Tobacco industry denormalisation beliefs in Hong Kong adolescents

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Abstract

Introduction: Tobacco industry denormalisation (TID) seeks to expose the industry's misconducts. Research on TID beliefs, meaning negative attitudes towards the tobacco industry (TI), may inform TID programmes, but was limited to western populations. We investigated TID beliefs and their association with smoking and sociodemographic characteristics in Hong Kong adolescents.

Methods: In a school-based cross-sectional survey of 14214 students (mean age 15.0 years, 51.5% boys), TID beliefs were assessed by two questions: (i) whether the TI was respectable and (ii) whether the TI tried to get youth to smoke, each with 4 options from "definitely no" to "definitely yes". Smoking susceptibility and behaviours were also assessed. Sociodemographic characteristics included age, sex, perceived family affluence, highest parental education, numbers of co-residing smokers, and school-level smoking prevalence.

Results: Of all students, 77.6% considered the TI not respectable and 56.6% believed that the TI tried to get youth to smoke. Stronger TID beliefs were inversely associated with smoking susceptibility and behaviours. For example, students considering the TI definitely not respectable (vs definitely yes) were 56% (95% CI 45-66%), 49% (41-56%), and 53% (36-65%) less likely to be susceptible to smoking (among never smokers) and be ever and current smokers, respectively. Of all correlates examined, only younger age and having no co-residing smoker were associated with TID beliefs.

Conclusions: Substantial proportions of Hong Kong adolescents did not hold TID beliefs, but those who did were less likely to smoke. Our results suggest that TID programmes may help reduce adolescent smoking.

Implications: The TI's misconducts and responsibility for the tobacco epidemic were not well known by Hong Kong adolescents. TID beliefs in this population were inversely associated with smoking. These findings suggest that TID programmes in local adolescents may be of value. The investigation of TID beliefs' correlates found that socio-economic status and school-level smoking prevalence was not associated with TID beliefs. This suggests that local TID programmes targeting adolescents in general, e.g., mass media campaigns, may be more appropriate than those targeting particular schools or selected groups of adolescents.

Introduction

Confronted by compelling scientific evidence of the harms of tobacco, the tobacco industry (TI), since the 1950s, has resisted government regulation of its products using various tactics. These tactics include buying scientific expertise to create controversy over tobacco harm, hiring lobbyists to influence policy-making, and corrupting government officials [1, 2]. Article 12 of the World Health Organisation Framework Convention on Tobacco Control supports raising public awareness of the TI's responsibility for the tobacco epidemic and exposing its deceptive and manipulative tactics [3]. Such intervention, known as tobacco industry denormalisation (TID), has been the focus of several anti-tobacco campaigns in the United States (US) [4]. Most of the TID campaigns targeted adolescents, and some were effective in reducing adolescent smoking prevalence [4]. The TI strongly opposed TID efforts, as revealed in its internal documents of the intention "to limit the spread of 'demonisation' (of the TI) from the developed world to the emerging markets" [5-7]. These reactions suggest that TID may be an effective tool for tobacco control.

However, TID has rarely been adopted outside the US. Even research on the public's TID beliefs, meaning negative attitudes towards the TI, has been limited to a few western countries [4, 8]. However, the TI's anti-regulation tactics in the West are being repeated in low-income and middle-income countries, on which the future of the industry will depend [7]. TID-related research in these settings is thus urgently needed, and may in several ways inform local TID programmes. First, local data on the prevalence of TID beliefs can help gauge the potential value of TID efforts. Second, the inverse associations between TID beliefs and smoking observed in western studies may be confirmed to support local TID programmes [9-13]. Third, identifying any sociodemographic correlates of TID beliefs may reveal high risk target groups.

In this study, we used data from a territory-wide school-based cross-sectional survey of secondary school students in Hong Kong to investigate the prevalence of TID beliefs and their association with smoking, and sociodemographic and other smoking-related correlates.

Methods

Data source

A cross-sectional survey using a stratified random sample of secondary schools in all 18 districts of Hong Kong was conducted from October 2014 to April 2015. All students in the recruited schools were invited to participate. The survey was conducted in classrooms, using anonymous paper-and-pencil questionnaires in three different versions. Each version comprised version-specific questions and "core" questions that were common to all versions. Each school was given one version by random. Ethics approval was granted by the Institutional Review Board of the University of Hong Kong/Hospital Authority Hong Kong West Cluster.

