



보건학석사 학위논문

## Comparison of Quit Success Rates by Fine Exemption Policy among Smoking Cessation Clinic Participants

금연클리닉 참여자의 흡연과태료 감면제도에 따른 금연성공률 비교

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김지연

## Comparison of Quit Success Rates by Fine Exemption Policy among Smoking Cessation Clinic Participants

지도 교수 조성일

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위역	원 장	<u>성 주 헌</u>	(인)
부위	원장	원 성 호	(인)
위	원	조 성 일	(인)

### Abstract

**Background:** Various penalties and incentive policies are being promoted to regulate tobacco use and help users to quit smoking but few studies have examined the results of both policies. By combining the two strategies, Korea implemented a policy to reduce or offer exemption from smoking fines in exchange for enrollment in smoking cessation programs in June 2020. This study evaluated Korea's fine exemption policy and proposes a new tobacco regulation plan combining fines and incentives.

**Methods**: We used data on 159,599 subjects from the Korea Health Promotion Institute's integrated smoking-cessation service information system, from 4 June 2020, the date of the system's implementation, to 31 December 2021. Participants in the smokingcessation clinic were divided into an exemption group and nonexemption group, and sociodemographic characteristics and success rates were compared between the groups. The factors associated with success in smoking cessation for 6 months were examined using regression analysis.

**Results**: The non-exemption group had the lowest proportion of participants under 30 years old, while the exemption group had the lowest proportion of participants over 60 years old. With regard to occupation, the non-exemption group had the highest proportion of blue-collar workers and the lowest proportion of students. In contrast, the exemption group had the lowest proportion of bluecollar workers and the highest proportion of students. The nonexemption group included many participants from areas outside the capital city, while the proportion of participants from the Seoul area was high in the exemption group. Participants in the non-exemption group smoked the largest number of cigarettes (11-20/day), while the exemption group smoked less than 10 cigarettes per day. The participation rate in the non-exemption group increased in proportion to the total smoking period, while the exemption group had a higher rate of participants with shorter smoking period. The non-exemption group had a higher smoking cessation success rate, with the highest rate seen among male and white-collar workers. In the exemption group, the rate was highest in female and blue-collar workers. Both groups had high proportions of participants outside the capital city. In the non-exemption group, smoking fewer cigarettes per day and later age at first smoking were associated with higher smoking cessation success but the exemption group was different.

**Conclusion:** The 6-month smoking cessation success rate was higher in the non-exemption group than the exemption group. However, there were higher proportions of students, short smoking period group, and participants from Seoul in exemption group compared to non-exemption group. The participation of these groups in the smoking cessation program might have been encouraged by the exemption. In addition, the high smoking cessation success rates among women and blue-collar workers are consistent with the purpose of easing the burden of fines on vulnerable groups. However, it seems necessary to promote the system nationwide to take the focus off of Seoul, and efforts such as simplifying the application process are needed to increase participation rates among the elderly and blue-collar workers.

**Keyword:** smoking, fine exemption policy, tobacco control policy, tobacco incentive, tobacco penalty, smoking cessation clinic **Student Number:** 2020–23143

## Table of Contents

Chapter 1.	Introduction1
1.	Study background1
2.	Policy to Reduce or Provide Exemptions from Smoking
	Fines3
3.	Smoking cessation clinic at a public health center4
4.	A Study on the Combination of Penalty and Incentive11
5.	6 months Successful in Smoking Cessation11
6.	Purpose of Research12
Chapter 2.	Methods13
1.	Data13
2.	Measure14
3.	Statistical analysis15
Chapter 3.	Results16
1.	Comparison of Sociodemographic Characteristic16
2.	Characteristics of Successful 6-month Smoking
	Cessation22
3.	Comparison of Quit Rate Between Exemption and
	Non-exemption Groups26
4.	Variables Influencing Quitting Success
Chapter 4.	Discussion34
Chapter 5.	Conclusion37
Bibliograp	hy
국문 초록.	

### List of tables

[Table 1]
[Table 2]
[Table 3]
[Table 4]
[Table 5]

## List of figures

[Figure 1]	13
Data Categorization and Number of Targets	

### Appendix

[Appendix 1]	
Questionnaire	
[Appendix 2]	
Data and Variables	

#### Chapter 1. Introduction

#### 1.1. Study Background

Various penalty and incentive policies are being promoted to control tobacco use. In legal policy, incentives and fines are rooted in the traditional dichotomies of rewards and punishments, profits, and costs. Incentives include subsidies, exemptions, and measures to facilitate voluntary behavioral changes. Punishment is a sanction imposed by legal authorities for violations of the law (Brigham & Brown, 1980). In the WHO's MPOWER measures, P (protecting people from tobacco smoke) is a representative policy frequently associated with penalties, which imposes fines for smoking in nonsmoking areas, while O (offering help to quit tobacco use) typically adopts incentives by providing free smoking-cessation services (Organization, 2021).

According to reports to the WHO Framework Convention on Tobacco Control (FCTC), in Canada, smoking in non-smoking areas is punished by fines up to \$50 for the first violation and up to \$100 for subsequent violations. Similarly, the UK imposes a fine of £50. Russia has fines of 500 to 1500 rubles, which increases to 2000 to 3000 rubles for smoking in a school playground (Legislation / Tobacco Control Laws, n.d.). Implementation of policies such as imposing fines on smokers in non-smoking areas increases compliance with antismoking laws by 30% (Peruga et al., 2018). Several studies have found that the designation of non-smoking areas increases smoking cessation and protects non-smokers from secondhand smoke without a decrease in sales (Lal & Siahpush, 2009; Philpot et al., 1999; Semple et al., 2007). However, research has shown that 21.8% of smokers oppose the designation of nonsmoking areas (Nagelhout et al., 2015), so it is necessary to improve public acceptance of the designation and management of non-smoking areas and the imposition of penalties.

1

Many countries are also operating various incentive systems using smoking-cessation quitlines, smoking-cessation clinics, and web-based smoking-cessation support services. Brazil, India, New Zealand, and Turkey fully cover the costs of their national quitlines, consulting, and nicotine replacement therapy (NRT). Austria, Canada, Germany, South Korea, the UK, and others, bear the full or partial costs of one or two national quitlines, coverage, and NRT consultations(*Cessation*, n.d.) This has a positive effect on the success of smoking cessation (Harhay et al., 2019; Sigmon & Patrick, 2012; van den Brand et al., 2021). In particular, the provision of incentives increases the rate of smoking cessation in low-income smokers (Baker et al., 2018; Fraser et al., 2017; Mundt et al., 2019).

Korea's fine reduction/exemption program has not previously been evaluated. Many previous studies have shown that smoking cessation rates are high when incentives are provided or penalties are imposed (Notley et al., 2019), but few studies have assessed the combination of both strategies. This study evaluated this program and proposed a new tobacco regulation plan that combines fines and incentives.

# 1.2. Policy to Reduce or Provide Exemptions from Smoking Fines

Although penalties and incentive strategies help increasing rates of smoking cessation, few studies have examined the results of both policies. To motivate smokers to quit smoking and ease the burden of fines for ordinary people, Korea implemented a policy in June 2020 to reduce smoking and fines in non-smoking areas in exchange for participation in an anti-smoking program.

In this program, fines for smoking are reduced by 50% in exchange for participation in a 3 h health education program and by 100% in exchange for participation in a smoking-cessation program for more than 3 months. Smoking-cessation support services include smoking-cessation clinics at public health centers, treatment at designated hospitals, telephone counseling, and camps. In 2021, about 29,000 fines were imposed for smoking in nonsmoking areas, of which about 10,000 were included in the fine exemption policy. Among these cases, 1400 people (14.0%) participated in smoking-cessation clinics in 2021. (KHEPI, 2022).

#### 1.3. Smoking cessation clinic at a public health center

Korea opened smoking-cessation clinics at public health centers nationwide in March 2005 with the aim of improving the quitting rate (and thus reducing the smoking rate). These clinics evaluate smokers' blood pressure, carbon monoxide (CO) concentration during exhalation, and nicotine dependence, and provide in-house counseling, visiting counseling, and telephone counseling services for 6 months (Ministry of Health and welfare, 2021). In 2021, such clinics reported success rates of 73.0% for 4 weeks and 33.2% for 6 months (KHEPI, 2022). Therefore, this is a very effective program; for comparison, the 4-week self-reported success rate was 59% in the UK in 2021 (*Statistics on NHS Stop Smoking Services in England – April 2020 to March 2021*, 2021).

