香港吸煙與健康委員會
HONG KONG COUNCIL ON SMOKING AND HEALTH

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Panel on Health Services, Legislative Council
Legislative Council Secretariat, Legislative Council Complex
1 Legislative Council Road, Central, Hong Kong

Dear Sir/ Madam,

COSH Reports 26 -27

Established as a statutory body under the Hong Kong Ordinance, Hong Kong Council on Smoking and Health (COSH) aims to protect the health of the community and inform the public on the harmful effects of tobacco. It is our great pleasure to furnish the Panel with a copy of COSH Reports 26 - 27 (bilingual versions for all reports), as follow:

Report 26: The 8th "Quit to Win" Contest – Effectiveness of a Combined Intervention of Brief Advice, Instant Messaging and Active Referral to Achieve Abstinence

Report 27: Effectiveness of New and Enlarged Pictorial Health Warnings on Cigarette Packs Report on Tobacco Control Policy-related Survey 2018

The reports are also available at COSH website (www.smokefree.hk) for public access.

On behalf of COSH, I would like to take this opportunity to thank you for your support to the Council and tobacco control in Hong Kong. We hope that you will find the report informative and useful.

Should you have any enquiries, please do not hesitate to contact our Project Manager Mr Fung WONG or Research Manager Ms Christie LEUNG at 2185 6388.

Regards,

Vienna LAI
Executive Director
Encl.

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The 8th "Quit to Win" Contest – Effectiveness of a Combined Intervention of Brief Advice, Instant Messaging and Active Referral to Achieve Abstinence

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1. Introduction

Despite a falling smoking prevalence, Hong Kong still had about 615,000 daily cigarette smokers (10.0%) in 2017[1]; at least half of whom would die prematurely because of smoking[2]. Every year, nearly 7,000 people succumb to diseases caused by active and passive smoking, with a substantial economic burden of about HK$5.6 billion in Hong Kong (0.3% of GDP)[3]. Smoking is highly addictive, and many smokers fail to quit unaided, especially those with high level of nicotine dependence. Engaging smokers who are not ready to quit smoking is a challenge — about 68.8% daily smokers in Hong Kong had no previous quit attempt and no interest in quitting[1]. Developing novel and brief interventions to motivate and assist smokers to quit is essential for public health implications.

Smoking cessation (SC) competitions or "Quit and Win" Contests encourage smokers from the community to quit smoking by offering opportunities to win prizes (e.g. by lottery) after making a successful quit attempt[4]. The "Quit to Win (QTW)" Contest cum Smoke-free Community Campaign is an annual event organized by The Hong Kong Council on Smoking and Health (COSH) in collaboration with School of Nursing and the School of Public Health, The University of Hong Kong (HKU). The goals include (1) motivating smokers to get rid of their smoking habit; (2) encouraging non-smokers to support their family members and friends to quit; (3) raising public awareness on smoking hazards and community participation in tobacco control; and (4) strengthening the promotion of smoke-free community and to strive for a smoke-free Hong Kong. Seven QTW Contests have been conducted since 2009 (except in 2011), which have engaged over 8,000 smokers from the community to quit smoking. The QTW Contests provided a unique platform to design and conduct RCTs to develop, evaluate and refine novel interventions for promoting quitting in community smokers[4].

Applying mobile technologies to provide SC support is an emerging area in SC treatment[5]. A 2016 Cochrane review found that mobile phone-based SC interventions (predominantly via SMS messaging) increased abstinence by about 70%[6]. Mobile instant messaging apps, such as WhatsApp or WeChat, have gradually surpassed SMS as the most widely used mobile messaging tool[7]. They provide a platform for exchange of text, emojis, voice messages and multimedia freely through internet in real time. A population-based study in Hong Kong has found adults exposed to health information through instant messaging were associated with reduced smoking[8]. WhatsApp online support group has also been found effective in preventing relapse among participants who have recently quit smoking among service users of Tung Wah Group of Hospitals Integrated Centre on Smoking Cessation[9]. It remains unknown if more personalized and interactive messaging support provided by using instant messaging apps could further improve cessation outcomes.

SC services are effective in increasing quit rate but are severely underused in Hong Kong — only 2.3% current smokers had ever sought professional help from SC services in 2017[1]. The 6th QTW Contest in 2015 provided strong evidence that actively referring participants to a SC service could increase SC service use and quit rate[10]. The results were also replicated by the 7th QTW Contest in 2016, which evaluated

active referral interventions of different intensities[11]. Active referral presents an important intervention to promote SC service use and quitting in the community.

In 2017, COSH collaborated with HKU, 18 District Councils, 17 district partners and 15 supporting organizations to organize the 8th QTW Contest. A two-arm randomized controlled trial (RCT) was conducted to examine the effectiveness of a combined intervention of face-to-face brief cessation advice (AWARD model), instant messaging SC support plus active referral to SC services (AIR) in promoting quitting.

2. Methods

2.1 Recruitment

From 18 June to 30 September 2017, participants were recruited in 68 recruitment sessions in shopping malls and public areas in all 18 districts in Hong Kong. Trained SC ambassadors were deployed to approach smokers in the community, screen for their eligibility, recruit eligible smokers into the QTW contest and RCT, and deliver assigned interventions to participants. Details of the research method of the RCT has been published in an international peer-refereed journal.

Eligibility criteria for RCT participation included:

1. Hong Kong residents aged 18 years or above;
2. Daily smokers who smoked at least 1 cigarette per day in the past 3 months;
3. Able to communicate in Cantonese and read Chinese;
4. Exhaled carbon monoxide (CO) of 4 parts per million (ppm) or above;
5. Intended to quit/ reduce smoking;
6. Using a cell phone with an instant messaging app (e.g. WhatsApp) installed; and
7. Able to use an instant messaging app for communication.

Written informed consents were obtained from all eligible participants who enrolled in the QTW Contest prior to delivery of the assigned treatment to the participants.

Recruitment sessions were randomized into either the intervention or control groups (1:1). All participants recruited in the same session were assigned the same interventions to prevent intervention contamination. Random permuted block size of two, four or six were used to ensure similar number of recruitment sessions in both groups of the RCT. The allocation sequence was generated by an investigator not involved in the recruitment using Microsoft Excel. The allocations were not disclosed to the SC ambassadors until immediately before the start of each recruitment session. Blinding of the participants and the ambassadors were not possible, but outcome assessors were blinded to the group assignment.

During recruitment, participants were given the options of participating in either the Lucky Draw group or SC Ambassador group. Five biochemically validated quitters at 3-month in the Lucky Draw group won a lottery prize of HK$10,000 supermarket coupon each. Three validated quitters at 3-month in the SC Ambassador group were chosen from interviews by a selection committee formed by COSH to win travelling vouchers of HK$25,000 to Australia (Champion), HK$15,000 to Singapore (1st runner-up) and HK$10,000 to Thailand (2nd runner-up).

2.2 Interventions and Follow-up

Intervention group: Participants received brief SC advice guided by the AWARD model[12, 13], which comprised the following components: **A**sking about the participants' smoking history, **W**arning about the harm of smoking using the result of the CO test and a health warning leaflet, **A**dvising them to quit as soon as possible, **R**eferring them to SC services using a referral card, and **D**oing-it-again — repeat the AWARD advice through instant messaging. The health warning leaflet covered information about the burden of smoking in the world and in Hong Kong, a list of diseases with pictures attributable to active and passive smoking, and the Department of Health Integrated Smoking Cessation Hotline 1833 183. The leaflet also contained three statements of (1) "The World Health Organization warns that 1 in 2 smokers will die prematurely due to smoking"; (2) "Emerging evidence suggests that 2 in 3 smokers who began smoking at a younger age, smoke more, or have greater number of years of smoking will die prematurely because of smoking"; and (3) "The life expectancy of smokers is on average 10 years shorter than non-smokers".

Participants in the intervention group also received SC support through instant messaging (WhatsApp) for 3 months from baseline. The design and content of the intervention was informed by a formative focus group study in current smokers in Hong Kong[14]. The intervention allowed an SC counselor to interact with a participant and provide personalized SC advice and information in real time. The counselor personalized the intervention according to the characteristics (surname, age and sex) and smoking behaviors (number of cigarettes per day and readiness to quit) of the participants. The counselors also monitored their quit or reduction progress and tailored the intervention content accordingly. Details of successfully booked SC service appointment (e.g. contacts and address of the SC service, appointment date and time) were also delivered to the participants. The participants could send a message to the counselor anytime and the counselor would respond during office hours (0930 to 1830 from Monday to Friday).

To initiate and facilitate the interaction between the SC counselors and the participants, 16 generic messages were sent to the participants via WhatsApp on a tapering schedule:

- Baseline to 1-month follow-up: 2 messages per week
- 1- to 2-month follow-up: 3 messages every fortnight
- 2- to 3-month follow-up: 1 message per week

The regular messages were developed based on the messages used in 7th QTW Contest and the findings from the formative qualitative study[14]. The messages covered motivational messages, strategies to quit and reduce smoking, strategies to prevent and manage craving, benefits of quitting, and encouragement to use SC services through the Department of Health Integrated Smoking Cessation Hotline (1833 183). A reminder to participate in each follow-up at 1-, 2-, 3- and 6-month were also sent, making up a total of 20 messages.

Participants in the intervention group also received active referral to SC services. Similar to the 6th QTW Contest, SC counselors used a 3-fold referral card to introduce the existing SC services in Hong Kong at baseline, which included (1) Integrated Smoking Cessation Hotline of Department of Health, (2) Tung Wah Group of Hospitals Integrated Centre on Smoking Cessation, (3) Hospital Authority Smoking Counseling and Cessation Centres, (4) Pok Oi Hospital Smoking Cessation Service, (5) Youth Quitline and Women Quitline of HKU. Participants were encouraged to select a service and complete an active referral form. With the consent of the participants, their contacts were then sent to the respective SC service for further actions.

Control group: Participants received general brief SC advice and one SMS reminder to participate in the telephone follow-ups at 1-, 2-, 3- and 6-month. Participants in all groups received a 12-page self-help SC booklet "Be Smart, Quit Smoking!" designed by COSH.

Non-trial group: Participants of the SC ambassador group, or those who did not own a smartphone with an instant messaging app installed, or those who were unable to read or communicate in Chinese, or recruited from a specific workplace, were assigned to the non-trial group. Participants in the non-trial group received the same treatment as their RCT counterparts recruited from the same recruitment session, including the same small cash incentives if they passed biochemical validation of their abstinence at 3- and 6-month follow-ups.

Telephone follow-ups were conducted to all participants at 1-, 2- ,3- and 6-month after randomization. To enhance the retention rate, an incentive of $100 was given to participants who completed all follow-ups. Those who could not be reached after a maximum of seven telephone calls and a voice message at the scheduled follow-up time points were considered lost to follow-up. Self-reported quitters (did not smoke even a puff for 7 days or longer) at the 3- and 6-month were invited to participate in the biochemical validations (exhaled CO and salivary cotinine tests). Those who passed the validations could receive a cash incentive of HK$500 each at 3- and 6- month.

The primary outcomes were self-reported 7-day point prevalence abstinence (PPA) at 3- and 6-month follow-ups after recruitment. Secondary outcomes included (1) biochemically validated abstinence, (2) smoking reduction by at least half of the baseline number of cigarette consumed per day, (3) self-reported quit attempt (abstinence for 24 hours or longer) and (4) SC service use at 3- and 6-month.

The baseline socio-demographic and smoking profile of all participants at baseline (N=1,311) were presented descriptively. The primary and secondary outcomes were compared between the two study groups by chi-square tests. Analyses were by intention-to-treat (ITT), such that participants with missing data were assumed to have no change in their smoking behavior, and by complete case (CC), in which participants with missing outcomes were excluded. We also assessed participants' use of SC services, change in perception of quitting, quit attempt with reasons and withdrawal symptoms experienced, perceived social support for quitting, perceptions and use of SC aids provided, and perception of follow-up calls.

3. Results

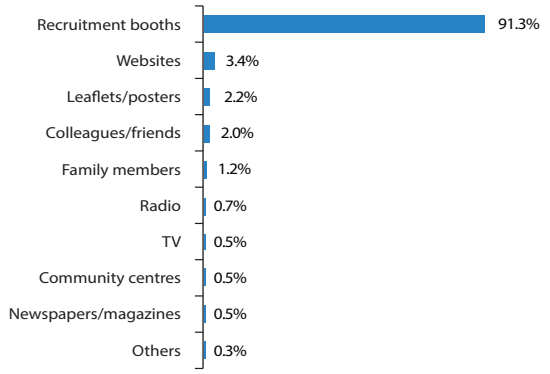
A total of 68 recruitment sessions were held with about 155,000 people passers-by. Over 9,400 people enquired about SC and the QTW Contest, visited the recruitment booth or participated in the anti-smoking game. 48 trained SC ambassadors were involved in promotional activities and recruitment sessions. They have approached nearly 2,700 smokers and 9,000 non-smokers.

Of 1,347 smokers screened for inclusion, 12 (0.9%) did not meet the eligibility criteria and were excluded. After excluding 24 (1.8%) eligible smokers who declined to participate in the QTW Contest, 1,311 (97.3%) smokers joined the QTW Contest. Of all participants, 1,185 (90.4%) participated in the RCT and were randomized to either the intervention (n=591) or control groups (n=594). The non-trial group, which was analyzed separately, consisted of 72 (5.5%) participants who joined the SC ambassador group and 54 (4.1%) participants who did not own a smartphone with an instant messaging app installed, or were unable to communicate in Chinese, or recruited from a specific workplace.

Most participants reported recruitment booths as the primary source from which they learnt about the 8th QTW Contest (91.3%) (Figure 1). This was followed by websites (3.4%), leaflets or posters (2.2%), and colleagues or friends (2.0%).

Figure 1

Sources of knowing the 8th "Quit to Win" Contest (N=1,311) [1,2]



[1]Missing data were not shown.

[2]Participants could choose more than one option.

3.1 Socio-demographic characteristics

The mean age of the participants was 42.1 (SD=14.6) years (ranged from 18 to 94) and most were male (78.1%). After excluding participants with missing information, 60.2% were married and 39.6% were living with at least a child; nearly half attained senior secondary education or above (67.3%), resided in rented public housing (48.2%) and had monthly household income below HK$20,000 (44.6%); and most were self-employed or employed (81.4%) (Table 1).