A total of 41035 students from 92 schools participated in the survey, with student-level and school-level response rates of 95% and 36%. This study used data collected by one questionnaire version, which was administered to 14414 students in 31 schools. The students (n=110) with missing data for age, sex, or over 50% of items and those (n=90) whose responses showed multiple internal inconsistencies were excluded. This left 14214 students for analysis. With further exclusion of 1945 ever smokers and 42 with a missing value for ever smoking status, another analytical sample comprised 12227 never smokers.

Measurements

TID beliefs were assessed by two questions: (1) "Do you think the tobacco industry is respectable"; (2) "do you think the tobacco industry tries to get youth to smoke". Both had response options of "definitely yes", "probably yes", "probably no", and "definitely no". Students' responses to these questions, as study factors, had 4 levels. As outcome variables, the responses to whether the TI was respectable were dichotomised as no (definitely no/probably no) versus yes (definitely yes/probably yes); the responses to

whether the TI tried to get youth to smoke were dichotomised as yes (definitely yes/probably yes) versus no (definitely no/probably no).

Smoking susceptibility was assessed by two questions: (1) "If one of your good friends offers you a cigarette, will you smoke it"; (2) "do you think you will smoke cigarettes in the next 12 months". Both had response options of "definitely not", "probably not", "probably will", and "definitely will". Those choosing "definitely not" for both questions were deemed non-susceptible to smoking, and the others susceptible to smoking. Smoking susceptibility strongly predicts future smoking in never smoking adolescents [14, 15]. Students also reported whether they had ever smoked (even one puff) and whether they smoked in the past 30 days. Those who smoked in the past 30 days were deemed current smokers, and the others non-current smokers [16].

Students also reported their age (in years), sex, perceived family affluence (relatively poor/poor to average/average/average to rich/relatively rich), highest parental education (primary or below/secondary/post-secondary or above/don't know), and number of co-residing smokers (0/1/2 or more). In addition, the 31 schools were evenly divided into three groups that, respectively, had low (10 schools, prevalence 0.0%-1.0%), medium (10 schools, 1.5%-6.9%), and high (11 schools, 7.8%-20.5%) school-level current smoking prevalence.

Analysis

Descriptive analysis was used to describe students' TID beliefs. All descriptive results were weighted by age, sex and grade based on the target population's characteristics provided by the Education Bureau of the Hong Kong Government.

Two-level generalised linear models with a random school-level intercept were used to examine the associations of interest. With outcomes assumed to be normally distributed and log-link functions, the models produced estimates of prevalence ratios (PRs). Because the outcomes were actually binary, robust variance estimators for standard errors were used [17, 18]. PRs, rather than odds ratios (ORs), were

estimated because the outcomes were not rare (e.g., ever smoking 14.1%; considering the TI not respectable 77.6%), and ORs, if interpreted as PRs, could be misleading in such situations.

We examined the associations of TID beliefs (study factors) with smoking susceptibility, ever smoking, and current smoking (outcomes), with and without adjusting for age, sex, perceived family affluence, highest parental education, numbers of co-residing smokers, and school-level smoking prevalence. The analyses for smoking susceptibility were conducted in never smokers. TID beliefs, as study factors, were also analysed as continuous variables to test linear trends. We also examined the associations of age, sex, perceived family affluence, highest parental education, numbers of co-residing smokers, and school-level smoking prevalence (study factors) with TID beliefs (outcomes), with mutual adjustment of the study factors.

All *p* values were two tailed, and values less than 0.05 were considered statistically significant. Analyses used Stata 13.1.

Results

Table 1 shows that students' mean age (standard deviation) was 15.0 (1.9) years, and 51.5% were boys. The prevalence of ever and current smoking were 14.1% and 5.5%, and 11.9% of never smokers were susceptible to smoking. Of all students, in response to whether the TI was respectable, 41.1% chose "definitely no", and 36.5%, 19.5%, and 3.0% chose "probably no", "probably yes", and "definitely yes", respectively. In response to whether the TI tried to get youth to smoke, only 15.9% chose "definitely yes", and 40.7%, 31.5%, and 11.9% chose "probably yes", "probably no", and "definitely no", respectively.