There have been several studies of these clinics but most have been limited to one health center with limited data. There is insufficient research that includes all registered smoking-cessation clinics in Korea. <Table1>.

					Lee &		
Cho et al.	(Hwang,	Jun et al.	Yoo	(MS. Lee	Lee , Kye-	(KJ. Lee	Kim,
(2006)	2010)	(2008)	(2008)	et al., 2010)	Hee	et al., 2006)	(2009)
					(2013)		
Data range							
10PHC <sup>①</sup> s	1PHC	1PHC	1PHC	1PHCC <sup>2</sup>	1PHC	1PHCC	1PHC
Data size							
716	187	274	226,744	2,125	749	1,495	568
Participant cha	racteristics of s	moking cessation	clinic				
Sociodemograp	hic Characterist	tics					
Gender							
M>F	M>F	M>F	M>F	M>F	M>F	_	-
Age							
40~64>~40>	51+>20~40	40~59>20~39	40~64	40~64	M 47.44	_	_
65~	>41~50	>60~	>~40>65~	>~40>65~			
Social security	type						
NHI>MA <sup>(3)</sup>	_	_	NHI>MA	NHI>MA	_	_	_
Education							
		High school~					
—	_	>High school >~High school	-	_	_	_	_

#### Table 1. Review of Previous Literature

 $^{\textcircled{1}}$  PHC: public health center

<sup>(2)</sup> PHCC : health centers affiliated with a city

<sup>(3)</sup> NHI: national health insurance / MA: medical allow

Job							
Officer>None >Self- employed >Student >Labors	White color >Blue color >Others	Officer >Service >None>Labor >Self-employed	Self-employed >Government> Others >Not occupied >White color >Blue color >Students	Y≻N	-	_	_
Region							
big city>small and medium city>rural	-	-	-	-	-	_	-
Health status cl	haracteristics						
Blood pressure							
-	_	_	_	Normal >HBP	_	_	_
BMI							
obesity≻und erweight and normal≻over weight	_	-	_	~24>25~	-	-	_
Health behaviors characteristics							
Alcohol consum	ption						
N>Y	_	_	_	$\sim 1>2/week$	N>Y	_	_
Exercise							
_	_	_	_	N>Y	_	_	_

Smoking chara	cteristics							
smoking amou	nts a day							
1>1~ >~1pack	10~20>21~30 >31~>~9	-	-	_	_	-	_	
First smoking	age							
-	20.52	_	20~29>~19> 30~39>40~49 >50~	_	_	_	-	
Smoking perio	d							
20~29>30~39> 10~19>40~>~9	28.79	_	-	_	-	_	-	
Characteristics	s of successful si	noking cessation						
Sociodemogra	phic Characterist	ics						
Age								
65~>40~64> ~39	51~>41~50 >20~40	40~59 >20~39	_	65~>40~64 >~39	_	the less	_	
Job								
Student>None	-	Officer>Service >Labor	-	-	-	-	-	
Health behavio	Health behaviors characteristics							
Alcohol consur	nption							
N>Y	-	-	_	_	-	the less	N>Y	
Exercise								
the more	_	_	_	_	_	the more	_	

#### 1.3.1. Participant characteristics

Regarding the characteristics of participants, there were studies on variables related to sociodemographic, health status, health behavior, and smoking characteristics.

Studies related to demographic and sociological characteristics in the characteristics of participants in smoking cessation clinics were about gender, age, social security, education, occupation, and region. In terms of gender, men had a higher participation rate than women(Cho et al., 2006; Hwang, 2010; Jun et al., 2008; H. Lee & Lee, 2013; M.-S. Lee et al., 2010; Yoo, 2008). The age was generally 40 to 64 years old, followed by under 40 years old and over 65 years old(Cho et al., 2006; M.-S. Lee et al., 2010; Yoo, 2008). In addition, according to the age classification, there were studies in which 40 to 59 years old were the most, 20 to 39 years old and 60 years old or older (Jun et al., 2008), other studies were 51 years old or older, 20 to 40 years old, 41 to 50 years old (Hwang, 2010), and another study showed an average age of 47.44 (H. Lee & Lee, 2013). Social security had more NHI than medical allow(Jun et al., 2008). As for educational background, those who graduated from junior college or higher were the most, followed by high school graduates and middle school graduates or lower (Jun et al., 2008). As for job characteristics, there were more jobs than unemployment (M.-S. Lee et al., 2010), and among the job groups, white collar was the most common, blue collar was the least (Cho et al., 2006; Hwang, 2010; Jun et al., 2008), and there were studies with the most selfemployed(Yoo, 2008)

In terms of health status characteristics, normal blood pressure had a higher enrollment rate than high blood pressure (M.-S. Lee et al., 2010). There have been studies suggesting that BMI is more under normal weight than obesity (M.-S. Lee et al., 2010), and other studies have been conducted in the order of obesity, under normal weight, and obesity (Cho et al., 2006), so the results of the two studies did not match.

In terms of health behavior characteristics, there were alcohol consumption and exercise variables. Those without alcohol problems had a higher registration rate than those with problems(Cho et al., 2006; H. Lee & Lee, 2013), and those who drank less than once a week had a higher registration rate than those who drank more than twice a week(M.-S. Lee et al., 2010). The percentage of registrants who did not exercise was higher(M.-S. Lee et al., 2010).

There were studies showing that smoking characteristics have a high registration rate in the order of smokers with 1 pack, 1 pack or more, and 1 pack or less(Cho et al., 2006), and another study showed that 10 to 20 cigarettes are the highest, 21 to 30, 31 and 9 smokers are the highest(Hwang, 2010). The first smoking age was in the order of people in their 20s, under 19, 30s, 40s, and 50s, with a high registration rate(Yoo, 2008) and an average of 20.52 years(Hwang, 2010). The total smoking period is 20 to 29 years among registrants, followed by 30 to 39 years, 10 to 19 years, 40 years or more, and 9 years or less(Cho et al., 2006), and according to other studies, an average of 28.79 years(Hwang, 2010).

#### 1.3.2. Successful characteristics

Regarding the characteristics of successful smoking cessation, there were studies on variables related to sociodemographic and health behavior characteristics.

As a result of regression analysis in social characteristics, the variables that appeared as success factors for smoking cessation were age and occupation, and the older the age, the higher the success rate for smoking cessation(Cho et al., 2006; Hwang, 2010; Jun et al., 2008; M.–S. Lee et al., 2010). However, in some studies, the younger the age, the higher the success rate of smoking cessation(K.–J. Lee et al., 2006). As for occupations, there were studies in which students had a higher success rate in smoking cessation than in unemployment, and studies in which the success rate in smoking cessation was higher in the order of Officer, service, and labor.

Alcohol consumption was a significant variable in relation to health behavior characteristics. Regarding alcohol consumption, there was a thesis that the success rate of smoking cessation was high if there were no alcohol problems (Cho et al., 2006; Y. H. Kim, 2009), and the lower the amount of alcohol consumed, the higher the success rate of smoking cessation (K.-J. Lee et al., 2006).

'Regarding the smoking characteristics, the smoking period was a significant variable, and the longer the smoking period, the higher the smoking cessation success rate(Cho et al., 2006; K.-J. Lee et al., 2006).

# 1.4. A Study on the Combination of Penalty and Incentive

There are not many studies on policies that combine punishment and incentives. There are few policies and studies related to the exemption or reduction of smoking fines.

In Korea, a system is implemented to reduce the effective number of days of driver's licenses suspended due to drunk driving when completing traffic safety education. According to the results of a study that analyzed the inhibitory effect of traffic safety education, there were fewer cases of DWI (Driving While Intoxicated) and the long period of DWI abidance, so there was an effect of inhibiting drunk driving(Jeong & Jang, 2011).

#### 1.5. 6 months Successful in Smoking Cessation

The success of smoking cessation at 6 months, defined as quitting smoking for 168 days after visiting a smoking-cessation clinic at a public health center and starting from the day of the decision to quit smoking. Successful quitting was evaluated by self-reporting, CO measurement, cotinine measurement, or CO + cotinine measurement. (Ministry of Health and welfare, 2021).

#### 1.6. Purpose of Research

This study evaluated Korea's fine exemption policy and proposes a new tobacco regulation plan combining fines and incentives.

**Objective 1.** Comparison of participation between general registrants of smoking cessation clinics and registrants for exemption from fines

Hypothesis 1) Exemption group has the highest proportion of students.

Hypothesis 2) Exemption group has the lowest proportion of blue-collar workers and the elderly.

