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Abstract

Introduction: Many adolescent smoking prevention programmes target social norms, typically evaluated with self-report, susceptible to social desirability bias. An alternative approach with little application in public health are experimental norms elicitation methods.

Methods: Using the Mechanisms of Networks and Norms Influence on Smoking in Schools (MECHANISMS) study baseline data, from 12-13 year old school pupils (n=1656) in Northern Ireland and Bogotá (Colombia), we compare two methods of measuring *injunctive* and *descriptive* smoking and vaping norms: (1) incentivized experiments, using monetary payments to elicit norms; (2) self-report scales. Confirmatory factor analysis (CFA) examined whether the methods measured the same construct. Paths from exposures (country, sex, personality) to social norms, and associations of norms with (self-reported and objectively measured) smoking behavior/intentions were inspected in another structural model.

Results: Second-order CFA showed that latent variables representing experimental and survey norms measurements were measuring the same underlying construct of anti-smoking/vaping norms (Comparative Fit Index=0.958, Tucker Lewis Index=0.951, Root Mean Square Error of Approximation=0.030, Standardized Root Mean Square Residual=0.034). Adding covariates into a structural model showed significant paths from country to norms (second-order anti-smoking/vaping norms latent variable: standardized factor loading [β]=0.30, standard error [SE]=0.09, $p<0.001$), and associations of norms with self-reported anti-smoking behavior (β=0.40, SE=0.04, $p<0.001$), self-reported anti-smoking intentions (β=0.42, SE=0.06, $p<0.001$), and objectively measured smoking behavior (β=-0.20, SE=0.06, p=0.001).

Conclusions: This paper offers evidence for the construct validity of behavioral economic methods of eliciting adolescent smoking and vaping norms. These methods seem to index the same underlying phenomena as commonly-used self-report scales.

Keywords: Confirmatory factor analysis; Latent variable modelling; Differential item functioning; Smoking; Adolescents; Norms; Behavior change; Behavioral economics; Game theory.

Introduction

Globally, tobacco smoking is still the most important preventable risk factor for chronic disease.[1] Smokers usually start during adolescence when the influence of social norms on behavior is most apparent.[2,] Early prevention is critical because young smokers can develop serious chronic health problems and are more sensitive to nicotine addiction.[3] With the introduction of e-cigarettes into the market in the mid-2000s, and as a result of large-scale marketing, e-cigarettes have gained popularity in all age groups, and particularly amongst adolescents.[4–7] Whilst e-cigarettes are seen as a potential cessation aid amongst adults, for adolescents they are more typically used for experimentation, similar to conventional cigarettes, are associated with willingness to smoke, and may act as a "gateway" to smoking.[4,8,9] Therefore, the current study examines social norms for smoking and vaping together. Adolescence is a time when young people are susceptible to social influence and many take their cues from the norms of friends, family, and most importantly, peers.[2] Therefore, many programmes aimed at smoking prevention are anchored in social norms approaches or overtly use peer influencers, with the majority targeting children at the outset of adolescence (around 12-13 years).[10–12] The Mechanisms of Networks and Norms Influence on Smoking in Schools (MECHANISMS) study aims to prevent smoking amongst adolescents and to investigate the mechanisms through which social norms for smoking and vaping are established and transmitted through social networks in schools.[13]

Social norms can be defined in terms of individuals' beliefs regarding the actions and beliefs of others in a reference group, and an important distinction has been made between *injunctive* norms (doing what others think one should do) and *descriptive* norms (doing what others do).[14] Survey-based measures of injunctive norms rely on participants' self-reports regarding what others who are important to them (e.g. parents, friends, peers) think they "should (not)" do. Similarly, survey-based measures of descriptive norms ask respondents how frequently

others who are important to them smoke. Such methods have the benefit of simplicity and clarity, but concerns about social desirability bias arise[15] because a respondent may perceive that researchers do not approve of smoking, and may not wish to reveal that a parent smokes or would not disapprove of smoking. When considering the issue of social norms measurement for evaluating public health interventions, practical methods which can mitigate the impact of social desirability bias and contribute to understanding mechanisms, are required.[14]

One potential method for eliciting social norms derives from game theory, a branch of economics that has developed well-defined mathematical models describing cooperation and competition. Using incentivized experimental approaches to elicit social norms has gained some traction in behavioral economics,[16] but there has been little evidence of transfer into public health. In behavioral economics research, these methods have been applied to explain behaviors such as reciprocity, co-operation, pro-sociality, or honouring agreements in the presence of a verbal promise.[17,18] The MECHANISMS study applies incentivized experimental approaches to reduce social desirability bias when measuring social norms for adolescent smoking and vaping by asking respondents to guess how *peers* would answer, and providing them with monetary incentives to 'match' their own response to the most common response in their school year group. To measure injunctive norms, respondents are asked to guess how peers would rate the social appropriateness of "a parent smoking in front of young children", for example. Respondents are told that they will be paid a fixed amount if their response "is the same as the most common response provided in your school year group". This modal response is elicited as the social norm. Since respondents are asked to think about how others will respond, rather than providing personal opinions, the need for social desirability is mitigated.[19] The introduction of incentives to guess how most others are guessing, provides further reason to report beliefs truthfully.

Our experiments' norm elicitation protocol (NEP) provides several additional advantages over a self-report survey. The underlying theoretical model hypothesizes that behavioral heterogeneity *within* a given setting is related to the degree to which individuals suffer disutility from norm violations or gain from norm adherence (i.e. individuals' norm-following sensitivities), whilst behavioral heterogeneity *between* different settings is related to the fact that norms vary between settings.[17] Our NEP measures both normative beliefs and norm-following sensitivities to account for these effects. We also observe how strong the 'norms' are (whether a relatively large or small proportion of respondents provide the modal response), and whether there are multiple actions of comparable social appropriateness. While experimental methods of norms' elicitation confer all of these advantages, self-report methods have the advantages of simplicity, low cost, and ease of distribution. Furthermore, the two methods focus on slightly different aspects of norms (the experiments inquire about the beliefs of the reference group whilst the self-report methods ask about influences amongst the respondent's family, friends and peers, who may or may not be representative of a particular reference group). Thus, we propose that the two methods should be viewed as complementary. Identification of latent norms constructs, and an understanding of their relative ability to explain variance in intervention effects, will improve our ability to understand the active mechanisms in such interventions.

Most studies of norms based public health programmes have been conducted in high-income countries while studies in low-middle income countries (LMICs) are limited.[10] Meanwhile, the tobacco industry has started to strategically target LMICs as its markets are depleted elsewhere.[20] Our study includes data collected from pupils attending schools throughout Northern Ireland [NI] (a constituent country of the United Kingdom [UK], a high income country,[21] with approximately 2 million inhabitants[22]) and Bogotá (the capital city of Colombia, an upper middle income country,[23] with over 7 million inhabitants[24]), and aims to

compare results between the two settings where the smoking rates, culture, and social norms are different. For example, current cigarette consumption amongst adolescents aged 11-16 years in NI, is 4% compared to 13.1% in Bogotá for adolescents aged 12-18 years.[25,26] Across the UK, current e-cigarette consumption was 4.9% in 2019 for adolescents aged 11-18 years, similar to rates for conventional cigarettes (5% of adolescents aged 11-15 years).[27,28] In Colombia, it is estimated that by 2017 e-cigarette consumption among adolescents will have reached the same prevalence rates as cigarette consumption (9% of adolescents aged 13-15 years).[29] In July 2009, Colombia adopted the World Health Organization's Framework Convention on Tobacco Control[30] into legislation, regulating advertising, packaging, sale to the underage population, and smoke-free public places. This was despite tobacco company opposition, reduced state capacity, historical political conditions (e.g. powerful alliances between the tobacco industry and government agricultural agencies, prevalence of tobacco plantations), and efforts to position tobacco as a post-conflict development strategy.[31,32] Thus, Latin American countries have historically been vulnerable to the effects of the tobacco epidemic, and smoking has been integrated into their culture and customs.[32] In the UK, the first tobacco harm reduction programme was introduced in 1972,[33] and whilst there has been a long history of anti-tobacco campaigning,[34] reliance on tobacco industry advice and research previously led to significant delays in introducing more comprehensive tobacco control policies before 1991.[33] Studying the measurement of social norms for adolescent smoking and vaping across such diverse settings will help to better characterize how they spread in schools and impact behavior. Therefore, it is important to understand potential differences in measurement properties of the instruments between the settings.

The current paper aims to compare and contrast the experimental and survey-based social norms measures which were collected as part of the MECHANISMS study.

Specific objectives include to:

1. Investigate the construct and factorial validity of the norms measures;
2. Examine whether the experimental and self-reported norms measures are determined by the same underlying latent construct;
3. Assess cross-country, sex, and personality differences on each latent variable and cross-country differences for individual norms items;
4. Investigate the relationship between the latent norms variables and self-reported anti-smoking behavior, self-reported anti-smoking intentions, and objectively measured smoking behavior.

Methods

Study design and participants

Fifteen schools (N=7 in NI, N=8 in Bogotá; participation=90.8%, n=1656/1824 pupils) took part in the MECHANISMS study between September 2018 and November 2019. We aimed to recruit all pupils in a single year group (aged 11-13 years/Year 9 in NI and 11-15 years/Year 7 in Bogotá, target age 12-13 years). During a single school semester, participants received one of two school-based smoking prevention programmes with proven effectiveness.[11,35] In a pre-post design, pupils participated in incentivized (monetary) norms elicitation experiments, whose design is rooted in the fields of behavioral economics and game theory,[16,17,36] and completed a self-report survey.

Ethics approval was granted from Queen's University Belfast on September 21, 2018 and from Universidad de los Andes, Bogotá Colombia on July 30, 2018. All participants and parents provided informed consent. The experimental protocol, and all data collection procedures, were carried out in accordance with institutional guidelines for research involving human participants. The baseline assessment consisted of two separate sessions with each class in the school year group in each school, during which participants completed

an experiment and self-report survey. Experiments and surveys were delivered via the platform Qualtrics (Qualtrics, Provo, Utah, USA) and completed on iPads. Information on study procedures, the study flow diagram, baseline characteristics of participants, and a glossary of terms are available in supplement 1. Prior to implementation in Bogotá, all study instruments underwent a cultural adaptation process including translation into Spanish language and back translation, using the heuristic framework for cultural adaptation proposed by Barrera & Castro. [37,38]

Incentivized Experiments

The incentivized (game theory) experiments consisted of a series of incentivized tasks based on published designs in behavioral economics.[16,17,36] There were four parts to the experiment and the current paper uses data from Parts 1-3. Part 1 consisted of a Rule-Following (RF) task measuring each participant's sensitivity to the effects of social norms.[17,36] The task instructs participants that they have five minutes to allocate 50 balls across two buckets (one blue and one yellow) following an explicitly stated arbitrary rule ("The rule is to put the balls in the blue bucket"). Following the rule imposes explicit monetary costs directly proportional to the degree of rule-following. The central premise is that the more a participant cares intrinsically about rule-following the more willing he/she will be to incur the costs of doing so.[36] Individuals' norms sensitivities were elicited as the number of balls allocated to the blue (rule-following) bucket.

Parts 2 and 3 of the experiment consisted of a series of incentivized coordination games which used methods employed by Krupka and Weber[16] to elicit injunctive and descriptive social norms around smoking and vaping in the whole school year group. Participants were provided with financial incentives to *match* their ratings/estimates to other participants' in their school year group as opposed to providing personal opinions. Specifically, participants

were informed that they would receive a payment if their response to a randomly selected question matched the most common answer provided in their school year group. Injunctive norms reflect shared beliefs among members of a population about what actions people *ought to* take.[16] Injunctive norms were assessed by asking participants to 'coordinate' with others in their school year group to rate the social appropriateness of a series of smoking- and vaping-related situations. Descriptive norms reflect shared beliefs among members of a population about what actions people *actually do* take.[16] Descriptive norms were assessed by asking participants to 'coordinate' with others in their school year group to estimate the proportion of their school year group who would be accepting of a close friend smoking or vaping. For each item, the 'norm' is elicited as the modal response in the year group. Table 1 shows the assessed smoking- and vaping-related scenarios and numerical coding of responses. More information on the theoretical underpinning of these methods, and full experimental protocols are provided in supplements 1 and 2.

Self-Report Survey

A survey was used to collect socio-demographic and personal characteristics, social networks data, past and present smoking behavior and intentions, psychosocial constructs and wellbeing. All survey items were previously validated and adopted from studies conducted with children of a similar age.[13] The current paper uses data collected from seven items measuring injunctive social norms for smoking,[39] five items measuring descriptive social norms for smoking,[39] one item measuring past smoking behavior,[40,41] one item measuring smoking intentions over the next six months,[42] a ten-item Need to Belong scale,[43,44] a 12-item Fear of Negative Evaluation Scale,[44–46] a five-item Pro-social Behavior Scale,[44,47] and the five subscales of the "Big 5" Personality Questionnaire[48,49] (table 1). Pupils also had their smoking behavior in the last 24 hours measured using a hand-held carbon monoxide monitor (PICOAdvantage Smokerlyzer, Bedfont).[50] This is an electrochemical sensor which measures

expelled air carbon monoxide in parts per million (ppm) in a range of 0–150 ppm with an accuracy of 2ppm/5% (whichever is greater).[50] A pupil was considered to have engaged in smoking behavior if they provided a reading of >9ppm in line with previous research.[35,51] We analysed objective smoking behavior as a continuous variable (expelled air carbon monoxide in ppm).[35]

Statistical Analysis

The statistical analysis was guided by the following specific objectives:

1. To conduct confirmatory factor analysis (CFA) to explore the construct and factorial validity of the norms measures;
2. To investigate whether the experimental and self-reported norms measures are determined by the same underlying latent construct using second-order CFA;
3. To assess cross-country, sex, and personality differences on each latent variable using multiple indicators multiple causes (MIMIC) modelling,[52,53] and cross-country differences for individual items using differential item functioning (DIF) analysis;
4. To investigate the relationship between the DIF-adjusted latent "anti-smoking/vaping norms" variables and self-reported anti-smoking behavior, self-reported anti-smoking intentions, and objectively measured smoking behavior, using structural equation modelling (SEM).

Analyses were conducted using Stata 13 (StataCorp)[54] and R version 3.6.1.[55] Means and standard deviations were computed and histograms were graphed to visualize distributions of all variables. Cronbach's alpha coefficients were computed for: (1) experimentally derived injunctive norms; (2) experimentally derived descriptive norms; (3) survey injunctive norms; (4) survey descriptive norms. As a preliminary step, we examined whether individual norms items from the experiments (Part 2 Situations 2-9, Part 3 Questions 1-2) and survey

(Injunctive Norms 1-7, Descriptive Norms 1-5) were showing theoretically expected inter-relationships and associations with self-reported anti-smoking behavior, intentions, and objectively measured smoking behavior. Spearman's rank-order correlations were computed, examining the association between individual norms items from the experiments and survey, and associations between self-reported anti-smoking behavior, intentions, and objectively measured smoking behavior. Individual norms items were examined for an association with self-reported anti-smoking behavior, self-reported anti-smoking intentions, and objectively measured smoking behavior, using mixed-effects regressions. Rule-following was compared between NI and Bogotá using a cluster-adjusted t-test with number of balls allocated to the blue bucket in the RF task as the outcome and participant school as the cluster variable. This was carried out using Stata's 'clttest' command.

CFA is a statistical technique to determine whether measures of a construct are consistent with a researcher's understanding of the nature of the construct, or factor, by testing whether the data fits a hypothesized measurement model.[56] To assess factorial and construct validity, separate CFAs were conducted for: experimental injunctive norms (model 1); survey injunctive norms (model 2); experimental descriptive norms (model 3); survey descriptive norms (model 4; objective 1). To compare the experimental and survey measurements, a CFA model was conducted containing four correlated first-order latent variables (model 5; figure 1). A final CFA model was derived, similar to model 5, in which the covariance between the first-order latent variables was described by an overall second-order latent construct labelled "Anti-Smoking/Vaping Norms" (model 6; figure 2; objective 2).[57] Since our experimentally derived measure of descriptive norms consisted only of two items, convergence was achieved by constraining the loadings of both indicators to be equal.[58]

CFAs were conducted using the lavaan package in R.[59] To reduce bias in standard errors which threatens maximum likelihood estimation,[60–62] robust standard errors were computed

289 (Huber White).[63,64] This estimator was favoured over the categorical estimators since all
290 indicators had more than five response categories.[62,65,66] It also permitted imputation of
291 missing data using full information maximum likelihood. The Little (1988) test was used to
292 determine whether data for individual items were missing completely at random (MCAR)
293 using Stata's 'mcartest' command with 200 iterations in the expectation maximization
294 algorithm.[67] A p-value of <0.0001 was obtained, indicating that the data were not MCAR,
295 which justified imputing missing data.[68] All analyses were repeated without imputation of
296 missing data (i.e. complete cases). Percentages of missing data requiring imputation for
297 individual items ranged from 3.7-3.9% (experimentally derived injunctive norms), 4.2-4.5%
298 (survey injunctive norms), 3.7-3.9% (experimentally derived descriptive norms), and 4.16-
299 4.22% (survey descriptive norms). For the most part, missing data occurred if a participant
300 was present in school on one of the days (for the experiment or the survey), but absent on the
301 other day (n=123/1636=7.5% of participants).

302 Model fit was assessed in relation to several goodness-of-fit indices. The chi-square statistic
303 can be used to assess the absolute fit of the model to the data, assuming correct model
304 specification.[57,69] A non-significant result ($p>0.05$) indicates good model fit. However, it can
305 be overly influenced by sample size, correlations, variance unrelated to the model, and
306 multivariate non-normality.[69,70] Comparative Fit Index (CFI) values of ≥0.96, Tucker-Lewis
307 Index (TLI) values of ≥0.95, Root Mean Square Error of Approximation (RMSEA) values of
308 ≤0.06, and Standardized Root Mean Square Residual (SRMR) values of ≤0.09 indicate good
309 model fit.[69,71] A number of parsimony based fit indices were also extracted including the
310 Akaike Information Criterion (AIC), Bayesian Information Criterion (BIC) and adjusted BIC.
311 Lower values on these indices indicate a more parsimonious model.[69] Measurement models
312 were modified to improve factorial validity by reference to modification indices (MIs).[72]
313 Modifications were made only where substantively appropriate, and with strong theoretical

justification.[69,73,74] Subsequent analyses were based on the second-order measurement model. Supplement 3 shows syntax for all analyses.

MIMIC models can be used to examine differences on latent variables by regressing them onto an observed grouping variable. Individual items can then be tested for DIF by regressing them onto the grouping variable whilst controlling for differences at the latent variable level.[52,53,75] These techniques were used to compare the norms measurements, and to assess measurement invariance, between NI and Colombia (objective 3). Baseline MIMIC models included a measurement model and a structural model: (1) the second-order latent variable regressed onto an observed country variable (0=NI, 1=Colombia); (2) the four first-order latent variables regressed simultaneously onto the observed country variable. This showed whether mean values on the overall latent constructs differed between the two countries. DIF occurs when an item has different measurement properties for one group versus another, irrespective of mean differences on the overall latent construct.[76] To determine which indicators showed DIF, direct paths between country and each observed indicator were constrained to 0, whilst controlling for country differences on the four first-order latent constructs. MIs were inspected along with expected parameter changes (EPCs) and DIF was determined to be present for an item if MI>3.84 and EPC≥0.10.[77] This novel approach to assessing DIF has been adopted from a recent study.[78] In the case of low power (<0.80), if these conditions were not met, the result was determined as inconclusive.

MIMIC models were also used to determine whether mean values on the overall first- and second-order latent constructs (adjusted for country differences on first-order latent variables and DIF) differed according to sex, personality characteristics (Need to Belong, Fear of Negative Evaluation, Pro-social Behavior, Big 5 personality subscales), and rule-following (number of balls allocated to the blue bucket in the RF task). We also examined, and found no evidence for, DIF according to participant sex (results not reported).

The DIF-adjusted second-order measurement model was investigated for associations with observed self-reported anti-smoking behavior, intentions, and objectively measured smoking behavior, using SEM (objective 4). The structural part of these models included either self-reported anti-smoking behavior, self-reported anti-smoking intentions, or objectively measured smoking behavior as the observed outcome variable regressed onto: (1) the second-order latent variable; (2) the four first-order latent variables simultaneously. Path coefficients were inspected ($p<0.05$ provided evidence for a significant association).

Results

Descriptive statistics are shown in table 2 and supplement 4. Mean responses for all experimental items are <0, indicating there were already anti-smoking norms established at baseline. Details on the methods and results of the correlational analyses and mixed-effects regressions are discussed in supplement 5. Individual items from the experiments and survey showed theoretically expected inter-relationships and associations with self-reported anti-smoking behavior and intentions (e.g. higher anti-smoking/vaping norm responses were associated with greater anti-smoking behavior and intentions). Theoretically expected inter-relationships were observed between self-reported anti-smoking behavior and intentions, and objectively measured smoking behavior. These models also indicate that (1) pupils who were more rule-following in the RF task were more likely to report higher anti-smoking behavior and intentions; (2) Colombian pupils were more likely to report lower anti-smoking behavior or intentions and to show higher levels of expelled air carbon monoxide in their Smokerlyzer readings (which accords with intercountry differences in smoking prevalence among adolescents). A cluster-adjusted t-test showed there were no between-country differences in rule-following (number of balls allocated to the blue bucket in the RF task, $p=0.19$).

Goodness-of-Fit statistics for our CFA models are shown in supplement 6. Although chi-square tests were significant for almost all of the models ($p<0.05$), we did not reject models on this basis as it can be overly influenced by sample size, correlations, variance unrelated to the model, and multivariate non-normality.[69,70] CFI values ranged from 0.958-1.000 and TLI values ranged from 0.947-1.017. RMSEA values ranged from 0.000-0.059 and SRMR values ranged from 0.000-0.034. Therefore, all models demonstrated a good or satisfactory fit (objective 1). Inspection of model fit indices indicated there was almost an identical fit between the first-order measurement model with four correlated latent variables (model 5; figure 1) and the second-order measurement model (model 6; figure 2). Subsequent analyses were based on the second-order measurement model. Diagrams showing final model structures and standardized factor loadings are provided in supplement 6 (figure 3 shows results for the final second-order measurement model).

The second-order measurement model showed negative standardized factor loadings for the paths connecting the first-order latent constructs representing experimentally derived norms to the underlying second-order latent construct (injunctive norms: standardized factor loading [β]=-0.69, standard error [SE]=0.11, $p<0.001$; descriptive norms: β=-0.67, SE=0.10, $p<0.001$), and positive standardized factor loadings for the paths connecting the first-order latent constructs representing survey norms to the underlying second-order latent construct (injunctive norms: β=0.47, SE=0.08, $p<0.001$; descriptive norms: β=0.45, SE=0.10, $p<0.001$). This is as expected since the experiment and survey items were coded in the opposite directions intuitively. Thus, higher values on the second-order latent variable represent greater anti-smoking/vaping norms. Therefore, we concluded that our hypothesized measurement models showed good fit to the data, and our four first-order latent variables were measuring the same overall second-order latent variable of "Anti-Smoking/Vaping Norms" (objective 2).

Baseline MIMIC models indicated that there was an association between country and the second-order latent variable measuring anti-smoking/vaping norms (β=0.30, SE=0.09, p<0.001). Therefore, Colombian pupils reported greater anti-smoking norms overall. There were significant intercountry differences for the first-order latent variables measuring experimentally derived injunctive norms (β=-0.21, SE=0.08, p=0.007), survey injunctive norms (β=-0.21, SE=0.07, p=0.004), experimentally derived descriptive norms (β=-0.31, SE=0.07, p<0.001), and survey descriptive norms (β=0.30, SE=0.12, p=0.008) (table 3). Therefore, Colombian pupils were more likely to give lower social appropriateness ratings in their experiment injunctive norms responses, and to rate that a lower proportion of their school year group would be accepting of a close friend smoking/vaping in their experiment descriptive norms responses. Colombian pupils were also more likely to think that people who are important to them (e.g. parents, siblings) would be more accepting of their own smoking behavior in their survey injunctive norms responses, and more likely to think that people who are important to them smoke less frequently in their survey descriptive norms responses.

Controlling for differences on the latent variables, there was evidence that the following items may be exhibiting DIF: Part 2 Situation 2, Part 2 Situation 5, Part 2 Situation 8, Injunctive Norms 1, Injunctive Norms 3, Injunctive Norms 4, Injunctive Norms 7, Descriptive Norms 2, Descriptive Norms 4, and Descriptive Norms 5. Results were inconclusive for Injunctive Norms 5, Injunctive Norms 6, Descriptive Norms 1, and Descriptive Norms 3 due to low power (supplement 7). There was no further evidence of DIF with the paths from country to the following indicators freely estimated: Part 2 Situation 2, Part 2 Situation 5, Injunctive Norms 1, Injunctive Norms 4, Descriptive Norms 2, and Descriptive Norms 3 (table 3). After adjusting for DIF, the path from country to the first-order latent variable measuring experimental injunctive norms was no longer statistically

significant (p=0.15) suggesting that between-country differences on this latent variable were due to the items Part 2 Situation 2 and Part 2 Situation 5. After adjusting for DIF, the path from country to the first-order latent variable measuring survey descriptive norms was no longer statistically significant (p=0.75) suggesting that between-country differences on this latent variable were due to the items Descriptive Norms 2 and Descriptive Norms 3.

Results of MIMIC models examining associations between sex, personality characteristics, and rule-following with latent norms variables are reported in supplement 8. For the second-order latent construct there were significant positive associations with the following variables: Need to Belong (p=0.003), Pro-Social Behavior (p<0.001), Openness (p<0.001), Extraversion (p=0.03), Agreeableness (p<0.001), Conscientiousness (p<0.001), and Stability (p<0.001). Thus, higher levels on these personality variables were associated with higher anti-smoking/vaping norms. Results are also presented for associations with first-order latent norms constructs (objective 3).

The results of SEM models are shown in table 4. Higher anti-smoking/vaping norms (on the second-order latent variable) were associated with higher self-reported anti-smoking behavior (β=0.40, SE=0.04, p<0.001), higher self-reported anti-smoking intentions (β=0.42, SE=0.06, p<0.001), and lower objectively measured smoking behavior (β=-0.20, SE=0.06, p=0.001). These models also show a negative association between country and self-reported anti-smoking behavior and intentions suggesting that Colombian pupils were more likely to report higher levels of past/current smoking behavior or greater intentions to take up smoking in the next six months compared to NI pupils. There was also a positive association between country and objective smoking behavior suggesting that Colombian pupils showed higher levels of expelled air carbon monoxide in their Smokerlyzer readings (objective 4).

Discussion

Using CFA, our results provide evidence supporting the construct and factorial validity of the two different measurement instruments that were used to elicit social norms for adolescent smoking and vaping as part of the MECHANISMS smoking prevention study (incentivized experiments and a self-report survey; objective 1). Second-order measurement models established that experimental and survey measures of injunctive and descriptive norms were measuring the same underlying second-order latent variable (objective 2). SEM models verified that there was a positive association between higher anti-smoking/vaping norms (the second-order latent variable) and higher self-reported anti-smoking behavior and intentions, and lower objectively measured smoking behavior (objective 4). Therefore our experimental and survey norms measures showed comparable explanatory power related to smoking behavior and intentions following cultural adaptation of the instruments. These findings suggest that our experimental measures of social norms capture the same phenomena as the commonly used self-report survey.

Baseline MIMIC models showed that experimentally elicited *injunctive* norms against smoking/vaping (measured among the school year group), were stronger in Colombia than in NI, but survey responses revealed weaker anti-smoking/vaping injunctive norms in the form of Colombian pupils' beliefs about their parents, siblings, etc. than among pupils in NI. Colombian pupils also showed weaker *descriptive* anti-smoking/vaping norms in both the experimental and survey measurements. Controlling for latent variable differences, the DIF analyses revealed which individual items were exhibiting measurement invariance for Colombia versus NI (objective 3). After controlling for differences on individual items, differences in experimentally derived injunctive norms and survey descriptive norms were non-significant at the latent variable level. The analysis indicates that the higher anti-smoking/vaping injunctive norms observed for Colombian pupils in their experimental responses were due entirely to differences in the items Part 2 Situation 2 and Part 2 Situation

5. The higher anti-smoking/vaping descriptive norms observed for Colombian pupils in their survey responses were also due entirely to differences in the items Descriptive Norms 2 and Descriptive Norms 3.

Differences in experimental injunctive norms were due to Colombian pupils providing lower social appropriateness ratings for items Part 2 Situation 2 (a parent smoking in their own home in front of children under the age of 5) and Part 2 Situation 5 (in a recent superhero movie the lead actor is seen smoking in the opening scene). Following the implementation of the tobacco control policy in Colombia, it has been found that smoke-free environments have a high acceptability rate among the Bogotá population (85% acceptance).[79] Therefore, our Colombian participants were potentially showing an awareness of a cultural de-normalization of indoor smoking as a result of this smoke-free environment tobacco control policy when answering Part 2 Situation 2.[80] By comparison, in 2016, one in eight young people reported living in a household with an adult who smokes inside the home in NI.[25] Our NI participants also reported seeing their mothers and fathers smoke more frequently than Colombian pupils, making it more likely that they see adults smoking indoors.

Regarding Part 2 Situation 5, there is considerable literature illustrating how celebrities can impact public health through their influence on knowledge, attitudes and decision-making,[81] and studies have shown a positive association between exposure to movie smoking and adolescent smoking rates.[82,83] In Colombia, the tobacco control policy includes a complete ban on tobacco advertisements, sponsorships, and promotions, and has a high level of implementation in television, cinemas and banners.[79] Moreover, non-paid tobacco product placement in films is not common in Latin America.[84] By comparison, previous research shows high rates of exposure to smoking in television and movies amongst the UK population.[85–87] In 2018, over 80% of adolescents (aged 11-18 years) reported seeing smoking in movies, whilst approximately 70% reported seeing smoking on television.[86]

Colombian pupils provided lower anti-smoking/vaping norms ratings at the latent variable level in their responses to experimental descriptive norms items compared to pupils in NI. Pupils in NI were more likely to estimate that a greater proportion of their school year group would be accepting of a close friend vaping than Colombian pupils (Part 3 Question 2). However, responses to the equivalent smoking item were similar between the two countries. A 2019 report from Public Health England shows that the number of 13-15 year olds who have never smoked but who have tried vaping is increasing in the UK.[88] Adolescents may be drawn towards e-cigarette use due to perceptions that they are safer and healthier than conventional cigarettes, product features (e.g. different flavourings), and marketing.[4] The market for e-cigarettes in Colombia is relatively new (since 2015), and they are not clearly regulated.[79] There is limited evidence regarding the knowledge and access amongst our target population. The UK is one of 20 countries worldwide that classifies certain types of e-cigarettes as medicinal.[89] Potentially, vaping is regarded as more acceptable in the UK as a result.

For the survey injunctive norms scale, the DIF analysis indicated that ratings for the items Injunctive Norms 1 (most of the people who are important to me think that I,… definitely should smoke,…definitely should not smoke) and Injunctive Norms 4 (my brother(s) think(s) that I,… definitely should smoke,… definitely should not smoke) were higher for Colombian versus NI pupils, in the opposite direction to differences at the latent variable level. Potentially the remaining items of the scale, enquiring individually about parents, sisters and friends, do not fully capture the range of individuals Colombian pupils consider to be "important to me". Future researchers may wish to consider expanding this scale to account for all potential influences and cultural differences regarding the socialization of adolescents. Cross-country differences at the latent variable level for survey descriptive norms items became non-significant when the models were adjusted for DIF on items Descriptive Norms

2 and Descriptive Norms 3. Colombian pupils were more likely to report seeing their mothers and fathers smoke less frequently than pupils in NI. In 2018, 14.7% of the UK population aged 18 years and above smoked cigarettes (15.5% NI).[90] In our NI sample, 17.5% of participants reported having mothers who smoked often or very often (19.6% for fathers). Possibly, smoking rates amongst the parents of our NI participants were higher than the NI adult population in general.

Strengths and limitations

Strengths of this paper include the large sample size and use of data from schools in two settings with varying normative, cultural and health behavioral traits following a rigorous cultural adaptation of all study instruments. We also examined measurement invariance across relevant subgroups (i.e. between countries) using MIMIC models and DIF analysis, and examined associations with both self-reported and objective measures of smoking behavior. This paper has several limitations. We did not cross-validate our CFA models on an independent sample. However, due to the complexity of our models, we were reluctant to decrease power for our analysis by reducing the sample size. We examined whether data were MCAR (finding evidence that the data were not MCAR) prior to imputing missing data, and are confident that the approach was appropriate.[68] Our results also remained unchanged when repeating analyses without imputing missing data. The MECHANISMS study is funded as a proof of concept study involving a relatively small sample of schools in each country. Therefore, we are cautious in generalizing our findings to other schools in NI and Bogotá (Colombia). There was low power for some items in the DIF analysis. One of our first-order latent variables is measured by two items as our study's assessment of experimentally derived descriptive norms only consisted of two items. Finally, results should be interpreted with caution due to multiple testing.

535 **Implications for future research**

536 This paper shows that incentivized experimental methods from the field of behavioral
537 economics[16,17,36] can be used to measure social norms for smoking and vaping behaviors
538 amongst adolescents in two different settings. It has been proposed that such measures are
539 less prone to bias, providing rich information regarding the distribution of acceptable actions
540 (i.e. norms) and individuals' norm-following sensitivities that can better explain behavioral
541 heterogeneity *within* and *between* different settings.[14,16,36] Our MIMIC models and DIF
542 analyses indicated when items operated differently from the rest of their scale (e.g. item
543 Injunctive Norms 1 and Injunctive Norms 4). Future researchers may wish to consider
544 amending/deleting such items or expanding the scale before conducting research with
545 children from diverse backgrounds. Our MIMIC models also showed positive associations
546 between personality variables (need to belong, pro-social behavior, openness, extraversion,
547 agreeableness, conscientiousness, and emotional stability) and greater perceived anti-
548 smoking/vaping norms. Therefore, when designing interventions attempting to leverage peer
549 influence to promote smoking prevention amongst adolescents (e.g. the ASSIST programme),
550 interventionists may wish to consider whether certain personality types may be more (or less)
551 suited to transmit anti-smoking/vaping norms.[91] Future research should investigate whether
552 these findings translate to larger, more diverse samples, and different countries.

553 **Conclusions**

554 The MECHANISMS study was conducted with 11-13 year old school pupils in NI (UK) and
555 11-15 year olds in Bogotá (Colombia) over a single school semester in 15 schools. This paper
556 contributes evidence supporting the construct validity of incentivized experimental and self-
557 report methods of eliciting injunctive and descriptive social norms for adolescent smoking
558 and vaping behaviors. A second-order CFA model confirmed that the experimental and

559 survey norms measures were measuring the same underlying latent construct of anti-
560 smoking/vaping norms. Thus, we propose that the two methods could be used as
561 complementary measures, to provide a richer understanding of the mechanisms through
562 which social norms influence health-related attitudes and behavior. MIMIC modelling and
563 DIF analyses showed that our norms measurements reflected differences between relevant
564 subgroups of participants (i.e. between two settings varying in smoking rates, culture, and
565 norms). Future research should investigate whether these results vary across repeated
566 measurements and whether they apply in different countries.

Additional information

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Author contributions

JMM is a Research Fellow working on the study, led the statistical analysis and drafted the manuscript. EOK is a study co-Investigator, designed the experiments, advised on the statistical analysis and helped draft the manuscript. ELK, AR and RK are study co-Investigators and designed the experiments. SCS collected the information provided about the legal framework in Colombia and assisted with the interpretation of the results in Colombia. JMP advised on the conduct of the statistical analysis. OLS, FK and RFH are study Principal Investigators and helped draft the manuscript. All authors reviewed and approved the final manuscript.

Competing interests

None declared.

Data availability

The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.