3.2 Smoking profile

The participants' mean age of smoking initiation was 18.2 (SD=5.7) years, and 45.1% (591) participants began smoking weekly before the age of 18 years (Figure 2). The mean duration of smoking was 24.0 (SD=14.6) years. The participants smoked on average 13.9 (SD=8.8) cigarettes per day. Over half of the participants (52.6%) smoked less than 10 cigarettes daily (Figure 3).

Figure 2

Age of starting weekly smoking in all participants (N=1,311) [1]

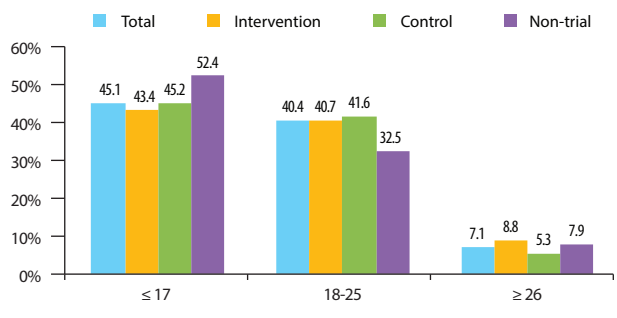


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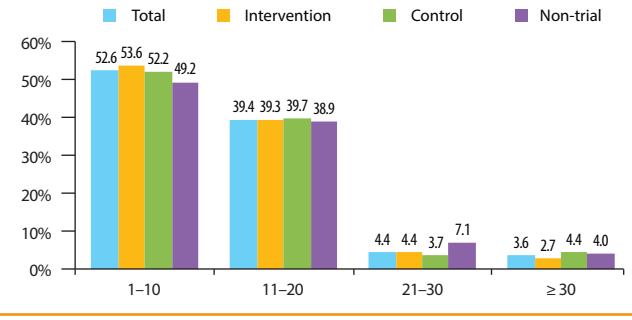
Figure 3

Daily cigarette consumption at baseline in all participants (N=1,311)[1]



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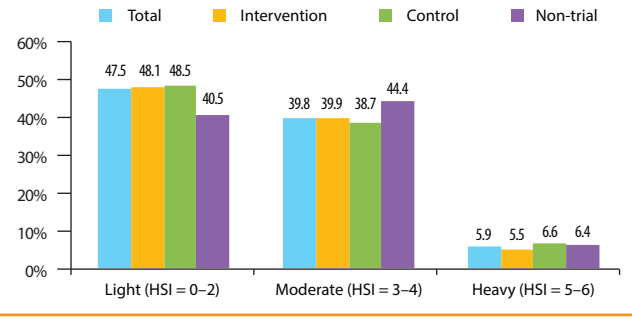
About a third of participants (33.0%) smoked their first cigarette of the day within 5 minutes after waking up. Nearly half had moderate to heavy nicotine dependence assessed by Heaviness of Smoking Index (HSI) (45.7%) (Figure 4), had no previous quit attempt (47.4%) (Figure 5), and had no intention to quit within 30 days at baseline (61.3%) (Figure 6). The non-trial group had significantly more participants with intention to quit within 7 days after baseline than the RCT group (P<0.001).

Figure 4

Nicotine dependence at baseline in all participants (N=1,311) [1]



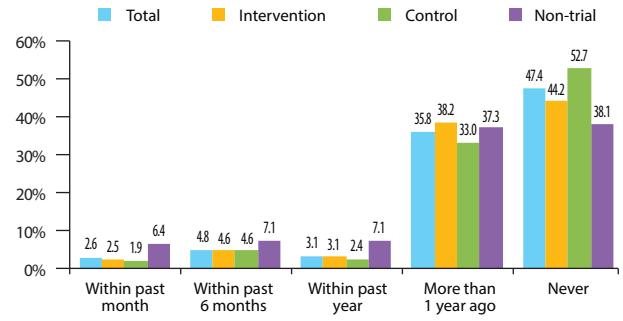
[1]Missing data were not shown.

Table 1. Socio-demographic characteristics of all participants (N=1,311)

n (%)	Total (N=1,311)	Non-trial (N=126)	Intervention (N=591)	Control (N=594)
Age, mean ± SD, years	42.1 ± 14.6	47.1 ± 18.5	40.6 ± 13.4	42.5 ± 14.5
Gender				
Male	1,024 (78.1)	106 (84.1)	450 (76.1)	468 (78.8)
Female	287 (21.9)	20 (15.9)	141 (23.9)	126 (21.2)
Marital status				
Single	327 (24.9)	43 (34.1)	154 (26.1)	130 (21.9)
Married/ Cohabited	553 (42.2)	54 (42.9)	243 (41.1)	256 (43.1)
Others	39 (3.0)	7 (5.6)	13 (2.2)	19 (3.2)
Missing	392 (29.9)	22 (17.5)	181 (30.6)	189 (31.8)
Living with a child aged below 18 years old				
Yes	328 (25.0)	28 (22.2)	140 (23.7)	160 (26.9)
No	501 (38.2)	66 (52.4)	223 (37.7)	212 (35.7)
Missing	482 (36.8)	32 (25.4)	228 (38.6)	222 (37.4)
Education level				
No formal education	19 (1.5)	8 (6.3)	6 (1.0)	5 (0.8)
Elementary education	72 (5.5)	17 (13.5)	19 (3.2)	36 (6.1)
Junior secondary education	179 (13.7)	14 (11.1)	74 (12.5)	91 (15.3)
Senior secondary education	379 (28.9)	27 (21.4)	191 (32.3)	161 (27.1)
Post-secondary or above	176 (13.4)	32 (25.4)	75 (12.7)	69 (11.6)
Missing	486 (37.1)	28 (22.2)	226 (38.2)	232 (39.1)
Employment status				
Student	22 (1.7)	6 (4.8)	7 (1.2)	9 (1.5)
Self-employed/ employed	753 (57.4)	58 (46.0)	356 (60.2)	339 (57.1)
Unemployed	39 (3.0)	9 (7.1)	14 (2.4)	16 (2.7)
Housewife	23 (1.8)	4 (3.2)	12 (2.0)	7 (1.2)
Retired	88 (6.7)	25 (19.8)	26 (4.4)	37 (6.2)
Missing	386 (29.4)	24 (19.0)	176 (29.8)	186 (31.3)
Monthly household income (HK$)				
Less than 10,000	110 (8.4)	26 (20.6)	42 (7.1)	42 (7.1)
10,000-19,999	233 (17.8)	26 (20.6)	114 (19.3)	93 (15.7)
20,000-29,999	177 (13.5)	7 (5.6)	80 (13.5)	90 (15.2)
30,000-39,999	108 (8.2)	5 (4.0)	48 (8.1)	55 (9.3)
40,000 or more	141 (10.8)	22 (17.5)	59 (10.0)	60 (10.1)
Missing	542 (41.3)	40 (31.7)	248 (42.0)	254 (42.8)
Housing condition				
Public housing (rental)	408 (31.1)	50 (39.7)	170 (28.8)	188 (31.6)
Public housing (purchased)	42 (3.2)	4 (3.2)	16 (2.7)	22 (3.7)
Home Ownership Scheme	101 (7.7)	14 (11.1)	41 (6.9)	46 (7.7)
Private housing (rental)	124 (9.5)	14 (11.1)	55 (9.3)	55 (9.3)
Private housing (purchased)	132 (10.1)	15 (11.9)	65 (11.0)	52 (8.8)
Others	39 (3.0)	4 (3.2)	22 (3.7)	13 (2.2)
Missing	465 (35.5)	25 (19.8)	222 (37.6)	218 (36.7)

Figure 5

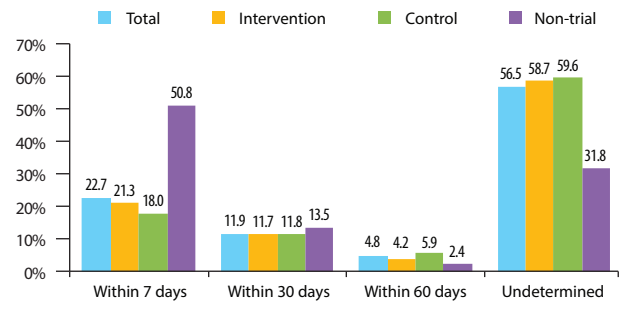
Past quit attempt at baseline in all participants (N=1,311) [1]



[1]Missing data were not shown.

Figure 6

Intention to quit at baseline in all participants (N=1,311) [1]



[1]Missing data were not shown.

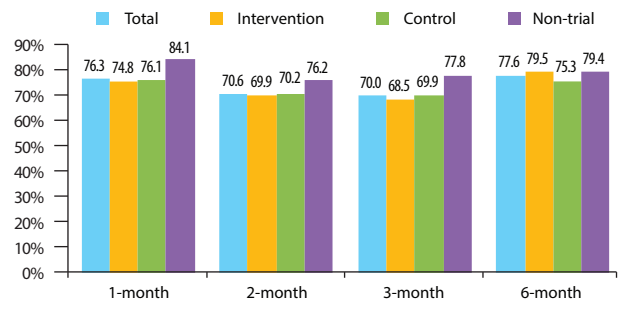
3.3 1-, 2-, 3- and 6-month follow-ups results

Retention rate

The overall retention rates were 76.3%, 70.6%, 70.0% and 77.6% at 1-, 2-, 3- and 6-month follow-ups, respectively. The retention rates were similar between the intervention and control groups at 1-month (74.8% vs 76.1%; P=0.60), 2-month (69.9% vs 70.2%; P=0.91), 3-month (68.5% vs 69.9%; P=0.62) and 6-month (79.5% vs 75.3%; P=0.079) follow-ups (Figure 7).

Figure 7

Retention rate of 1-, 2-, 3- and 6-month follow-ups (N=1,311)

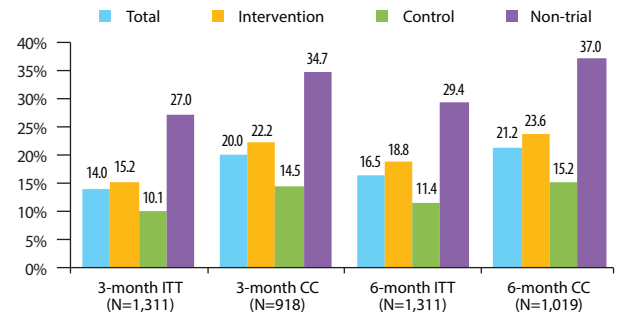


Primary outcome: Self-reported 7-day point prevalence abstinence rate at 3- and 6-month follow-ups

By ITT analysis, the overall self-reported 7-day PPA was 14.0% at 3-month and 16.5% at 6-month follow-ups. Significantly more participants in the intervention group reported abstinence in the past 7 days than in the control group at 3- month (15.2% vs 10.1%; P=0.008) and 6-month (18.8% vs 11.4%; P<0.001), equivalent to about 50% to 65% increase in quitting in the intervention than in the control group. The CC analysis yielded similar results. (Figure 8).

Figure 8

Self-reported abstinence rates at 3- and 6-month follow-ups, by ITT and CC analysis



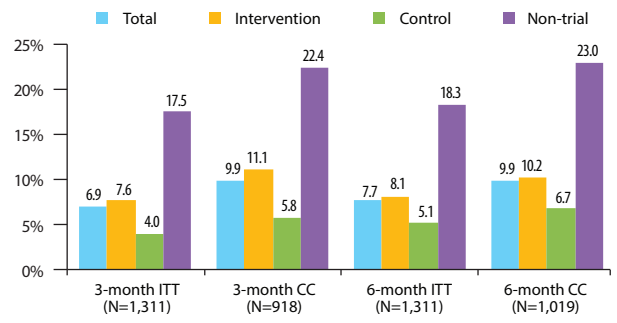
ITT: Intention-to-treat analysis; CC: Complete-case analysis

Biochemically validated abstinence rate at 3- and 6-month follow-ups

The overall biochemically validated quit rate was 6.9% at 3- month and 7.7% at 6-month follow-ups by ITT analysis. The figures were significantly higher in the intervention group than in the control group (7.6% vs 4.0%; P=0.009) at 3-month and (8.1% vs 5.1%; P=0.033) at 6-month, which were amounted to about 60% to 90% increase in the intervention than in the control group. The results were supported by the CC analysis (Figure 9).

Figure 9

Biochemically validated abstinence rates at 3- and 6-month follow-ups, by ITT and CC analysis



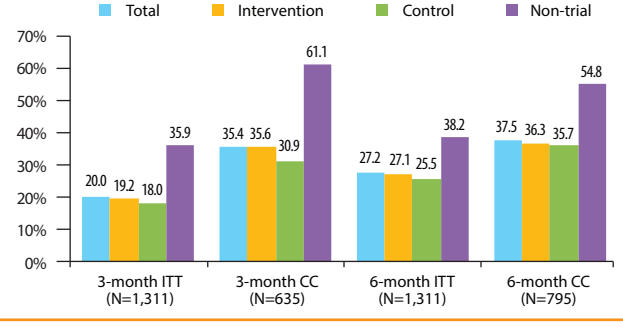
ITT: Intention-to-treat analysis; CC: Complete-case analysis

Smoking reduction rate at the 3- and 6-month follow-ups

By ITT analysis, the proportion of participants who cut their daily cigarette consumption by half or more after joining the QTW Contest was 20.0% at 3-month and 27.2% at 6-month among those who failed to quit (Figure 10). The smoking reduction rates were higher in the intervention group than in the control group at all follow-up time points, although the differences were insignificant (all P>0.05).

Figure 10

Rate of smoking reduction by at least half in continuing smokers at 3- and 6-month follow-ups, by ITT and CC analysis

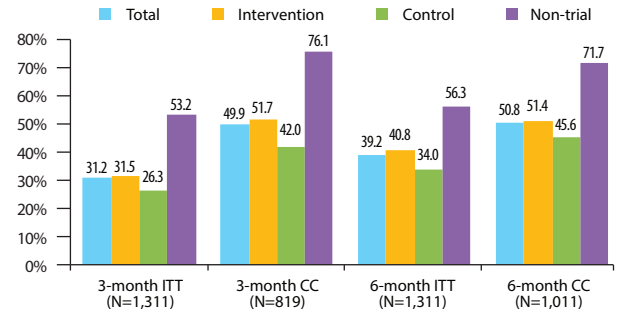


ITT: Intention-to-treat analysis; CC: Complete case analysis

By ITT analysis, the overall rate of smoking reduction or cessation were 31.2% and 39.2% at 3- and 6-month, respectively (Figure 11). The smoking reduction or quit rate was significantly higher in the intervention group than in the control group at 3-month (31.5% vs 26.3%; P=0.048) and at 6-month (40.8% vs 34.0%; P=0.016) follow-ups. CC analysis yielded similar results.

