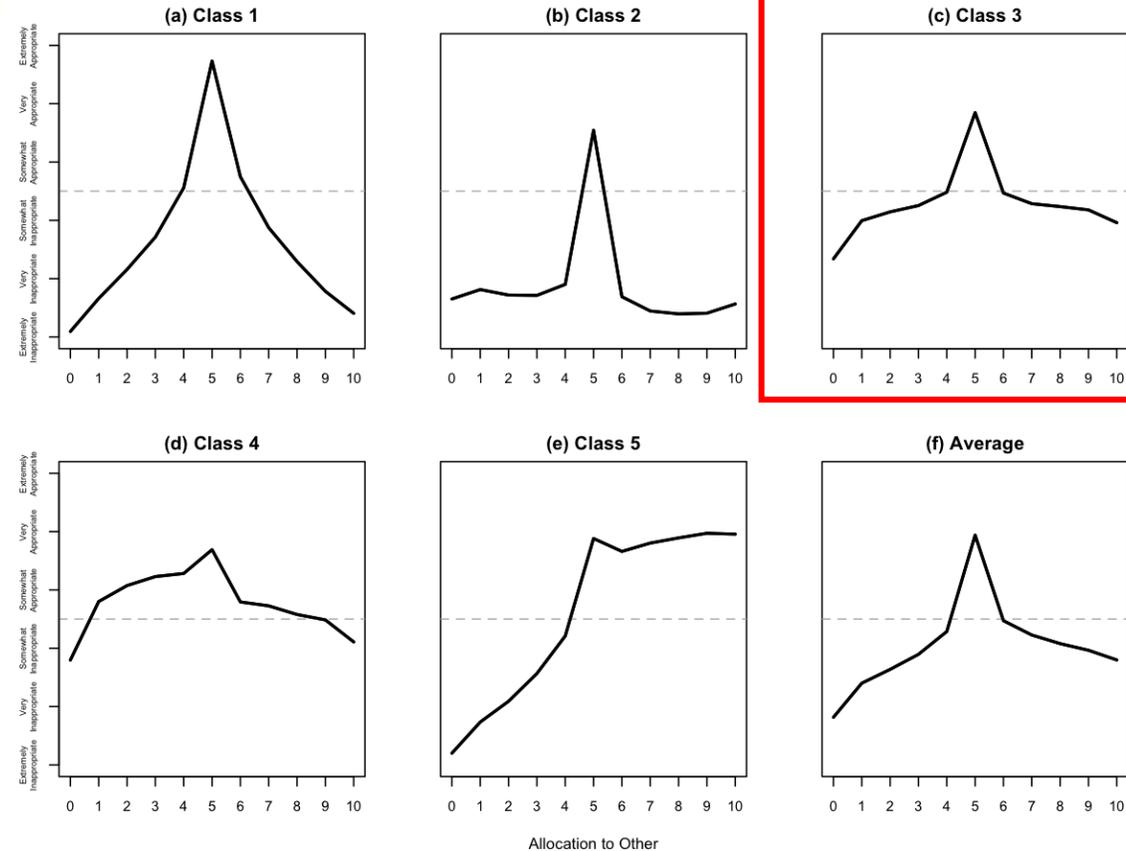


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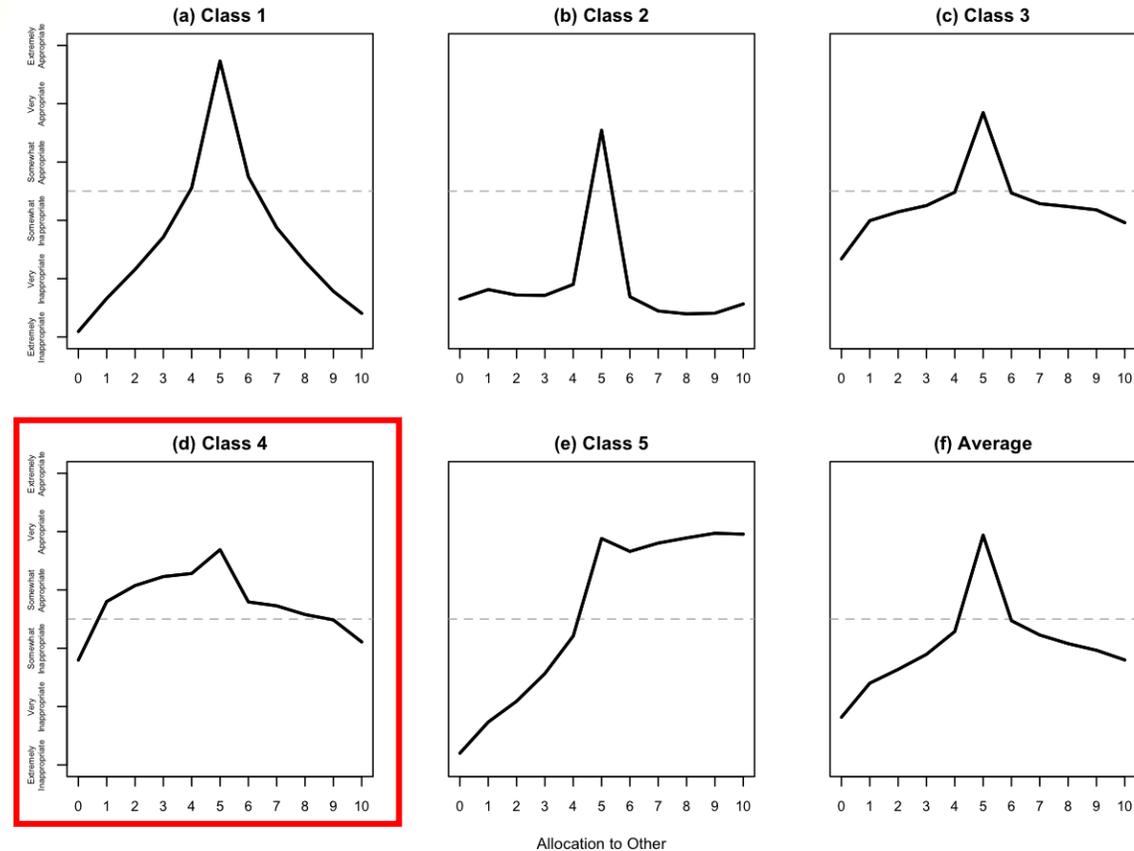


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Beliefs are stable, on average, but there is far less agreement than one might expect based on the averages!



# Even in seemingly simple settings, norms are heterogeneous and changing...

- Norms are not singular “best practices”; instead they describe a profile of beliefs about related actions (and how the appropriateness of those actions compare)
- We show that these profiles of beliefs are quite heterogeneous in the population.
- We also show that they are more prone to change when people are connected to others whose beliefs differ.
- This suggests that there remains a scope for interventions that target normative change via networks.



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## Jennifer Murray

Comparing different ways of measuring smoking and vaping social norms in teenagers.



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# Background

- During **adolescence** young people are susceptible to **social comparisons** (peers, friends, family).
- People who smoke usually start as teenagers, when the **influence of social norms** (i.e. what we think those around us believe, or do) on behaviour is strong.
- Early prevention is important because young smokers can develop serious **chronic health problems**, and are more sensitive to **addiction**.
- **E-cigarettes** were introduced into the market in the mid-2000s, and are gaining popularity, particularly amongst adolescents.
- We studied adolescent **social norms around smoking and vaping** together, as this would help us better understand how some public health prevention programs work.

# Background

- Many smoking prevention programmes are anchored in ***social norms approaches***.
- ***Social norms*** have been defined in terms of individuals' beliefs about the beliefs and actions of others in a reference group (e.g. your school year group).
- ***Injunctive norms*** – doing what others think one should do.
- ***Descriptive norms*** – doing what others do.
- Adequate ***measurement instruments for assessing social norms*** are required to improve social norms based intervention research.

# Background

- Public health research typically relies on ***self-report methods*** of assessing social norms.
- Self-report methods assess ***injunctive norms*** by asking participants whether those who are important to them (e.g. friends, parents, siblings) think they should/should not smoke.
- Self-report methods assess ***descriptive norms*** by asking participants whether those who are important to them are smokers themselves.
- ***Experimental methods*** from behavioural economics (“game theory”) have been developed, which work by providing participants with small financial incentives to think about how most others would respond, instead of providing personal opinions.

# Background

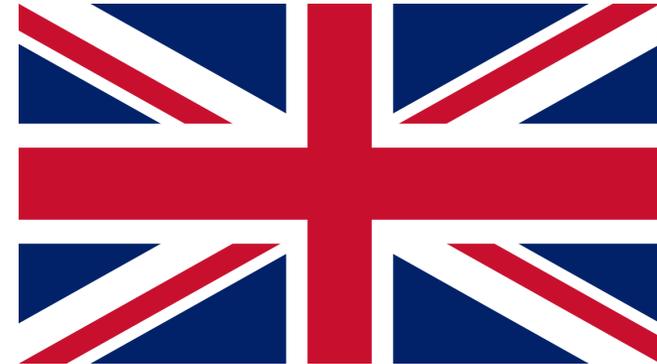
Self-reports	Experiments
<ul style="list-style-type: none"><li>✓ Simple and clear for participants.</li><li>✓ Low cost. Easy to apply.</li><li>✓ Previous use and validation in public health research.</li> <li>✗ “Social desirability” bias.</li></ul>	<ul style="list-style-type: none"><li>✓ Financial incentives reduce social desirability bias.</li><li>✓ Provides richer information about norms and norms sensitivities that can better explain differences in behaviour <i>within</i> and <i>between</i> different settings.</li> <li>✗ Higher cost. Harder to implement.</li></ul>

**Experimental methods** have had little previous application in public health research. A better understanding of **intervention mechanisms** is possible if constructs identified by alternative measurement instruments are aligned and have **comparable explanatory power** for effects mediated by interventions.

# Background



- **Bogotá:** Capital city of Colombia (~7 million inhabitants).
- Adolescent smoking in **Colombia** is up to 10% higher than in the UK.<sup>1</sup>
- In schools in **Bogotá**, the prevalence is even higher at 13.1% (12-18 year olds).<sup>2</sup>
- **Colombia:** Estimated that e-cigarettes would be used by 9% of 13-15 year olds by 2017.<sup>3</sup>



- **NI:** Constituent country of the UK (~2 million inhabitants).
- **NI:** In 2016, 4% of 11-16 year olds were current smokers.<sup>4</sup>
- **UK:** In 2018, 5% of 11-15 year olds were current smokers.<sup>5</sup>
- **UK:** In 2019, 5% of 11-15 year olds used e-cigarettes.<sup>6,7</sup>

# Aims

1. To investigate the construct validity of the norms measures, using ***confirmatory factor analysis (CFA)***.
2. To investigate whether the experimental and self-report methods were measuring the same underlying constructs (norms), using ***second-order CFA***.
3. To examine differences in the norms measures according to country (NI or Colombia), sex, and personality characteristics, using ***structural equation modelling (SEM)***.
4. To examine the association between the norms measures and: (1) pupils' self-reported smoking behaviour; (2) pupils' self-reported smoking intentions; and (3) pupils' objectively measured smoking behaviour; using ***SEM***.

# Overview of MECHANISMS schools

n (%)	Northern Ireland (N=7; n=825)	Colombia (N=8; n=999)	All schools (N=15; n=1824)
<b>Participation</b>	764 (93%) [696 games, 701 survey]	892 (89%) [880 games, 872 survey]	1656 (91%) [1576 games, 1573 survey]
<b>Deprivation<sup>a</sup></b>	355 (219)	2.4 (0.5)	-
<b>Sex</b>	335 boys (48%) 355 girls (51%) 11 PNTS (2%)	436 boys (50%) 431 girls (49%) 5 PNTS (1%)	771 boys (49%) 786 girls (50%) 16 PNTS (1%)
<b>Age</b>	279 12 years (40%) 414 13 years (59%) 8 Other (1%)	320 12 years (36%) 313 13 years (36%) 249 Other (28%)	599 12 years (38%) 727 13 years (46%) 257 Other (16%)
<b>Ethnicity</b>	171 White British (25%) 474 White Irish (68%) 54 Other (8%)	36 Indigenous (4%) 4 Gypsy/rom (1%) 79 Afro (9%) 753 Other (86%)	-

<sup>a</sup>Means and SDs. Northern Ireland: Multiple deprivation measure (1=most deprived to 890=least deprived); Colombia: Institute for the Promotion of Higher Education Socio-economic level index (1=Lower; 2=Middle-low; 3=Middle-high; 4=Higher).

# Game Theory Experiments

## Part 2-Identifying Injunctive Social Norms Related to Smoking/Vaping

**Co-ordination games** measuring injunctive norms for smoking/vaping by asking participants to “co-ordinate” with others in their school year group to rate the social appropriateness of various smoking- and vaping-related actions (Krupka and Weber, 2013).<sup>8</sup>

Injunctive norms reflect shared beliefs about what actions people *ought* to take.

-1=Extremely socially inappropriate; -0.6=Very socially inappropriate; -0.2=Somewhat socially inappropriate;  
+0.2=Somewhat socially appropriate; +0.6=Very socially appropriate; +1=Extremely socially appropriate.

# Experiment Part 2

**Situation 2** - Parent smoking in their own home in front of children under age of 5.

**Situation 3** - An adult smoking in a car with children under the age of 16 in the car.

**Situation 4** - Someone selling cigarettes to a teenager who looks younger than 16 without requesting proof of age.

**Situation 5** - In a recent superhero movie the lead actor is seen smoking in the opening scene.

**Situation 6** - An older student from school is smoking outside school, for example, at a bus stop.

**Situation 7** - A pupil from school is using an e-cigarette while walking to school.

**Situation 8** - A pupil from school shares a photograph of him/herself using an e-cigarette on social media.

**Situation 9** - A pupil from school is chewing tobacco.

# Experiment Part 2

➤ **Northern Irish schools: situation 2** - Parent smoking in their own home in front of children under age of 5.

Extremely socially inappropriate	Very socially inappropriate	Somewhat socially inappropriate	Somewhat socially appropriate	Very socially appropriate	Extremely socially appropriate
<b>498 (72%)</b>	129 (19%)	50 (7%)	7 (1%)	5 (1%)	6 (1%)

➤ **Colombian schools: situation 2** - Parent smoking in their own home in front of children under age of 5.

Extremely socially inappropriate	Very socially inappropriate	Somewhat socially inappropriate	Somewhat socially appropriate	Very socially appropriate	Extremely socially appropriate
<b>806 (92%)</b>	53 (6%)	12 (1%)	3 (0.3%)	2 (0.2%)	4 (0.5%)

## Experiment Part 2

➤ **Northern Irish schools: situation 5** - Lead actor seen smoking in opening scene of recent superhero movie.

Extremely socially inappropriate	Very socially inappropriate	Somewhat socially inappropriate	Somewhat socially appropriate	Very socially appropriate	Extremely socially appropriate
95 (14%)	182 (26%)	<b>290 (42%)</b>	93 (13%)	21 (3%)	14 (2%)

➤ **Colombian schools: situation 5** - Lead actor seen smoking in opening scene of recent superhero movie.

Extremely socially inappropriate	Very socially inappropriate	Somewhat socially inappropriate	Somewhat socially appropriate	Very socially appropriate	Extremely socially appropriate
235 (27%)	246 (28%)	<b>313 (36%)</b>	66 (8%)	11 (1%)	9 (1%)

# Game Theory Experiments

## Part 3-Identifying Descriptive Social Norms Related to Smoking/Vaping

*Co-ordination games* measuring descriptive norms for smoking.

Descriptive norms reflect shared beliefs about what actions people *actually* do take.

*Share of year group that would be accepting of a close friend (1) smoking; (2) vaping.*

-1=None of my peers; -0.6=Only a few of my peers; -0.2=Some of my peers; +0.2=A lot of my peers; +0.6=Most of my peers; +1=All of my peers.



# Experiment Part 3

➤ **Northern Irish schools: question 1** - Share of year group that would be accepting of a close friend smoking.

None of my peers	Only a few of my peers	Some of my peers	A lot of my peers	Most of my peers	All of my peers
198 (28%)	<b>252 (36%)</b>	137 (20%)	41 (6%)	51 (7%)	16 (2%)

➤ **Colombian schools: question 1** - Share of year group that would be accepting of a close friend smoking.

None of my peers	Only a few of my peers	Some of my peers	A lot of my peers	Most of my peers	All of my peers
297 (34%)	<b>329 (37%)</b>	166 (19%)	30 (3%)	48 (5%)	10 (1%)

# Experiment Part 3

➤ **Northern Irish schools: question 2** - Share of year group that would be accepting of a close friend vaping.

None of my peers	Only a few of my peers	Some of my peers	A lot of my peers	Most of my peers	All of my peers
160 (23%)	<b>197 (28%)</b>	148 (21%)	77 (11%)	87 (13%)	24 (3%)

➤ **Colombian schools: question 2** - Share of year group that would be accepting of a close friend vaping.

None of my peers	Only a few of my peers	Some of my peers	A lot of my peers	Most of my peers	All of my peers
248 (28%)	<b>329 (37%)</b>	165 (19%)	59 (7%)	57 (6%)	22 (3%)

# Self-report survey

- Socio-demographics
- Social networks
- Smoking behaviour and intentions
- Self-report smoking norms
- Mediators (e.g. self-efficacy, perceived risks/benefits)
- Personality variables (e.g. Big5, pro-sociality)
- Wellbeing, truancy, pocket money

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- Wellbeing, truancy, pocket money

# Self-report survey

## ➤ Anti-Smoking Behaviour

*Tick the statement that applies to you...*

1=Sometimes smoke; 2=Previous smoker; 3=Smoked once; 4=Never smoked.

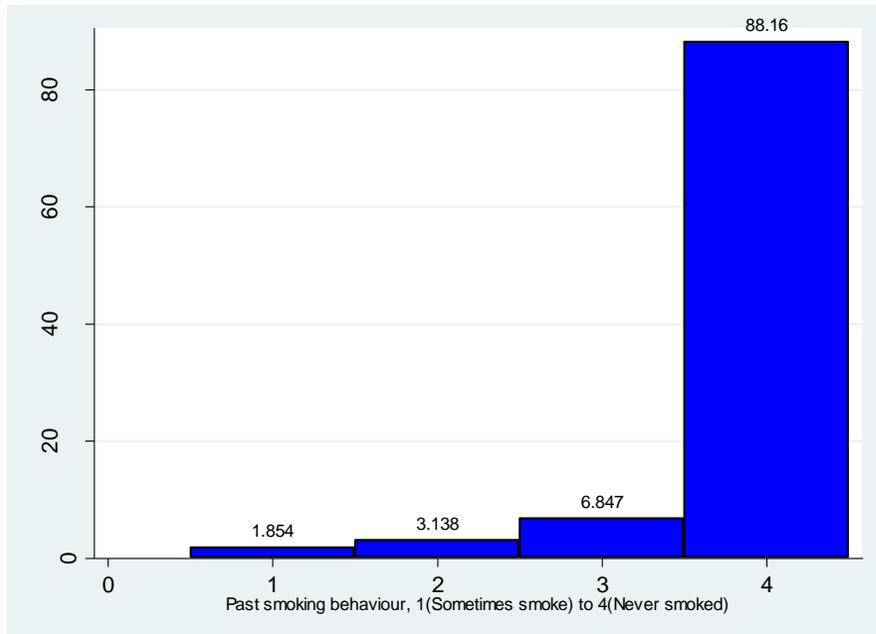
## ➤ Anti-Smoking Intentions

*Do you intend to take up smoking in the next 6 months?*

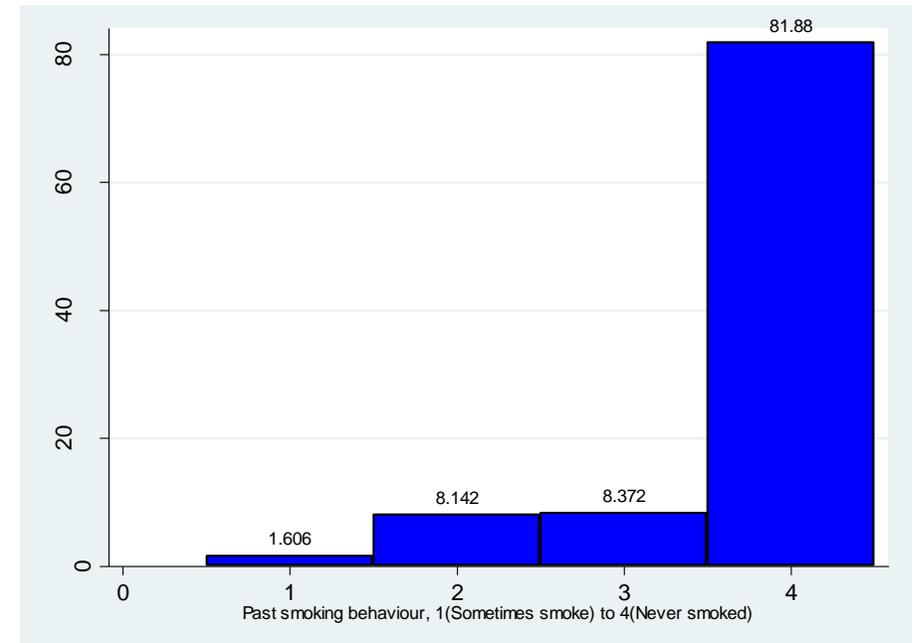
1=I am a smoker; 2=Definitely start smoking; 3=Probably start smoking;  
4=Don't know; 5=Probably remain; 6=Definitely remain a non-smoker.

