







# MECHANISMS Study: Using game theory to assess the effects of social norms and social networks on adolescent smoking in schools

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|--|---|--|
| <b>Submission date</b><br>09/12/2022   | <b>Recruitment status</b><br>No longer recruiting |  Retrospectively registered |
|  |   |  Protocol added             |
| <b>Registration date</b><br>09/01/2023 | <b>Overall study status</b><br>Completed          |  SAP not yet added          |
|  |   |  Results added              |
| <b>Last Edited</b><br>13/02/2024       | <b>Condition category</b><br>Not Applicable       |  Raw data not yet added     |
|  |   |  Study completed            |

## Plain English Summary

### Background and study aims

This proof-of-concept study harnesses novel transdisciplinary insights to contrast two school-based smoking prevention interventions among adolescents in the UK and Colombia. We compare schools in these locations because smoking rates and norms are different, in order to better understand social norms-based mechanisms of action related to smoking. We aim to improve the measurement of social norms for smoking behaviors in adolescents and reveal how they spread in schools, to better characterize the mechanisms of action of smoking prevention interventions in schools and learn lessons for future intervention research. The A Stop Smoking in Schools Trial (ASSIST) intervention harnesses peer influence, while the Dead Cool intervention uses classroom pedagogy. Both interventions were originally developed in the UK but were culturally adapted for a Colombian setting. This Game Theoretic approach used allows us to estimate proxies for norms and norm sensitivity parameters and to test for the influence of individual student attributes and their social networks within a Markov Chain Monte Carlo modeling framework. We identify hypothesized mechanisms by triangulating results with qualitative data from participants. The MECHANISMS study is innovative in the interplay of Game Theory and longitudinal social network analytical approaches, and in its transdisciplinary research approach. This study will help us to better understand the mechanisms of smoking prevention interventions in high and middle-income settings.

### Who can participate?

Students in three schools for each intervention in the UK and the same in Colombia

### What does the study involve?

In a before and after design, we will obtain psychosocial, friendship, and behavioral data (e.g., attitudes and intentions toward smoking and vaping) from ~300 students in three schools for each intervention in the UK and the same number in Colombia (i.e., ~1,200 participants in total). Pre-intervention, participants take part in a Rule Following task, and in Coordination Games that allow us to assess their judgments about the social appropriateness of a range of smoking-related and unrelated behaviors, and elicit individual sensitivity to social norms. After the

interventions, these behavioral economic experiments are repeated, so we can assess how social norms related to smoking have changed, how sensitivity to classroom and school year group norms have changed and how individual changes are related to changes among friends.

What are the possible benefits and risks of participating?

Possible benefits include preventing the uptake of smoking behaviour and the associated known health benefits. There are no risks to participating in the study.

Where is the study run from?

Queen's University Belfast (UK)

When is the study starting and how long is it expected to run for?

March 2018 to June 2019

Who is funding the study?

Medical Research Council (UK)

Who is the main contact?

Prof Ruth Hunter, [ruth.hunter@qub.ac.uk](mailto:ruth.hunter@qub.ac.uk)

## Contact information

### Type(s)

Principal Investigator

### Contact name

Prof Ruth Hunter

### ORCID ID

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### Contact details

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## Additional identifiers

### EudraCT/CTIS number

Nil known

### IRAS number

### ClinicalTrials.gov number

Nil known

### **Protocol/serial number**

Nil known

## **Study information**

### **Scientific Title**

MECHANISMS Study: Using game theory to assess the effects of social norms and social networks on adolescent smoking in schools

### **Acronym**

MECHANISMS

### **Study hypothesis**

1. How are individual psychosocial and cognitive traits at baseline related to individual sensitivity to social norms? (H01: that they are independent);
2. How does individual sensitivity to social norms cluster among friendship cliques and across school year groups? (H02: that the individual social norms sensitivities among friendship cliques are un-correlated);
3. How are average social norms, measured at the classroom and year group level, affected by social network structures? (H03: that social norms and social network structures are independent);
4. After each intervention: how are changes in attitudes, intentions and behaviors toward smoking related to social norms sensitivity at the individual level, and to average social norms at the class and year group level? (H04: that the changes in smoking-related attitudes, intentions, and behaviors are independent of norm-sensitivity at the individual level and the same in schools which offered each intervention);
5. After each intervention: have smoking-related social norms changed and how are these changes correlated among friendship cliques? (H05: that any changes in social norms are independent among members of the same friendship clique; we assume that there will be little change in measures of homophily across one semester).