Code availability

589 The code used to generate the results reported in the current study are included in the
590 supplementary files.

591 **Ethical compliance**

592 This study complies with all relevant ethical regulations.

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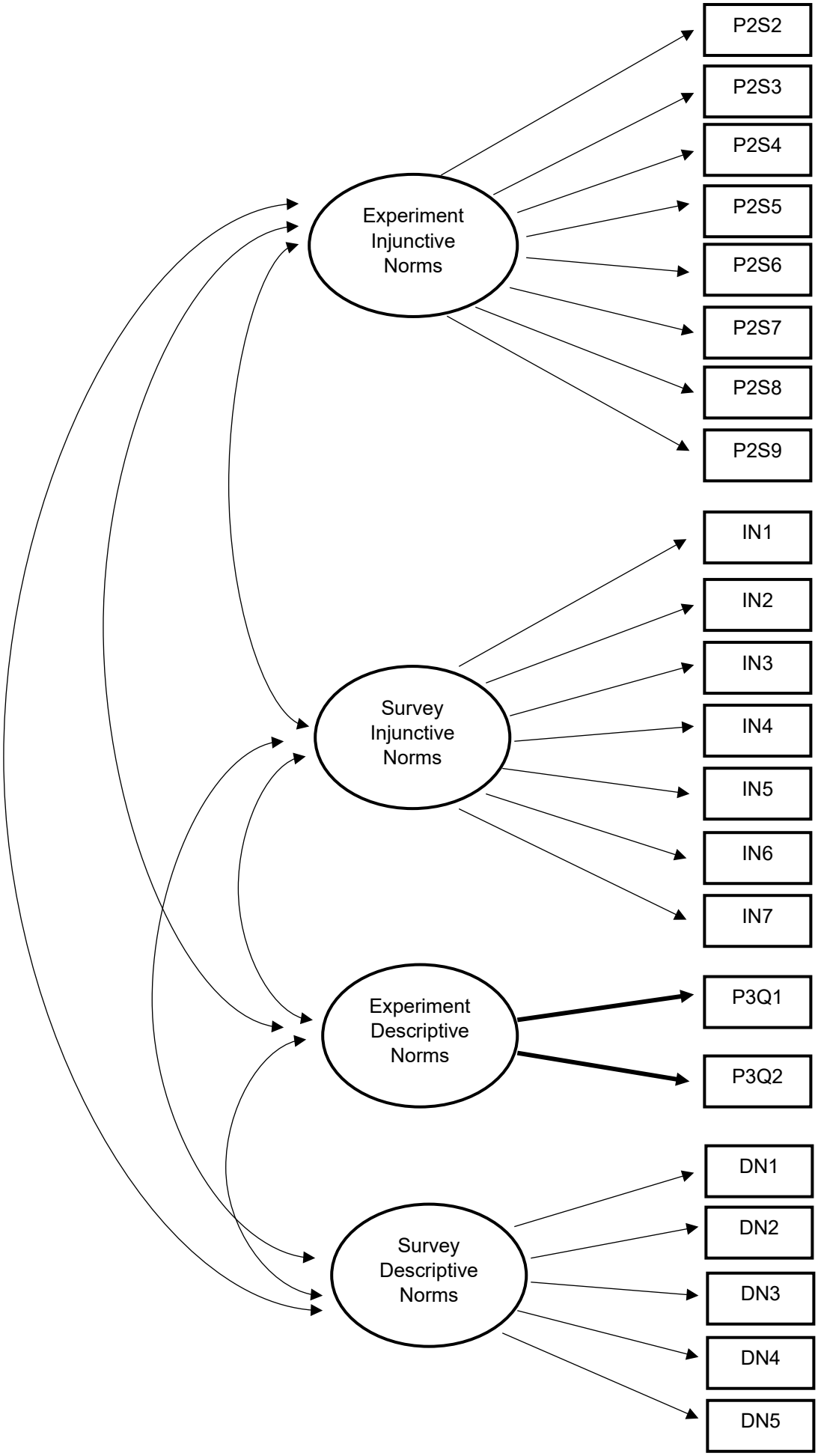

Figure 1. Theoretic first-order measurement model with four correlated latent variables

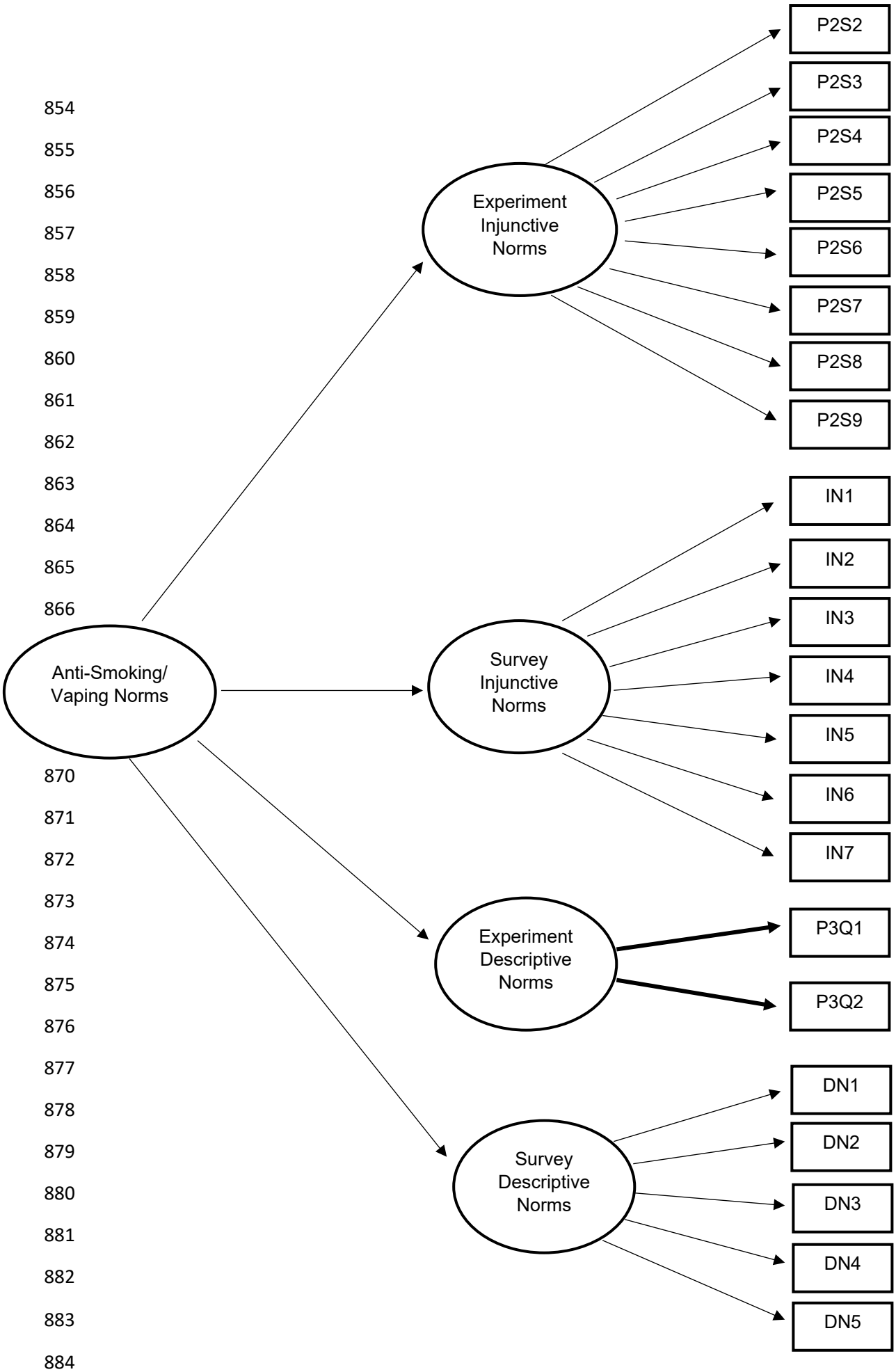

Figure 2. Theoretic second-order measurement model with four first-order latent variables

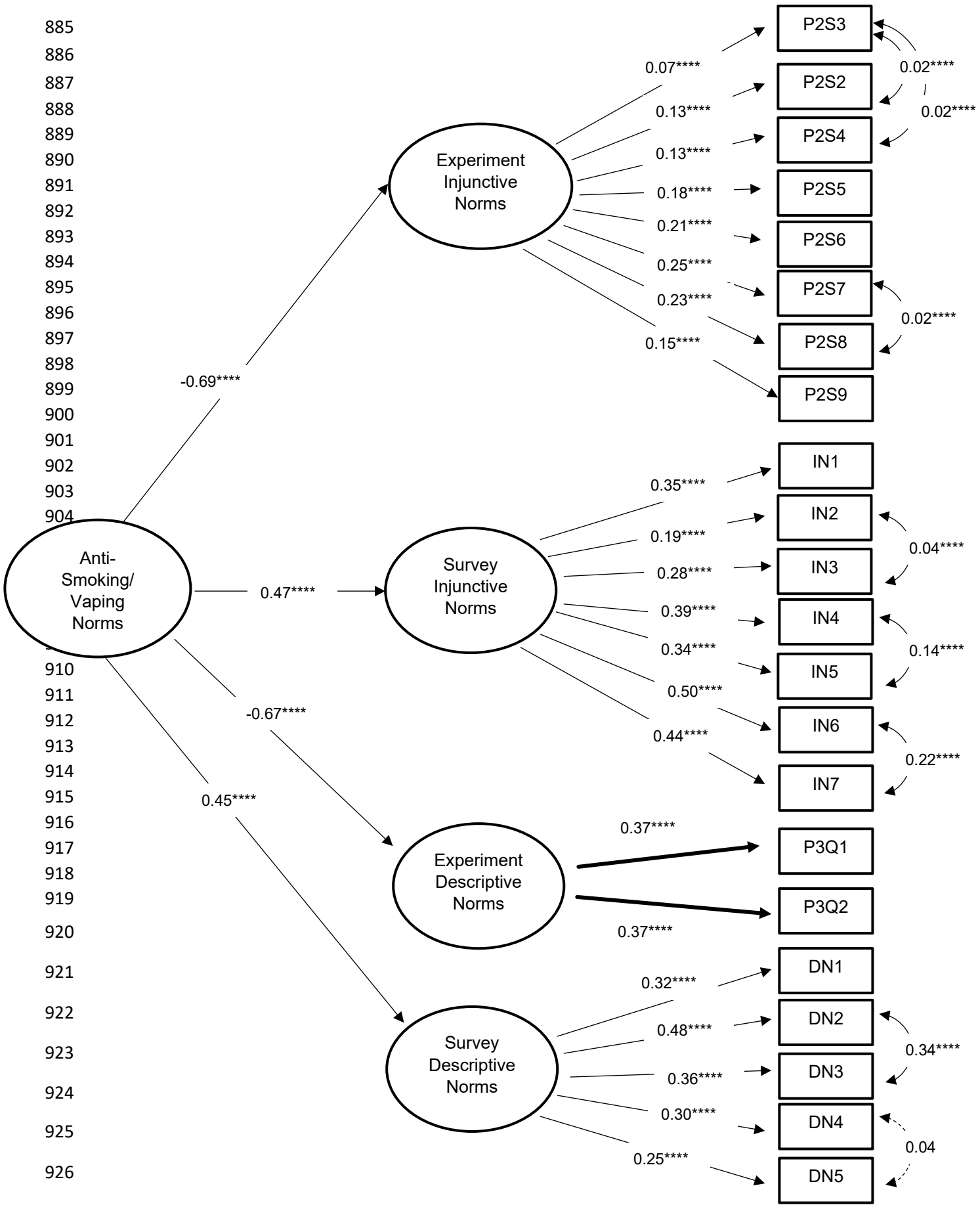

Figure 3. Second-order measurement model with four first-order latent variables, standardized factor loadings, *p<0.10; **p<0.05; ***p<0.01; ****p≤0.001

927 **Table 1. Smoking/vaping-related injunctive and descriptive social norms elicited in the**
928 **experiment and self-report survey**

Variable name	Scenario/Question	Responses/Coding
Experiment Part 1: Rule-following		
Rule-following (BlueBucket)	Rule-following (individuals' norms sensitivities): Number of balls allocated to the blue (rule-following) bucket.	1 (least rule-following) to 50 (most rule-following).
Experiment Part 2: Injunctive norms (α=0.77)[a]		
Part 2 Situation 2 (P2S2)	Parent smoking in their own home in front of children under age of 5.	-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.
Part 2 Situation 3 (P2S3)	An adult smoking in a car with children under the age of 16 in the car.	*As per P2S2.*
Part 2 Situation 4 (P2S4)	Someone selling cigarettes to a teenager who looks younger than 16 without requesting proof of age.	*As per P2S2.*
Part 2 Situation 5 (P2S5)	In a recent superhero movie the lead actor is seen smoking in the opening scene.	*As per P2S2.*
Part 2 Situation 6 (P2S6)	An older student from school is smoking outside school, for example, at a bus stop.	*As per P2S2.*
Part 2 Situation 7 (P2S7)	A pupil from school is using an e-cigarette while walking to school.	*As per P2S2.*
Part 2 Situation 8 (P2S8)	A pupil from school shares a photograph of him/herself using an e-cigarette on social media.	*As per P2S2.*
Part 2 Situation 9 (P2S9)	A pupil from school is chewing tobacco.	*As per P2S2.*
Experiment Part 3: Descriptive norms (α=0.85)[a]		
Part 3 Question 1 (P3Q1)	The proportion of my peers who would be accepting of a close friend smoking.	-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.
Part 3 Question 2 (P3Q2)	The proportion of my peers who would be accepting of a close friend vaping.	*As per P3Q1.*
Survey: Self-reported injunctive norms (α=0.74)[b,c]		
Injunctive Norms 1 (IN1)	Most of the people who are important to me think 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.
Injunctive Norms 2 (IN2)	My mother thinks that I…	*As per IN1. Responses of "I don't have a mother" were also set to 0.*

Injunctive Norms 3 (IN3)	My father thinks that I…	*As per IN1. Responses of "I don't have a father" were also set to 0.*
Injunctive Norms 4 (IN4)	My brother(s) think(s) that I…	*As per IN1. Responses of "I don't have a brother" were also set to 0.*
Injunctive Norms 5 (IN5)	My sister(s) think(s) that I…	*As per IN1. Responses of "I don't have a sister" were also set to 0.*
Injunctive Norms 6 (IN6)	My friends think that I…	*As per IN1. Responses of "I don't have a friend" were also set to 0.*
Injunctive Norms 7 (IN7)	My best friend thinks that I…	*As per IN1. Responses of "I don't have a best friend" were also set to 0.*
Survey: Self-reported descriptive norms (α=0.54)[b,c]		
Descriptive Norms 1 (DN1)	Does your best friend smoke?	1=Very often; 2=Often; 3=Occasionally; 4=Rarely; 5=Never/Don't know. *Responses of "I don't have a best friend" were also set to 5.*
Descriptive Norms 2 (DN2)	Does your mother smoke?	*As per DN1. Responses of "I don't have a mother" were also set to 5.*
Descriptive Norms 3 (DN3)	Does your father smoke?	*As per DN1. Responses of "I don't have a father" were also set to 5.*
Descriptive Norms 4 (DN4)	Do any of your brothers smoke?	*As per DN1. Responses of "I don't have a brother" were also set to 5.*
Descriptive Norms 5 (DN5)	Do any of your sisters smoke?	*As per DN1. Responses of "I don't have a sister" were also set to 5.*
Survey: Self-reported smoking behavior and intentions[b]		
Past Smoking Behavior (SmokePast)	Now read the following statements carefully and tick the box next to the one which best describes you. (I have never smoked; I have only ever tried smoking once; I used to smoke sometimes but I never smoke a cigarette now; I sometimes smoke cigarettes now but I don't smoke as many as one a week).	1=Sometimes smoke; 2=Previous smoker; 3=Smoked once; 4=Never smoked.
Intentions (Intent)	If you DON'T currently smoke, 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.
Smokerlyzer readings: Objectively measured smoking behavior		
Carbon monoxide reading (COreading)	Objectively measured smoking behavior over the past 24 hours captured using hand-held carbon monoxide monitors (PICOAdvantage Smokerlyzer, Bedfont) to measure expelled air carbon monoxide in parts per million (ppm) in a range of 0–150 ppm with an accuracy of 2ppm/5% (whichever is greater).	Continuous variable (ppm).

Survey: Self-reported sex and personality characteristics[b]		
Sex	Participant sex	0=Boy; 1=Girl/Prefer not to say.
Need to Belong (Belong)	Need to Belong Scale.	Average of 10 items, each coded 1-5: 1 (lowest need to belong)-5 (greatest need to belong). Not available for two Colombian schools.
Fear of Negative Evaluation (Negative)	Fear of Negative Evaluation Scale.	Average of 12 items, each coded 1-5: 1 (lowest fear of negative evaluation)-5 (greatest fear of negative evaluation). Not available for two Colombian schools.
Prosocial Behavior (Prosocial)	Prosocial Behavior Scale.	Sum of five items, each coded 0-2: 0 (least prosocial)-10 (most prosocial).
Big 5 Openness (Big5Open)	Big 5 Personality Questionnaire (Openness subscale).	Average of 10 items, each coded 0-4: 0 (lowest openness)-4 (greatest openness).
Big 5 Extraversion (Big5Extra)	Big 5 Personality Questionnaire (Extraversion subscale).	Average of 10 items, each coded 0-4: 0 (least extraverted)-4 (most extraverted).
Big 5 Agreeableness (Big5Agree)	Big 5 Personality Questionnaire (Agreeableness subscale).	Average of 10 items, each coded 0-4: 0 (least agreeable)-4 (most agreeable).
Big 5 Conscientiousness (Big5Cons)	Big 5 Personality Questionnaire (Conscientiousness subscale).	Average of 10 items, each coded 0-4: 0 (least conscientious)-4 (most conscientious).
Big 5 Stability (Big5Stab)	Big 5 Personality Questionnaire (Stability subscale).	Average of 10 items, each coded 0-4: 0 (least stability)-4 (most stability).

[a]Responses to experimental items were numerically coded to run between -1 and +1 following procedures adopted in Krupka and Weber (2013).[16]

[b]All items on the survey were coded such that higher numerical values represented greater anti-smoking norms, greater anti-smoking behavior or intentions, or higher values of the personality traits (Need to Belong, Fear of Negative Evaluation, Pro-social Behavior, Big 5 Personality Questionnaire).

[c]Responses to survey injunctive norms items were numerically coded to run between -2 and +2 following Cremers et al. (2014).[92]

[d]Responses to survey descriptive norms items were numerically coded to run between +1 and +5 following Cremers et al. (2014).[92]

939 **Table 2. Baseline summary statistics, means and standard deviations**

	Northern Ireland (N=7)	Colombia (N=8)	All schools (N=15)
Experiment, n	696	880	1576
Survey, n	701	872	1573
Experiment Part 1: Balls allocated to blue (rule-following) bucket	28.8 (19.2)	31.6 (16.9)	30.4 (18.0)
Experiment Part 2 (injunctive social norms)[a]			
P2S2	-0.8 (0.3)	-0.9 (0.2)	-0.9 (0.3)
P2S3	-0.7 (0.4)	-0.7 (0.3)	-0.7 (0.4)
P2S4	-0.9 (0.3)	-0.9 (0.3)	-0.9 (0.3)
P2S5	-0.3 (0.4)	-0.5 (0.4)	-0.4 (0.4)
P2S6	-0.6 (0.4)	-0.5 (0.4)	-0.6 (0.4)
P2S7	-0.5 (0.4)	-0.6 (0.4)	-0.5 (0.4)
P2S8	-0.5 (0.4)	-0.5 (0.4)	-0.5 (0.4)
P2S9	-0.8 (0.4)	-0.8 (0.3)	-0.8 (0.3)
Experiment Part 3 (descriptive social norms)[b]			
P3Q1	-0.5 (0.5)	-0.5 (0.5)	-0.5 (0.5)
P3Q2	-0.3 (0.6)	-0.5 (0.5)	-0.4 (0.5)
Survey: Smoking behavior[c]	3.8 (0.6)	3.7 (0.7)	3.8 (0.6)
Survey: Smoking intentions[d]	5.7 (0.8)	5.5 (1.2)	5.6 (1.1)
Survey: Injunctive social norms[e]			
IN1	1.7 (0.7)	1.8 (0.6)	1.8 (0.7)
IN2	1.9 (0.3)	1.9 (0.4)	1.9 (0.4)
IN3	1.8 (0.6)	1.7 (0.7)	1.7 (0.7)
IN4	1.4 (0.9)	1.4 (0.9)	1.4 (0.9)
IN5	1.4 (0.9)	1.4 (0.9)	1.4 (0.9)
IN6	1.5 (0.9)	1.3 (1.0)	1.4 (0.9)
IN7	1.7 (0.7)	1.5 (0.9)	1.6 (0.8)
Survey: Descriptive social norms[f]			
DN1	4.8 (0.8)	4.8 (0.7)	4.8 (0.7)
DN2	4.2 (1.4)	4.6 (1.0)	4.4 (1.2)
DN3	4.2 (1.4)	4.4 (1.2)	4.3 (1.3)
DN4	4.7 (0.9)	4.7 (0.8)	4.7 (0.9)
DN5	4.8 (0.7)	4.8 (0.7)	4.8 (0.7)
Survey: Sex and psycho-social variables			
Sex, n(%)[g]			
Boys	335 (47.8%)	436 (50.0%)	771 (49.0%)
Girls	355 (50.6%)	431 (49.4%)	786 (50.0%)
Prefer not to say	11 (1.6%)	5 (0.6%)	16 (1.0%)
Need to Belong Scale (1-5)[h]	3.1 (0.6)	2.8 (0.6)	3.0 (0.6)
Fear of Negative Evaluation (1-5)[i]	2.9 (0.7)	2.6 (0.6)	2.7 (0.7)
Pro-social Behavior (0-10)[j]	8.1 (2.1)	7.3 (2.1)	7.6 (2.1)
Big 5 (Openness; 0-4)[k]	2.4 (0.6)	2.7 (0.7)	2.6 (0.7)
Big 5 (Extraversion; 0-4)[k]	2.6 (0.8)	2.7 (0.7)	2.6 (0.7)
Big 5 (Agreeableness; 0-4)[k]	1.9 (0.8)	2.6 (0.7)	2.6 (0.7)

Big 5 (Conscientiousness; 0-4)[k]	2.7 (0.7)	2.4 (0.6)	2.4 (0.7)
Big 5 (Stability; 0-4)[k]	1.9 (0.8)	2.1 (0.7)	2.0 (0.7)
Smokerlyzer readings: Objective smoking behavior (carbon monoxide, ppm)[l]	1.5 (1.4)	3.4 (1.5)	2.5 (1.7)

[a]-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.

[b]-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.

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

[d]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.

[e]-2=Definitely should smoke; -1=Maybe should smoke; 0=Don't know/neutral; +1=Maybe should not smoke; +2=Definitely should not smoke. "I don't have…" responses set to 0.[f]1=Very often; 2=Often; 3=Occasionally; 4=Rarely; 5=Never/Don't know. “I don’t have…” responses set to 5.

[g]In all analyses, sex is coded (0=Boy; 1=Girl/Prefer not to say).

[h]Average of 10 items, coded 1-5. Not available for two Colombian schools (excluded from analysis).

[i]Average of 12 items, coded 1-5. Not available for two Colombian schools (excluded from analysis).

[j]Sum of five items, coded 0-2.

[k]Average of 10 items, coded 0-4.

[l]Not available for one Northern Irish school and two Colombian schools (excluded from analysis).

Table 3. Effects of country on first-order norms latent variables, second-order norms latent variables and observed indicators, standardized regression coefficients

Latent variable/ Observed indicator	Baseline MIMIC model		DIF corrected model	
	B (SE)	p-value	B (SE)	p-value
Second-order latent variables				
Anti-Smoking/Vaping Norms	0.30 (0.09)	<0.001	-	-
First-order latent variables				
Expt. Inj. Norms	-0.21 (0.08)	0.007	-0.11 (0.07)	0.15
Sur. Inj. Norms	-0.21 (0.07)	0.004	-0.35 (0.08)	<0.001
Expt. Desc. Norms	-0.31 (0.07)	<0.001	-0.31 (0.07)	<0.001
Sur. Desc. Norms	0.30 (0.12)	0.008	0.03 (0.09)	0.75
Indicators[a]				
P2S2	-	-	-0.10 (0.01)	<0.001
P2S5	-	-	-0.14 (0.02)	<0.001
IN1	-	-	0.15 (0.03)	<0.001
IN4	-	-	0.15 (0.04)	0.001
DN2	-	-	0.38 (0.06)	<0.001
DN3	-	-	0.22 (0.07)	0.001

[a]Controlling for country differences on the underlying first-order latent variable (0=Northern Ireland, 1=Colombia).

MIMIC: multiple indicators multiple causes; DIF: differential item functioning.

968 **Table 4. DIF-adjusted models predicting self-reported anti-smoking behavior, self-reported anti-smoking intentions, and objectively**
969 **measured smoking behavior**

	Outcome variable					
	Anti-smoking behavior		Anti-smoking intentions		Objective smoking behavior[a]	
Parameter	**B (SE)**	**p-value**	**B (SE)**	**p-value**	**B (SE)**	**p-value**
Second-order latent norm variables as predictor						
Outcome variable						
Anti-Smoking/Vaping Norms (second-order latent)	0.40 (0.04)	<0.001	0.42 (0.06)	<0.001	-0.20 (0.06)	0.001
Country (observed)	-0.11 (0.03)	0.001	-0.26 (0.05)	<0.001	1.83 (0.08)	<0.001
First-order latent norms variables as predictors						
Outcome variable						
Expt. Inj. Norms (first-order latent)	0.004 (0.02)	0.83	-0.007 (0.03)	0.81	0.02 (0.05)	0.67
Sur. Inj. Norms (first-order latent)	0.07 (0.03)	0.01	0.17 (0.04)	<0.001	-0.02 (0.05)	0.63
Expt. Desc. Norms (first-order latent)	-0.01 (0.02)	0.47	-0.002 (0.03)	0.94	0.10 (0.04)	0.02
Sur. Desc. Norms (first-order latent)	0.31 (0.04)	<0.001	0.28 (0.05)	<0.001	-0.05 (0.06)	0.44
Country (observed)	-0.11 (0.03)	0.001	-0.21 (0.05)	<0.001	1.85 (0.08)	<0.001
Expt. Inj. Norms (first-order latent)						
Country (observed)	-0.11 (0.07)	0.14	-0.11 (0.07)	0.15	0.03 (0.08)	0.75
Sur. Inj. Norms (first-order latent)						
Country (observed)	-0.35 (0.08)	<0.001	-0.35 (0.08)	<0.001	-0.37 (0.08)	<0.001
Expt. Desc. Norms (first-order latent)						
Country (observed)	-0.31 (0.07)	<0.001	-0.31 (0.07)	<0.001	-0.21 (0.08)	0.005
Sur. Desc. Norms (first-order latent)						
Country (observed)	0.06 (0.09)	0.47	0.04 (0.09)	0.65	0.18 (0.10)	0.09

970 [a]Objective smoking behavior readings not available for one Northern Irish school and two Colombian schools (excluded from analysis).
971

Title: Confirmatory factor analysis comparing incentivized experiments with self-report methods to elicit adolescent smoking and vaping social norms: MECHANISMS study

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Supplement 1: Study procedures, study flow diagram, baseline characteristics, and glossary of terms

Procedures

A parental opt-out procedure was used with all participants providing their informed consent. Pupils who consented to participate took part in a baseline assessment consisting of a series of game theory experiments and completion of a self-report survey. Following the baseline assessment, each school took part in one of two previously tested smoking prevention interventions: ASSIST[1–3] (N=4 schools in Northern Ireland [NI], N=4 Bogotá) or Dead Cool[4–6] (N=3 NI, N=4 Bogotá) over a single school semester (approximately 10 weeks). Briefly, the ASSIST intervention is designed to train the most influential pupils in the year group, nominated in a Peer Questionnaire completed by all participants prior to the baseline assessment, to use informal contacts with their peers (i.e. other pupils in their school year group) to encourage them not to smoke. Dead Cool is underpinned by more conventional classroom pedagogy, including training of school teachers in programme delivery and provision of programme resources (lesson plans, pupil work books, fact sheets and a DVD) to enhance pupils' knowledge of potential influences on smoking behavior from family, friends and the media. Following intervention delivery in each school, all participants took part in a follow-up assessment, again completing the game theory experiments and a self-report survey. Prior to implementation in Colombia, all study materials (experiments, surveys, intervention materials) underwent a 'cultural adaptation' process, including translation into Spanish language, using a previously published framework.[7,8] Participation in the study's experiments required a monetary payment to be made to each individual pupil. In NI the payment was made in cash, however due to Colombian ethical regulations the payment was made using gift cards to pupils in Bogotá.

Ethics approval was granted from the School of Medicine, Dentistry and Biomedical Sciences Ethics Committee at Queen's University Belfast (QUB) on September 21, 2018 and from the Research Ethics Committee at Universidad de los Andes (Uniandes) on September 17, 2018.

Data collection

The baseline assessment consisted of two separate sessions, held approximately one week apart, with each class in the school year group in each school. Sessions lasted approximately 50 minutes. Participating pupils completed the game theory experiments during the first session and the self-report survey during the second session. Experiments and surveys were collected on iPads using the platform Qualtrics (web-based platform in NI and offline version in Bogotá) (Qualtrics, Provo, Utah, USA). At the start of each session, participants were assured that any information provided would be treated as confidential. They were also instructed not to communicate with other participants and to direct any questions to a researcher. In NI, poster boards were used at iPad stations to discourage communication between participants. In both countries, instructions were delivered onscreen with key portions read aloud by the experimenter. The experimenter read out introductory instructions at the start of the experiment, and at the start

of Parts 1, 2 and 4. Pupils were invited to ask any questions. Dummy screens were inserted at the end of Parts 1 and 3 instructing pupils to wait until all of their classmates were ready to proceed to the next part so that instructions could be read together. Parts 2 and 3 were otherwise self-paced, and pupils were invited to raise their hand to have any further questions answered privately. The same procedures were used during the follow-up assessment.

Game Theory Experiments

The game theory experiments consisted of a series of incentivized tasks which were based on published works in the field of behavioral economics,[9–11] and designed by the original producers (Kimbrough, Krupka) and other experts in the field (Kumar, Ramalingam). There were four parts to the experiment: (1) a Rule-Following (RF) task measuring each individual participant's sensitivity to the effects of social norms; (2) a series of coordination games attempting to elicit *injunctive* social norms unrelated and related to smoking and vaping behaviors; (3) a series of coordination games attempting to elicit *descriptive* social norms related to smoking and vaping behaviors; (4) a willingness-to-pay task designed to measure each individual participant's support for cultivating anti-smoking norms. These are outlined in more detail below. The current paper uses data from Parts 1-3. The full experimental protocol is available in supplement 2.

At the start of experimental sessions, participants were informed that they would receive a participation fee of £5.00 (NI; *COP* $5.000 in Bogotá), and that they could earn money in each part of the experiment (maximum £35 in NI, *COP* $50.000 in Bogotá) depending on the answers they provided and those provided by other pupils in their year group. They were told that the researchers would determine their payment by performing two sets of randomizations for each part of the experiment: (1) to determine whether payment was based on answers provided at baseline or follow-up; (2) to determine which question of each part would result in payment.

Part 1: Identifying individual-level norms sensitivity

Part 1 of the experiment consisted of an individual decision task (a variant of the RF Task)[10,11] measuring participants' preferences for following established rules and social norms, without peer interaction. The task instructs participants to follow an explicitly stated arbitrary rule when doing so provides them with no monetary benefits, but actually imposes explicit monetary costs directly proportional to the degree of rule-following. We employed the version of the RF task introduced by Kimbrough and Vostroknutov (2018).[10] Specifically, participants were asked to sequentially allocate 50 balls across two buckets (one blue and one yellow). They were told that "The rule is to put the balls in the blue bucket". They were also informed that they would receive £0.05 (NI; *COP* $100 Bogotá) for every ball they put in the blue bucket and £0.10 (NI; *COP COP* $200 Bogotá) for every ball they put in the yellow bucket. Lastly, they were informed that they would be given five minutes to allocate the 50 balls between the two buckets and that any

balls which were not allocated by the end of the five minutes were worth nothing.[1] No other information was provided. Therefore, assuming a participant allocated all 50 balls, the minimum amount that he/she could earn was £2.50 (NI; *COP* $5.000 Bogotá) if he/she followed the rule completely and allocated all 50 balls to the blue bucket. The maximum amount that could be earned was £5.00 (NI; *COP* $10.000 in Bogotá) if he/she completely ignored the rule and allocated all 50 balls to the yellow bucket. The central premise is that the more a participant cares intrinsically about rule-following the more willing he/she will be to incur the costs of doing so.[11] The extent of rule-following in the RF task provides a measure of individual norm-following proclivity, and this norm sensitivity measure has been shown to correlate with willingness to follow norms of cooperation, reciprocity and prosocial behavior across decision contexts.[11] To avoid introducing any potential biases due to preference for bucket placement, participants were randomized to a version of the RF task with the blue bucket on the left (n=778), or a version with the blue bucket on the right (n=798).

Parts 2-3: Measuring injunctive and descriptive social norms

Parts 2 and 3 of the experiment consisted of a series of incentivized coordination games which used methods employed by Krupka and Weber[9] to elicit injunctive and descriptive social norms around smoking and vaping. Injunctive norms reflect shared beliefs among members of a population about what actions people *ought to* take; descriptive norms reflect shared beliefs among members of a population about what actions people *actually do* take.[9]

In Part 2, participants were asked to rate the social appropriateness of various actions that others might take on a six-point Likert scale: "extremely socially inappropriate", "very socially inappropriate", "somewhat socially inappropriate", "somewhat socially appropriate", "very socially appropriate", "extremely socially appropriate". Situation 1 aimed to elicit pro-sociality injunctive norms by asking participants to co-ordinate with others in their year group to rate the social appropriateness of a range of actions one might take in a standard Dictator game. The Dictator game is commonly used as a measure of social preferences, in particular, altruism.[12] Such norms are unlikely to be affected by interventions targeted at altering smoking behavior. Eight items (situations 2-9) were asked to assess smoking- and vaping-related injunctive social norms. In Part 3, participants were asked to estimate the proportion of peers in their school year group who would be accepting of certain behaviors on a six-point Likert scale: "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". Two items were asked to assess smoking- and vaping-related descriptive social norms.

[1]Only one participant failed to allocate all 50 balls during the baseline experiment. There were several changes made to the experimental protocol after baseline was completed in the first pilot school in Northern Ireland. The first version of the experiment included a forced waiting time for the RF task of seven minutes, the idea being to make sure that all pupils proceeded to the second part together. Subsequently it was decided to reduce the time allocated for the RF task from seven minutes to five minutes, to remove the forced waiting time and to insert dummy screens informing participants when to wait for further instructions from the experimenter.

The principal feature of this part of the experiment is that participants are provided with incentives to *match* their ratings/estimates to other participants' in their school year group on the day as opposed to providing personal opinions. For example, participants are informed that they will receive £10 (NI; *COP* $15.000 Bogotá) if the answer they provide for a randomly selected question matches the most common answer in the school year group. Assuming that a norm exists, and in the absence of peer interaction, participants attempting to match others' responses in order to win the incentive will anticipate the extent to which others will rate an action as socially appropriate or inappropriate (or anticipate the extent to which others will estimate that a large or small proportion of their peers would be accepting of certain behaviors), and respond accordingly.[2] Therefore, in Part 2 of the experiment participants play a coordination game in which the incentive elicits an empirical measure of injunctive social norms as collective perceptions of the social appropriateness of various behaviors. In Part 3 they play a coordination game in which the incentive elicits an empirical measure of descriptive social norms as collective perceptions of the rate of acceptance of certain behaviors.

As proposed by the original authors, the components elicited in Parts 1-3 of the experiment can be examined within the context of a norm-dependent utility framework to further our understanding of how the existence of social norms, and individuals' norms sensitivities, can influence behavior in social settings.[9–11] Within this framework, behavioral heterogeneity in a given social context is proposed as being related to the fact that people suffer disutility from violating norms and that those individuals differ in sensitivity to own-norm violations.

$$u(a_k) = V\{л(a_k)\} + \gamma N(a_k) \quad (1)$$

In the above framework, social norms are modelled quantitatively, such that a decision maker's "pay-off", $u(a_k)$, from each action, $V\{л(a_k)\}$, is traded off against the normative appropriateness of each action according to the parameter $\gamma \geq 0$, representing the degree to which the individual cares about adhering to social norms, with the function N capturing the social norm. $N_g(a_k)$ denotes the social norms for group g, which are estimated from the coordination games in Parts 2 and 3 of the experiment. γ is the parameter reflecting individual sensitivity to the norm, estimated using the total number of balls allocated to the blue "rule-following" bucket in the RF task of Part 1.

Part 4: Measuring willingness to pay to support anti-smoking norms

Part 4 of the experiment gives us a chance to test the implications of this model. Participants are given an endowment of £5 (NI; *COP* $10.000 Bogotá) and asked to decide how much of the £5

[2]The measurement property of content validity suggests that in order to be considered adequate, a measurement instrument should adequately reflect the underlying theoretical construct being measured[13]. Thus, one of the advantages of the Krupka-Weber method of eliciting social norms is that the structure of the game itself provides incentives for people to report their beliefs about others' beliefs about social appropriateness. The existence of such shared "second-order" beliefs are a theoretical precondition for the existence of a social norm according to the work of Bicchieri[14].

to donate to the organizations responsible for ASSIST/Dead Cool, depending on which programme their school was taking part in, and how much to keep for themselves. They are provided with a description of ASSIST/Dead Cool as "a smoking prevention programme which aims to prevent the uptake of smoking among adolescents your age". Therefore, in the same way that a willingness to incur a cost to follow the rule in the RF task reveals a respect for following norms in general, the extent of a participant's willingness to incur a cost to make a higher donation to a programme whose aim is to encourage smoking reduction by others reveals their support for anti-smoking norms. Since a donation may be taken as revealing a participant's belief that such smoking prevention programmes are normatively appealing and effective, this task may be taken as providing evidence for the behavioral impact of an injunctive anti-smoking social norm.

To connect this to the model (1), we need only assume that V is increasing in the participant's own payoff; then when facing the decision about whether to donate to the anti-smoking intervention charity, subjects trade off their own higher payoff from keeping the money for themselves against the normative appropriateness of donating to help prevent smoking. The theory implies that when norms are stronger, or an individual's γ is larger, the amount donated will be higher.

Further details on the smoking- and vaping-related scenarios assessed in Parts 2 and 3 of the experiment and numerical coding of responses are provided in table 1 of the manuscript. Responses to the experiment items from Part 2 were coded such that numerical responses ran between -1 (extremely socially inappropriate) and +1 (extremely socially appropriate) following procedures adopted in Krupka and Weber (2013).[9] Similarly, responses to experiment items from Part 3 were coded such that numerical responses ran between -1 (none of my peers) and +1 (all of my peers).