# Self-report survey

## ➤ Anti-Smoking Behaviour



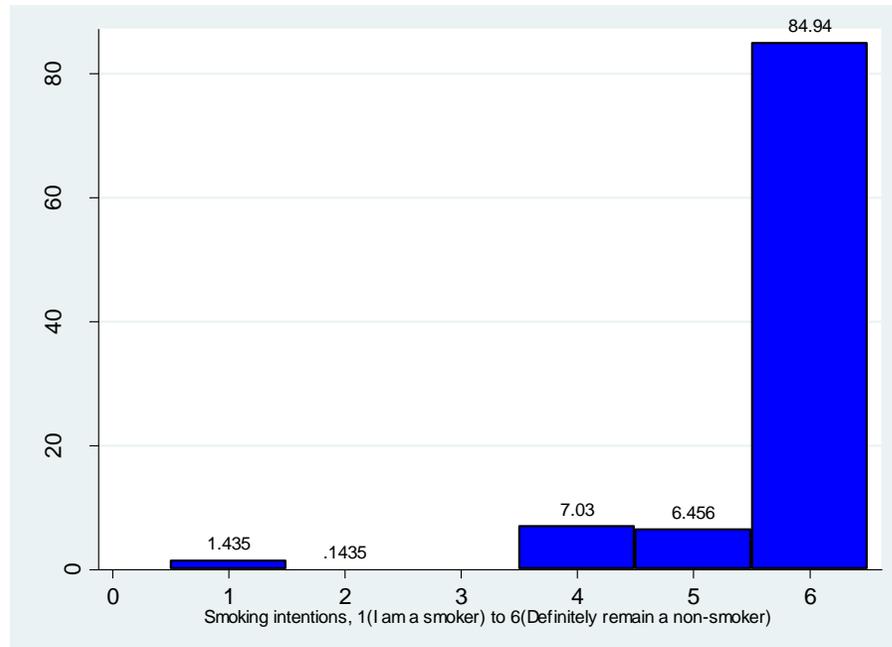
**Northern Ireland**



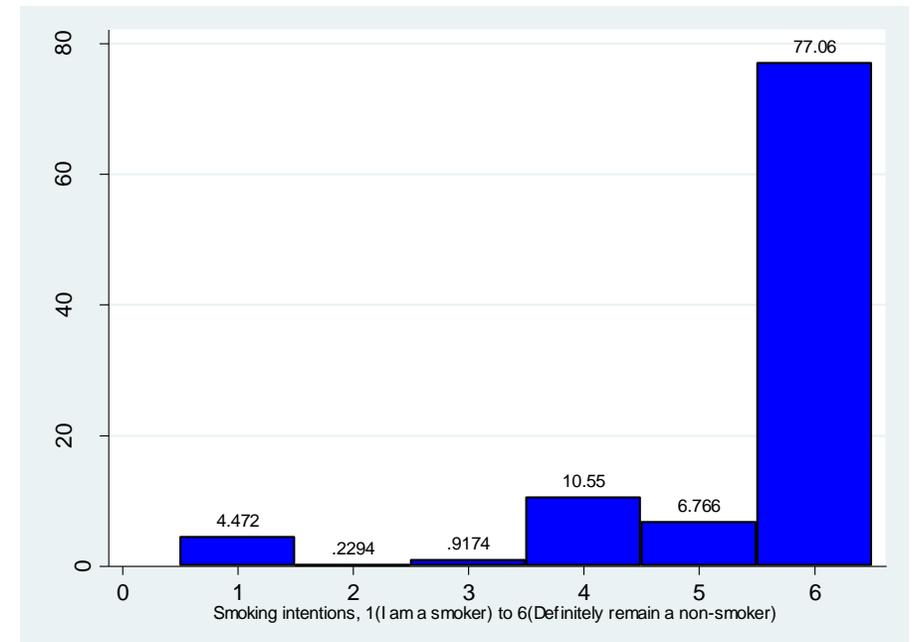
**Colombia**

# Self-report survey

## ➤ Anti-Smoking Intentions



Northern Ireland



Colombia

# Self-report survey

## ➤ Injunctive norms for smoking.

7 items reflecting the degree to which important others think you should smoke.

1. Most of the **people who are important to me** think that I...
2. My **mother** thinks that I...
3. My **father** thinks that I...
4. My **brother(s)** think(s) that I...
5. My **sister(s)** think(s) that I...
6. My **friends** think that I...
7. My **best friend** thinks that I...

-2=Definitely should smoke; -1=Maybe should smoke; 0=Don't know/neutral;  
+1=Maybe should not smoke; +2=Definitely should not smoke

# Self-report survey

## ➤ Descriptive norms for smoking.

5 items reflecting how often important others engage in smoking behaviour.

1. Does your **best friend** smoke?
2. Does your **mother** smoke?
3. Does your **father** smoke?
4. Do any of your **brothers** smoke?
5. Do any of your **sisters** smoke?

1=Very often; 2=Often; 3=Occasionally; 4=Rarely; 5=Don't know/Never

# Self-report survey: Personality

- Big 5 Personality Characteristics (5 subscales)
  - Openness (10 items, 0-4)
  - Extraversion (10 items, 0-4)
  - Agreeableness (10 items, 0-4)
  - Conscientiousness (10 items, 0-4)
  - Stability (10 items, 0-4)
- Need to Belong Scale (10 items, 1-5)
- Fear of Negative Evaluation (12 items, 1-5)
- Pro-sociality (sum 5 items, aggregated score 0-10)

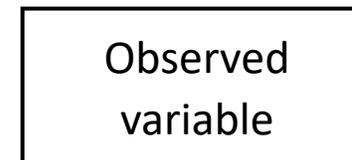
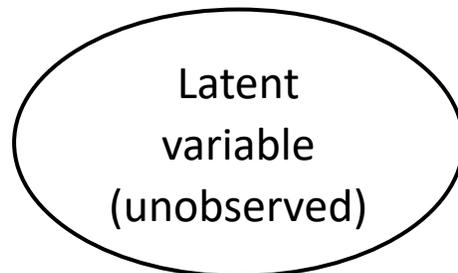
# Objectively measured smoking behaviour



- Carbon monoxide monitors (Smokerlyzer).
- Measures expelled air carbon monoxide in parts per million (ppm).
- A pupil was considered to have engaged in smoking behaviour over the previous 24 hours if they provided a reading of >9ppm.

# Aim 1: Construct validity

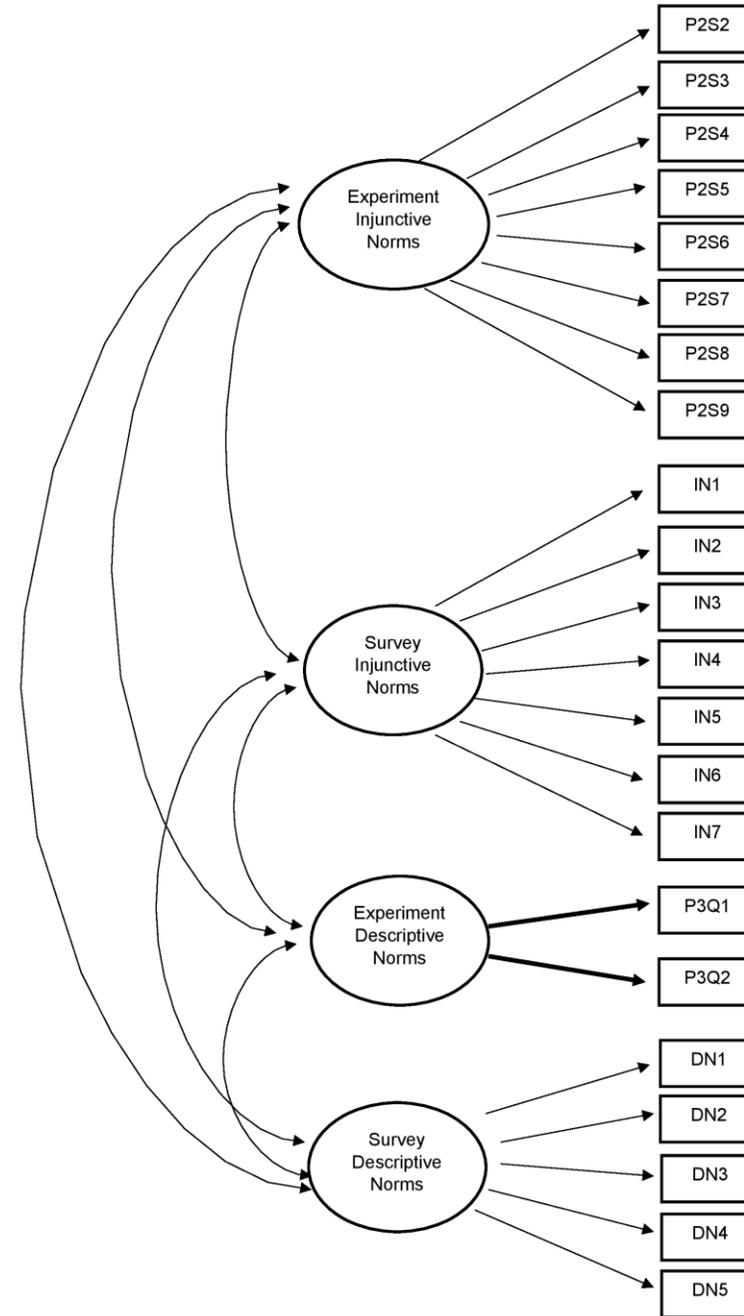
- A first step when establishing a new measurement instrument is to investigate its **construct validity**.
- Construct validity is a broad term describing how you might establish that a **measurement instrument measures what it is supposed to**, and how to **interpret** the test scores.
- Usually involves determining whether the different items are showing **theoretically expected** inter-relationships and relationships with other measures (e.g. a gold standard).
- **Confirmatory factor analysis (CFA)**: a statistical technique to determine whether measures of a construct are consistent with the researcher's understanding of the construct by testing whether the data fits a **hypothesized measurement model**.



# Aim 1: Construct validity

## Model fit indices – cut-points

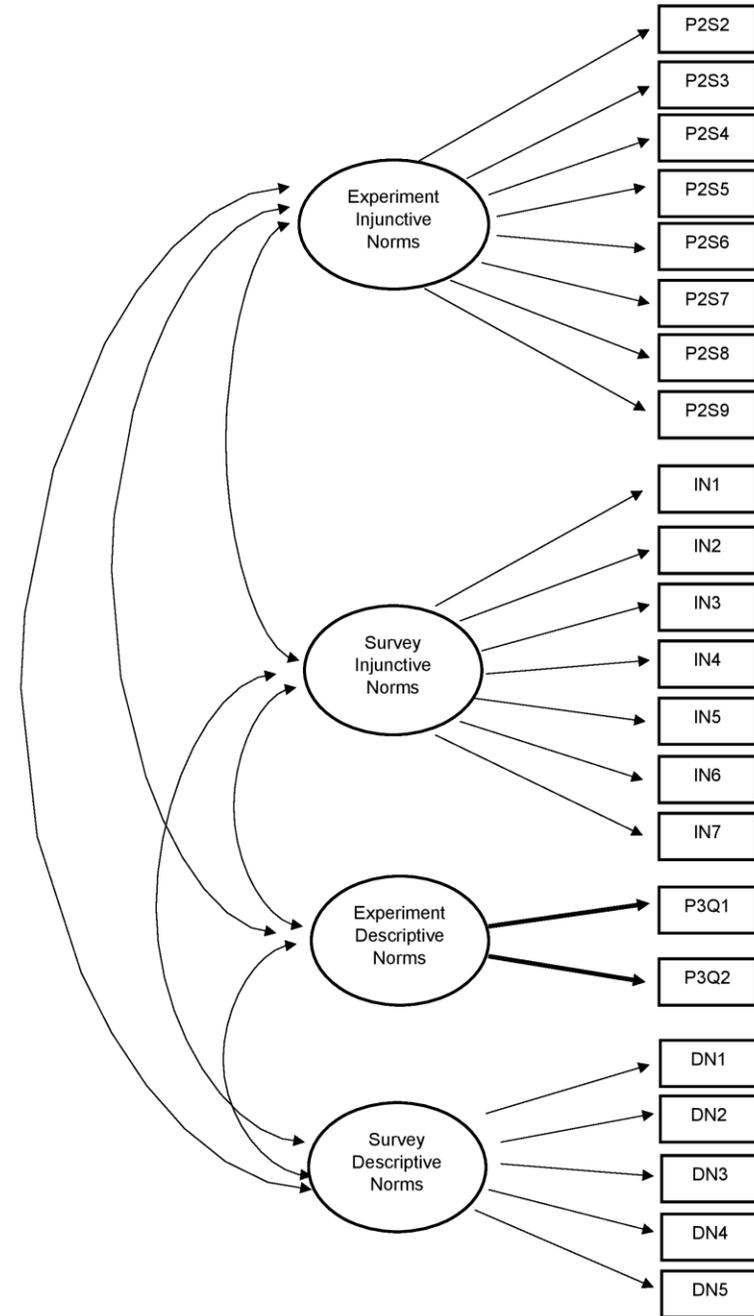
- Model chi-square test ( $p < 0.05$ ).
- Comparative Fit Index (CFI):  $\geq 0.96$ .
- Tucker Lewis Index (TLI):  $\geq 0.95$ .
- Root Mean Square Error of Approximation (RMSEA):  $\leq 0.06$ .
- Standardized Root Mean Square Residual (SRMR):  $\leq 0.09$ .



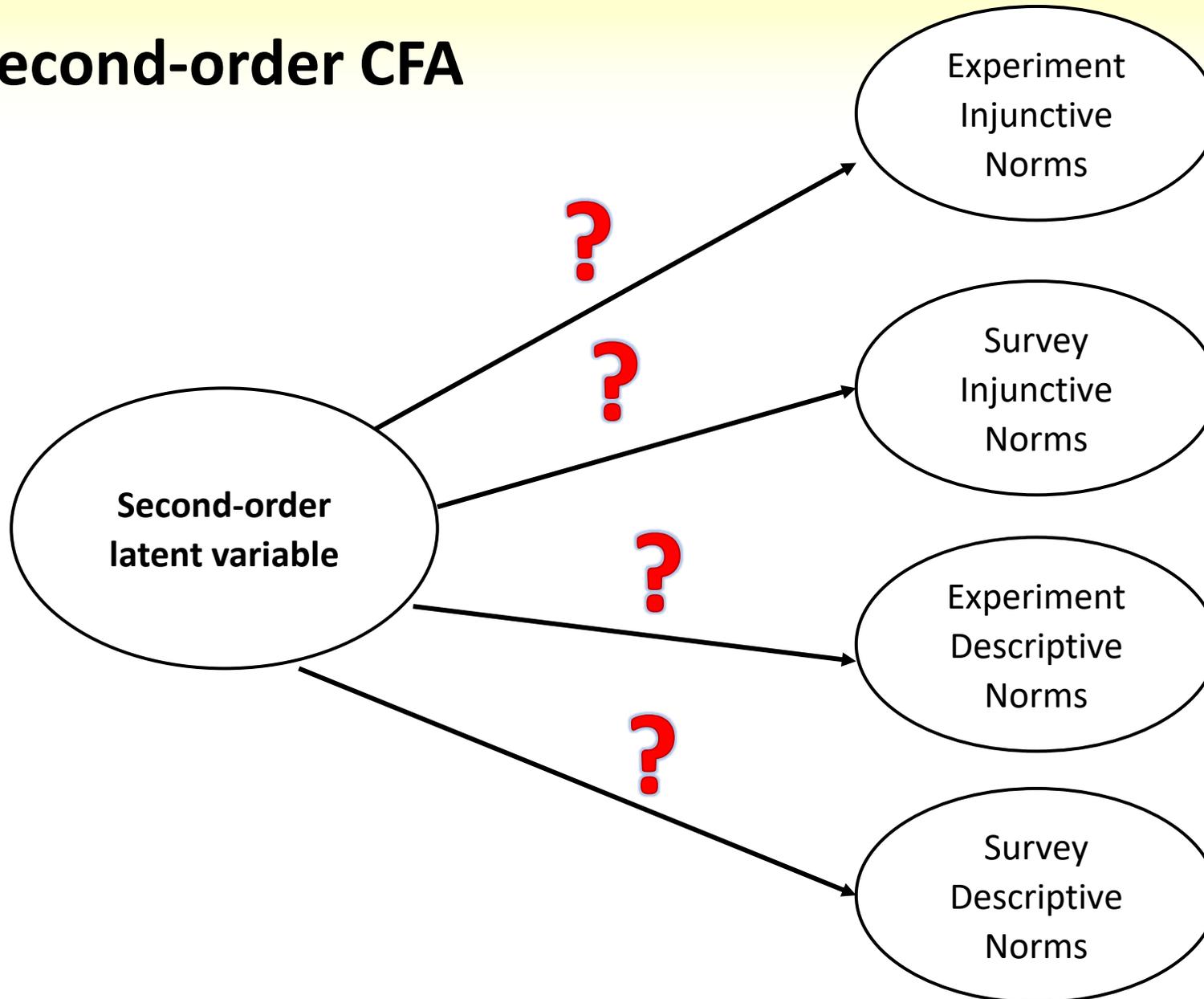
# Aim 1: Construct validity

## Model fit indices –results

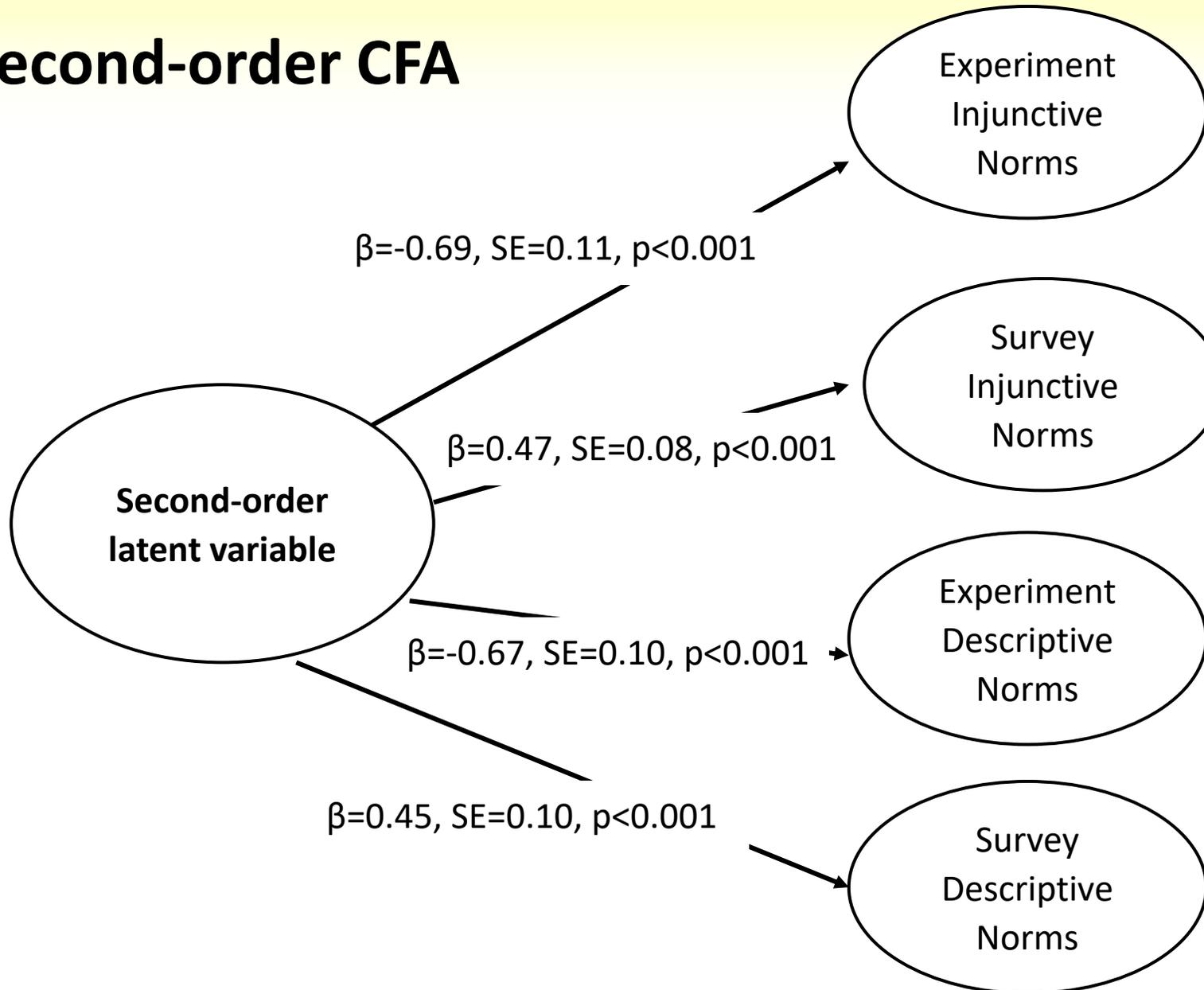
- Model chi-square test:  $p > 0.05$ .
- CFI=0.959.
- TLI=0.952.
- RMSEA=0.030.
- SRMR=0.033.