### **Ethics approval required**

Old ethics approval format

### **Ethics approval(s)**

1. Approved 01/09/2018, Queen's University Belfast School of Medicine, Dentistry and Biomedical Sciences ethics committee (Queen's University Belfast, 63 University Road, Belfast, BT7 1NN, UK; telephone not provided; s.curran@qub.ac.uk), ref: 18:39
2. Approved 01/07/2018, Research Committee of the Universidad de Los Andes, Bogotá (address not provided; tel not provided; osarmien@uniandes.edu.co), ref: 937/2018

### **Study design**

Quasi-experiment with a before and after design

### **Primary study design**

Interventional

## **Secondary study design**

Quasi-experiment with a before and after design

## **Study setting(s)**

School

## **Study type(s)**

Other

## **Participant information sheet**

### **Condition**

Prevention of smoking uptake in adolescents

### **Interventions**

Dead Cool Intervention

Dead Cool is a smoking prevention intervention for pupils aged 12–13 years old designed by Cancer Focus Northern Ireland (a local cancer charity). The intervention is designed to be delivered by teachers and consists of eight lesson plans and an accompanying DVD of short video clips to supplement each lesson. The intervention aims to reduce the number of young people who start smoking and to examine the influences on smoking behavior from friends, parents, other family members, and the media. Teachers from the school deliver the intervention in their own classes over an 8-weeks period. The lessons last for ~20–30 min. Teachers have a Teachers' Resource Pack and pupils have a Pupil Workbook that contains exercises for each lesson. Before the start of the intervention, pupils have an introductory session to the intervention and teachers receive professional development that outlines the focus and epistemology behind the product design.

ASSIST (A Stop Smoking in Schools Trial) Intervention

The ASSIST intervention is designed to train influential pupils to use informal contacts with peers in their school year group to encourage them not to smoke. The effectiveness of the ASSIST intervention for smoking prevention has previously been established in a cluster RCT. The logic model depicts assumed pathways of change for participants receiving the ASSIST intervention. Underpinned by Diffusion of Innovations Theory, its core elements include the identification and recruitment of peer supporters (through a process of nominating pupils), who are then trained to diffuse prevention messages through informal conversations with their classmates.

### **Outcomes**

A hand-held PICOAdvantage Smokerlyzer (Bedfont) was used to measure expelled air carbon monoxide from the pupils at the two testing time points. This is an electrochemical sensor which measures carbon monoxide in parts per million (ppm). It measures a range of 0–150 ppm with an accuracy of 2 ppm/5% (whichever is greater).

### **Intervention Type**

Behavioural

### **Primary outcome measure**

Smoking behavior measured using a hand-held carbon monoxide monitor (administered by a trained member of the research team) at baseline and at 12 weeks (immediately post-intervention)

### **Secondary outcome measures**

All assessed at baseline and at 12 weeks (1-week post-intervention):

1. The game theory experiments included several incentivized tasks. Part 1 included a rule-following task measuring individuals' social norms sensitivities. Parts 2-3 included incentivized coordination games to elicit injunctive and descriptive norms for smoking and vaping in whole school year groups. Part 4 assessed participants' willingness to pay to support anti-smoking norms
2. Self-report injunctive smoking norms were assessed with seven items enquiring about perceived approval of smoking from groups of important others
3. Self-report descriptive smoking norms were assessed with two scales. The first scale consisted of five items enquiring about how often groups of important others engaged in smoking behaviour. Pupils provided their answers on a five-point scale ("very often" to "never"/"don't know"). The second scale consisted of three items enquiring about the proportion of groups of important others who are smokers
4. Self-report smoking outcomes included past/current smoking behaviour, smoking intentions and susceptibility
5. Hypothesised mediators measured using smoking knowledge, attitudes towards smoking, self-efficacy (emotional, friends, and opportunity subscales), perceived risks (physical, social, and addiction subscales), perceived benefits, perceived behavioural control (easy to quit smoking), and perceived behavioural control (to avoid smoking)
6. Social networks measured by asking pupils to name up to ten of their closest friends in their school year group
7. Pro-sociality measured using the Need to Belong Scale, Fear of Negative Evaluation Scale, and Pro-Social Behavior Scale
8. Adolescent personality traits (Openness, Extraversion, Agreeableness, Conscientiousness, Emotional Stability) measured using the Big Five Trait Short Questionnaire (BFPTSQ)
9. Well-being measured using a self-perceived well-being scale

