

BMJ Open Government's subsidisation policy and utilisation of smoking cessation treatments: a population-based cross-sectional study in Taiwan

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ABSTRACT

Objectives This study examined the associations between the Second-Generation Cessation Payment Scheme (SCPS) and the use of smoking cessation treatments. Furthermore, these associations were compared between light and heavy smokers in Taiwan.

Design This study had a cross-sectional design.

Setting Data were obtained from the Taiwan Adult Smoking Behaviour Surveillance System 2010–2011 and 2013–2014; data for each year consisted of a nationally representative sample of adults aged 18 years and older.

Participants Current smokers who had either quit or made a serious attempt to quit smoking were selected for the analysis.

Primary outcome measure The primary outcome measure was the use of a smoking cessation clinic or pharmacy in a twice daily to quit smoking.

Results According to multivariate analysis, the SCPS was positively associated with the combined use of a smoking cessation clinic and a pharmacy (OR=3.947; 95% CI: 1.359 to 11.463) when individual-level predictors (gender, age, education level, marital status, monthly household income, daily cigarette consumption, smoking status and self-reported health) were controlled. Heavy smokers showed a significant increase in the sole use of a pharmacy (OR=1.676; 95% CI: 1.094 to 2.569) and combined use of a smoking cessation clinic and pharmacy (OR=8.984; 95% CI: 1.914 to 42.173) after the SCPS was introduced. In addition, when related factors were controlled, the use of smoking cessation services was more frequent among heavy smokers than light smokers, including any treatment (OR=1.594; 95% CI: 1.308 to 1.942), a smoking cessation clinic (OR=1.539; 95% CI: 1.232 to 1.922), a pharmacy (OR=1.632; 95% CI: 1.157 to 2.302) and the combination of a smoking cessation clinic and pharmacy (OR=4.608; 95% CI: 1.331 to 15.949).

Conclusions The SCPS subsidisation policy increased the use of smoking cessation treatments, particularly among heavy smokers.

INTRODUCTION

In 2005, the WHO Framework Convention on Tobacco Control (FCTC; WHO-FCTC) came into force. The WHO-FCTC is the

Strengths and limitations of this study

- This is the first study to evaluate the use of combined treatments or difference in use before and after subsidisation policy introduction in an Asian country.
- The database consisted of data of random individuals from the national population of Taiwan.
- The results of this study provide useful information regarding the effect of the government's subsidisation policy on the use of smoking cessation treatments.
- This study considered only individual-level covariates.

first international global health treaty with the aim of reducing tobacco consumption and protecting people from tobacco exposure; by providing countries with a legally binding instrument, the WHO-FCTC guides the implementation of effective tobacco control policy measures.¹ To help countries meet WHO-FCTC obligations, the WHO introduced the six MPOWER measures that track the effectiveness of a country's tobacco control policies. Offering help (eg, treatment) for smoking cessation is one of the MPOWER measures.²

Evidence-based treatments—such as counselling and medication, including nicotine replacement therapy (NRT) and non-NRT medication—significantly improve a smoker's likelihood of cessation success. Rather than using counselling and medication individually, the combination of these modalities is more effective.³ However, a low utilisation rate of smoking cessation treatment, reportedly 4.0%–36.1%, has been reported.^{4–7}

In 2017, the smoking rate in Taiwan was 26.4% and 2.3% for men and women, respectively.⁸ Taiwanese smokers were estimated

to have lost 22 years in life expectancy due to smoking-related diseases.⁹ Since 2002, a surcharge of NT\$5 (US\$0.14) per pack of cigarettes has been imposed for tobacco-related health and welfare, the proceeds of which have been used to subsidise smoking cessation services. In addition, the Taiwanese government implemented the Outpatient Smoking Cessation Services (OSCS) programme in 2002 and subsidised smoking cessation services including pharmacotherapy and a brief counselling session with a physician.¹⁰ Physicians must be certified from a training programme if they are to receive reimbursement for the OSCS. A study indicated that the training programme was effective in increasing physicians' knowledge and adherence to a practice guideline.¹¹ Many subsequent alterations were made to the OSCS programme, including specialties that provide smoking cessation services, patients' out-of-pocket prescription copayment, and subsidies for low-income households. However, smokers had to pay a weekly out-of-pocket prescription copayment of NT\$550–NT\$1250 (US\$18.33–US\$21.67). For low-income individuals, this financial burden may have discouraged their use of smoking cessation services. Although the benefits of the OSCS programme outweighed the cost—it had an estimated net social benefit of US\$196 million,¹² the number of OSCS users gradually decreased from 2006 to 2011.⁸ Thus, to remove the financial barrier and increase the use of smoking cessation services, the government started the Second-Generation Cessation Payment Scheme (SCPS) in 2012.

Two US studies have evaluated the effect of subsidisation of smoking cessation treatment on its use. One study found that providing Medicaid programme coverage for smoking cessation yielded a 3-month increase in the use of smoking cessation medication.⁶ The subjects in that study belonged to a Medicaid population and were mostly from low-income families. Moreover, that study analysed only the rate of treatment use, without controlling for smoking behaviour or the individual characteristics of smokers. Another study, using a national sample of the US population, discovered that after controlling for individual-level predictors, Medicaid coverage had a positive effect only on non-NRT medication use; it had no effect on NRT and behavioural support use.⁷ That study did not evaluate the use of combined treatments or the difference in use before and after implementing the subsidisation policy. Thus, the influence of subsidisation policy on service use has not been well evaluated, especially in an Asian context. Therefore, using a population-based Taiwanese database, we evaluated the effect of a subsidisation policy (the SCPS) on the use of cessation treatments while controlling for individual-level factors.

One study discovered that the number of cigarettes smoked per day was related to the use of smoking cessation treatments.⁴ Thus, we divided smokers into light and heavy smokers, using a threshold of 15 cigarettes per day,¹³ and compared the influence of the SCPS on the use

of smoking cessation treatments between light and heavy smokers.

This study had two purposes. First, we aimed to examine the associations between the government's subsidisation policy and the use of smoking cessation treatments. Second, we sought to compare how these associations differed between light and heavy smokers in Taiwan.