Figure 11

Rate of smoking reduction by at least half or cessation at 3- and 6-month follow-ups, by ITT analysis and CC analysis



ITT: Intention-to-treat analysis; CC: Complete case analysis

Use of smoking cessation services at 1-, 2-, 3- and 6-month follow-ups

Participants only in the intervention group were actively referred to SC services owing to the RCT study design. Throughout the entire study period, there were 345 referral requests to SC services made by 26.3% of all QTW Contest participants (Table 2). The cumulative number of referral requests were 292 in the intervention group, compared with 13 in the control group.

Table 2 Referral status for all participants (N=1,311)

	Total (N=1,311)	Intervention (N=591)	Control (N=594)	Non-trial (N=126)
Had made a referral request	345 (26.3)	292 (49.4)	13 (2.2)	40 (31.7)

The number of participants who ever used a SC service increased through follow-up time points. Overall, 11.5% of all participants had used a SC service at least once by the 6-month follow-up (Table 3). The cumulative prevalence of SC service use was significantly higher in the intervention group than in the control group at all follow-up time points (All P<0.001).

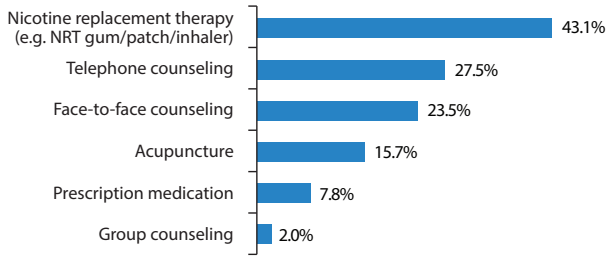
Table 3 Use of SC service (N=1,311)

	Total (N=1,311)	Intervention (N=591)	Control (N=594)	Non-trial (N=126)
1-month	78 (6.0)	56 (9.5)	8 (1.4)	14 (11.1)
2-month	108 (8.2)	76 (12.9)	11 (1.9)	21 (16.7)
3-month	127 (9.7)	91 (15.4)	13 (2.2)	23 (18.3)
6-month	151 (11.5)	102 (17.3)	23 (3.9)	26 (20.6)

Among 102 service users who reported the type of treatment used in the intervention group, the most frequently received treatment from the SC services were nicotine replacement therapy (43.1%), followed by telephone counseling (27.5%) and face-to-face counseling (23.5%) (Figure 12).

Figure 12

Types of smoking cessation services being used among service users (N=102) [1]

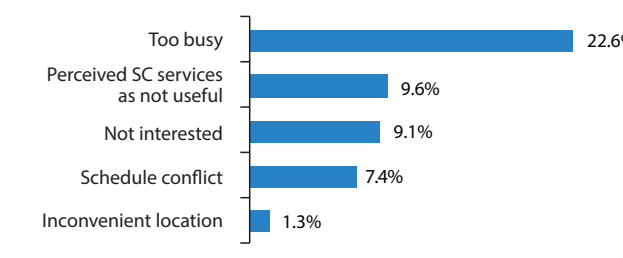


[1]Participants could choose more than one option.

In the intervention group, 230 participants who did not use SC service at 1 month provided a reason for not using the SC services. The primary reasons were "too busy" (22.6%), followed by "perceived SC services as not useful" (9.6%); "not interested" (9.1%); "schedule conflict" (7.4%); "inconvenient location" (1.3%) (Figure 13).

Figure 13

Reasons for not using smoking cessation services among non-service users (N=230) [1]



[1]Participants could choose more than one option.

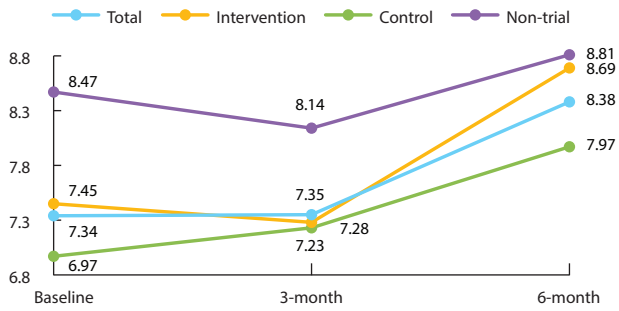
Self-efficacy of quitting

Perceived importance to quit smoking

Among participants with complete data at all time points, the overall mean score of perceived importance to quit smoking were similar between baseline and 3-month follow-up (7.34 vs 7.35; P=0.91), but significantly increased from 3-month to 6-month follow-up (from 7.35 to 8.38; P<0.001). The mean score significantly increased from 3- to 6-month follow-up and from baseline to 6-month follow-up in both study groups (all P<0.001), and the increase was significantly greater in the intervention group than in the control group from 3- to 6-month follow-up (P<0.001) (Figure 14).

Figure 14

Perceived importance to quit smoking (N=673)[1]



	P value for within-group comparisons		P value for between-group comparisons
	Intervention	Control	
Baseline to 3-month	0.24	0.054	**0.029**
3-month to 6-month	**<0.001**	**<0.001**	**<0.001**
Baseline to 6-month	**<0.001**	**<0.001**	**0.20**

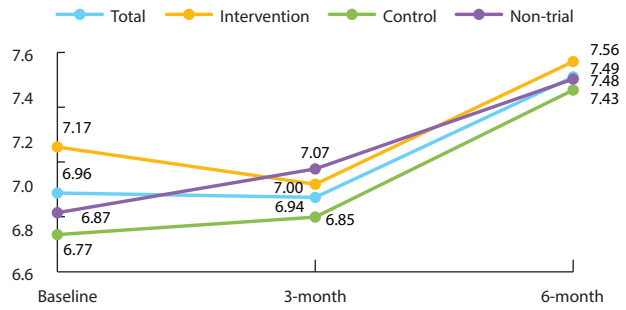
[1]From 0 (not important at all) to 10 (very important); missing data were excluded.

Perceived difficulty to quit smoking

In participants who responded to the questions, the mean score of perceived difficulty to quit smoking were similar between baseline and 3-month follow-up (from 6.96 to 6.94; P=0.86), then increased from 3-month to 6-month follow-up (6.94 to 7.49; P<0.001). The mean score significantly increased from 3-month to 6-month and from baseline to 6-month in both study groups (P≤0.004). There was no significant between-group difference in change in mean scores between any time points (P=0.19 to 0.90) (Figure 15).

Figure 15

Perceived difficulty to quit smoking (N=665)[1]



	P value for within-group comparisons		P value for between-group comparisons
	Intervention	Control	
Baseline to 3-month	0.31	0.66	0.31
3-month to 6-month	**<0.001**	**<0.001**	0.90
Baseline to 6-month	**0.004**	**<0.001**	0.19

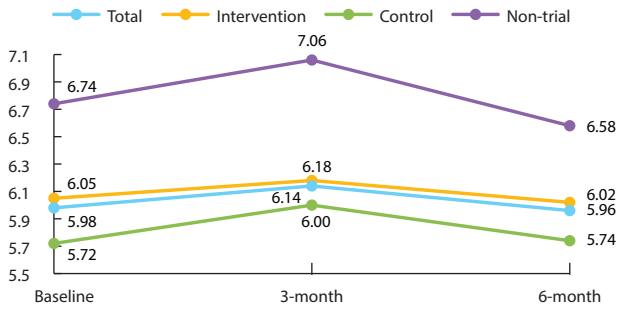
[1]From 0 (not difficult at all) to 10 (very difficult); missing data were excluded.

Perceived confidence to quitting

In participants with complete data, there was no significant change in the mean scores of perceived confidence to quit smoking between baseline and 3-month (5.98 vs 6.14; P=0.062) and baseline and 6-month (5.98 vs 5.96; P=0.84), despite a small and significant decrease from 3-month to 6-month (6.14 vs 5.96; P=0.010). The decrease is significant in participants in the control group (6.00 vs 5.74; P=0.049). There was no significant difference in changes in mean scores between any time points between both study groups (P=0.38 to 0.82) (Figure 16).

Figure 16

Perceived confidence to quit smoking (N=662)[1]



	P value for within-group comparisons		P value for between-group comparisons
	Intervention	Control	
Baseline to 3-month	0.61	0.08	0.38
3-month to 6-month	0.37	**0.049**	0.41
Baseline to 6-month	0.84	0.9	0.82

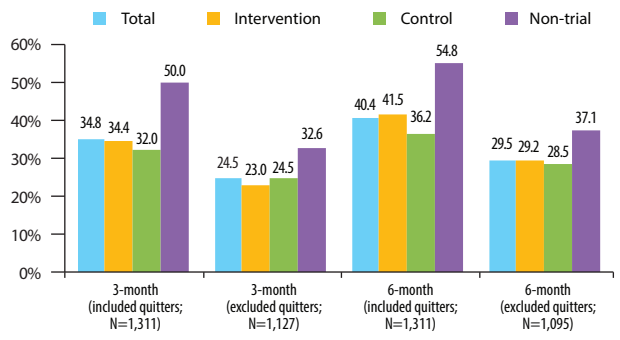
[1]From 0 (not confident at all) to 10 (very confident); missing data were excluded.

Quit attempt at 3- and 6-month follow-ups

By ITT analysis, the proportion of participants with at least one quit attempt was 34.8% by 3-month and 40.4% by 6 -month (Figure 17). Excluding those participated who quitted successfully, the corresponding figures were 24.5% and 29.5% respectively. Although the proportion of participants with at least a quit attempt by 3- and 6-month were slightly greater in the intervention group than in the control group with or without inclusion of quitters, there was no significant differences (P=0.063 to 0.82).

Figure 17

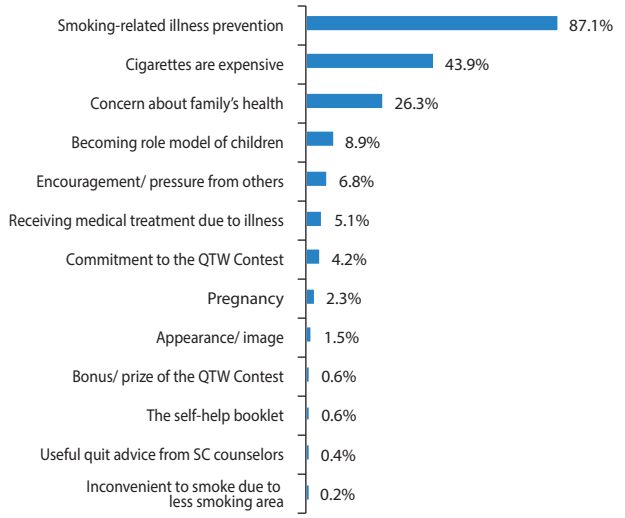
Quit attempt rates at 3- and 6-month follow-ups



Among participants who made at least one quit attempt during the study period, the leading reasons for making the quit attempts were "smoking-related illness prevention (87.1%), followed by "cigarettes are expensive" (43.9%) and "concern about family's health" (26.3%) (Figure 18). There was no significant difference in the proportion of participants reporting each reason for quit attempt between the intervention and control groups (all P>0.05).

Figure 18

Reasons for quit attempts in participants who had at least one quit attempt during the study period (N=529)[1,2]

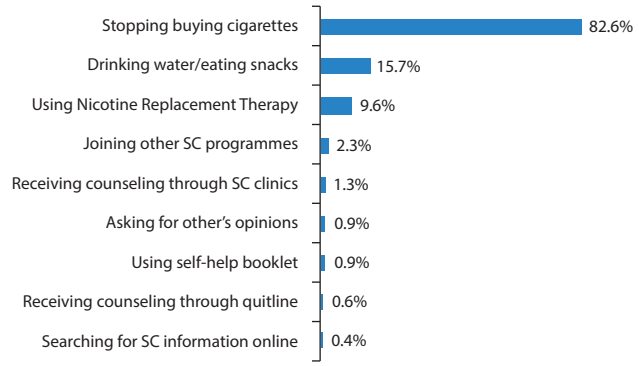


[1]Participants who were lost to follow-up were excluded.
[2]Participants could choose more than one option.

All participants who made at least a quit attempt used specific methods when making the quit attempts. The most common methods to quit smoking were "stop buying cigarettes" (82.6%), "drinking water/ eating snacks" (15.7%) and "using Nicotine Replacement Therapy" (9.6%) (Figure 19).

Figure 19

Methods of quitting in participants who had at least one quit attempt during the study period (N=529)[1,2]

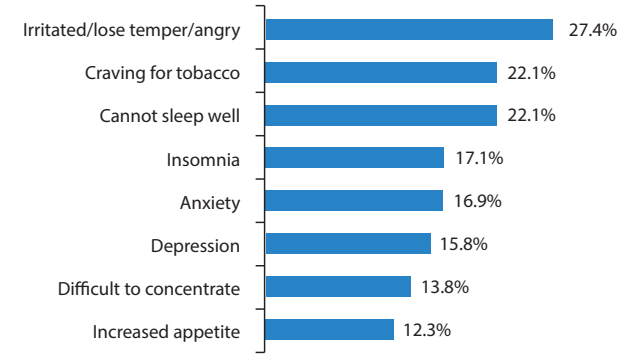


[1]Participants who were lost to follow-up were excluded.
[2]Participants could choose more than one option.

Withdrawal symptoms were assessed in 1-, 2- and 3-month follow-ups. Among the participants who had at least one quit attempt up to the 3-month follow-up, 60.1% reported having experienced withdrawal symptoms during the quit attempt. The most common withdrawal symptoms were "irritated/ lose temper/angry" (27.4%), followed by "craving for tobacco" (22.1%) and "cannot sleep well" (22.1%) (Figure 20).