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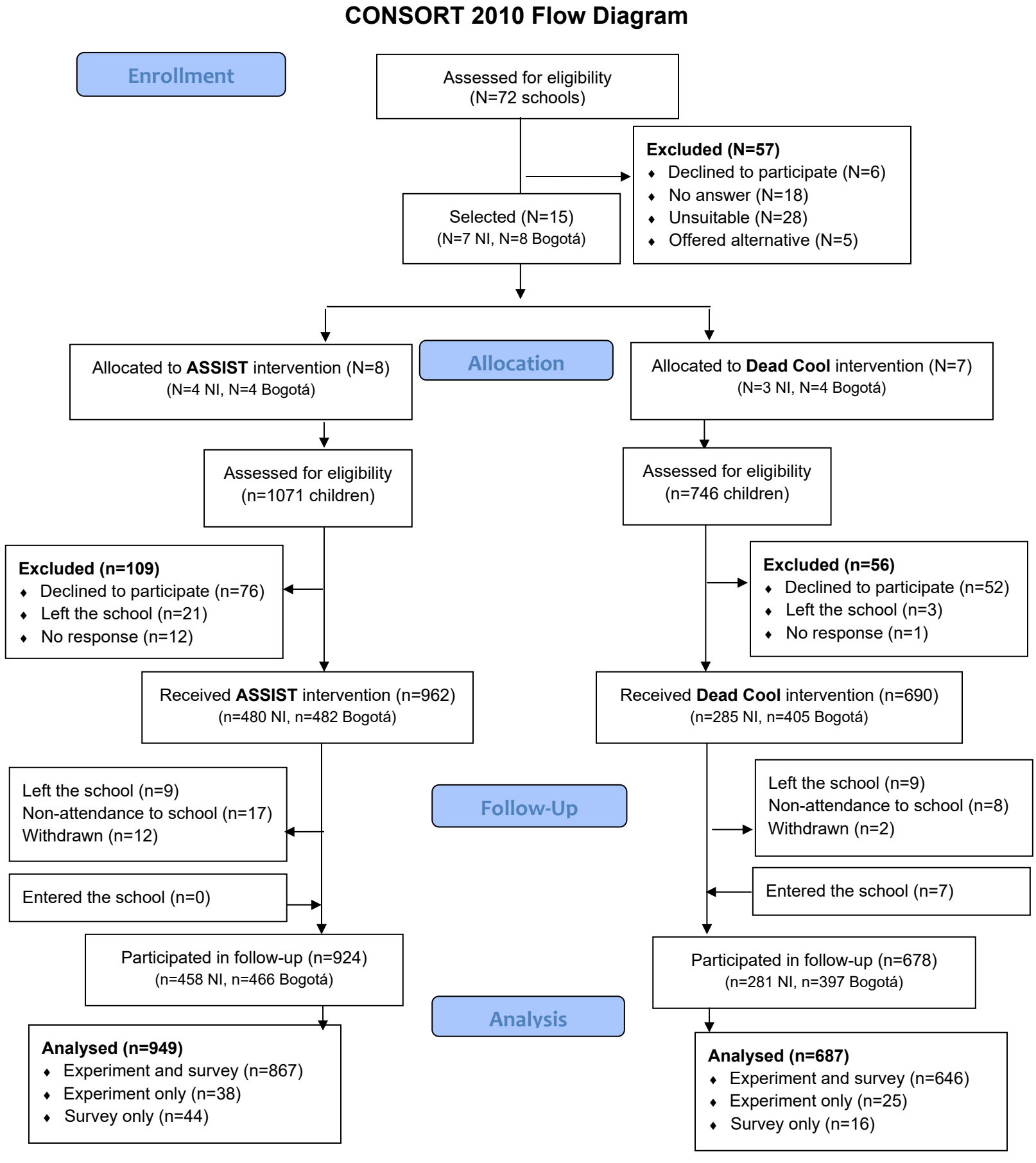
Study flow diagram



Baseline pupil characteristics for MECHANISMS schools. Mean (SD) unless otherwise stated

	Northern Ireland (N=7)	Colombia (N=8)	All schools (N=15)
Intervention, N			
ASSIST schools	4	4	8
Dead Cool schools	3	4	7
No. of classes, N	36	32	68
No. of pupils, n	825	999	1824
Participation, n (%)	764 (92.6%)	892 (89.3%)	1656 (90.8%)
School MDM (1-890)[a]	355 (219)		
School INSE (1-4)[b]		2.4 (0.5)	
Individual MDM (1-890)[a]	366 (238)		
Individual DANE SES (0-6)[c]		2.1 (0.9)	
Sex, n(%)			
Boys	335 (43.8%)	436 (48.9%)	771 (46.6%)
Girls	355 (46.5%)	431 (48.3%)	786 (47.5%)
Prefer not to say	11 (1.4%)	5 (0.6%)	16 (1.0%)
Age, n (%)			
11 years old	1 (0.1%)	26 (2.9%)	27 (1.6%)
12 years old	279 (36.5%)	320 (35.9%)	599 (36.2%)
13 years old	414 (54.2%)	313 (35.1%)	727 (43.9%)
14 years old	7 (0.9%)	146 (16.4%)	153 (9.2%)
15 or more years old	-	77 (8.6%)	77 (4.6%)
Ethnicity, n (%)[d]			
White British	171 (22.4%)	-	171 (10.3%)
White Irish	474 (62.0%)	-	474 (28.6%)
Colombian: No ethnic minority	-	753 (84.4%)	753 (45.5%)
Ethnic minority	54 (7.1%)	119 (13.3%)	173 (10.4%)
Family			
Lives with mother, n (%)	677 (88.6%)	747 (83.7%)	1424 (86.0%)
Lives with father, n (%)	529 (69.2%)	443 (49.7%)	599 (36.2%)
Number of family members in household	2.6 (0.7)	2.6 (0.9)	2.6 (0.8)

[a]Multiple deprivation measure (NI only; 1=most deprived to 890=least deprived). Calculated based on ranking of NI postcodes for seven domains of deprivation including income; employment; health and disability; education, skills and training; access to services; living environment; crime and disorder. Provided by Northern Ireland Statistics and Research Agency (NISRA).

[b]Socio-economic level index (Bogotá only; 1=Lower; 2=Middle-low; 3=Middle-high; 4=Higher). Calculated each year using a sample from each school, based on the characteristics of the home and its infrastructure, some household assets, the relationship of the children with their

parents, among other characteristics. Schools are then classified into four levels according to the average of the responses of the pupils enrolled in them. Provided by the Instituto Colombiano para el Fomento de la Educación Superior (ICFES; “Colombian Institute for the Promotion of Higher Education”).

[c]Socioeconomic level index of individual pupils (Bogotá only; 0=Informal settlement; 1=Lowest; 2=Low; 3=Middle-Low; 4=Middle; 5=Middle-High; 6=High), according to the Departamento Administrativo Nacional de Estadística (DANE; "National Administrative Department of Statistics").

[d]White Irish, White British (NI only); Colombian: No ethnic minority (Bogotá only).

Glossary of terms

Akaike Information Criterion (AIC): A parsimony fit index. These statistics are generally used when comparing non-nested or non-hierarchical models estimated with the same data and indicates to the researcher which of the models is the most parsimonious. Smaller values suggest a good fitting, parsimonious model however because these indices are not normed to a 0-1 scale it is difficult to suggest a cut-off other than that the model that produces the lowest value is the most superior.

Bayesian Information Criterion (BIC): The BIC and adjusted BICs are parsimony fit indices, closely related to the AIC, which impose a greater penalty term for the number of parameters in the model. Smaller values suggest a good fitting, parsimonious model.

Chi-square statistic: The chi-square statistic can be used to assess the absolute fit of the model to the data, assuming correct model specification. A non-significant result ($p>0.05$) indicates good model fit. However, it can be overly influenced by sample size, correlations, variance unrelated to the model, and multivariate non-normality.

Comparative Fit Index (CFI): The CFI compares the chi-square statistic from the specified model with the chi-square statistic from the null model, in which all of the variables are uncorrelated. Values range between 0 and 1. CFI values of ≥ 0.96 indicate good model fit.

Confirmatory factor analysis (CFA): CFA is a statistical technique to determine whether measures of a construct are consistent with a researcher's understanding of the nature of the construct, or factor, by testing whether the data fits a hypothesized measurement model. Model fit is assessed by reference to a number of goodness-of-fit indices.

Construct validity: Construct validity refers to the extent to which inferences from test scores can be made in relation to the construct of interest and is determined based on integration of any evidence with a bearing on interpretation or meaning of test scores. Some methods of investigating construct validity include appraising theoretically expected relationships among individual items, between test scores and other measures (including external criteria, e.g. by comparison with a 'gold standard' or other outcome measure expected to show an association with the construct) or comparing scores between groups expected to differ on the underlying construct.

Coordination game: A coordination game is a type of simultaneous game used in game theory when players benefit from coordinating their activities by making the same decisions. In the MECHANISMS study, coordination games are played in Parts 2 (injunctive norms) and 3 (descriptive norms) of the incentivized norms elicitation experiments, in which participants are asked to 'coordinate' with others in their school year group to rate the social appropriateness of various smoking-related activities (Part 2) or the proportion of their school year group who

would be accepting of a close friend smoking or vaping (Part 3). To encourage them to think about the social norm instead of providing personal opinions, they are informed that they will receive a cash (or cash equivalent) payment if the answer they provide to a randomly selected question matches the most common answer provided in the school year group on the day.

Descriptive norms: Descriptive norms reflect shared beliefs among members of a population about what actions people *actually do* take.

Differential item functioning (DIF): DIF occurs when an item on a test or questionnaire has different measurement properties for one group versus another, irrespective of mean differences on the overall latent construct. Individual items can be tested for DIF by regressing them onto the grouping variable whilst controlling for differences at the latent variable level.

Expected parameter change (EPC): The EPC is associated with the modification index, and shows the predicted value of the freely estimated parameter.

Factorial validity: Factorial validity examines the extent to which the underlying putative structure of a scale is recoverable in a set of test scores.

Full Information Maximum Likelihood (FIML): A method to deal with missing data. It estimates parameters directly using all the information that is already contained in the incomplete data set. FIML obtains parameter estimates by maximizing the likelihood function of the incomplete data.

Game theory: Game theory is a branch of behavioral economics that has developed well-defined mathematical models for describing and understanding cooperation and competition amongst individuals and groups.

Incentivized experiments: Methods derived from the field of behavioral economics to elicit normative beliefs and norm-sensitivities using cash (and cash equivalent) payments.

Injunctive norms: Injunctive norms reflect shared beliefs among members of a population about what actions people *ought to* take.

Missing completely at random (MCAR): A type of mechanism causing missing data. If the mechanism causing missing data depends neither on observed data nor on missing data, the data are said to be MCAR. MCAR causes enlarged standard errors due to the reduced sample size, but does not cause bias (‘systematic error’ that is overestimation of benefits and underestimation of harms). In this situation, the incomplete datasets are representative for the entire dataset.

Modification index (MI): MIs correspond to a reduction in the chi-square value (absolute model fit statistic) when a specific parameter is freed. A reduction of 3.84 with one degree of freedom represents a significant improvement in absolute model fit.

Multiple indicators multiple causes (MIMIC): MIMIC models can be used to examine differences on latent variables by regressing them onto an observed grouping variable.

Normative beliefs: Normative beliefs refer to the perceived behavioral expectations of important referent individuals or groups.

Norm-sensitivity: Individuals' norms sensitivities represent the degree to which they experience utility or disutility from norm violations or gain from norm adherence.

Root Mean Square Error of Approximation (RMSEA): The RMSEA compares the observed sample covariance matrix with the hypothesized covariance model. It indicates how well the model, with unknown but optimally chosen parameter estimates would fit the sample covariance matrix. The RMSEA favors parsimony and will choose the model with the least number of parameters. It is also possible for a confidence interval to be calculated around its value. RMSEA values of ≤ 0.06 indicate good model fit.

Social desirability bias: Social desirability bias is a type of response bias that is the tendency of survey respondents to answer questions in a manner that will be viewed favorably by others (e.g. researchers collecting data).

Social norms: Individuals' beliefs regarding the actions and beliefs of others in a reference group.

Standardized Root Mean Square Residual (SRMR): The SRMR is the square root of the difference between the residuals of the sample covariance matrix and the hypothesized covariance model. It is standardized to range from 0-1. SRMR values of ≤ 0.09 indicate good model fit.

Structural equation modelling (SEM): A broad framework for data analysis which permits testing of hypotheses regarding the structure of relationships between a set of variables.

Tucker-Lewis Index (TLI): The TLI, or Non-Normed Fit Index (NNFI), is related to the CFI, comparing the chi-square statistic from the specified model with the chi-square statistic from the null model, in which all of the variables are uncorrelated. The TLI overcomes the issue of sensitivity to sample size that occurs with the CFI, which underestimates fit for samples less than 200. The TLI prefers simpler models, and due to its non-normed nature, values outside of the range 0-1 are possible. TLI values of ≥ 0.95 indicate good model fit.

Supplement 2: English and Spanish language versions of the experimental protocol

What is your name and your form class?

First name _____

Surname _____

Form class _____

Experimental Instructions

General information

This is a study about decision-making. You will be paid a fee of £5 for taking part, as outlined below. In addition, you may receive some extra money based on your choices and the choices made by others during the study.

If you have any questions during the session, please raise your hand and wait for a researcher to come to you. Please do not talk or try to communicate with other participants during the experiment. It is important that everyone taking part makes his or her own decisions.

This is an on-going study, which has received funding from the UK Medical Research Council to cover all current and future costs. You can be certain that all participants who complete the study will be paid as described in the instructions. If you have any concerns, please contact:

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Institute of Clinical Science B, Royal Victoria Hospital
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There are four parts to today's study.

You can earn money in each part.

Your earnings from today will **not** be paid to you today. We will come back to your school at the end of the programme in ten weeks' time. At that time, we would like you to participate in another study. There will be four parts to that study, and you can earn money in each part of that study too.

After you have participated in the study at the end of the program we will determine for each part whether you receive earnings from today or from the study at the end of the programme. For each part, we will toss a coin to determine this. We will record your choices in both today’s study and the study at the end of the program. You will be able to review your choices from both experiments when you learn your payment, if you wish.

Part 1

In Part 1 of this study, you will decide how to allocate 50 balls between two buckets. Your task is to put each of the balls, one-by-one, into one of the two buckets: the blue bucket or the yellow bucket. The balls will appear to the left-hand side of your screen, and you can allocate each ball by clicking and dragging it to the bucket of your choice. 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.

Once the experiment begins, you will have 5 minutes to put the balls into the buckets. When you are finished, please click on the next button and wait quietly for further instructions from the experimenter. Any balls that have not been placed in a bucket at the end of the 5 minutes are worth nothing. Your earnings from Part 1 will be based on your decisions: it is the sum of earnings from the blue and yellow buckets.

This is the end of the instructions for Part 1. If you have any questions, please raise your hand and a researcher will answer them privately. Otherwise, please wait quietly until all of your classmates are ready and click on the next button to begin the experiment.

Timer indicating five-minute count-down for completing Rule-Following task.

Part 1

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.

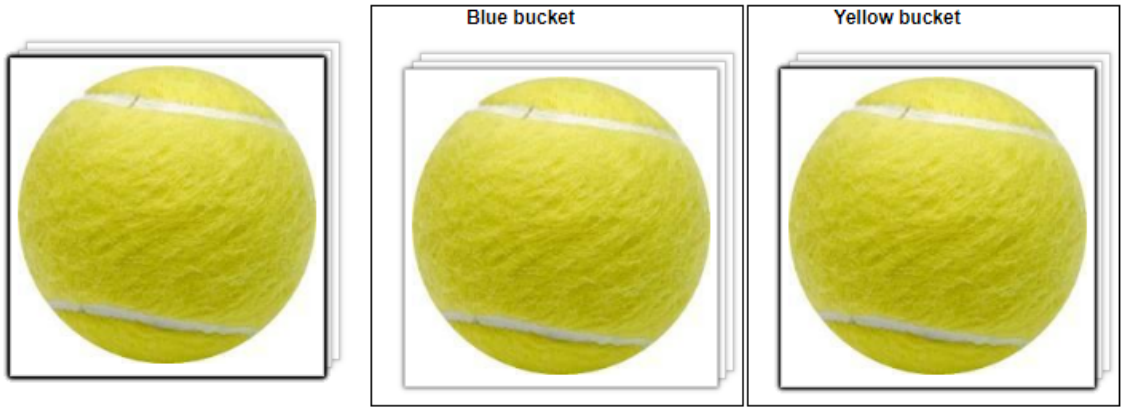
The rule is to put the balls in the blue bucket.

Count of balls in blue bucket: 5

Updated as balls are dragged in or out of the blue bucket.

Count of balls in yellow bucket: 17

Updated as balls are dragged in or out of the yellow bucket.



The 50 balls can be re-located individually to either the blue or yellow bucket by mouse click and drag-and-drop.

N.B. Participants were randomised to this version of the experiment or to a version that had the buckets in reverse order to overcome any potential bias due to positioning of buckets.

Part 2

On the following screens, you will read descriptions of a series of situations. These descriptions correspond to situations in which one person must make a decision or has taken an action. For each situation, you will be given a description of the decision faced or action taken by this person.

After you read the description of the situation, you will be asked to evaluate the decision or action taken. You will be asked to decide whether taking that decision or action would be "socially appropriate" and "consistent with moral or proper social behaviour" or "socially inappropriate" and "inconsistent with moral or proper social behaviour". By socially appropriate, we mean behaviour that most people in your school year group agree is the "correct" or "ethical" thing to do. Another way to think about what we mean is that if the person in the situation were to select a socially inappropriate choice, then someone else in your school year group might be angry with that person for doing so.

In each of your responses, we would like you to answer as truthfully as possible, based on your opinions of what constitutes socially appropriate or socially inappropriate behaviour.

To give you an idea of how the experiment will proceed, we will go through an example and show you how you will indicate your responses. On the next screen you will see an example of a situation.

Part 2

Example Situation

A person is at a local coffee shop near school. While there, the person notices that someone has left a wallet at one of the tables. The person must decide what to do. This person has four possible choices: take the wallet, ask others nearby if the wallet belongs to them, leave the wallet where it is, or give the wallet to the shop manager. The person can choose one of these four options.

The table below presents a list of the possible choices available to this person. For each of the choices, you will be asked to indicate whether you believe choosing that option is extremely socially inappropriate, very socially inappropriate, somewhat socially inappropriate, somewhat socially appropriate, very socially appropriate, or extremely socially appropriate. To indicate your response, you would select the corresponding option.

The person's choice...

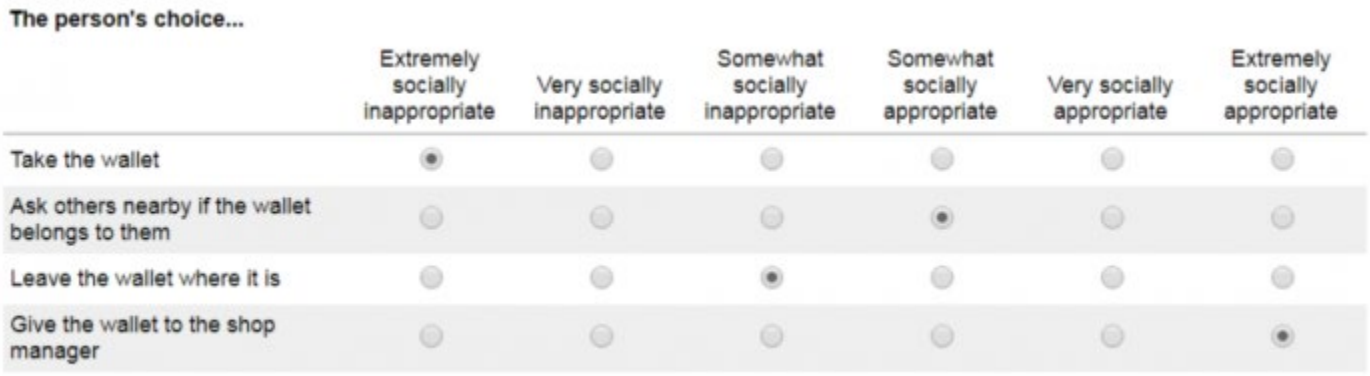
	Extremely socially inappropriate	Very socially inappropriate	Somewhat socially inappropriate	Somewhat socially appropriate	Very socially appropriate	Extremely socially appropriate
Take the wallet	○	○	○	○	○	○
Ask others nearby if the wallet belongs to them	○	○	○	○	○	○
Leave the wallet where it is	○	○	○	○	○	○
Give the wallet to the shop manager	○	○	○	○	○	○

Please make sure that you have placed one tick in each row.

If this were one of the situations for this study, you would consider each of the possible choices above and, for that choice, indicate the extent to which you believe taking that action would be socially appropriate" and "consistent with moral or proper social behaviour" or "socially inappropriate" and "inconsistent with moral or proper social behaviour". Recall that by socially appropriate we mean behaviour that most people agree is the "correct" or "ethical" thing to do.

Part 2

For example, suppose you thought that taking the wallet was *extremely socially inappropriate*, asking others nearby if the wallet belongs to them was *somewhat socially appropriate*, leaving the wallet where it is was *somewhat socially inappropriate*, and giving the wallet to the shop manager was *extremely socially appropriate*. Then you would indicate your responses as follows:



The person's choice...

	Extremely socially inappropriate	Very socially inappropriate	Somewhat socially inappropriate	Somewhat socially appropriate	Very socially appropriate	Extremely socially appropriate
Take the wallet	●	○	○	○	○	○
Ask others nearby if the wallet belongs to them	○	○	○	●	○	○
Leave the wallet where it is	○	○	●	○	○	○
Give the wallet to the shop manager	○	○	○	○	○	●

Are there any questions about this example situation or about how to indicate your responses? On the following pages, there are several situations, all dealing with decisions that another person might have to make.

You will indicate your appropriateness rating by selecting the corresponding option.

At the end of the experiment today, we will randomly select one of the situations. For this situation, we will also randomly select one of the possible choices that Individual A could make. Thus, we will select both a situation and one possible choice at random. For the choice selected, we will find out which response was selected by most people in your school year group today.

If you give the same response as that most frequently given by other people in your school year group, then your earning from Part 2 will be £10. This amount will be paid to you, in cash, at the conclusion of the study in ten weeks. For instance, if we were to select the example situation above and the possible choice "Leave the wallet where it is", and if your response had been "somewhat socially inappropriate", then your earning from Part 2 would be £10, if this was the response selected by most other people in your school year group today. Otherwise your earning from Part 2 would be £0.

You are now going to complete some similar questions to this example on your own. You can go at your own pace.

If you have any questions from this point on, please raise your hand and wait for the researcher to come to you.

Part 2

Situation 1

Consider two hypothetical individuals from your school year group – Individual A and Individual B. Suppose that Individual A is randomly paired with another person in your school year group, Individual B in an experiment. The pairing is anonymous, meaning that neither individual will ever know the identity of the other individual with whom he or she is paired.

In this hypothetical experiment, Individual A will make a choice, the researcher will record this choice, and then both individuals will be informed of the choice and paid money based on the choice made by Individual A, as well as a small participation fee. Suppose that neither individual will receive any other money for participating in the experiment.

In each pair, Individual A will receive £10. Individual A will then have the opportunity to give any amount of his or her £10 to Individual B. That is, Individual A can give any of the £10 he or she receives to Individual B. For instance, Individual A may decide to give £0 to Individual B and keep £10 for him or herself. Or Individual A may decide to give £10 to Individual B and keep £0 for him or herself. Individual A may also choose to give any other amount between £0 and £10 to Individual B. This choice will determine how much money each will receive, privately and in cash, at the end of the experiment.

The table below gives a list of the possible choices available to Individual A. For each of the choices, please indicate whether you believe choosing that option is extremely socially inappropriate, very socially inappropriate, somewhat socially inappropriate, somewhat socially appropriate, very socially appropriate, or extremely socially appropriate. To indicate your response, please select the corresponding option.

Remember that you will earn money (£10) if your response to a randomly selected question is the same as the most common response provided in your school year group today.

Individual A's choice...

	Extremely socially inappropriate	Very socially inappropriate	Somewhat socially inappropriate	Somewhat socially appropriate	Very socially appropriate	Extremely socially appropriate
Give £0 to Individual B (Individual A gets £10, Individual B gets £0)	○	○	○	○	○	○
Give £1 to Individual B (Individual A gets £9, Individual B gets £1)	○	○	○	○	○	○
Give £2 to Individual B (Individual A gets £8, Individual B gets £2)	○	○	○	○	○	○
Give £3 to Individual B (Individual A gets £7, Individual B gets £3)	○	○	○	○	○	○
Give £4 to Individual B (Individual A gets £6, Individual B gets £4)	○	○	○	○	○	○
Give £5 to Individual B (Individual A gets £5, Individual B gets £5)	○	○	○	○	○	○
Give £6 to Individual B (Individual A gets £4, Individual B gets £6)	○	○	○	○	○	○
Give £7 to Individual B (Individual A gets £3, Individual B gets £7)	○	○	○	○	○	○
Give £8 to Individual B (Individual A gets £2, Individual B gets £8)	○	○	○	○	○	○
Give £9 to Individual B (Individual A gets £1, Individual B gets £9)	○	○	○	○	○	○
Give £10 to Individual B (Individual A gets £0, Individual B gets £10)	○	○	○	○	○	○

If you have any questions, please raise your hand and wait for the experimenter.

Part 2

Situation 2

A parent is smoking in their own home in front of their children who are under the age of 5.

Please indicate whether you believe the parent smoking at home in front of their young children is extremely socially inappropriate, very socially inappropriate, somewhat socially inappropriate, somewhat socially appropriate, very socially appropriate, or extremely socially appropriate. To indicate your response, please select the corresponding option.

Remember that you will earn money (£10) if your response to a randomly selected question is the same as the most common response provided in your school year group today.

A parent smoking at home in front of their young children.

- ○ Extremely socially inappropriate
- ○ Very socially inappropriate
- ○ Somewhat socially inappropriate
- ○ Somewhat socially appropriate
- ○ Very socially appropriate
- ○ Extremely socially appropriate

Part 2

Situation 3

An adult is smoking in a car with children under the age of 16 in the car.

Please indicate whether you believe the adult smoking in the car with children in the car is extremely socially inappropriate, very socially inappropriate, somewhat socially inappropriate, somewhat socially appropriate, very socially appropriate, or extremely socially appropriate. To indicate your response, please select the corresponding option.

Remember that you will earn money (£10) if your response to a randomly selected question is the same as the most common response provided in your school year group today.

Adult smoking in a car with children on board.

- ○ Extremely socially inappropriate
- ○ Very socially inappropriate
- ○ Somewhat socially inappropriate
- ○ Somewhat socially appropriate
- ○ Very socially appropriate
- ○ Extremely socially appropriate

Part 2

Situation 4

Someone sells cigarettes to a teenager who looks younger than 16 without requesting proof of age.

Please indicate whether you believe someone selling cigarettes without proof of age is extremely socially inappropriate, very socially inappropriate, somewhat socially inappropriate, somewhat socially appropriate, very socially appropriate, or extremely socially appropriate. To indicate your response, please select the corresponding option.

Remember that you will earn money (£10) if your response to a randomly selected question is the same as the most common response provided in your school year group today.

Someone selling cigarettes without proof of age.

- ○ Extremely socially inappropriate
- ○ Very socially inappropriate
- ○ Somewhat socially inappropriate
- ○ Somewhat socially appropriate
- ○ Very socially appropriate
- ○ Extremely socially appropriate

Part 2

Situation 5

In a recent superhero movie the lead actor is seen smoking in the opening scene.

Please indicate whether you believe the movie showing the lead character smoking is extremely socially inappropriate, very socially inappropriate, somewhat socially inappropriate, somewhat socially appropriate, very socially appropriate, or extremely socially appropriate. To indicate your response, please select the corresponding option.

Remember that you will earn money (£10) if your response to a randomly selected question is the same as the most common response provided in your school year group today.

A movie showing the lead character smoking.

- ○ Extremely socially inappropriate
- ○ Very socially inappropriate
- ○ Somewhat socially inappropriate
- ○ Somewhat socially appropriate
- ○ Very socially appropriate
- ○ Extremely socially appropriate

Part 2

Situation 6

An older student in your school is smoking outside school, for example, at a bus stop.

Please indicate whether you believe an older student smoking outside school is extremely socially inappropriate, very socially inappropriate, somewhat socially inappropriate, somewhat socially appropriate, very socially appropriate, or extremely socially appropriate. To indicate your response, please select the corresponding option.

Remember that you will earn money (£10) if your response to a randomly selected question is the same as the most common response provided in your school year group today.

An older student from your school smoking outside school.

- ○ Extremely socially inappropriate
- ○ Very socially inappropriate
- ○ Somewhat socially inappropriate
- ○ Somewhat socially appropriate
- ○ Very socially appropriate
- ○ Extremely socially appropriate

Part 2

Situation 7

A pupil from your school is using an e-cigarette while walking to school.

Please indicate whether you believe the pupil using an e-cigarette is extremely socially inappropriate, very socially inappropriate, somewhat socially inappropriate, somewhat socially appropriate, very socially appropriate, or extremely socially appropriate. To indicate your response, please select the corresponding option.

Remember that you will earn money (£10) if your response to a randomly selected question is the same as the most common response provided in your school year group today.

A school student smoking an e-cigarette.

- ○ Extremely socially inappropriate
- ○ Very socially inappropriate
- ○ Somewhat socially inappropriate
- ○ Somewhat socially appropriate
- ○ Very socially appropriate
- ○ Extremely socially appropriate

Part 2

Situation 8

A pupil from your school shares a photograph of him/herself using an e-cigarette on social media (e.g. Facebook, Instagram).

Please indicate whether you believe the pupil sharing an image of e-cigarette use is extremely socially inappropriate, very socially inappropriate, somewhat socially inappropriate, somewhat socially appropriate, very socially appropriate, or extremely socially appropriate. To indicate your response, please select the corresponding option.

Remember that you will earn money (£10) if your response to a randomly selected question is the same as the most common response provided in your school year group today.

A student sharing a photo of his/her e-cigarette use.

- ○ Extremely socially inappropriate
- ○ Very socially inappropriate
- ○ Somewhat socially inappropriate
- ○ Somewhat socially appropriate
- ○ Very socially appropriate
- ○ Extremely socially appropriate

Part 2

Situation 9

A pupil from your school is chewing tobacco.

Please indicate whether you believe the pupil chewing tobacco is extremely socially inappropriate, very socially inappropriate, somewhat socially inappropriate, somewhat socially appropriate, very socially appropriate, or extremely socially appropriate. To indicate your response, please select the corresponding option.

Remember that you will earn money (£10) if your response to a randomly selected question is the same as the most common response provided in your school year group today.

A school pupil chewing tobacco.

- ○ Extremely socially inappropriate
- ○ Very socially inappropriate
- ○ Somewhat socially inappropriate
- ○ Somewhat socially appropriate
- ○ Very socially appropriate
- ○ Extremely socially appropriate

This is the end of Part 2 of the experiment.

In Part 3 of today's experiment you will be asked some questions about the behaviour of your peers. By peers, we mean “other students in your school year group”. After today we will randomly select a question from part 3. If you give the same response as that most frequently given by other people in your school year group, then your earning from Part 3 will be £10. This amount will be paid to you, in cash, at the conclusion of the study in ten weeks. Please click on the next button when you are ready to proceed.

Part 3

Question 1

What share of your school year group would be accepting of one of their close friends smoking?

Please indicate what proportion of students in your school year group (your peers) you believe would be accepting of one of their close friends smoking: All of my peers; most of my peers; a lot of my peers; some of my peers; only a few of my peers; none of my peers. To indicate your response, please select the corresponding option.

Remember that you will earn money (£10) if your response to a randomly selected question is the same as the most common response provided in your school year group today.

The proportion of my peers who would be accepting of a close friend smoking.

- ○ All of my peers
- ○ Most of my peers
- ○ A lot of my peers
- ○ Some of my peers
- ○ Only a few of my peers
- ○ None of my peers

Part 3

Question 2

What share of your school year group would be accepting of one of their close friends vaping (using an e-cigarette)?

Please indicate what proportion of students in your school year group (your peers) you believe would be accepting of one of their close friends using an e-cigarette: All of my peers; most of my peers; a lot of my peers; some of my peers; only a few of my peers; none of my peers. To indicate your response, please select the corresponding option.

Remember that you will earn money (£10) if your response to a randomly selected question is the same as the most common response provided in your school year group today.

The proportion of my peers who would be accepting of a close friend vaping.

- ○ All of my peers
- ○ Most of my peers
- ○ A lot of my peers
- ○ Some of my peers
- ○ Only a few of my peers
- ○ None of my peers

This is the end of Part 3 of the experiment.

Please wait for the experimenter to tell you when to proceed to Part 4.

Part 4

You will be given 10 virtual tokens. Each token is worth 50 pence. That means you will receive tokens worth £5.

You will then have the opportunity to give any amount of your £5 to the ASSIST Programme.

ASSIST is a smoking prevention programme which aims to prevent the uptake of smoking among adolescents your age.

You can give any of the £5 you receive to ASSIST. For instance, you may decide to give £0 to ASSIST and keep £5 for yourself. Or you may decide to give £5 to ASSIST and keep £0 for yourself. You may also choose to give any other amount between £0 and £5 to ASSIST.

The value of any tokens you do not give to ASSIST will be your earnings for this Part. That is, each token that you do not give to ASSIST will increase your own payment for Part 4 by 50 pence.

How many tokens do you want to give to ASSIST?

- ○ 0 (you earn £5.00)
- ○ 1 (you earn £4.50)
- ○ 2 (you earn £4.00)
- ○ 3 (you earn £3.50)
- ○ 4 (you earn £3.00)
- ○ 5 (you earn £2.50)
- ○ 6 (you earn £2.00)
- ○ 7 (you earn £1.50)
- ○ 8 (you earn £1.00)
- ○ 9 (you earn £0.50)
- ○ 10 (you earn £0.00)

Instrucciones para los experimentos

Información general

Este es un estudio sobre toma de decisiones. Por participar te daremos un monto de $ 5.000 en una tarjeta de regalo. Además, puedes recibir un dinero extra en esta tarjeta en función de tus elecciones y las decisiones tomadas por otros durante el estudio.

Si tienes alguna pregunta durante la sesión, levanta la mano y espera a la persona encargada. Es muy importante que no hables ni trates de comunicarte con otros estudiantes durante el experimento. También es importante que todos los participantes tomen sus propias decisiones.

Este es un estudio que recibe financiación del Consejo de Investigación Médica del Reino Unido y cubrirá todos los gastos actuales y futuros. Por eso, puedes estar seguro de que a todos los estudiantes que participan se les pagará como se describe en las instrucciones en una tarjeta de regalo. Si tienes alguna duda, comunícate con el encargado en el salón o con Sharon Sánchez en la Facultad de Medicina de la Universidad de los Andes al teléfono 3394949 ext.3803 o al correo sc.sanchez@uniandes.edu.co.

Hay cuatro partes en el estudio de hoy. Puedes ganar dinero en cada parte.

Tus ganancias NO se pagarán hoy. La tarjeta de regalo será entregada al final del programa en 16 semanas. En ese momento volveremos para realizar otro estudio similar a este en el que podrás ganar dinero en cada parte. Tus ganancias dependen de tus respuestas en la sesión de experimentos de hoy y en la sesión del final del programa. Ten en cuenta que recibirás ganancias solo por una de las sesiones de experimentos, que se elegirá al azar lanzando una moneda. Para poder determinar tus ganancias, registraremos tus respuestas tanto en la sesión de hoy como en la sesión al final del programa. Si lo deseas, al final podrás verificar que el pago asignado corresponde a las respuestas que realizaste durante las dos sesiones.

Parte 1

En la parte 1 de este estudio, decidirás cómo encestar 50 pelotas entre dos baldes. Tu tarea es colocar cada una de las pelotas, una a una, en uno de los dos baldes: el balde azul o el balde amarillo. Las pelotas aparecerán en la parte izquierda de la pantalla, y puedes encestar cada pelota haciendo clic y arrastrándola al balde de tu elección. Por cada pelota que pongas en el balde azul, recibirás $100, y por cada pelota que pongas en el balde amarillo, recibirás $200.

La regla es poner las pelotas en el balde azul.

Una vez que comience el experimento, tendrás 5 minutos para poner las pelotas en los baldes. Cuando hayas terminado, espera en silencio hasta que el tiempo se acabe. Las bolas que no hayan sido encestadas en ningún balde no valen nada. Tus ganancias de la parte 1 se basarán en tus decisiones: es la suma de los pagos correspondientes a las pelotas que se encuentren en los baldes azules y amarillos.

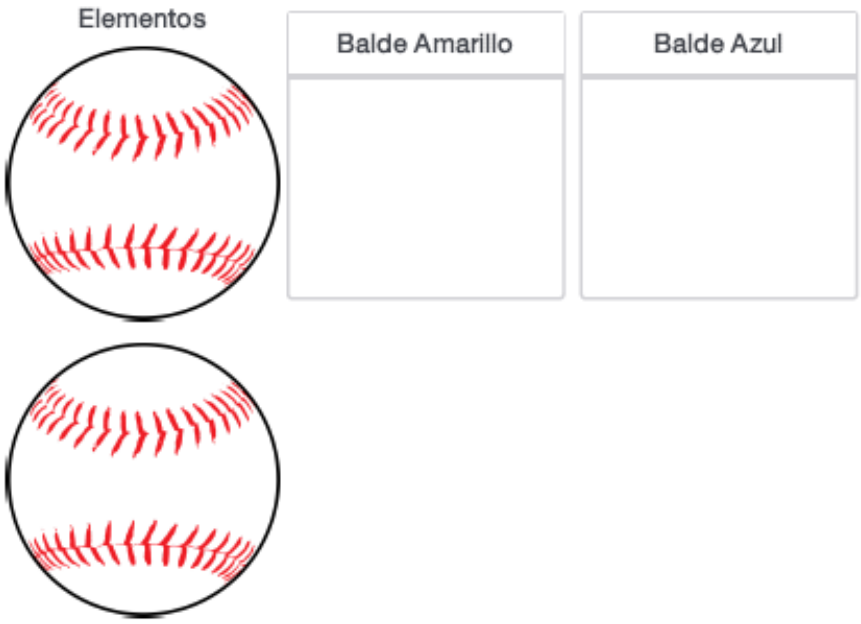
Este es el final de las instrucciones para la parte 1. Si tienes alguna pregunta, levanta la mano y el encargado las contestará en privado. De lo contrario, espera en silencio hasta que todo el mundo haya terminado. **Solo cuando el encargado lo indique**, da clic en la siguiente pestaña para comenzar el experimento.

Parte 1

Tienes 50 pelotas. Por cada pelota que pongas en el balde azul, recibirás $100, y por cada bola que pongas en el balde amarillo, recibirás $200.

La regla es poner las bolas en el balde azul.

Arrastra y suelta cada pelota dentro del espacio correspondiente. Clasifique los elementos arrastrándolos y colocándolos en su lugar.



Este es el final de la Parte 1 del experimento.

Por favor, espera a que el encargado te indique cuándo empezar con la parte 2.

Parte 2

En las siguientes pantallas, se describirán varias situaciones. En estas situaciones una persona debe tomar una decisión o ha realizado una acción. Para cada situación, se describe la decisión o acción tomada por esta persona.

Después de leer la situación, se te pedirá que evalúes la decisión o acción tomada por esa persona. Debes decidir si lo que la persona hace sería "socialmente apropiado" y "consistente con un comportamiento moralmente aceptable o socialmente apropiado" o si el comportamiento de la persona sería "socialmente inapropiado" e "incompatible con una conducta moralmente aceptable o socialmente apropiada". Por socialmente apropiado, nos referimos al comportamiento que la mayoría de las personas en tu grado escolar está de acuerdo que es lo "correcto" o "ético". Otra forma de pensar sobre lo que queremos decir es que, si la persona en la situación descrita elije una opción socialmente inapropiada, alguien más en el grado escolar podría estar enojado con esa persona por hacerlo.

En cada una de tus respuestas, nos gustaría que respondas lo más sinceramente posible, en función de tus opiniones sobre lo que es un comportamiento socialmente apropiado o socialmente inapropiado.

Para explicarte cómo procederá el experimento, veremos un ejemplo y te mostraremos cómo podrías indicar tus respuestas. Recuerda que este es solo un ejemplo, tú podrás marcar cada respuesta de acuerdo con lo que opines. No hay respuestas buenas y malas. En la siguiente pantalla, verás un ejemplo de una situación y el encargado del salón lo explicará para todos.