Second-Generation Cessation Payment Scheme

The Taiwan government implemented the OSCS programme in 2002 to subsidise smoking cessation services that included pharmacotherapy by physicians.¹⁰ To reduce the economic barrier to smoking cessation and expand the scope of services, the government launched the SCPS in March 2012. With the SCPS, every smoker can now take two courses instead of one per year, and each course provides a combination of 8 weeks of medication and eight individual counselling sessions. Furthermore, the copayment is now 20% of the total medication cost, with an upper limit of NT\$200 (US\$6.67). By contrast, before the SCPS, smokers had subsidies of up to NT\$250 (US\$8.33) and a copayment of NT\$550–NT\$1250 (US\$18.33–US\$21.67) per week. Low-income smokers now receive full subsidies and are not bound by the previous weekly upper limit of NT\$500 (US\$16.66). In addition, the maximum length of a prescription has been extended from 2 to 4 weeks, and physicians can now prescribe more expensive medications, such as varenicline, at a low copayment. In addition to outpatient services, the scope of cessation services has been extended to inpatients, emergency rooms and pharmacy services. To improve care quality, case management and follow-up fees are now subsidised at NT\$100 (US\$3.33) per treatment course and NT\$50 (US\$1.66) per follow-up. However, physician fees are still NT\$250 (US\$8.33) per visit.⁸

METHODS

Data source

We obtained yearly 2010–2011 and 2013–2014 data from the Taiwan Adult Smoking Behaviour Surveillance System (ASBS). The ASBS contains annual cross-sectional population-based data that are obtained from county-based random-digit-dialled computer-assisted telephone interview surveys that have been conducted by the Health Promotion Administration since 2004. Additional details regarding the methodology used by the ASBS are available on the ASBS website (<https://www.hpa.gov.tw/Pages/List.aspx?nodeid=1710>).

Study sample

We analysed data of adults who had reported being smokers, quit smoking or made a serious attempt to quit smoking. Smokers who had quit smoking more >1 year previously were excluded. The ASBS sample was selected from a national non-institutionalised population of adults (aged ≥18 years) in Taiwan. Since 2013, those aged 13–15 years have been

included in the population. Random samples were selected from each of the 25 counties and cities in Taiwan in accordance with the probability proportional to size principle. Depending on the population size, each county or city accounted for 300–800 samples in 2004–2012 and 300–1068 samples from 2013 onwards, resulting in an estimated total of 16 000–26 000 000 samples nationwide. In total, 16 295, 16 905, 25 964 and 26 145 adults completed the phone interview in 2010, 2011, 2013 and 2014, respectively. The ASBS survey included questions on demographic characteristics, tobacco use, smoking cessation behaviour and cessation treatment use.

Outcome measures

Smokers who had made an attempt to quit that lasted >24 hour in the previous 12 months were asked the following in the ASBS survey: 'Did you use a smoking cessation clinic (including NRT, non-NRT medication, and behavioural treatment) or pharmacy (including NRT and non-NRT medication) to quit smoking in the past 12 months?' Respondents answered yes or no to each method separately. Furthermore, ASBS participants were queried regarding their use of auxiliary resources—such as a Quitline, smoking cessation programme and traditional Chinese medicine. However, such resources were not included in our analysis because their costs are not subsidised under the SCPS.

Control variables

We identified individual-level predictors (all retrieved from the ASBS) on the basis of a method used elsewhere.^{4 7 12} The predictors were gender, age, education level (elementary or below, junior high school, high school, junior college, or undergraduate or above), marital status (single; married; or divorced, widowed or separated), monthly household income (≤NT\$20 000 (US\$667), NT\$20 001–NT\$40 000 (US\$667–US\$1333), NT\$40 001–NT\$60 000 (US\$1333–US\$2000), NT\$60 001–NT\$80 000 (US\$2000–US\$2667), NT\$80 001–NT\$100 000 (US\$2667–US\$3333) and ≥NT\$100 001 (US\$3333)), daily cigarette consumption (≤15 (light) or ≥16 (heavy)), smoking status (every day or some days) and self-reported health (from 1 (very poor) to 5 (very good)).

Statistical analysis

IBM SPSS Statistics V.22.0 was used for statistical analysis. Because the SCPS was introduced in 2012, we compared the use of smoking cessation treatments by smokers between 2010 and 2011 (before policy) and 2013 and 2014 (after policy). Multivariable logistic regression was used to assess associations between the government's subsidisation policy and the use of smoking cessation treatments among smokers after controlling the respondents' individual-level characteristics (gender, age, education level, marital status, monthly household income, daily cigarette consumption, smoking status and self-reported health). Subsequently, we compared the aforementioned associations between the two daily cigarette consumption groups when controlling all covariates.

Table 1 Demographic

Variables	N (%) / mean±SD
Gender	
Male	3653 (89.2)
Female	442 (10.8)
Age	45.94±14.49
Education level	
Elementary or below	469 (11.5)
Junior high school	680 (16.6)
High school	1666 (40.7)
Junior college	567 (13.8)
Undergraduate or above	713 (17.4)
Marital status	
Single	976 (23.9)
Married	2685 (65.8)
Divorced/widowed/separated	421 (10.3)
Monthly household income (NTU)	
≤20 000	640 (18.4)
20 001–40 000	910 (26.1)
40 001–60 000	707 (20.3)
60 001–80 000	481 (13.8)
80 001–100 000	267 (7.7)
≥100 001	482 (13.8)
Daily cigarette consumption	
≤15 (light)	2017 (49.4)
≥16 (heavy)	2069 (50.6)
Smoking status	
Everyday	3353 (81.9)
Some days	742 (18.1)
Self-reported health	3.71±1.08

Patient and public involvement

No patients were involved.

RESULTS

Demographic characteristics

In the study, 2060 and 2035 subjects in 2010–2011 and 2013–2014, respectively, were analysed. The vast majority of the respondents were men (89.2%), almost half had education no higher than high school education (40.7%), and more than half were married (65.8%), had a monthly household income of <NT\$60 000 (64.8%), were heavy smokers (50.6%) and smoked everyday (81.9%). Their mean age was 45.94±14.49 years, and their self-reported health was 3.71±1.08 (table 1).