Figure 20

Withdrawal symptoms experienced by participants who had at least one quit attempt by 3-month follow-up (N=456) [1,2]



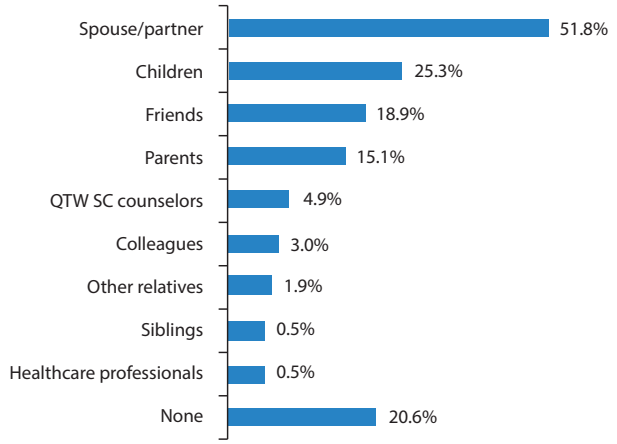
[1]Participants who were lost to follow-up were excluded.
[2]Participants could choose more than one option.

Perceived social support for quitting

Among the participants who responded to follow-ups in the study period, 79.4% perceived having received support from other persons. The most common sources of perceived support were from "spouse/partner" (51.8%), followed by "children" (25.3%) and "friends" (18.9%) (Figure 21). However, about one-fifth (20.6%) of participants did not perceive any social support.

Figure 21

Perceived social support for quitting in all participants who responded to follow-ups in the study period (N=1,081) [1, 2]



[1]Participants who were lost to follow-up were excluded.
[2]Participants could choose more than one option.

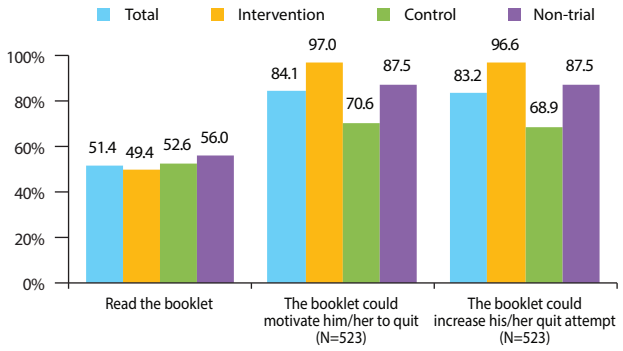
Use and satisfaction of smoking cessation aids provided

"Be smart, Quit Smoking!" booklet

Over half (51.4%) of the participants at 6 months reported having read the 12-page "Be smart, Quit Smoking" SC booklet (Figure 22). The proportions of participants who read the booklet were similar between the intervention and control groups (49.4% vs 52.6%; P=0.78). Most participants who read the booklet perceived the booklet to be useful in motivating them to quit (84.1%) and in increasing their quit attempt (83.2%). More participants in the intervention group than in the control group thought the booklet could motivate them to quit (97.0% vs 70.6%; P<0.001) and increase their quit attempt (96.6% vs 68.9%; P<0.001).

Figure 22

Experience of reading "Be smart, Quit Smoking!" SC booklet at 6-month follow-up (N=1,017) [1, 2]

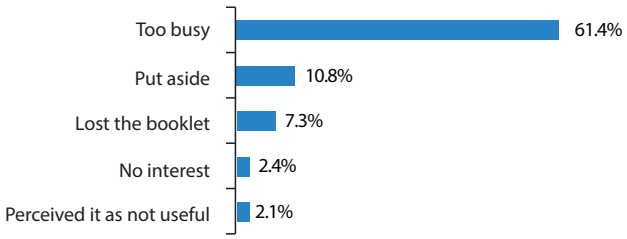


[1]Participants who were lost to follow-up at 6 months were excluded.
[2]Missing data were not shown.

Among the participants who had never read the booklet, "too busy" was the most frequently reported reason (61.4%), which was followed by "put aside" (10.8%) and "lost the booklet" (7.3%) (Figure 23).

Figure 23

Reasons for not reading the booklet of participants (N=381) [1, 2]



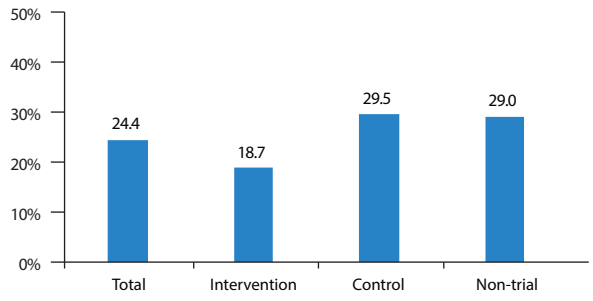
[1] Participants could choose more than one option.
[2] Participants who were lost to follow-up at 6-month or with missing data were excluded.

Tangle

24.4% of the participants reported having used a tangle at 6-month follow-up. On a scale of 1 (not helpful at all) to 5 (very helpful), the mean (SD) score of perceived helpfulness of "Tangle" for SC was 1.27 (0.55) in participants who had ever used the "Tangle" at the 6-month follow-up. The score was significantly lower among participants in the intervention group than in the control group (1.19 vs 1.32; P=0.014) (Figure 24).

Figure 24

Proportion of use of "Tangle" in all participants at 6-month follow-up (N=1,017) [1]



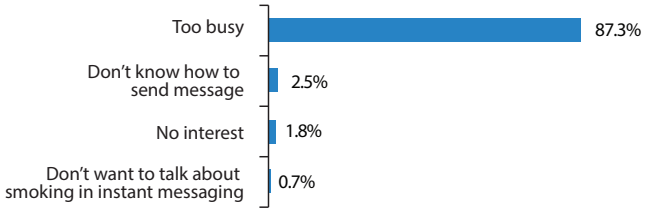
[1] Participants who were lost to follow-up at 6-month were excluded; missing data were not shown

Instant messaging support via WhatsApp

Of all participants in the intervention group followed at 3 months, 13.4% reported having ever interacted with a counselor through WhatsApp instant messaging. On a scale of 0 (not satisfied/ useful at all) to 10 (very satisfied/ useful), those who had ever interacted with a counselor via WhatsApp gave a mean (SD) score of 8.1(1.2) for level of satisfaction with the WhatsApp instant messaging support. The corresponding mean (SD) scores for perceived helpfulness of the interaction to increase motivation to quit and number of quit attempts were 7.4(1.6) and 7.5(1.6), respectively. "Too busy" was reported as the leading reason among participants for not interacting with a counselor via WhatsApp (87.3%) (Figure 25).

Figure 25

Reasons for not using instant messaging support in the intervention group (N=275) [1, 2]



[1] Participants could choose more than one option.

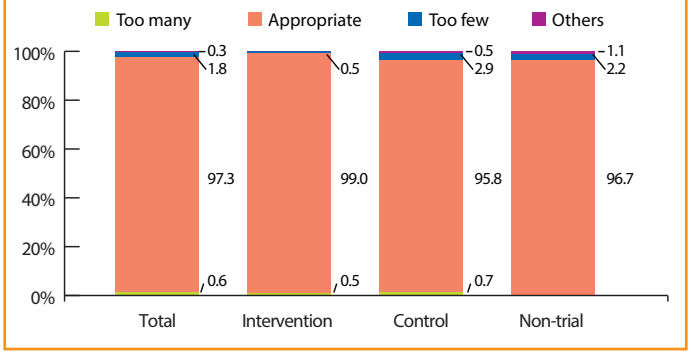
[2] Participants who were lost to follow-up at 3-month or with missing data were excluded.

Perception on the frequency of follow-up calls

The frequency of the follow-up calls was considered appropriate by most participants responding to the 6-month follow-up (97.3%). Slightly more participants in the control group considered the frequency to be "too few" than the intervention group (2.9% vs 0.51%; P=0.014) (Figure 26).

Figure 26

Perception of the follow-up call frequency in all participants at 6-month follow-up (N=1,017) [1]



[1] Participants who were lost to follow-up at 6 months were excluded; missing data were not shown.

4. Discussion

Through 68 promotion and recruitment activities held in all 18 districts in Hong Kong, the 8th "Quit to Win" Contest cum Smoke-free Community Campaign spread the smoke-free messages to over 50,000 members of public and engaged over 1,300 smokers in SC. By intention-to-treat analysis, the self-reported past 7-day PPA was 16.5% at 6 months, which was higher than those reported in QTW 2013 (9.4%), 2014 (10.9%), 2015 (13.0%) and 2016 (16.0%).

A cluster RCT was nested within the 8th QTW Contest to examine the effectiveness of an innovative, integrated AIR (brief advice, instant messaging intervention via WhatsApp and active referral) intervention for increasing quit rate in proactively recruited smokers in the community. By intention-to-treat analyses, the AIR intervention was found to be effective in increasing self-reported past 7-day PPA and biochemically validated abstinence and use of SC service at 3 and 6 months after baseline. The effect sizes of about 50% to 65% increase in self-reported abstinence and 60% to 90% increase in biochemically validated abstinence in the intervention group relative to the control group were moderate. The results were confirmed in sensitivity analyses (complete case analysis). The full trial results have been published in an international, peer-referred journal [15].

The RCT has provided the first evidence on the utility of instant messaging support via WhatsApp for SC, which was the major component of the AIR intervention being examined in the 8th QTW Contest. Consistent with the law of attrition, which purported that a large proportion of participants in any trials of digital health intervention do not use the intervention [16], few participants in the intervention group had ever interacted with a SC counselors via WhatsApp (13.4% at 3 months). Time constraint or busy schedule appeared to be the major barriers. However, participants who had ever interacted with a SC counselor reported a high level of satisfaction (mean score=8.1 on a scale of 0 to 10), supporting the acceptability of the intervention. This suggested the instant messaging intervention could be an important component of the AIR intervention model. Future studies to explore methods to increase the utilization of the WhatsApp interaction, such as extending the intervention duration to non-office hours and non-working days, and to examine WhatsApp intervention as a stand-alone intervention are warranted.

Since active referral was not the major component being examined in 8th QTW Contest, the intensity of the active referral intervention was less than those used in intervention groups of the 7th QTW Contest (High intensity active referral) and the 6th QTW Contest (AWARD advice plus active referral)[10]. This could explain the lower cumulative proportion of participants who used an SC service (17.3%) in the 8th than those of the 7th (36.2%) and the 6th (25.8%) QTW Contests. Nevertheless, the proportion of participants using a SC service was significantly greater in the intervention group than in the control group.

The proportions of participants who had ever read the 12-page "Be smart, Quit Smoking!" SC booklet were similar in both study groups. However, significantly more participants in the intervention group perceived it as useful in motivating them to quit and increasing their quit attempt. Whether there is synergistic effect between the AIR intervention and print-based materials on SC outcomes requires further investigation. We also noted a significantly greater increase in the perceived level of importance to quit in the intervention than control groups. All these may be the underlying mechanisms of the AIR intervention on SC outcomes, which warrant further studies.

5. Conclusions

To conclude, the 8th QTW Contest cum Smoke-free Community Campaign, encompassing SC counseling training, the QTW Contest, community-based promotion and a RCT, successfully delivered smoke-free messages to a large number of non-smokers and smokers in the Hong Kong community. The AIR intervention was found to be effective in increasing quit rate and use of SC services. Instant messaging support via WhatsApp could be a promising platform for delivering SC support to smokers. Future studies to examine and refine the instant messaging intervention in different settings and populations and with longer follow-up (e.g., 12 months) are warranted.

6. Clinical trial Registration

Trial registry: ClinicalTrials.gov, number NCT03182790.

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HONG KONG COUNCIL ON SMOKING AND HEALTH

Effectiveness of New and Enlarged Pictorial Health Warnings on Cigarette Packs Tobacco Control Policy-related Surveys 2018

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1. Introduction

Under Article 11 of the Framework Convention on Tobacco Control (FCTC), the World Health Organization (WHO) highly recommends its signatories to adopt pictorial health warnings that large, visible, clear and legible messages on harms of tobacco use should be displayed on the principal areas of each tobacco pack[1]. Pictorial health warnings are a cost-effective channel to disseminate knowledge of harms of smoking. Previous studies have shown that pictorial health warnings effectively arouse negative emotional reactions (e.g. fears and worries), preventing smoking initiation in never smokers and promoting intention to quit in smokers[2-5]. As of 11 February 2020, 109 countries and jurisdictions have finalized pictorial health warnings that cover at least 50% of the principal areas of each tobacco product pack, with 8 having the warnings covering at least 85%[6].

Pictorial health warnings on tobacco packages were first introduced in Hong Kong in 2007, after the adoption of text health warnings in 1983[7]. Each package was required to bear one of 6 pictorial health warnings that covered at least 50% of the area of the 2 largest surfaces[8]. A territory-wide study in Hong Kong found pictorial health warnings might have made the social environment less favourable for smoking, even in hardcore smokers[9].

Remaining unchanged for a decade, these pictorial health warnings might have become less effective in discouraging smoking. The Smoking (Public Health) (Notices) (Amendment) Order 2017 (the Amendment Order), which aimed to amend the requirements on the pictorial health warnings, was passed in June 2017. The Amendment Order requires at least 85% of the 2 largest surfaces of each cigarette pack to be covered by one of the 12 new pictorial health warnings (including damaged toes, lung cancer, a body at mortuary, a funeral with a portrait of the deceased young lady, burning banknotes, a downward curving cigarette, a man using oxygen mask, a woman using nasogastric tube in hospital, a wrinkled woman, throat with hole, use of walker and an ill child)[10](Appendix). The Integrated Smoking Cessation Hotline (1833 183) must also be shown. A 6-month transitional period (from 21 December 2017 to 20 June 2018) was granted, during which it was still legal to sell tobacco products with the old warnings. Tobacco products must be covered by the new pictorial health warnings from 21 June 2018.

The new and enlarged warnings with stronger images and warning messages aim to reduce tobacco use in Hong Kong, but the effectiveness has not been studied. Smokers may have counteractions in response to the new pictorial

health warnings, which were understudied. Effects of the new pictorial health warnings and the counteractions of smokers should be examined.