Parte 2

Ejemplo de situación.

Una persona está en una cafetería cerca del colegio. Mientras está allí, la persona se da cuenta de que alguien ha dejado una billetera en una de las mesas. La persona debe decidir qué hacer. Esta persona tiene cuatro posibles opciones: llevarse la billetera, preguntar a otras personas que estén cerca si la billetera es suya, dejar la billetera donde está o darle la billetera al administrador de la tienda. La persona debe elegir una de las cuatro opciones.

La siguiente tabla presenta una lista de las posibles opciones disponibles para esta persona. Para cada una de las opciones, debes indicar si crees que elegir esa opción es extremadamente inapropiado, socialmente muy inapropiado, socialmente algo inapropiado, socialmente algo apropiado, socialmente muy apropiado, extremadamente apropiado. Para indicar tu respuesta, marca la casilla correspondiente a la opción deseada:

La persona elige:	*Extremadamente inapropiado*	*Socialmente muy inapropiado*	*Socialmente algo inapropiado*	*Socialmente algo apropiado*	*Socialmente muy apropiado*	*Extremadamente apropiado*
Llevarse la billetera	o	o	o	o	o	o

Preguntar a personas cercanas si la billetera es suya.	o	o	o	o	o	o
Dejar la billetera donde está	o	o	o	o	o	o
Darle la billetera al administrador de la tienda.	o	o	o	o	o	o

Por favor, asegúrate de seleccionar la opción deseada

Si esta fuera una de las situaciones para este estudio, tú considerarías cada una de las posibles opciones anteriores y, para esa elección, indicarías hasta qué punto crees que tomar esa acción sería "socialmente apropiado" y "consistente con un comportamiento moralmente aceptable o socialmente apropiado" o si el comportamiento de la persona sería "socialmente inapropiado" e "incompatible con una conducta moralmente aceptable o socialmente apropiada. Recuerda que por "socialmente apropiado" nos referimos al comportamiento con el que la mayoría de las personas está de acuerdo, es lo "correcto" o "ético".

Parte 2

Por ejemplo, supongamos que pensaste que tomar la billetera era *Extremadamente inapropiado*, preguntar a otras personas cercanas si la billetera era suya era *socialmente algo apropiado*, dejar la billetera donde estaba era *socialmente algo inapropiado* y darle la billetera al administrador de la tienda era *Extremadamente apropiado*. Entonces, tu habrías indicado tus respuestas de la siguiente manera:

La persona elige:

	Extremadamente inapropiado	Socialmente muy inapropiado	Socialmente algo inapropiado	Socialmente algo apropiado	Socialmente muy apropiado	Extemadamente apropiado
Llevarse la billetera	●	○	○	○	○	○
Preguntar a personas cercanas si la billetera es suya.	○	○	○	●	○	○
Dejar la billetera donde está	○	○	●	○	○	○
Darle la billetera al administrador de la tienda.	○	○	○	○	○	●

¿Hay alguna pregunta sobre este ejemplo o sobre cómo indicar tus respuestas? En las siguientes páginas, hay varias situaciones, todas relacionadas con decisiones que una persona podría tener que hacer.

Para cada situación, podrás marcar qué tan idóneo te parece cada acción en el recuadro correspondiente.

Al final del experimento de hoy, con un juego de lotería seleccionaremos al azar una de las situaciones. Para esta situación, también seleccionaremos al azar una de las opciones posibles que la persona podría hacer. Por lo tanto, seleccionaremos una situación y una posible elección al azar. Para la opción seleccionada, descubriremos qué respuesta fue seleccionada hoy por la mayoría de tus compañeros en el grado escolar.

Si tú escribes la misma respuesta que la mayoría de tus compañeros de grado, podrás recibir $15.000 por la parte 2 del experimento. Este premio se te entregará en la tarjeta de regalo al final del programa 16 semanas para EntreParceros. Por ejemplo, si en el ejemplo anterior, seleccionáramos al azar para premiar la opción "deje la billetera donde está", y si tu respuesta fuese la misma que la mayoría de tus compañeros, entonces tu ganancia sería de $15.000, si esta fue la respuesta seleccionada por la mayoría de tus compañeros de grado el día de hoy. De lo contrario, su ganancia de la parte 2 sería $0.
Ahora, vas a completar algunas preguntas similares a este ejemplo por tu cuenta. Puedes ir a tu propio ritmo.

Si tienes alguna pregunta a partir de este punto, levanta la mano y espera a que el encargado acuda.

Parte 2

Situación 1.

Imagina dos personas hipotéticas de tu grado escolar que son ubicados en parejas al azar: Individuo A e Individuo B. El emparejamiento es anónimo, es decir, nadie sabe quién es la pareja de quién.
En este experimento hipotético, el individuo A hará una elección sobre dar dinero al otro, el encargado del curso registrará esta elección, y luego se la informará a ambas personas. Supongamos que ninguna persona recibirá ningún otro dinero diferente a lo que haga en esta situación hipotética.

En la pareja, el individuo A recibe $10.000. El individuo A tendrá entonces la oportunidad de dar cualquier cantidad de sus $10.000 al individuo B. Es decir, el individuo A puede darle al individuo B lo que quiera de los $10.000 que recibió. Por ejemplo, el individuo A puede decidir darle al individuo B $0 y mantener $10.000 para él o ella. O el individuo A puede decidir darle al individuo B los $10.000 y mantener $0 para él o ella. El individuo A también puede optar por dar cualquier otra cantidad entre $0 y $10.000 al individuo B.

Recuerda que tu respuesta sobre lo socialmente apropiado de las acciones del individuo A determinará la ganancia en tu tarjeta de regalo al final del estudio.

La siguiente tabla presenta una lista de las posibles opciones disponibles para esta persona. Para cada una de las opciones, por favor, indica si crees que elegir esa opción es extremadamente inapropiado, socialmente muy inapropiado, socialmente algo inapropiado, socialmente algo apropiado, socialmente muy apropiado, extremadamente apropiado. Para indicar tu respuesta, marca la casilla correspondiente.

Recuerda que ganarás un premio ($15.000) en la tarjeta de regalo si tu respuesta a una pregunta seleccionada al azar coincide con la respuesta más común brindada hoy por tus compañeros del grado escolar. Es decir, **para que sea más probable ganar el premio, debes responder según lo que tú crees que la mayoría de tus compañeros piensan.**

El individuo A elige:

El individuo A elige:	***Extremadamente inapropiado***	***Socialmente muy inapropiado***	***Socialmente algo inapropiado***	***Socialmente algo apropiado***	***Socialmente muy apropiado***	***Extremadamente apropiado***
Darle $0 al individuo B (Individuo A obtiene $10.000, Individuo B obtiene $0)	o	o	o	o	o	o
Darle $1.000 al individuo B (Individuo A obtiene $9.000, Individuo B obtiene $1.000	o	o	o	o	o	o

Darle $2.000 al individuo B (Individuo A obtiene $8.000, Individuo B obtiene $2.000)	o	o	o	o	o	o
Darle $3.000 al individuo B (Individuo A obtiene $7.000, Individuo B obtiene $3.000)	o	o	o	o	o	o
Darle $4.000 al individuo B (Individuo A obtiene $6.000, Individuo B obtiene $4.000)	o	o	o	o	o	o
Darle $5.000 al individuo B (Individuo A obtiene $5.000, Individuo B obtiene $5.000)	o	o	o	o	o	o
Darle $6.000 al individuo B (Individuo A obtiene $4.000, Individuo B obtiene $6.000)	o	o	o	o	o	o
Darle $5.000 al individuo B (Individuo A obtiene $3.000, Individuo B obtiene $7.000)	o	o	o	o	o	o
Darle $8.000 al individuo B (Individuo A obtiene $2.000, Individuo B obtiene $8.000)	o	o	o	o	o	o
Darle $9.000 al individuo B (Individuo A obtiene $1.000,	o	o	o	o	o	o

Individuo B obtiene $9.000) Darle $10.000 al individuo B (Individuo A obtiene $0, Individuo B obtiene $10.000)

Si tienes alguna pregunta, por favor levanta la mano y espera por el encargado del salón.

Parte 2

Situación 2.

Un padre o una madre fuma en su propia casa frente a sus hijos menores de 5 años.

Indica si crees que el padre fumando en la casa delante de sus hijos pequeños es extremadamente inapropiado, socialmente muy inapropiado, socialmente algo inapropiado, socialmente algo apropiado, socialmente muy apropiado, extremadamente apropiado. Para indicar tu respuesta marca la casilla correspondiente.

Recuerda que ganarás un premio ($15.000) en la tarjeta de regalo si tu respuesta a una pregunta seleccionada al azar coincide con la respuesta más común brindada hoy por tus compañeros del grado escolar. Es decir, **para que sea más probable ganar el premio, debes responder según lo que tú crees que la mayoría de tus compañeros piensan.**

Un padre o una madre fuma en su propia casa frente a sus hijos menores de 5 años.

Extremadamente inapropiado	*Socialmente muy inapropiado*	*Socialmente algo inapropiado*	*Socialmente algo apropiado*	*Socialmente muy apropiado*	*Extremadamente apropiado*
o	o	o	o	o	o

Parte 2

Situación 3.

Un adulto fuma en un carro con personas menores de 16 años en el auto.

Indica si crees que un adulto fumando en un carro con niños menores de 16 años en el carro es extremadamente inapropiado, socialmente muy inapropiado, socialmente algo inapropiado, socialmente algo apropiado, socialmente muy apropiado, extremadamente apropiado. Para indicar tu respuesta marca la casilla correspondiente.

Recuerda que ganarás un premio ($15.000) en la tarjeta de regalo si tu respuesta a una pregunta seleccionada al azar coincide con la respuesta más común brindada hoy por tus compañeros del grado escolar. Es decir, **para que sea más probable ganar el premio, debes responder según lo que tú crees que la mayoría de tus compañeros piensan.**

Un adulto fuma en un carro con personas menores de 16 años en el auto.

Extremadamente inapropiado	*Socialmente muy inapropiado*	*Socialmente algo inapropiado*	*Socialmente algo apropiado*	*Socialmente muy apropiado*	*Extremadamente apropiado*
o	o	o	o	o	o

Parte 2

Situación 4.

Alguien vende cigarrillos a un adolescente que parece tener menos de 16 años sin pedirle la cédula para comprobar su edad.

Indica si crees que alguien venda cigarrillos a un adolescente que parece tener menos de 16 años sin solicitar prueba de edad es extremadamente inapropiado, socialmente muy inapropiado, socialmente algo inapropiado, socialmente algo apropiado, socialmente muy apropiado, extremadamente apropiado.

Recuerda que ganarás un premio ($15.000) en la tarjeta de regalo si tu respuesta a una pregunta seleccionada al azar coincide con la respuesta más común brindada hoy por tus compañeros del grado escolar. Es decir, **para que sea más probable ganar el premio, debes responder según lo que tú crees que la mayoría de tus compañeros piensan.**

Alguien vende cigarrillos a un adolescente que parece tener menos de 16 años sin pedirle la cédula para comprobar su edad.

Extremadamente inapropiado	*Socialmente muy inapropiado*	*Socialmente algo inapropiado*	*Socialmente algo apropiado*	*Socialmente muy apropiado*	*Extremadamente apropiado*
o	o	o	o	o	o

Parte 2

Situación 5.

En una película reciente de superhéroes, se ve al actor principal fumando en la primera escena.

Indica si crees que en una película mostrando al actor principal fumando en la primera escena es extremadamente inapropiado, socialmente muy inapropiado, socialmente algo inapropiado, socialmente algo apropiado, socialmente muy apropiado, extremadamente apropiado.

Recuerda que ganarás un premio ($15.000) en la tarjeta de regalo si tu respuesta a una pregunta seleccionada al azar coincide con la respuesta más común brindada hoy por tus compañeros del grado escolar. Es decir, **para que sea más probable ganar el premio, debes responder según lo que tú crees que la mayoría de tus compañeros piensan.**

En una película reciente de superhéroes, se ve al actor principal fumando en la primera escena.

Extremadamente inapropiado	*Socialmente muy inapropiado*	*Socialmente algo inapropiado*	*Socialmente algo apropiado*	*Socialmente muy apropiado*	*Extremadamente apropiado*
o	o	o	o	o	o

Parte 2

Situación 6.

Un estudiante mayor de tu colegio está fumando fuera del colegio, por ejemplo, en un paradero de bus.

Indica si crees que un estudiante mayor de tu colegio está fumando fuera del colegio es extremadamente inapropiado, socialmente muy inapropiado, socialmente algo inapropiado, socialmente algo apropiado, socialmente muy apropiado, extremadamente apropiado. Para indicar tu respuesta marca la casilla correspondiente.

Recuerda que ganarás un premio ($15.000) en la tarjeta de regalo si tu respuesta a una pregunta seleccionada al azar coincide con la respuesta más común brindada hoy por tus compañeros del grado escolar. Es decir, **para que sea más probable ganar el premio, debes responder según lo que tú crees que la mayoría de tus compañeros piensan.**

Un estudiante mayor de tu colegio está fumando fuera del colegio, por ejemplo, en un paradero de bus.

Extremadamente inapropiado	*Socialmente muy inapropiado*	*Socialmente algo inapropiado*	*Socialmente algo apropiado*	*Socialmente muy apropiado*	*Extremadamente apropiado*
o	o	o	o	o	o

Parte 2

Situación 7.

Un estudiante de tu colegio usa un cigarrillo electrónico mientras camina hacia el colegio.

Indica si crees que el alumno usando un cigarrillo electrónico mientras camina hacia el colegio es extremadamente inapropiado, socialmente muy inapropiado, socialmente algo inapropiado, socialmente algo apropiado, socialmente muy apropiado, extremadamente apropiado. Para indicar tu respuesta marca la casilla correspondiente.

Recuerda que ganarás un premio ($15.000) en la tarjeta de regalo si tu respuesta a una pregunta seleccionada al azar coincide con la respuesta más común brindada hoy por tus compañeros del grado escolar. Es decir, **para que sea más probable ganar el premio, debes responder según lo que tú crees que la mayoría de tus compañeros piensan.**

Un estudiante de tu colegio usa un cigarrillo electrónico mientras camina hacia el colegio.

Extremadamente inapropiado	*Socialmente muy inapropiado*	*Socialmente algo inapropiado*	*Socialmente algo apropiado*	*Socialmente muy apropiado*	*Extremadamente apropiado*
o	o	o	o	o	o

Parte 2

Situación 8.

Un estudiante de tu colegio comparte una fotografía de sí mismo utilizando un cigarrillo electrónico en redes sociales (Ej. Facebook o Instagram).

Indica si crees que un alumno de tu colegio compartiendo una fotografía de sí mismo utilizando un cigarrillo electrónico en redes sociales (Ej. Facebook o Instagram) *es extremadamente inapropiado, socialmente muy inapropiado, socialmente algo inapropiado, socialmente algo apropiado, socialmente muy apropiado, extremadamente apropiado.*

Recuerda que ganarás un premio ($15.000) en la tarjeta de regalo si tu respuesta a una pregunta seleccionada al azar coincide con la respuesta más común brindada hoy por tus compañeros del grado escolar. Es decir, **para que sea más probable ganar el premio, debes responder según lo que tú crees que la mayoría de tus compañeros piensan.**

Un estudiante de tu colegio comparte una fotografía de sí mismo utilizando un cigarrillo electrónico en redes sociales (Ej. Facebook o Instagram).

Extremadamente inapropiado	*Socialmente muy inapropiado*	*Socialmente algo inapropiado*	*Socialmente algo apropiado*	*Socialmente muy apropiado*	*Extremadamente apropiado*
o	o	o	o	o	o

Parte 2

Situación 9.

Un estudiante de tu colegio está masticando tabaco.

Indica si crees que un estudiante de tu colegio masticando tabaco es extremadamente inapropiado, socialmente muy inapropiado, socialmente algo inapropiado, socialmente algo apropiado, socialmente muy apropiado, extremadamente apropiado. Para indicar tu respuesta marca la casilla correspondiente.

Recuerda que ganarás un premio ($15.000) en la tarjeta de regalo si tu respuesta a una pregunta seleccionada al azar coincide con la respuesta más común brindada hoy por tus compañeros del grado escolar. Es decir, **para que sea más probable ganar el premio, debes responder según lo que tú crees que la mayoría de tus compañeros piensan.**

Un estudiante de tu colegio está masticando tabaco.

Extremadamente inapropiado	*Socialmente muy inapropiado*	*Socialmente algo inapropiado*	*Socialmente algo apropiado*	*Socialmente muy apropiado*	*Extremadamente apropiado*
o	o	o	o	o	o

Este es el final de la Parte 2 del experimento.

En la Parte 3 del experimento de hoy responderás varias preguntas sobre el comportamiento de tus compañeros, es decir, otros estudiantes en tu mismo grado escolar. Al final del estudio, con un juego de lotería seleccionaremos al azar una de las situaciones. Para esta situación, también seleccionaremos al azar una de las opciones posibles. Por lo tanto, seleccionaremos una situación y una posible elección al azar. Para la opción seleccionada, descubriremos qué respuesta fue seleccionada por la mayoría de tus compañeros en el grado escolar.

Si tú escribes la misma respuesta que la mayoría de tus compañeros de grado, podrás recibir $15.000 por la parte 3 del experimento. Este premio se te entregará en la tarjeta de regalo al final del programa 16 semanas para EntreParceros.

Por favor, da click en el botón cuando estés listo para empezar con la Parte 3.

Parte 3

Pregunta 1.

¿Cuántos de tus compañeros del grado aceptarían que uno de sus amigos cercanos fumara?

Indica qué proporción de estudiantes del grado crees que aceptaría que uno de sus amigos cercanos fumara: todos mis compañeros, la mayoría de mis compañeros, muchos de mis compañeros, algunos de mis compañeros, solo unos pocos de mis compañeros, ninguno de mis compañeros. Para indicar tu respuesta marca la casilla correspondiente.

Recuerda que ganarás un premio ($15.000) en la tarjeta de regalo si tu respuesta a una pregunta seleccionada al azar coincide con la respuesta más común brindada hoy por tus compañeros del grado escolar. Es decir, **para que sea más probable ganar el premio, debes responder según lo que tú crees que la mayoría de tus compañeros piensan.**

¿Cuántos de tus compañeros del grado aceptarían que uno de sus amigos cercanos fumara?

Todos mis compañeros	*La mayoría de mis compañeros*	*Muchos de mis compañeros*	*Algunos de mis compañeros*	*Solo unos pocos de mis compañeros*	*Ninguno de mis compañeros*
o	o	o	o	o	o

Parte 3

Pregunta 2.

¿Cuántos de tus compañeros del grado aceptarían que uno de tus amigos cercanos usara un cigarrillo electrónico?

Indica qué proporción de estudiantes del grado crees que aceptaría que uno de sus amigos cercanos usara un cigarrillo electrónico: todos mis compañeros, la mayoría de mis compañeros, muchos de mis compañeros, algunos de mis compañeros, solo unos pocos de mis compañeros, ninguno de mis compañeros. Para indicar tu respuesta marca la casilla correspondiente.

Recuerda que ganarás un premio ($15.000) en la tarjeta de regalo si tu respuesta a una pregunta seleccionada al azar coincide con la respuesta más común brindada hoy por tus compañeros del grado escolar. Es decir, **para que sea más probable ganar el premio, debes responder según lo que tú crees que la mayoría de tus compañeros piensan.**

¿Cuántos de tus compañeros del grado aceptarían que uno de tus amigos cercanos usara un cigarrillo electrónico?

Todos mis compañeros	*La mayoría de mis compañeros*	*Muchos de mis compañeros*	*Algunos de mis compañeros*	*Solo unos pocos de mis compañeros*	*Ninguno de mis compañeros*
o	o	o	o	o	o

Este es el final de la Parte 3 del experimento

Por favor, espera a que el encargado del salón te indique que puedes seguir con la Parte 4.

Parte 4.

Se te darán 10 fichas virtuales equivalentes a $10.000. Es decir, recibirás 10 fichas de $1.000 cada una. A continuación, tendrás la oportunidad de dar cualquier cantidad de tus $10.000 al programa Des-ahógate [reemplazar con el nombre del programa asignado a la institución Des-ahógate – EntreParceros. El programa de prevención Des-ahógate EntreParceros pretende evitar el consumo de tabaco entre adolescentes de tu edad.

Puedes dar cualquier cantidad de los $10.000 que recibiste a Des-ahógate - EntreParceros. Por ejemplo, puedes decidir dar $0 a Des-ahógate EntreParceros y mantener $10.000 para ti. O puedes decidir dar $10.000 a Des-ahógate EntreParceros y mantener $0 para ti. También puedes optar por dar cualquier otra cantidad entre $0 y $10.000 a Des-ahógate EntreParceros.

La cantidad de dinero que no le des a Des-ahógate EntreParceros hará parte de tus ganancias en esta parte. Recuerda que cada ficha equivale a $1.000.

¿Cuántas **fichas** quieres donar a Des-ahógate EntreParceros?

- 0 (tú ganas $10.000)
- 1 (tú ganas $9.000)
- 2 (tú ganas $8.000)
- 3 (tú ganas $7.000)
- 4 (tú ganas $6.000)
- 5 (tú ganas $5.000)
- 6 (tú ganas $4.000)
- 7 (tú ganas $3.000)
- 8 (tú ganas $2.000)
- 9 (tú ganas $1.000)
- 10 (tú ganas $0)

Gracias por participar de este experimento.

Tus respuestas serán guardas para determinar tus ganancias.

Recuerda que en 16 semanas semanas volveremos para hacer otro estudio igual a este.

Supplement 3: Syntax used to generate results

Confirmatory factor analysis models

```
model1 <- 'ExptInj  =~ p2sit2 + p2sit3 + p2sit4 + p2sit5 + p2sit6 + p2sit7 + p2sit8 + p2sit9
p2sit2 ~~ p2sit3
p2sit7 ~~ p2sit8
p2sit2 ~~ p2sit4'
fit1 <- cfa(model = model1, data = inData, estimator="MLR", missing="fiml")
summary(fit1,fit.measures=TRUE,standardized=TRUE)
fit1.2 <- cfa(model = model1, data = inData,std.lv = TRUE, estimator="MLR", missing="fiml")
summary(fit1.2,fit.measures=TRUE,standardized=TRUE,rsquare=TRUE)
modificationIndices(fit1.2)

model2 <- 'SurveyInj =~ injunc1 + injunc2 + injunc3 + injunc4 + injunc5 + injunc6 + injunc7
injunc2 ~~ injunc3
injunc4 ~~ injunc5
injunc6 ~~ injunc7'
fit2 <- cfa(model = model2, data = inData, estimator="MLR", missing="fiml")
summary(fit2,fit.measures=TRUE,standardized=TRUE)
fit2.2 <- cfa(model = model2, data = inData,std.lv = TRUE, estimator="MLR", missing="fiml")
summary(fit2.2,fit.measures=TRUE,standardized=TRUE,rsquare=TRUE)
modificationIndices(fit2.2)

model3 <- 'ExptDesc  =~ a*p3q1 + a*p3q2'
fit3 <- cfa(model = model3, data = inData, estimator="MLR", missing="fiml")
summary(fit3,fit.measures=TRUE,standardized=TRUE)
fit3.2 <- cfa(model = model3, data = inData,std.lv = TRUE, estimator="MLR", missing="fiml")
summary(fit3.2,fit.measures=TRUE,standardized=TRUE,rsquare=TRUE)
modificationIndices(fit3.2)

model4 <- 'SurveyDesc  =~ desc1 + desc2 + desc3 + desc4 + desc5
desc2 ~~ desc3
desc4 ~~ desc5'
fit4 <- cfa(model = model4, data = inData, estimator="MLR", missing="fiml")
summary(fit4,fit.measures=TRUE,standardized=TRUE)
fit4.2 <- cfa(model = model4, data = inData,std.lv = TRUE, estimator="MLR", missing="fiml")
summary(fit4.2,fit.measures=TRUE,standardized=TRUE,rsquare=TRUE)
modificationIndices(fit4.2)

model5 <- 'ExptInj  =~ p2sit2 + p2sit3 + p2sit4 + p2sit5 + p2sit6 + p2sit7 + p2sit8 + p2sit9
SurveyInj =~ injunc1 + injunc2 + injunc3 + injunc4 + injunc5 + injunc6 + injunc7
ExptDesc  =~ a*p3q1 + a*p3q2
SurveyDesc  =~ desc1 + desc2 + desc3 + desc4 + desc5
p2sit2 ~~ p2sit3
p2sit7 ~~ p2sit8
p2sit2 ~~ p2sit4
```

```
injunc2 ~~ injunc3
injunc4 ~~ injunc5
injunc6 ~~ injunc7
desc2 ~~ desc3
desc4 ~~ desc5
ExptInj ~~ SurveyInj
ExptInj ~~ ExptDesc
ExptInj ~~ SurveyDesc
SurveyInj ~~ ExptDesc
SurveyInj ~~ SurveyDesc
ExptDesc ~~ SurveyDesc'
fit5 <- cfa(model = model5, data = inData, estimator="MLR", missing="fiml")
summary(fit5,fit.measures=TRUE,standardized=TRUE)
fit5.2 <- cfa(model = model5, data = inData,std.lv = TRUE, estimator="MLR", missing="fiml")
summary(fit5.2,fit.measures=TRUE,standardized=TRUE,rsquare=TRUE)
modificationIndices(fit5.2)

model6 <- 'ExptInj  =~ p2sit2 + p2sit3 + p2sit4 + p2sit5 + p2sit6 + p2sit7 + p2sit8 + p2sit9
SurveyInj =~ injunc1 + injunc2 + injunc3 + injunc4 + injunc5 + injunc6 + injunc7
ExptDesc  =~ a*p3q1 + a*p3q2
SurveyDesc  =~ desc1 + desc2 + desc3 + desc4 + desc5
p2sit2 ~~ p2sit3
p2sit7 ~~ p2sit8
p2sit2 ~~ p2sit4
injunc2 ~~ injunc3
injunc4 ~~ injunc5
injunc6 ~~ injunc7
desc2 ~~ desc3
desc4 ~~ desc5
Norm =~ ExptInj + ExptDesc + SurveyInj + SurveyDesc'
fit6 <- cfa(model = model6, data = inData, estimator="MLR", missing="fiml")
summary(fit6,fit.measures=TRUE,standardized=TRUE)
fit6.2 <- cfa(model = model6, data = inData,std.lv = TRUE, estimator="MLR", missing="fiml")
summary(fit6.2,fit.measures=TRUE,standardized=TRUE,rsquare=TRUE)
modificationIndices(fit6.2)
```

Multiple indicators multiple causes models

```
model7 <- 'ExptInj  =~ p2sit2 + p2sit3 + p2sit4 + p2sit5 + p2sit6 + p2sit7 + p2sit8 + p2sit9
SurveyInj =~ injunc1 + injunc2 + injunc3 + injunc4 + injunc5 + injunc6 + injunc7
ExptDesc  =~ a*p3q1 + a*p3q2
SurveyDesc  =~ desc1 + desc2 + desc3 + desc4 + desc5
p2sit2 ~~ p2sit3
p2sit7 ~~ p2sit8
p2sit2 ~~ p2sit4
injunc2 ~~ injunc3
injunc4 ~~ injunc5
```

```
injunc6 ~~ injunc7
desc2 ~~ desc3
desc4 ~~ desc5
Norm =~ ExptInj + ExptDesc + SurveyInj + SurveyDesc
Norm ~ Country'
fit7 <- cfa(model = model7, data = inData, estimator="MLR", missing="fiml")
summary(fit7,fit.measures=TRUE,standardized=TRUE)
fit7.2 <- cfa(model = model7, data = inData,std.lv = TRUE, estimator="MLR", missing="fiml")
summary(fit7.2,fit.measures=TRUE,standardized=TRUE,rsquare=TRUE)


model8 <- 'ExptInj  =~ p2sit2 + p2sit3 + p2sit4 + p2sit5 + p2sit6 + p2sit7 + p2sit8 + p2sit9
SurveyInj =~ injunc1 + injunc2 + injunc3 + injunc4 + injunc5 + injunc6 + injunc7
ExptDesc  =~ a*p3q1 + a*p3q2
SurveyDesc  =~ desc1 + desc2 + desc3 + desc4 + desc5
p2sit2 ~~ p2sit3
p2sit7 ~~ p2sit8
p2sit2 ~~ p2sit4
injunc2 ~~ injunc3
injunc4 ~~ injunc5
injunc6 ~~ injunc7
desc2 ~~ desc3
desc4 ~~ desc5
Norm =~ ExptInj + ExptDesc + SurveyInj + SurveyDesc
ExptInj ~ Country
SurveyInj ~ Country
ExptDesc ~ Country
SurveyDesc ~ Country'
fit8 <- cfa(model = model8, data = inData, estimator="MLR", missing="fiml")
summary(fit8,fit.measures=TRUE,standardized=TRUE)
fit8.2 <- cfa(model = model8, data = inData,std.lv = TRUE, estimator="MLR", missing="fiml")
summary(fit8.2,fit.measures=TRUE,standardized=TRUE,rsquare=TRUE)
```

Differential item functioning analyses

```
model9 <- 'ExptInj  =~ p2sit2 + p2sit3 + p2sit4 + p2sit5 + p2sit6 + p2sit7 + p2sit8 + p2sit9
SurveyInj =~ injunc1 + injunc2 + injunc3 + injunc4 + injunc5 + injunc6 + injunc7
ExptDesc  =~ a*p3q1 + a*p3q2
SurveyDesc  =~ desc1 + desc2 + desc3 + desc4 + desc5
p2sit2 ~~ p2sit3
p2sit7 ~~ p2sit8
p2sit2 ~~ p2sit4
injunc2 ~~ injunc3
injunc4 ~~ injunc5
injunc6 ~~ injunc7
desc2 ~~ desc3
desc4 ~~ desc5
```

```
Norm =~ ExptInj + ExptDesc + SurveyInj + SurveyDesc
ExptInj ~ Country
SurveyInj ~ Country
ExptDesc ~ Country
SurveyDesc ~ Country
p2sit2 ~ 0*Country
p2sit3 ~ 0*Country
p2sit4 ~ 0*Country
p2sit5 ~ 0*Country
p2sit6 ~ 0*Country
p2sit7 ~ 0*Country
p2sit8 ~ 0*Country
p2sit9 ~ 0*Country
injunc1 ~ 0*Country
injunc2 ~ 0*Country
injunc3 ~ 0*Country
injunc4 ~ 0*Country
injunc5 ~ 0*Country
injunc6 ~ 0*Country
injunc7 ~ 0*Country
p3q1 ~ 0*Country
p3q2 ~ 0*Country
desc1 ~ 0*Country
desc2 ~ 0*Country
desc3 ~ 0*Country
desc4 ~ 0*Country
desc5 ~ 0*Country'
fit9 <- cfa(model = model9, data = inData, estimator="MLR", missing="fiml")
summary(fit9,fit.measures=TRUE,standardized=TRUE)
fit9.2 <- cfa(model = model9, data = inData,std.lv = TRUE, estimator="MLR", missing="fiml")
summary(fit9.2,fit.measures=TRUE,standardized=TRUE,rsquare=TRUE)
modificationIndices(fit9.2, power=TRUE)
```

Measurement models controlling for differential item functioning

```
model10 <- 'ExptInj  =~ p2sit2 + p2sit3 + p2sit4 + p2sit5 + p2sit6 + p2sit7 + p2sit8 + p2sit9
SurveyInj =~ injunc1 + injunc2 + injunc3 + injunc4 + injunc5 + injunc6 + injunc7
ExptDesc  =~ a*p3q1 + a*p3q2
SurveyDesc  =~ desc1 + desc2 + desc3 + desc4 + desc5
p2sit2 ~~ p2sit3
p2sit7 ~~ p2sit8
p2sit2 ~~ p2sit4
injunc2 ~~ injunc3
injunc4 ~~ injunc5
injunc6 ~~ injunc7
desc2 ~~ desc3
desc4 ~~ desc5
Norm =~ ExptInj + ExptDesc + SurveyInj + SurveyDesc
```

```
ExptInj ~ Country
SurveyInj ~ Country
ExptDesc ~ Country
SurveyDesc ~ Country
p2sit2 ~ Country
p2sit5 ~ Country
injunc1 ~ Country
injunc4 ~ Country
desc2 ~ Country
desc3 ~ Country'
fit10 <- cfa(model = model10, data = inData, estimator="MLR", missing="fiml")
summary(fit10,fit.measures=TRUE,standardized=TRUE)
fit10.2 <- cfa(model = model10, data = inData,std.lv = TRUE, estimator="MLR", missing="fiml")
summary(fit10.2,fit.measures=TRUE,standardized=TRUE,rsquare=TRUE)
```

Structural equation models

```
model11 <- 'ExptInj  =~ p2sit2 + p2sit3 + p2sit4 + p2sit5 + p2sit6 + p2sit7 + p2sit8 + p2sit9
SurveyInj =~ injunc1 + injunc2 + injunc3 + injunc4 + injunc5 + injunc6 + injunc7
ExptDesc  =~ a*p3q1 + a*p3q2
SurveyDesc  =~ desc1 + desc2 + desc3 + desc4 + desc5
p2sit2 ~~ p2sit3
p2sit7 ~~ p2sit8
p2sit2 ~~ p2sit4
injunc2 ~~ injunc3
injunc4 ~~ injunc5
injunc6 ~~ injunc7
desc2 ~~ desc3
desc4 ~~ desc5
Norm =~ ExptInj + ExptDesc + SurveyInj + SurveyDesc
ExptInj ~ Country
SurveyInj ~ Country
ExptDesc ~ Country
SurveyDesc ~ Country
p2sit2 ~ Country
p2sit5 ~ Country
injunc1 ~ Country
injunc4 ~ Country
desc2 ~ Country
desc3 ~ Country
SmokePast ~ Norm + Country'
fit11 <- cfa(model = model11, data = inData, estimator="MLR", missing="fiml")
summary(fit11,fit.measures=TRUE,standardized=TRUE)
fit11.2 <- cfa(model = model11, data = inData,std.lv = TRUE, estimator="MLR", missing="fiml")
summary(fit11.2,fit.measures=TRUE,standardized=TRUE,rsquare=TRUE)


model12 <- 'ExptInj  =~ p2sit2 + p2sit3 + p2sit4 + p2sit5 + p2sit6 + p2sit7 + p2sit8 + p2sit9
```

```
SurveyInj =~ injunc1 + injunc2 + injunc3 + injunc4 + injunc5 + injunc6 + injunc7
ExptDesc  =~ a*p3q1 + a*p3q2
SurveyDesc  =~ desc1 + desc2 + desc3 + desc4 + desc5
p2sit2 ~~ p2sit3
p2sit7 ~~ p2sit8
p2sit2 ~~ p2sit4
injunc2 ~~ injunc3
injunc4 ~~ injunc5
injunc6 ~~ injunc7
desc2 ~~ desc3
desc4 ~~ desc5
Norm =~ ExptInj + ExptDesc + SurveyInj + SurveyDesc
ExptInj ~ Country
SurveyInj ~ Country
ExptDesc ~ Country
SurveyDesc ~ Country
p2sit2 ~ Country
p2sit5 ~ Country
injunc1 ~ Country
injunc4 ~ Country
desc2 ~ Country
desc3 ~ Country
SmokePast ~ ExptInj + SurveyInj + ExptDesc + SurveyDesc + Country'
fit12 <- cfa(model = model12, data = inData, estimator="MLR", missing="fiml")
summary(fit12,fit.measures=TRUE,standardized=TRUE)
fit12.2 <- cfa(model = model12, data = inData,std.lv = TRUE, estimator="MLR", missing="fiml")
summary(fit12.2,fit.measures=TRUE,standardized=TRUE,rsquare=TRUE)


model13 <- 'ExptInj  =~ p2sit2 + p2sit3 + p2sit4 + p2sit5 + p2sit6 + p2sit7 + p2sit8 + p2sit9
SurveyInj =~ injunc1 + injunc2 + injunc3 + injunc4 + injunc5 + injunc6 + injunc7
ExptDesc  =~ a*p3q1 + a*p3q2
SurveyDesc  =~ desc1 + desc2 + desc3 + desc4 + desc5
p2sit2 ~~ p2sit3
p2sit7 ~~ p2sit8
p2sit2 ~~ p2sit4
injunc2 ~~ injunc3
injunc4 ~~ injunc5
injunc6 ~~ injunc7
desc2 ~~ desc3
desc4 ~~ desc5
Norm =~ ExptInj + ExptDesc + SurveyInj + SurveyDesc
ExptInj ~ Country
SurveyInj ~ Country
ExptDesc ~ Country
SurveyDesc ~ Country
p2sit2 ~ Country
p2sit5 ~ Country
```

```
injunc1 ~ Country
injunc4 ~ Country
desc2 ~ Country
desc3 ~ Country
Intent ~ Norm + Country'
fit13 <- cfa(model = model13, data = inData, estimator="MLR", missing="fiml")
summary(fit13,fit.measures=TRUE,standardized=TRUE)
fit13.2 <- cfa(model = model13, data = inData,std.lv = TRUE, estimator="MLR", missing="fiml")
summary(fit13.2,fit.measures=TRUE,standardized=TRUE,rsquare=TRUE)


model14 <- 'ExptInj  =~ p2sit2 + p2sit3 + p2sit4 + p2sit5 + p2sit6 + p2sit7 + p2sit8 + p2sit9
SurveyInj =~ injunc1 + injunc2 + injunc3 + injunc4 + injunc5 + injunc6 + injunc7
ExptDesc  =~ a*p3q1 + a*p3q2
SurveyDesc  =~ desc1 + desc2 + desc3 + desc4 + desc5
p2sit2 ~~ p2sit3
p2sit7 ~~ p2sit8
p2sit2 ~~ p2sit4
injunc2 ~~ injunc3
injunc4 ~~ injunc5
injunc6 ~~ injunc7
desc2 ~~ desc3
desc4 ~~ desc5
Norm =~ ExptInj + ExptDesc + SurveyInj + SurveyDesc
ExptInj ~ Country
SurveyInj ~ Country
ExptDesc ~ Country
SurveyDesc ~ Country
p2sit2 ~ Country
p2sit5 ~ Country
injunc1 ~ Country
injunc4 ~ Country
desc2 ~ Country
desc3 ~ Country
Intent ~ ExptInj + SurveyInj + ExptDesc + SurveyDesc + Country'
fit14 <- cfa(model = model14, data = inData, estimator="MLR", missing="fiml")
summary(fit14,fit.measures=TRUE,standardized=TRUE)
fit14.2 <- cfa(model = model14, data = inData,std.lv = TRUE, estimator="MLR", missing="fiml")
summary(fit14.2,fit.measures=TRUE,standardized=TRUE,rsquare=TRUE)


model15 <- 'ExptInj  =~ p2sit2 + p2sit3 + p2sit4 + p2sit5 + p2sit6 + p2sit7 + p2sit8 + p2sit9
SurveyInj =~ injunc1 + injunc2 + injunc3 + injunc4 + injunc5 + injunc6 + injunc7
ExptDesc  =~ a*p3q1 + a*p3q2
SurveyDesc  =~ desc1 + desc2 + desc3 + desc4 + desc5
p2sit2 ~~ p2sit3
p2sit7 ~~ p2sit8
p2sit2 ~~ p2sit4
```

```
injunc2 ~~ injunc3
injunc4 ~~ injunc5
injunc6 ~~ injunc7
desc2 ~~ desc3
desc4 ~~ desc5
Norm =~ ExptInj + ExptDesc + SurveyInj + SurveyDesc
ExptInj ~ Country
SurveyInj ~ Country
ExptDesc ~ Country
SurveyDesc ~ Country
p2sit2 ~ Country
p2sit5 ~ Country
injunc1 ~ Country
injunc4 ~ Country
desc2 ~ Country
desc3 ~ Country
COreading ~ Norm + Country'
fit15 <- cfa(model = model15, data = inData, estimator="MLR", missing="fiml")
summary(fit15,fit.measures=TRUE,standardized=TRUE)
fit15.2 <- cfa(model = model15, data = inData,std.lv = TRUE, estimator="MLR", missing="fiml")
summary(fit15.2,fit.measures=TRUE,standardized=TRUE,rsquare=TRUE)


model16 <- 'ExptInj  =~ p2sit2 + p2sit3 + p2sit4 + p2sit5 + p2sit6 + p2sit7 + p2sit8 + p2sit9
SurveyInj =~ injunc1 + injunc2 + injunc3 + injunc4 + injunc5 + injunc6 + injunc7
ExptDesc  =~ a*p3q1 + a*p3q2
SurveyDesc  =~ desc1 + desc2 + desc3 + desc4 + desc5
p2sit2 ~~ p2sit3
p2sit7 ~~ p2sit8
p2sit2 ~~ p2sit4
injunc2 ~~ injunc3
injunc4 ~~ injunc5
injunc6 ~~ injunc7
desc2 ~~ desc3
desc4 ~~ desc5
Norm =~ ExptInj + ExptDesc + SurveyInj + SurveyDesc
ExptInj ~ Country
SurveyInj ~ Country
ExptDesc ~ Country
SurveyDesc ~ Country
p2sit2 ~ Country
p2sit5 ~ Country
injunc1 ~ Country
injunc4 ~ Country
desc2 ~ Country
desc3 ~ Country
COreading ~ ExptInj + SurveyInj + ExptDesc + SurveyDesc + Country'
fit16 <- cfa(model = model16, data = inData, estimator="MLR", missing="fiml")
```

```
summary(fit16,fit.measures=TRUE,standardized=TRUE)
fit16.2 <- cfa(model = model16, data = inData,std.lv = TRUE, estimator="MLR", missing="fiml")
summary(fit16.2,fit.measures=TRUE,standardized=TRUE,rsquare=TRUE)
```

Supplement 4: Summary statistics and histograms showing response distributions for all variables

Baseline and follow-up summary statistics.