Use of smoking cessation treatments

As detailed in table 2, 18.0% of those attempting to quit had used some form of cessation treatment. Specifically, 12.8% used a smoking cessation clinic, 4.7% used a pharmacy, and 0.5% used both. After controlling for individual-level characteristics, smoking cessation services

Table 2 Logistic regressions on tobacco-cessation treatments among Taiwanese adults aged 18 years or above (prepolicy and postpolicy)

Variables	Treatment use		Smoking cessation clinic (%)/ mean±SD 499 (12.8%) B	Combining a smoking cessation clinic and a pharmacy (%)/ mean±SD 20 (0.5%) D	Any treatment		A smoking cessation clinic		A pharmacy		Combination of a smoking cessation clinic and pharmacy	
	None (%)/ mean±SD 3197 (82.0%) A	Pharmacy (%)/ mean±SD 184 (4.7%) C			B+C+D ^a A ^b	B+D ^a A ^b	C+D ^a A ^b	D ^a A ^b				
									Adjusted OR (95% CI)	Adjusted OR (95% CI)	Adjusted OR (95% CI)	Adjusted OR (95% CI)
Policy												
Before policy (2010–2011)	1554 (82.0)		259 (13.7)	6 (0.3)	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
After policy (2013–2014)	1643 (81.9)		240 (12.0)	14 (0.7)	0.933 (0.775 to 1.124)	0.932 (0.756 to 1.149)	1.356 (0.985 to 1.866)	3.947 (1.359 to 11.463)				
Gender												
Male	2861 (82.1)		441 (12.7)	19 (0.5)	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Female	336 (80.8)		58 (13.9)	1 (0.2)	1.199 (0.886 to 1.623)	1.178 (0.838 to 1.657)	1.069 (0.630 to 1.812)	0.521 (0.063 to 4.291)				
Age	45.94±14.75		46.20±13.33	41.75±13.65	0.993 (0.984 to 1.002)	0.994 (0.984 to 1.004)	0.985 (0.970 to 1.001)	0.938 (0.892 to 0.987)				
Education level												
Elementary or below	374 (84.8)		51 (11.6)	2 (0.5)	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Junior high school	527 (82.9)		69 (10.8)	3 (0.5)	1.012 (0.684 to 1.496)	0.896 (0.568 to 1.383)	1.245 (0.634 to 2.445)	0.544 (0.080 to 3.711)				
High school	1310 (82.5)		204 (12.8)	5 (0.3)	1.144 (0.789 to 1.660)	1.268 (0.837 to 1.920)	0.836 (0.428 to 1.632)	0.391 (0.058 to 2.650)				
Junior college	417 (76.7)		89 (16.4)	6 (1.1)	1.625 (1.079 to 2.447)	1.706 (1.082 to 2.692)	1.402 (0.688 to 2.857)	2.002 (0.314 to 12.788)				
Undergraduate or above	569 (82.3)		86 (12.4)	4 (0.6)	1.240 (0.810 to 1.898)	1.321 (0.822 to 2.123)	1.043 (0.491 to 2.212)	0.647 (0.075 to 5.592)				
Marital status												
Single	793 (85.6)		91 (9.8)	6 (0.6)	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Married	2070 (81.0)		346 (13.5)	13 (0.5)	1.463 (1.124 to 1.906)	1.542 (1.142 to 2.081)	1.223 (0.784 to 1.909)	1.948 (0.541 to 7.021)				
Divorced/widowed/separated	324 (79.8)		60 (14.8)	1 (0.2)	1.807 (1.244 to 2.625)	1.795 (1.177 to 2.736)	1.480 (0.786 to 2.785)	0.735 (0.072 to 7.531)				
Monthly household income (NTU)												
≤20 000	500 (82.8)		83 (13.7)	5 (0.8)	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
20 001 to 40 000	720 (83.3)		96 (11.1)	5 (0.6)	0.808 (0.568 to 1.148)	0.918 (0.627 to 1.344)	0.668 (0.348 to 1.291)	2.204 (0.459 to 10.584)				
40 001 to 60 000	556 (81.9)		79 (11.6)	2 (0.3)	0.724 (0.535 to 0.979)	0.645 (0.460 to 0.903)	1.045 (0.621 to 1.759)	1.075 (0.261 to 4.437)				
60001 to 80 000	374 (82.0)		62 (13.6)	2 (0.4)	0.832 (0.614 to 1.126)	0.672 (0.477 to 0.947)	1.273 (0.762 to 2.126)	0.426 (0.075 to 2.420)				
80001 to 10 000	197 (78.2)		37 (14.7)	1 (0.4)	0.827 (0.594 to 1.151)	0.806 (0.561 to 1.159)	0.821 (0.448 to 1.503)	0.517 (0.091 to 2.941)				
≥1 00 001	369 (78.3)		76 (16.1)	4 (0.8)	1.052 (0.721 to 1.534)	0.861 (0.563 to 1.318)	1.378 (0.735 to 2.583)	0.486 (0.052 to 4.539)				
Daily cigarette consumption												
≤15 (light)	1645 (85.2)		206 (10.7)	4 (0.2)	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
≥16 (heavy)	1545 (78.8)		292 (14.9)	16 (0.8)	1.594 (1.308 to 1.942)	1.539 (1.232 to 1.922)	1.632 (1.157 to 2.302)	4.608 (1.331 to 15.949)				
Smoking status												
Everyday	2577 (80.8)		434 (13.6)	18 (0.6)	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Some days	620 (87.4)		65 (9.2)	2 (0.3)	1.453 (1.098 to 1.923)	1.450 (1.053 to 1.996)	1.299 (0.795 to 2.122)	0.929 (0.187 to 4.624)				
Self-reported health	2.27±1.07		2.39±1.09	2.85±1.27	0.909 (0.837 to 0.988)	0.932 (0.848 to 1.023)	0.846 (0.736 to 0.972)	0.680 (0.458 to 1.009)				

^a Categories in the index group, indicated by letters corresponding to columns under treatment use.