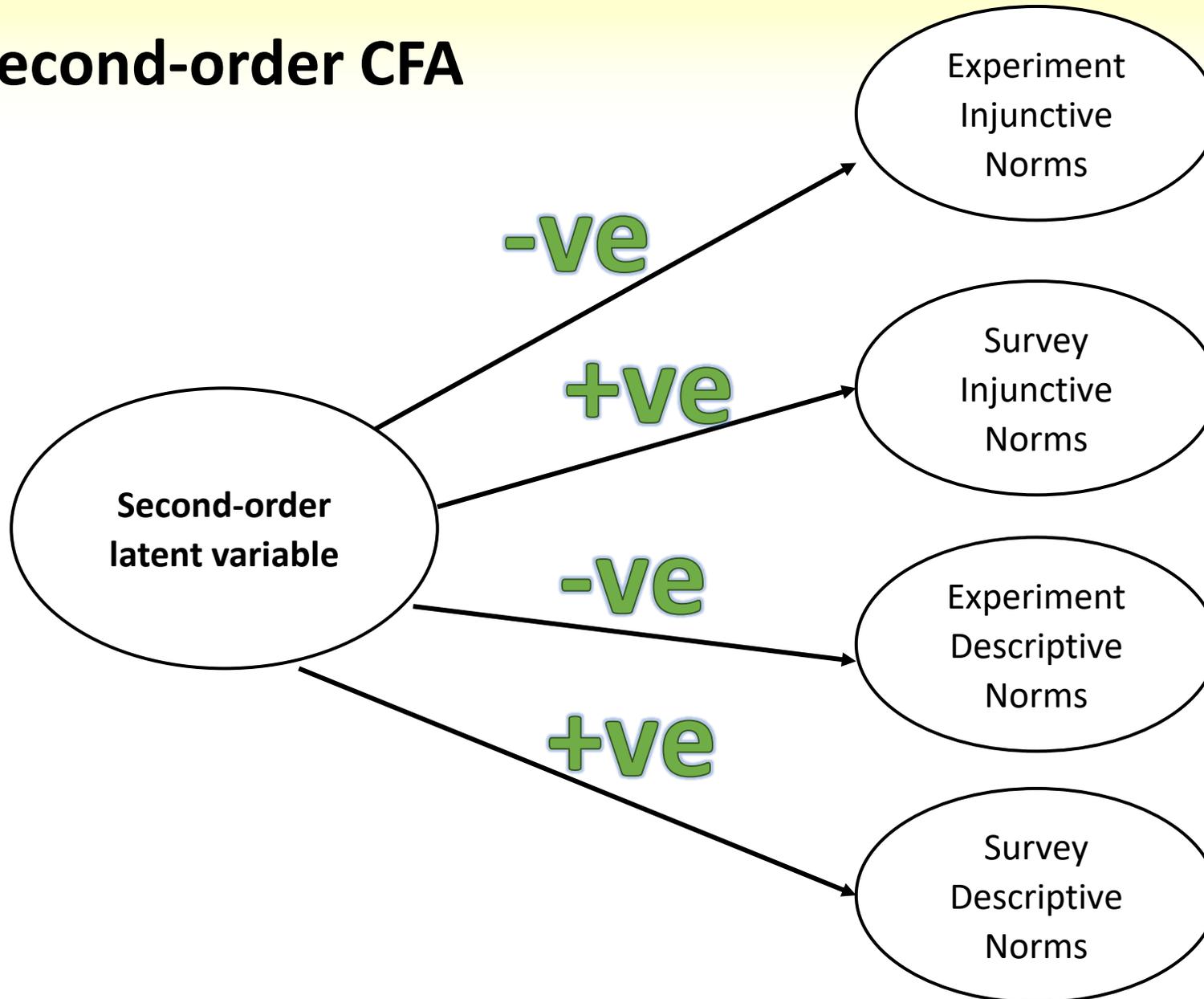
## Aim 2: Second-order CFA



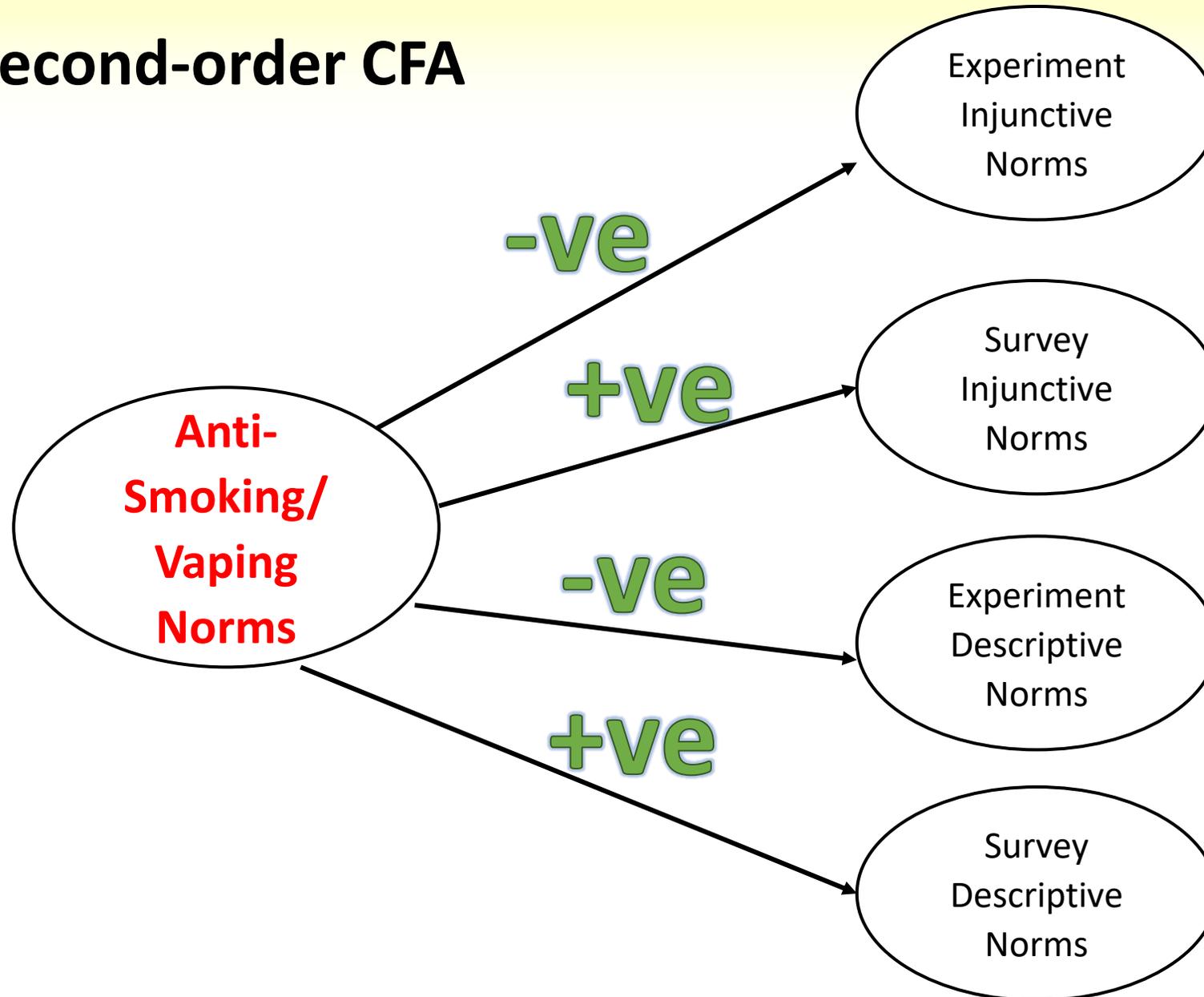
## Aim 2: Second-order CFA



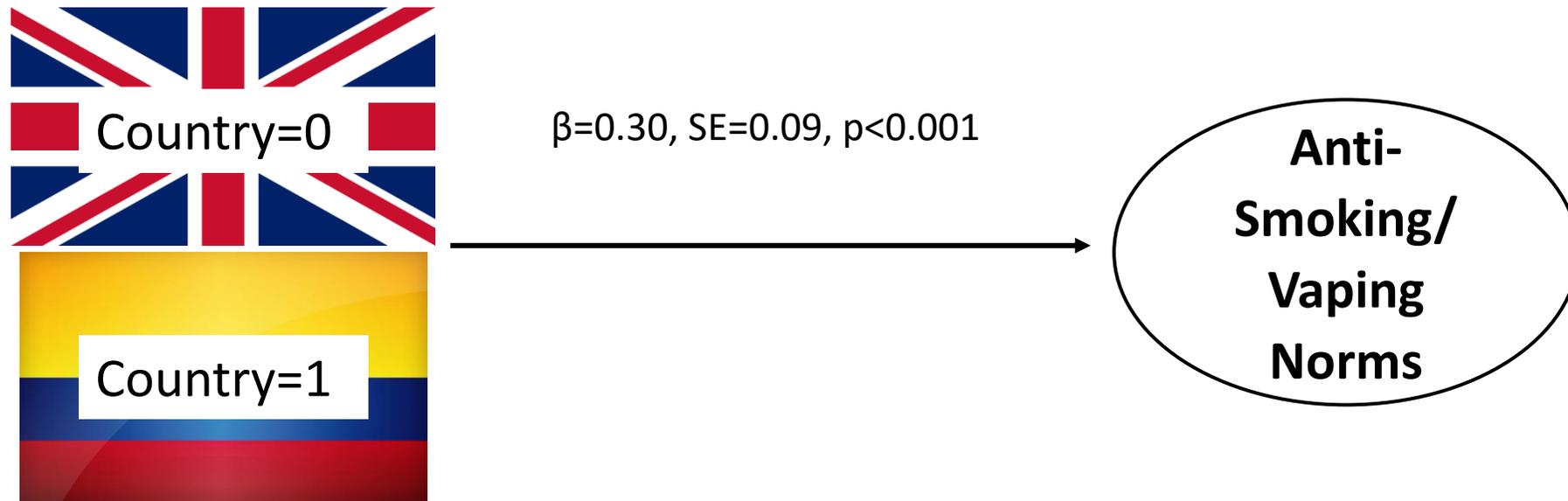
## Aim 2: Second-order CFA



## Aim 2: Second-order CFA



## Aim 3: Country differences on norms (SEM)



Higher anti-smoking/vaping norms in Colombia compared to NI.

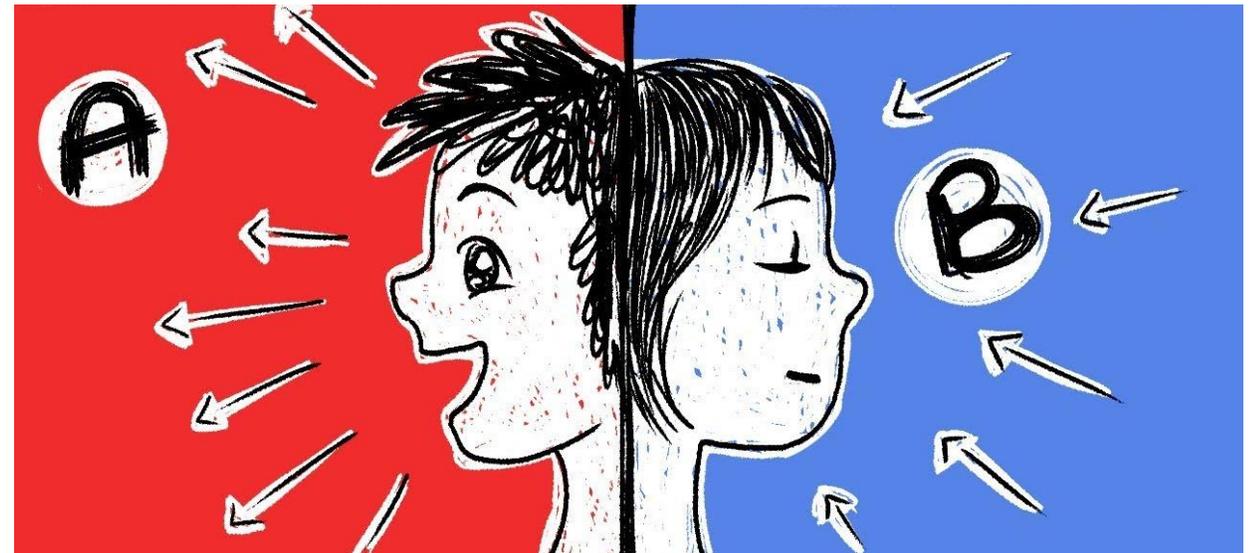
## Aim 3: Sex and personality differences on norms (SEM)

### Higher anti-smoking/vaping norms associated with

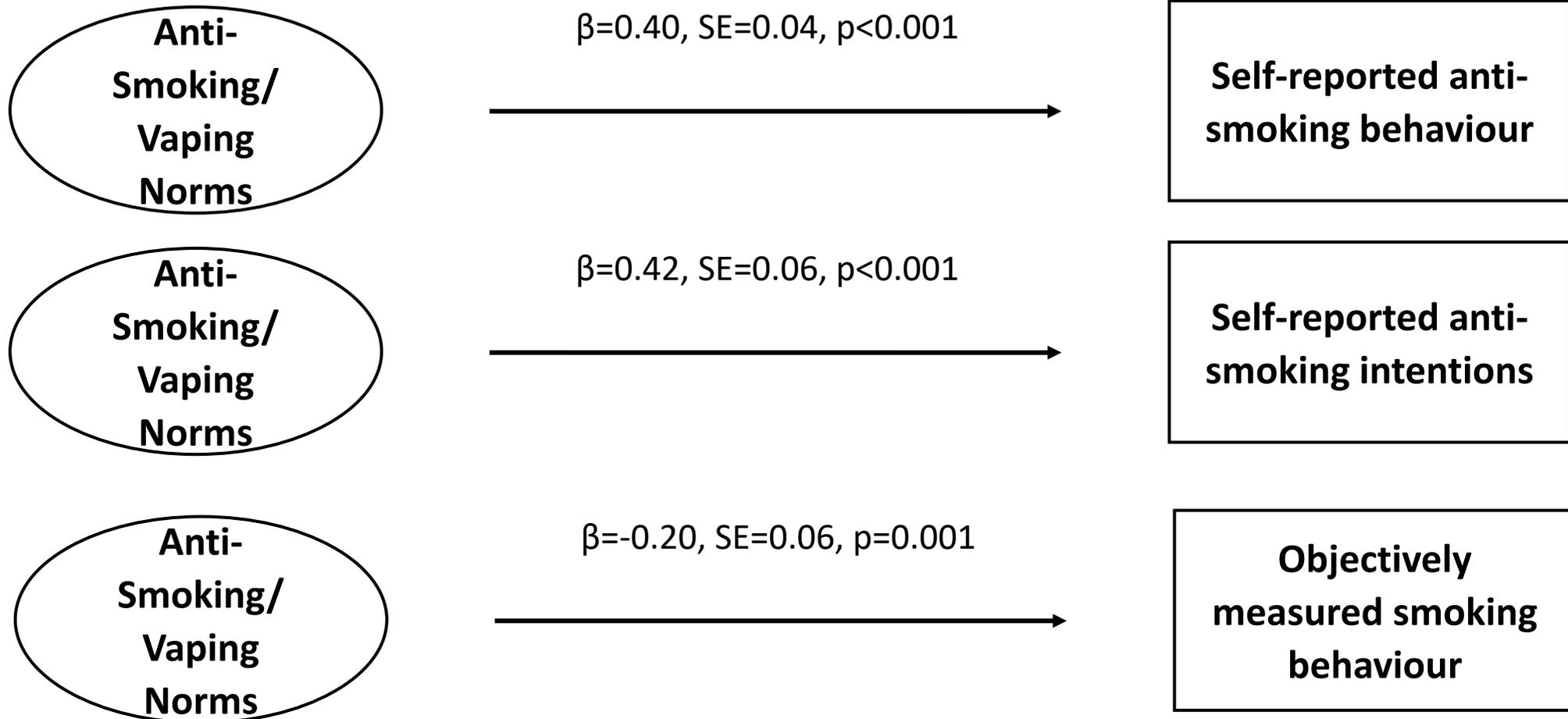
- Higher need to belong ( $p=0.003$ ).
- Higher pro-sociality ( $p<0.001$ ).
- Higher openness ( $p<0.001$ ).
- Higher extraversion ( $p=0.03$ ).
- Higher agreeableness ( $p<0.001$ ).
- Higher conscientiousness ( $p<0.001$ ).
- Higher stability ( $p<0.001$ ).

### No association with

- Sex.
- Fear of negative evaluation.



## Aim 4: Associations of norms with behaviour/intentions (SEM)



# Conclusions

- Evidence has been provided for the construct validity of the experimental and self-report norms measurement instruments.
- The experimental and self-report norms measures were measuring the same underlying latent construct of anti-smoking/vaping norms.
- The norms measures differed according to country (NI or Colombia), and personality characteristics.
- The norms measures were associated with smoking behaviour and intentions.
- Future research should investigate whether these results vary across repeated measurements and whether they apply in different countries/settings.

# Paper reference

Murray JM, Kimbrough EO, Krupka EL, *et al.* Confirmatory factor analysis comparing incentivized experiments with self-report methods to elicit adolescent smoking and vaping social norms. *Sci Rep* 2020; **10**: 15818. DOI: 10.1038/s41598-020-72784-z

**Authors:** Jennifer M. Murray (Queen's University Belfast), Erik O. Kimbrough (Chapman University), Erin L. Krupka (University of Michigan), Abhijit Ramalingam (Appalachian State University), Rajnish Kumar (Queen's University Belfast), Joanna McHugh Power (Maynooth University), Sharon C. Sanchez-Franco (Universidad de los Andes), Olga L. Sarmiento (Universidad de los Andes), Frank Kee (Queen's University Belfast), Ruth F. Hunter (Queen's University Belfast).