	Northern Ireland (N=7)		Colombia (N=8)		All schools (N=15)	
	Baseline	**Follow-up**	**Baseline**	**Follow-up**	**Baseline**	**Follow-up**
Experiment, n	696	684	880	852	1576	1536
Survey, n	701	654	872	846	1573	1500
Experiment Part 1 (rule-following task)						
Blue bucket (1-50)[a]						
Mean (SD)	28.8 (19.2)	29.0 (20.3)	31.6 (16.9)	32.7 (17.7)	30.4 (18.0)	31.1 (19.0)
Median (IQR)	26.0 (11.5 to 50.0)	27.0 (2.0 to 50.0)	30.0 (22.0 to 50.0)	35.0 (23.0 to 50.0)	28.0 (21.0 to 50.0)	33.0 (19.5 to 50.0)
Yellow bucket (1-50)[a]						
Mean (SD)	21.2 (19.2)	21.0 (20.3)	18.4 (16.9)	17.3 (17.7)	19.6 (18.0)	18.9 (19.0)
Median (IQR)	24.0 (0.0 to 38.5)	23.0 (0.0 to 48.0)	20.0 (0.0 to 28.0)	15.0 (0.0 to 27.0)	22.0 (0.0 to 29.0)	17.0 (0.0 to 30.5)
Experiment Part 2 (injunctive social norms)[b]						
Situation 2 (Parent smoking in front of young children)						
Mean (SD)	-0.8 (0.3)	-0.8 (0.4)	-0.9 (0.2)	-0.9 (0.3)	-0.9 (0.3)	-0.9 (0.3)
Median (IQR)	-1.0 (-1.0 to -0.6)	-1.0 (-1.0 to -0.6)	-1.0 (-1.0 to -1.0)	-1.0 (-1.0 to -1.0)	-1.0 (-1.0 to -1.0)	-1.0 (-1.0 to -1.0)
Modal response, n (%)	498 (71.7%)	449 (65.7%)	806 (91.6%)	706 (82.9%)	1304 (82.8%)	1155 (75.2%)
Situation 3 (Adult smoking in car with under 16's onboard)						
Mean (SD)	-0.7 (0.4)	-0.7 (0.4)	-0.7 (0.3)	-0.7 (0.3)	-0.7 (0.4)	-0.7 (0.3)
Median (IQR)	-0.6 (-1.0 to -0.6)	-0.6 (-1.0 to -0.6)	-0.8 (-1.0 to -0.6)	-0.6 (-1.0 to -0.6)	-0.6 (-1.0 to -0.6)	-0.6 (-1.0 to -0.6)
Modal response, n (%)	316 (45.5%)	314 (45.9%)	444 (50.5%)	439 (51.5%)	760 (48.3%)	753 (49.0%)
Situation 4 (Selling cigarettes to someone who looks younger than 16 without asking for proof of age)						
Mean (SD)	-0.9 (0.3)	-0.8 (0.3)	-0.9 (0.3)	-0.8 (0.3)	-0.9 (0.3)	-0.8 (0.3)
Median (IQR)	-1.0 (-1.0 to -1.0)	-1.0 (-1.0 to -0.6)	-1.0 (-1.0 to -1.0)	-1.0 (-1.0 to -0.6)	-1.0 (-1.0 to -1.0)	-1.0 (-1.0 to -0.6)
Modal response, n (%)	537 (77.2%)	482 (70.8%)	676 (76.8%)	529 (62.1%)	1213 (77.0%)	1011 (65.9%)
Situation 5 (Lead actor smoking in opening scene of a recent superhero movie)						
Mean (SD)	-0.3 (0.4)	-0.3 (0.4)	-0.5 (0.4)	-0.4 (0.4)	-0.4 (0.4)	-0.4 (0.4)
Median (IQR)	-0.2 (-0.6 to -0.2)	-0.2 (-0.6 to -0.2)	-0.6 (-1.0 to -0.2)	-0.2 (-1.0 to -0.2)	-0.2 (-0.6 to -0.2)	-0.2 (-0.6 to -0.2)
Modal response, n (%)	295 (42.4%)	334 (48.8%)	364 (41.4%)	369 (43.3%)	659 (41.8%)	703 (45.8%)
Situation 6 (Older student smoking outside school)						
Mean (SD)	-0.6 (0.4)	-0.5 (0.4)	-0.5 (0.4)	-0.5 (0.4)	-0.6 (0.4)	-0.5 (0.4)
Median (IQR)	-0.6 (-1.0 to -0.2)	-0.6 (-1.0 to -0.2)	-0.6 (-1.0 to -0.2)	-0.6 (-1.0 to -0.2)	-0.6 (-1.0 to -0.2)	-0.6 (-1.0 to -0.2)
Modal response, n (%)	258 (37.3%)	273 (40.0%)	349 (39.7%)	413 (48.5%)	607 (38.6%)	686 (44.7%)
Situation 7 (School pupil using an e-cigarette whilst walking to school)						
Mean (SD)	-0.5 (0.4)	-0.5 (0.4)	-0.6 (0.4)	-0.5 (0.4)	-0.5 (0.4)	-0.5 (0.4)
Median (IQR)	-0.6 (-1.0 to -0.2)	-0.6 (-0.6 to -0.2)	-0.6 (-1.0 to -0.2)	-0.6 (-1.0 to -0.2)	-0.6 (-1.0 to -0.2)	-0.6 (-1.0 to -0.2)

Modal response, n (%)	263 (37.8%)	273 (40.0%)	373 (42.4%)	333 (39.1%)	636 (40.4%)	606 (39.5%)
Situation 8 (School pupil sharing a photograph of his/her e-cigarette use on social media)						
Mean (SD)	-0.5 (0.4)	-0.5 (0.4)	-0.5 (0.4)	-0.5 (0.4)	-0.5 (0.4)	-0.5 (0.4)
Median (IQR)	-0.6 (-1.0 to -0.2)	-0.6 (-0.6 to -0.2)	-0.6 (-1.0 to -0.2)	-0.6 (-1.0 to -0.2)	-0.6 (-1.0 to -0.2)	-0.6 (-0.8 to -0.2)
Modal response, n (%)	255 (36.7%)	266 (38.9%)	389 (44.2%)	346 (40.6%)	644 (40.9%)	612 (39.8%)
Situation 9 (School pupil chewing tobacco)						
Mean (SD)	-0.8 (0.4)	-0.7 (0.4)	-0.8 (0.3)	-0.8 (0.3)	-0.8 (0.3)	-0.7 (0.3)
Median (IQR)	-1.0 (-1.0 to -0.6)	-1.0 (-1.0 to -0.6)	-1.0 (-1.0 to -0.6)	-1.0 (-1.0 to -0.6)	-1.0 (-1.0 to -0.6)	-1.0 (-1.0 to -0.6)
Modal response, n (%)	427 (61.4%)	355 (52.0%)	591 (67.2%)	503 (59.0%)	1018 (64.6%)	858 (55.9%)
Experiment Part 3 (descriptive social norms)[c]						
Q1 (Proportion of peers who would be accepting of a close friend smoking)						
Mean (SD)	-0.5 (0.5)	-0.4 (0.5)	-0.5 (0.5)	-0.4 (0.5)	-0.5 (0.5)	-0.4 (0.5)
Median (IQR)	-0.6 (-1.0 to -0.2)	-0.6 (-0.6 to -0.2)	-0.6 (-1.0 to -0.2)	-0.6 (-0.6 to -0.2)	-0.6 (-1.0 to -0.2)	-0.6 (-0.6 to -0.2)
Modal response, n (%)	268 (38.6%)	248 (36.3%)	367 (41.7%)	390 (45.8%)	635 (40.3%)	638 (41.5%)
Q2 (Proportion of peers who would be accepting of a close friend vaping)						
Mean (SD)	-0.3 (0.6)	-0.2 (0.6)	-0.5 (0.5)	-0.3 (0.6)	-0.4 (0.5)	-0.3 (0.6)
Median (IQR)	-0.6 (-0.6 to 0.2)	-0.2 (-0.6 to 0.2)	-0.6 (-1.0 to -0.2)	-0.6 (-0.6 to -0.2)	-0.6 (-1.0 to -0.2)	-0.2 (-0.6 to 0.2)
Modal response, n (%)	220 (31.7%)	206 (30.1%)	403 (45.8%)	304 (35.7%)	623 (39.6%)	510 (33.2%)
Experiment Part 4 (number of tokens donated to ASSIST/Dead Cool; 0-10)						
Mean (SD)	3.5 (3.1)	3.1 (2.8)	4.0 (2.5)	3.8 (2.5)	3.8 (2.8)	3.4 (2.7)
Median (IQR)	3.0 (1.0 to 5.0)	3.0 (0.0 to 5.0)	5.0 (2.0 to 5.0)	5.0 (2.0 to 5.0)	4.0 (1.0 to 5.0)	4.0 (1.0 to 5.0)
Survey: Smoking behavior, intentions, and attitudes						
Smoking behavior, n (%)[d]						
Mean (SD)	3.8 (0.6)	3.8 (0.7)	3.7 (0.7)	3.7 (0.7)	3.8 (0.6)	3.7 (0.7)
Sometimes smoke	13 (1.9%)	20 (3.1%)	14 (1.6%)	12 (1.4%)	27 (1.7%)	32 (2.1%)
Previous smoker	22 (3.1%)	27 (4.1%)	71 (8.1%)	79 (9.3%)	93 (5.9%)	106 (7.1%)
Smoked once	48 (6.9%)	46 (7.0%)	73 (8.4%)	91 (10.8%)	121 (7.7%)	137 (9.1%)
Never smoked	618 (88.2%)	561 (85.8%)	714 (81.9%)	664 (78.5%)	1332 (84.7%)	1225 (81.7%)
Intent to take up smoking in the next 6 months, n(%)[e]						
Mean (SD)	5.7 (0.8)	5.6 (0.9)	5.5 (1.2)	5.3 (1.3)	5.6 (1.1)	5.5 (1.2)
I am a smoker	10 (1.4%)	13 (2.0%)	39 (4.5%)	48 (5.7%)	49 (3.1%)	61 (4.1%)
Definitely start smoking	1 (0.1%)	1 (0.2%)	2 (0.2%)	-	3 (0.2%)	1 (0.1%)
Probably start smoking	-	3 (0.5%)	8 (0.9%)	14 (1.7%)	8 (0.5%)	17 (1.1%)
Don't know	49 (7.0%)	54 (8.3%)	92 (10.6%)	115 (13.6%)	141 (9.0%)	169 (11.3%)
Probably remain a non-smoker	45 (6.5%)	42 (6.5%)	59 (6.8%)	76 (9.0%)	104 (6.6%)	118 (7.9%)
Definitely remain a non-smoker	592 (84.9%)	538 (82.6%)	672 (77.1%)	593 (70.1%)	1264 (80.6%)	1131 (75.6%)
Survey: Self-reported injunctive social norms, n(%)[f]						

Most of the people who are important to me think that I…						
Mean (SD)	1.7 (0.7)	1.7 (0.7)	1.8 (0.6)	1.7 (0.7)	1.8 (0.7)	1.7 (0.7)
Definitely should smoke-Maybe should not smoke	101 (14.6%)	105 (16.3%)	128 (14.7%)	144 (17.0%)	229 (14.6%)	249 (16.7%)
Definitely should not smoke	593 (85.5%)	540 (83.7%)	744 (85.3%)	702 (83.0%)	1337 (85.4%)	1242 (83.3%)
My mother thinks that I…						
Mean (SD)	1.9 (0.3)	1.9 (0.4)	1.9 (0.4)	1.9 (0.5)	1.9 (0.4)	1.9 (0.4)
Definitely should smoke-Maybe should not smoke	28 (4.0%)	26 (4.0%)	53 (6.1%)	62 (7.3%)	81 (5.2%)	88 (5.9%)
Definitely should not smoke	663 (95.4%)	618 (95.7%)	815 (93.5%)	779 (92.1%)	1478 (94.3%)	1397 (93.6%)
I don't have a mother	4 (0.6%)	2 (0.3%)	4 (0.5%)	5 (0.6%)	8 (0.5%)	7 (0.5%)
My father thinks that I…						
Mean (SD)	1.8 (0.6)	1.8 (0.6)	1.7 (0.7)	1.7 (0.7)	1.7 (0.7)	1.7 (0.7)
Definitely should smoke-Maybe should not smoke	35 (5.1%)	44 (6.8%)	93 (10.7%)	106 (12.5%)	128 (8.2%)	150 (10.1%)
Definitely should not smoke	627 (90.6%)	575 (89.2%)	701 (80.4%)	683 (80.7%)	1328 (84.9%)	1258 (84.4%)
I don't have a father	30 (4.3%)	26 (4.0%)	78 (8.9%)	57 (6.7%)	108 (6.9%)	83 (5.6%)
My brother(s) think(s) that I…						
Mean (SD)	1.4 (0.9)	1.4 (0.9)	1.4 (0.9)	1.5 (0.8)	1.4 (0.9)	1.4 (0.9)
Definitely should smoke-Maybe should not smoke	81 (11.7%)	87 (13.5%)	159 (18.2%)	133 (15.7%)	240 (15.4%)	220 (14.8%)
Definitely should not smoke	465 (67.3%)	430 (66.7%)	583 (66.9%)	605 (71.5%)	1048 (67.1%)	1035 (69.4%)
I don't have a brother	145 (21.0%)	128 (19.8%)	130 (14.9%)	108 (12.8%)	275 (17.6%)	236 (15.8%)
My sister(s) think(s) that I…						
Mean (SD)	1.4 (0.9)	1.4 (0.9)	1.4 (0.9)	1.4 (0.9)	1.4 (0.9)	1.4 (0.9)
Definitely should smoke-Maybe should not smoke	54 (7.8%)	63 (9.8%)	125 (14.3%)	112 (13.2%)	179 (11.4%)	175 (11.7%)
Definitely should not smoke	476 (68.7%)	432 (67.0%)	570 (65.4%)	586 (69.3%)	1046 (66.8%)	1018 (68.3%)
I don't have a sister	163 (23.5%)	150 (23.3%)	177 (20.3%)	148 (17.5%)	340 (21.7%)	298 (20.0%)
My friends think that I…						
Mean (SD)	1.5 (0.9)	1.5 (0.9)	1.3 (1.0)	1.3 (0.9)	1.4 (0.9)	1.4 (0.9)
Definitely should smoke-Maybe should not smoke	207 (29.8%)	169 (26.2%)	347 (39.8%)	346 (40.9%)	554 (35.4%)	515 (34.5%)
Definitely should not smoke	480 (69.2%)	469 (72.7%)	523 (60.0%)	498 (58.9%)	1003 (64.1%)	967 (64.9%)
I don't have a friend	7 (1.0%)	7 (1.1%)	2 (0.2%)	2 (0.2%)	9 (0.6%)	9 (0.6%)
My best friend thinks that I…						
Mean (SD)	1.7 (0.7)	1.6 (0.8)	1.5 (0.9)	1.5 (0.9)	1.6 (0.8)	1.6 (0.8)
Definitely should smoke-Maybe should not smoke	115 (16.6%)	116 (18.0%)	220 (25.2%)	211 (24.9%)	335 (21.4%)	327 (21.9%)

Definitely should not smoke	568 (81.8%)	520 (80.5%)	607 (69.6%)	592 (70.0%)	1175 (75.0%)	1112 (74.5%)
I don't have a best friend	11 (1.6%)	10 (1.6%)	45 (5.2%)	43 (5.1%)	56 (3.6%)	53 (3.6%)
Survey: Self-reported descriptive social norms, n(%)[g]						
Does your best friend smoke?						
Mean (SD)	4.8 (0.8)	4.7 (0.8)	4.8 (0.7)	4.8 (0.6)	4.8 (0.7)	4.8 (0.7)
Very often-Rarely	72 (10.4%)	83 (12.8%)	80 (9.2%)	80 (9.5%)	152 (9.7%)	163 (10.9%)
Never/Don't know	603 (86.8%)	533 (82.4%)	704 (80.7%)	686 (81.1%)	1307 (83.4%)	1219 (81.7%)
I don't have a best friend	20 (2.9%)	31 (4.8%)	88 (10.1%)	80 (9.5%)	108 (6.9%)	111 (7.4%)
Does your mother smoke?						
Mean (SD)	4.2 (1.4)	4.3 (1.3)	4.6 (1.0)	4.6 (1.0)	4.4 (1.2)	4.5 (1.1)
Very often-Rarely	206 (29.6%)	181 (28.0%)	159 (18.2%)	144 (17.0%)	365 (23.3%)	325 (21.8%)
Never/Don't know	486 (69.8%)	461 (71.3%)	708 (81.2%)	697 (82.4%)	1194 (76.2%)	1158 (77.6%)
I don't have a mother	4 (0.6%)	5 (0.8%)	5 (0.6%)	5 (0.6%)	9 (0.6%)	10 (0.7%)
Does your father smoke?						
Mean (SD)	4.2 (1.4)	4.2 (1.4)	4.4 (1.2)	4.4 (1.1)	4.3 (1.3)	4.3 (1.3)
Very often-Rarely	204 (29.4%)	189 (29.2%)	217 (24.9%)	209 (14.9%)	421 (26.9%)	398 (26.7%)
Never/Don't know	453 (65.2%)	421 (65.1%)	570 (65.4%)	571 (67.5%)	1023 (65.3%)	992 (66.4%)
I don't have a father	38 (5.5%)	37 (5.7%)	85 (9.8%)	66 (7.8%)	123 (7.9%)	103 (6.9%)
Do any of your brothers smoke?						
Mean (SD)	4.7 (0.9)	4.7 (0.9)	4.7 (0.8)	4.7 (0.9)	4.7 (0.9)	4.7 (0.9)
Very often-Rarely	47 (10.1%)	79 (12.2%)	105 (8.0%)	111 (13.1%)	175 (11.2%)	190 (12.7%)
Never/Don't know	451 (64.9%)	415 (64.1%)	592 (67.9%)	588 (69.5%)	1043 (66.6%)	1003 (67.2%)
I don't have a brother	174 (24.0%)	153 (23.7%)	175 (20.1%)	147 (17.4%)	349 (22.3%)	300 (20.1%)
Do any of your sisters smoke?						
Mean (SD)	4.8 (0.7)	4.8 (0.7)	4.8 (0.7)	4.8 (0.7)	4.8 (0.7)	4.8 (0.7)
Very often-Rarely	47 (6.8%)	51 (7.9%)	70 (8.0%)	68 (8.0%)	117 (7.5%)	119 (8.0%)
Never/Don't know	458 (65.9%)	415 (64.2%)	563 (64.6%)	558 (66.0%)	1021 (65.2%)	973 (65.2%)
I don't have a sister	190 (27.3%)	181 (28.0%)	239 (27.4%)	220 (26.0%)	429 (27.4%)	401 (26.9%)
Survey: Psycho-social characteristics						
Need to Belong Scale[h]						
Mean (SD)	3.1 (0.6)	-	2.8 (0.6)	-	3.0 (0.6)	-
Median (IQR)	3.1 (2.7 to 3.5)	-	2.8 (2.3 to 3.2)	-	3.0 (2.5 to 3.4)	-
Fear of Negative Evaluation[i]						
Mean (SD)	2.9 (0.7)	-	2.6 (0.6)	-	2.7 (0.7)	-
Median (IQR)	2.8 (2.4 to 3.4)	-	2.5 (2.3 to 2.9)	-	2.7 (2.3 to 3.1)	-
Pro-social Behavior[j]						
Mean (SD)	8.1 (2.1)	-	7.3 (2.1)	-	7.6 (2.1)	-
Median (IQR)	9.0 (7.0 to 10.0)	-	8.0 (6.0 to 9.0)	-	8.0 (6.0 to 9.0)	-

Big 5 (Openness)[k]						
Mean (SD)	2.4 (0.6)	-	2.7 (0.7)	-	2.6 (0.7)	-
Median (IQR)	2.4 (2.0 to 2.9)	-	2.7 (2.2 to 3.2)	-	2.6 (2.1 to 3.1)	-
Big 5 (Extraversion)[k]						
Mean (SD)	2.6 (0.8)	-	2.7 (0.7)	-	2.6 (0.7)	-
Median (IQR)	2.6 (2.0 to 3.2)	-	2.7 (2.2 to 3.2)	-	2.6 (2.1 to 3.2)	-
Big 5 (Agreeableness)[k]						
Mean (SD)	2.5 (0.6)	-	2.6 (0.7)	-	2.6 (0.7)	-
Median (IQR)	2.5 (2.0 to 3.0)	-	2.6 (2.1 to 3.1)	-	2.5 (2.0 to 3.0)	-
Big 5 (Conscientiousness)[k]						
Mean (SD)	2.3 (0.7)	-	2.4 (0.6)	-	2.4 (0.7)	-
Median (IQR)	2.1 (1.9 to 2.7)	-	2.3 (2.0 to 2.8)	-	2.2 (1.9 to 2.8)	-
Big 5 (Stability)[k]						
Mean (SD)	1.9 (0.8)	-	2.1 (0.7)	-	2.0 (0.7)	-
Median (IQR)	1.9 (1.3 to 2.4)	-	2.0 (1.6 to 2.5)	-	2.0 (1.5 to 2.5)	-
Smokerlyzer readings: Objective smoking behavior (expelled air carbon monoxide, ppm)[l]						
Mean (SD)	1.5 (1.4)	2.0 (1.0)	3.4 (1.5)	3.5 (1.7)	2.5 (1.7)	2.8 (1.6)
Non-smoker (≤9 ppm), n (%)	590 (99.8%)	591 (100.0%)	643 (99.2%)	614 (99.0%)	1233 (99.5%)	1205 (99.5%)
Smoker (>9 ppm), n (%)	1 (0.2%)	0 (0.0%)	5 (0.8%)	6 (1.0%)	6 (0.5%)	6 (0.5%)

[a]Number of balls allocated to the blue (rule-following) or yellow (rule-breaking) buckets.

[b]-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.

[c]-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.

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

[e]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.

[f]-2=Definitely should smoke; -1=Maybe should smoke; 0=Don't know/neutral; +1=Maybe should not smoke; +2=Definitely should not smoke. "I don't have…" responses set to 0.

[g]1=Very often; 2=Often; 3=Occasionally; 4=Rarely; 5=Never/Don't know. “I don’t have…” responses set to 5.

[h]Average of 10 items, coded 1-5. Not available for two Colombian schools (excluded from analysis).

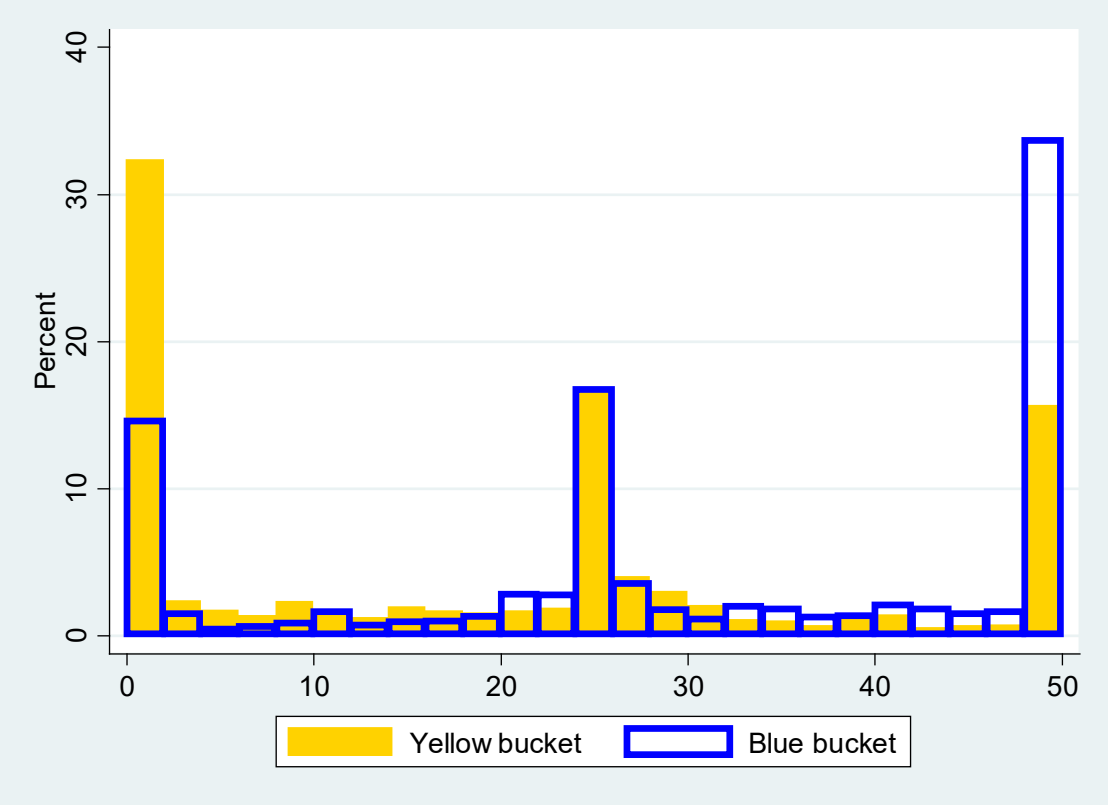
[i]Average of 12 items, coded 1-5. Not available for two Colombian schools (excluded from analysis).

[j]Sum of five items, coded 0-2.

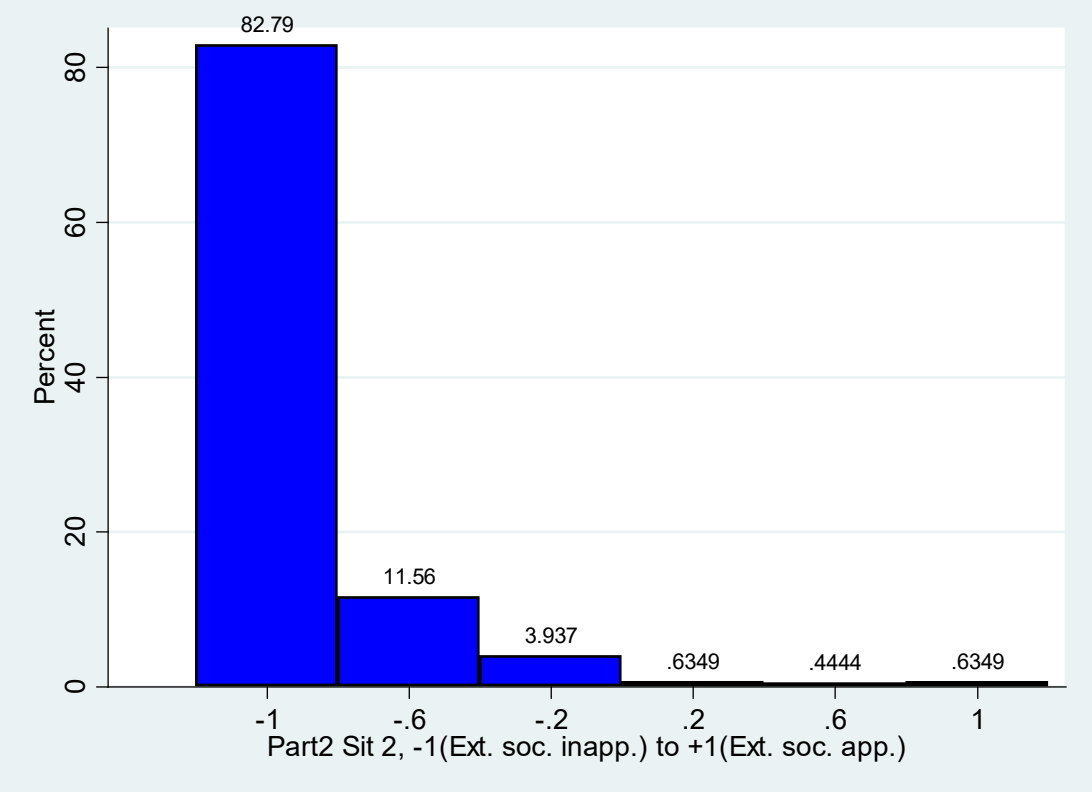
[k]Average of 10 items, coded 0-4.

[l]Not available for one Northern Irish school and two Colombian schools (excluded from analysis).

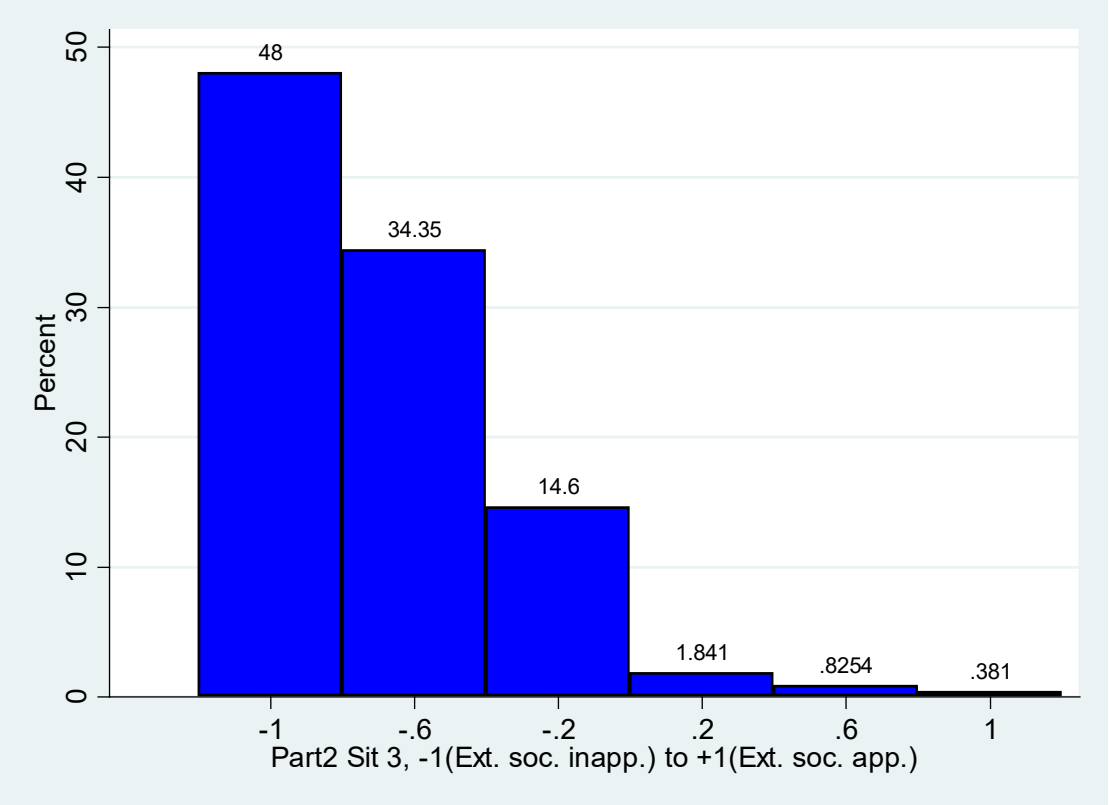
Experiment: Part 1 (Number of balls allocated to blue and yellow buckets, blue=rule-following)



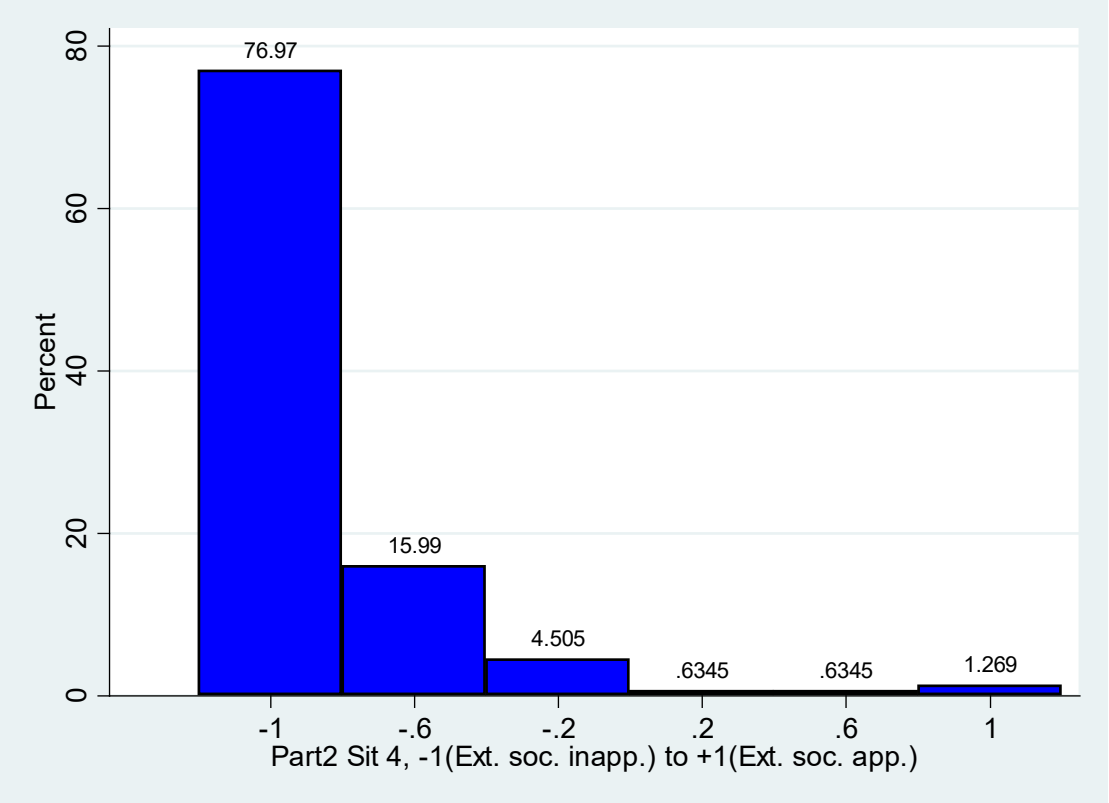
Experiment: Part 2, Situation 2 (Parent smoking at home in front of young children)