The Hong Kong Council on Smoking and Health (COSH) has commissioned the Tobacco Control Policy-related Survey (TCPS), a regular cross-sectional survey, to collect population-representative information on smoking and related public opinions since 2013. Since 2015, each survey recruits around 5,100 respondents, with oversampling of current smokers and ex-smokers. TCPS 2018 included 2 waves of surveys, conducted during the transitional period of the Amendment Order (Wave 1) and after full implementation (Wave 2). Together with TCPS 2017, effects of the new pictorial health warnings can be evaluated. The periods of TCPS 2017, TCPS 2018 Wave 1 and TCPS 2018 Wave 2 are hereafter referred to as pre-implementation, transitional period and post-full implementation, respectively.

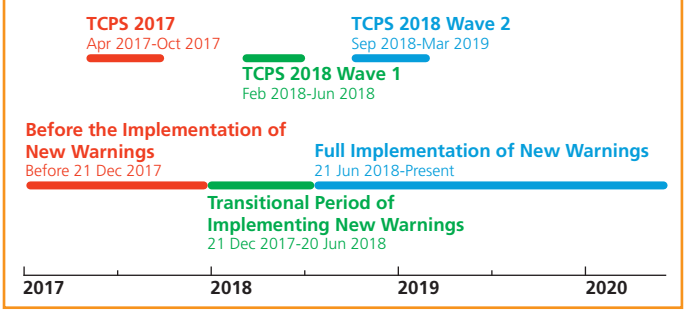
2. Methods

2.1 Study design and participants

Anonymous computer-assisted telephone interviews were conducted by the Public Opinion Programme, The University of Hong Kong (currently known as Hong Kong Public Opinion Research Institute Limited). Figure 1 shows the 3 survey periods of TCPSs in relation to the schedule of implementation of the new health warnings: April to October 2017 (pre-implementation), February to June 2018 (transitional period) and September 2018 to March 2019 (post-full implementation). Respondents aged 15 years or above and spoke Cantonese were recruited. They were divided into 3 groups: (a) current smokers, who smoked daily or occasionally at the time of survey; (b) ex-smokers, who smoked previously but did not smoke any at the time of the survey; and (c) never smokers, who had never smoked in their lifetime. Smoking referred only to using cigarettes in 2017, and using all types of tobacco products in the 2 waves of surveys in 2018. This renders the results between 2017 and 2018 less comparable. Telephone calls took place between 2:00 pm and 10:30 pm on weekdays and weekends to cover respondents of different occupations and working hours. Each randomly selected telephone number was called 5 times, at different hours and days of the week, before being considered as "non-contact". All respondents provided oral consent before the interview and could withdraw from the interview at any time. The protocol of this study, including respondent recruitment, oral informed consent procedures and data collection, was approved by the Institutional Review Board of The University of Hong Kong/Hospital Authority Hong Kong West Cluster.

Figure 1

Timeline of conducting TCPSs and implementation of new pictorial health warnings



2.2 Sampling methods and respondent selection

Telephone numbers were randomly selected from a sampling frame originated from the residential telephone directories. To capture unlisted numbers, another set of numbers was generated by a computer programme using the "plus/minus one/two" method and appended to the sampled numbers. After eliminating duplicated numbers, the remaining numbers were dialled in random order. When a telephone contact was successfully established with a target household, one eligible person would be selected from all eligible family members who were at home at the time of the interview, using the "next birthday" procedure.

2.3 Questionnaire development

The questionnaires used in TCPS 2017 (pre-implementation), TCPS 2018 Wave 1 (transitional period) and TCPS 2018 Wave 2 (post-full implementation) were modified from those in previous rounds of surveys, including core questions and random questions. Random question sets were designed for random subsamples of respondents with certain smoking status. Socio-demographic characteristics, such as sex, age, education attainment, monthly household income, and employment status were core questions for all respondents. Questions on pictorial health warnings in TCPS

2017 (pre-implementation) were mostly random questions for current smokers, and in TCPS 2018 Wave 1 (transitional period) and TCPS 2018 Wave 2 (post-full implementation) were mostly core questions for current smokers. Questions on point-of-sale tobacco displays were covered in various random subsets for all smoking status.

2.4 Weighting and statistical analysis

TCPS 2017 (pre-implementation) recruited 5,131 respondents, including 1,712 never smokers, 1,715 ex-smokers and 1,704 current smokers. TCPS 2018 Wave 1 (transitional period) recruited 5,132 respondents, including 1,713 never smokers, 1,707 ex-smokers and 1,712 current smokers. TCPS 2018 Wave 2 (post-full implementation) recruited 5,156 respondents, including 1,714 never smokers, 1,739 ex-smokers and 1,703 current smokers. Data of each survey wave were weighted against the projected sex and age distribution of the Hong Kong population and smoking status in the corresponding year to produce population-representative estimates. All percentages shown in this report are estimates for the general population.

Results presented in this report include: (a) socio-demographic characteristics of respondents, (b) awareness of pictorial health warnings (i.e. saw in the past 30 days), (c) impacts of new pictorial health warnings on smoking-related risk perceptions and behaviours, (d) counteractions of current smokers to avoid seeing pictorial health warnings, and (e) awareness of point-of-sale tobacco displays (i.e. saw in the past 30 days). The survey methods and statistical analysis used in these 3 surveys were similar.

Univariate analysis of variables of interest by smoking status was conducted using Chi-square tests. Poisson regression yielded relative risks (RRs) to estimate the effect size of the impacts of new pictorial health warnings (relative change) during the transitional period and post-full implementation. Statistical significance was set at $p<0.05$. Statistical analysis was conducted using Stata (Version 15.1, TX: StataCorp LLC).

3. Results

3.1 Socio-demographic characteristics of respondents

Table 1 shows that males constituted 45.2% of TCPS 2017 (pre-implementation) sample, 45.1% of TCPS 2018 Wave 1 (transitional period) sample, and 44.9% of TCPS 2018 Wave 2 (post-full implementation) sample. Over half the respondents were aged 15-49 years in all waves (54.0% in TCPS 2017, 53.1% in TCPS 2018 Wave 1 and 53.3% in TCPS 2018 Wave 2). Most attained at least secondary education (88.1% in TCPS 2017, 88.6% in TCPS 2018 Wave 1 and 88.9% in TCPS 2018 Wave 2). About half were employed (49.0% in TCPS 2017, 54.9% in TCPS 2018 Wave 1 and 50.0% in TCPS 2018 Wave 2).

3.2 Awareness of pictorial health warnings

Figure 2 shows that before implementation of the new warnings, 39.0% of all respondents (77.6% of current smokers, 27.1% of ex-smokers and 35.3% of never smokers) were aware of (i.e. saw in the past 30 days) pictorial health warnings. The awareness increased to 41.8% (88.3% of current smokers, 34.6% of ex-smokers and 36.5% of never smokers) during the transitional period.

Figure 2 also shows that the awareness of the new pictorial health warnings further increased to 45.2% (88.6% of current smokers, 37.4% of ex-smokers and 40.3% of never smokers) after full implementation.

Figure 3 shows that 11.3% of all respondents and 45.6% of current smokers saw new pictorial health warnings in the past 30-days during the transitional period. Out of 100 cigarette packs they saw, the median proportion of new health warnings was 80% (IQR 50%-100%, not shown in the figure).

The difference among these 3 surveys was statistically significant for all respondents ($p<0.001$) and for each smoking status group (all $p<0.001$). Table 2 shows that current smokers and ex-smokers in the transitional period were more likely to be aware of pictorial health warnings than before implementation. After full implementation, all respondents were 14% (95% CI 4%–26%) and current smokers were 15% (95% CI 7%-23%) more likely to be aware of pictorial health warnings than those in the pre-implementation period. Compared with the population in the transitional period, respondents were 8% (95% CI 1%-16%) more likely to be aware of the pictorial health warnings after full implementation.

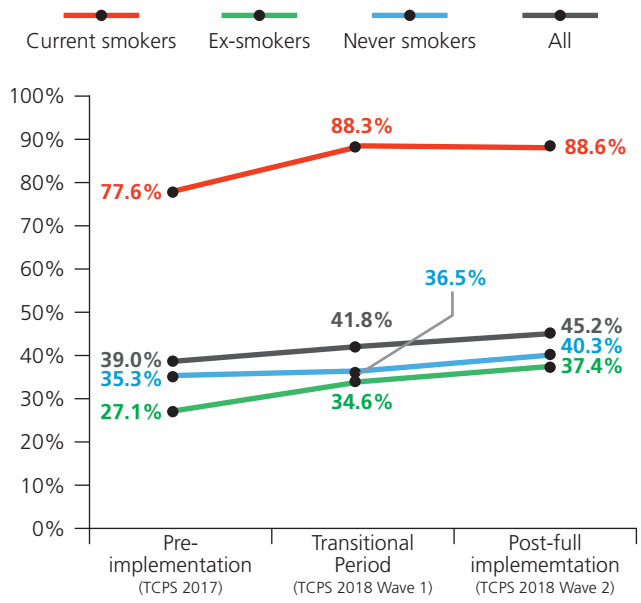
Table 1 Socio-demographic characteristics of respondents in TCPS 2017 (Pre-implementation), TCPS 2018 Wave 1 (Transitional period) and TCPS 2018 Wave 2 (Post-full implementation)

	TCPS 2017 (Pre-implementation)	TCPS 2018 Wave 1 (Transitional period)	TCPS 2018 Wave 2 (Post-full implementation)
Number of all respondents	(N=5,131)	(N=5,132)	(N=5,156)
Sex (%)			
Male	45.2	45.1	44.9
Female	54.8	54.9	55.1
Age group, years(%)			
15-29	19.2	18.5	18.6
30-39	17.5	17.4	17.5
40-49	17.3	17.2	17.2
50-59	19.1	18.6	18.7
60 or above	26.4	27.3	27.4
DK/RTA	0.5	1.0	0.6
Education attainment (%)			
Primary or below	11.6	10.7	11.1
Secondary	43.7	43.1	46.0
Tertiary	44.4	45.5	42.9
DK/RTA	0.3	0.7	0.0
Employment status (%)			
Employed	49.0	54.9	50.0
Student	10.6	8.7	9.6
Homemaker/Unemployed/Retired	39.5	35.6	40.1
DK/RTA	0.9	0.8	0.3

DK/RTA: Didn't know or refused to answer. Sample sizes (N) refer to the actual number of respondents. Percentages were weighted by sex, age and smoking status to the 2017 or 2018 Hong Kong population.

Figure 2

Seeing pictorial health warnings on cigarette packs in the past 30 days



Sample sizes (N) refer to the actual number of respondents. Percentages were weighted by sex, age and smoking status to the 2017 or 2018 Hong Kong population. Statistical significance was tested by chi-square test. All: p<0.001; CS: p<0.001; ES: p<0.001; NS: p<0.001

TCPS 2017: All=1,546; NS=839; ES=420; CS=287

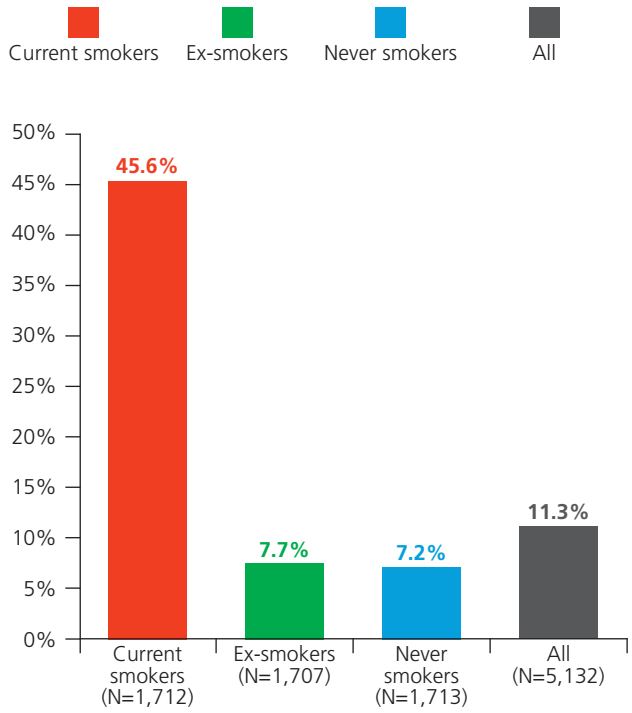
TCPS 2018 Wave 1: All=5,132; NS=1,713; ES=1,707; CS=1,712

TCPS 2018 Wave 2: All=5,156; NS=1,714; ES=1,739; CS=1,703

All: All respondents; NS: Never smokers; ES: Ex-smokers; CS: Current smokers.

Figure 3

Seeing the new pictorial health warnings on cigarette packs in the past 30 days during the transitional period (TCPS 2018 Wave 1)



Sample sizes (N) refer to the actual number of respondents. Percentages were weighted by sex, age and smoking status to the 2018 Hong Kong population.

Table 2 Changes in awareness of pictorial health warnings on cigarette packs, from pre-implementation to the transitional period and post-full implementation

Relative Risk [RR] (95% Confidence Interval)				
	All	Current smokers	Ex-smokers	Never smokers
Transitional period vs. Pre-implementation	1.06 (0.97-1.17)	1.14 (1.06-1.23) ***	1.26 (1.05-1.51) **	1.03 (0.91-1.16)
Post-full implementation vs. Pre-implementation	1.14 (1.04-1.26) **	1.15 (1.07-1.23) ***	1.37 (1.14-1.63) ***	1.13 (0.99-1.27)
Post-full implementation vs. Transitional period	1.08 (1.01-1.16) *	1.00 (0.98-1.03)	1.08 (0.99-1.19)	1.10 (1.00-1.21)

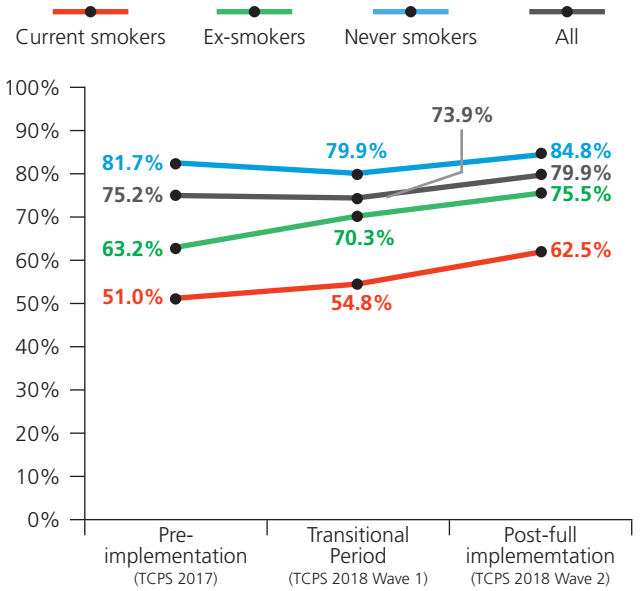
Weighted by sex, age and smoking status to the 2017 or 2018 Hong Kong population.
* p<0.05; ** p<0.01; *** p<0.001

3.3 Impacts of new pictorial health warnings on smoking-related risk perceptions and behaviours

Figure 4 shows that 75.2% of all respondents (51.0% of current smokers, 63.2% of ex-smokers and 81.7% of never smokers) thought about the harms of smoking after seeing pictorial health warnings on cigarette packs in the past 30 days before implementation of the new warnings. The prevalence remained similar (73.9% of all respondents) during the transitional period but increased to 79.9% (62.5% of current smokers, 75.5% of ex-smokers and 84.8% of never smokers) after full implementation. The difference among these 3 surveys was statistically significant for all respondents ($p<0.05$), current smokers ($p<0.001$) and ex-smokers ($p<0.05$). Table 3 shows that current smokers were 23% (95% CI 6%-43%) more likely to think about the harms of smoking after seeing pictorial health warnings post-full implementation than pre-implementation. Compared with the transitional period, all respondents were 8% (95% CI 3%-13%) and current smokers were 15% (95% CI 7%-23%) more likely to think about the harms of smoking post-full implementation.