### **Overall study start date**

01/03/2018

### **Overall study end date**

30/06/2019

## **Eligibility**

### **Participant inclusion criteria**

All pupils in the school year were invited to participate

### **Participant type(s)**

Healthy volunteer

### **Age group**

Other

### **Sex**

Both

**Target number of participants**

1600

**Total final enrolment**

1656

**Participant exclusion criteria**

Parents/Guardians who did not wish their child to take part were asked to return completed Opt-Out Forms.

**Recruitment start date**

01/09/2018

**Recruitment end date**

30/09/2018

## **Locations**

**Countries of recruitment**

Colombia

Northern Ireland

United Kingdom

**Study participating centre**

**Queen's University Belfast**

Centre for Public Health  
Institute of Clinical Sciences B  
Royal Victoria Hospital  
Grosvenor Road  
Belfast  
United Kingdom  
BT12 6BJ

**Study participating centre**

**University of the Andes**

Cra. 1 #18a-12, La Candelaria  
Bogota  
Colombia  
NA

## **Sponsor information**

**Organisation**

Queen's University Belfast

**Sponsor details**

Research Governance  
University Road  
Belfast  
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Northern Ireland  
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BT7 1NN  
+44 (0)28 9024 5133  
researchgovernance@qub.ac.uk

**Sponsor type**

University/education

**Website**

<https://www.qub.ac.uk/Research/Governance-ethics-and-integrity/Policies-procedures-and-guidelines/>

**ROR**

<https://ror.org/00hswnk62>

**Funder(s)****Funder type**

Research council

**Funder Name**

Medical Research Council

**Alternative Name(s)**

UK Medical Research Council, MRC

**Funding Body Type**

Government organisation

**Funding Body Subtype**

National government

**Location**

United Kingdom

# Results and Publications

## Publication and dissemination plan

Planned publication in a high-impact peer-reviewed journal

## Intention to publish date

31/01/2023

## Individual participant data (IPD) sharing plan

The datasets generated during and/or analysed during the current study are available from the corresponding author upon reasonable request to Professor Ruth Hunter, [ruth.hunter@qub.ac.uk](mailto:ruth.hunter@qub.ac.uk).

1. The type of data that will be shared: Socio-demographic data and all outcomes measures at both time points in a csv file
2. Dates of availability: No restrictions
3. Whether consent from participants was required and obtained: Written informed consent to participate in this study was provided by the participant's legal guardian/next of kin
4. Comments on data anonymization: Data is fully anonymised. No identifiable data will be shared
5. Any ethical or legal restrictions: Ethics approval has already been sought

## IPD sharing plan summary

Available on request

## Study outputs

| Output type                        | Details   | Date created | Date added | Peer reviewed? | Patient-facing? |
|------------------------------------|---|--------------|------------|----------------|-----------------|
| <a href="#">Protocol article</a>   | protocol  | 04/08/2020   | 12/12/2022 | Yes            | No              |
| <a href="#">Other publications</a> | comparing incentivized experiments with self-report methods using MECHANISMS study baseline data  | 25/09/2020   | 20/12/2022 | Yes            | No              |
| <a href="#">Other publications</a> | cultural adaptation of the interventions  | 26/04/2021   | 20/12/2022 | Yes            | No              |
| <a href="#">Results article</a>    | personality and cognitive traits associated with adolescents' sensitivity to social norms in a cross-sectional sample - secondary outcome | 09/09/2022   | 20/12/2022 | Yes            | No              |
| <a href="#">Results article</a>    | smoking susceptibility - secondary outcome  | 09/12/2021   | 20/12/2022 | Yes            | No              |
| <a href="#">Results article</a>    |   | 21/02/2023   | 13/02/2024 | Yes            | No              |