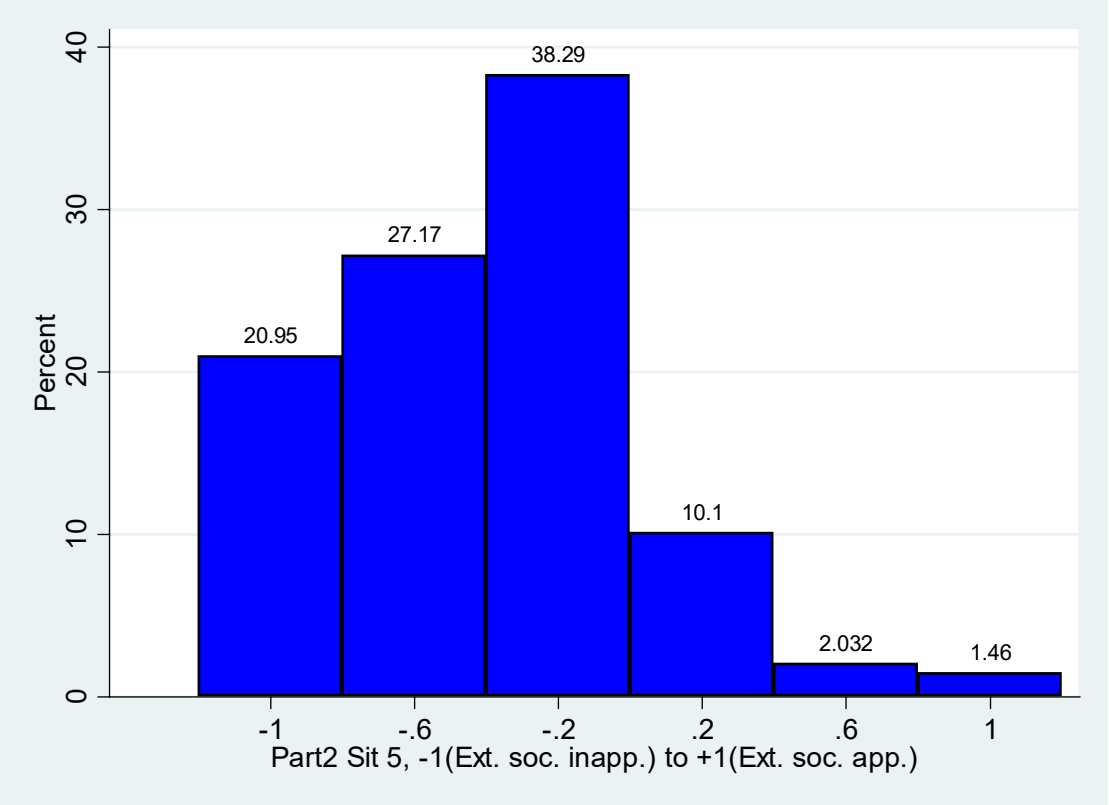
Experiment: Part 2, Situation 3 (Adult smoking in car with children onboard)



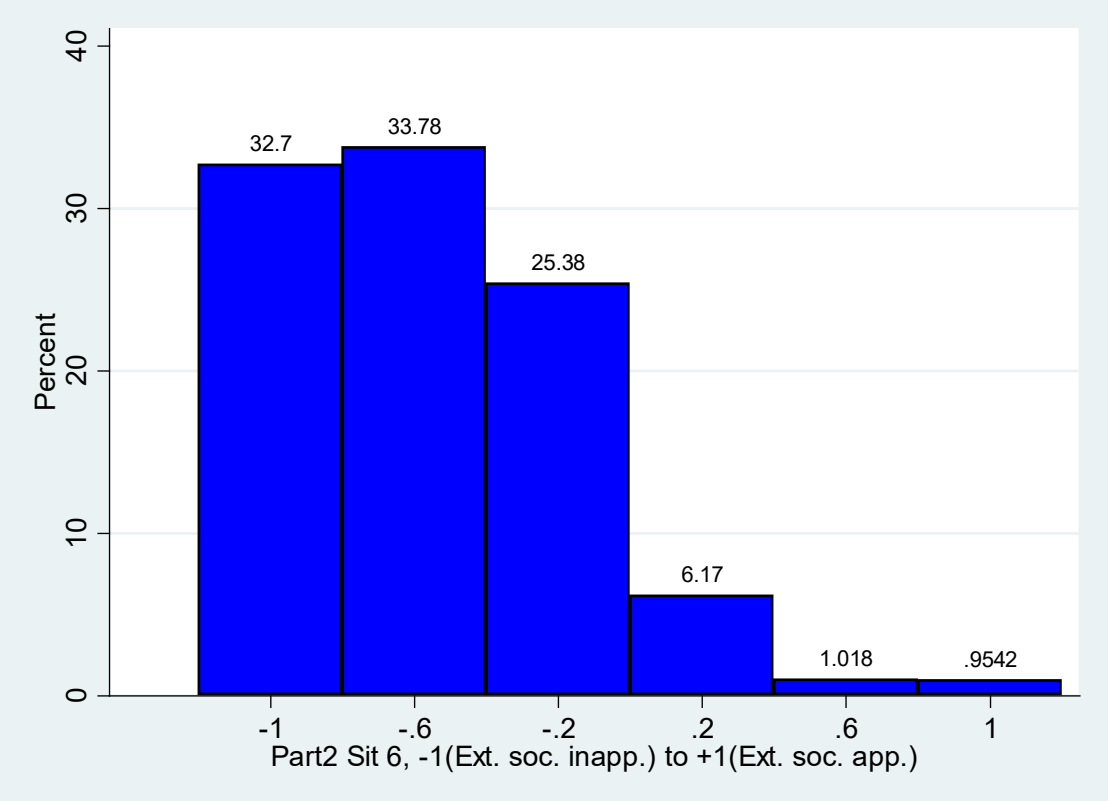
Experiment: Part 2, Situation 4 (Someone selling cigarettes without proof of age)



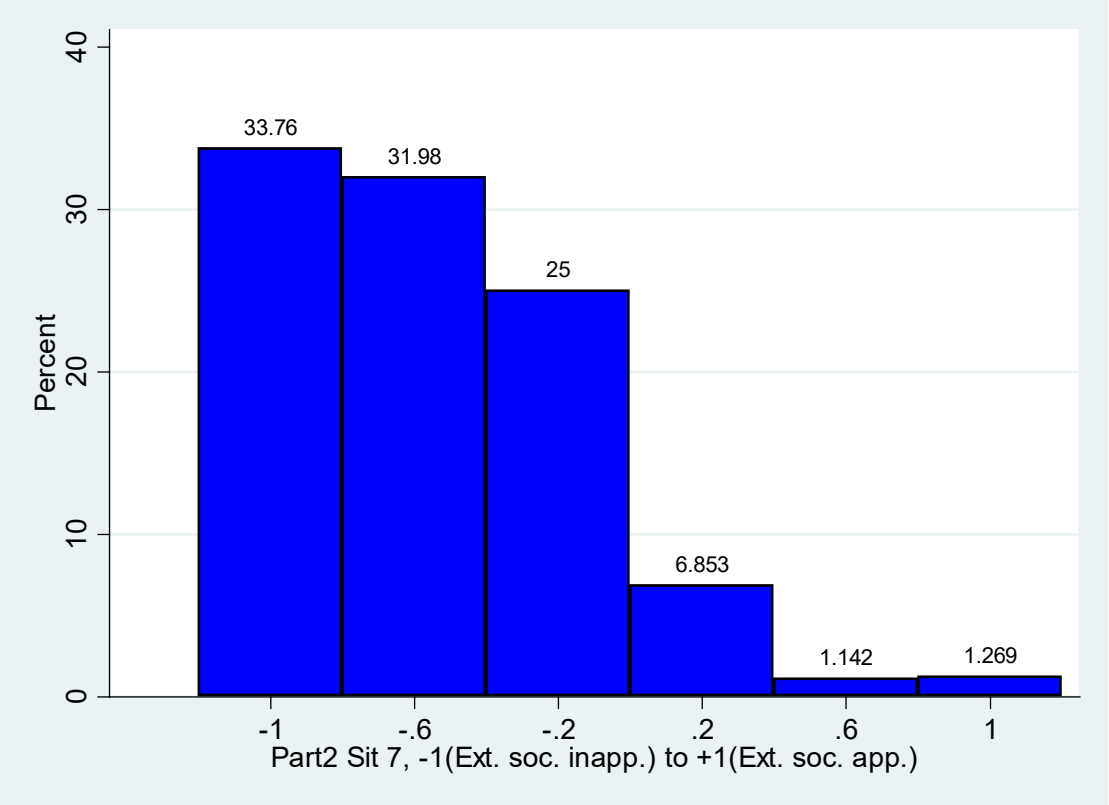
Experiment: Part 2, Situation 5 (Movie showing the lead character smoking)



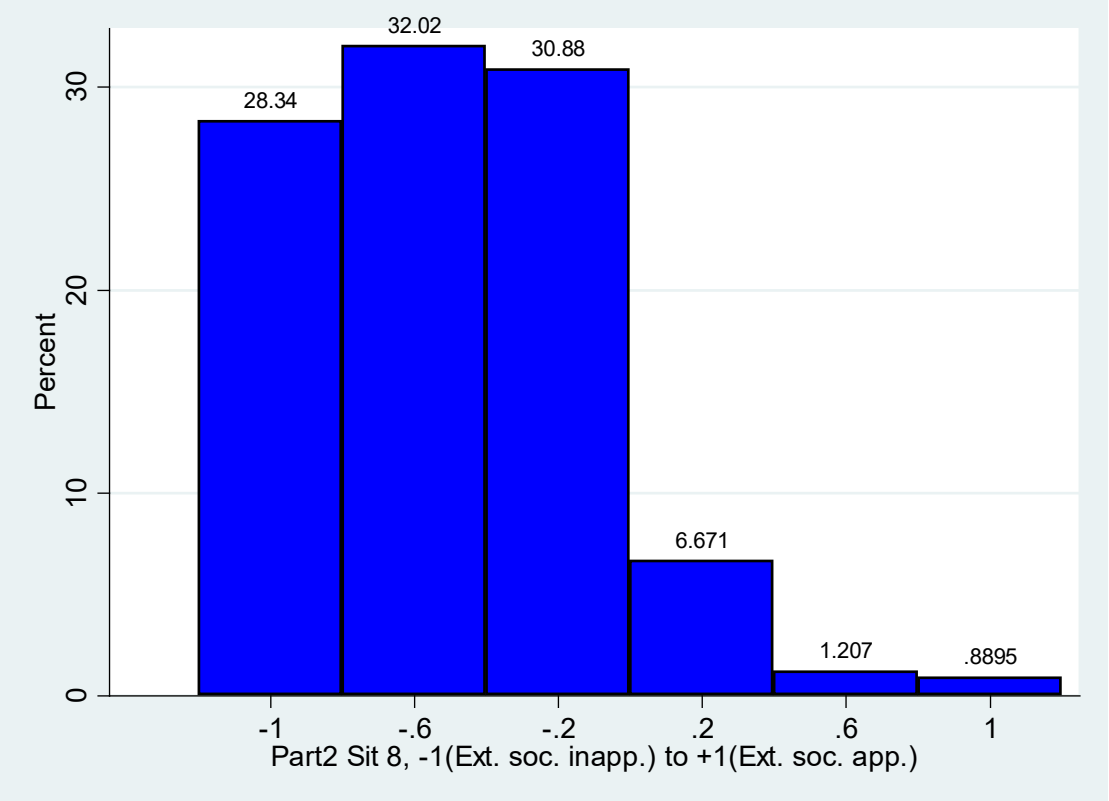
Experiment: Part 2, Situation 6 (Older student smoking outside school)



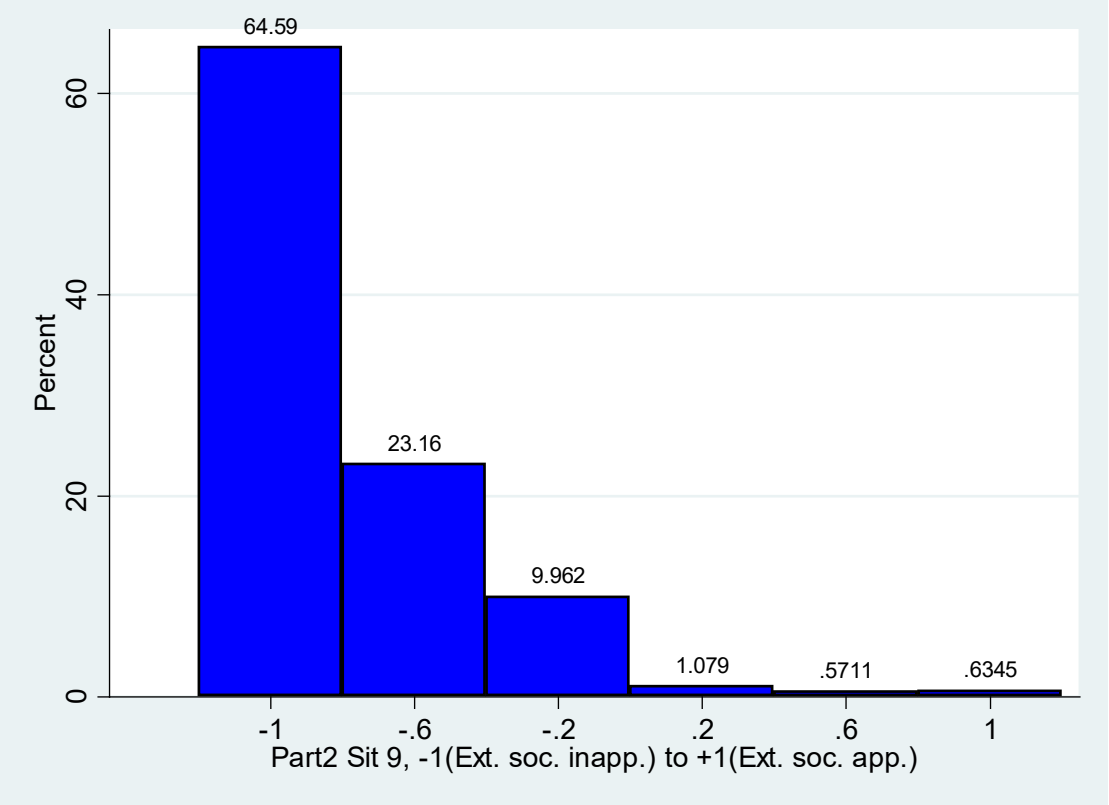
Experiment: Part 2, Situation 7 (School student smoking an e-cigarette)



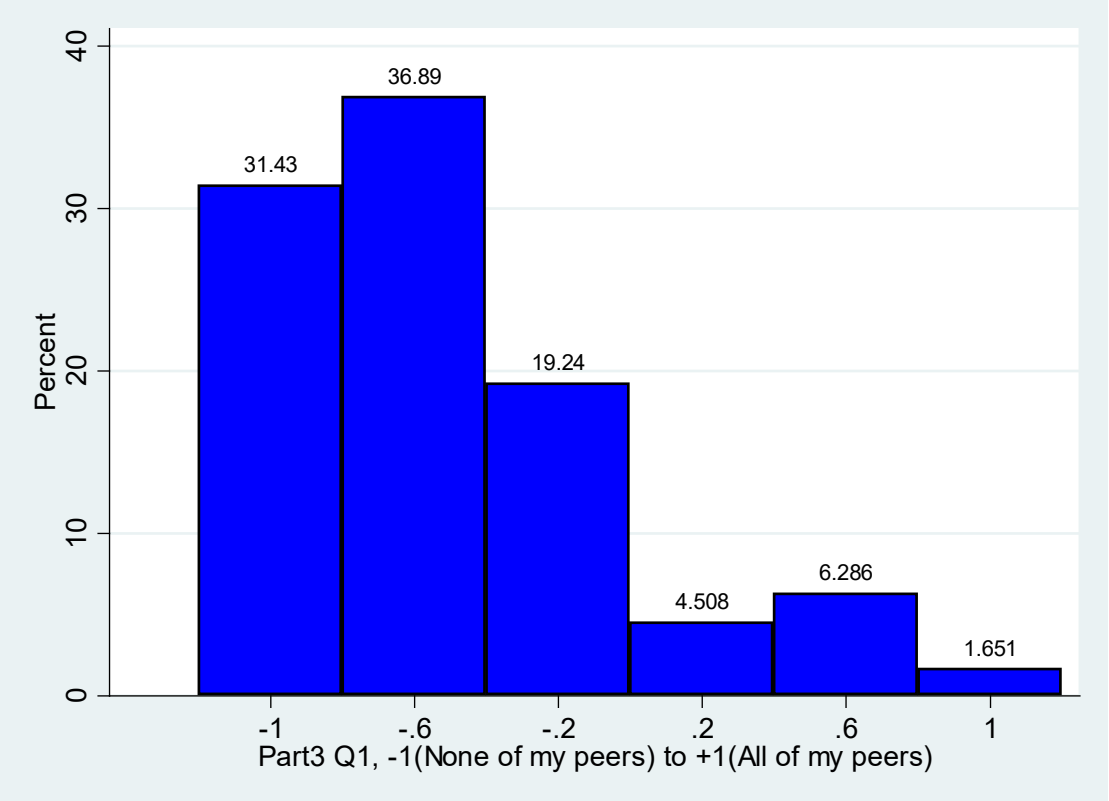
Experiment: Part 2, Situation 8 (School student sharing a photo of his/her e-cigarette use)



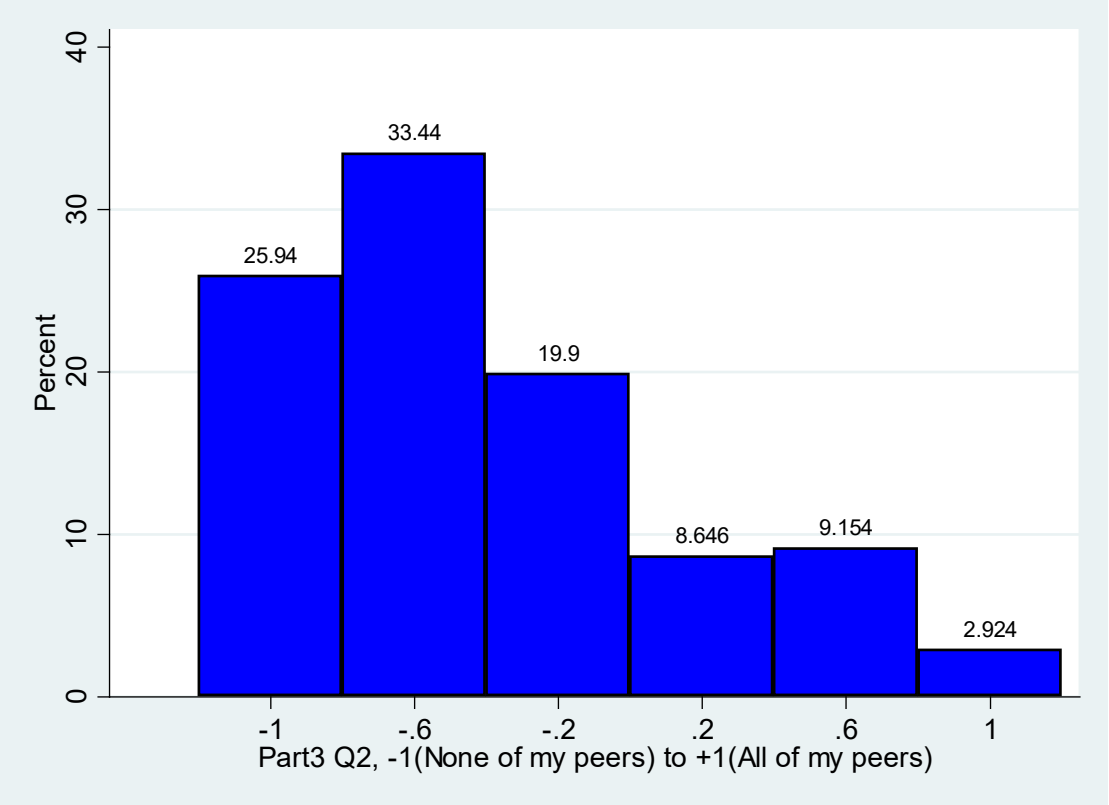
Experiment: Part 2, Situation 9 (School student chewing tobacco)



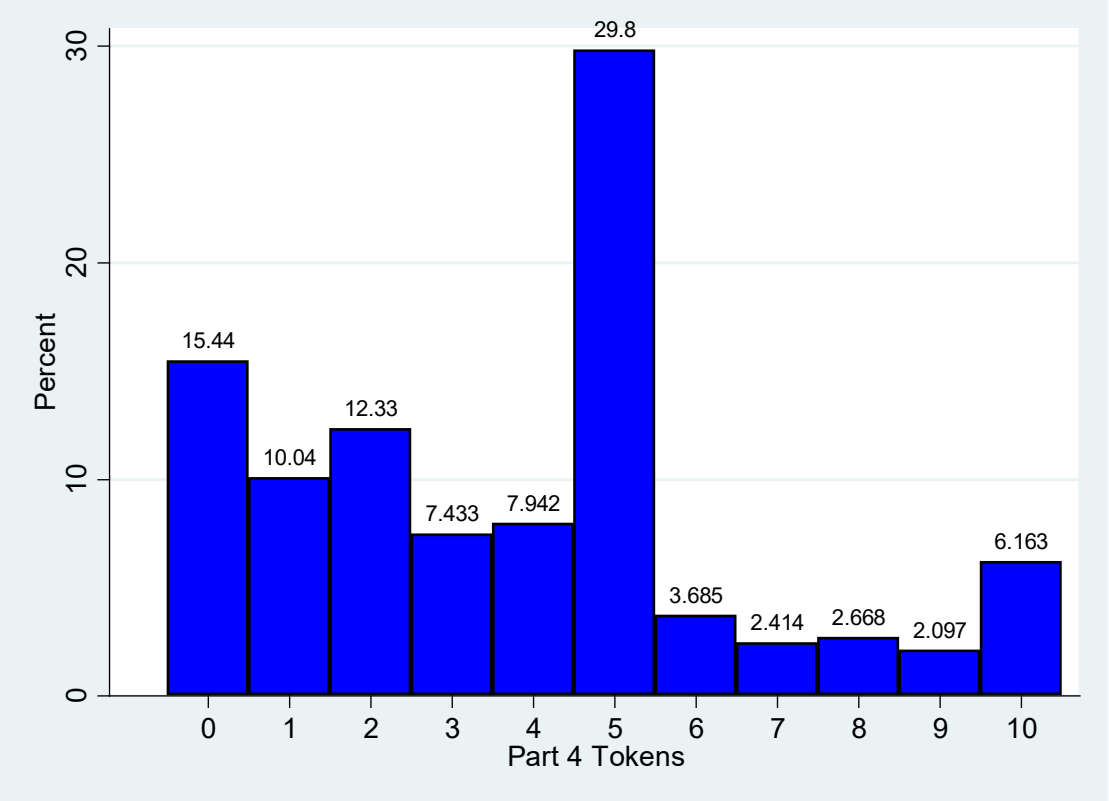
Experiment: Part 3, Q1 (Proportion of peers accepting of a close friend smoking)



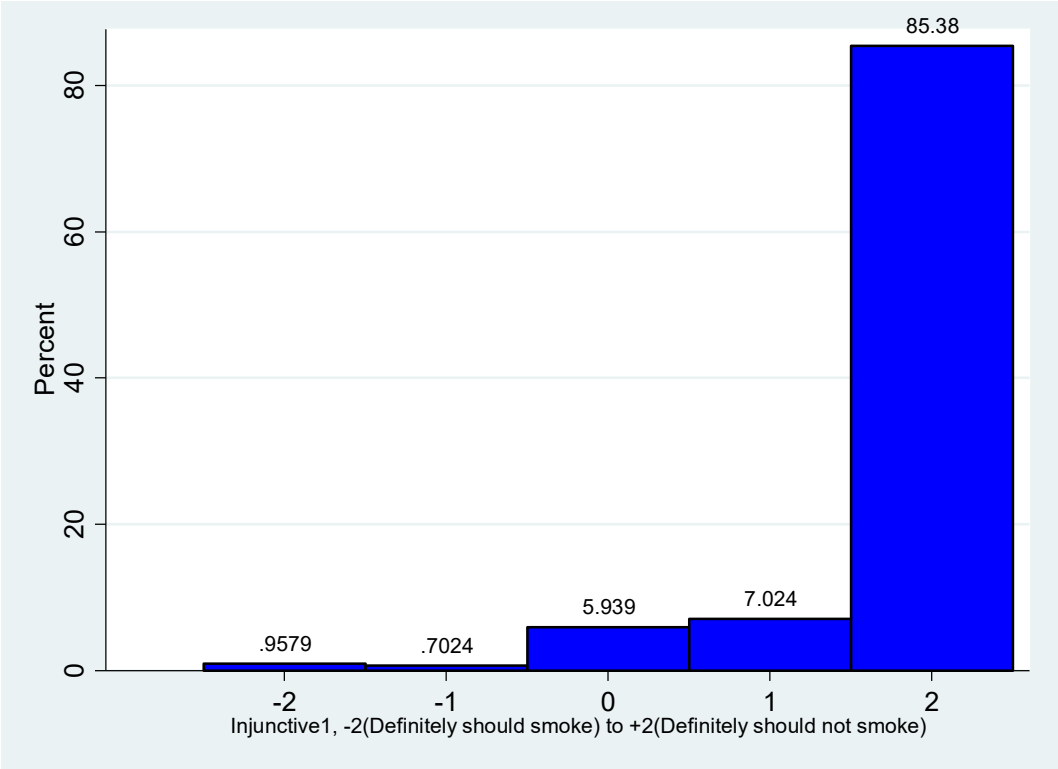
Experiment: Part 3, Q2 (Proportion of peers accepting of a close friend vaping)



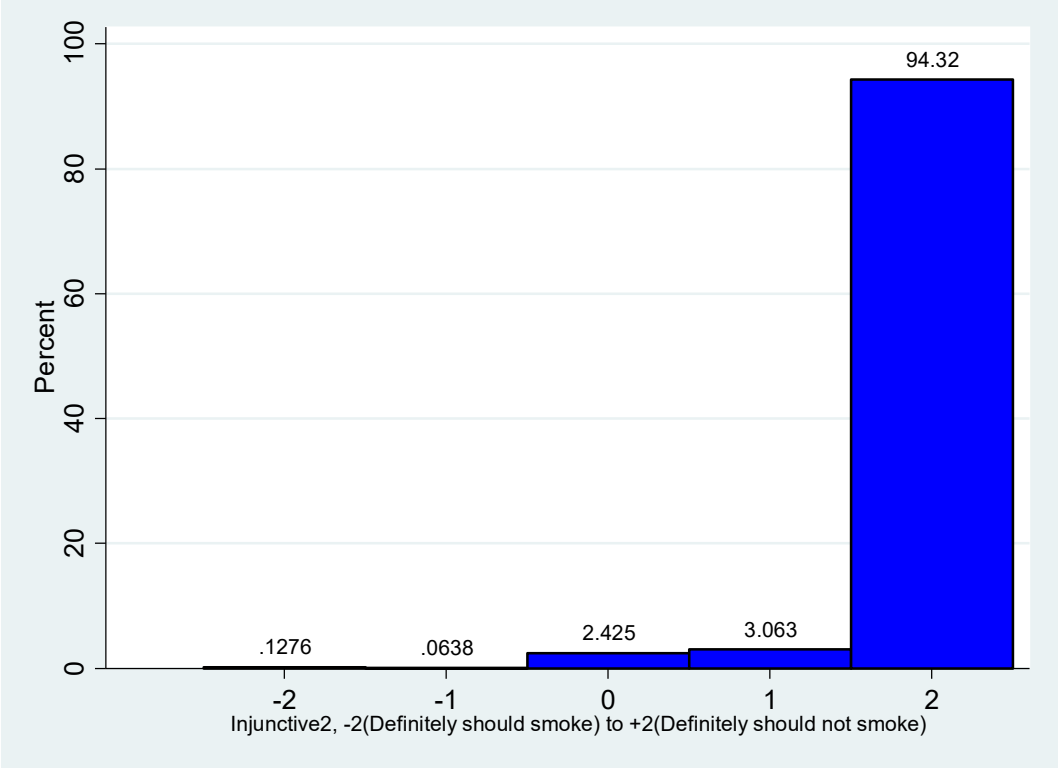
Experiment Part 4: Number of tokens donated



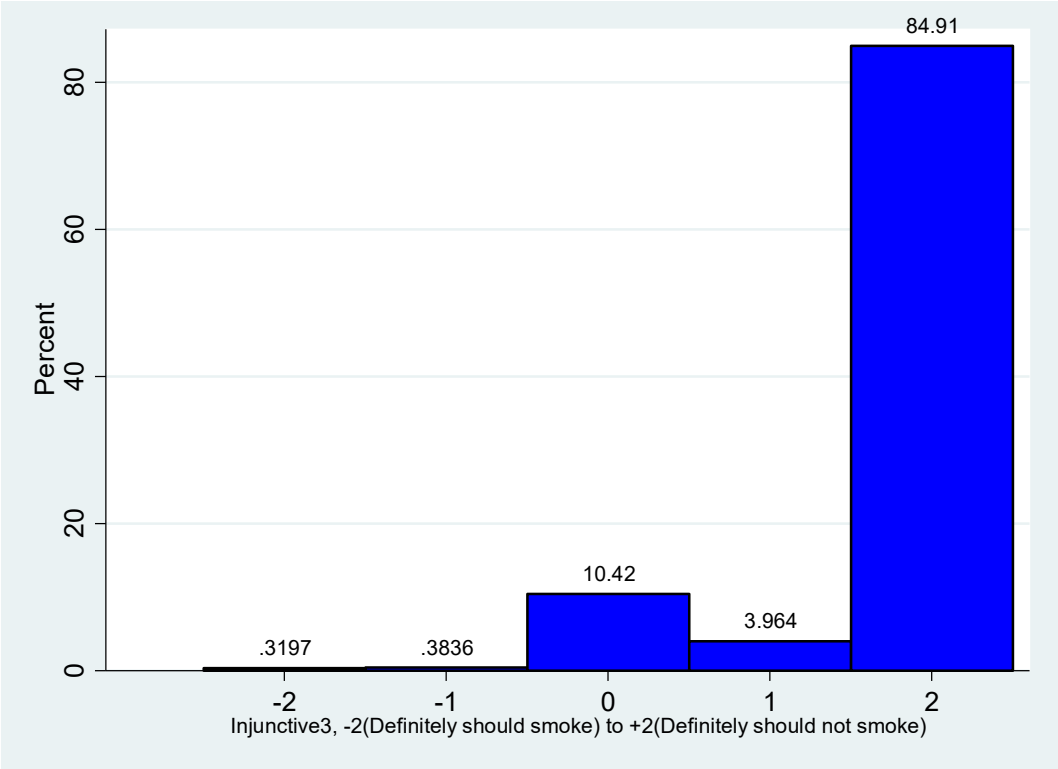
Survey: Injunctive norms 1 (Most of the people who are important to me think that I…)



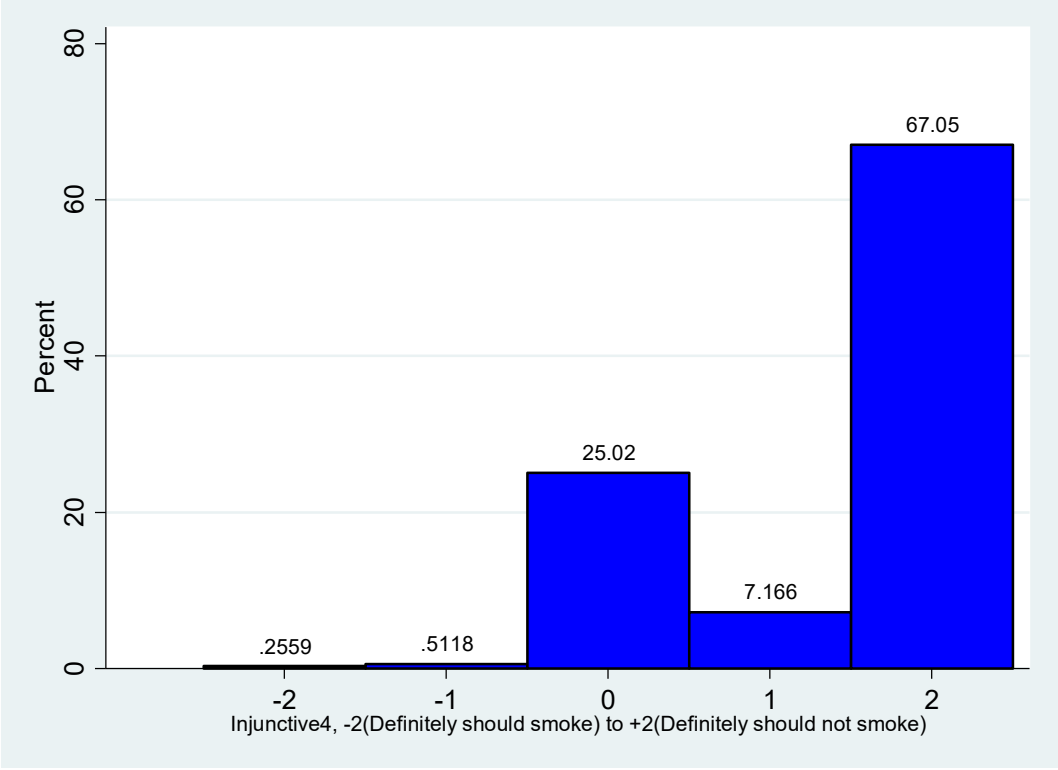
Survey: Injunctive norms 2 (My mother thinks that I…)



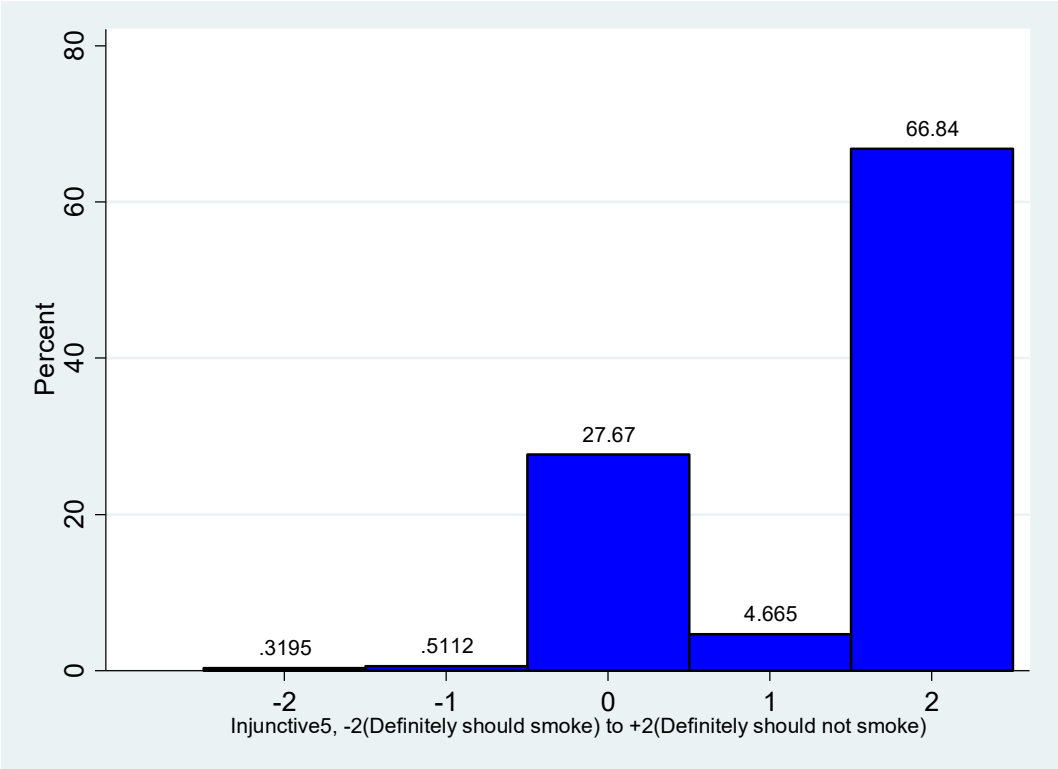
Survey: Injunctive norms 3 (My father thinks that I…)



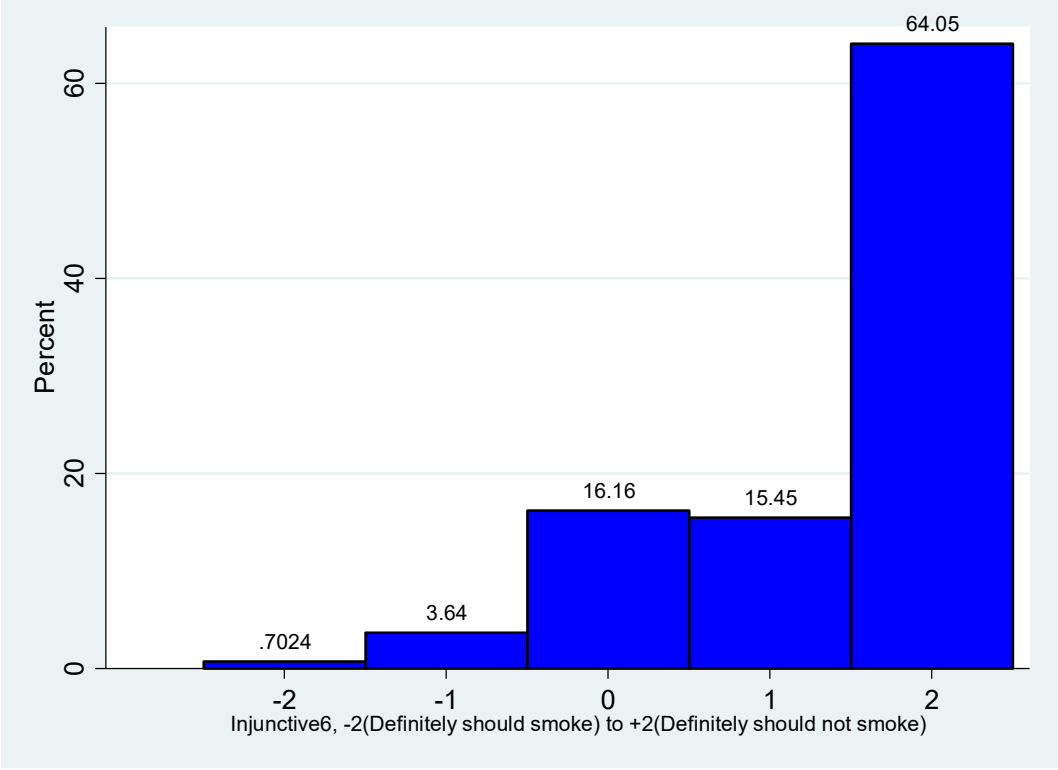
Survey: Injunctive norms 4 (My brother(s) think(s) that I…)