Table 2 shows that, in general, considering the TI not respectable was inversely associated with smoking susceptibility, ever smoking, and current smoking in both crude and adjusted models (*ps* for trend < 0.001). Compared with choosing "definitely yes" for whether the TI was respectable, choosing "definitely no" and "probably no" were associated with adjusted PRs (95% confidence intervals) of 0.44

(0.34-0.55) and 0.76 (0.60-0.97), respectively, for smoking susceptibility. For ever smoking, the corresponding adjusted PRs were 0.51 (0.44-0.59) and 0.65 (0.55-0.77); for current smoking, the adjusted PRs in relation to "definitely no", "probably no", and "probably yes" were 0.47 (0.35-0.64), 0.53 (0.39-0.74), and 0.70 (0.55-0.91), respectively.

Table 2 also shows that, in general, believing that the TI tried to get youth to smoke was inversely associated with smoking susceptibility, ever smoking, and current smoking in both crude and adjusted models (*ps* for trend < 0.001). Compared with choosing "definitely no" for whether the TI tried to get youth to smoke, choosing "definitely yes" was associated with an adjusted PR of 0.63 (0.49, 0.81) for smoking susceptibility. For ever smoking, the adjusted PRs in relation to "definitely no", "probably no", and "probably yes" were 0.71 (0.61-0.82), 0.67 (0.58-0.78), and 0.82 (0.73-0.92), respectively; for current smoking, the corresponding figures were 0.60 (0.48-0.74), 0.53 (0.45-0.64), and 0.61 (0.50-0.75).

Table 3 shows that sex, perceived family affluence, highest parental education, and school-level smoking prevalence were all not associated with TID beliefs. Younger age was generally associated with TID beliefs. For example, compared with ≥17 years of age, 14, 13, and ≤12 were associated with adjusted PRs of 1.06 (1.03-1.10), 1.08 (1.04-1.12), and 1.12 (1.09-1.15), respectively, for considering the TI not respectable. In addition, having no co-residing smoker, compared with having 2 or more, was associated with an adjusted PR of 1.08 (1.03-1.12) for considering the TI not respectable; and 1.13 (1.08-1.18) for believing that the TI tried to get youth to smoke. The corresponding figures for having one co-residing smoker were non-significant.

Discussion

We found that substantial proportions of Hong Kong adolescents did not hold TID beliefs. Almost one quarter of them considered the TI respectable. Moreover, more than two-fifths of them did not believe that the TI tried to get youth to smoke, and only less than one-fifth firmly believed that this was the case.

Surveys in developed countries, which used different questions to assess TID beliefs, also showed awareness gaps in the TI's malpractices among adults and adolescents [8, 19]. We also found that TID beliefs were inversely associated with smoking, which was consistent with the studies in the West [9-13]. The above findings collectively suggest that local TID programmes may have a potential to prevent adolescent smoking.

In Hong Kong, after 30 years of strong tobacco control measures that have reduced the adult daily smoking prevalence to one of the lowest in the developed world (10.5% in 2015) [20], TID may represent an opportunity for further progress in tobacco control. TID may be preferable to the communication of long-term health risks in adolescents because the latter are generally not their main concerns. Another advantage of TID is that it targets the industry instead of smokers. Tobacco control advocates would be seen as a group acting for the public well-being by challenging the industry's vested interests, rather than as they are often viewed by the public as an elitist group who unfairly impose their own standards on others [21]. When fully implemented by June 2018, the number of different graphic health warnings on cigarette packets in Hong Kong will increase from six to twelve, including mainly health consequences but also one on smoking offence penalties [22]. TID messages in this context should also be considered. Future tobacco control campaigns in Hong Kong may use TID messages along with other evidence-based approaches, eg, graphic health effect campaigns [23]; and further research is needed to explore the relative effectiveness of these approaches as well as potential effect variation by target groups. However, there may be challenges in launching TID campaigns, such as other health promotion priorities, opposition from the TI, and fear of industry litigation [24, 25]. The local evidence provided in our study should be of value in the decision-making process.

