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Using Game Theory to assess the effects of social norms and social networks on adolescent smoking in schools: The MECHANISMS Study

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Cancer Focus NORTHERN IRELAND

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Background

- One method of changing behaviour at the population level involves altering social norms.

- ***Game Theory*** is a branch of economics that has developed well-defined mathematical models for describing and understanding cooperation and competition among individuals and groups.

- An experimental design rooted in Game Theory offers new ways to explore the behavioural economic mechanisms underlying the influence of social norms on health related attitudes and behaviour.

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Background

- Globally, ***tobacco use*** is still the ***most important preventable risk factor*** for chronic disease.

- Smoking rates are declining in high income countries but ***continue to rise in low and middle income countries*** (LMIC).

- This study will examine ***social norms around smoking*** before and after ***two different types of school based prevention programmes*** in Belfast (UK) and Bogotá (Colombia).

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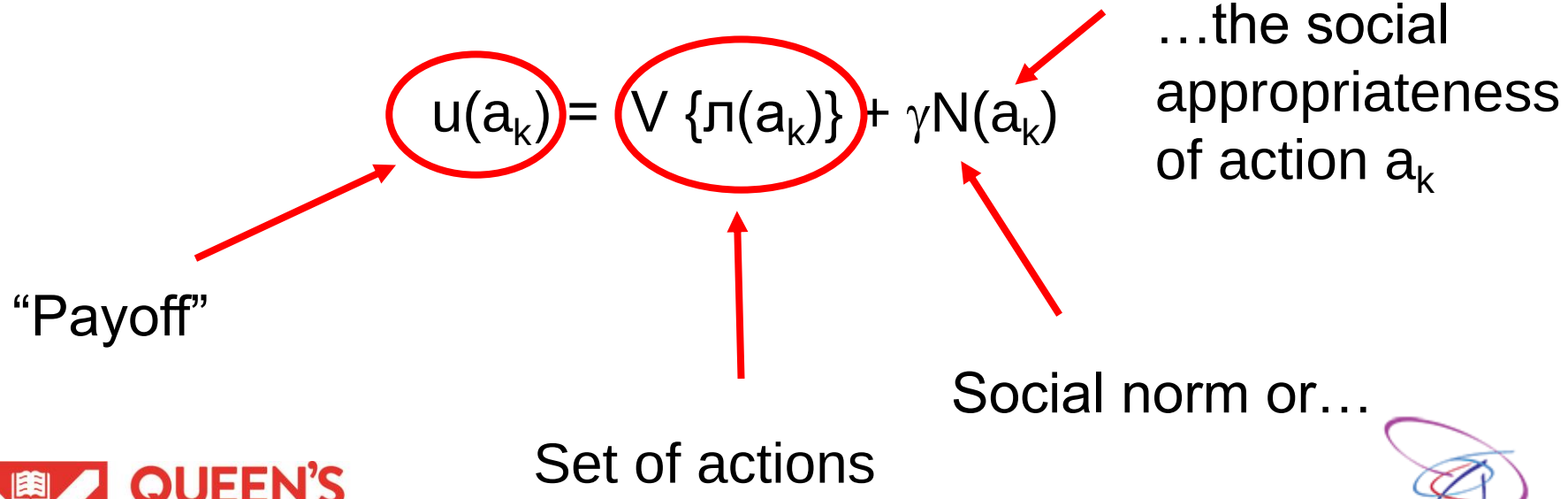
Baseline overview of schools

- 15 schools (N=7 NI; N=8 Colombia).
- 1818 pupils (n=825 NI; n=993 Colombia).
- 87% participation (n=1587).
- 51% female (n=772), 48% male (n=739).
- Most pupils were aged 12-13 years (84%, n=1297; range 11-15 years).
- Mean socio-economic status of schools was roughly middling in both countries.

Game Theory Experiments

Part 1-Identifying General Norms Sensitivity

Rule Following task measuring participants' preferences for following established rules and social norms (Kimbrough et al. 2016).



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Game Theory Experiments

Part 1-Identifying General Norms Sensitivity

$$\gamma > 0$$

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Part 1

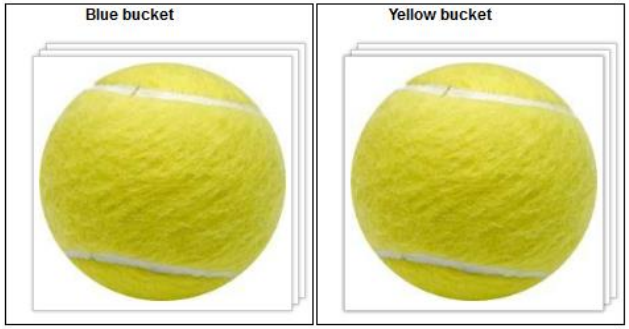
You have 50 balls. For each ball you put in the blue bucket, you will receive 5 pence, and for each ball you put in the yellow bucket, you will receive 10 pence.