^b Reference category for comparison to index group directly above, indicated by letters corresponding to columns under treatment use.

were found to be used more by heavy smokers than light smokers, including any treatment (OR=1.594; 95% CI: 1.308 to 1.942), a smoking cessation clinic (OR=1.539; 95% CI: 1.232 to 1.922), a pharmacy (OR=1.632; 95% CI: 1.157 to 2.302) and combination of a smoking cessation clinic and pharmacy (OR=4.608; 95% CI: 1.331 to 15.949).

Change in use of smoking cessation treatments before and after SCPS

Table 2 details the use of smoking cessation treatments before and after the SCPS began to be implemented. The prevalence of use of only a smoking cessation clinic decreased from 13.7% in 2010–2011 to 12.0% in 2013–2014. The use of only a pharmacy increased from 4.0% in 2010–2011 to 5.4% in 2013–2014. The use of combination of a smoking cessation clinic and pharmacy increased from 0.3% in 2010–2011 to 0.7% in 2013–2014. After controlling for individual-level characteristics, the SCPS was associated with an increase in the likelihood of a smoker using the combination of a smoking cessation clinic and pharmacy (OR=3.947; 95% CI: 1.359 to 11.463). However, the change in the use of only one type of treatment (OR=0.933; 95% CI: 0.775 to 1.124), regardless of whether it was a smoking cessation clinic (OR=0.932; 95% CI: 0.756 to 1.149) or pharmacy (OR=1.356; 95% CI: 0.985 to 1.866), did not reach significance in the multi-variable logistic regression.

Individual-level characteristics and use of smoking cessation treatments

With respect to individual-level characteristics, compared with those who had an elementary-level education or below, respondents who had a junior college education were more likely to use any type of smoking cessation treatment and a smoking cessation clinic. Married respondents were more likely to use at least one treatment and a smoking cessation clinic than single respondents. Elderly respondents were less likely to use a pharmacy and smoking cessation clinic in combination than younger respondents (OR=0.938; 95% CI: 0.892 to 0.987; table 2).

Change in the use of smoking cessation treatments before and after SCPS among heavy smokers

Table 3 details the effect of the SCPS on the use of smoking cessation treatment among heavy smokers. The use of only a smoking cessation clinic decreased from 16.2% in 2010–2011 to 13.8% in 2013–2014. The use of only a pharmacy increased from 4.5% in 2010–2011 to 6.4% in 2013–2014. The use of both a smoking cessation clinic and pharmacy increased from 0.3% in 2010–2011 to 1.2% in 2013–2014. After controlling for individual-level characteristics, the SCPS was associated with a significant increase in the use of a pharmacy (OR=1.676; 95% CI: 1.094 to 2.569) and the combination of a smoking cessation clinic and pharmacy (OR=8.984; 95% CI: 1.914 to 42.173).

DISCUSSION

This is the first study of an Asian country in which associations between the government's subsidisation policy and the use of smoking cessation treatments are evaluated. Data were obtained from repeated cross-sectional surveys of a representative sample of the national population of Taiwan. We found that among heavy smokers, use of a pharmacy and combined use of a smoking cessation clinic and pharmacy were significantly increased after the SCPS was introduced. However, the SCPS had no associations with the use of smoking cessation treatment by light smokers (see online supplemental table 1). According to our study and the number of smokers reported in government statistics¹⁴ for Taiwan, we estimated that the number of heavy smokers using a pharmacy and the combination of a smoking cessation clinic and pharmacy increased from 79 208 and 5281 in 2010–2011 to 110 961 and 20 805 in 2013–2014, respectively. This suggests that the subsidisation policy was mostly used by dependent smokers. The SCPS helped the group with great need of cessation treatment because heavy smokers are less likely than light smokers to quit successfully.¹⁵

In this study conducted using the population-based Taiwanese ASBS database, the treatment use rate among adult smokers was 18%, which was similar to that of the US population from 2010 to 2011⁷ but higher than that among those included in the Arkansas Medicaid programme from 2004 to 2008.⁶ However, the rate for the Taiwanese population was much lower than that of the population included in the Massachusetts Medicaid programme (37.0%) from 2006 to 2008.¹⁶ This may be attributable to the longer treatment course in Massachusetts (90 days) than in Taiwan (56 days). In addition, Massachusetts' Medicaid enrollees were more likely to be women and have higher education than the respondents in this research. One study determined that women and more educated smokers were more likely to use treatment in an attempt to quit.⁵

We discovered that after other known variables were controlled, the government's policy of subsidising smoking cessation treatments was associated with an increase in the use of the combination of a smoking cessation clinic and pharmacy at the population level. Similarly, on the basis of the results of this study and government statistics,¹⁴ we estimated that the number of smokers using the combination of a smoking cessation clinic and pharmacy increased from 10 888 in 2010–2011 to 22 985 in 2013–2014. The subsidisation policy is likely to encourage those trying to quit smoking to take advantage of multiple treatment methods. The present result is similar to those of other studies on the effect of governments' subsidisation policy on the use of smoking cessation treatments. For example, Arkansas Medicaid expanded its coverage to smoking cessation treatments on 1 October 2004, which generated an initial increase in the use of smoking cessation medication.⁶ In addition, a study conducted in the USA used a nationally representative sample database and determined that

Table 3 Logistic regressions on tobacco-cessation treatments among Taiwanese adults aged 18 years or above among heavy smokers (prepolicy and postpolicy)