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- <sup>7</sup>Action on Smoking and Health (ASH). Young People and Smoking. London (2019).  
<http://ash.org.uk/category/information-and-resources/briefings/1>. Accessed 30 July 2020.
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## Christopher Tate

Socio-environmental and psychosocial predictors of smoking susceptibility among adolescents with contrasting socio-cultural characteristics: A comparative analysis

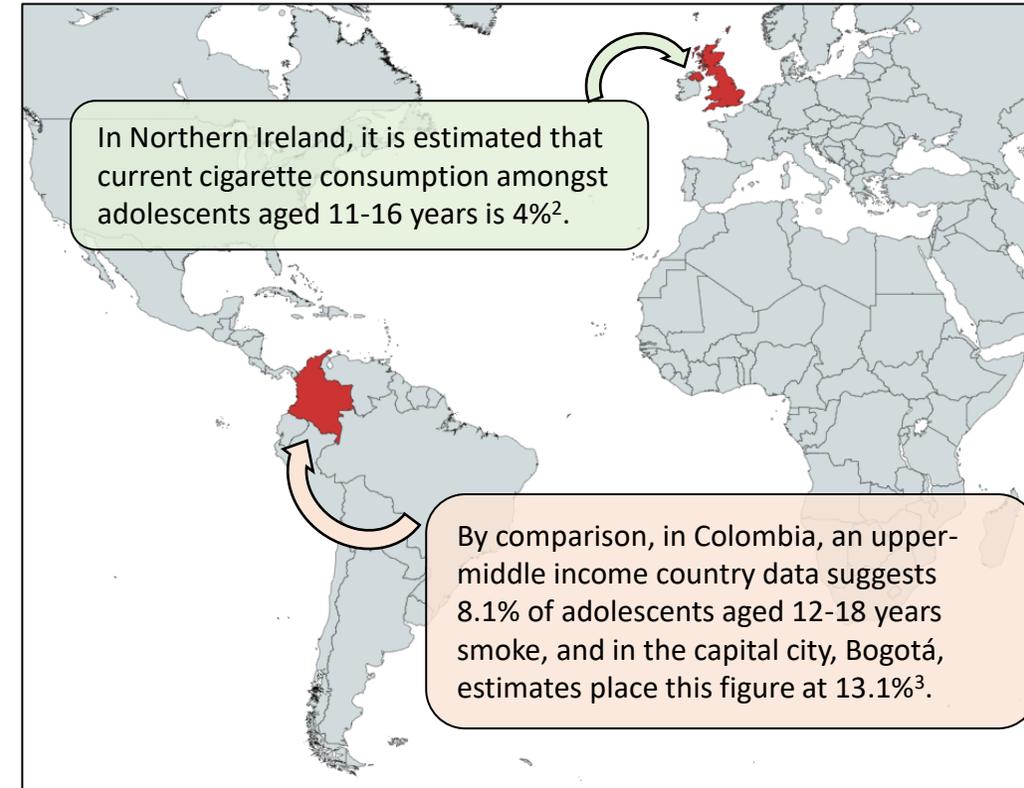


**Smoking,  
friendship networks  
and norms:**  
*a tale of two cities*

**Tabaquismo,  
redes de amigos  
y normas:**  
*una historia de dos ciudades*

# Background

- Adolescent smoking is a prevalent risk factor for non-communicable disease in low-middle income countries (LMICs) as well as high-income countries.
- However, research has shown that a disproportionate number of those aged 15 years and over who smoke (approximately 80%) live in LMICs<sup>1</sup>.
- There are a number of reasons for this:
  1. A higher concentration of tobacco marketing in these countries<sup>4</sup>;
  2. Exploitation of local tobacco control legislation by the tobacco industry<sup>5</sup>; and
  3. Inconsistencies in the application of smoke-free regulatory frameworks across LMICs<sup>6</sup>.



# Background

*Additional factors that contribute to adolescent smoking*



## **Socio-environmental Factors:**

- Social norms
  - Descriptive norms
  - Injunctive norms
- School smoking policies
- Exposure to smoking in media
- Exposure to tobacco advertisements in shops

## **Psychosocial Traits:**

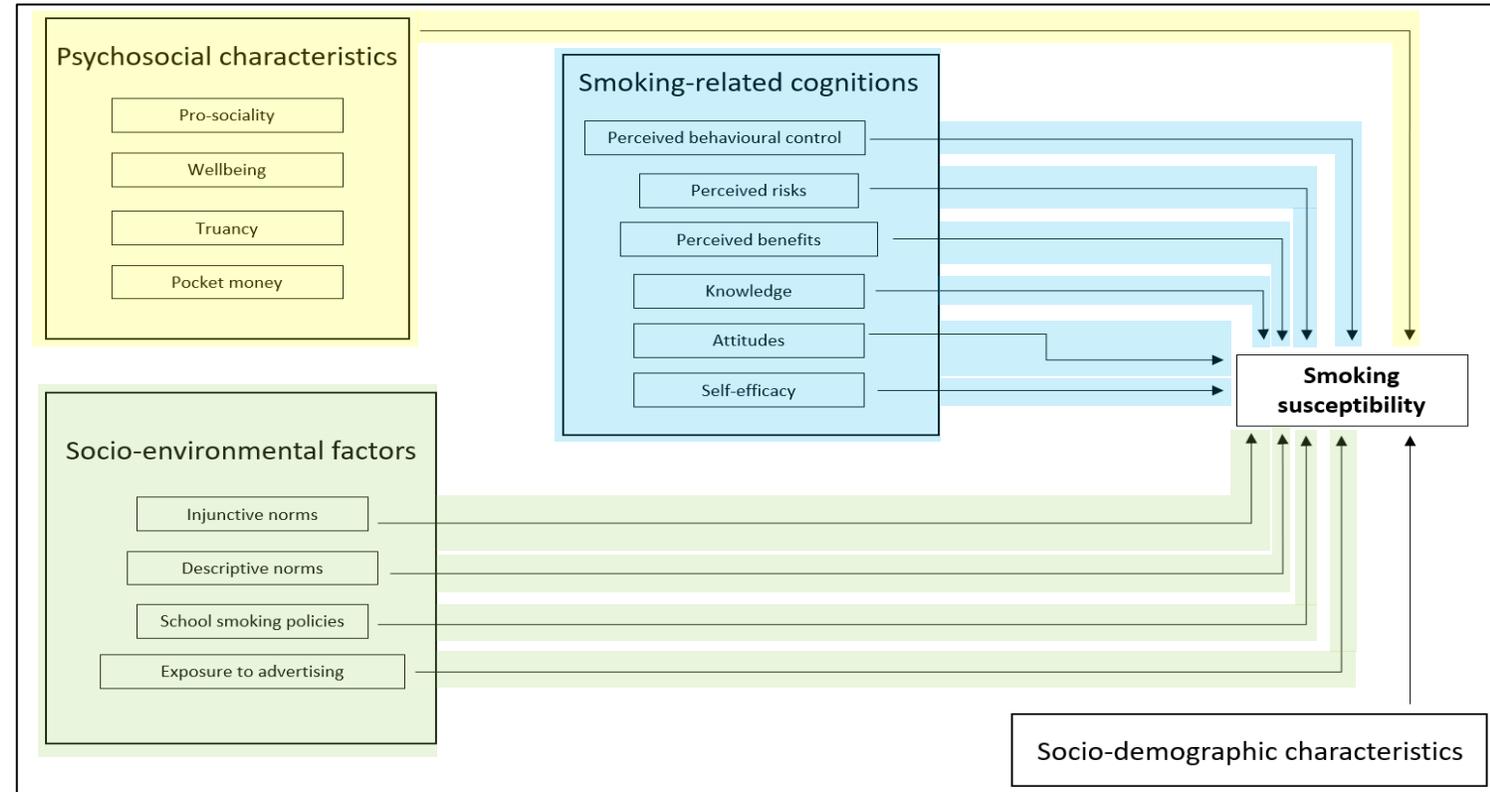
- Need to belong
- Fear of negative evaluation
- Prosociality
- Openness
- Extraversion
- Agreeableness
- Conscientiousness
- Emotional stability
- Wellbeing
- Truancy

## **Smoking-related cognitions:**

- Self-efficacy
- Perceived risks of smoking
- Perceived benefits of smoking
- Perceived behavioural control
- Attitudes towards smoking
- Knowledge of health effects

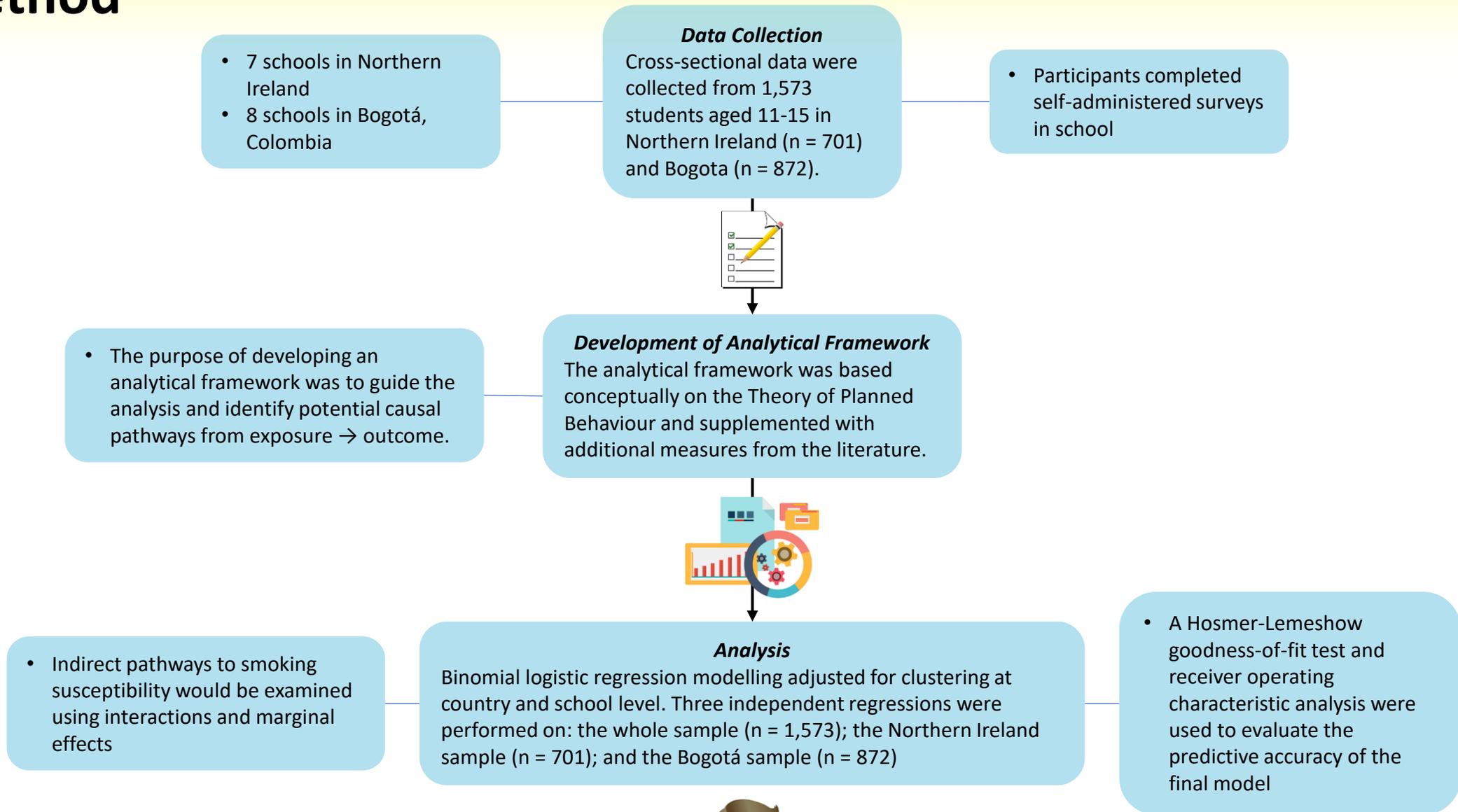
# Study Objectives

1. To understand if the association between socio-environmental and individual-level factors, and susceptibility to smoking, differ between low-middle income settings and high-income settings; and
2. Address whether or not differences exist in the magnitude or distribution of individual and socio-environmental risk factors across countries.



Susceptibility to smoking was defined as *the absence of a firm commitment not to smoke*. Participants were classified as susceptible or not based on three items measuring intentions to smoke (adapted from Pierce et al, 1996)<sup>7</sup>

# Method



# Results

## Sample characteristics

- A smaller proportion of students in the Bogotá cohort reported having never smoked (80%) compared to Northern Ireland (85%).
- A larger proportion of students in Bogotá (43%) were classified as susceptible compared to the Northern Ireland cohort (31%).
- Furthermore, the proportion of students who recorded an exhaled carbon monoxide reading over six was significantly higher in Bogotá (14% compared to <1% in Northern Ireland).

Table 1: Sample Smoking Behaviour and Intentions Characteristics

	Total (n = 1,573)		Northern Ireland (n = 701)		Bogotá (n = 872)		$\chi^2$
<b>Sample Characteristics<sup>1</sup></b>							
<b>Smoking Behaviour</b>							0.004
Current smoker	58	(4%)	27	(4%)	31	(4%)	
Previous smoker	224	(14%)	77	(11%)	147	(17%)	
Never smoker	1291	(82%)	597	(85%)	694	(80%)	
<b>Exhaled carbon monoxide (PPM)<sup>2</sup></b>							0.000
0 - 4 (Non-smoker)	1230	(82%)	624	(89%)	606	(69%)	
5 - 6 (Casual smoker)	144	(10%)	4	(<1%)	140	(16%)	
> 6 (Smoker)	125	(8%)	1	(<1%)	124	(14%)	
Missing values	74	(<1%)	72	(10%)	2	(<1%)	
<b>Smoking Susceptibility</b>							0.000
<b>Susceptible to Smoking</b>							
Yes	587	(37%)	215	(31%)	372	(43%)	
No	985	(63%)	485	(69%)	500	(57%)	

<sup>1</sup> Variable distributions are reported as n (%) unless otherwise stated.

<sup>2</sup> Smoker classifications based on piCO Smokelyzer operating manual (Bedfont, 2010)<sup>8</sup>

# Results

## *Factors that predicted smoking susceptibility in Northern Ireland and Bogotá*

### Northern Ireland

### Bogotá

#### Socio-environmental factors

- Having a mother that did not smoke **increased** the odds of being susceptible
- Having fewer family members that smoked **reduced** the odds of being susceptible
- Access to smoking information in school **reduced** the odds of being susceptible

- Reporting that fewer friends smoked **reduced** the odds of being susceptible

#### Smoking-related cognitions

- Reporting negative attitudes towards smoking significantly **reduced** the odds of being susceptible

- A greater score on the self-efficacy scale **reduced** the odds of being susceptible
- Students who reported a greater perceived behavioural control to quit smoking were at **reduced** risk of future smoking

#### Psychosocial Traits

- Students who were more receptive to new ideas or demonstrated more curiosity (openness) were **less likely** to be susceptible
- Higher levels of extraversion **increased** the odds of being susceptible
- Higher levels of wellbeing **reduced** the odds of being susceptible

- Students who did not skip school were **less likely** to be classified as susceptible to future smoking

# Implications for Policy Design

The findings illustrate that there were differences in predictors of adolescent smoking susceptibility across the two settings.

## *The importance of the individual*

Our data support the notion that policies targeting self-efficacy may be more effective in LMICs where smoking is more prevalent. In high-income countries, more conventional educational policies targeting attitudes towards smoking may be more effective.

## *The importance of context*

By using a comparative approach, we demonstrated that smoking interventions and policies must be sensitive to the cultural and normative context within which they are implemented.



**Increased risk for future smoking**

**Northern Ireland**

**Bogotá**

Having a mother that does not smoke  
↓  
Extraverted behavioural tendencies



**Decreased risk for future smoking**

**Northern Ireland**

**Bogotá**

Less smoking among family  
↓  
School providing information about smoking  
↓  
Negative attitudes towards smoking  
↓  
Openness (receptiveness to new ideas / curiosity)  
↓  
Greater wellbeing

Less smoking among friends  
↓  
Higher levels of self-efficacy  
↓  
Greater PBC to quit  
↓  
Lower levels of truancy

# Strengths and Limitations

Strengths	Limitations
<ul style="list-style-type: none"><li>• Sample size</li><li>• The study used robust maximum variation sampling to ensure there was sufficient heterogeneity between schools in both countries serving urban and rural areas</li><li>• To ensure the validity of student's responses participants were assured their responses would not be shared with other students or teachers</li></ul>	<ul style="list-style-type: none"><li>• Social desirability bias from self-reports</li><li>• Potential for under-reporting of smoking behaviours</li><li>• Potential for inaccurate estimates of smoking prevalence among friends / family ("pluralistic ignorance")</li><li>• Students who did not participate were potentially more likely to be smokers who did not want to report their behaviour</li><li>• Cross-sectional nature of the data limits the establishment of causality</li><li>• The findings from this study may not generalise to other populations due to cultural and social factors unique to the two settings</li></ul>

Thanks for listening



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# A tale of two cities: unlocking the mechanisms through understanding the context of smoking prevention

Sharon Sánchez-Franco, Shannon Montgomery, Erika Torres, Ana Ramirez, Angela López, Jennifer M. Murray, Ruth F. Hunter, Frank Kee, Olga L. Sarmiento.

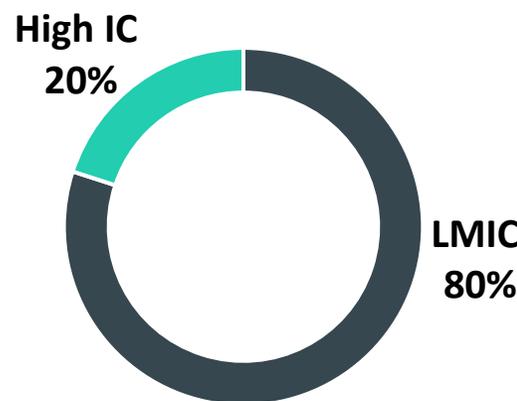


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# Unlocking the mechanisms by which smoking prevention works in different contexts is very important



Change behavioural theories have been used to design interventions for smoking prevention and incorporate social influence.