We found that younger age was associated with TID beliefs. As adolescent smoking increases with age, higher peer smoking in older adolescents may have led to more receptive attitudes towards smoking and the TI. This was in line with our finding that having no co-residing smoker was also associated with TID beliefs, although the association was weak. The association suggests that having family members who smoked may also have led adolescents to perceive the TI positively. In addition, we found no

association of school-level smoking prevalence and indicators of socio-economic status, i.e., perceived family affluence and highest parental education, with TID beliefs. Our findings generally suggest that, to denormalise the TI in Hong Kong adolescents, a general population approach, e.g., mass media campaign and territory-wide school-based education, may be more appropriate than a targeted approach for individuals, schools, or communities with certain characteristics.

Our study has several limitations. First, the survey's response rate on school-level was relatively low (36%). However, the non-responses were mainly due to administrative reasons, and the recruited and not recruited schools were similar with regard to districts, mediums of instruction, sources of financial support, and single or mixed sex education (Chi-square tests, $ps > 0.05$). Second, while the validated measure of smoking susceptibility comprised three questions, two of them were used in our study, and both had slightly different wordings [14, 15]. It was possible for these differences to affect the strength of the predictive ability of our indicator of smoking susceptibility for future smoking. Third, it was difficult to establish temporal relations with the cross-sectional design. Specifically, apart from TID beliefs' effects, the inverse associations between TID beliefs and smoking may also have been due to smokers' reluctance to concede that the TI was manipulative, deceitful, or disrespectable, to avoid dissonance with their own smoking behaviours. Smoking susceptibility, however, seemed less likely to have such reverse causal effect. Fourth, because of the observational design, we cannot rule out residual confounding effect in the observed associations.

To conclude, substantial proportions of Hong Kong adolescents did not hold TID beliefs, but those who did were less likely to smoke. These beliefs did not vary significantly by socio-economic status or school factors. Our results suggest that TID programmes that increase adolescents' knowledge about TI malpractices may help reduce smoking uptake, and that such programmes may be best implemented as general population-wide approaches, rather than targeted at particular groups of adolescents, schools or communities.

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Declaration of interests

None declared.

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Table 1. Background characteristics (n=14214)

	N (%)[a]
Age (in years)	
≤12	1614 (11.4)
13	2051 (14.4)
14	2308 (16.2)
15	2156 (15.2)
16	2310 (16.3)
≥17	3772 (26.5)
Mean age in years (standard deviation)	15.0 (1.9)
Sex	
Girls	6889 (48.5)
Boys	7321 (51.5)
Perceived family affluence	
Relatively poor	941 (6.6)
Poor to average	3600 (25.4)
Average	8078 (57.0)
Average to rich	1349 (9.5)
Relatively rich	209 (1.5)
Highest parental education	
Primary or below	945 (6.7)
Secondary	8163 (57.5)
Post-secondary or above	2836 (20.0)
Don't know	2265 (15.9)
Number of co-residing smokers	
0	8839 (62.6)
1	3929 (27.8)
2 or more	1364 (9.7)
The tobacco industry is respectable	
Definitely no	5829 (41.1)
Probably no	5176 (36.5)
Probably yes	2764 (19.5)
Definitely yes	421 (3.0)
The tobacco industry tries to get youth to smoke	
Definitely no	1683 (11.9)
Probably no	4471 (31.5)
Probably yes	5769 (40.7)
Definitely yes	2260 (15.9)
Smoking susceptibility (in never smokers)	
No	10722 (88.2)
Yes	1441 (11.9)
Smoking status	
Never smoking	12163 (85.9)
Ever smoking	2003 (14.1)
Non-current smoking	13385 (94.5)

Current smoking	785 (5.5)

[a] Number and proportion unless otherwise stated.