Variables	Treatment use		Combining a smoking cessation clinic and a pharmacy (%)/ mean±SD 20 (0.5%)	Any treatment		A smoking cessation clinic		A pharmacy		Combination of a smoking cessation clinic and pharmacy	
	None (%)/ mean±SD 3197 (82.0%) A	Smoking cessation clinic (%)/ mean±SD 499 (12.8%) B		Pharmacy (%)/ mean±SD 184 (4.7%) C	B+C+D ^a A ^b	B+D ^a A ^b	C+D ^a A ^b	D ^a A ^b	Adjusted OR (95% CI)	Adjusted OR (95% CI)	
Policy											
Before policy (2010–2011)		716 (78.9)	147 (16.2)	41 (4.5)	3 (0.3)	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
After policy (2013–2014)		829 (78.7)	145 (13.8)	67 (6.4)	13 (1.2)	1.003 (0.784 to 1.283)	0.915 (0.694 to 1.208)	1.676 (1.094 to 2.569)	8.984 (1.914 to 42.173)		
Gender											
Male		1460 (79.1)	274 (14.8)	97 (5.3)	15 (0.8)	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Female		85 (73.9)	18 (15.7)	11 (9.6)	1 (0.9)	1.396 (0.861 to 2.261)	1.141 (0.640 to 2.033)	1.975 (0.974 to 4.003)	0.987 (0.118 to 8.230)		
Age		48.12±13.79	47.98±13.19	47.81±11.21	43.56±9.53	0.993 (0.981 to 1.005)	0.995 (0.982 to 1.009)	0.980 (0.960 to 1.001)	0.933 (0.879 to 0.991)		
Education level											
Elementary or below		221 (82.8)	34 (12.7)	10 (3.7)	2 (0.7)	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Junior high school		297 (79.2)	48 (12.8)	27 (7.2)	3 (0.8)	1.096 (0.686 to 1.753)	0.999 (0.586 to 1.705)	1.219 (0.556 to 2.674)	0.540 (0.076 to 3.812)		
High school		648 (79.9)	116 (14.3)	42 (5.2)	5 (0.6)	1.064 (0.672 to 1.683)	1.143 (0.684 to 1.911)	0.785 (0.355 to 1.737)	0.374 (0.050 to 2.801)		
Junior college		190 (71.4)	54 (20.3)	18 (6.8)	4 (1.5)	1.683 (1.013 to 2.796)	1.831 (1.039 to 3.227)	1.358 (0.573 to 3.219)	1.458 (0.200 to 10.637)		
Undergraduate or above		189 (78.1)	40 (16.5)	11 (4.5)	2 (0.8)	1.149 (0.663 to 1.992)	1.223 (0.661 to 2.261)	0.814 (0.309 to 2.146)	0.238 (0.015 to 3.877)		
Marital status											
Single		331 (83.0)	50 (12.5)	14 (3.5)	4 (1.0)	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Married		1017 (77.9)	198 (15.2)	79 (6.1)	11 (0.8)	1.411 (0.987 to 2.017)	1.353 (0.906 to 2.020)	1.582 (0.856 to 2.923)	2.279 (0.484 to 10.729)		
Divorced/widowed/separated		189 (76.2)	43 (17.3)	15 (6.0)	1 (0.4)	1.819 (1.132 to 2.924)	1.712 (1.005 to 2.916)	1.812 (0.807 to 4.070)	0.878 (0.074 to 10.368)		
Monthly household income (NTU)											
≤20 000		280 (80.9)	51 (14.7)	11 (3.2)	4 (1.2)	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
20 001 to 40 000		359 (79.1)	66 (14.5)	25 (5.5)	4 (0.9)	0.719 (0.458 to 1.128)	0.765 (0.469 to 1.248)	0.728 (0.315 to 1.681)	1.758 (0.291 to 10.622)		
40 001 to 60 000		237 (77.2)	40 (13.0)	28 (9.1)	2 (0.7)	0.724 (0.492 to 1.066)	0.668 (0.437 to 1.021)	0.984 (0.490 to 1.978)	0.934 (0.187 to 4.680)		
60001 to 80 000		157 (78.5)	31 (15.5)	10 (5.0)	2 (1.0)	0.846 (0.567 to 1.262)	0.627 (0.396 to 0.994)	1.600 (0.811 to 3.156)	0.531 (0.084 to 3.371)		
80001 to 10 000		64 (71.1)	18 (20.0)	8 (8.9)	0	0.773 (0.493 to 1.213)	0.736 (0.450 to 1.206)	0.902 (0.398 to 2.043)	0.639 (0.100 to 4.082)		
≥1 00 001						1.095 (0.635 to 1.887)	0.909 (0.491 to 1.680)	1.504 (0.594 to 3.806)	–		
Smoking status											
Everyday		1472 (78.5)	285 (15.2)	103 (5.5)	15 (0.8)	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Some days		73 (84.9)	7 (8.1)	5 (5.8)	1 (1.2)	1.420 (0.745 to 2.710)	1.786 (0.798 to 4.000)	0.831 (0.340 to 2.030)	0.582 (0.071 to 4.765)		
Self-reported health		3.68±1.10	3.65±1.12	3.50±1.07	3.06±1.34	0.904 (0.811 to 1.008)	0.923 (0.817 to 1.043)	0.820 (0.686 to 0.980)	0.679 (0.432 to 1.066)		

^a Categories in the index group, indicated by letters corresponding to columns under treatment use.

^b Reference category for comparison to index group directly above, indicated by letters corresponding to columns under treatment use.

Medicaid coverage had a positive influence on non-NRT medication use.⁷ These results imply that government subsidisation of smoking cessation treatment can significantly increase the uptake of evidence-based cessation methods.

However, the use of any type of smoking cessation treatment, a smoking cessation clinic or a pharmacy did not increase significantly after the SCPS policy was implemented in Taiwan. Studies have revealed that compared with the absence of financial coverage, partial financial coverage had no effect on NRT and behavioural treatments. However, full financial coverage increased the use of NRT relative to partial financial coverage.¹⁷ This implies that full financial coverage is more effective than partial financial coverage in encouraging smokers to use smoking cessation treatments. The behaviour of providers is another factor. In Taiwan, a cross-sectional nationwide survey was conducted to evaluate the effects of the SCPS policy on smoking cessation services from the physician's perspective. In that study, only 18.7% of medical institutions reported that they increased their allocation of physicians for providing smoking cessation services, and 55.0% of physicians reported an increase in the willingness of patients to adopt pharmacotherapy for smoking cessation after the SCPS was introduced.¹⁸ This suggests that the low incentives given to medical institutions to hire smoking cessation providers and provider behaviour are responsible for the non-significant increase in use of smoking cessation treatment since the SCPS was introduced.