**ASSIST**

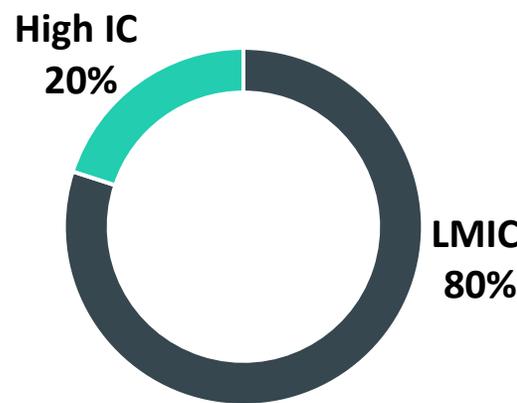


**Dead Cool**



Both interventions have shown effectiveness in decreasing the number of children that begin smoking

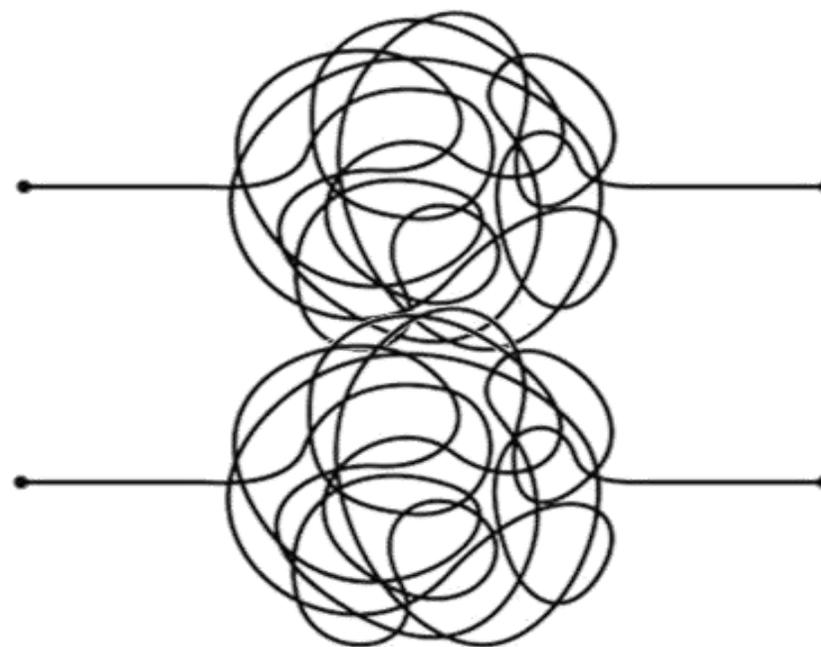
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ASSIST

Dead Cool

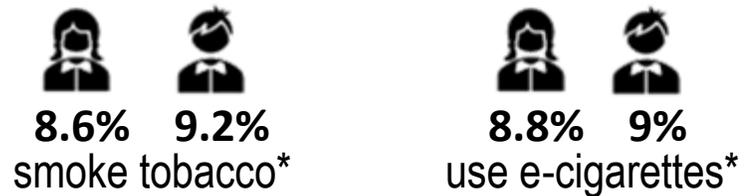


Both interventions have shown effectiveness in decreasing the number of children that begin smoking, **but the mechanisms by which these intervention works are unclear.**

We conducted a **comparative qualitative analysis** to explore the mechanisms by which ASSIST and Dead Cool change participants' reasoning to smoke or not-smoke in two different contexts

## Bogotá, Colombia

7 million inhabitants  
Low and middle-income country  
4.1 % are absolute poor  
26 pupils per teaching staff

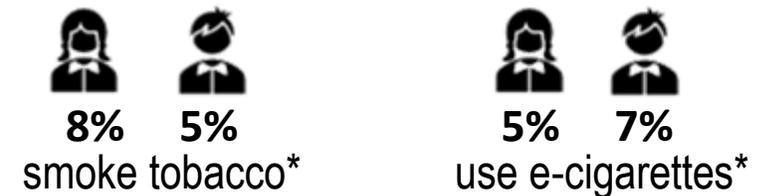


▶  
**13 years old**  
onset tobacco use\*\*

Aged \*13-15; \*\*12-18

## Northern Ireland, UK

2 million inhabitants  
High-income country  
0.2 % are absolute poor  
17 pupils per teaching staff

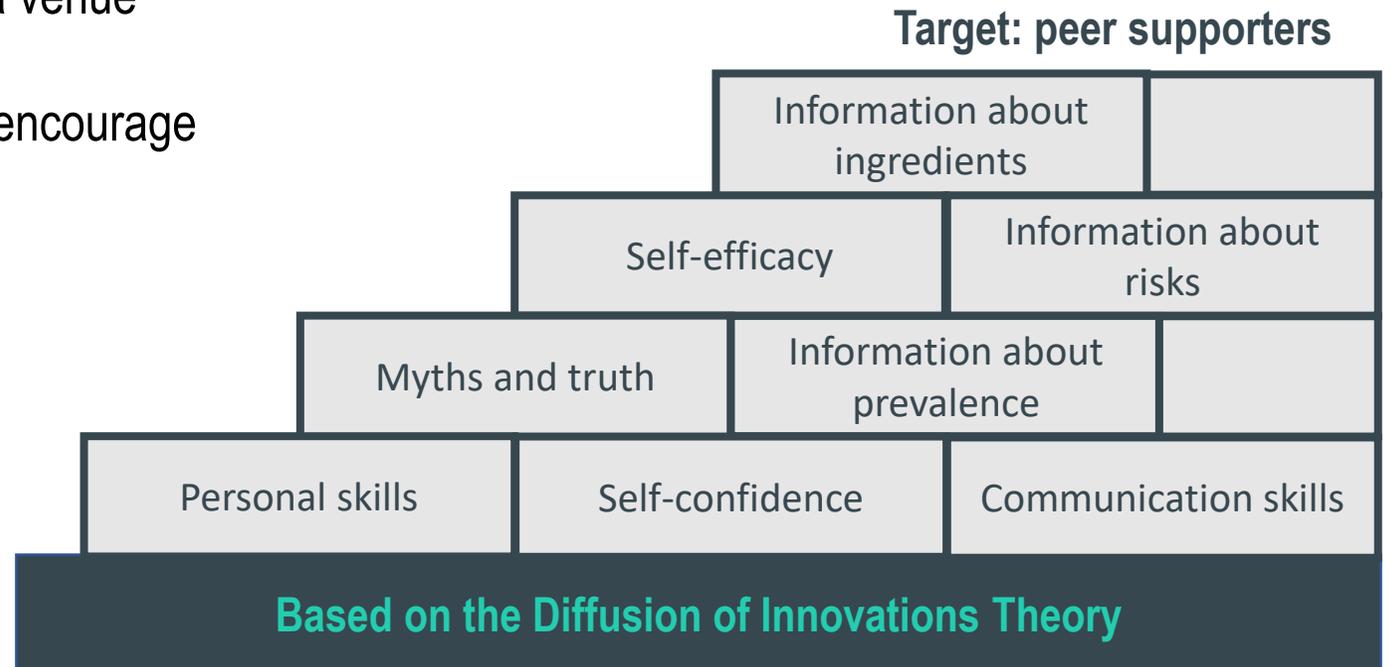


▶  
**14 years old**  
onset tobacco use\*\*

Aged \*11-16; \*\*11-15

# ASSIST program (Entre Parceros)

1. All pupils nominate the influencer classmates.
2. The top 18% of nominated pupils are trained at a venue away from school.
3. Peer supporters have informal conversations to encourage their peers not to smoke.
4. Trainers visit peer supporters to follow-up.

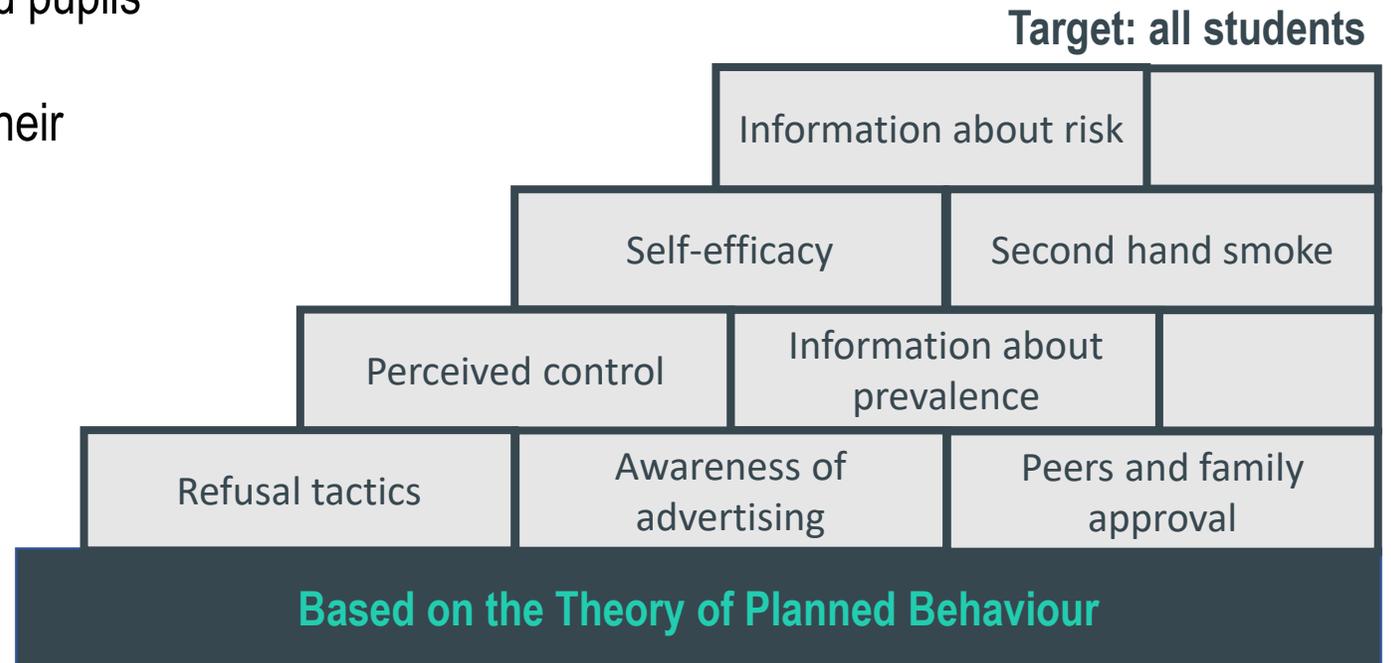


ASSIST focuses on leveraging social networks to spread anti-smoking social norms



# Dead Cool program (Bacanísimo)

1. Teachers from school are instructed.
2. Teachers are provided with a resources pack and pupils with a workbook.
3. Eight lesson plans are delivered by teachers in their classroom over eight weeks.



Dead Cool uses conventional classroom pedagogy to promote social and personal skills learning.



We conducted 29 focus groups with participants from both interventions



## Bogotá, Colombia

**3** schools received ASSIST (333 students)

**16** participant students from ASSIST

**16** participant peers supporters from ASSIST

---

**3** schools received Dead Cool (305 students)

**24** participant students from Dead Cool



49%

Aged  
11-13

74%



14%



54%

## Northern Ireland, UK

**3** schools received ASSIST (393 students)

**59** participant students from ASSIST

**25** participant peers supporters from ASSIST

---

**3** schools received Dead Cool (284 students)

**55** participant students from Dead Cool



53%

Aged  
11-13

99%



8%



45%

# Contextual differences

Realistic approach (Dalkin et al, 2015; Aviles & Reed, 2017)

## Bogotá, Colombia

- Smoker families
- Unsafe neighbourhoods
- Misuses of other substances in the neighbourhood and school
- Availability: cigarettes purchase by unit
- Advertising: e-cigarettes by social media

## Northern Ireland, UK

- Smoker families
- Previous smoking information from the school
- Participation in advising groups and sport groups
- Availability: e-cigarettes purchase by the internet
  - Advertising: e-cigarettes by social media

## Contextual differences

Realistic approach (Dalkin et al, 2015; Aviles & Reed, 2017)

*“Let's say when you are at home, and think of something that is not like what others think, they scold me and tell me: you can't have a cell phone for a day! [...] What else did you like about the intervention? That you tell us that no answer is wrong”*

Student,  
Bogotá

*“It gets taught about smoking in science. [...] In my youth club one of the youth workers brought in one of the wee things that are in cigarettes, and there was loads of oil and poisonous stuff in them”*

Student,  
Northern Ireland



## Bogotá, Colombia

### Increased:

- Intention to not smoke
- Knowledge on tobacco risk
- Knowledge on what contains a cigarette
- Perception of consequences of smoke
- Personal skills for awareness on indirect advertising
- Empathy for supporting others

## Northern Ireland, UK

**Maintained** intention to not smoke

### Increased:

- Awareness of the influence of others' smoking behaviour
- Knowledge about tobacco risk
- Perception of consequences of smoke

# Behavioural changes

Theoretical Domains Framework (Michie et al, 2005; Cane, 2012; Atkins, 2017)

Bogotá, Colombia

Inc

“It was a change for me because before the program I had the thought that as soon as I turn eighteen I was going to smoke my first cigarette. But, after finding out that the cigarette has consequences, well I don't want to do it”

Student,  
Bogotá

Northern Ireland, UK

Maint

“I wasn't planning on smoking anyway [...] It's just been the same, because I've already been told not to do it. It hasn't really changed anything, just kind of told me how bad it actually is”

Student,  
Northern Ireland



## Bogotá, Colombia

### ASSIST

Knowledge about consequences  
Knowledge about ingredients

Perception of health consequences  
Perception of social consequences (family)

Self-efficacy to not smoke  
Communication skills

Encourage others peers to not smoke  
Encourage families to not smoke

Demands for more information on e-cigarettes  
Demands for more information on other substances

### Dead Cool

Knowledge about health consequences

Perception of health consequences

Self-efficacy to not smoke  
Personal skills to refuse  
Personal skills to awareness of advertising

Encourage friends to not smoke

Demands for more information on e-cigarettes  
Demands for more information on other substances



## Northern Ireland, UK

### ASSIST

Knowledge about consequences  
Knowledge about ingredients  
Knowledge about e-cigarettes

Perception of health consequences  
Perception of social consequences (peers and families)

Self-efficacy to not smoke  
Communication skills

Encourage others peers to not smoke  
Encourage families to not smoke

Demands for more information on e-cigarettes

### Dead Cool

Knowledge about health consequences  
Knowledge about e-cigarettes

Perception of health consequences  
Perception of social consequences (peers and families)

Self-efficacy to not smoke  
Personal skills to refuse

Encourage friends to not smoke  
Encourage families to not smoke



# Conclusions

Context demands and resources are important

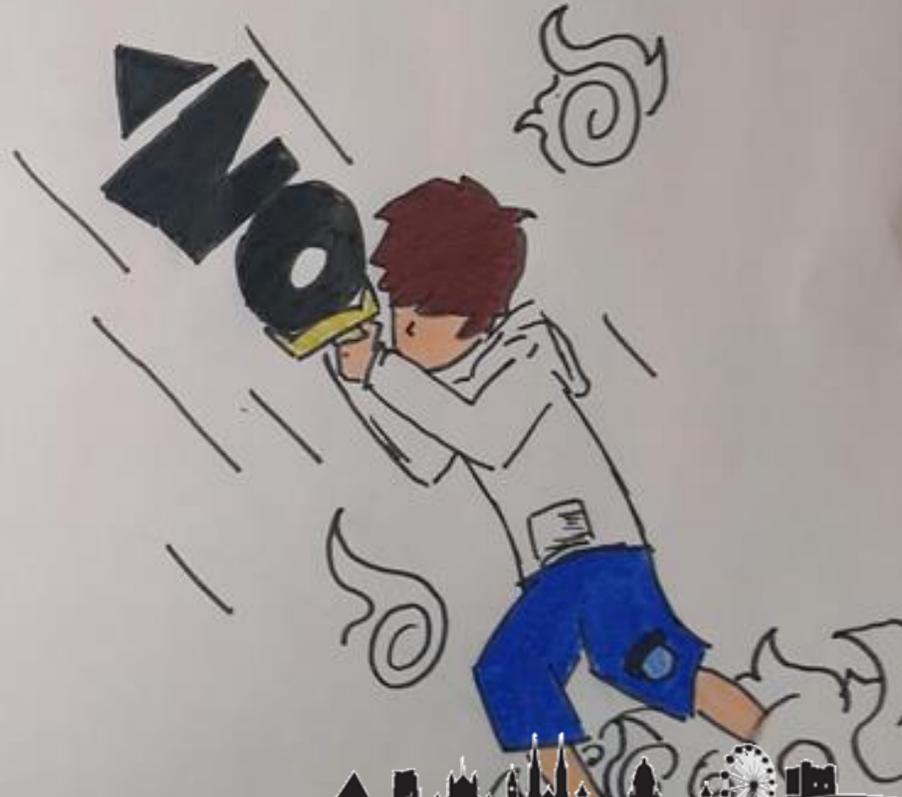
Opportunities of interventions in the close context: schools and neighborhoods

Advantages of qualitative research for unlocking mechanisms

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Thanks!





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## Speakers: Felipe Montes and Martha Blanco

Exploring the relation between the social norms and the social network structure for the ASSIST and Dead Cool smoking prevention interventions



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## Speakers: Felipe Montes and Martha Blanco

**Coauthors:** Felipe Montes, Martha María Blanco, Carlos Caro, Andrés Felipe Useche, Sharon Carolina Sanchez, Lei Tong, Jie Li, Huiyu Zhou, Shannon Montgomery, Olga L. Sarmiento, Frank Kee, Ruth F. Hunter.



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# Aim

Investigate the **mechanistic pathways** by which the **social network structures** influence the **social norms** before and after the ASSIST and Dead Cool **smoking prevention interventions** in Bogota and Northern Ireland schools.

# Networks size are similar within schools and countries over time.



N=1407

12 schools, 6 for each country,  
3 per intervention in each country

## Survey- Injunctive norms

7 items (Liker scale)

## Coordination game- Injunctive norms

8 items (Liker scale)

## Survey- Descriptive norms

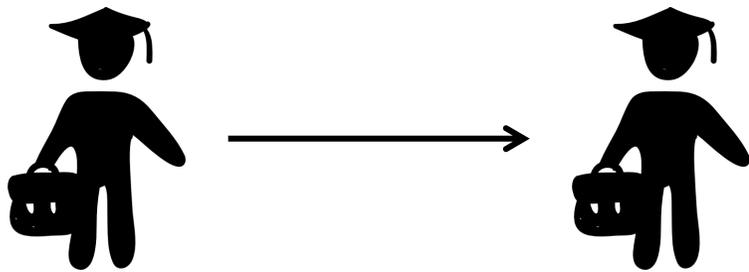
8 items (Liker scale)

## Coordination game- Descriptive norms

2 items (Liker scale)

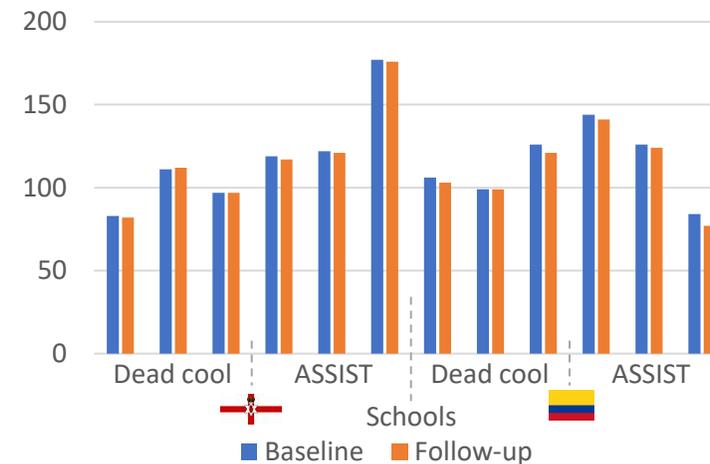
## Sociodemographics:

- Categorical age
- Sex
- Ethnic minority
- Home composition

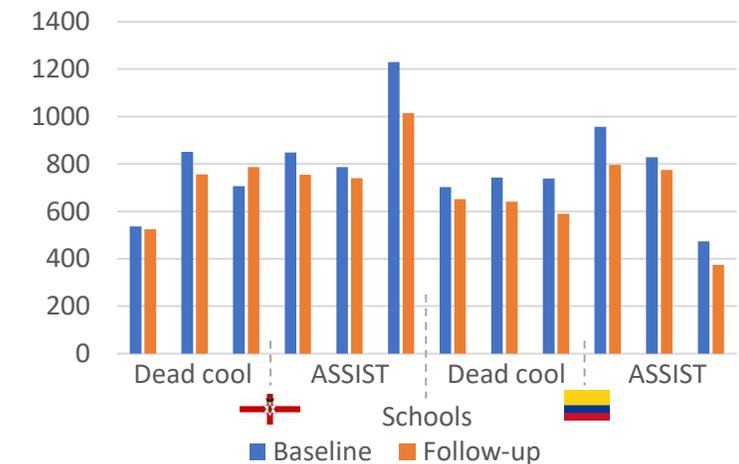


12 networks, one per school

Nodes



Edges



# Methodology

## Objective

Identify latent classes that emerge when grouping the students according to their social norms



Assess the change over time of the friendship network structure



Assess if changes in the social norms are related with changes in the friendship network structure (homophily) or with changes in friends' social norms (influence)