Table 2. PRs (95% CIs)[a] of smoking in relation to TID beliefs in adolescents (whole sample, n=14214; never smokers, n=12227)

TID beliefs	Smoking susceptibility (in never smokers)		Ever smoking		Current smoking	
	Crude PR (95% CI)	Adjusted PR (95% CI)[b]	Crude PR (95% CI)	Adjusted PR (95% CI)[b]	Crude PR (95% CI)	Adjusted PR (95% CI)[b]
The tobacco industry is respectable						
Definitely yes	1	1	1	1	1	1
Probably yes	1.02 (0.79-1.31)	1.05 (0.82-1.35)	0.86 (0.69-1.05)	0.86 (0.70-1.05)	0.67 (0.51-0.87)**	0.70 (0.55-0.91)**
Probably no	0.72 (0.56-0.93)*	0.76 (0.60-0.97)*	0.60 (0.49-0.74)***	0.65 (0.55-0.77)***	0.40 (0.31-0.52)***	0.53 (0.39-0.74)***
Definitely no	0.43 (0.33-0.56)***	0.44 (0.34-0.55)***	0.42 (0.35-0.50)***	0.51 (0.44-0.59)***	0.27 (0.21-0.33)***	0.47 (0.35-0.64)***
P for trend	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
The tobacco industry tries to get youth to smoke						
Definitely no	1	1	1	1	1	1
Probably no	0.99 (0.82-1.20)	1.03 (0.84-1.26)	0.85 (0.73-0.99)*	0.82 (0.73-0.92)**	0.57 (0.46-0.69)***	0.61 (0.50-0.75)***
Probably yes	0.84 (0.70-1.01)	0.87 (0.72-1.06)	0.65 (0.52-0.80)***	0.67 (0.58-0.78)***	0.45 (0.32-0.62)***	0.53 (0.45-0.64)***
Definitely yes	0.63 (0.49-0.81)***	0.63 (0.49-0.81)***	0.62 (0.52-0.75)***	0.71 (0.61-0.82)***	0.50 (0.36-0.69)***	0.60 (0.48-0.74)***
P for trend	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

*P < 0.05; **P < 0.01; ***P < 0.001.

[a] PRs = prevalence ratios; CIs = confidence intervals.

[b] With adjustment of age, sex, perceived family affluence, highest parental education, numbers of co-residing smokers, and school-level smoking prevalence.

Table 3. Adjusted PRs (95% CIs)[a] of TID beliefs in relation to sociodemographic and smoking-related characteristics (n=14214)

Characteristics	The tobacco industry is respectable No[b] vs Yes[c] (reference)	The tobacco industry tries to get youth to smoke Yes[c] vs No[b] (reference)
Age (in years)		
≥17	1	1
16	1.01 (0.98-1.04)	1.01 (0.95-1.08)
15	1.02 (0.99-1.06)	1.06 (0.96-1.16)
14	1.06 (1.03-1.10)***	1.12 (1.00-1.26)*
13	1.08 (1.04-1.12)***	1.18 (1.05-1.33)**
≤12	1.12 (1.09-1.15)***	1.21 (1.05-1.40)**
Sex		
Girls	1	1
Boys	0.99 (0.97-1.01)	1.03 (1.00-1.06)
Perceived family affluence		
Relatively poor	1	1
Poor to average	1.02 (0.98-1.07)	0.95 (0.89-1.01)
Average	1.01 (0.98-1.05)	0.96 (0.91-1.01)
Average to rich	1.03 (0.98-1.08)	0.98 (0.91-1.06)
Relatively rich	0.93 (0.82-1.05)	0.95 (0.84-1.07)
Highest parental education		
Primary or below	1	1
Secondary	1.00 (0.96-1.04)	0.99 (0.92-1.06)
Post-secondary or above	0.99 (0.94-1.05)	0.97 (0.90-1.04)
Don't know	0.97 (0.92-1.02)	1.00 (0.92-1.09)
Number of co-residing smokers		
2 or more	1	1
1	1.05 (1.00-1.09)	1.05 (1.00-1.11)
0	1.08 (1.03-1.12)***	1.13 (1.08-1.18)***
School-level smoking prevalence		
High	1	1
Medium	1.02 (0.98-1.06)	1.06 (0.95-1.18)
Low	1.02 (0.99-1.07)	1.00 (0.90-1.10)

*P < 0.05; **P < 0.01; ***P < 0.001.

[a] PRs = prevalence ratios; CIs = confidence intervals. With mutual adjustment of all the sociodemographic and smoking-related characteristics in the table.

[b] Comprising definitely no and probably no.

[c] Comprising definitely yes and probably yes.