Our study has some limitations. First, this study had no control group (where the policy was unchanged), a general problem in population analysis. Second, data collected in the Taiwan ASBS were self-reported and may have been subject to recall bias. Third, we only included individual-level covariates in the model, and a future study should include county-level and city-level factors when evaluating the use of cessation treatment. Fourth, ethnicity influences how tobacco control policy affects the use of smoking cessation treatments. Because the ethnicity measurements were different between 2011–2013 and 2014, we did not include ethnicity in the model. Future studies should consider ethnicity. Fifth, we did not control for the effects of any macroeconomic shocks or policy change. Everyone in Taiwan has the national health insurance (NHI), and all smokers have equal opportunity to use tobacco treatments provided under the NHI. In addition, the tobacco control policy was the same in the periods before and after SCPS introduction. Therefore, the influence of any macroeconomic shocks or policy changes may have been negligible. Finally, we did not analyse the use of medications because the ASBS did not include medication data. Future research could compare the effect of subsidisation policy on the use of different cessation medications.

CONCLUSIONS

The current study demonstrated that the government's subsidisation policy, the SCPS, was related to an increase in the combined use of a smoking cessation clinic and pharmacy. Among heavy smokers, the SCPS had a positive effect on use of a pharmacy and combined use of a smoking cessation clinic and pharmacy. However, among light smokers, the SCPS was not related to the use of smoking cessation treatments. Rather than providing partial subsidies, full financial subsidies should be considered to eliminate financial barriers. In addition, medical institutions should be more highly incentivised to hire more smoking cessation providers.

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Supplementary materials

Table 1 Logistic regressions on tobacco-cessation treatments among Taiwanese adults aged 18 years or above among light smokers (pre- and post-policy)

Variables	Treatment use				Any treatment	A smoking cessation clinic	A pharmacy	Combination of a smoking cessation clinic and pharmacy ^c
	None (%)	Smoking cessation clinic (%)	Pharmacy (%)	Combining a smoking cessation clinic and a pharmacy (%)	B + C + D ^a	B + D ^a	C + D ^a	D ^a
	/ Mean ± SD	/ Mean ± SD	/ Mean ± SD	/ Mean ± SD	A ^b	A ^b	A ^b	A ^b
	3197 (82.0%)	499 (12.8%)	184 (4.7%)	20 (0.5%)	Adjusted OR (95% CI)	Adjusted OR (95% CI)	Adjusted OR (95% CI)	Adjusted OR (95% CI)
Policy								

Table 1 Logistic regressions on tobacco-cessation treatments among Taiwanese adults aged 18 years or above among light smokers (pre- and post-policy)

Variables	Treatment use				Any treatment	A smoking cessation clinic	A pharmacy	Combination of a smoking cessation clinic and pharmacy ^c
	None (%) / Mean ± SD	Smoking cessation clinic (%) / Mean ± SD	Pharmacy (%) / Mean ± SD	Combining a smoking cessation clinic and a pharmacy (%) / Mean ± SD	B + C + D ^a / A ^b / Adjusted OR (95% CI)	B + D ^a / A ^b / Adjusted OR (95% CI)	C + D ^a / A ^b / Adjusted OR (95% CI)	D ^a / A ^b / Adjusted OR (95% CI)
Before policy (2010-2011)	838 (84.8)	112 (11.3)	35 (3.5)	3 (0.3)	Ref.	Ref.	Ref.	-
After policy (2013-2014)	807 (85.6)	94 (10.0)	41 (4.3)	1 (0.1)	0.852 (0.640 – 1.136)	0.807 (0.581 – 1.122)	0.984 (0.591 – 1.641)	-

Table 1 Logistic regressions on tobacco-cessation treatments among Taiwanese adults aged 18 years or above among light smokers (pre- and post-policy)

Variables	Treatment use				Any treatment	A smoking cessation clinic	A pharmacy	Combination of a smoking cessation clinic and pharmacy ^c
	None (%) / Mean ± SD 3197 (82.0%) A	Smoking cessation clinic (%) / Mean ± SD 499 (12.8%) B	Pharmacy (%) / Mean ± SD 184 (4.7%) C	Combining a smoking cessation clinic and a pharmacy (%) / Mean ± SD 20 (0.5%) D	B + C + D ^a A ^b Adjusted OR (95% CI)	B + D ^a A ^b Adjusted OR (95% CI)	C + D ^a A ^b Adjusted OR (95% CI)	D ^a A ^b Adjusted OR (95% CI)
Gender								
Male	1791 (86.6)	186 (9.0)	81 (3.9)	9 (0.4)	Ref.	Ref.	Ref.	-
Female	315	44 (11.7)	17 (4.5)	0	1.096 (0.738	1.239 (0.798	0.670 (0.293	-

Table 1 Logistic regressions on tobacco-cessation treatments among Taiwanese adults aged 18 years or above among light smokers (pre- and post-policy)

Variables	Treatment use				Any treatment	A smoking cessation clinic	A pharmacy	Combination of a smoking cessation clinic and pharmacy ^c
	None (%) / Mean ± SD	Smoking cessation clinic (%) / Mean ± SD	Pharmacy (%) / Mean ± SD	Combining a smoking cessation clinic and a pharmacy (%) / Mean ± SD	B + C + D ^a / A ^b / Adjusted OR (95% CI)	B + D ^a / A ^b / Adjusted OR (95% CI)	C + D ^a / A ^b / Adjusted OR (95% CI)	D ^a / A ^b / Adjusted OR (95% CI)
	3197 (82.0%)	499 (12.8%)	184 (4.7%)	20 (0.5%)				
Age	(83.8)	43.47 ± 15.34	42.05 ± 13.94	40.67 ± 17.10	– 1.629) / 0.992 (0.979) / – 1.005)	– 1.925) / 0.991 (0.976) / – 1.006)	– 1.533) / 0.994 (0.970) / – 1.018)	-
Education level								

Table 1 Logistic regressions on tobacco-cessation treatments among Taiwanese adults aged 18 years or above among light smokers (pre- and post-policy)