## How?

1. Reduce the dimensionality of the students social norms data (CFA)
2. Latent Transition Analysis



1. Measure friendships changes with Jaccard Index



1. STERGM
2. Descriptive analysis

# 1. Identify latent classes according to the social norms



**Descriptive Smoking Norms**

**Base line and follow-up**

**Injunctive Smoking Norms**

**Base line and follow-up**

**Sociodemographics:**

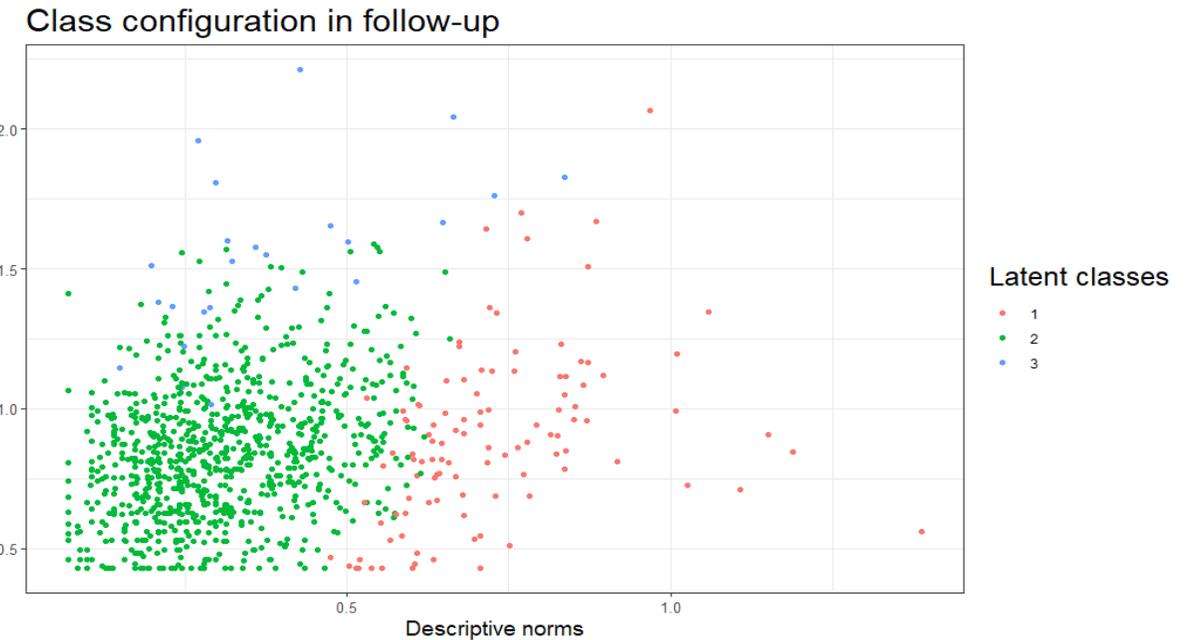
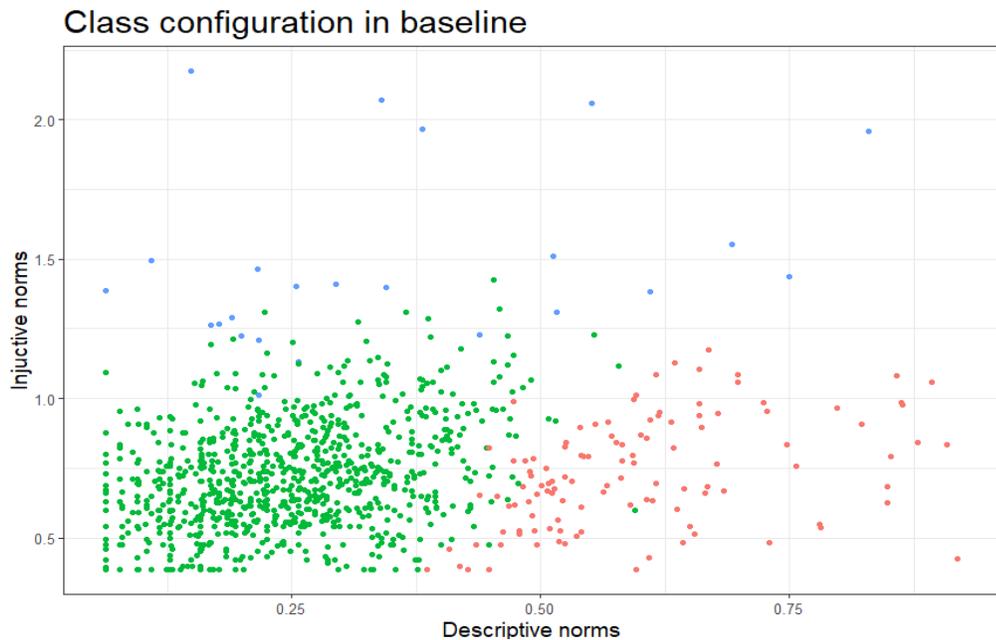
- Categorical age
- Sex
- Ethnic minority
- Home composition

**Base line**

Using CFA we reduced the 25 social norms indicators into 2 factors

# LTA grouped students in 3 latent classes and estimated the transition of the observations within the groups

	Label	Class interpretation
 Class 1	Descriptive social norm towards smoking	I think other smoke, but I think others think I should not smoke.
 Class 2	Social norms against smoking	I think others do not smoke and they think I should not smoke
 Class 3	Social norms towards smoking	Regardless of whether I believe they smoke or not, I believe that others believe that I should smoke



The majority of the students remained/transitioned to the class with social norms against smoking, ~5% transitioned to a norm towards smoking

### Proportions for each class in baseline and follow-up

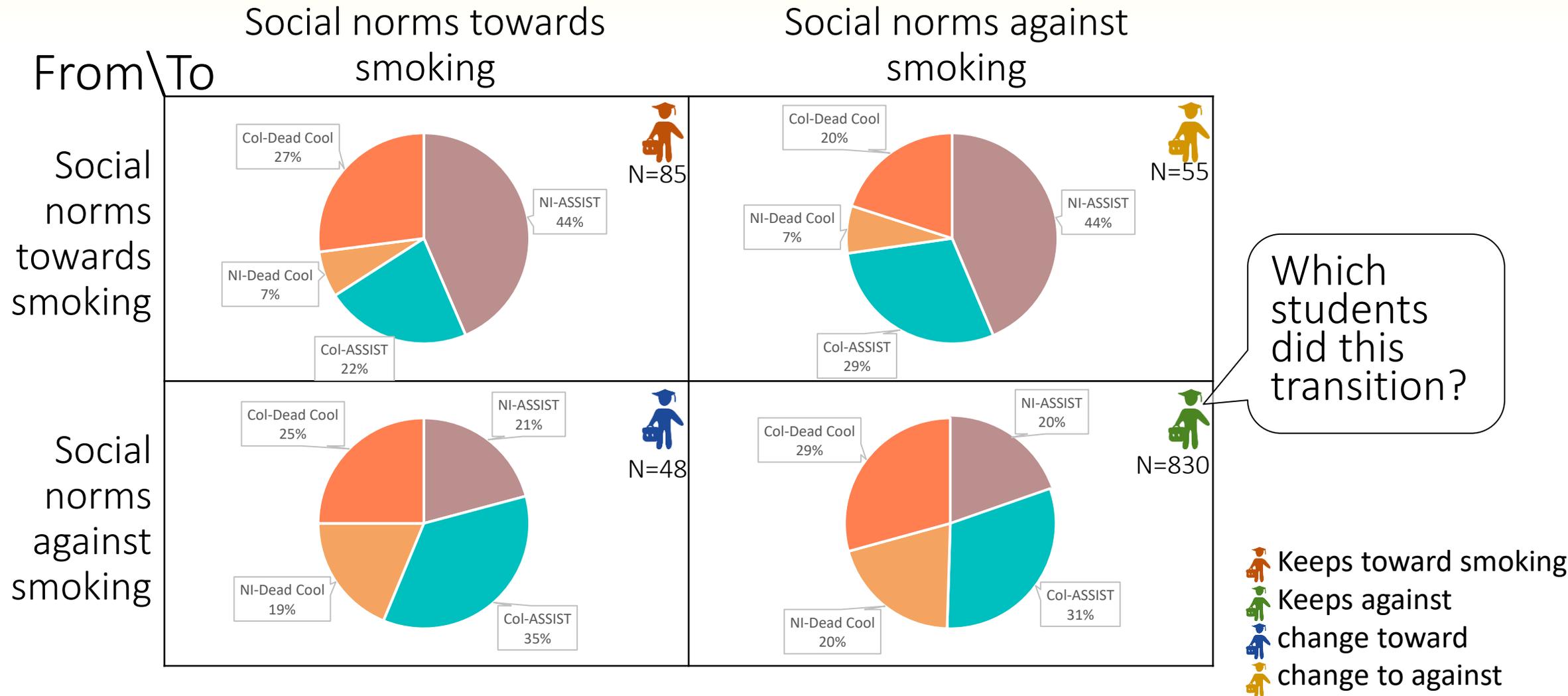
Class	Baseline (T0)	Follow-up (T1)
1	116 (11.4%)	109 (10.7%)
2	878 (86.2%)	885 (86.9%)
3	24 (2.4%)	24 (2.4%)

### Transition matrix from baseline to follow-up

From \ To	1	2	3
1	62	50	4
2	45	830	3
3	2	5	17

	Label	Class interpretation
 Class 1	Descriptive social norm towards smoking	I think other smoke, but I think others think I should not smoke.
 Class 2	Social norms against smoking	I think others do not smoke and they think I should not smoke
 Class 3	Social norms towards smoking	Regardless of whether I believe they smoke or not, I believe that others believe that I should smoke

The ASSIST intervention, which is based on peer influence, shows a greater class transition to the social norms class against smoking than the Dead Cool intervention.



Older students are more likely to be assigned to a class with social norms towards smoking

Boys are more likely to be assigned to a class with social norms against smoking

	Intercept (A)	Sex = Girl	Sex = Prefer not to say	Age = 12	Age = 13	Age = 14	Age = 15 or more
Class 1	2.13E-9***	1.64*	0.95	2.46E7***	3.63E7***	6.03E7***	9.26E7***
Class 3	6.91E-9***	0.79	3.23E-5	1.66E6***	2.25E6***	2.01E6***	2.02E6***

	Ethnicity minority = 2	Home composition = 2	Home composition = 3	Intervened	Country = NI
Class 1	1.18	0.84	1.12	0.77	1.84*
Class 3	2.03	1.15	3.00	0.45	2.10

Reference for sex is boy, for age is 11, for ethnicity minority is 1, for home composition is 1 and for country is Colombia

\*<0.05

\*\*<0.01

\*\*\*<0.001

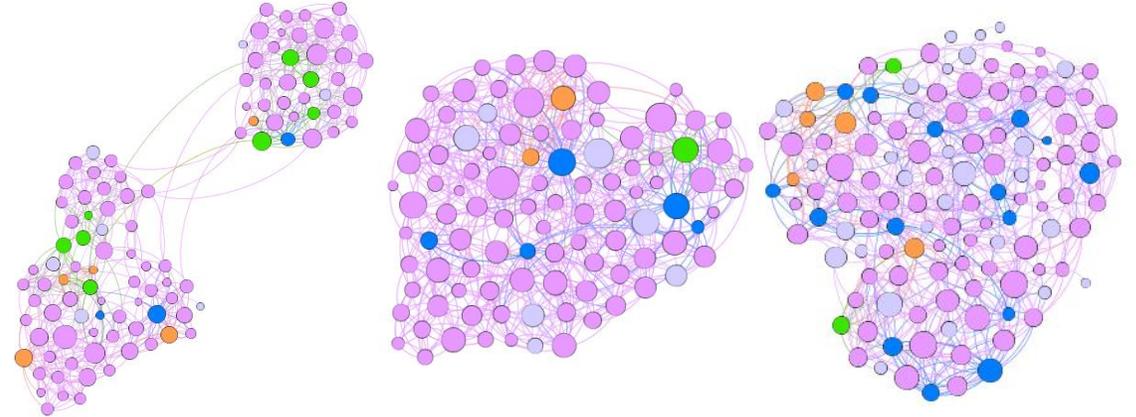
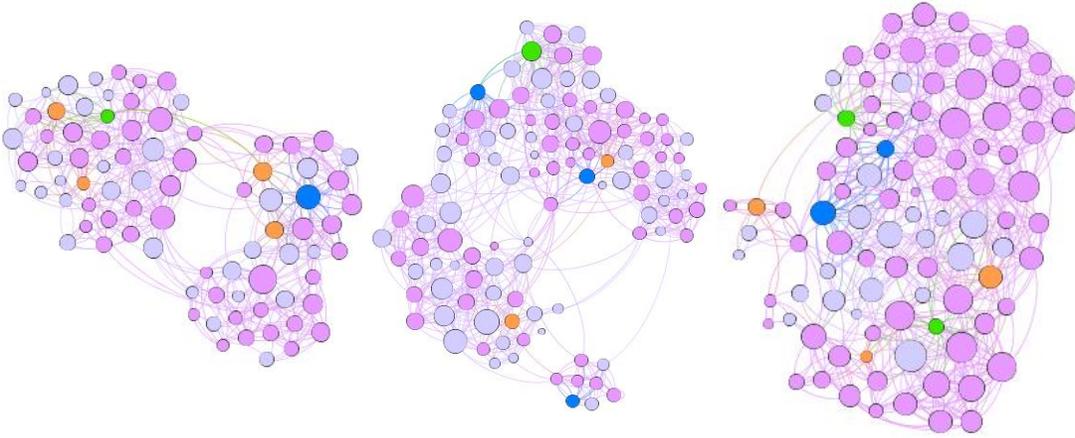
# 2. Assess the change over time of the friendship network structure

Nodes color  
● Keeps toward  
● Keeps against  
● change toward  
● change to against  
Nodes size: in-degree

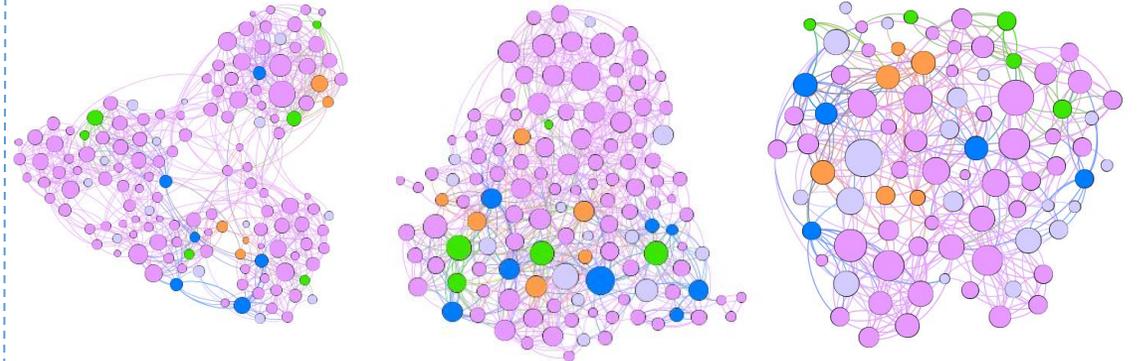
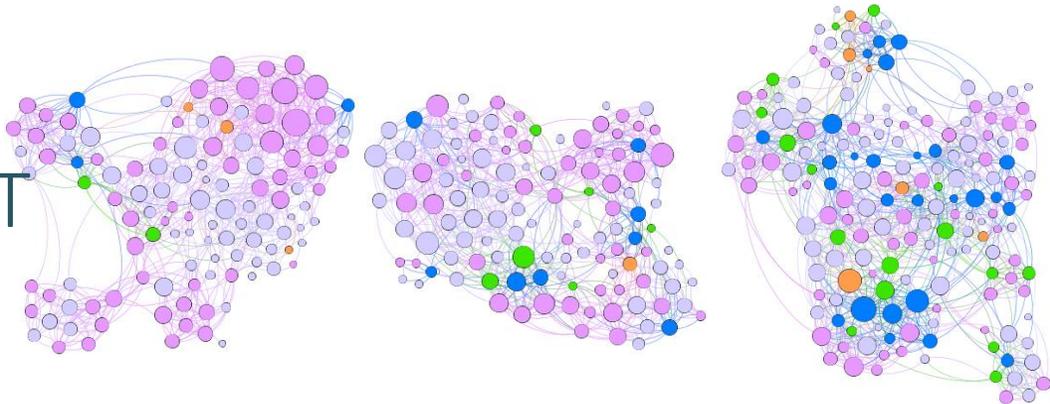
Northern Ireland

Colombia

Dead  
Cool



ASSIST



# Homophily should be analyzed due to significant changes in friendships over time

## Jaccard Index

$$J_i = \frac{E_{(1,1)}}{E_{(1,0)} + E_{(0,1)} + E_{(1,1)}}$$



If the index varies between 0.3 and 0.6, it can be concluded that there are significant changes in friendships over time.

- $E_{(1,1)}$  Friendships that existed in T0 and also in T1.
- $E_{(1,0)}$  Friendships that existed in T0 but not in T1
- $E_{(0,1)}$  Friendships that did not exist in T0 but did in T1

	Northern Ireland	Colombia
<b>Dead Cool</b>	0,44	0,42
	0,46	0,41
	0,56	0,38
<b>ASSIST</b>	0,40	0,34
	0,40	0,33
	0,42	0,26

# 3. Assess if changes in the social norms are related with homophily or with influence

From \ To	1 or 3: Social norms towards smoking	2: Social norms against smoking
1 or 3: Social norms towards smoking	 Maintains social norms toward smoking (N=85)	 Change social norms to against smoking.(N=55)
2: Social norms against smoking	 Change social norms towards smoking(N=48)	 Maintains social norms against smoking(N=830)

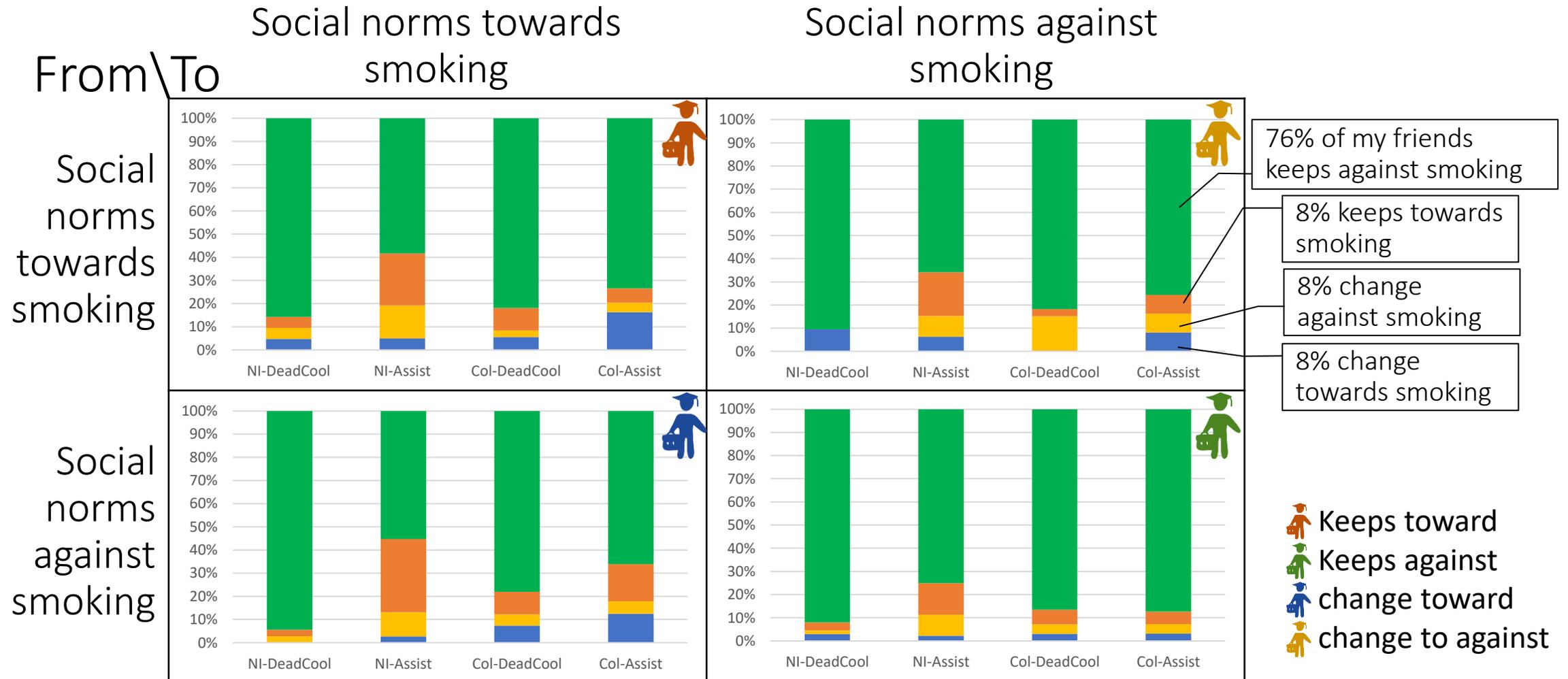
# There is no significant formation or dissolution of friendships related to social norm classes for a given intervention