**Objective 2.** Comparison of 6-month smoking cessation success rate between the groups.

Hypothesis) The smoking cessation success rate of bluecollar workers will be high in the exemption group.

#### Chapter 2. Methods

#### 2.1. Data



Figure 1. Data Categorization and Number of Targets

The data for this study were obtained from the Non-Smoking Service Integrated Information System, which manages information of all people registered at the smoking-cessation clinics of public health centers in Korea. The Korea Health Promotion Development Institute provided data for a total of 265,871 participants from 4 June 2020, the date of the system's implementation, to 31 March 2022. We limited this to 31 December 31 2021. In addition, participants for whom data such as blood pressure, BMI, alcohol use, smoking, and age were missing were removed. Ultimately, data for a total of 159,599 participants were used in the study. Subjects completed a self-entry questionnaire at the time of registration, and those who elected to participate in the fine exemption program checked the relevant box. Applicants interested in exemption made up the exemption group and the other were considered the nonexemption group.

#### 2.2. Measure

The dependent variable was the success of smoking cessation at 6 months. The independent variables were sociodemographic characteristics (sex, age, education, occupation, region), health status characteristics (blood pressure, abdominal circumference, BMI), health behavior characteristics (alcohol consumption, exercise), and smoking characteristics (smoking amount per day, first-time smoking age, smoking period).

As smokers generally initiate smoking before the age of 30, age was classified as under 30, 30-59, and 60 or over

Health insurance type was classified as "national health insurance," "other" (medical benefits, unknown, and not registered), and "no response." Education was classified into "High school or below", "College or above", and "No response" With regard to occupation, managers, professionals, and office workers were classified as white-collar workers, service workers and salespeople were classified as service workers, and those in manufacturing, agriculture, and elementary occupations were classified as blue-collar workers. The region of residence was grouped as "Seoul,", "Gyeonggi, and "Other."

Health status characteristics included blood pressure, abdominal circumference, and BMI. Blood pressure was classified as Normal vs. Hypertension based on systolic pressure of 120 mmHg and diastolic pressure of 80 mmHg. Abdominal circumference was classified into Normal vs. High based on cutoff values of 35 inches for men and 32 inches for women. BMI was classified into Non-obese vs. Obese based on a cutoff value of 25 kg/m2. Alcohol drinking and exercise were measured as health behavior characteristics. As smoking characteristics, we examined the daily smoking amount, first-time smoking age (divided into  $\leq 15$  years, 16-18 years old, and  $\geq 19$  years), and total smoking period.

As characteristics of participation in the smoking cessation program, we examined the number of consultations, whether the participant quit smoking or not, and methods of confirming smoking cessation at 4, 6, and 12 weeks (self-report, CO measurement, cotinine measurement, and both CO and cotinine measurement).

#### 2.3. Statistical analysis

Descriptive statistics were used to examine all characteristics. The chi-square test was used to analyze the success rate of smoking cessation according to each variable and by group. Logistic regression analysis was performed by extracting significant variables (P<0.001) associated with quitting. The P-value for alcohol consumption was 0.113 but was included in the analysis anyway as previous study has reported a correlation between drinking alcohol and smoking (C. M. Lee et al., 2006) Odds ratios (ORs) with 95% confidence intervals (CIs) for prediction of quitting were calculated using logistic regression analysis. Data were cleaned using python version 3.10 (https://www.python.org/downloads/), and all data analyses were performed with REX (https://rexsoft.org/).

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15

#### Chapter 3. Results

#### 3.1. Comparison of Sociodemographic Characteristics

The characteristics are summarized in Table 1. The total number of participants was 159,599, consisting of 158,601 in the non-exemption group and 998 in the exemption group. Most participants were male (85.7%), in both groups. The nonexemption group had the smallest number of participants under 30 years old (18.4%), while the exemption group had the smallest number of participants over 60 years old (11.3%) and a higher proportion of participants under 30 years old (42.6%). With regard to health insurance type, 71.2% of participants were covered by the Korean National Health Insurance. Most subjects had been educated to above college level (34.9%). With the exception of the 'other' category, blue-collar workers accounted for the largest proportion of participants in the non-exemption group (15.9%), while the exemption group had the most students (14.1%). By region, the non-exemption group had the smallest proportion of participants from Seoul (9.4%) and the largest proportion classified as other (63.4%), while in the exemption group the largest proportion was from Seoul (50.6%) with other accounting for the lowest proportion (23.5%).

With regard to health status, 33.0% of participants had hypertension and 11.5% reported waist circumference above the normal range. BMI was less than 25 kg/m2 in 52.1% of participants.

With regard to health-related behaviors, 48.0% of participants were current alcohol drinkers and 35.0% exercised at least once a week.

In the non-exemption group, the largest proportion of participants smoked 11-20 cigarettes per day (49.7%), while in the

exemption group the largest proportion smoked less than 10 cigarettes per day (49.5%). The first-time smoking age was most commonly over the age of 19 (67.3%). In the non-exemption group, the largest proportion of participants had smoked for over 31 years (39.9%), while the largest proportion in the exemption group had smoked for less than 10 years (38.9%).

The greatest proportion of participants in the non-exemption group had 5-8 smoking-cessation clinic consultations (35.1%), while the largest proportion in the exemption group had 9-12 consultations (36.7%). The proportion of participants that successfully quit decreased over time (4 weeks, 76.2%; 6 weeks, 69.1%; 12 weeks, 53.7%; 6 months, 33.2%).

Variables	ALL		Non-exer grouj	nption p	Exemption group	
	п	%	п	%	n	%
Total	159,599	100.0	158,601	99.4	998	0.6
Year						
2020	92,395	57.9	91,901	57.9	494	49.5
2021	67,204	42.1	66,700	42.1	504	50.5
Sociodemographic Chara	cteristics					
Sex						
Male	136,763	85.7	135,899	85.7	864	86.6
Female	22,836	14.3	22,702	14.3	134	13.4
Age (years)						
<30	29,551	18.5	29,126	18.4	425	42.6
30-59	94,967	59.5	94,507	59.6	460	46.1
≥60	35,081	22.0	34,968	22.0	113	11.3
Health insurance type						
NHI	113,633	71.2	113,039	71.3	594	59.5
Other	11,197	7.0	11,080	7.0	117	11.7
No response	34,769	21.8	34,482	21.7	287	28.8
Education						
≤High school	53,307	33.4	53,037	33.4	270	27.1
≥College	55,712	34.9	55,363	34.9	349	35.0
No response	50,580	31.7	50,201	31.7	379	38.0
Occupation						
White-collar	25,129	15.7	25,005	15.8	124	12.4
Service and sales	17,665	11.1	17,562	11.1	103	10.3
Blue collar	25,353	15.9	25,267	15.9	86	8.6
Student	9,474	5.9	9,333	5.9	141	14.1
Other	81,978	51.4	81,434	51.3	544	54.5
Region						
Seoul	15,426	9.7	14,921	9.4	505	50.6
Gyeonggi	43,376	27.2	43,118	27.2	258	25.9
Other	100,797		100,562	63.4	235	23.5

Table 2. Comparison of Participant Characteristics Between Nonexemption and Exemption Groups

Health status charact	eristics					
Blood pressure (mmI	Hg)					
Normal	64,168	40.2	63,810	40.2	358	35.9
Hypertension	52,593	33.0	52,302	33.0	291	29.2
No response	42,838	26.8	42,489	26.8	349	35.0
Abdominal circumfered	ence (inches)					
Normal	141,278	88.5	140,382	88.5	896	89.8
High	18,321	11.5	18,219	11.5	102	10.2
BMI (kg/m2)						
Non-obese	83,114	52.1	82,547	52.0	567	56.8
Obese	48,671	30.5	48,376	30.5	295	29.6
No response	27,814	17.4	27,678	17.5	136	13.6
Health behaviors						
Alcohol consumption						
Yes	76,600	48.0	76,090	48.0	510	51.1
No	56,550	35.4	56,177	35.4	373	37.4
Exercise						
Yes	55,819	35.0	55,458	35.0	361	36.2
No	77,042	48.3	76,522	48.2	520	52.1
Smoking characterist	ics					
Smoking amount per	day (number o	f cigaret	tes)			
<10	58,255	36.5	57,761	36.4	494	49.5
11-20	79,196	49.6	78,767	49.7	429	43.0
≥21	22,148	13.9	22,073	13.9	75	7.5
First-time smoking a	age (years)					
≤15	17,081	10.7	16,942	10.7	139	13.9
16-18	35,132	22.0	34,892	22.0	240	24.0
≥19	107,386	67.3	106,767	67.3	619	62.0
Smoking period (year	rs)					
≤10	27,613	17.3	27,225	17.2	388	38.9
11-20	29,649	18.6	29,450	18.6	199	19.9
21-30	38,727	24.3	38,549	24.3	178	17.8
≥31	63,610	39.9	63,377	40.0	233	23.3