Figure 4

Thought about the harms of smoking after seeing pictorial health warnings on cigarette packs in the past 30 days



Sample sizes (N) refer to the actual number of respondents. Percentages were weighted by sex, age and smoking status to the 2017 or 2018 Hong Kong population. Statistical significance was tested by chi-square test. All: $p<0.05$; CS: $p<0.001$; ES: $p<0.05$; NS: $p=0.31$

TCPS 2017: All=607; NS=268; ES=115; CS=224

TCPS 2018 Wave 1: All=2,598; NS=564; ES=565; CS=1,469

TCPS 2018 Wave 2: All= 2,633 NS=550; ES=608; CS=1,475

All: All respondents; NS: Never smokers; ES: Ex-smokers; CS: Current smokers.

Table 3 Thought about the harms of smoking after seeing the pictorial health warnings in the past 30 days, from pre-implementation to the transitional period and post-full implementation

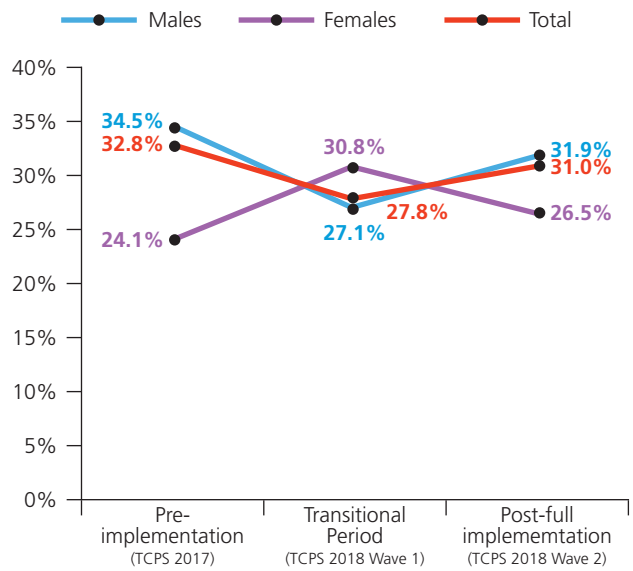
Relative Risk [RR] (95% Confidence Interval)				
	All	Current smokers	Ex-smokers	Never smokers
Transitional period vs. Pre-implementation	0.99 (0.92-1.06)	1.08 (0.93-1.25)	1.11 (0.95-1.31)	0.98 (0.91-1.06)
Post-full implementation vs. Pre-implementation	1.06 (1.00-1.14)	1.23 (1.06-1.43) **	1.20 (1.03-1.40) *	1.04 (0.97-1.12)
Post-full implementation vs. Transitional period	1.08 (1.03-1.13) **	1.15 (1.07-1.23) ***	1.08 (1.00-1.16)	1.06 (1.00-1.12) *

Weighted by sex, age and smoking status to the 2017 or 2018 Hong Kong population.
* $p<0.05$; ** $p<0.01$; *** $p<0.001$

Figure 5 shows that, before implementation, 32.8% of current smokers thought about quitting after seeing the pictorial health warnings on cigarette packs in the past 30 days. The prevalence decreased to 27.8% during the transitional period but then increased to 31.0% post-full implementation. The difference among these 3 surveys was not statistically significant. Table 4 also shows no significant change across surveys, except that male current smokers were more likely to think about quitting after full implementation than during the transitional period.

Figure 5

Thought about quitting after seeing pictorial health warnings on cigarette packs in the past 30 days in current smokers



Sample sizes (N) refer to the actual number of respondents. Percentages were weighted by sex and age distribution of current smokers in Hong Kong in 2017 or 2018. Statistical significance was tested by chi-square test. CS: p=0.29; M: p=0.06; F: p=0.56

TCPS 2017: CS=224; M=183; F=41

TCPS 2018 Wave 1: CS=1,469; M=1,231; F=238

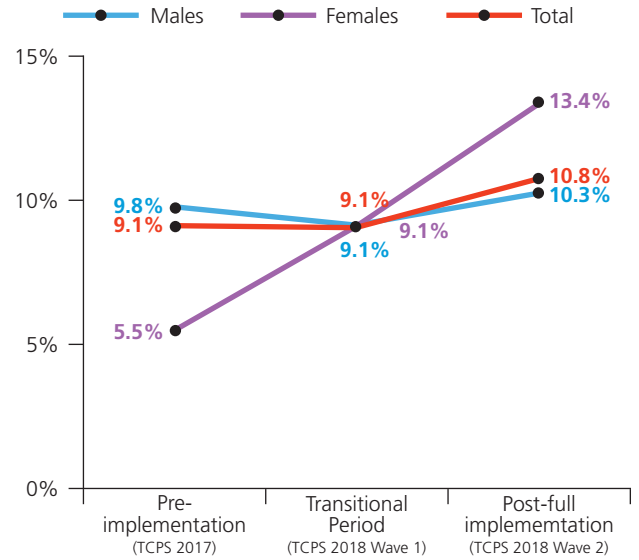
TCPS 2018 Wave 2: CS=1,475; M=1,257; F=218

CS: Current smokers; M: Male current smokers; F: Female current smokers.

Figure 6 shows that the prevalence of current smokers holding back from smoking after noticing pictorial health warnings remained unchanged as 9.1% before implementation and during the transitional period, but increased to 10.8% after full implementation. A sharp increase was observed in female current smokers that the prevalence increased from 5.5% to 13.4% over the same period. The difference among these 3 surveys was not statistically significant. Table 5 shows that female current smokers were 138% (95% CI -30%-720%) and 47% (95% CI -20%-170%) more likely to hold back from smoking after full implementation of new pictorial health warnings than pre-implementation and during the transitional period, respectively. The difference in prevalence and RRs for female current smokers were remarkable but not significant, possibly due to the small number of them in the surveys.

Figure 6

Holding back from smoking after seeing pictorial health warnings on cigarette packs in the past 30 days in current smokers



Sample sizes (N) refer to the actual number of respondents. Percentages were weighted by sex and age distribution of current smokers in Hong Kong in 2017 or 2018. Statistical significance was tested by chi-square test. CS: p=0.58; M: p=0.86; F: p=0.16

TCPS 2017: CS=224; M=183; F=41

TCPS 2018 Wave 1: CS=1,469; M=1,231; F=238

TCPS 2018 Wave 2: CS=1,475; M=1,257; F=218

CS: Current smokers; M: Male current smokers; F: Female current smokers.

Table 4 Thought about quitting after seeing pictorial health warnings in the past 30 days in current smokers, from pre-implementation to the transitional period and post-full implementation

Relative Risk [RR] (95% Confidence Interval)			
	All current smokers	Male current smokers	Female current smokers
Transitional period vs. Pre-implementation	0.86 (0.68-1.08)	0.80 (0.62-1.02)	1.30 (0.72-2.34)
Post-full implementation vs. Pre-implementation	0.96 (0.76-1.21)	0.94 (0.73-1.20)	1.12 (0.60-2.03)
Post-full implementation vs. Transitional period	1.12 (0.98-1.27)	1.18 (1.02-1.36) *	0.85 (0.61-1.19)

Weighted by sex and age distribution of current smokers in Hong Kong in 2017 or 2018.
* p<0.05; ** p<0.01; *** p<0.001

Table 5 Holding back from smoking after seeing pictorial health warnings on cigarette packs in the past 30 days in current smokers, from pre-implementation to the transitional period and post-full implementation

Relative Risk [RR] (95% Confidence Interval)			
	All current smokers	Male current smokers	Female current smokers
Transitional period vs. Pre-implementation	1.00 (0.63-1.58)	0.93 (0.57-1.52)	1.62 (0.47-5.58)
Post-full implementation vs. Pre-implementation	1.18 (0.75-1.86)	1.05 (0.64-1.70)	2.38 (0.70-8.14)
Post-full implementation vs. Transitional period	1.18 (0.92-1.51)	1.12 (0.86-1.46)	1.47 (0.80-2.70)

Weighted by sex and age distribution of current smokers in Hong Kong in 2017 or 2018.
* p<0.05; ** p<0.01; *** p<0.001

3.4 Counteractions of current smokers to avoid seeing pictorial health warnings

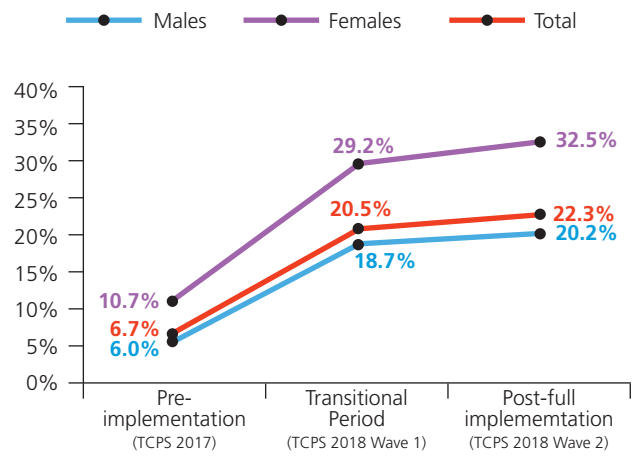
TCPS 2017 (pre-implementation), TCPS 2018 Wave 1 (transitional period) and TCPS 2018 Wave 2 (post-full implementation) explored 4 possible counteractions of current smokers to avoid seeing pictorial health warnings: (a) covering cigarette packs, (b) keeping cigarette packs somewhere out of sight, (c) changing to another cigarette package, and (d) avoiding buying specific cigarette packs.

Figure 7 shows that 6.7% of current smokers took at least one of these 4 counteractions in the past 30 days before implementation of new pictorial health warnings. The prevalence increased to 20.5% during the transitional period, and slightly further increased to 22.3% after full implementation. The difference among these 3 surveys was statistically significant for all current smokers ($p<0.001$). A similar significant increase was observed in both male ($p<0.001$) and female ($p<0.05$) current smokers. Table 6 shows that current smokers (including both male and female) were more likely to take counteractions during the transitional period than before implementation. After full implementation, current smokers were 231% (95% CI 104%-437%) more likely to take at least one counteractions to avoid seeing pictorial warnings than those before implementation. A similar increase in likelihood was observed in both male (235%, 95% CI 89%-507%) and female (204%, 95% CI 32%-599%) current smokers. The results during the transitional period and post-full implementation were similar.

Figure 8 shows that 1.0% of current smokers covered the cigarette packs in the past 30 days before implementation of new pictorial health warnings. The prevalence increased to 5.9% during the transitional period and remained similar (6.0%) after full implementation. The difference among these 3 surveys was statistically significant for all current smokers ($p<0.05$). Table 7 shows that current smokers were around 5 times more likely to cover cigarette packs during the transitional period and after full implementation, than before implementation. The results during the transitional period and post-full implementation were similar.

Figure 7

Any counteractions* to avoid seeing pictorial health warnings in the past 30 days in current smokers



* See Figure 8, 9, 10 and 11 for specific actions.

Sample sizes (N) refer to the actual number of respondents. Percentages were weighted by sex and age distribution of current smokers in Hong Kong in 2017 or 2018. Statistical significance was tested by chi-square test. CS: $p<0.001$; M: $p<0.001$; F: $p<0.05$

TCPS 2017: CS=224; M=183; F=41

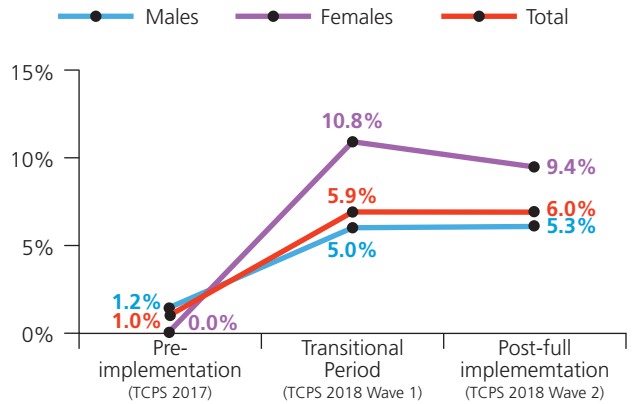
TCPS 2018 Wave 1: CS=1,469; M=1,231; F=238

TCPS 2018 Wave 2: CS=1,475; M=1,257; F=218

CS: Current smokers; M: Male current smokers; F: Female current smokers.

Figure 8

Covering the cigarette packs in the past 30 days in current smokers



Sample sizes (N) refer to the actual number of respondents. Percentages were weighted by sex and age distribution of current smokers in Hong Kong in 2017 or 2018. Statistical significance was tested by chi-square test. CS: $p<0.05$; M:$p=0.06$; F: $p=0.27$

TCPS 2017: CS=224; M=183; F=41

TCPS 2018 Wave 1: CS=1,469; M=1,231; F=238

TCPS 2018 Wave 2: CS=1,475; M=1,257; F=218

CS: Current smokers; M: Male current smokers; F: Female current smokers.