Variables	Treatment use				Any treatment	A smoking cessation clinic	A pharmacy	Combination of a smoking cessation clinic and pharmacy ^c
	None (%) / Mean ± SD 3197 (82.0%) A	Smoking cessation clinic (%) / Mean ± SD 499 (12.8%) B	Pharmacy (%) / Mean ± SD 184 (4.7%) C	Combining a smoking cessation clinic and a pharmacy (%) / Mean ± SD 20 (0.5%) D	B + C + D ^a A ^b Adjusted OR (95% CI)	B + D ^a A ^b Adjusted OR (95% CI)	C + D ^a A ^b Adjusted OR (95% CI)	D ^a A ^b Adjusted OR (95% CI)
Elementary or below	185 (88.1)	19 (9.0)	6 (2.9)	0	Ref.	Ref.	Ref.	-
Junior high school	286 (89.1)	21 (6.5)	13 (4.0)	1 (0.3)	0.875 (0.426 – 1.798)	0.729 (0.316 – 1.680)	1.421 (0.357 – 5.652)	-

Table 1 Logistic regressions on tobacco-cessation treatments among Taiwanese adults aged 18 years or above among light smokers (pre- and post-policy)

Variables	Treatment use				Any treatment	A smoking cessation clinic	A pharmacy	Combination of a smoking cessation clinic and pharmacy ^c
	None (%) / Mean ± SD	Smoking cessation clinic (%) / Mean ± SD	Pharmacy (%) / Mean ± SD	Combining a smoking cessation clinic and a pharmacy (%) / Mean ± SD	B + C + D ^a / A ^b / Adjusted OR (95% CI)	B + D ^a / A ^b / Adjusted OR (95% CI)	C + D ^a / A ^b / Adjusted OR (95% CI)	D ^a / A ^b / Adjusted OR (95% CI)
	3197 (82.0%)	499 (12.8%)	184 (4.7%)	20 (0.5%)				
High school	854 (86.3)	100 (10.1)	35 (3.5)	0	1.266 (0.658 – 2.438)	1.338 (0.643 – 2.786)	1.159 (0.305 – 4.410)	-
Junior college	293 (83.0)	41 (11.6)	15 (4.2)	4 (1.1)	1.565 (0.768 – 3.190)	1.490 (0.665 – 3.340)	2.229 (0.558 – 8.901)	-

Table 1 Logistic regressions on tobacco-cessation treatments among Taiwanese adults aged 18 years or above among light smokers (pre- and post-policy)

Variables	Treatment use				Any treatment	A smoking cessation clinic	A pharmacy	Combination of a smoking cessation clinic and pharmacy ^c
	None (%) / Mean ± SD	Smoking cessation clinic (%) / Mean ± SD	Pharmacy (%) / Mean ± SD	Combining a smoking cessation clinic and a pharmacy (%) / Mean ± SD	B + C + D ^a / A ^b / Adjusted OR (95% CI)	B + D ^a / A ^b / Adjusted OR (95% CI)	C + D ^a / A ^b / Adjusted OR (95% CI)	D ^a / A ^b / Adjusted OR (95% CI)
	3197 (82.0%)	499 (12.8%)	184 (4.7%)	20 (0.5%)				
Undergraduate or above	486 (85.6)	49 (8.6)	29 (5.1)	4 (0.7)	1.339 (0.654 – 2.741)	1.339 (0.595 – 3.015)	1.675 (0.409 – 6.858)	-
Marital status								
Single	604	49 (7.2)	27 (4.0)	2 (0.3)	Ref.	Ref.	Ref.	-

Table 1 Logistic regressions on tobacco-cessation treatments among Taiwanese adults aged 18 years or above among light smokers (pre- and post-policy)

Variables	Treatment use				Any treatment	A smoking cessation clinic	A pharmacy	Combination of a smoking cessation clinic and pharmacy ^c
	None (%) / Mean ± SD 3197 (82.0%) A	Smoking cessation clinic (%) / Mean ± SD 499 (12.8%) B	Pharmacy (%) / Mean ± SD 184 (4.7%) C	Combining a smoking cessation clinic and a pharmacy (%) / Mean ± SD 20 (0.5%) D	B + C + D ^a A ^b Adjusted OR (95% CI)	B + D ^a A ^b Adjusted OR (95% CI)	C + D ^a A ^b Adjusted OR (95% CI)	D ^a A ^b Adjusted OR (95% CI)
Married	(88.6) 1346 (85.2)	162 (10.3)	64 (4.1)	7 (0.4)	1.541 (1.034 – 2.297)	1.822 (1.143 – 2.905)	0.981 (0.493 – 1.951)	-
Divorced/widowed/separate	153	18 (10.1)	7 (3.9)	0	1.757 (0.940	1.882 (0.907	1.433 (0.485	-

Table 1 Logistic regressions on tobacco-cessation treatments among Taiwanese adults aged 18 years or above among light smokers (pre- and post-policy)

Variables	Treatment use				Any treatment	A smoking cessation clinic	A pharmacy	Combination of a smoking cessation clinic and pharmacy ^c
	None (%) / Mean ± SD 3197 (82.0%) A	Smoking cessation clinic (%) / Mean ± SD 499 (12.8%) B	Pharmacy (%) / Mean ± SD 184 (4.7%) C	Combining a smoking cessation clinic and a pharmacy (%) / Mean ± SD 20 (0.5%) D	B + C + D ^a A ^b Adjusted OR (95% CI)	B + D ^a A ^b Adjusted OR (95% CI)	C + D ^a A ^b Adjusted OR (95% CI)	D ^a A ^b Adjusted OR (95% CI)
d	(86.0)				– 3.284)	– 3.903)	– 4.237)	
Monthly household income (NTU)								
≤ 20000	291	33 (9.9)	10 (3.0)	1 (0.3)	Ref.	Ref.	Ref.	-

Table 1 Logistic regressions on tobacco-cessation treatments among Taiwanese adults aged 18 years or above among light smokers (pre- and post-policy)