Smoking-cessation clin	ic participat	ion				
Number of consultations	\$					
$\leq 4$	13,023	8.2	13,014	8.2	9	0.9
5-8	55,977	35.1	55,663	35.1	314	31.5
9-12	55,256	34.6	54,890	34.6	366	36.7
13-16	22,927	14.4	22,728	14.3	199	19.9
≥17	12,416	7.8	12,306	7.8	110	11.0
Week 4 check						
Success	121,608	76.2	121,136	76.4	472	47.3
Failure	37,991	23.8	37,465	23.6	526	52.7
Week 4 check type						
Self-report	108,248	67.8	107,748	67.9	500	50.1
CO measurement	11,129	7.0	11,103	7.0	26	2.6
Cotinine measurement	2,058	1.3	2,058	1.3	0	0.0
CO + cotinine	228	0.1	228	0.1	0	0.0
Non-exemption	37,936	23.8	37,464	23.6	472	47.3
Week 6 check						
Success	110,235	69.1	109,737	69.2	498	49.9
Failure	49,364	30.9	48,864	30.8	500	50.1
Week 6 check type						
Self-report	98,165	61.5	97,707	61.6	458	45.9
CO measurement	9,933	6.2	9,898	6.2	35	3.5
Cotinine measurement	1,904	1.2	1,898	1.2	6	0.6
CO + cotinine	241	0.2	241	0.2	0	0.0
Non-execution	49,356	30.9	48,857	30.8	499	50.0
Week 12 check						
Success	85,688	53.7	85,263	53.8	425	42.6
Failure	73,911	46.3	73,338	46.2	573	57.4
Week 12 check type						
Self-report	71,877	45.0	71,503	45.1	374	37.5
CO measurement	6,281	3.9	6,261	3.9	20	2.0
Cotinine measurement	5,960	3.7	5,938	3.7	22	2.2
CO + cotinine	1,577	1.0	1,567	1.0	10	1.0
Non-execution	73,904	46.3	73,332	46.2	572	57.3

Month 6 check						
Success	52,982	33.2	52,715	33.2	267	26.8
Failure	106,617	66.8	105,886	66.8	731	73.2
Month 6 check type						
Self-report	29,906	18.7	29,724	18.7	182	18.2
CO measurement	2,149	1.3	2,135	1.3	14	1.4
Cotinine measurement	16,132	10.1	16,068	10.1	64	6.4
CO + cotinine	4,804	3.0	4,797	3.0	7	0.7
Non-execution	106,608	66.8	105,877	66.8	731	73.2

# 3.2. Characteristics of Successful 6-month Smoking Cessation

With the exception of alcohol consumption, all characteristics examined showed significant correlations with smoking cessation success at 6 months (Table 2).

The quit rate was significantly higher in the non-exemption group and in 2021.

With regard to socioeconomic characteristics, 50.1% of men and 47.2% of women successfully quit, and the success rate increased with age ( $\geq 60$ s). Participants who subscribed to health insurance had a 34.4% success rate. The rate was highest among those who had attended college or higher (35.4%) and white-collar workers (36.9%). Regionally, the success rates decreased in the order Other, Seoul, and Gyeonggi (34.6% vs. 31.5% vs. 30.4%, respectively).

With regard to health status characteristics, the quit rate was highest in participants with hypertension, abdominal obesity, and normal BMI.

With regard to health behaviors, it was highest in non-drinkers and those who exercised.

With regard to smoking characteristics, those who smoked fewer cigarettes per day (<10/day), began smoking at an older age ( $\geq$ 19 years), and with a longer total smoking period ( $\geq$ 31 years) had higher quit rates.

Finally, a greater number of smoking cessation consultations  $(\geq 17)$  was associated with a higher success rate (66.3%). In addition, 43.5%, 48.1%, and 61.8% of those who maintained smoking cessation at 4, 6, and 12 weeks succeeded in quitting smoking at 6 months, respectively. In all periods, the method of confirming smoking cessation was highest when both CO and cotinine measurement were performed.

22

Variables	All	Success g n	roup %	P-value
FINE				
Non-exemption group	158,601	52,715	33.2	20.01
exemption group	998	267	26.8	\0.01
YEAR				
2020	92,395	28,991	31.4	<0.01
2021	67.204	23,991	35.7	(0.01
Sociodemographic Characteris	tics			
Sex				
Male	91,106	45,657	50.1	<0.01
Female	15,511	7,325	47.2	(0.01
Age (years)				
<30	29,551	7,936	26.9	
30–59	94,967	31,356	33.0	<0.01
≥60	35,081	13,690	39.0	
Health insurance type				
NHI	113,633	39,101	34.4	
Other	11,197	3,216	28.7	<0.01
No response	34,769	10,665	30.7	
Education				
≤High school	53,307	17,203	32.3	
≥College	55,712	19,725	35.4	<0.01
No response	50,580	16,054	31.7	
Occupation				
White-collar	25,129	9,277	36.9	
Service and sales	17,665	5,819	32.9	
Blue collar	25,353	8,433	33.3	<0.01
Student	9,474	2,547	26.9	
Other	81,978	26,906	32.8	
Region				
Seoul	15,426	4,863	31.5	
Gyeonggi	43,376	13,204	30.4	<0.01
Other	100,797	34,915	34.6	

#### Table 3. Characteristics of successful 6-month smoking cessation

Health status characteristics				
Blood pressure (mmHg)				
Normal	64,168	21,476	33.5	
Hypertension	52,593	17,959	34.1	<0.01
No response	42,838	13,547	31.6	
Abdominal circumference (incl	nes)			
Normal	141,278	46,519	32.9	20.01
High	18,321	6,463	35.3	\0.01
BMI (kg/m2)				
Non-obese	83,114	28,143	33.9	
Obese	48,671	16,443	33.8	<0.01
No response	27,814	8,396	30.2	
Health behaviors characteristic	cs			
Alcohol consumption				
Yes	76,600	25,280	33.0	0.11
No	82,999	27,702	33.4	0.11
Exercise				
Yes	55,819	19,576	35.1	ZO 01
No	103,780	33,406	32.2	<0.01
Smoking characteristics				
Smoking amount per day (num	ber of cigaret	tes)		
<10	58,255	21,608	37.1	
11-20	79,196	25,064	31.6	<0.01
≥21	22,148	6,310	28.5	
First-time smoking age (years	s)			
≤15	17,081	4,618	27.0	
16-18	35,132	10,694	30.4	<0.01
≥19	107,386	37,670	35.1	
Smoking period (years)				
≤10	27,613	7,744	28.0	
11-20	29,649	9,354	31.5	20.01
21–30	38,727	12,738	32.9	<0.01
≥31	63,610	23,146	36.4	
	24		-	

Smoking-cessation clinic participation characteristics						
Number of consultations						
≤4	13,023	276	2.1			
5-8	55,977	6,308	11.3			
9-12	55,256	24,596	44.5	<0.01		
13–16	22,927	13,572	59.2			
≥17	12,416	8,230	66.3			
Week 4 check						
Success	121,662	52,982	43.5	20.01		
Failure	37,937	0	0.0	\0.01		
Week 4 check type						
Self-report	108,248	46,436	42.9			
CO measurement	11,129	5,283	47.5			
Cotinine measurement	2,058	1,108	53.8	< 0.01		
CO + cotinine	228	155	68.0			
Non-execution	37,936	0	0.0			
Week 6 check						
Success	110,235	52,982	48.1	<0.01		
Failure	49,364	0	0.0	(0.01		
Week 6 check type						
Self-report	98,165	46,625	47.5			
CO measurement	9,933	5,083	51.2			
Cotinine measurement	1,904	1,112	58.4	< 0.01		
CO + cotinine	241	161	66.8			
Non-execution	49,356	1	0.0			
Week 12 check						
Success	85,688	52,982	61.8	<0.01		
Failure	73,911	0	0.0	(0.01		
Week 12 check type						
Self-report	71,877	43,767	60.9			
CO measurement	6,281	3,697	58.9			
Cotinine measurement	5,960	4,199	70.5	< 0.01		
CO + cotinine	1,577	1,319	83.6			
Non-execution	73,904	0	0.0			
	25					

## 3.3. Comparison of Quit Rate Between Exemption and Non-exemption Groups

The success rate according to each variable was compared between the exemption and non-exemption groups (Table 3). For most variables, the rate was higher in the non-exemption group. The rate was higher in the non-exemption group in both 2020 and 2021 but not significantly so.