Attribute	Formation	Dissolution
<b>Homophily according to social norms class</b>	Students in the same social norm class in T0 tend to become friends in 3 out of 12 schools ( $\alpha = 10\%$ )	Cannot concluded dissolution by similar class in T1 (only one school was significant)
<b>Reciprocity</b>	Students tend to form reciprocal friendships	Students tend to stop being friends when there is reciprocity
<b>Transitivity</b>	Students tend to be friends of students with mutual friends	Students tend to stop being friends when there are mutual friends

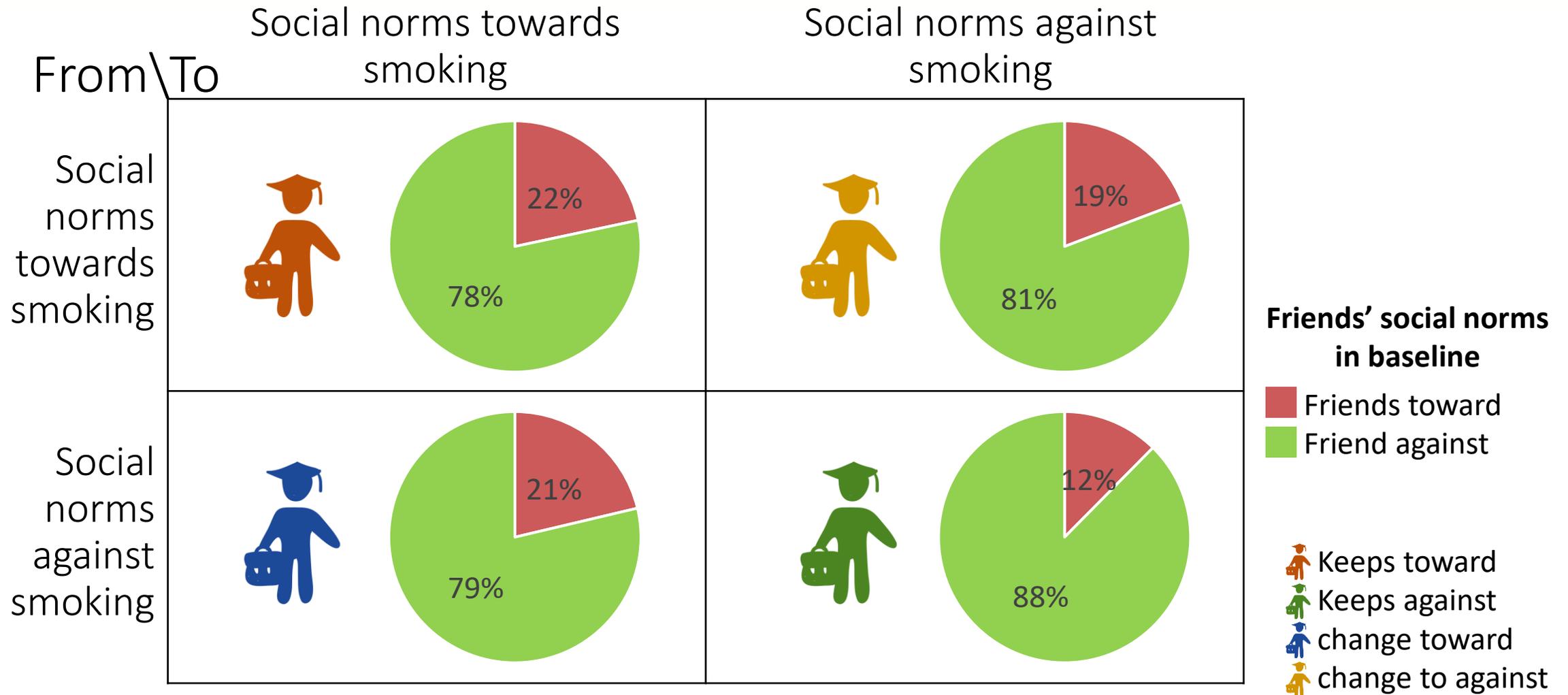
## **Separable Temporal Exponential Random Graph Model (STERGM)**

Assess the formation and dissolution of friendships in the networks over time according to attributes.

# Students are more likely to nominate friends who remain in the social norm class against smoking, regardless of their class change and intervention



# Students that remain or change in favor of smoking, are likely to have more friends in favor of smoking in baseline, and vice-versa, regardless of their country and intervention



# In resume

The ASSIST intervention shows a greater class transition to the social norms class against smoking than the Dead Cool intervention.

Students are more likely to nominate friends who remain in the social norm class against smoking, regardless of their class change and intervention.

Students that remain or change in favor of smoking, are likely to have more friends in favor of smoking in baseline, and vice-versa, regardless of their country and intervention.



# Thank you

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**Smoking,  
friendship networks  
and norms:**  
*a tale of two cities*



**Tabaquismo,  
redes de amigos  
y normas:**  
*una historia de dos ciudades*



**QUEEN'S  
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**Wednesday 24 & Thursday 25 March 2021**  
@ 14:30hrs (UK) / 09:30hrs (Bogota)



**THE UNIVERSITY  
of EDINBURGH**



**UNIVERSITY OF  
LEICESTER**

MRC/CSO Social and Public Health Sciences Unit



## Jennifer Murray

Peer influence effects for spreading adolescent  
smoking and vaping norms in schools:  
The MECHANISMS study.



**Smoking,  
friendship networks  
and norms:**  
*a tale of two cities*



**Tabaquismo,  
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# Background

- Smoking is a “**socially contagious**” behaviour. People who smoke usually start when they are teenagers, because peer pressure from friends is strongest at this age (“**peer influence**”).
- **Social norms** depend on **connections and shared “understandings”** between people about what behaviours are appropriate. Social norms for smoking can spread by peer influence.
- Adolescent smokers tend to have more friends who are smokers, whilst non-smokers tend to have more non-smoking friends.
- This is potentially due to **two different mechanisms**: (1) homophily processes; (2) peer influence processes.

# Background

- **Homophily**: the tendency for individuals to form friendships with others of similar characteristics and behaviours.
- **Peer influence**: a social process by which a focal individual's behavior or attitudes are affected by those of the peers acting as reference points for the individual within **social networks**.
- This correlation between an individual's smoking and the smoking behaviors of their peers has been shown to differ according to **cultural characteristics**.
- In the **MECHANISMS study**, we might also expect to observe differences in peer influence processes around the implementation of the **ASSIST** program compared to the **Dead Cool** program.

# Background

- **ASSIST** works by leveraging peer influence processes (peer education and diffusion).
- **Dead Cool** works through more conventional classroom pedagogy (focusing on influences for smoking from parents, friends, and the media).
- **Schools are ideal settings** for delivering smoking prevention programs to adolescents: (1) almost all children can be reached; (2) tobacco education fits naturally into school activities; (3) important determinant of friendship formation.
- We aimed to investigate how **social norms for adolescent smoking and vaping** are established and transmitted through **social networks** in schools.



# Aims

1. To investigate ***pre-post intervention changes*** in norms for adolescent smoking/vaping (and other smoking-related outcomes) using ***Wilcoxon matched-pairs signed-ranks tests***.
2. To investigate ***homophily processes*** by examining whether the absolute difference between a focal participant's outcome score, and the outcome score of a potential friend, predicts whether the focal participant: (1) nominated the individual as a friend at baseline; (2) added the individual as a friend between baseline and follow-up; (3) dropped the individual as a friend between baseline and follow-up; using ***logistic regressions***.
3. To investigate ***peer influence processes*** by examining whether focal participants' outcome scores at follow-up were predicted by the average of their: (1) nominated friends; (2) school class; (3) school year group; using ***ordinary least square (OLS) regressions***.

# Game Theory Experiments

## Part 2-Identifying Injunctive Social Norms Related to Smoking/Vaping

**Co-ordination games** measuring injunctive norms for smoking/vaping by asking participants to “co-ordinate” with others in their school year group to rate the social appropriateness of various smoking- and vaping-related actions (Krupka and Weber, 2013).<sup>1</sup>

Injunctive norms reflect shared beliefs about what actions people *ought* to take.

-1=Extremely socially inappropriate; -0.6=Very socially inappropriate; -0.2=Somewhat socially inappropriate; +0.2=Somewhat socially appropriate; +0.6=Very socially appropriate; +1=Extremely socially appropriate.



# Experiment Part 2

**Situation 2** - Parent smoking in their own home in front of children under age of 5.

**Situation 3** - An adult smoking in a car with children under the age of 16 in the car.

**Situation 4** - Someone selling cigarettes to a teenager who looks younger than 16 without requesting proof of age.

**Situation 5** - In a recent superhero movie the lead actor is seen smoking in the opening scene.

**Situation 6** - An older student from school is smoking outside school, for example, at a bus stop.

**Situation 7** - A pupil from school is using an e-cigarette while walking to school.

**Situation 8** - A pupil from school shares a photograph of him/herself using an e-cigarette on social media.

**Situation 9** - A pupil from school is chewing tobacco.

# Game Theory Experiments

## Part 3-Identifying Descriptive Social Norms Related to Smoking/Vaping

*Co-ordination games* measuring descriptive norms for smoking.

Descriptive norms reflect shared beliefs about what actions people *actually* do take.

*Share of year group that would be accepting of a close friend (1) smoking; (2) vaping.*

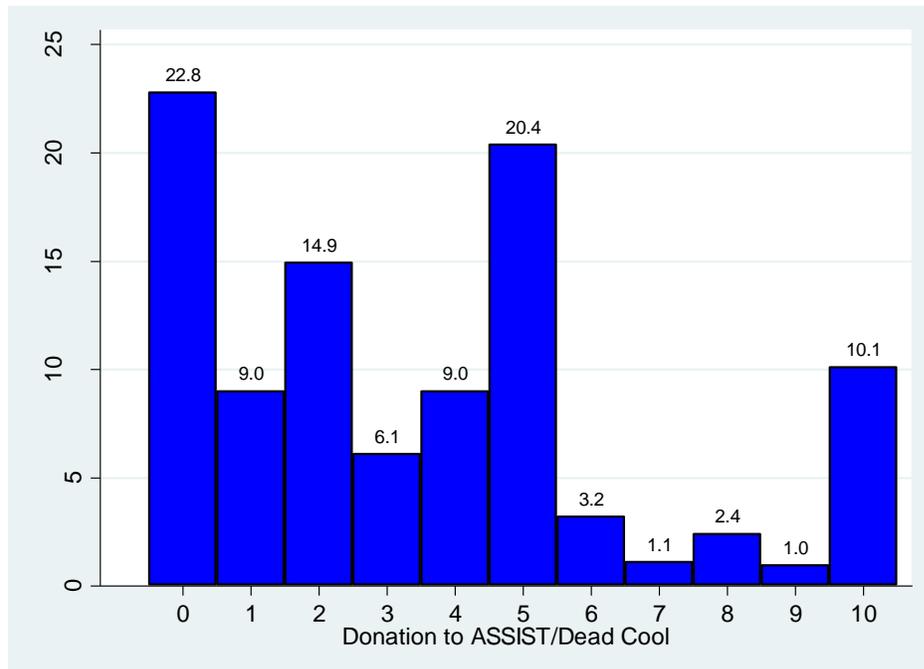
-1=None of my peers; -0.6=Only a few of my peers; -0.2=Some of my peers; +0.2=A lot of my peers; +0.6=Most of my peers; +1=All of my peers.



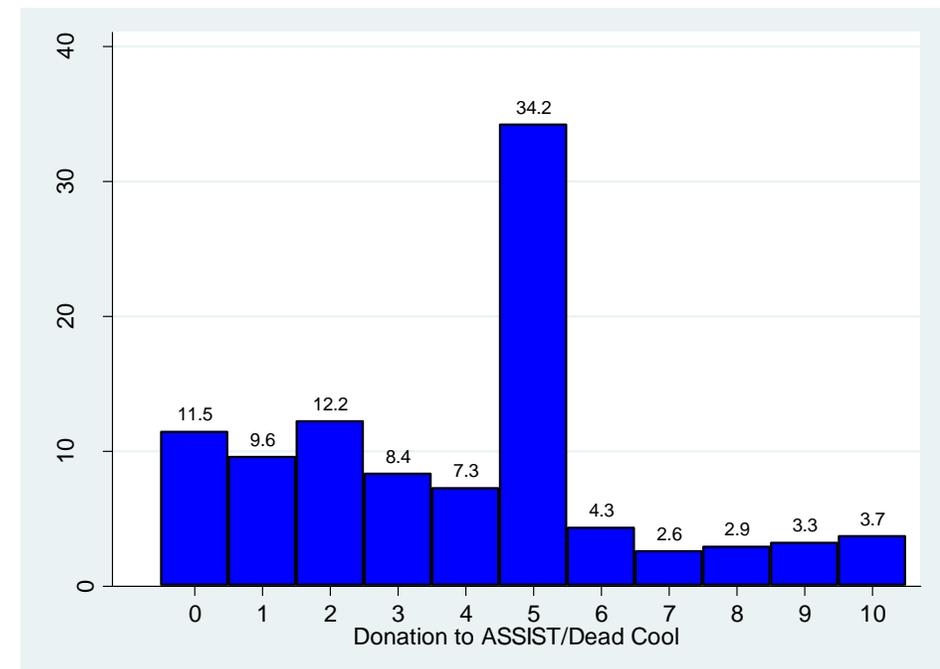
# Game Theory Experiments

## Part 4-Measuring Willingness to Pay to Support Anti-Smoking Norms

A willingness to incur a cost to encourage smoking reduction by others reveals support for anti-smoking norms.



Northern Irish schools



Colombian schools

Number of tokens donated to ASSIST/Dead Cool (0-10)

# Self-report survey

- Socio-demographics
- Social networks
- Smoking behaviour and intentions
- Self-report smoking norms
- Mediators (e.g. self-efficacy, perceived risks/benefits)
- Personality variables (e.g. Big5, pro-sociality)
- Wellbeing, truancy, pocket money

# Self-report survey

- Socio-demographics
- **Social networks**
- **Smoking behaviour and intentions**
- **Self-report smoking norms**
- **Mediators (e.g. self-efficacy, perceived risks/benefits)**
- Personality variables (e.g. Big5, pro-sociality)
- Wellbeing, truancy, pocket money

# Self-report survey

## ➤ Social networks

Please name **up to ten** of your closest friends in your school year.

- Asked to provide first name, surname, and form class for each nomination.
- Provided with class rosters to help with spelling.
- Reminded that they didn't need to fill out all ten names.
- Asked not to communicate with other participants.
- Asked to put a mark (\*) beside their best friend's name.

# Self-report survey

## ➤ Anti-Smoking Behaviour

*Tick the statement that applies to you...*

1=Sometimes smoke; 2=Previous smoker; 3=Smoked once; 4=Never smoked.

## ➤ Anti-Smoking Intentions

*Do you intend to take up smoking in the next 6 months?*

1=I am a smoker; 2=Definitely start smoking; 3=Probably start smoking;  
4=Don't know; 5=Probably remain; 6=Definitely remain a non-smoker.

# Self-report survey

## ➤ Injunctive norms for smoking.

7 items reflecting the degree to which important others think you should smoke.

1. Most of the **people who are important to me** think that I...
2. My **mother** thinks that I...
3. My **father** thinks that I...
4. My **brother(s)** think(s) that I...
5. My **sister(s)** think(s) that I...
6. My **friends** think that I...
7. My **best friend** thinks that I...

-2=Definitely should smoke; -1=Maybe should smoke; 0=Don't know/neutral;  
+1=Maybe should not smoke; +2=Definitely should not smoke

# Self-report survey

## ➤ Descriptive norms for smoking scale 1.

5 items reflecting how often important others engage in smoking behaviour.

1. Does your **best friend** smoke?
2. Does your **mother** smoke?
3. Does your **father** smoke?
4. Do any of your **brothers** smoke?
5. Do any of your **sisters** smoke?

1=Very often; 2=Often; 3=Occasionally; 4=Rarely; 5=Don't know/Never

# Self-report survey

## ➤ Descriptive norms for smoking scale 2.

3 items reflecting the proportion of groups of important others who engage in smoking behaviour.

1. How many of your **friends** smoke?
2. How many of your **other family members** smoke?
3. How many of your **classmates** smoke?

1=Almost all of them; 2=Many of them; 3=Half of them; 4=A few of them;  
5=Almost none of them/Don't know/Don't have.

# Self-report survey: Mediators

- Susceptibility to commencing smoking (0=Not susceptible; 1=Susceptible)
- Attitudes (12 items, 1-5)
- Knowledge (6 items, number of correct answers 0-6)
- Self-efficacy (3 subscales)
  - Emotion (9 items, 1-6)
  - Friends (9 items, 1-6)
  - Opportunity (11 items, 1-6)

# Self-report survey: Mediators

- Perceived risks (3 subscales)
  - Physical (7 items, 0-100%)
  - Social (3 items, 0-100%)
  - Addiction (3 items, 0-100%)
- Perceived benefits (5 items, 0-100%)
- Perceived behavioural control: easy to quit (1 item, 1-5).
- Perceived behavioural control: can avoid smoking (1 item, 1-5).

# Objectively measured smoking behaviour

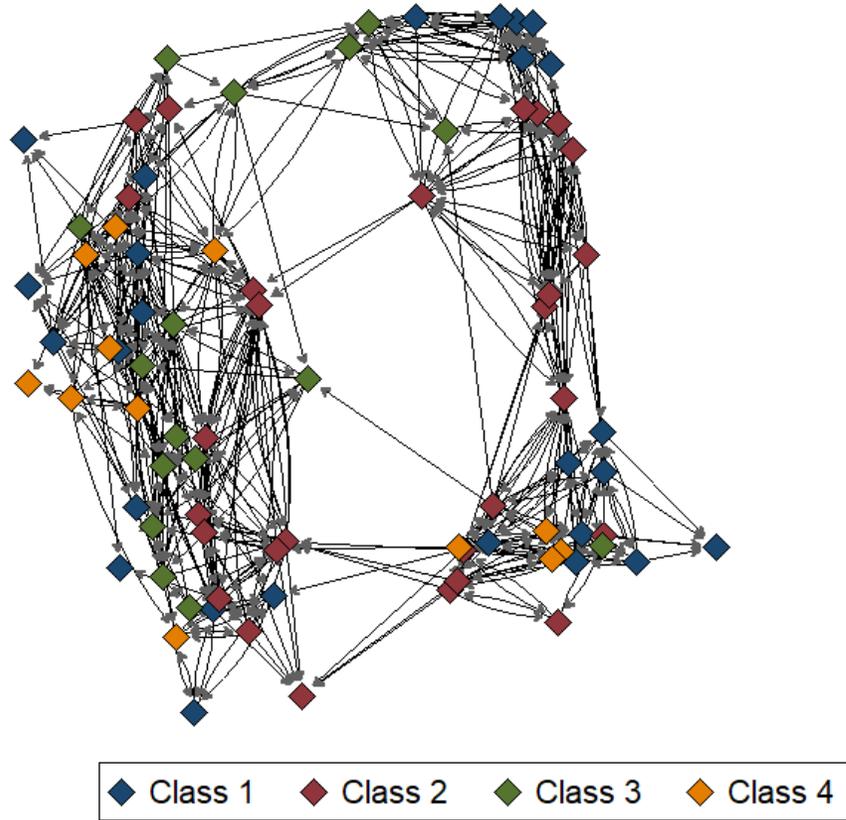


- Carbon monoxide monitors (Smokerlyzer).
- Measures expelled air carbon monoxide in parts per million (ppm).
- A pupil was considered to have engaged in smoking behaviour over the previous 24 hours if they provided a reading of >9ppm.