Table 6 Any counteractions to avoid seeing pictorial health warnings in the past 30 days in current smokers, from pre-implementation to the transitional period and post-full implementation

Relative Risk [RR] (95% Confidence Interval)			
	All current smokers	Male current smokers	Female current smokers
Transitional period vs. Pre-implementation	3.06 (1.89-4.96) ***	3.17 (1.77-5.68) ***	2.74 (1.20-6.26) *
Post-full implementation vs. Pre-implementation	3.31 (2.04-5.37) ***	3.35 (1.89-6.07) ***	3.04 (1.32-6.99) **
Post-full implementation vs. Transitional period	1.08 (0.92-1.27)	1.07 (0.89-1.28)	1.11 (0.81-1.52)

Weighted by sex and age distribution of current smokers in Hong Kong in 2017 or 2018.
* p<0.05; ** p<0.01; *** p<0.001

Table 7 Covering cigarette packs in the past 30 days in current smokers, from pre-implementation to the transitional period and post-full implementation

Relative Risk [RR] (95% Confidence Interval)			
	All current smokers	Male current smokers	Female current smokers[#]
Transitional period vs. Pre-implementation	6.14 (1.89-19.97) **	4.32 (1.31-14.20) *	N/A
Post-full implementation vs. Pre-implementation	6.19 (1.90-20.21) **	4.59 (1.40-15.09) *	N/A
Post-full implementation vs. Transitional period	1.01 (0.72-1.41)	1.06 (0.72-1.58)	0.88 (0.46-1.68)

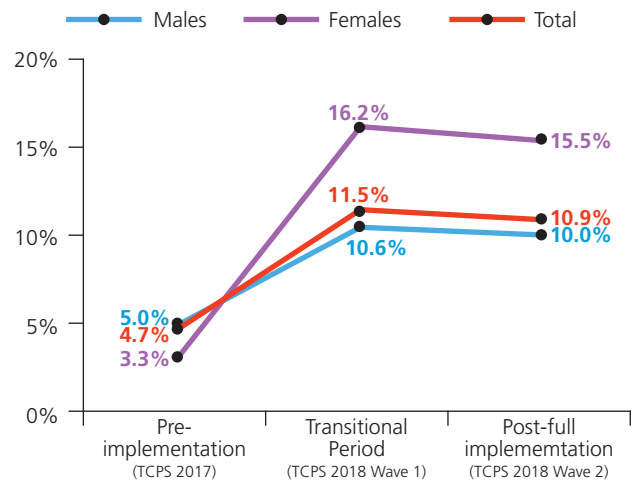
Weighted by sex and age distribution of current smokers in Hong Kong in 2017 or 2018.
RR cannot be calculated as no female current smokers covered the cigarette packs in the past 30 days in 2017
* p<0.05; ** p<0.01; *** p<0.001

Figure 9 shows that 4.7% of current smokers kept cigarette packs out of sight before implementation of new pictorial health warnings. The prevalence increased to 11.5% during the transitional period and remained similar (10.9%) after full implementation. The difference among 3 surveys was statistically significant for all current smokers ($p<0.05$). Table 8 shows that current smokers were nearly 1.5 times more likely to keep cigarette packs out of their sights during the transitional period and after full implementation of new pictorial health warnings, than before implementation. The results during the transitional period and post-full implementation were similar.

Figure 10 shows that 1.7% of current smokers changed to another cigarette package in the past 30 days before implementation of new pictorial health warnings. The prevalence increased to 6.3% during the transitional period and remained similar (6.6%) after full implementation. The difference among these 3 surveys was marginally significant for all current smokers ($p=0.07$). Table 9 shows that current smokers were more than 2.5 times more likely to change to another cigarette package during the transitional period and after full implementation of new pictorial health warnings, than before implementation. The results during the transitional period and post-full implementation were similar.

Figure 9

Keeping cigarette packs out of sights in the past 30 days in current smokers



Sample sizes (N) refer to the actual number of respondents. Percentages were weighted by sex and age distribution of current smokers in Hong Kong in 2017 or 2018. Statistical significance was tested by chi-square test. CS: $p<0.05$; M: $p=0.13$; F: $p=0.36$

TCPS 2017: CS=224; M=183; F=41

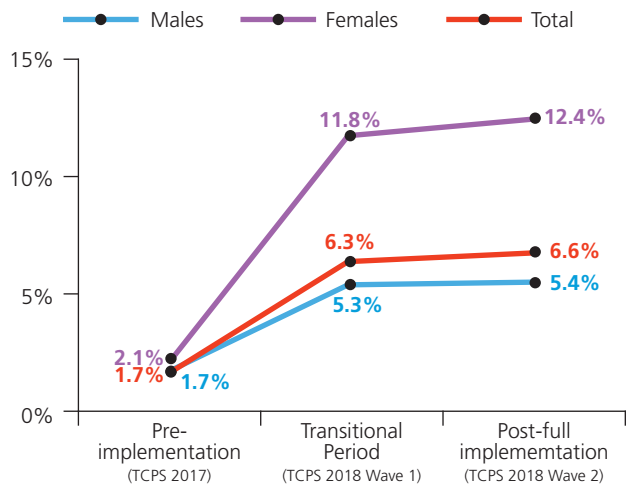
TCPS 2018 Wave 1: CS=1,469; M=1,231; F=238

TCPS 2018 Wave 2: CS=1,475; M=1,257; F=218

CS: Current smokers; M: Male current smokers; F: Female current smokers.

Figure 10

Changing to another cigarette package in the past 30 days in current smokers



Sample sizes (N) refer to the actual number of respondents. Percentages were weighted by sex and age distribution of current smokers in Hong Kong in 2017 or 2018. Statistical significance was tested by chi-square test. CS: $p=0.07$; M: $p=0.21$; F: $p=0.24$

TCPS 2017: CS=224; M=183; F=41

TCPS 2018 Wave 1: CS=1,469; M=1,231; F=238

TCPS 2018 Wave 2: CS=1,475; M=1,257; F=218

CS: Current smokers; M: Male current smokers; F: Female current smokers.

Table 8 Keeping cigarette packs out of sight in the past 30 days in current smokers, from pre-implementation to the transitional period and post-full implementation

Relative Risk [RR] (95% Confidence Interval)			
	All current smokers	Male current smokers	Female current smokers
Transitional period vs. Pre-implementation	2.48 (1.34-4.58) **	2.16 (1.10-4.22) *	4.94 (1.20-20.38) *
Post-full implementation vs. Pre-implementation	2.35 (1.27-4.36) **	2.03 (1.04-3.99) *	4.73 (1.13-19.83) *
Post-full implementation vs. Transitional period	0.95 (0.75-1.20)	0.94 (0.72-1.23)	0.96 (0.59-1.56)

Weighted by sex and age distribution of current smokers in Hong Kong in 2017 or 2018.
* p<0.05; ** p<0.01; *** p<0.001

Table 9 Changing to another cigarette package in the past 30 days in current smokers, from pre-implementation to the transitional period and post-full implementation

Relative Risk [RR] (95% Confidence Interval)			
	All current smokers	Male current smokers	Female current smokers
Transitional period vs. Pre-implementation	3.69 (1.28-10.63) *	3.22 (0.94-10.99)	5.46 (0.75-39.85)
Post-full implementation vs. Pre-implementation	3.83 (1.33-11.03) *	3.30 (0.97-11.24)	5.75 (0.78-42.40)
Post-full implementation vs. Transitional period	1.04 (0.75-1.43)	1.02 (0.69-1.51)	1.05 (0.60-1.86)

Weighted by sex and age distribution of current smokers in Hong Kong in 2017 or 2018.
* p<0.05; ** p<0.01; *** p<0.001

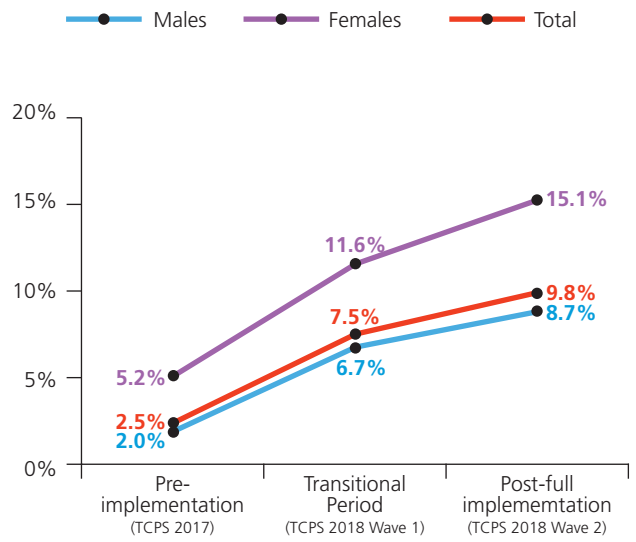
Figure 11 shows that 2.5% of current smokers avoided buying cigarette packs with specific pictorial health warnings in the past 30 days before implementation of new pictorial health warnings. The prevalence increased to 7.5% during the transitional period and further increased to 9.8% after full implementation. The difference among these 3 surveys was statistically significant for all current smokers ($p<0.001$). Table 10 shows that current smokers were about 2 to 3 times more likely to avoid buying cigarette packs with specific pictorial health warnings during the transitional period and post-full implementation than pre-implementation. The difference between transitional period and post-full implementation was not statistically significant.

3.5 Awareness of point-of-sale tobacco displays

Figure 12 shows that before implementation of the new pictorial health warnings, 64.0% of all respondents (76.4% of current smokers, 58.4% of ex-smokers and 62.9% of never smokers) were aware of point-of-sale tobacco displays (i.e. saw in the past 30 days). The awareness increased to 69.2% during the transitional period and remained similar (69.3%) after full implementation. A greater increase was observed in current smokers and ex-smokers than in never smokers since the transitional period. The difference among these 3 surveys was statistically significant for all respondents ($p<0.001$) and for each smoking status group (all $p<0.05$). Table 11 shows that all respondents were 10% (95% CI 4%-17%) and current smokers were 19% (95% CI 10%-28%) more likely to be aware of point-of-sale tobacco

Figure 11

Avoiding buying cigarette packs with specific pictorial health warnings in the past 30 days in current smokers



Sample sizes (N) refer to the actual number of respondents. Percentages were weighted by sex and age distribution of current smokers in Hong Kong 2017 or 2018. Statistical significance was tested by chi-square test. CS: $p<0.01$; M: $p<0.01$; F: $p=0.23$

TCPS 2017: CS=224; M=183; F=41

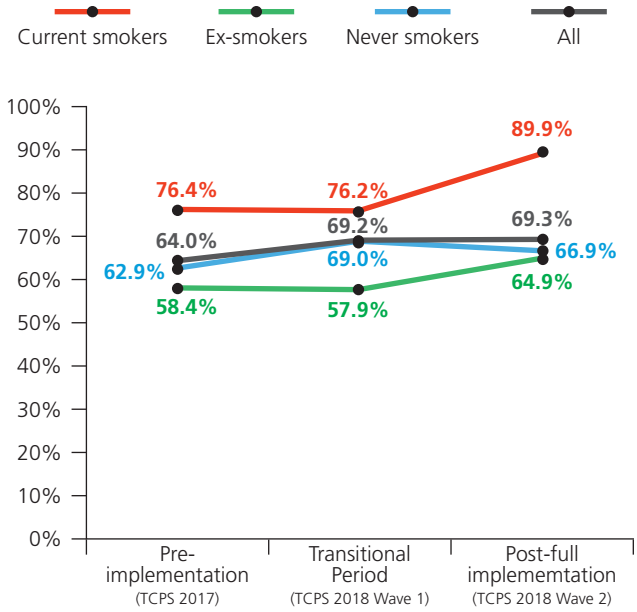
TCPS 2018 Wave 1: CS=1,469; M=1,231; F=238

TCPS 2018 Wave 2: CS=1,475; M=1,257; F=218

CS: Current smokers; M: Male current smokers; F: Female current smokers.

Figure 12

Seeing point-of-sale tobacco displays in the past 30 days



Sample sizes (N) refer to the actual number of respondents. Percentages were weighted by sex, age and smoking status to the 2017 or 2018 Hong Kong population. Statistical significance was tested by chi-square test. All: $p<0.001$; CS: $p<0.001$; ES: $p<0.05$; NS: $p<0.01$

TCPS 2017: All=1,546; NS=839; ES=420; CS=287

TCPS 2018 Wave 1: All=1,582; NS=861; ES=430; CS=291

TCPS 2018 Wave 2: All=1,619; NS=893; ES=425; CS=300

All: All respondents; NS: Never smokers; ES: Ex-smokers; CS: Current smokers.

Table 10 Avoid buying cigarette packs with specific pictorial health warnings in the past 30 days in current smokers, from pre-implementation to the transitional period and post-full implementation

Relative Risk [RR] (95% Confidence Interval)			
	All current smokers	Male current smokers	Female current smokers
Transitional period vs. Pre-implementation	3.00 (1.43-6.29) **	3.38 (1.34-8.52) *	2.23 (0.65-7.61)
Post-full implementation vs. Pre-implementation	3.88 (1.86-8.11) ***	4.36 (1.74-10.92) **	2.88 (0.84-9.88)
Post-full implementation vs. Transitional period	1.29 (0.99-1.70)	1.29 (0.94-1.77)	1.29 (0.75-2.22)

Weighted by sex and age distribution of current smokers in Hong Kong in 2017 or 2018.
* p<0.05; ** p<0.01; *** p<0.001

Table 11 Change in awareness of point-of-sale tobacco displays in the past 30 days from pre-implementation to the transitional period and post-full implementation

Relative Risk [RR] (95% Confidence Interval)				
	All	Current smokers	Ex-smokers	Never smokers
Transitional period vs. Pre-implementation	1.06 (0.99-1.13)	1.05 (0.96-1.15)	1.02 (0.91-1.14)	1.07 (0.99-1.15)
Post-full implementation vs. Pre-implementation	1.10 (1.04-1.17) **	1.19 (1.10-1.28) ***	1.15 (1.04-1.28) **	1.08 (1.01-1.16) *
Post-full implementation vs. Transitional period	1.04 (0.98-1.10)	1.14 (1.06-1.22) ***	1.13 (1.02-1.26) *	1.02 (0.95-1.09)

Weighted by sex, age and smoking status to the 2017 or 2018 Hong Kong population.
* p<0.05; ** p<0.01; *** p<0.001

displays post-full implementation than pre-implementation. Current smokers were 14% (95% CI 6%-22%) more likely to be aware of point-of-sale tobacco displays post-full implementation than during the transitional period.