With regard to sociodemographic characteristics, the rate was significantly lower for men in the exemption group; there was no significant difference for women. The rate was significantly higher in the 30-59 years age group in the non-exemption group. There were no significant differences in rate according to health insurance and education. Among blue-collar workers, it was significantly higher in the exemption group. By region, the success rates were highest for the 'other' category in both groups, followed by Seoul and Gyeonggi in the non-exemption group.

In terms of health status characteristics, there was no significant difference between groups according to blood pressure, but the rate was significantly higher in the non-exemption group according to abdominal circumference and BMI. In terms of health behavior characteristics, the success rate was significantly higher in the non-exemption group compared to exemption group among those who did not drink and those who did not exercise. With regard to the smoking-related characteristics, the rate was significantly higher in the non-exemption group for participants who smoked less than 20 cigarettes per day, smoking start age of 19 years or older, and smoking period of 10 years or less.

Regardless of the number of consultations, the rate was higher in the non-exemption group, and the difference was significant for participants with 9 or more consultations. In all periods (4, 6, and 12 weeks), the rate was higher in the exemption group, and the differences were significant between 4 and 6 weeks. The success rate of the exemption group was high regardless of the method used to confirm smoking cessation, while the non-exemption group showed a high success rate only when both CO and cotinine were measured at 12 weeks.

	Non-exemption group			Exem	Exemption group			
<b>T</b> 7 • 1 1	iton en	Succe	SS	BACI	Success			
Variables	All	grou	р	All	gro	oup	value	
		п	%		n	%		
Total	158,601	52,715	33.2	998	267	26.8	< 0.01	
YEAR								
2020	91,901	28,848	31.4	494	143	28.9	0.24	
2021	66,700	23,867	35.8	504	124	24.6	0.26	
Sociodemogra	ohic Charact	eristics						
Sex								
Male	135,899	45,428	33.4	864	229	26.5	< 0.01	
Female	22,702	7,287	32.1	134	38	28.4	0.36	
Age (years)								
<30	29,126	7,838	26.9	425	98	23.1	0.08	
30-59	94,507	31,231	33.0	460	125	27.2	0.01	
≥60	34,968	13,646	39.0	113	44	38.9	0.99	
Health insuranc	e type							
NHI	113,039	38,910	34.4	594	191	32.2	0.25	
Other	11,080	3,187	28.8	117	29	24.8	0.34	
No response	34,482	10,618	30.8	287	47	16.4	< 0.01	
Education								
$\leq$ High school	53,037	17,126	32.3	270	77	28.5	0.19	
≥College	55,363	19,616	35.4	349	109	31.2	0.10	
No response	50,201	15,973	31.8	379	81	21.4	< 0.01	
Occupation								
White-collar	25,005	9,239	36.9	124	38	30.6	0.15	
Service and sales	17,562	5,791	33.0	103	28	27.2	0.21	
Blue collar	25,267	8,395	33.2	86	38	44.2	0.03	
Student	9,333	2,511	26.9	141	36	25.5	0.72	
Other	81,434	26,779	32.9	544	127	23.3	< 0.01	
Region								
Seoul	14,921	4,763	31.9	505	100	19.8	< 0.01	
Gyeonggi	43,118	13,148	30.5	258	56	21.7	< 0.01	
Other	100,562	34,804	34.6	235	111	47.2	<0.01	

Table 4. Comparison of 6-Month Smoking Cessation Success Rates Between the Exemption and Non-exemption Groups

Health status ch	Health status characteristics							
Blood pressure	(mmHg)							
Normal	63,810	21,373	33.5	358	103	28.8	0.06	
Hypertension	52,302	17,870	34.2	291	89	30.6	0.20	
No response	42,489	13,472	31.7	349	75	21.5	<0.01	
Abdominal circu	umference (i	inch)						
Normal	140,382	46,276	33.0	896	243	27.1	0.00	
High	18,219	6,439	35.3	102	24	23.5	0.01	
BMI (kg/m2)								
Non-obese	82,547	27,992	33.9	567	151	26.6	0.00	
Obese	48,376	16,365	33.8	295	78	26.4	0.01	
No response	27,678	8,358	30.2	136	38	27.9	0.57	
Health behavior	characteris	tics						
Alcohol consum	ption							
Yes	76,090	25,121	33.0	510	159	31.2	0.38	
No	82,511	27,594	33.4	488	108	22.1	<0.01	
Exercise								
Yes	55,458	19,465	35.1	361	111	30.7	0.08	
No	103,143	33,250	32.2	637	156	24.5	<0.01	
Smoking charac	teristics							
Smoking amoun	t per day (n	umber of o	cigarett	es)				
<10	57,761	21,477	37.2	494	131	26.5	<0.01	
11-20	78,767	24,952	31.7	429	112	26.1	0.01	
≥21	22,073	6,286	28.5	75	24	32.0	0.50	
First-time smo	king age (ye	ears)						
≤15	16,942	4,579	27.0	139	39	28.1	0.79	
16-18	34,892	10,635	30.5	240	59	24.6	0.05	
≥19	106,767	37,501	35.1	619	169	27.3	<0.01	
Smoking period	(years)							
≤10	27,225	7,654	28.1	388	90	23.2	0.03	
11-20	29,450	9,302	31.6	199	52	26.1	0.10	
21-30	38,549	12,689	32.9	178	49	27.5	0.13	
≥31	63,377	23,070	36.4	233	76	32.6	0.23	

Smoking-cessat	Smoking-cessation clinic participation characteristics						
Number of const	ultations						
≤4	13,014	276	2.1	9	0	0.0	0.66
5-8	55,663	6,278	11.3	314	30	9.6	0.34
9-12	54,890	24,512	44.7	366	84	23.0	<0.01
13-16	22,728	13,475	59.3	199	97	48.7	0.00
≥17	12,306	8,174	66.4	110	56	50.9	0.00
Week 4 check							
Success	121,136	52,715	43.5	526	267	50.8	0.01
Failure	37,465	0	0.0	472	0	0.0	_
Week 4 check ty	pe						
Self-report	107,748	46,189	42.9	500	247	49.4	0.00
СО	11,103	5,263	47.4	26	20	76.9	0.00
Cotinine	2,058	1,108	53.8	0	0	0.0	_
CO + cotinine	228	155	68.0	0	0	0.0	_
Non- execution	37,464	0	0.0	472	0	0.0	_
Week 6 check							
Success	109,737	52,715	48.0	498	267	53.6	0.01
Failure	48,864	0	0.0	500	0	0.0	_
Week 6 check ty	vpe						
Self-report	97,707	46,385	47.5	458	240	52.4	0.04
СО	9,898	5,061	51.1	35	22	62.9	0.17
Cotinine	1,898	1,107	58.3	6	5	83.3	0.21
CO + cotinine	241	161	66.8	0	0	0.0	_
Non- execution	48,857	1	0.0	499	0	0.0	0.92
Week 12 check							
Success	85,263	52,715	61.8	425	267	62.8	0.67
Failure	73,338	0	0.0	573	0	0.0	_
Week 12 check	type						
Self-report	71,503	43,534	60.9	374	233	62.3	0.58
СО	6,261	3,685	58.9	20	12	60.0	0.92
Cotinine	5,938	4,183	70.4	22	16	72.7	0.81
CO + cotinine	1,567	1,313	83.8	10	6	60.0	0.04
Non- execution	73,332	0	0.0	572	0	0.0	_

#### 3.4. Variables Influencing Quitting Success

Regression analysis was performed using quitting success as a dependent variable to identify the main factors affecting successful quitting. First, regression analysis was performed for each variable, and then all significant variables were included in the model. The independent variables in the logistic regression model were sociodemographic variables, health status, health behaviors, smoking, and use of smoking-cessation clinics (Table 4). All of the variables included in the regression model were significant with the exception of Gyeonggi as region, blood pressure, BMI, and smoking period of 11-20 years. The p-value of the Hosmer-Lemeshow goodness-of-fit test was suitable at 0.07.

The success rate of the exemption group was lower than that of the non-exemption group (OR 0.83, 95% CI 0.72 to 0.95).