The rule is to put the balls in the blue bucket.

Count of balls in blue bucket: 3

Count of balls in yellow bucket: 4

Total earnings for Part 1: £0.55



0% 100%

Game Theory Experiments

Part 2-Identifying Social Norms Related to Smoking

$$u(a_k) = V\{\Pi(a_k)\} + \gamma N(a_k)$$

$N(a_k)$

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Game Theory Experiments

Part 2-Identifying Injunctive Social Norms Related to Smoking

Co-ordination games measuring injunctive norms for smoking.

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

1=Extremely socially inappropriate; 2=Very socially inappropriate; 3=Somewhat socially inappropriate; 4=Somewhat socially appropriate; 5=Very socially appropriate; 6=Extremely socially appropriate.

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Baseline 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

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; 2=Only a few of my peers; 3=Some of my peers; 4=A lot of my peers; 5=Most of my peers; 6=All of my peers.

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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…

1=Definitely should smoke; 2=Maybe should smoke; 3=Don't know/neutral; 4=Maybe should not smoke; 5=Definitely should not smoke

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Self-report Survey

➢ **Descriptive Norms for Smoking 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; 6=Never

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Self-report Survey

➢ **Descriptive Norms for Smoking 2**

3 items reflecting the proportion of groups of important others who are smokers.

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; 6=Don't know

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Self-report Survey

- **Smoking Behaviour**

Tick the statement that applies to you…

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

- **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.

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Objectives

1. To determine whether ***experimental*** measures of injunctive and descriptive smoking norms (Parts 2 and 3) are associated with smoking behaviour and intentions using mixed-effects ordered logistic regressions.
2. To determine whether the ***experimental measure of norms sensitivity*** (Part 1) is associated with smoking behaviour and intentions.
3. To determine whether ***survey*** measures of injunctive and descriptive smoking norms are associated with smoking behaviour and intentions using mixed-effects ordered logistic regressions.
4. To examine ***correlations*** between individual items from the experiment and survey.

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Results of mixed-effects ordered logistic regressions showing relationship between anti-smoking behaviour and responses to smoking norm questions Experiment Parts 2-3.

INJUNCTIVE NORMS

P2Sit4: OR<1, p<0.05
P2Sit7: OR<1, p<0.01
P2Sit8: OR<1, p<0.01
P2Sit9: OR<1, p<0.05

DESCRIPTIVE NORMS

P3Q1: OR<1, p<0.01
P3Q2: OR<1, p<0.01

Results of mixed-effects ordered logistic regressions showing relationship between anti-smoking intentions and responses to smoking norm questions Experiment Parts 2-3.

INJUNCTIVE NORMS

P2Sit4: OR<1, p<0.01
P2Sit6: OR<1, p<0.05
P2Sit7: OR<1, p<0.01
P2Sit8: OR<1, p<0.01

DESCRIPTIVE NORMS

P3Q1: OR<1, p<0.01
P3Q2: OR<1, p<0.01

Results of mixed-effects ordered logistic regressions showing relationship between anti-smoking behaviour and responses to survey smoking norm questions.

INJUNCTIVE NORMS

All 7 items: OR>1, p<0.01

DESCRIPTIVE NORMS 1

All 5 items: OR>1, p<0.01

DESCRIPTIVE NORMS 2

All 3 items: OR>1, p<0.01

Results of mixed-effects ordered logistic regressions showing relationship between anti-smoking intentions and responses to survey smoking norm questions.

INJUNCTIVE NORMS

All 7 items: OR>1, p<0.01

DESCRIPTIVE NORMS 1

All 5 items: OR>1, p<0.01

DESCRIPTIVE NORMS 2

All 3 items: OR>1, p<0.01

Key messages

- Schools are showing ***anti-smoking norms*** at baseline.
- Both the ***experimental and self-report measures of norms*** are showing associations with self-report smoking ***behaviours and intentions*** that are in an intuitive direction.
- The ***norm-sensitivity parameter*** was associated with self-report smoking behaviours and intentions (in an intuitive direction).
- ***Pupils in Colombia*** were more likely to report behaviours and intentions geared towards smoking than pupils in NI.
- ***Individual items from the experiment and survey measures*** of norms are showing ***correlations*** that are in an intuitive direction.

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Next steps

- To formally compare the experiment and survey measures of injunctive and descriptive norm measures using ***factor analysis or principal components analysis techniques***.
- To investigate ***measurement invariance*** across countries and timepoints.
- To investigate ***moderation*** of the relationship between norms and smoking behaviours/intentions ***by personality characteristics*** (e.g. BIG5 personality questionnaire, Prosociality, Fear of Negative Evaluation, Need to Belong).

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