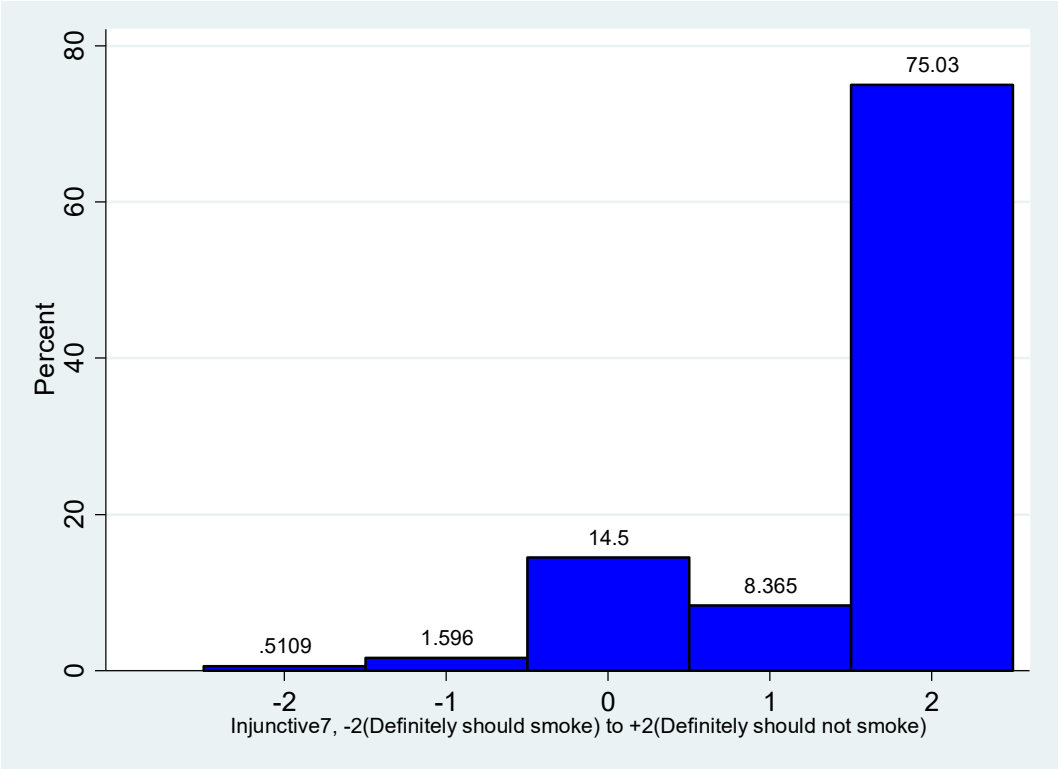
Survey: Injunctive norms 5 (My sister(s) think(s) that I…)



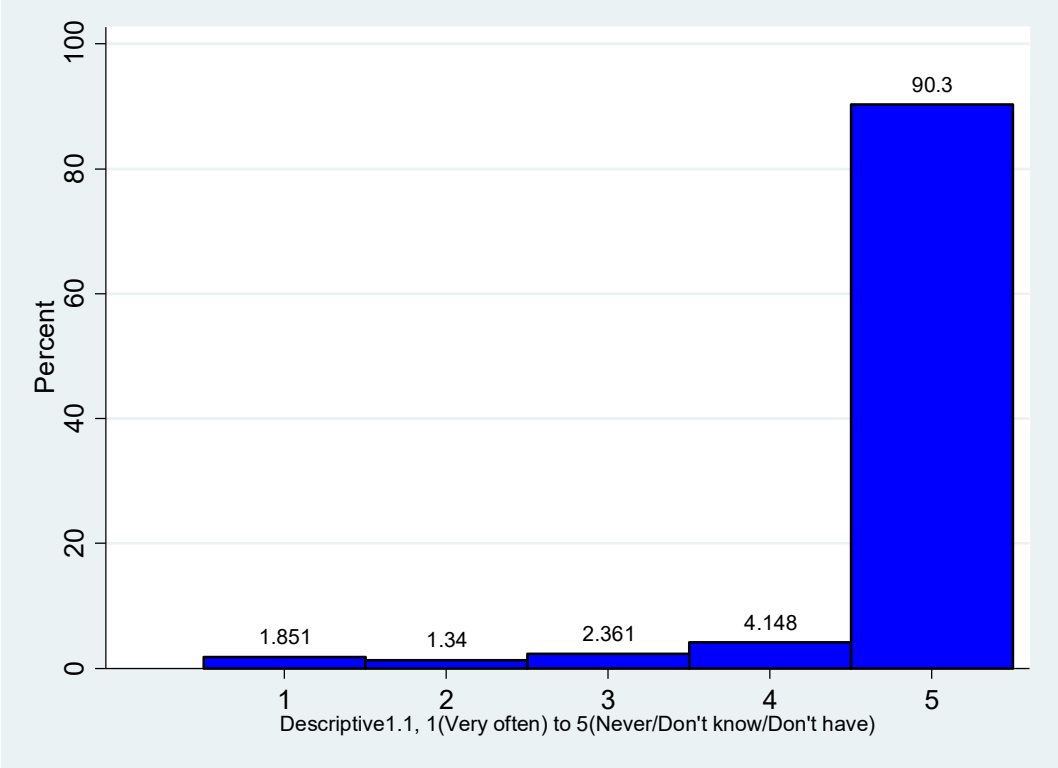
Survey: Injunctive norms 6 (My friends think that I…)



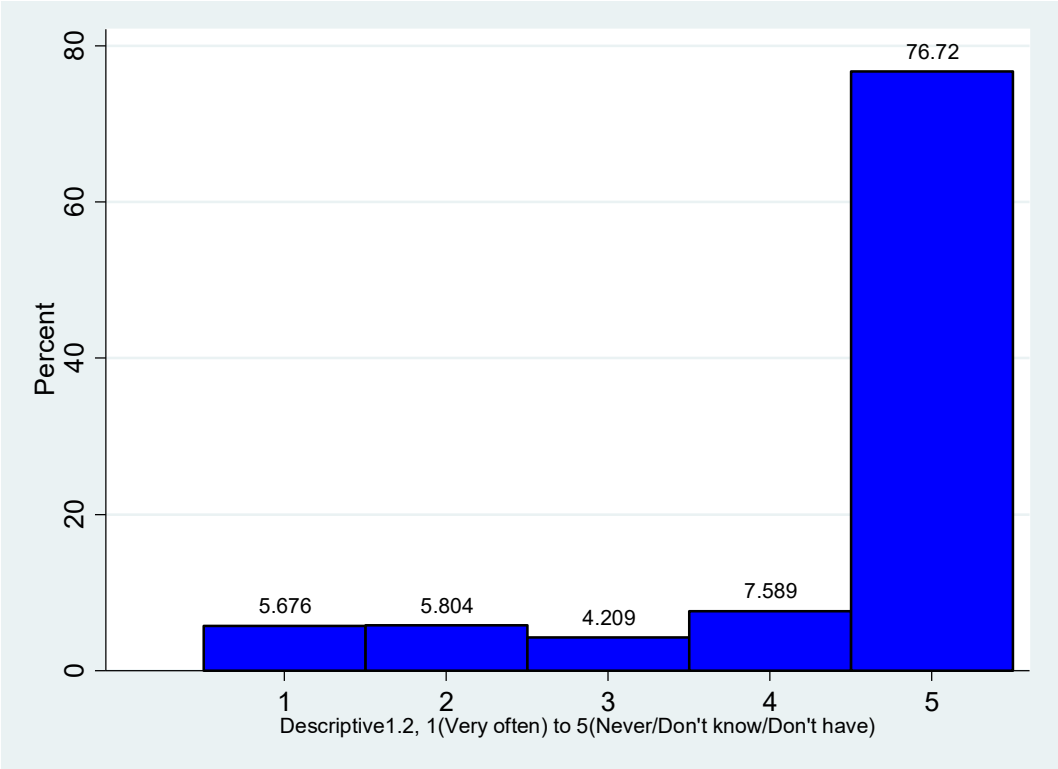
Survey: Injunctive norms 7 (My best friend thinks that I…)



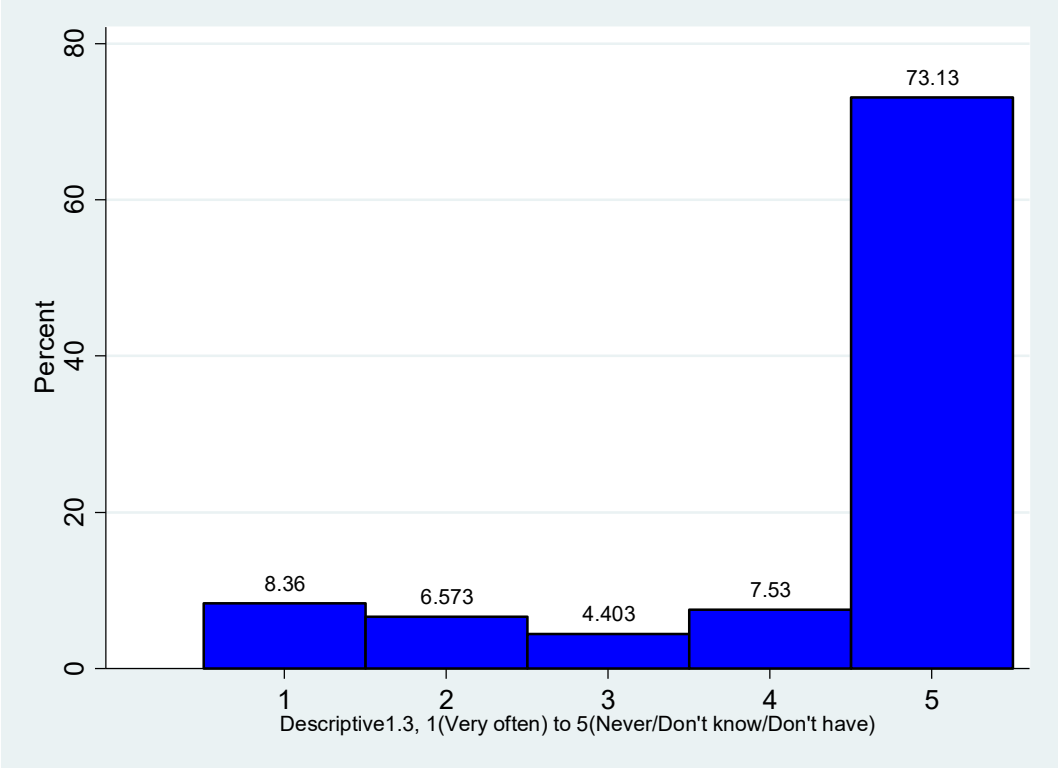
Survey: Descriptive norms 1 (Does your best friend smoke?)



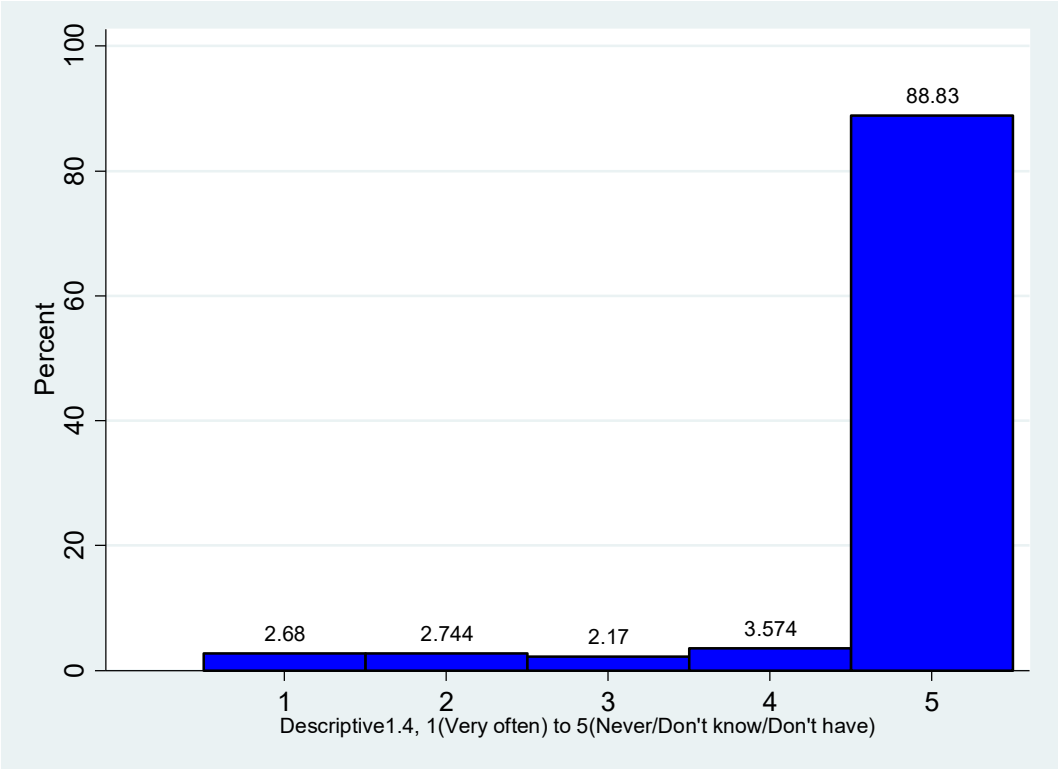
Survey: Descriptive norms 2 (Does your mother smoke?)



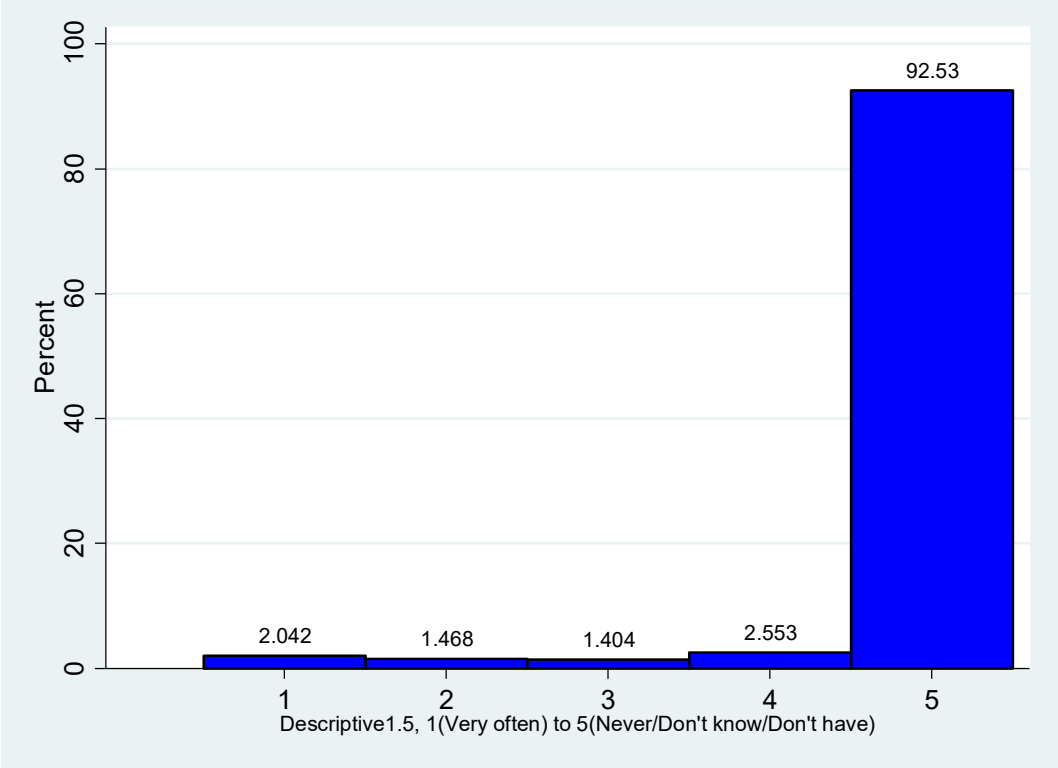
Survey: Descriptive norms 3 (Does your father smoke?)



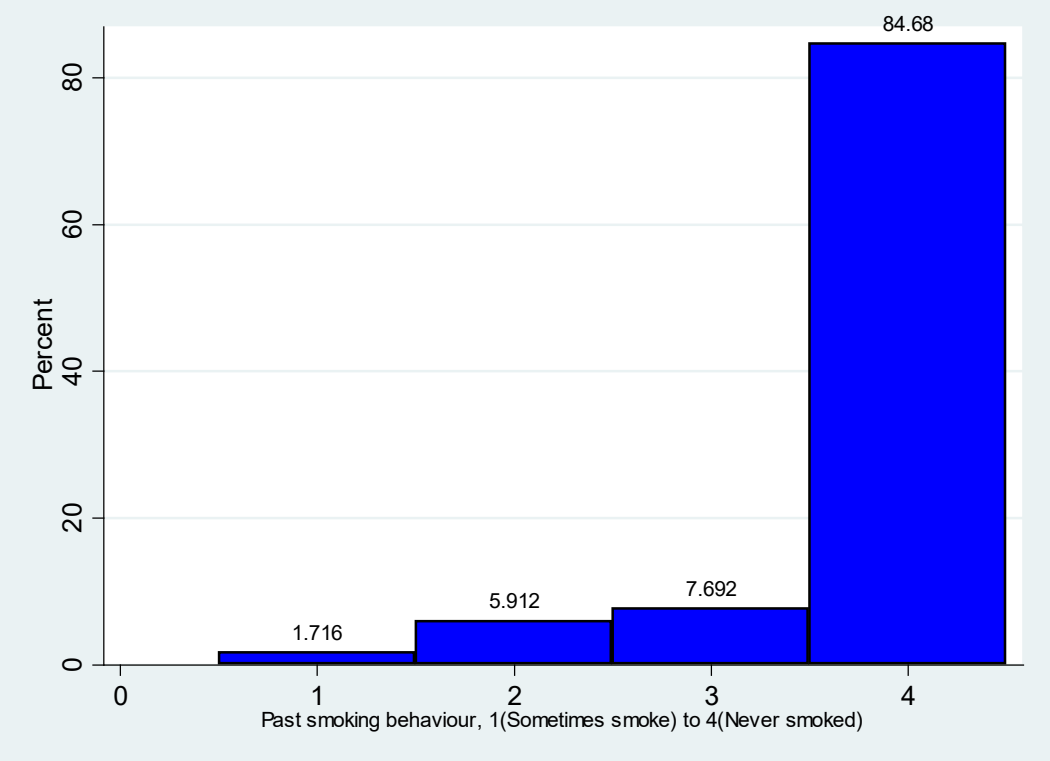
Survey: Descriptive norms 4 (Do any of your brothers smoke?)



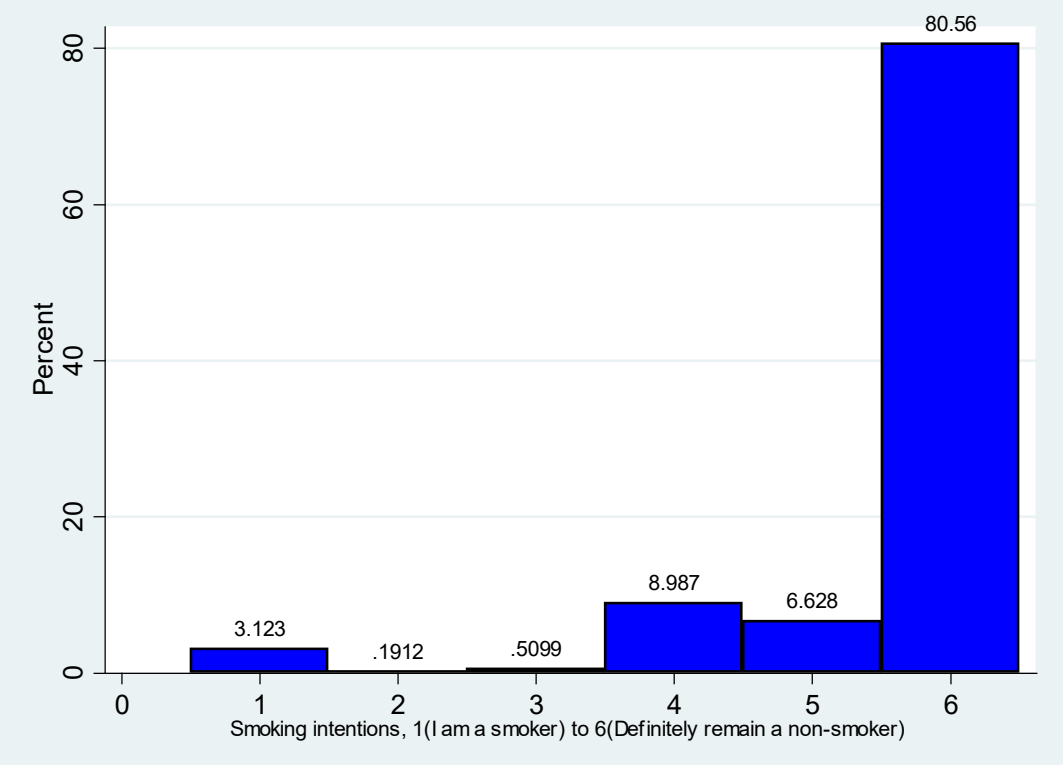
Survey: Descriptive norms 5 (Do any of your sisters smoke?)



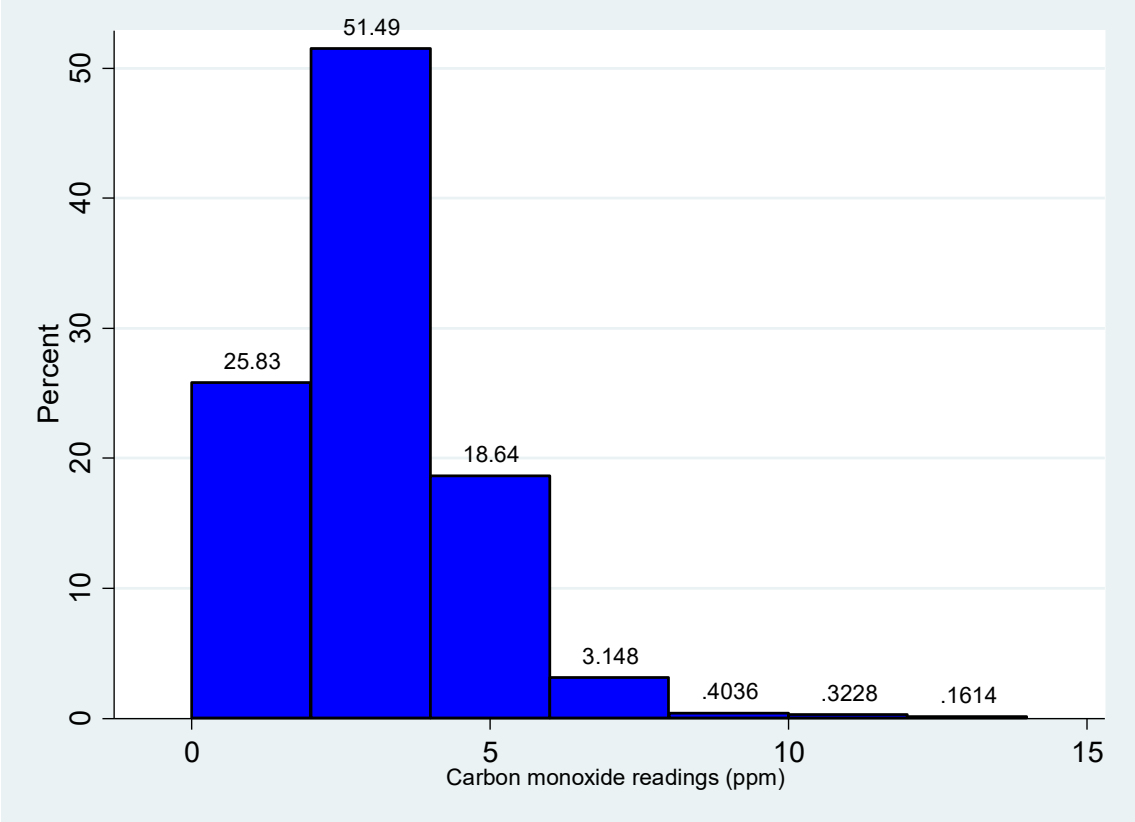
Survey: Past smoking behavior (1=Sometimes smoke; 2=Previous smoker; 3=Smoked once; 4=Never smoked)



Survey: Smoking intentions (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)



Smokerlyzer readings: Objective smoking behavior (expelled air carbon monoxide, parts per million; ppm). Not available for one Northern Irish school and two Colombian schools.



Supplement 5: Spearman's rank-order correlations and results of mixed-effects regressions

Methods for correlational analyses and mixed-effects regressions

As a first step towards establishing a basis for construct validity, Spearman's rank-order correlations were computed, examining the association between individual items from the experiments and survey, separately for injunctive and descriptive norm items. Spearman's rank-order correlations were also computed examining the associations between self-reported anti-smoking behavior and intentions, and objectively measured smoking behavior. Next, individual items from the experiment and survey were examined for an association with self-reported anti-smoking behavior and intentions using mixed-effects ordered logistic regressions. Individual items from the experiment and survey were examined for an association with objectively measured smoking behavior derived from the Smokerlyzer readings using mixed-effects linear regressions with robust standard errors (i.e. examining individual items in relation to an external criteria). In each model either anti-smoking behavior, anti-smoking intentions, or objectively measured smoking behavior (expelled air carbon monoxide in parts per million; ppm) was the dependent variable, and individual injunctive or descriptive norm items from the experiment or survey were the independent variables. Models were also adjusted for sex (boy, girl/Prefer not to say), intervention (ASSIST, Dead Cool) and country (NI, Colombia). Models including items from the experiment were adjusted for rule-following (number of balls allocated to the blue bucket in Part 1). Each model had three levels, including random effects modelling classes within schools. For the mixed-effects ordered logistic regression models (including self-reported anti-smoking behavior or intentions as the dependent variable), analyses were conducted using Stata's 'meologit' command. Reported results are odds ratios (ORs) and 95% confidence intervals (CIs). The proportional odds assumption was tested for each model using Stata's 'omodel' module which performs an approximate likelihood-ratio test of proportionality of odds across response categories ($p<0.05$ indicated a potential violation of the proportional odds assumption). These models were re-run as mixed-effects linear regressions using Stata's 'mixed' command with no major differences to the results (data not presented). For the mixed effects linear regression models (including objective smoking behavior as the dependent variable), analyses were conducted using Stata's 'mixed' command with the 'vce(robust)' option specified. Reported results are regression coefficients (*b*) and 95% CIs. Results should be interpreted with caution due to multiple testing. However, our objectives were to provide a preliminary appraisal of whether there were theoretically expected relationships between individual item scores and between individual items and relevant external criteria.

Results of correlational analyses and mixed-effects regressions

Correlation matrices showing Spearman's rank-order correlations between individual items from the experiments and survey are shown below. All correlations between items from different instruments (experiment vs. survey; located in the bottom left-hand side of tables) with $p<0.05$ are negative. Most correlations between individual items from the same instrument (experiment

or survey) are positive with $p<0.01$. A correlation matrix is also shown with Spearman's rank-order correlations between self-reported anti-smoking behavior and intentions, and objectively measured smoking behavior. The correlations between self-reported anti-smoking behavior and objective smoking behavior are negative with $p<0.01$. The correlation between self-reported anti-smoking behavior and self-reported anti-smoking intentions is positive with $p<0.01$.

These results are as expected since numerically the experiment and survey norms are coded in intuitively the opposite direction. Experiment injunctive norms items are coded such that higher numerical values equate to higher perceptions that situations involving smoking or vaping are socially appropriate. By contrast, survey injunctive norm items are coded such that higher numerical values equate to higher perceptions that others who are important to you think that you should **not** smoke. Experiment descriptive norms are coded such that higher numerical values equate to higher perceptions that a greater number of your peers would be accepting of smoking or vaping behaviors by others. By contrast, survey descriptive norms are coded such that higher numerical values equate to higher perceptions that others who are important to you engage in smoking behaviors **less** often. Self-reported anti-smoking behaviors and intentions from the survey are coded such that higher numerical values equate to **less** smoking behavior in the past or greater intentions **not** to smoke. Higher values on the objectively measured smoking behavior variable indicate readings with greater levels of expelled air carbon monoxide in ppm (a reading of >9ppm indicates smoking behavior within the past 24 hours).

Results of mixed-effects ordered logistic regressions and mixed effects linear regressions are also shown below. The following items from the experiment showed an association with self-reported anti-smoking behavior ($p<0.05$): P2Sit4, P2Sit7, P2Sit8, P2Sit9, P3Q1, P3Q2 (ORs 0.46-0.62). The following experiment items showed an association with self-reported anti-smoking intentions ($p<0.05$): P2Sit3, P2Sit4, P2Sit6, P2Sit7, P2Sit8, P2Sit9, P3Q1, P3Q2 (ORs 0.45-0.69). None of the individual items from the experiment showed associations with objectively measured smoking behavior. The results of the ordered logistic regression models may be interpreted as proportional ORs representing the multiplicative change in odds of at least a one-unit increase in response category to the dependent variable (more self-reported anti-smoking behavior/greater intentions not to smoke) for a one-unit increase in response category to the relevant norm question (increasingly socially appropriate/increasing perceptions that more peers would be accepting of a close friend smoking or vaping), holding other variables constant. Since the OR values are all <1.0 for self-reported outcomes, this indicates that pupils who gave higher social appropriateness ratings for situations involving smoking or vaping, and pupils who thought that more peers would be accepting of a close friend smoking or vaping were more likely to give answers geared away from anti-smoking behavior and intentions. The results of these models also indicate that pupils who were more rule-following in Part 1 were more likely to give answers geared towards anti-smoking behavior and intentions (ORs>1.0, $p<0.01$ for self-reported outcomes). This is as expected since there were already anti-smoking norms established in the schools at baseline and rule-following individuals are expected to be more sensitive to norms.

Finally, these models indicate that Colombian pupils were more likely to provide answers geared away from anti-smoking behavior and intentions or to have higher levels of expelled air carbon monoxide in their Smokerlyzer readings (ORs<1.0, p<0.01 for self-reported outcomes; *b*s>0, p<0.01 for objectively measured outcomes), and that pupils in Dead Cool schools had lower levels of expelled air carbon monoxide in their Smokerlyzer readings at baseline (p<0.05).

Most of the injunctive and descriptive norm items from the survey showed associations with self-reported anti-smoking behavior and anti-smoking intentions (ORs 1.25-2.49, p<0.01). These results may be interpreted as proportional ORs representing the multiplicative change in odds of at least a one-unit increase in response category to the dependent variable (more self-reported anti-smoking behavior/greater intentions not to smoke) for a one-unit increase in response category to the relevant norm question (increasing perceptions that important others think you should not smoke/increasing perceptions that important others do not smoke often), holding other variables constant. Since the OR values are all >1.0, this indicates that pupils who had higher perceptions that others who are important to them think they should not smoke or that others who are important to them do not smoke often were more likely to give answers geared towards anti-smoking behavior and intentions. There was an association between item IN7 and objectively measured smoking behavior (*b*=-0.08, p<0.05). Again, these models showed that Colombian pupils were more likely to provide answers geared away from anti-smoking behavior and intentions or to have higher levels of expelled air carbon monoxide in their Smokerlyzer readings (ORs<1.0, p<0.05 for self-reported outcomes; *b*s>0, p<0.01 for objectively measured outcomes), and that pupils in Dead Cool schools had lower levels of expelled air carbon monoxide in their Smokerlyzer readings at baseline (p<0.05).

In summary, individual items from the experiment and survey are showing theoretically expected inter-relationships and associations with self-reported anti-smoking behavior and intentions. Most items showed non-significant associations with objectively measured smoking behavior derived from the Smokerlyzer readings.

Spearman's rank-order correlations between experiment and survey measures of injunctive norms for smoking and vaping

		Expt. measures								Survey measures						
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
		P2S2	P2S3	P2S4	P2S5	P2S6	P2S7	P2S8	P2S9	IN1	IN2	IN3	IN4	IN5	IN6	IN7
Expt.	(1)	1.00														
	(2)	0.29***	1.00													
	(3)	0.18***	0.24***	1.00												
	(4)	0.21***	0.24***	0.20***	1.00											
	(5)	0.13***	0.27***	0.27***	0.28***	1.00										
	(6)	0.18***	0.31***	0.28***	0.33***	0.45***	1.00									
	(7)	0.11***	0.24***	0.27***	0.35***	0.43***	0.56***	1.00								
	(8)	0.16***	0.23***	0.24***	0.21***	0.28***	0.33***	0.36***	1.00							
Survey	(9)	-0.03	-0.04	-0.13***	-0.03	-0.11***	-0.12***	-0.15***	-0.04*	1.00						
	(10)	-0.01	-0.02	-0.04	-0.001	-0.04*	-0.06**	-0.07***	0.01	0.35***	1.00					
	(11)	0.02	-0.05**	-0.07***	-0.03	-0.06**	-0.06**	-0.08***	-0.03	0.23***	0.41***	1.00				
	(12)	-0.04	-0.09***	-0.04	-0.06**	-0.09***	-0.10***	-0.09***	-0.07***	0.22***	0.26***	0.27***	1.00			
	(13)	0.003	-0.06**	-0.06**	-0.01	-0.05**	-0.05**	-0.05*	-0.01	0.19***	0.26***	0.27***	0.37***	1.00		
	(14)	-0.01	-0.07***	-0.10***	-0.12***	-0.12***	-0.15***	-0.16***	-0.10***	0.39***	0.26***	0.22***	0.32***	0.24***	1.00	
	(15)	-0.01	-0.08***	-0.13***	-0.07***	-0.12***	-0.11***	-0.16***	-0.10***	0.37***	0.29***	0.24***	0.28***	0.23***	0.63***	1.00

***p<0.01; **p<0.05; *p<0.10.

Spearman's rank-order correlations between experiment and survey measures of descriptive norms for smoking and vaping

		Expt. measures		Survey measures				
		(1)	(2)	(3)	(4)	(5)	(6)	(7)
		P3Q1	P3Q2	DN1	DN2	DN3	DN4	DN5
Expt.	(1)	1.00						
	(2)	0.73***	1.00					
Survey	(3)	-0.15***	-0.16***	1.00				
	(4)	-0.07***	-0.10***	0.14***	1.00			
	(5)	-0.07***	-0.10***	0.11***	0.35***	1.00		
	(6)	-0.04	-0.04	0.16***	0.13***	0.10***	1.00	
	(7)	-0.03	-0.03	0.16***	0.17***	0.12***	0.23***	1.00

***p<0.01; **p<0.05; *p<0.10.

Spearman's rank-order correlations between self-reported anti-smoking behavior and intentions, and objectively measured smoking behavior

	Anti-smoking behavior	Anti-smoking intentions	Objective smoking behavior
	(1)	**(2)**	**(3)**
(1)	1.00		
(2)	0.40***	1.00	
(3)	-0.11***	-0.08***	1.00

***p<0.01; **p<0.05; *p<0.10.

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

	Dependent variable: Anti-smoking behavior									
	P2S2	**P2S3**	**P2S4**	**P2S5**	**P2S6**	**P2S7**	**P2S8**	**P2S9**	**P3Q1**	**P3Q2**
	OR (95% CI)	*OR* (95% CI)	*OR* (95% CI)	*OR* (95% CI)	*OR* (95% CI)	*OR* (95% CI)	*OR* (95% CI)	*OR* (95% CI)	*OR* (95% CI)	*OR* (95% CI)
n	1512	1512	1513	1513	1509	1513	1512	1513	1513	1511
Norm[a]	1.04 (0.59, 1.84)	0.84 (0.55, 1.27)	0.62** (0.42, 0.90)	0.73* (0.52, 1.03)	0.74* (0.52, 1.04)	0.54*** (0.39, 0.74)	0.50*** (0.36, 0.71)	0.58*** (0.39, 0.86)	0.46*** (0.35, 0.60)	0.46*** (0.36, 0.60)
Blue bucket	1.01*** (1.005, 1.02)	1.01*** (1.005, 1.02)	1.01*** (1.005, 1.02)	1.01*** (1.005, 1.02)	1.01*** (1.005, 1.02)	1.01*** (1.005, 1.02)	1.01*** (1.01, 1.02)	1.01*** (1.005, 1.02)	1.01*** (1.005, 1.02)	1.01*** (1.004, 1.02)
Sex										
Girl/PNTS	1.06 (0.79, 1.42)	1.08 (0.81, 1.45)	1.05 (0.78, 1.41)	1.04 (0.78, 1.40)	1.08 (0.80, 1.44)	1.03 (0.76, 1.38)	1.07 (0.80, 1.44)	1.04 (0.78, 1.40)	1.2 (0.83, 1.50)	1.06 (0.79, 1.42)
Intervention										
Dead Cool	1.28 (0.75, 2.18)	1.27 (0.75, 2.18)	1.26 (0.74, 2.13)	1.30 (0.76, 2.23)	1.27 (0.75, 2.16)	1.25 (0.74, 2.12)	1.24 (0.73, 2.13)	1.30 (0.77, 2.19)	1.19 (0.71, 1.99)	1.22 (0.73, 2.02)
Country										
Colombia	0.47*** (0.28, 0.81)	0.46*** (0.27, 0.79)	0.47*** (0.28, 0.80)	0.45*** (0.26, 0.77)	0.48*** (0.28, 0.82)	0.46*** (0.27, 0.77)	0.48*** (0.28, 0.83)	0.46*** (0.27, 0.78)	0.44*** (0.26, 0.74)	0.42*** (0.25, 0.70)

[a]Note on interpretation: these are proportional odds ratios representing the multiplicative change in odds of **at least** a one-unit increase in response category to the smoking behavior question (more anti-smoking) for a one-unit increase in response category to the relevant norm question (increasingly socially appropriate/increasing perceptions that more peers would be accepting of a close friend smoking or vaping), holding other variables constant. P2 Norms coded (-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). P3 Norms coded (-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).