4. Discussion

Over one-tenth of respondents had already seen the new pictorial health warnings during the transitional period, soon after the new warnings were implemented in December 2017. These respondents reported that the majority of the pictorial health warnings they saw were the new ones. Public awareness of the pictorial health warnings, regardless of smoking status, increased during the transitional period (TCPS 2018 Wave 1) and further increased after full implementation (TCPS 2018 Wave 2).

Pictorial health warnings efficiently disseminate the harms of smoking to not only smokers but also non-smokers. Compared with pre-implementation, the proportion of respondents who thought about the harms of smoking increased after full implementation. Such an increase was more prominent in current smokers and ex-smokers. The results of TCPS 2018 Wave 1 (transitional period) and Wave 2 (post-full implementation) indicated the short-term effects of enlarged pictorial health warnings with stronger images and warning messages. Future TCPSs should continue to evaluate the longer-term effects. The present results shall also support other countries and jurisdictions where proposals on enlarging pictorial health warnings on cigarette packs are under consideration.

Although more current smokers thought about harms of smoking after full implementation of new pictorial health warnings, no substantial increase in thinking about quitting or holding back from smoking after noticing pictorial health warnings was observed. This suggests the effectiveness of new pictorial health warnings in promoting quitting is not

conclusive. The small sample size might explain. Another possible reason was that many smokers in Hong Kong, with the smoking prevalence among the lowest in the developed world, were hardcore smokers and were reluctant to quit, even they had thought more about the harms of smoking after implementation. Further evaluations with a greater sample size are warranted to assess the effects of new pictorial health warnings on current smokers.

There was a sharp increase in counteractions of current smokers to avoid seeing the warnings during the transitional period (TCPS 2018 Wave 1), followed by a small increase post-full implementation (TCPS 2018 Wave 2). A possible reason was that nearly half the current smokers had already seen the new pictorial health warnings and might have reacted during the transitional period. The increase in counteractions post-full implementation was less obvious. A previous study suggested these counteractions often have the opposite effect of increasing "unwanted" thoughts, such as thinking about the harms of smoking, and can increase motivation to quit smoking[11]. Investigations on the association of these counteractions with subsequent quitting behaviours are warranted.

To further reduce the attractiveness of cigarette packs, plain packaging should also be introduced as recommended by WHO FCTC Article 11[1]. At present, nearly 20 countries have implemented plain packaging (e.g. Australia, France, Ireland, Thailand, Canada, Singapore and Uruguay) or passed the law (e.g. Romania)[12, 13]. Plain packaging means that all distinctive tobacco brand characteristics including slogan, logo, colour and promotional elements are not allowed while only brand names in standardized typeface, unattractive colour and large health warnings can be used. Apart from reducing the attractiveness of cigarette packs, plain packaging may also reduce smokers' misperceptions that some cigarette brands are less harmful and increase the effectiveness of health warnings as the warnings without the distraction of the logos, etc., would be more noticeable[11, 14].

Since the impacts of the same pictorial health warnings will decrease over time[15, 16], the HKSAR Government should consider rotation in due course. FCTC Article 11 suggests rotation of pictorial health warnings to maintain the effects of pictorial health warnings[1]. Rotation every 1 to 2 years is highly recommended[11]. The HKSAR government should prepare another set of pictorial health warnings and implement rotation as soon as possible. We also strongly recommend that the warnings should include "smoking kills at least one out of two smokers" to further emphasize the harms of smoking.

Awareness of point-of-sale tobacco displays in current smokers remained similar during the transitional period (TCPS 2018 Wave 1 vs. TCPS 2017), and started to increase after full implementation (TCPS 2018 Wave 2 vs. TCPS 2018 Wave 1). This might be due to counterbalance measures by the tobacco industry to reduce smokers' exposure to the new pictorial health warnings at point-of-sale of cigarettes. For example, some shops only display the bottom or top side of the cigarette packs, which is not covered by the pictorial health warnings but clearly shows the logos, colours and designs of the cigarette brands. Glamourous boxes are also used to display tobacco products. These measures can attract smokers to use these products[17]. Previous studies found that the removal of point-of-sale tobacco displays reduces the use of tobacco products and promotes quitting[18, 19]. We advocate the HKSAR Government to consider banning point-of-sale tobacco displays in accordance with Article 13 of FCTC[20], which has been implemented in Macau since January 2018[21]. The Article affirms that a comprehensive ban on advertising, promotion and sponsorship, which includes point-of-sale tobacco displays as a type of sale and distribution arrangement, would reduce the consumption of tobacco products[22].

To encourage quitting, more effective tobacco control measures such as a substantial and annual tobacco tax increase, and further expansion of smoke-free areas should be implemented. More funding should be allocated to public education, free smoking cessation services, development of more effective interventions, and rigorous evaluation of all tobacco control measures.

5. Limitations

This study had several limitations. First, the term "current smokers" included both daily and occasional smokers, and "ex-smokers" included both ex-daily and ex-occasional smokers. Smoking-related behaviours, perceptions, and opinions may be different between daily and occasional users, but distinguishing the two is not an objective of the current study. Second, all information was collected by telephone interviews without verification of smoking status by the interviewer. However, this method can ensure anonymity that more truthful data might be collected. Third,

the cross-sectional design limited our ability to measure changes over time in the same group of respondents. A cohort study or panel survey with longitudinal data would be better in measuring changes within the same individuals over time. Finally, all data were self-reported, which may be subjected to recall bias.

6. Conclusions

Public awareness of pictorial health warnings progressively increased when the new pictorial health warnings gradually replaced the old ones. After full implementation, more current smokers had thought about the harms of smoking, but the evidence of more current smokers thinking about quitting or holding back from smoking was not conclusive. These results show some short-term effects of the new pictorial health warnings, but also suggest that continuous evaluation on longer term effects is warranted. To maintain the effects of pictorial health warnings, the HKSAR government should prepare a new set of pictorial health warnings for rotation as soon as possible. The increased awareness of point-of-sale tobacco displays after full implementation of new pictorial health warnings might indicate the tactics of the tobacco industry to counteract the new warnings and encourage smoking. Hence, a total ban on the displays is warranted.

7. Other key results of TCPS 2018 Wave 1 and Wave 2

7.1 Awareness (i.e. had heard of or seen) and ever use of electronic cigarettes (e-cigarettes) and heat-not-burn (HNB) tobacco products

- Majority (81.3%) of all respondents (86.9% of current smokers, 83.2% of ex-smokers and 80.5% of never smokers) in Wave 1 were aware of e-cigarettes. The awareness was not assessed in Wave 2.
- Ever e-cigarette use was reported by 3.6% of all respondents in Wave 1 and 2.9% in Wave 2. In current smokers, the prevalence of ever use was 25.9% and 27.0%, respectively (in Wave 1 and 2). In ex-smokers, it was 2.9% and 2.3%, respectively (in Wave 1 and 2).
- Current e-cigarette use (past 30-day use) was reported by 0.7% of all respondents in both Wave 1 Wave 2. In current smokers, the prevalence of current use was 5.2% and 6.5%, respectively (in Wave 1 and 2).
- A quarter (24.5%) of all respondents (43.6% of current smokers, 23.4% of ex-smokers and 22.3% of never smokers) in Wave 1 were aware of HNB tobacco products. The awareness increased to 27.4% in Wave 2 (53.1% of current smokers, 23.3 of ex-smokers and 24.5% of never smokers).
- Ever HNB tobacco product use was reported by 1.7% of all respondents in Wave 1 and 2.5% in Wave 2. In current smokers, the prevalence of ever use was 14.5% and 24.1%, respectively (in Wave 1 and 2). In ex-smokers, it was 1.6% and 0.4%, respectively (in Wave 1 and 2).
- Current HNB tobacco product use (past 30-day use) was reported by 0.7% of all respondents in Wave 1 and 1.0% in Wave 2. In current smokers the prevalence of current use was 6.4% and 9.8%, respectively (in Wave 1 and 2).

7.2 Single and multiple tobacco product use in current smokers in the past 4 weeks

- Majority (81.5%) of current smokers in Wave 2 reported they had used only 1 tobacco product in the past 4 weeks (conventional cigarettes: 76.0%, HNB tobacco products: 2.3%, e-cigarettes: 1.2% and other tobacco products: 2.1%). Multiple use in the past 4 weeks was not assessed in Wave 1.
- About 13.7% reported they had ever used 2 or more tobacco products in the past 4 weeks.
- The most common combination of use of multiple tobacco products included "conventional cigarettes and HNB tobacco products" (4.5%), "conventional cigarettes and e-cigarettes" (2.8%), "conventional cigarettes, HNB tobacco products, and e-cigarettes" (1.6%), and "HNB tobacco products and e-cigarettes" (0.2%).

7.3 Smoking and quitting characteristics of current smokers

- In Wave 1 and Wave 2, current smokers consumed 12.4 (SD 8.3) and 12.7 (SD 8.3) cigarettes per day in the past 7 days on average, respectively.
- Nearly half (46.7% in Wave 1 and 44.9% in Wave 2) the current smokers smoked the first cigarette within 30 minutes after waking up.

- Half (50.9% in Wave 1 and 54.7% in Wave 2) the current smokers had no intention to quit using all forms of tobacco products. Few (18.7% and 15.7% in Wave 1 and Wave 2) planned to quit within 6 months.
- About 13.1% and 13.2% of current smokers in Wave 1 and Wave 2 had ever used smoking cessation services. About 20.5% and 19.2% of them, respectively (in Wave 1 and 2), had ever used smoking cessation products.

7.4 Secondhand smoke (SHS) exposure at home

- In all respondents in Wave 1 and Wave 2, about 14.0% and 14.2% reported SHS exposure at home in the past 7 days, respectively. Excluding respondents who reported no SHS exposure at home in the past 7 days, the average number of days with SHS exposure at home in the past 7 days was 4.4 and 4.5, respectively (in Wave 1 and 2).

7.5 Raising tobacco tax

- Most (81.4% in Wave 1 and 79.6% in Wave 2) respondents supported the Government to raise tobacco tax next year, in which 51.6% and 54.2%, respectively, thought that the increment should be equivalent to or higher than inflation.
- Most (75.6% in Wave 1 and 70.9% in Wave 2) respondents supported the Government to raise tobacco tax annually, in which 51.0% and 47.5%, respectively, thought that the increment should be equivalent to or higher than inflation.

7.6 Tobacco promotion, advertising and sponsorship

- More than two-thirds (67.8% in Wave 1 and 70.6% in Wave 2) thought that point-of-sale tobacco displays were cigarette advertisements and promotions. Around two-thirds (66.8% in Wave 1 and 65.0% in Wave 2) supported a ban on point-of-sale tobacco displays.

7.7 Expansion of smoke-free areas

- More than 90% of respondents (93.7% in Wave 1 and 96.0% in Wave 2) supported to extend the statutory smoke-free areas to all public transport stops such as taxi stands, public light bus stops, bus stops and tramways stops.
- More than 90% of respondents (94.7% in Wave 1 and 93.7% in Wave 2) supported to totally ban smoking from queueing lines in public areas.
- More than 80% of respondents supported to extend statutory smoke-free areas to pedestrian walkways (82.5% in Wave 1 and 83.4% in Wave 2) and busy streets (84.0% in Wave 1 and 83.1% in Wave 2).
- In addition, more than 80% of respondents (85.5% in Wave 1 and 84.8% in Wave 2) supported to increase the fines of smoking at smoking-free areas.

7.8 Opinion on future tobacco control policies

- Majority of all respondents (83.3% in Wave 1 and 79.5% in Wave 2) and current smokers (67.3% in Wave 1 and 69.3% in Wave 2) supported to increase the legal age of buying cigarettes from 18 to 21.
- Over 90% of all respondents (90.1% in Wave 1 and 92.7% in Wave 2) and over 3 quarters of current smokers (75.6% in Wave 1 and 83.6% in Wave 2) supported that only shops with a licence can sell tobacco products.
- Nearly 80% of all respondents (79.0% in Wave 1 and 79.4% in Wave 2) supported to set a cigarette sale quota that decreased year by year. This measure was also supported by 47.9% and 39.7% of current smokers, respectively (in Wave 1 and 2).
- Majority (65.9% in Wave 1 and 68.0% in Wave 2) of all respondents agreed to totally ban smoking when the smoking prevalence in Hong Kong decreases to 5% or lower. This measure was also supported by 39.7% and 34.8% of current smokers, respectively (in Wave 1 and 2).
- Majority of all respondents (65.9% in Wave 1 and 70.8% in Wave 2) supported a total ban on the sale of all forms of tobacco products. This measure was also supported by 35.5% and 33.1% of current smokers, respectively (in Wave 1 and 2).
- Over two-thirds of all respondents (69.1% in Wave 1 and 72.7% in Wave 2) supported a total ban on using all forms of tobacco products. This measure was also supported by 31.8% and 33.6% of current smokers, respectively (in Wave 1 and 2).

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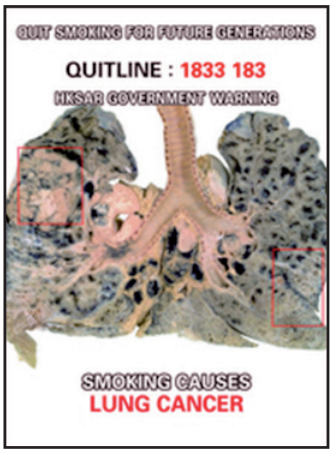
Appendix: The 12 pictorial health warnings in Hong Kong first introduced on 21 December 2017 and fully implementated on 21 June 2018

Description:
Damaged toes



Description:
Lung cancer

Description:
A body at a mortuary

Description:
A funeral with a portrait of the deceased young lady

Description:
Burning banknotes

Description:
A downward curving cigarette

Description:
A man using an oxygen mask

Description:
A woman using a nasogastric tube in hospital

Description:
A wrinkled woman

Description:
Throat with hole

Description:
Use of walker

Description:
An ill child

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