The smoking cessation success rate was lower in the exemption group, lower among women, and increased with age. The rate was higher among those with an education level of college or above, white-collar workers, who lived in other, with high abdominal circumference and who were obese, those who did not drink alcohol, who did exercise, and who smoked less per day, started smoking later in life, and had a longer total smoking period.

	5100 11					00000			
		Cr	ude		Adjusted <sup>⊕</sup>				
Variables	OP	959	6CI	<i>P</i> –	OP	959	6CI	<i>P</i> –	
	OR	low	high	value	UK	low	high	value	
FINE									
Non-exemption	1								
exemption	0.73	0.64	0.84	< 0.01	0.83	0.72	0.95	< 0.01	
Sociodemograph	nic Chai	acteris	tics						
GENDER									
Male									
Female	0.94	0.91	0.97	<0.01	0.93	0.90	0.96	<0.01	
Age(years)									
<30									
30-59	1.34	1.30	1.38	<0.01	1.24	1.17	1.30	<0.01	
≥60	1.74	1.69	1.80	< 0.01	1.53	1.44	1.63	< 0.01	
Education									
$\leq$ High school									
≥College	1.15	1.12	1.18	<0.01	1.16	1.12	1.19	<0.01	
No response	0.98	0.95	1.00	0.066	1.04	1.01	1.08	0.02	
Job									
White collar									
Service and sales	0.84	0.81	0.87	<0.01	0.90	0.86	0.93	<0.01	
Blue Collar	0.85	0.82	0.88	<0.01	0.88	0.84	0.91	< 0.01	
Students	0.63	0.60	0.66	<0.01	0.91	0.85	0.97	<0.01	
Other	0.83	0.81	0.86	<0.01	0.89	0.86	0.92	< 0.01	
Region									
Seoul									
Gyeonggi	0.95	0.91	0.99	0.01	0.97	0.93	1.01	0.17	
Other	1.15	1.11	1.19	< 0.01	1.17	1.13	1.22	< 0.01	

Table 5. Variables Influencing 6-Month Smoking Cessation Success

 ${}^{\textcircled{4}}$  Adjusted for all other variables in the table

Health status characteristics								
Blood pressure(	mmHg)							
Normal								
Hypertension	1.03	1.01	1.06	0.015	1.00	0.97	1.02	0.85
No response	0.92	0.90	0.94	<0.01	0.97	0.94	0.99	0.01
Abdominal circu	mferen	ce(inch	)					
Normal								
High	1.11	1.08	1.15	<0.01	1.05	1.02	1.09	<0.01
BMI (kg/m2)								
Non-obese								
Obese	1.00	0.97	1.02	0.776	1.01	0.98	1.04	0.48
No response	0.84	0.82	0.87	<0.01	0.89	0.86	0.93	<0.01
Health behavior	s chara	cteristi	cs					
Alcohol consum	ption							
Yes								
No	1.02	1.00	1.04	0.113	1.09	1.06	1.11	<0.01
Exercise								
Yes								
No	0.88	0.86	0.90	<0.01	0.91	0.89	0.93	<0.01
Smoking charac	teristic	S						
Smoking amount	t a day(	(pieces)						
<10								
11~20	0.79	0.77	0.80	<0.01	0.74	0.72	0.76	<0.01
≥21	0.68	0.65	0.70	<0.01	0.63	0.61	0.66	<0.01
First smoking ag	ge(year	·s)						
≤15								
16-18	1.18	1.13	1.23	<0.01	1.09	1.04	1.14	<0.01
≥19	1.46	1.41	1.51	<0.01	1.23	1.18	1.28	<0.01
Smoking period	(years)							
≤10		0.38	0.40	<0.01				
11-20	1.18	1.14	1.23	<0.01	1.03	0.97	1.08	0.32
21-30	1.26	1.22	1.30	<0.01	1.07	1.01	1.13	0.02
≥31	1.47	1.42	1.51	<0.01	1.15			<0.01

#### Chapter 4. Discussion

This study evaluated the effectiveness of a smoking fine reduction and exemption policy in Korea. Although the 6-month smoking cessation success rate was lower among smokers who participated in the program. However, the participation of these groups in the smoking cessation program might have been encouraged by the exemption. In addition, it can ease the burden of fines and provide opportunities to quit smoking to socially disadvantaged groups. However, as there was regional variation in participation, it is necessary to promote participation evenly at the national level.

This was the first study to date regarding the effects of the combination of penalties and incentives on smoking cessation. Similar to previous studies, both groups in the present study (exception and non-exemption) had high proportions of participants 30-59 years old (Cho et al., 2006; Jun et al., 2008; M.-S. Lee et al., 2010; Yoo, 2008). The non-exemption group had the lowest proportion of participants under 30 years old, while the exemption group had the lowest proportion of those over 60 years old. Similar to previous studies, the non-exemption group included the highest proportions of blue-collar and white-collar workers (Cho et al., 2006; Hwang, 2010; Jun et al., 2008), and the lowest proportion of students (Yoo, 2008). In contrast to previous studies, the exemption group had the lowest proportion of blue-collar workers and the highest proportion of students. The exemption group had many participants from Seoul, the largest proportion of those who smoked less than 10 cigarettes per day, and the largest proportion of participants who had smoked for less than 10 years. The nonexemption group had the largest proportion of participants who smoked 11-20 cigarettes per day, and their participation rate increased with total smoking period.

The smoking cessation success rate was high in the nonexemption group. Similar to previous studies, the quit rate was high for men (Cho et al., 2006) and white-collar workers in the nonexemption group (Jun et al., 2008). Similar to Jun et al.(2008), quit rate was high for smoking fewer cigarettes per day, older firstsmoking age, and longer smoking period in the non-exemption group. Unlike previous studies, smoking cessation success rates were high for women and blue-collar workers in the exemption group. Regionally, proportion of Seoul resident was highest. Daily smoking amount and the start age of smoking differed between the exemption and non-exemption groups.

In exemption group, the proportions of participants over 60 years old and blue-collar workers, who were the main users of the cessation clinics, were low in this study. Therefore, we inferred that the barriers to participation in the program are high. Thus, it is necessary to simplify the policy. Second, unlike the non-exemption group, the exemption group included a high proportion of students and those under 30 years old, suggesting that implementation of the policy expanded the range of participants in smoking-cessation clinics. Third, as the participation rate was concentrated in Seoul, it is necessary to expand policy promotion nationwide.

The success rate was low in the exemption group, which has several important policy implications. First, unlike women and bluecollar workers in the non-exemption group, smoking cessation success rates were high among participants in the exemption group. This suggests that this system helped alleviate the burden of fines for the socially vulnerable, because several studies have classified women (Cha, 2012; Park, 2018) and blue-collar workers (K. Kim & Choi, 2006) as socially vulnerable groups. Second, both groups had high smoking cessation success rates in areas other than Seoul and Gyeonggi, but considering that the participants in the exemption group were concentrated in Seoul, promotion efforts should be strengthened to increase the registration rate nationwide. Third, smoking fewer cigarettes per day and older first-time smoking age were associated with a higher quit rate in the non-exemption group. However, the exemption group was different, suggesting that the policy has expanded the range of people trying to quit smoking in Korea.

#### Limitation

This study targeted only participants in smoking-cessation clinics, and did not investigate other smoking cessation and penalty reduction or exemption programs, such as education, smokingcessation clinics, smoking cessation telephone counseling, smoking cessation treatment, and smoking cessation camps. Therefore, further studies are needed to evaluate the overall program. In addition, we had no data on those caught smoking in non-smoking areas who did not participate in this policy, so related analysis could not be performed. For future evaluation, it will be necessary to conduct a national survey among those who do not participate in the reduction or exemption program. Finally, as this study was performed during the COVID-19 pandemic, the research should be repeated after the pandemic restrictions have been lifted.

Nevertheless, this study evaluated the fine exemption system for the first time, and confirmed the factors associated with smoking cessation success based on national data. Our results will form the basis for the widespread adoption of a combined policy where research and policies combining incentives and penalties are lacking.

#### Chapter 5. Conclusion

This study evaluated the smoking fine exemption system by confirming the characteristics of participants and success of smoking-cessation clinic registrants. The 6-month quit rate itself was higher in the non-exemption group. However, the high proportions of students, those with short smoking periods, and those from Seoul suggest that the policy is motivating new groups of smokers to quit. In addition, the quit rates were high among women and blue-collar workers, suggesting that the policy fulfilled its purpose of easing the burden of fines on socially vulnerable groups.