Variables	Treatment use				Any treatment	A smoking cessation clinic	A pharmacy	Combination of a smoking cessation clinic and pharmacy ^c
	None (%) / Mean ± SD	Smoking cessation clinic (%) / Mean ± SD	Pharmacy (%) / Mean ± SD	Combining a smoking cessation clinic and a pharmacy (%) / Mean ± SD	B + C + D ^a / A ^b / Adjusted OR (95% CI)	B + D ^a / A ^b / Adjusted OR (95% CI)	C + D ^a / A ^b / Adjusted OR (95% CI)	D ^a / A ^b / Adjusted OR (95% CI)
	3197 (82.0%)	499 (12.8%)	184 (4.7%)	20 (0.5%)				
20001 to 40000	485 (86.9%)	38 (6.9%)	22 (4.0%)	3 (0.5%)	0.963 (0.548 – 1.695)	1.175 (0.623 – 2.214)	0.560 (0.185 – 1.697)	-
40001 to 60000	421 (88.5%)	43 (8.9%)	19 (3.9%)	1 (0.2%)	0.713 (0.439 – 1.161)	0.619 (0.348 – 1.101)	1.016 (0.460 – 2.214)	-

Table 1 Logistic regressions on tobacco-cessation treatments among Taiwanese adults aged 18 years or above among light smokers (pre- and post-policy)

Variables	Treatment use				Any treatment	A smoking cessation clinic	A pharmacy	Combination of a smoking cessation clinic and pharmacy ^c
	None (%) / Mean ± SD	Smoking cessation clinic (%) / Mean ± SD	Pharmacy (%) / Mean ± SD	Combining a smoking cessation clinic and a pharmacy (%) / Mean ± SD	B + C + D ^a / A ^b Adjusted OR (95% CI)	B + D ^a / A ^b Adjusted OR (95% CI)	C + D ^a / A ^b Adjusted OR (95% CI)	D ^a / A ^b Adjusted OR (95% CI)
	3197 (82.0%)	499 (12.8%)	184 (4.7%)	20 (0.5%)				
60001 to 80000	(87.0) 279	34 (10.6)	9 (2.8)	0	– 1.158) 0.816 (0.510	– 1.100) 0.819 (0.476	– 2.246) 0.778 (0.343	-
80001 to 10000	(86.6) 162	22 (11.2)	10 (5.1)	2 (1.0)	– 1.306) 0.867 (0.529	– 1.408) 0.945 (0.540	– 1.765) 0.616 (0.245	-

Table 1 Logistic regressions on tobacco-cessation treatments among Taiwanese adults aged 18 years or above among light smokers (pre- and post-policy)

Variables	Treatment use				Any treatment	A smoking cessation clinic	A pharmacy	Combination of a smoking cessation clinic and pharmacy ^c
	None (%) / Mean ± SD	Smoking cessation clinic (%) / Mean ± SD	Pharmacy (%) / Mean ± SD	Combining a smoking cessation clinic and a pharmacy (%) / Mean ± SD	B + C + D ^a / A ^b / Adjusted OR (95% CI)	B + D ^a / A ^b / Adjusted OR (95% CI)	C + D ^a / A ^b / Adjusted OR (95% CI)	D ^a / A ^b / Adjusted OR (95% CI)
	3197 (82.0%)	499 (12.8%)	184 (4.7%)	20 (0.5%)				
Smoking status	≥ 100001 (82.7%)	29 (10.4%)	15 (5.4%)	2 (0.7%)	– 1.421) / 1.013 (0.592) / – 1.732)	– 1.655) / 0.967 (0.517) / – 1.806)	– 1.549) / 1.160 (0.484) / – 2.785)	-

Table 1 Logistic regressions on tobacco-cessation treatments among Taiwanese adults aged 18 years or above among light smokers (pre- and post-policy)

Variables	Treatment use				Any treatment	A smoking cessation clinic	A pharmacy	Combination of a smoking cessation clinic and pharmacy ^c
	None (%) / Mean ± SD 3197 (82.0%) A	Smoking cessation clinic (%) / Mean ± SD 499 (12.8%) B	Pharmacy (%) / Mean ± SD 184 (4.7%) C	Combining a smoking cessation clinic and a pharmacy (%) / Mean ± SD 20 (0.5%) D	B + C + D ^a A ^b Adjusted OR (95% CI)	B + D ^a A ^b Adjusted OR (95% CI)	C + D ^a A ^b Adjusted OR (95% CI)	D ^a A ^b Adjusted OR (95% CI)
Everyday	1394 (84.8)	167 (10.2)	75 (4.6)	8 (0.5)	Ref.	Ref.	Ref.	-
Some days	712 (89.1)	63 (7.9)	23 (2.9)	1 (0.1)	1.463 (1.071 – 1.999)	1.405 (0.985 – 2.004)	1.640 (0.922 – 2.917)	-

Table 1 Logistic regressions on tobacco-cessation treatments among Taiwanese adults aged 18 years or above among light smokers (pre- and post-policy)

Variables	Treatment use				Any treatment	A smoking cessation clinic	A pharmacy	Combination of a smoking cessation clinic and pharmacy ^c
	None (%) / Mean ± SD	Smoking cessation clinic (%) / Mean ± SD	Pharmacy (%) / Mean ± SD	Combining a smoking cessation clinic and a pharmacy (%) / Mean ± SD	B + C + D ^a / A ^b / Adjusted OR (95% CI)	B + D ^a / A ^b / Adjusted OR (95% CI)	C + D ^a / A ^b / Adjusted OR (95% CI)	D ^a / A ^b / Adjusted OR (95% CI)
Self-reported health	3.77 ± 1.04	3.70 ± 1.03	3.66 ± 1.06	3.89 ± 0.78	0.919 (0.806 – 1.048)	0.933 (0.804 – 1.084)	0.885 (0.703 – 1.115)	-

^a Categories in the index group, indicated by letters corresponding to columns under treatment use.

^b Reference category for comparison to index group directly above, indicated by letters corresponding to columns under treatment use.

c The analysis was not completed because the number of using combining a smoking cessation clinic and a pharmacy was only 9.