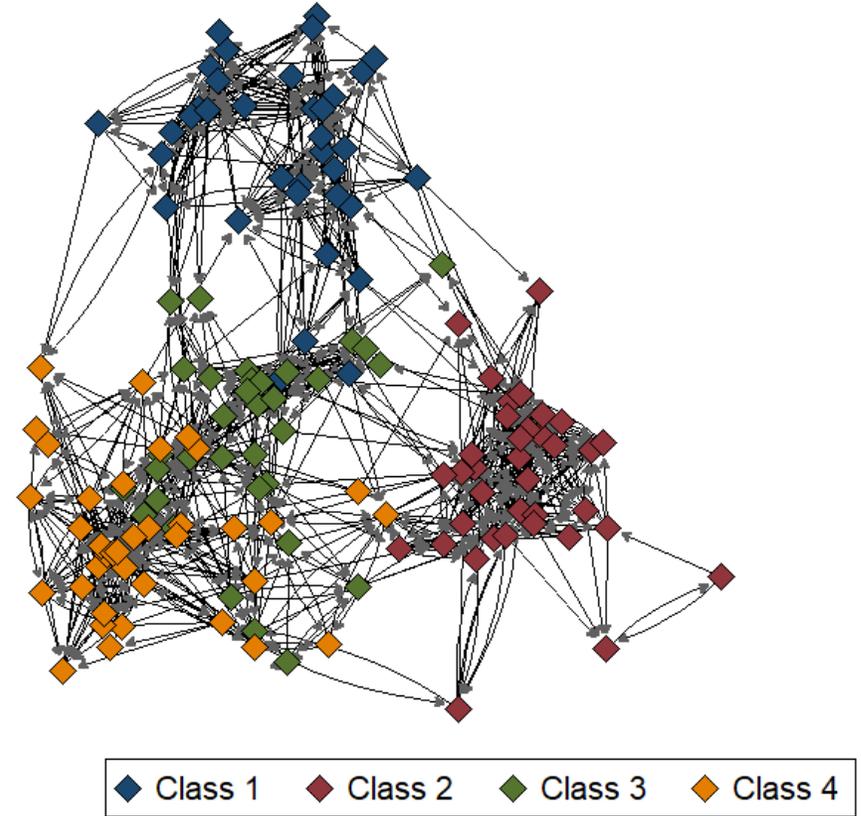
# Aim 1: Pre-post intervention changes in outcomes

- This paper used data from the 12 MECHANISMS schools which participated in the full phase (n=1344/1444 pupils).
- Wilcoxon matched-pairs signed-ranks tests showed:
  - Increases in **smoking knowledge** between baseline and follow-up ( $p < 0.001$ ).
  - Increases in **perceived physical risks** between baseline and follow-up ( $p < 0.001$ ).
  - Increases in **perceived addiction risks** between baseline and follow-up ( $p < 0.001$ ).
  - Most of the other smoking-related variables changed in the **pro-smoking direction** between baseline and follow-up ( $p < 0.01$ ).
- **Note:** we cannot attribute a **causal interpretation** to these results, because the study was not designed to provide a test of effectiveness of the interventions, and did not include a control group.

# Aims 2 and 3: Homophily and peer influence processes



Northern Ireland Dead Cool school



Colombia ASSIST school

## Aim 2: Homophily processes

- **Jaccard similarity indices** were calculated for each school. This measures the degree of similarity between the friendship networks between baseline and follow-up. Range: 0 (completely dissimilar) to 1 (completely similar).
- Jaccard indices between 0.30 and 0.60 indicate **significant changes in the network over time**.<sup>2</sup>
- Jaccard indices varied between **0.29 and 0.63** for MECHANISMS schools.
- This indicates that MECHANISMS participants **changed their friendship nominations between baseline and follow-up** by a fair amount.
- Some scope to explore **homophily processes**. E.g. Does how similar you are to someone on the smoking-related variables predict whether you: (1) nominated them as a friend at baseline; (2) added them as a friend; or (3) dropped them as a friend?

## Aim 2: (1) Baseline homophily

➤ *Logistic regressions* showed how similar you were to another participant in your school year group was a predictor of whether you nominated them as a friend for the following outcomes (**odds ratio [OR]<1.00, p<0.01**).

Experiment norms	Self-report norms	Other self-report/objective smoking outcomes
➤ P2S7	➤ IN2	➤ Self-report smoking behaviour.
➤ P2S8	➤ IN3	➤ Self-report smoking intentions.
➤ P3Q1	➤ IN5	➤ Attitudes towards smoking.
➤ P3Q2	➤ IN6	➤ Self-efficacy (emotion).
➤ Donation	➤ IN7	➤ Self-efficacy (friends).
	➤ DN1.1	➤ Self-efficacy (opportunity).
	➤ DN1.2	➤ Perceived risks (physical).
	➤ DN1.3	➤ Perceived risks (social),
	➤ DN2.1	➤ Perceived behavioural control: easy to quit.
	➤ DN2.3	➤ Objectively measured smoking behaviour.

Matching susceptibility statuses: OR=1.20, p<0.001.

## Aim 2: (1) Baseline homophily

➤ *Logistic regressions* showed how similar you were to another participant in your school year group was a predictor of whether you nominated them as a friend for the following outcomes (**OR<1.00**, **p<0.01**).

Experiment norms	Self-report norms
<ul style="list-style-type: none"><li>➤ <b>P2S7</b> – a school student smoking an e-cigarette.</li><li>➤ <b>P2S8</b> – a student sharing a photo of his/her e-cigarette use.</li><li>➤ <b>P3Q1</b> – proportion of school year group accepting a close friend smoking.</li><li>➤ <b>P3Q2</b> – proportion of school year group accepting a close friend vaping.</li><li>➤ <b>Donation</b> – willingness to pay to support anti-smoking norms.</li></ul>	<ul style="list-style-type: none"><li>➤ <b>IN2</b> – mother thinks I should (not) smoke.</li><li>➤ <b>IN3</b> – father thinks I should (not) smoke.</li><li>➤ <b>IN5</b> – sister(s) think(s) I should (not) smoke.</li><li>➤ <b>IN6</b> – friend(s) think(s) I should (not) smoke.</li><li>➤ <b>IN7</b> – best friend thinks I should (not) smoke.</li><li>➤ <b>DN1.1</b> – best friend smokes [often,... never].</li><li>➤ <b>DN1.2</b> – mother smokes [often,... never].</li><li>➤ <b>DN1.3</b> – father smokes [often,... never].</li><li>➤ <b>DN2.1</b> – [Almost all,... almost none] of my friends smoke.</li><li>➤ <b>DN2.3</b> – [Almost all,... almost none] of my classmates smoke.</li></ul>

## Aim 2: (2) Homophily – adding friends

➤ **Logistic regressions** showed how similar you were to another participant in your school year group was a predictor of whether you **added** them as a friend between baseline and follow-up for the following outcomes (**OR<1.00, p≤0.01**).

Differences at baseline	Differences at follow-up
<ul style="list-style-type: none"><li>➤ <b>P2S2</b> – a parent smoking at home in front of their young children.</li><li>➤ <b>P2S7</b> – a school student smoking an e-cigarette.</li><li>➤ <b>P2S8</b> – a student sharing a photo of his/her e-cigarette use.</li><li>➤ <b>P3Q1</b> – proportion of school year group accepting a close friend smoking.</li><li>➤ <b>Donation</b> – willingness to pay to support anti-smoking norms.</li><li>➤ Objectively measured smoking behaviour.</li></ul>	<ul style="list-style-type: none"><li>➤ <b>P2S8</b> – a student sharing a photo of his/her e-cigarette use.</li></ul>

### Matching susceptibility statuses

Baseline: OR=1.15, p=0.002; Follow-up: OR=1.26, p<0.001.

## Aim 2: (3) Homophily – dropping friends

➤ **Logistic regressions** showed how similar you were to another participant in your school year group was a predictor of whether you **dropped** them as a friend between baseline and follow-up for the following outcomes (**OR>1.00, p≤0.01**).

### Differences at baseline

- **IN3** – father thinks I should (not) smoke.
- **IN6** – friend(s) think(s) I should (not) smoke.
- **IN7** – best friend thinks I should (not) smoke.
- **DN1.1** – best friend smokes [often,... never].
- **DN1.5** – sister(s) smoke(s) [often,... never].
- **DN2.1** – [Almost all,... almost none] of my friends smoke.
- Self-report smoking behaviour.
- Self-efficacy (emotion).
- Self-efficacy (friends).
- Self-efficacy (opportunity).
- Perceived risks (physical).
- Perceived risks (social).

Counter-intuitive result for:

**P2S2** – a parent smoking at home in front of their young children (OR=0.76, p=0.003).

## Aim 2: (3) Homophily – dropping friends

➤ **Logistic regressions** showed how similar you were to another participant in your school year group was a predictor of whether you **dropped** them as a friend between baseline and follow-up for the following outcomes (**OR>1.00, p≤0.01**).

### Differences at follow-up

- |  |  |
|--|--|
| <ul style="list-style-type: none"><li>➤ <b>P2S7</b> – a school student smoking an e-cigarette.</li><li>➤ <b>P3Q1</b> – proportion of school year group accepting a close friend smoking.</li><li>➤ <b>P3Q2</b> – proportion of school year group accepting a close friend vaping.</li><li>➤ <b>IN1</b> – most of the people who are important to me think that I should (not) smoke.</li><li>➤ <b>IN2</b> – mother thinks I should (not) smoke.</li><li>➤ <b>IN3</b> – father thinks I should (not) smoke.</li><li>➤ <b>IN6</b> – friend(s) think(s) I should (not) smoke.</li><li>➤ <b>IN7</b> – best friend thinks I should (not) smoke.</li><li>➤ <b>DN1.1</b> – best friend smokes [often,... never].</li><li>➤ <b>DN2.1</b> – [Almost all,... almost none] of my friends smoke.</li></ul> | <ul style="list-style-type: none"><li>➤ Self-report smoking behaviour.</li><li>➤ Self-report smoking intentions.</li><li>➤ Attitudes towards smoking.</li><li>➤ Self-efficacy (emotion).</li><li>➤ Self-efficacy (friends).</li><li>➤ Self-efficacy (opportunity).</li><li>➤ Perceived risks (social).</li><li>➤ Perceived behavioural control: can avoid smoking.</li><li>➤ Objectively measured smoking behaviour.</li></ul> |
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# Aim 3: Peer influence effects from peers at baseline

➤ **OLS regressions** showed the average scores of your nominated friends/school class/school year group at **baseline** predicted your outcome score at follow-up for the following outcomes (**standardised regression coefficient  $[\beta] > 0.00$ ,  $p \leq 0.01$** ).

Experiment norms	Friends	School class (excluding focal)	School year group (excluding focal)
<b>P2S2</b> – a parent smoking at home in front of their young children.	$\beta=0.14$	$\beta=0.12$	$\beta=0.15$
<b>P2S5</b> – a movie showing the lead character smoking.	$\beta=0.09$	$\beta=0.10$	$\beta=0.10$
<b>P2S6</b> – an older student from your school smoking outside school.		$\beta=0.10$	
<b>P2S7</b> – a school student smoking an e-cigarette.	$\beta=0.09$	$\beta=0.10$	
<b>P2S8</b> – a student sharing a photo of his/her e-cigarette use.	$\beta=0.16$	$\beta=0.10$	$\beta=0.09$
<b>P2S9</b> – a school pupil chewing tobacco.		$\beta=0.12$	$\beta=0.08$
<b>P3Q2</b> – proportion of school year group accepting a close friend vaping.	$\beta=0.10$	$\beta=0.12$	$\beta=0.09$

Models adjusted for: sex, age, intervention group, socio-economic status, ethnic minority status, baseline values of the focal participant's outcome.

## Aim 3: Peer influence effects from peers at baseline

➤ **OLS regressions** showed the average scores of your nominated friends/school class/school year group at **baseline** predicted your outcome score at follow-up for the following outcomes ( **$\beta > 0.00$** ,  **$p \leq 0.01$** ).

Self-report norms	Friends	School class (excluding focal)	School year group (excluding focal)
<b>IN6</b> – friend(s) think(s) I should (not) smoke.	$\beta = 0.10$		$\beta = 0.08$
<b>IN7</b> – best friend thinks I should (not) smoke.			$\beta = 0.10$
<b>DN1.1</b> – best friend smokes [often,... never].	$\beta = 0.13$		$\beta = 0.18$
<b>DN1.2</b> – mother smokes [often,... never].	$\beta = 0.07$		
<b>DN2.2</b> – [Almost all,... almost none] of my other family members smoke.	$\beta = 0.08$	$\beta = 0.10$	$\beta = 0.10$
<b>DN2.3</b> – [Almost all,... almost none] of my classmates smoke.	$\beta = 0.13$	$\beta = 0.19$	$\beta = 0.17$

Models adjusted for: sex, age, intervention group, socio-economic status, ethnic minority status, baseline values of the focal participant's outcome.

## Aim 3: Peer influence effects from peers at baseline

➤ **OLS regressions** showed the average scores of your nominated friends/school class/school year group at **baseline** predicted your outcome score at follow-up for the following outcomes ( $\beta > 0.00$ ,  $p \leq 0.01$ ).

Other self-report/objective smoking outcomes	Friends	School class (excluding focal)	School year group (excluding focal)
Self-report smoking behaviour.			$\beta = 0.09$
Self-report smoking intentions.		$\beta = 0.11$	$\beta = 0.12$
Smoking knowledge.	$\beta = 0.10$	$\beta = 0.16$	$\beta = 0.14$
Attitudes towards smoking.	$\beta = 0.08$		
Self-efficacy (emotion).		$\beta = 0.07$	$\beta = 0.08$
Self-efficacy (opportunity).		$\beta = 0.08$	
Perceived risks (social).	$\beta = 0.09$	$\beta = 0.11$	$\beta = 0.12$
Perceived risks (addiction).	$\beta = 0.12$	$\beta = 0.19$	$\beta = 0.23$
Perceived behavioural control: easy to quit.	$\beta = 0.15$	$\beta = 0.20$	$\beta = 0.23$
Perceived behavioural control: can avoid smoking.		$\beta = 0.09$	$\beta = 0.13$
Objectively measured smoking behaviour.	$\beta = 0.27$	$\beta = 0.26$	$\beta = 0.37$

Logistic regressions showed a 10% increase in the number of friends classified as “susceptible to commencing smoking” increased the odds of the focal participant being classified as susceptible (OR=1.14,  $p < 0.001$ ).

## Aim 3: Peer influence effects from peers at follow-up

➤ *OLS regressions* showed the average scores of your nominated friends/school class/school year group at **follow-up** predicted your outcome score at follow-up for the following outcomes ( $\beta > 0.00$ ,  $p \leq 0.01$ ).

Experiment norms	Friends	School class (excluding focal)	School year group (excluding focal)
<b>P2S2</b> – a parent smoking at home in front of their young children.		$\beta = 0.09$	$\beta = 0.12$
<b>P2S4</b> – someone selling cigarettes without proof of age.		$\beta = 0.08$	
<b>P2S5</b> – a movie showing the lead character smoking.	$\beta = 0.09$	$\beta = 0.16$	$\beta = 0.11$
<b>P2S6</b> – an older student from your school smoking outside school.	$\beta = 0.08$	$\beta = 0.14$	$\beta = 0.10$
<b>P2S7</b> – a school student smoking an e-cigarette.	$\beta = 0.15$	$\beta = 0.14$	
<b>P2S8</b> – a student sharing a photo of his/her e-cigarette use.	$\beta = 0.12$	$\beta = 0.17$	$\beta = 0.11$
<b>P2S9</b> – a school pupil chewing tobacco.	$\beta = 0.12$	$\beta = 0.12$	
<b>P3Q1</b> – proportion of school year group accepting a close friend smoking.		$\beta = 0.09$	
<b>P3Q2</b> – proportion of school year group accepting a close friend vaping.	$\beta = 0.09$	$\beta = 0.11$	
<b>Donation</b> – willingness to pay to support anti-smoking norms.	$\beta = 0.19$	$\beta = 0.16$	$\beta = 0.15$

Models adjusted for: sex, age, intervention group, socio-economic status, ethnic minority status, baseline values of the focal participant's outcome.

## Aim 3: Peer influence effects from peers at follow-up

➤ *OLS regressions* showed the average scores of your nominated friends/school class/school year group at **follow-up** predicted your outcome score at follow-up for the following outcomes ( $\beta > 0.00$ ,  $p \leq 0.01$ ).

Self-report norms	Friends	School class (excluding focal)	School year group (excluding focal)
<b>IN6</b> – friend(s) think(s) I should (not) smoke.	$\beta = 0.13$	$\beta = 0.08$	$\beta = 0.08$
<b>IN7</b> – best friend thinks I should (not) smoke.	$\beta = 0.09$		
<b>DN1.1</b> – best friend smokes [often,... never].	$\beta = 0.17$		$\beta = 0.14$
<b>DN2.1</b> – [Almost all,... almost none] of my friends smoke.	$\beta = 0.10$		
<b>DN2.2</b> – [Almost all,... almost none] of my other family members smoke.			$\beta = 0.08$
<b>DN2.3</b> – [Almost all,... almost none] of my classmates smoke.	$\beta = 0.11$	$\beta = 0.15$	$\beta = 0.16$

Models adjusted for: sex, age, intervention group, socio-economic status, ethnic minority status, baseline values of the focal participant's outcome.

## Aim 3: Peer influence effects from peers at follow-up

➤ **OLS regressions** showed the average scores of your nominated friends/school class/school year group at **follow-up** predicted your outcome at follow-up for the following outcomes ( $\beta > 0.00$ ,  $p \leq 0.01$ ).

Other self-report/objective smoking outcomes	Friends	School class (excluding focal)	School year group (excluding focal)
Self-report smoking behaviour.	$\beta = 0.13$	$\beta = 0.07$	$\beta = 0.09$
Self-report smoking intentions.	$\beta = 0.12$		$\beta = 0.08$
Smoking knowledge.	$\beta = 0.16$	$\beta = 0.18$	$\beta = 0.14$
Attitudes towards smoking.	$\beta = 0.08$		
Self-efficacy (emotion).	$\beta = 0.15$		$\beta = 0.09$
Self-efficacy (friends).	$\beta = 0.10$		
Perceived risks (social).			$\beta = 0.11$
Perceived risks (addiction).	$\beta = 0.08$	$\beta = 0.16$	$\beta = 0.21$
Perceived behavioural control: easy to quit.	$\beta = 0.10$	$\beta = 0.20$	$\beta = 0.22$
Perceived behavioural control: can avoid smoking.			$\beta = 0.10$
Objectively measured smoking behaviour.	$\beta = 0.39$	$\beta = 0.55$	$\beta = 0.51$

Logistic regressions showed a 10% increase in the number of friends/school class/school year group classified as “susceptible to commencing smoking” increased the odds of the focal participant being classified as susceptible (ORs=1.14-1.31,  $p \leq 0.004$ ).

# Conclusions

- Pupils' smoking knowledge, perceived physical risks, and perceived addiction risks increased after the programs.
- There was a significant amount of variation in pupils' friendship nominations between baseline and follow-up.
- **Homophily:** Pupils were more likely to nominate someone as a friend if they were similar to them on the smoking-related outcomes (or drop them as a friend if they were less similar on the smoking-related outcomes).
- **Peer influence:** There were positive associations between focal participant outcomes, and the average outcomes of their friends, school classes, and school year groups.

# Conclusions

- Peer influence effects are important for spreading norms for smoking and vaping through social networks in schools.
- Future research should investigate which children (e.g. those who are most “popular”) are best placed within social networks to spread social norms.
- Future research should also examine whether these results apply in different settings (e.g. other countries with different norms and culture).

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**Target journal:** Nature Human Behavior.



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# Ruth Hunter

Overview of the evidence



**Smoking,  
friendship networks  
and norms:**  
*a tale of two cities*

**Tabaquismo,  
redes de amigos  
y normas:**  
*una historia de dos ciudades*

# Key Findings

Contextual, content, training and implementation modifications to address cultural factors

Stability of both measures of norms. Individual-level responses are less stable

Evidence for the construct validity of behavioural economic methods of eliciting adolescent smoking and vaping norms

Differences in predictors of adolescent smoking susceptibility across the two settings

Importance of individual and contextual characteristics that are related to smoking behaviour among adolescents

ASSIST may have greater effects on chaining social norms against smoking than the Dead Cool intervention in NI