However, it is necessary to promote the system nationwide to take the focus off of Seoul, and efforts such as simplifying the system application process are needed to increase the participation rates among the elderly and blue-collar workers.

Our results confirm that the combined policy can motivate smoking cessation attempts and help ease the burden of fines on socially vulnerable groups. Research and policies combining incentives and penalties are lacking both domestically and internationally, and our results can be used as basic data in future research and policy considerations related to tobacco regulation and smoking cessation.

37

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39

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43

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## Appendix

### Appendix.1 Questionnaire

	금연클리닉	등록켜	가드	
등록일	년 월 일	등	록번호	
성명		4	성별	□①남 □②여
생년월일	년 월 일 (만 세)	THE	집	
주소		신외	휴대폰	
이메일		신오	직장	
금연클리닉 등록경로 (다중 선택 가능)	<ul> <li>□① TV 및 라디오 광고를 통해</li> <li>□③ 인터넷을 통해</li> <li>□⑤ 주변의 권유</li> <li>□⑦ 행사/이벤트를 통해</li> <li>□⑨ 기타 :</li> </ul>		□2 플 □4 보 □6 금 □8 의 	랜카드, 포스터, 홍보책자 등을 통해 건소 안내문을 통해 연상담전화를 통해 료진의 권고
처음	흡연연령 하루 평균	흡연량		총 흡연 기간
만 세 (홈	은 년도)	개비		년개월
사용 중인 담배제품 (모두 선택)	<ul> <li>□① 궐련(일반담배)</li> <li>□③ 액상형 전자담배 (니코틴 미함유)</li> <li>□⑤ CSV형 전자담배(쥴, 릴 베이퍼 =</li> <li>□⑦ 파이프 담배</li> <li>□⑨ 각련(말아 피우는 담배)</li> <li>□⑪ 씹는 담배</li> <li>□⑬ 무응답</li> </ul>	) 등)	□2 액 □4 궐 □6 머 □8 엽 □10 물 □12 냄	상형 전자담배 (니코틴 함유) 련형 전자담배 (아이코스, 릴, 글로 등) 금는 담배(스누스) 궐련(시가) · 담배 새 맡는 담배
금연지지자 (다중 선택 가능)	금연하는데 도움을 주는 사람은 누구입 □① 부모/조부모 □② 형제자매 □⑤ 친구/선후배 □⑥ 직장동료 □⑨ 기타 :	님니까? 	□3 배 □7 교 □10 없	우자/애인 □④ 자녀 사 □⑧ 의료인 음
질병정보	□① 구강인두암         ③ 식도암         □⑤ 급성 골수성 백혈병         □⑦ 간암         □⑨ 신장암         □⑪ 자궁경부암         □⑪ 지궁경부암         □⑲ 결직장암         □⑲ 친芬명, 백내장, 노인성 황반변성증         □⑲ 치주염         □⑲ 관상동맥심질환         □⑳ 동맥경화성폐질환 말초혈관질환         □⑳ 당뇨         □⑳ 남성 성기능-발기부전         □⑳ 고혈압         □⑳ 기타		□2       후         □4       기         □6       위         □6       위         □9       요         □9       명         □9       교         □9       교	두암 관, 기관지 및 폐암 암 장암 관암 졸중 성흡연으로 인한 선천적 결함:구강안면 파열 소년기 대동맥류, 조기 복대동맥죽상경화증 렴 성폐쇄성폐질환, 결핵, 천식, 호흡기영향, 비염 성 생식기계영향(생식능력저하 포함) 궁외임신 -마티스관절염 지혈증
현재 복용 중인 약물		복용	용이유	

니금	코틴패치 기증 여부	□① 최근 2주 □③ 뇌졸중 □⑤ 피부 알 □⑦	내 불안정 협심증 혹은 '레르기 기타	은 심근경색 [] [] : []	]② 중중 부정맥 ]④ 장기적인 피부 ]⑥ 임신 또는 수 ]⑧ 없음	4염(건선 등) 유 중		
신	장 (cm)		체중 (kg)		BMI			
복부	둘레 (inch)		혈압 (mmHg)	1	호기일산화탄소 농도 (ppm)			
음주		D 최근 1년 간 D 최근 1년 간	술을 전혀 마시지 술을 마신 적이	니 않았음 있음				
경험	1회 음주량	₹	한 ※ 종류에 상관	없이 술잔을 기준으	으로 음주량 확인. 단,	캔맥주 1개(355cc)=1.6잔		
	음주 횟수	일주일에 평	균 회					
운동 여부		※ - D 있음 ( D 없음 - 	주1회, 10분 이상, 심장이 약간 빠르기 일, 이동, 스포츠 예: 빠르게 걷기,	중강도 신체활동 에 뛸 정도) 여가 활동을 ! 웨이트 트레이닝	통 실천 여부 (평소 모두 포함하여 응 성, 필라테스, 물건	보다 숨이 약간 차거나, 답 나르기, 청소, 육아 등		
	운동 종류		<b>운동 횟수</b> 일주일에 평균 회					
	운동량	한 번 운동형	활 때 평균	시간	분			
※ 다 그 필	음의 3가지는 것을 바탕으로 요한 경우 응답	금연정책의 목표 더 나은 금연지 '을 거부하실 수	E와 우선순위 결정, 원서비스를 제공하 있으며, 미응답 시	정책과 사업의 기 위한 목적에/  에도 금연지원/	효과성 평가 등 [ 너 수집하는 추가 { 너비스를 이용하실	다양한 근거를 산출하고, 문항입니다. 수 있습니다.		
7	건강보험 종류	□① 국민건경 □④ 미가입	강보험 [	]② 의료급여 ]⑤ 무응답/응답	□③ 달거부	모름		
i	교육수준	□① 무학 □④ 고등학3 □⑦ 모름	교 졸업 이하 [ [	]② 초등학교 죌 ]⑤ 전문대/대학교 ]⑧ 무응답/응답	탄업 이하 □③ ! 졸업 이하 □⑥ 답거부	중학교 졸업 이하 대학원 수료 이상		
(보 0 ® 자/	고 2 문       [1] 관리자 (의회의원, 공공기관, 기업 등 고위직, 임원 및 관리자 등)         고 2 건문가 및 관련종사자 (연구원, 프로그래머, 건축가, 기술자, 의사, 교사, 종교인 등)         고 3 사무 종사자 (사무원, 행정원, 비서, 상담원 등)         그 4 비스 종사자 (경찰, 소방관, 간병인, 승무원, 미용사, 조리사 등)         그 5 판매 종사자 (경찰, 소방관, 간병인, 승무원, 미용사, 조리사 등)         그 6 농림어업 숙련 종사자 (강종 영업 및 판매원)         여려울 시         ④ 기타란에         가능한         가능한         다세히 기입)         그 1 눈순 노무 종사자 (건설, 하역, 운송 등 단순 노무 종사자)         그 1 눈순 노무 종사자 (건설, 하역, 운송 등 단순 노무 종사자)         그 1 눈         그 1 탄:         그 1 탄:         그 1 탄 도류 지청, 한국표준직업분류, 2017(제7차 개정))							
금	연결심일	년	_ 월 일 👘	금연시작일	년_	월 일		

Variable	Values	Indicator		
Fino	저스버호	Non-exemption group		
1 me	油干型坚	Exemption group		
Veer	도로이	2020		
rear	572	2021		
Sociodemographic Ch	naracteristics			
Sev	남	Male		
JEX	여	Female		
		<30		
Age (years)	등록 당시 나이	30-59		
		≥60		
	국민건강보험	NHI		
Hoalth incurance	의료급여			
type	모름	Other		
type	미가입			
	무응답/응답거부	No response		
	중학교 졸업 이하			
	고등학교 졸업 이하	< High school		
	초등학교 졸업 이하	⇒nigii school		
	무학			
Education	전문대/대학교 졸업			
Education	이하			
	대학원 수료 이상	∠ conege		
	대학교 재학 중			
	모름	no rosponso		
	무응답/응답거부	no response		
	관리자			
	전문가	White-collar		
	사무 종사자			
	서비스 종사자	Service and sales		
Occupation	판매 종사자	Service and sales		
Occupation	농어업 숙련 종사자			
	기능 종사자			
	장치, 기계, 조립	Blue collar		
	종사자			
	단순 노무 종사자			