***p<0.01; **p<0.05; *p<0.10.

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

	Dependent variable: Anti-smoking intentions									
	P2S2	**P2S3**	**P2S4**	**P2S5**	**P2S6**	**P2S7**	**P2S8**	**P2S9**	**P3Q1**	**P3Q2**
	OR (95% CI)	*OR* (95% CI)	*OR* (95% CI)	*OR* (95% CI)	*OR* (95% CI)	*OR* (95% CI)	*OR* (95% CI)	*OR* (95% CI)	*OR* (95% CI)	*OR* (95% CI)
n	1508	1508	1509	1509	1505	1509	1508	1509	1509	1507
Norm[a]	0.77 (0.48, 1.24)	0.68** (0.47, 0.98)	0.62*** (0.44, 0.89)	0.74* (0.55, 1.01)	0.69** (0.51, 0.95)	0.56*** (0.42, 0.76)	0.45*** (0.33, 0.62)	0.68** (0.47, 0.99)	0.53*** (0.41, 0.68)	0.56*** (0.44, 0.71)
Blue bucket	1.01** (1.001, 1.02)	1.01** (1.001, 1.02)	1.01** (1.001, 1.02)	1.01** (1.001, 1.02)	1.01** (1.001, 1.02)	1.01** (1.001, 1.02)	1.01** (1.002, 1.02)	1.01** (1.001, 1.02)	1.01** (1.001, 1.02)	1.01** (1.001, 1.02)
Sex										
Girl/PNTS	0.93 (0.72, 1.22)	0.92 (0.71, 1.21)	0.91 (0.70, 1.19)	0.91 (0.70, 1.19)	0.93 (0.71, 1.21)	0.90 (0.69, 1.17)	0.93 (0.71, 1.22)	0.91 (0.70, 1.19)	0.96 (0.74, 1.26)	0.92 (0.70, 1.20)
Intervention										
Dead Cool	1.08 (0.70, 1.67)	1.08 (0.70, 1.66)	1.07 (0.70, 1.62)	1.09 (0.71, 1.68)	1.05 (0.69, 1.61)	1.05 (0.68, 1.62)	1.03 (0.67, 1.60)	1.09 (0.71, 1.67)	1.02 (0.68, 1.54)	1.04 (0.69, 1.58)
Country										
Colombia	0.48*** (0.31, 0.75)	0.49*** (0.31, 0.75)	0.50*** (0.33, 0.77)	0.48*** (0.31, 0.74)	0.50*** (0.33, 0.78)	0.48*** (0.31, 0.75)	0.51*** (0.33, 0.80)	0.49*** (0.32, 0.76)	0.48*** (0.31, 0.72)	0.46*** (0.30, 0.70)

[a]Note on interpretation: these are proportional odds ratios representing the multiplicative change in odds of **at least** a one-unit increase in response category to the smoking intentions question (greater intentions not to smoke) for a one-unit increase in response category to the relevant norm question (increasingly socially appropriate/increasing perceptions that more peers would be accepting of a close friend smoking or vaping), holding other variables constant. P2 Norms coded (-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). P3 Norms coded (-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).

***p<0.01; **p<0.05; *p<0.10.

Results of mixed-effects linear regressions showing relationship between objectively measured smoking behavior and responses to smoking norm questions Experiment Parts 2-3

	Dependent variable: Objective smoking behavior (expelled air carbon monoxide, ppm)[b]									
	P2S2	**P2S3**	**P2S4**	**P2S5**	**P2S6**	**P2S7**	**P2S8**	**P2S9**	**P3Q1**	**P3Q2**
	b (95% CI)	*b* (95% CI)	*b* (95% CI)	*b* (95% CI)	*b* (95% CI)	*b* (95% CI)	*b* (95% CI)	*b* (95% CI)	*b* (95% CI)	*b* (95% CI)
n	1158	1157	1158	1158	1155	1158	1157	1158	1158	1157
Norm[a]	0.22 (-0.24, 0.69)	0.22* (-0.04, 0.49)	0.18 (-0.09, 0.45)	0.04 (-0.20, 0.28)	0.06 (-0.06, 0.19)	-0.007 (-0.18, 0.17)	0.02 (-0.21, 0.25)	0.15 (-0.10, 0.40)	0.19* (-0.02, 0.39)	0.15* (-0.03, 0.33)
Blue bucket	-0.0002 (-0.005, 0.004)	0.00001 (-0.004, 0.004)	-0.0001 (-0.005, 0.004)	-0.0001 (-0.005, 0.004)	-0.00005 (-0.005, 0.004)	-0.0001 (-0.005, 0.004)	-0.00002 (-0.005, 0.005)	0.00002 (-0.004, 0.004)	-0.00007 (-0.005, 0.004)	0.00001 (-0.005, 0.004)
Sex										
Girl/PNTS	-0.02 (-0.18, 0.14)	-0.02 (-0.18, 0.14)	-0.01 (-0.17, 0.15)	-0.01 (-0.18, 0.15)	-0.01 (-0.17, 0.14)	-0.02 (-0.18, 0.14)	-0.02 (-0.17, 0.14)	-0.09 (-0.17, 0.15)	-0.03 (-0.18, 0.13)	-0.02 (-0.17, 0.14)
Intervention										
Dead Cool	-0.52** (-0.97, -0.07)	-0.50** (-0.95, -0.06)	-0.51** (-0.95, -0.06)	-0.51** (-0.96, -0.07)	-0.51** (-0.96, -0.05)	-0.51** (-0.96, -0.07)	-0.51** (-0.96, -0.05)	-0.51** (-0.96, -0.07)	-0.49** (-0.95, -0.03)	-0.49** (-0.94, -0.03)
Country										
Colombia	1.83*** (1.41, 2.26)	1.82*** (1.37, 2.27)	1.81*** (1.36, 2.27)	1.82*** (1.35, 2.28)	1.82*** (1.36, 2.27)	1.81*** (1.36, 2.27)	1.82*** (1.37, 2.26)	1.82*** (1.36, 2.27)	1.82*** (1.36, 2.28)	1.83*** (1.37, 2.29)
Constant	1.93*** (1.37, 2.50)	1.89*** (1.54, 2.23)	1.89*** (1.51, 2.27)	1.75*** (1.52, 1.99)	1.76*** (1.54, 1.99)	1.74*** (1.50, 1.98)	1.74*** (1.50, 1.98)	1.85*** (1.51, 2.19)	1.82*** (1.60, 2.04)	1.77*** (1.56, 1.98)

[a]Note on interpretation: these are regression coefficients representing the increase in carbon monoxide reading (more smoking) for a one-unit increase in response category to the relevant norm question (increasingly socially appropriate/increasing perceptions that more peers would be accepting of a close friend smoking or vaping), holding other variables constant. P2 Norms coded (-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). P3 Norms coded (-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).

[b]Carbon monoxide readings not available for one Northern Irish school and two Colombian schools (excluded from analysis).

***p<0.01; **p<0.05; *p<0.10.

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

	Dependent variable: Anti-smoking behavior											
	IN1	**IN2**	**IN3[b]**	**IN4**	**IN5**	**IN6[b]**	**IN7**	**DN1**	**DN2**	**DN3**	**DN4**	**DN5**
	OR (95% CI)	*OR* (95% CI)	*OR* (95% CI)	*OR* (95% CI)	*OR* (95% CI)	*OR* (95% CI)	*OR* (95% CI)	*OR* (95% CI)	*OR* (95% CI)	*OR* (95% CI)	*OR* (95% CI)	*OR* (95% CI)
n	1566	1567	1564	1563	1565	1566	1566	1567	1568	1567	1567	1567
Norm[a]	1.60*** (1.36, 1.89)	1.86*** (1.42, 2.43)	1.37*** (1.15, 1.64)	1.14 (0.98, 1.32)	1.14* (0.99, 1.32)	1.58*** (1.38, 1.81)	1.64*** (1.42, 1.90)	2.49*** (2.15, 2.88)	1.41*** (1.27, 1.56)	1.36*** (1.24, 1.49)	1.53*** (1.35, 1.74)	1.33*** (1.14, 1.55)
Sex												
Girl/PNTS	1.11 (0.84, 1.47)	1.11 (0.84, 1.48)	1.16 (0.88, 1.54)	1.12 (0.85, 1.48)	1.13 (0.85, 1.49)	1.07 (0.80, 1.42)	1.03 (0.78, 1.38)	1.10 (0.82, 1.47)	1.15 (0.87, 1.52)	1.12 (0.84, 1.48)	1.16 (0.87, 1.54)	1.11 (0.84, 1.48)
Intervention												
Dead Cool	1.42 (0.86, 2.35)	1.36 (0.81, 2.30)	1.32 (0.78, 2.21)	1.37 (0.82, 2.30)	1.36 (0.81, 2.27)	1.40 (0.88, 2.23)	1.39 (0.85, 2.28)	1.28 (0.76, 2.15)	1.32 (0.81, 2.14)	1.32 (0.81, 2.15)	1.34 (0.83, 2.19)	1.39 (0.84, 2.29)
Country												
Colombia	0.51*** (0.31, 0.85)	0.54** (0.32, 0.91)	0.56** (0.33, 0.93)	0.53** (0.31, 0.88)	0.53** (0.32, 0.89)	0.59** (0.37, 0.93)	0.61** (0.37, 0.99)	0.50*** (0.30, 0.84)	0.45*** (0.28, 0.74)	0.49*** (0.30, 0.80)	0.53*** (0.32, 0.86)	0.53** (0.32, 0.88)

[a]Note on interpretation: these are proportional odds ratios representing the multiplicative change in odds of **at least** a one-unit increase in response category to the smoking behavior question (more anti-smoking) for a one-unit increase in response category to the relevant norm question (increasing perceptions that important others think you should not smoke/increasing perceptions that important others do not smoke often), holding other variables constant.

[b]Approximate likelihood-ratio test indicates potential violation of the proportional odds assumption ($p<0.05$).

***$p<0.01$; **$p<0.05$; *$p<0.10$.

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

	Dependent variable: Anti-smoking intentions											
	IN1[b]	**IN2**	**IN3**	**IN4**	**IN5[b]**	**IN6**	**IN7[b]**	**DN1**	**DN2**	**DN3**	**DN4**	**DN5**
	OR (95% CI)	*OR* (95% CI)	*OR* (95% CI)	*OR* (95% CI)	*OR* (95% CI)	*OR* (95% CI)	*OR* (95% CI)	*OR* (95% CI)	*OR* (95% CI)	*OR* (95% CI)	*OR* (95% CI)	*OR* (95% CI)
n	1563	1564	1561	1560	1562	1563	1563	1564	1565	1564	1564	1564
Norm[a]	1.81*** (1.56, 2.11)	1.86*** (1.44, 2.41)	1.37*** (1.17, 1.62)	1.25*** (1.09, 1.44)	1.25*** (1.10, 1.43)	1.75*** (1.54, 1.98)	1.79*** (1.56, 2.04)	1.85*** (1.61, 2.13)	1.31*** (1.18, 1.45)	1.25*** (1.15, 1.37)	1.41*** (1.25, 1.60)	1.29*** (1.11, 1.50)
Sex												
Girl/PNTS	0.99 (0.76, 1.28)	0.99 (0.77, 1.29)	1.03 (0.79, 1.33)	0.99 (0.76, 1.28)	0.999 (0.77, 1.30)	0.93 (0.72, 1.21)	0.90 (0.69, 1.18)	0.98 (0.75, 1.27)	1.03 (0.79, 1.33)	0.99 (0.77, 1.29)	1.03 (0.79, 1.34)	0.999 (0.77, 1.30)
Intervention												
Dead Cool	1.20 (0.81, 1.76)	1.14 (0.76, 1.71)	1.12 (0.74, 1.71)	1.16 (0.77, 1.74)	1.15 (0.76, 1.72)	1.21 (0.85, 1.73)	1.19 (0.82, 1.73)	1.11 (0.77, 1.59)	1.13 (0.76, 1.67)	1.14 (0.78, 1.68)	1.15 (0.78, 1.71)	1.16 (0.78, 1.72)
Country												
Colombia	0.49*** (0.33, 0.73)	0.53*** (0.35, 0.80)	0.53*** (0.35, 0.81)	0.50*** (0.33, 0.75)	0.51*** (0.34, 0.76)	0.56*** (0.39, 0.80)	0.59*** (0.40, 0.86)	0.50*** (0.35, 0.72)	0.46*** (0.31, 0.68)	0.49*** (0.33, 0.72)	0.51*** (0.35, 0.76)	0.51*** (0.34, 0.77)

[a]Note on interpretation: these are proportional odds ratios representing the multiplicative change in odds of **at least** a one-unit increase in response category to the smoking intentions question (greater intentions not to smoke) for a one-unit increase in response category to the relevant norm question (increasing perceptions that important others think you should not smoke/increasing perceptions that important others do not smoke often), holding other variables constant.
[b]Approximate likelihood-ratio test indicates potential violation of the proportional odds assumption ($p<0.05$).
***$p<0.01$; **$p<0.05$; *$p<0.10$.

Results of mixed-effects linear regressions showing relationship between objectively measured smoking behavior and responses to survey smoking norm questions

	Dependent variable: Objective smoking behavior (expelled air carbon monoxide, ppm)[b]											
	IN1	**IN2**	**IN3**	**IN4**	**IN5**	**IN6**	**IN7**	**DN1**	**DN2**	**DN3**	**DN4**	**DN5**
	b (95% CI)	*b* (95% CI)	*b* (95% CI)	*b* (95% CI)	*b* (95% CI)	*b* (95% CI)	*b* (95% CI)	*b* (95% CI)	*b* (95% CI)	*b* (95% CI)	*b* (95% CI)	*b* (95% CI)
n	1202	1203	1200	1199	1201	1202	1202	1203	1204	1203	1203	1203
Norm[a]	-0.09 (-0.26, 0.08)	-0.07 (-0.29, 0.14)	0.05 (-0.03, 0.12)	-0.01 (-0.10, 0.07)	-0.04 (-0.13, 0.06)	-0.004 (-0.09, 0.08)	-0.08** (-0.15, -0.005)	-0.05 (-0.17, 0.07)	-0.04 (-0.09, 0.02)	-0.01 (-0.06, 0.05)	-0.05 (-0.24, 0.13)	0.0003 (-0.09, 0.09)
Sex												
Girl/PNTS	-0.0001 (-0.15, 0.15)	-0.001 (-0.14, 0.14)	0.01 (-0.13, 0.15)	0.001 (-0.14, 0.15)	0.002 (-0.14, 0.14)	0.001 (-0.14, 0.15)	0.01 (-0.14, 0.16)	-0.01 (-0.15, 0.14)	-0.01 (-0.15, 0.13)	-0.004 (-0.14, 0.14)	-0.01 (-0.15, 0.14)	-0.002 (-0.14, 0.14)
Intervention												
Dead Cool	-0.49** (-0.95, -0.04)	-0.49** (-0.94, -0.04)	-0.50** (-0.95, -0.05)	-0.49** (-0.94, -0.04)	-0.49** (-0.94, -0.04)	-0.50** (-0.95, -0.05)	-0.49** (-0.95, -0.04)	-0.49** (-0.94, -0.03)	-0.48** (-0.94, -0.03)	-0.50** (-0.95, -0.05)	-0.49** (-0.95, -0.03)	-0.50** (-0.95, -0.04)
Country												
Colombia	1.81*** (1.36, 2.26)	1.80*** (1.35, 2.25)	1.82*** (1.37, 2.28)	1.81*** (1.36, 2.26)	1.80*** (1.36, 2.25)	1.81*** (1.36, 2.25)	1.79*** (1.35, 2.23)	1.81*** (1.36, 2.26)	1.82*** (1.37, 2.27)	1.81*** (1.35, 2.27)	1.81*** (1.35, 2.26)	1.81*** (1.36, 2.26)
Constant	1.88*** (1.54, 2.22)	1.87*** (1.41, 2.34)	1.63*** (1.33, 1.93)	1.74*** (1.50, 1.98)	1.77*** (1.52, 2.03)	1.73*** (1.48, 1.99)	1.85*** (1.60, 2.10)	1.98*** (1.40, 2.57)	1.87*** (1.50, 2.25)	1.75*** (1.52, 1.99)	1.98*** (1.10, 2.87)	1.73*** (1.26, 2.19)

[a]Note on interpretation: these are regression coefficients representing the increase in carbon monoxide reading (more smoking) for a one-unit increase in response category to the relevant norm question (increasing perceptions that important others think you should not smoke/increasing perceptions that important others do not smoke often), holding other variables constant.

[b]Carbon monoxide readings not available for one Northern Irish school and two Colombian schools (excluded from analysis).

***p<0.01; **p<0.05; *p<0.10.

Supplement 6: Model fit statistics and diagrams showing structure and standardized factor loadings from confirmatory factor analyses

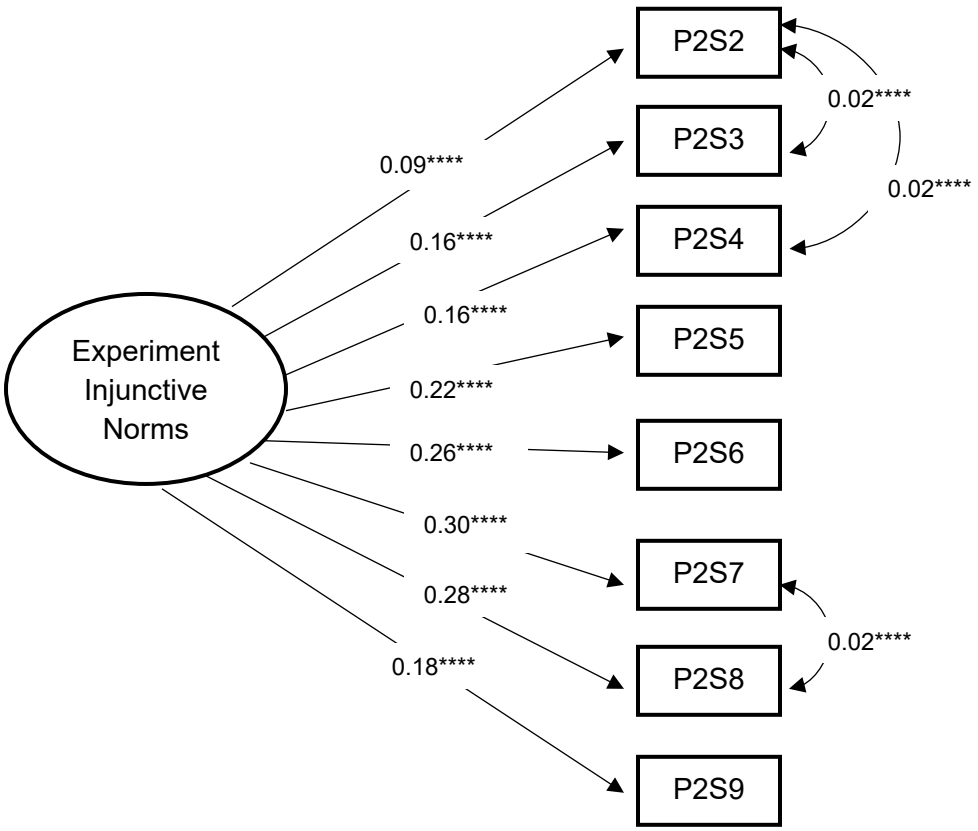
Model fit statistics

MODEL	Obs[a]	X^2	df	CFI	TLI	RMSEA (90% CI)	SRMR	AIC	BIC	BIC (adjusted)
1	1576	56.421****	17	0.977	0.962	0.047 (0.034, 0.061)	0.026	8106.089	8250.880	8165.107
2	1567	61.719****	11	0.972	0.947	0.059 (0.045, 0.074)	0.029	22216.848	22345.415	22269.172
3	1575	-	-	1.000	1.000	0.000 (0.000, 0.000)	0.000	3478.691	3505.501	3489.617
4	1568	1.496	3	1.000	1.017	0.000 (0.000, 0.043)	0.007	20434.250	20525.328	20471.323
5	1635	434.569****	196	0.959	0.952	0.030 (0.026, 0.034)	0.033	54004.817	54431.369	54180.399
6	1635	440.713****	198	0.958	0.951	0.030 (0.026, 0.034)	0.034	54010.895	54426.649	54182.033

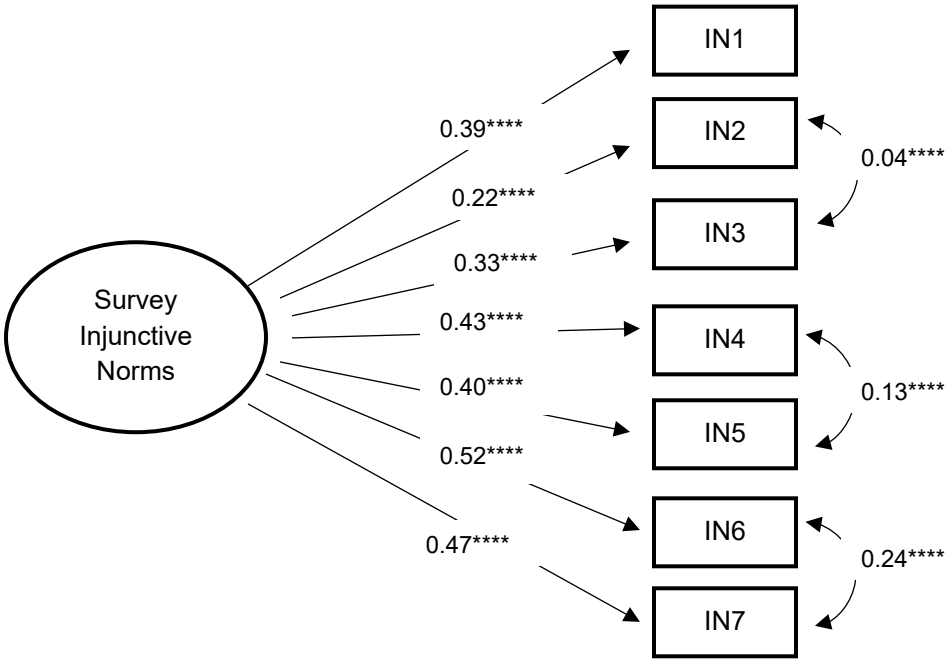
[a]Missing data are imputed using full information maximum likelihood (FIML). Cases are included as long as the pupil completed at least one of the relevant items on the experiment or survey.

X^2 = Chi-square Goodness of Fit statistic; df = degrees of freedom; CFI = Comparative Fit Index; TLI = Tucker Lewis Index; RMSEA = Root Mean Square Error of Approximation; CI = confidence interval; SRMR = Standardized Root Mean Square Residual; AIC = Akaike Information Criterion; BIC = Bayesian Information Criterion; *p<0.10; **p<0.05; ***p<0.01; ****p≤0.001.

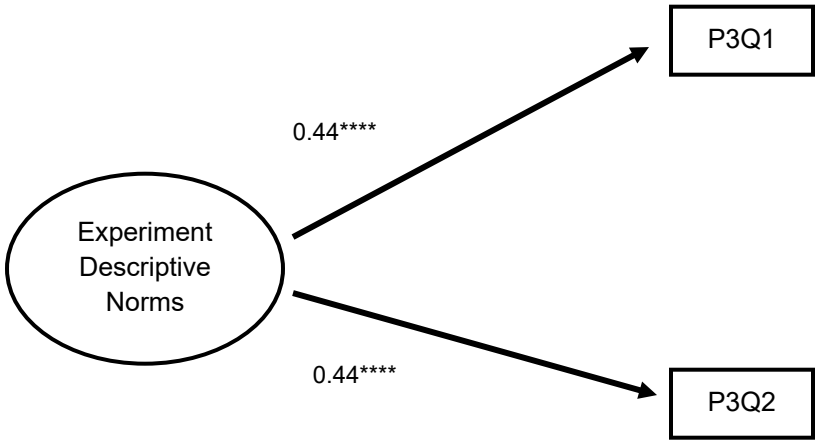
Model 1: Measurement model for experimental measure of injunctive norms, standardized factor loadings, *p<0.10; **p<0.05; ***p<0.01; ****p≤0.001



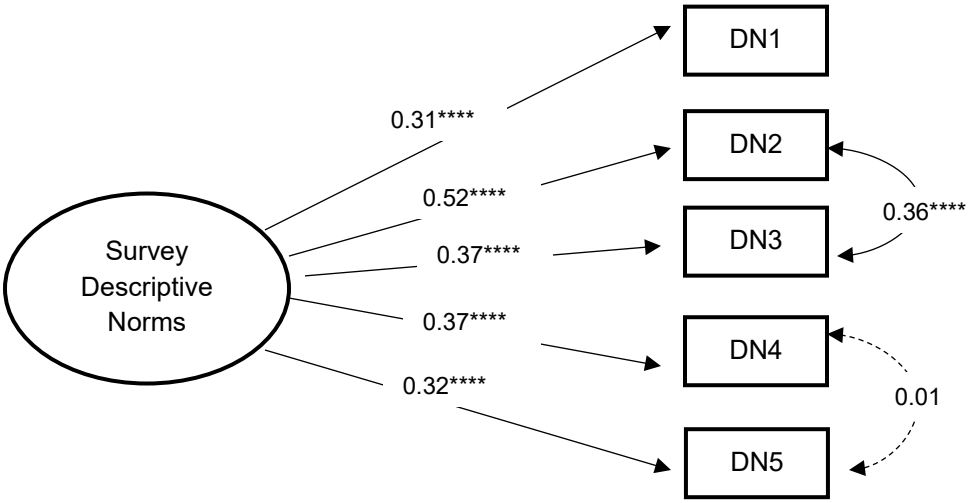
Model 2: Measurement model for survey measure of injunctive norms, standardized factor loadings, *p<0.10; **p<0.05; ***p<0.01; ****p≤0.001



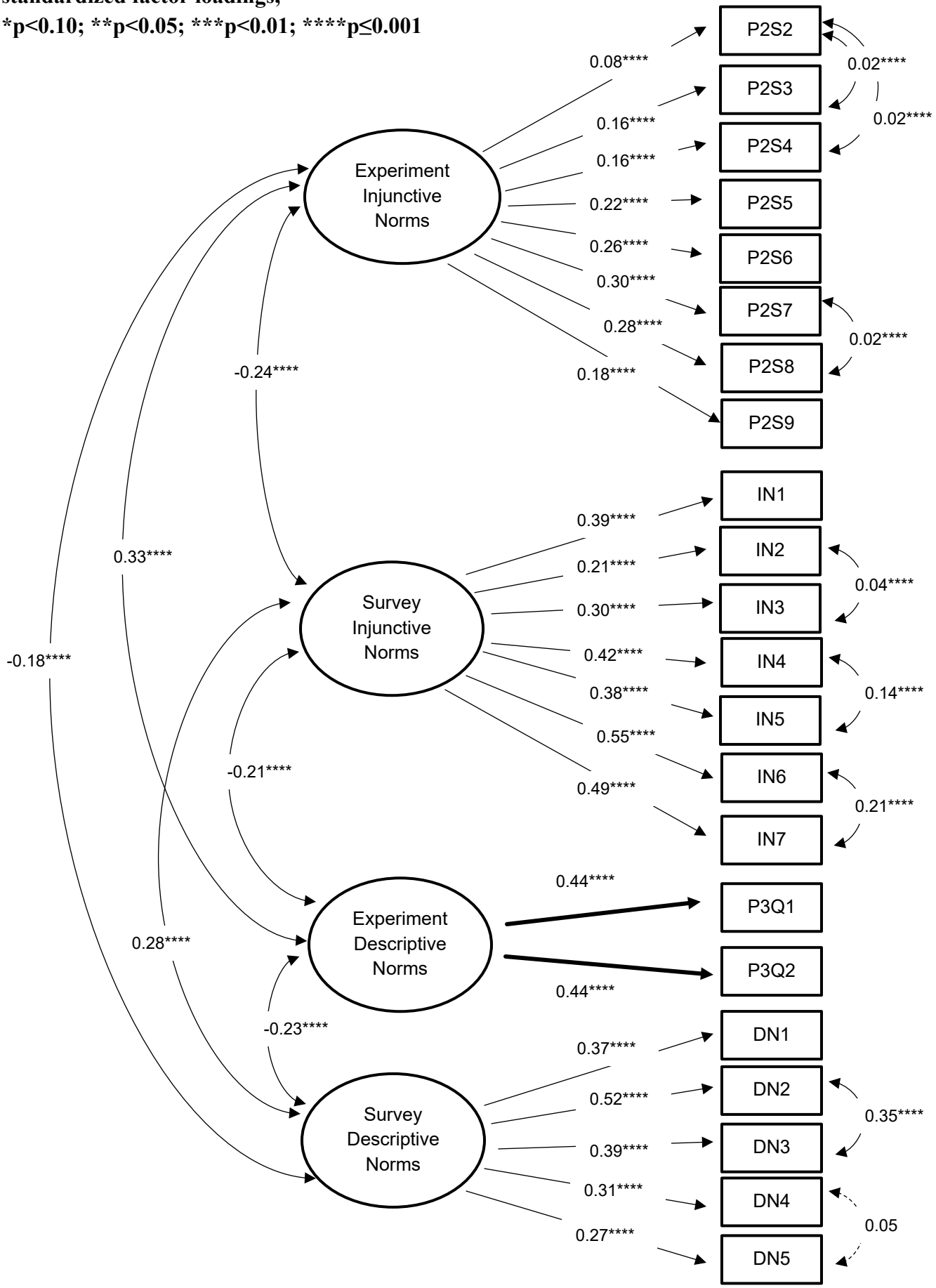
Model 3: Measurement model for experimental measure of descriptive norms, standardized factor loadings, *p<0.10; **p<0.05; ***p<0.01; ****p≤0.001



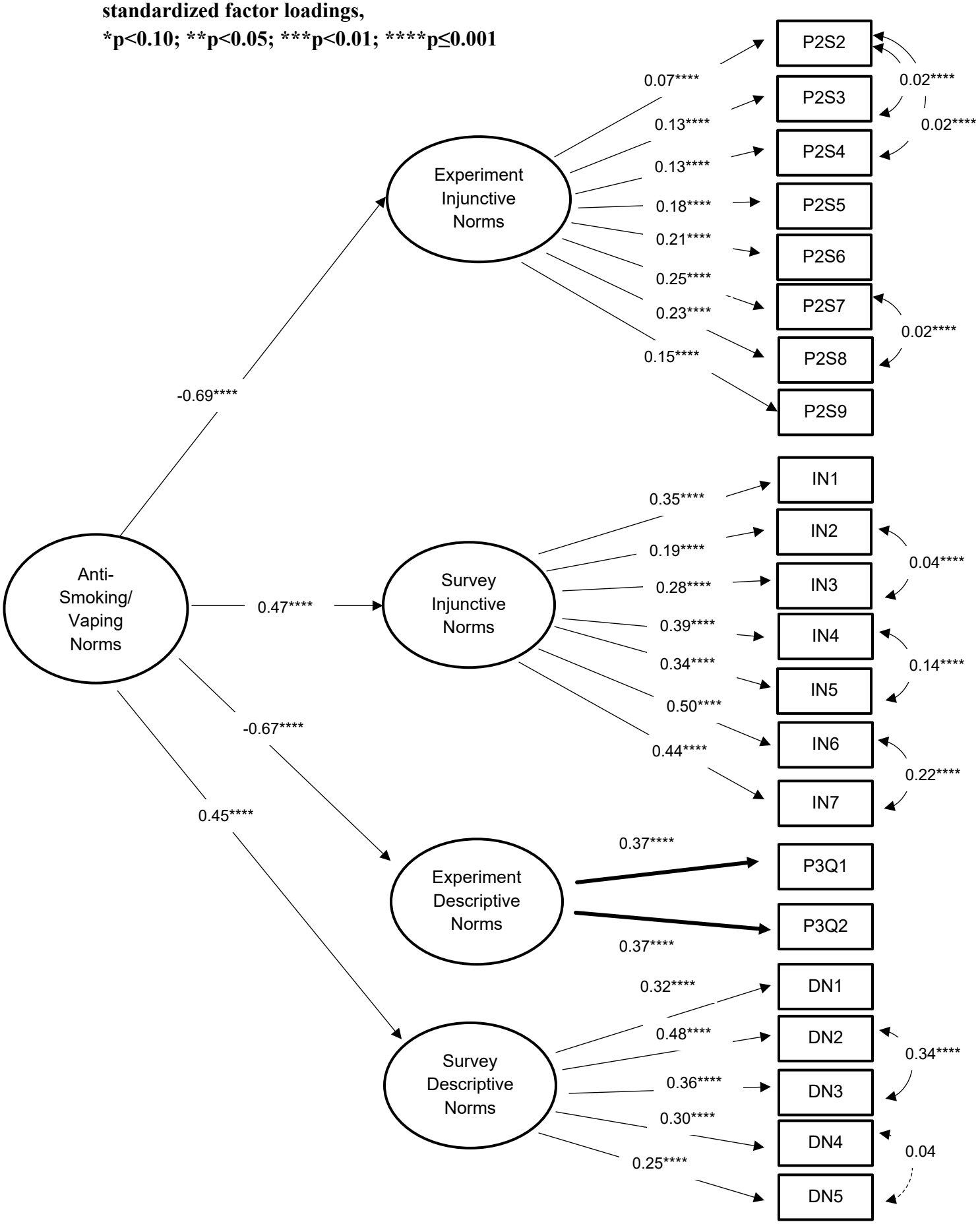
Model 4: Measurement model for survey measure of descriptive norms, standardized factor loadings, *p<0.10; **p<0.05; ***p<0.01; ****p≤0.001



Model 5: First-order measurement model with four correlated latent variables, standardized factor loadings,
***p<0.10; **p<0.05; ***p<0.01; ****p≤0.001**



Model 6: Second-order measurement model with four first-order latent variables, standardized factor loadings,
***p<0.10; **p<0.05; ***p<0.01; ****p≤0.001**



Supplement 7: Statistical information and decisions on whether individual items are demonstrating differential item functioning

Parameter	MI	EPC	NCP	Power	Decision
P2S2 on Country	62.674	-0.101	61.139	1.000	DIF
P2S3 on Country	0.211	-0.007	39.587	1.000	No DIF
P2S4 on Country	8.375	0.044	43.540	1.000	No DIF
P2S5 on Country	49.588	-0.141	24.945	0.999	DIF
P2S6 on Country	15.599	0.072	29.959	1.000	No DIF
P2S7 on Country	7.287	-0.046	35.144	1.000	No DIF
P2S8 on Country	39.421	0.103	36.922	1.000	DIF
P2S9 on Country	0.556	-0.012	41.864	1.000	No DIF
IN1 on Country	14.413	0.123	9.562	0.871	DIF
IN2 on Country	1.969	0.024	33.218	1.000	No DIF
IN3 on Country	14.034	-0.119	9.947	0.884	DIF
IN4 on Country	7.568	0.114	5.800	0.673	DIF
IN5 on Country	0.081	0.012	5.299	0.634	Inconclusive
IN6 on Country	0.000	-0.001	7.390	0.776	Inconclusive
IN7 on Country	13.719	-0.122	9.188	0.858	DIF
P3Q1 on Country	13.100	0.068	28.050	1.000	No DIF
P3Q2 on Country	13.100	-0.068	28.050	1.000	No DIF
DN1 on Country	3.854	-0.078	6.362	0.713	Inconclusive
DN2 on Country	25.867	0.305	2.787	0.386	DIF
DN3 on Country	0.676	0.052	2.469	0.349	Inconclusive
DN4 on Country	6.085	-0.109	5.090	0.616	DIF
DN5 on Country	7.700	-0.103	7.256	0.768	DIF

MI: modification indices; EPC: expected parameter change; NCP: non-centrality parameter; DIF: differential item functioning.

Supplement 8: Effects of sex and psycho-social variables on first-order and second-order norms latent variables, standardized regression coefficients

Predictor	B (SE)	p-value
Experiment Injunctive Norms (first-order latent)		
Sex[a]	-0.14 (0.07)	0.046
Need to Belong Scale[b]	-0.29 (0.07)	<0.001
Fear of Negative Evaluation[c]	-0.10 (0.07)	0.16
Pro-social Behavior[d]	-0.10 (0.02)	<0.001
Big 5 (Openness)[e]	-0.18 (0.06)	0.001
Big 5 (Extraversion)[e]	-0.10 (0.05)	0.06
Big 5 (Agreeableness)[e]	-0.48 (0.06)	<0.001
Big 5 (Conscientiousness)[e]	-0.36 (0.06)	<0.001
Big 5 (Stability)[e]	-0.19 (0.05)	<0.001
Rule-following[f]	-0.004 (0.002)	0.05
Survey Injunctive Norms (first-order latent)		
Sex[a]	0.07 (0.07)	0.30
Need to Belong Scale[b]	0.04 (0.07)	0.61
Fear of Negative Evaluation[c]	-0.04 (0.06)	0.50
Pro-social Behavior[d]	0.12 (0.02)	<0.001
Big 5 (Openness)[e]	0.19 (0.05)	<0.001
Big 5 (Extraversion)[e]	0.15 (0.05)	0.002
Big 5 (Agreeableness)[e]	0.40 (0.05)	<0.001
Big 5 (Conscientiousness)[e]	0.36 (0.05)	<0.001
Big 5 (Stability)[e]	0.17 (0.04)	<0.001
Rule-following[f]	0.002 (0.002)	0.38
Experiment Descriptive Norms (first-order latent)		
Sex[a]	0.08 (0.07)	0.24
Need to Belong Scale[b]	-0.15 (0.07)	0.02
Fear of Negative Evaluation[c]	0.05 (0.06)	0.42
Pro-social Behavior[d]	-0.07 (0.02)	<0.001
Big 5 (Openness)[e]	-0.06 (0.05)	0.29
Big 5 (Extraversion)[e]	-0.01 (0.05)	0.77
Big 5 (Agreeableness)[e]	-0.32 (0.06)	<0.001
Big 5 (Conscientiousness)[e]	-0.33 (0.06)	<0.001
Big 5 (Stability)[e]	-0.22 (0.05)	<0.001
Rule-following[f]	-0.001 (0.002)	0.71
Survey Descriptive Norms (first-order latent)		
Sex[a]	-0.03 (0.08)	0.74
Need to Belong Scale[b]	0.02 (0.08)	0.79
Fear of Negative Evaluation[c]	-0.10 (0.08)	0.19
Pro-social Behavior[d]	0.07 (0.03)	0.005
Big 5 (Openness)[e]	0.18 (0.07)	0.01
Big 5 (Extraversion)[e]	0.03 (0.06)	0.58

Big 5 (Agreeableness)[e]	0.33 (0.06)	<0.001
Big 5 (Conscientiousness)[e]	0.33 (0.07)	<0.001
Big 5 (Stability)[e]	0.32 (0.07)	<0.001
Rule-following[f]	0.005 (0.003)	0.04
Anti-Smoking/Vaping Norms (second-order latent)		
Sex[a]	0.05 (0.08)	0.52
Need to Belong Scale[b]	0.25 (0.08)	0.003
Fear of Negative Evaluation[c]	-0.02 (0.08)	0.76
Pro-social Behavior[d]	0.16 (0.02)	<0.001
Big 5 (Openness)[e]	0.25 (0.07)	<0.001
Big 5 (Extraversion)[e]	0.12 (0.05)	0.03
Big 5 (Agreeableness)[e]	0.71 (0.08)	<0.001
Big 5 (Conscientiousness)[e]	0.62 (0.07)	<0.001
Big 5 (Stability)[e]	0.37 (0.06)	<0.001
Rule-following[f]	0.004 (0.002)	0.06

[a]In all analyses, sex is coded (0=Boy; 1=Girl/Prefer not to say).

[b]Average of 10 items, coded 1-5. Not available for two Colombian schools (excluded from analysis).

[c]Average of 12 items, coded 1-5. Not available for two Colombian schools (excluded from analysis).

[d]Sum of five items, coded 0-2.

[e]Average of 10 items, coded 0-4.

[f]Number of balls allocated to the blue bucket in Part 1 of the experiments.