#### Appendix.2 Data and Variables

	대학생	C+ 1 +
	청소년(만 18 세이하)	Student
	군인	
	기타	
	무직	Other
	모름	
	무응답/응답거부	
	서울	Seoul
	경기	Gyeonggi
	부산	
	대구	
	인천	
	광주	
	대전	
	울산	
Region	세종	
	강원	Other
	충북	
	충남	
	전북	
	전남	
	경북	
	경남	
	제주	
Health status charact	teristics	
Discience		Normal
(mmHg)	혈압(이완, 수축)	Hypertension
(11111115)		No response
Abdominal		Normal
circumference (inches)	복부둘레	High
		Non-obese
BMI (kg/m2)	BMI	Obese
		No response

Health behaviors char	racteristics	
Alcohol	ର୍ଜା	Yes
consumption	아니요	No
Exercise	ର୍ବା	Yes
	아니요	No
Smoking characteristi	ics	
Smoking amount per day (number of cigarettes)	개피	<10
		11-20
		≥21
First-time smoking age (years)	세	≤15
		16-18
		≥19
Smoking period (years)	년 ·	≤10
		11-20
		21-30
		≥31
Smoking-cessation c	linic participation charac	cteristics
Number of consultations	्र ब्रे	$\leq 4$
		5-8
		9-12
		13-16
		≥17
Week4 check	성공	Success
	실패	Failure
	미시행	
Week4 check type	자가	Self-report
	CO 측정	CO measurement
	코티닌측정	Cotinine measurement
	CO 측정+코티닌측정	CO + cotinine
	미시행	Non-execution
Week6 check	성공	Success
	실패	Failure
	미시행	

Week6 check type	자가	Self-report
	CO 측정	CO measurement
	코티닌측정	Cotinine measurement
	CO 측정+코티닌측정	CO + cotinine
	미시행	Non-execution
Week12 check	성공	Success
	실패	Failure
	미시행	
Week12 check type	자가	Self-report
	CO 측정	CO measurement
	코티닌측정	Cotinine measurement
	CO 측정+코티닌측정	CO + cotinine
	미시행	Non-execution
MONTH6 check	성공	Success
	실패	Failure
	미시행	
MONTH6 check type	자가	Self-report
	CO 측정	CO measurement
	코티닌측정	Cotinine measurement
	CO 측정+코티닌측정	CO + cotinine
	미시행	Non-execution

#### 국문초록

연구배경: 담배 규제와 금연지원을 위해 다양한 패널티과 인센티브 정책이 추진되고 있으나 두 정책을 결합한 사례와 연구는 많지 않다. 한국은 이 두 전략을 결합하여 흡연자의 금연 동기를 부여하고, 서민들의 과태료 부담을 덜어주기 위해 2020년 6 월부터 금연 프로그램에 참여할 경우 금연구역 내 흡연자의 과태료를 감경하거나 면제하는 정책을 시행하고 있다. 본 연구는 보건소 금연클리닉 이용자를 대상으로 한국의 흡연 과태료 감면 정책을 평가하고, 패널티(과태료 부과)와 인센티브를 결합한 새로운 담배규제 방안을 제안한다.

연구방법: 제도 시행일인 2020 년 6 월 4 일부터 2021 년 12 월 31 일까지 전국 258 개 보건소 금연클리닉 등록자 159,599 명을 흡연과태료 면제 그룹과 비면제 그룹으로 구분하여 집단간 등록 특성과 성공률을 비교하고, 회귀분석을 이용하여 6 개월간 금연성공 요인을 분석하였다.

연구결과: 참여 특성은 비감면군은 30 대의 참여율이 가장 낮은 반면 감면군은 60 대 이상이 가장 낮았다. 직업별 특성으로는 비감면군은 블루칼라 직업군의 참여율이 가장 높고 학생의 참여율이 낮은 반면 감면군은 블루칼라 직업군의 참여율이 가장 낮고, 학생의 참여율이 가장 높았다. 지역별 특성으로는 비감면군은 수도권 외 지역의 참여율이 높았으며, 감면군은 서울이 가장 높았다. 흡연 특성은 비감면군은 하루 11-20 개피와 총 흡연량이 증가할수록 참여율이 높았고, 감면군은 하루 10 개피 미만과 총흡연 기간이 짧은 경우 높았다. 금연성공 특성은 비감면군의 금연성공률이 더 높았는데, 비감면군은 남성과 화이트 칼라의 성공률이 높은 반면 감면군은 여성과 블루칼라의 성공률이 높았다. 지역별로는 두 지역 모두 수도권 외 지역의 금연성공률이 높았다. 비감면군은 하루 흡연량이 적고 첫 흡연연령이 높을수록 금연성공률이 높았으나 감면군은 다른 양상을 보였다. 결론: 본 연구결과 6 개월 금연성공률은 비감면군이 더 높았다. 하지만 기존 등록자와는 다르게 학생, 흡연기간이 짧은 그룹, 서울 지역의 참여율이 높은 것을 통해 금연구역 내 흡연자의 금연 동기부여라는 정책의 의도 달성에 긍정적인 평가를 할 수 있다. 또한 여성과 블루칼라의 금연성공률이 높은 것을 통해 서민 과태료 부담 완화라는 목적에도 부합한 것을 알 수 있다. 다만, 감면제도 참여의 수도권 편중을 완화하기 위해 전국적으로 제도 홍보가 필요할 것으로 보이며, 노인, 블루칼라 직군 등의 참여율을 높이기 위해 제도 신청 절차 간소화 등의 노력이 더욱 필요할 것이다.

#### 감사의 글

대학원 입학 후 멀게만 느껴지던 졸업이었는데 이렇게 논문을 마무리하는 날이 왔네요. 힘든 과정이었지만 무사히 마칠 수 있어 감사함을 느낍니다. 회사 생활과 함께 학교생활을 하는 것이 쉽지 않을 때가 많았고, 한창 논문을 쓰던 시기에 결혼 준비도 하게 되어 과연 뭐 하나 잘 끝낼 수 있을까 걱정했었는데 무사히 마무리를 짓게 되었네요.

때로는 포기하고 싶은 순간도 있었는데 그럼에도 불구하고 마칠 수 있었던 것은 다 조성일 교수님 덕분입니다. 항상 따뜻하게 격려해주시고, 논문 지도뿐만 아니라 학위 취득의 과정까지 정말 세세한 부분 하나하나 챙겨주신 덕분에 이렇게 졸업을 할 수 있게 되었습니다. 돌이켜보면 데이터 클리닝부터 분석, 논문을 쓸 때 항목 별 작성사항 등을 다 교수님께 배웠으니 이 논문의 모든 과정에는 교수님의 가르침이 담겨 있네요. 정말 진심으로 감사합니다.

멀리 떨어져 있고, 가족에게만은 애살 없는 무뚝뚝한 딸임에도 불구하고 항상 응원하고 지지해주는 사랑하는 부모님, 나의 언니, 동생에게도 무한한 사랑과 고마움을 전합니다. 아직 부족한 점이 많지만 자랑스러운 딸, 동생, 누나가 될 수 있도록 바르게 살아가겠습니다.

제 인생의 소중한 발자취이자 본 논문의 주제를 발굴할 수 있는 기회를 준 회사와 원장님, 센터장님, 팀장님, 팀원분들, 선배님들에게도 감사의 말을 전합니다. 우연이 모여 인생이 된다고 생각하는데, 여러 회사 중 이 곳에 자리하게 되고, 흡연 과태료 감면제도와 관련된 업무를 맡게 됨으로써 본 논문까지 나올 수 있었던 것이 저에게는 큰 행운이었던 것 같습니다. 덧붙여 나의 입사 및 생치 동기들 사랑해!

뿐만 아니라 긴 학위 기간 동안 한결같이 함께해주고 있는 너무나도 소중한 슈주, 대학 및 친구들, 리믹스, 알맹이, 아무말 등등! 모두모두 너무 감사합니다. 덕분에 공부와 일에만 집중할 수 있었어요. 우리 지사보 멤버들과 논자시 스터디 친구들도 정말 고마워요. 덕분에 졸업합니다!!!! 마지막으로 대학원 입학 즈음 연애를 시작해 대학원 졸업 즈음 연애를 끝내고 결혼을 하게 된, 사랑하는 나의 반려자 김지현씨~ 공부하는 동안 끊기지 않게 젤리를 챙겨주고, 지지해주고, 사랑해줘서 많이 고마워요. 이제부터 재미있게 잘 살아보자!

이외에도 혹시나 제가 언급하지 못한 분이 있더라도 저와 함께 시간을 보내주신 모든 분들께 진심으로 감사의 말씀을 전합니다.

#### 2023년 봄을 앞둔 어느 날 김지연 올림