

Reducing Smoking with Financial Incentives



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This project aimed to contribute to tobacco control in the current world's tobacco epicenter – Asia-Pacific. Initially planned to conduct activities in East Timor, the project was later readapted to China due to logistic constraints. This change proved very productive given that DKU is based in China, and China is the world's largest producer and consumer of tobacco. Moreover, with a change in focus to China, the initial interest on financial incentives interventions was maintained but new, additional topics were also examined, inspired by the specific Chinese context. Tobacco control in China is very limited but efforts to reduce smoking are gaining momentum. However, there is much to be done and most interventions thus far have focused on education about health risks, with results showing limited effectiveness. The project explored different pathways to reduce smoking in China and globally: (1) testing financial incentives for tobacco abstinence; (2) estimating the environmental footprint of smoking behavior; (3) examining whether financial incentives buffer the withdrawal symptoms of smoking cessation; (4) uncovering how schools have been neglected as venues for tobacco control and (5) mapping the state of research about workplace-based interventions for smoking cessation.

Project Activities

The project started (September-November 2025) with lectures and class discussions about the theoretical foundations of financial incentives for addictive behaviors (including smoking) covering operant conditioning principles and its applications and variations to contingency management, conditional cash transfers and behavioral economics. The team then moved to research methods training, particularly how to conduct experimental studies in the field and systematic reviews/ meta-analysis (December 2025 - January 2026).

From February to May 2026, students were organized in teams of two members to conduct specific sub-projects, plus with two individual projects (details are presented below):

- **Zuhui Wang** (MSc student in Global Health Class 2026) participated in the project's activities for 3 months in preparation for her Master dissertation. Supervised by Prof. Claudia Nisa, she conducted a pilot field study at DKU predominantly with security staff, who smoked at least one cigarette per day and were able to attend daily testing (N=30). Participants completed a baseline questionnaire, followed by a 7-day CO-verified financial incentive intervention (daily exhaled CO testing using a Smokerlyzer® device). Participants with CO ≤ 10 ppm received an immediate 50 RMB reward via WeChat transfer; those attending all 7 days with no CO > 10 ppm received an additional 100 RMB bonus. Participants met the CO qualification threshold (≤ 10 ppm) on a mean of 6.87 days (SD = 0.51), and 28/30 (93.3%) were eligible for the 7-day bonus. Mean CO decreased from 4.90 ppm (SD = 4.44) on day 1 to 3.50 ppm (SD = 1.66) on day 7, with lower and more tightly clustered values by day 7. However, at one-week follow-up, mean CO increased to 5.28 ppm (SD = 3.82; n = 29), suggesting rebound after incentives ended.
- **Ayesha Jehanzeb** (DKU Class 2026) estimated the environmental footprint and economic cost of smoking behavior (Draft Paper attached);
- **Yiwen Chen and Yixuan Jin** (DKU Class 2027) conducted a systematic review examining whether the effectiveness of smoking cessation interventions could be attributed to the extent that interventions address withdrawal symptoms. Particularly, whether the reward properties of financial incentives could buffer withdrawal symptoms more than other types of interventions;
- **John Simoneaux and Ruojin Wang** (DKU Class 2029) uncovered how schools have been overlooked for tobacco control in non-student populations i.e., parents and teachers. The large majority of anti-smoking interventions conducted in schools only targets students, neglecting that (particularly in China) both parents and teachers also smoke inside and around the school;
- **Yufei Zhang and Gele Cheng** (DKU Class 2027) conducted a mapping review of the interventions (pre-post designs and experimental studies) conducted in the workplace to reduce smoking. They also conducted informal interviews with high-stress workers with very high smoking rates (delivery drivers and construction workers).



THE ENVIRONMENTAL IMPACT AND ECONOMIC COST OF SMOKING

Ayesha Jehanzeb



INTRODUCTION

Smoking is widely regarded as a major public health concern. Lesser known, however, are the environmental and economic externalities. Every cigarette consumed produces a complex mixture of pollutants that are released into both indoor and outdoor environments, contributing to air pollution and long-term environmental degradation. At the same time, greenhouse-gas emissions from cigarette combustion contribute to climate change, creating an associated economic cost of mitigation. This paper aims to bridge these perspectives by providing an analysis of the environmental impact and economic cost of smoking.



MATERIALS & METHODS

This study quantifies the environmental and economic impact of cigarette smoking using a multi-pollutant emission framework. Emission factors for key pollutants were compiled from experimental studies of environmental tobacco smoke, standardized to mg per cigarette, and summed to estimate total emissions per cigarette, which were then scaled globally using consumption data. Economic costs were calculated using a damage-based approach by multiplying per-cigarette greenhouse gas emissions (CO_2 , CH_4 , N_2O) by their social cost values reported by the U.S. EPA.

ENVIRONMENTAL RESULTS

Estimated emissions total 19.72 mg of pollutants per cigarette, including PM, VOCs, carbonyls, and PAHs. When scaled globally (~6 trillion cigarettes year), this corresponds to ~118,000 metric tons of pollutants annually, indicating a significant cumulative environmental burden despite small per unit emissions.

ECONOMIC RESULTS

Using greenhouse gas emissions and social cost estimates, the climate-related cost per cigarette is approximately \$0.000196–\$0.000263 (0.020–0.026 cents). While small individually, these costs accumulate at scale and represent only a lower bound, as non-climate damages are not included.

CONCLUSIONS

Although emissions per cigarette are small, their large-scale consumption results in a significant cumulative burden, both in terms of pollution and climate-related costs. Importantly, the economic estimates presented here capture only a fraction of total damages, suggesting that the true social cost of smoking is substantially higher.

These findings highlight the need to consider environmental impacts in discussions of tobacco use and policy.

Do financial incentives reduce withdrawal symptoms compared to other smoking cessation interventions?

Yiwen Chen, Yixuan Jin

Bass Connections | Instructor: Prof. Claudia Nisa

Introduction

1.1 Background

- Smoking cessation is often accompanied by withdrawal symptoms (e.g., irritability, insomnia, anxiety, weight gain), which may increase relapse risk.
- A range of pharmacological and behavioral interventions is available for smoking cessation.
- However, evidence remains unclear on how different interventions influence withdrawal symptoms, especially psychological symptoms.

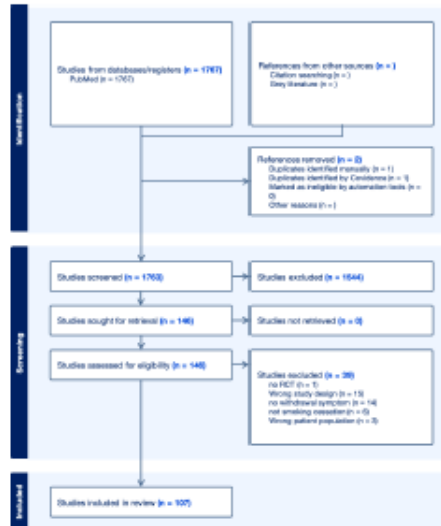
1.2 Gap

- Limited understanding of how interventions affect withdrawal symptoms, especially psychological symptoms.

1.3 Aim

To evaluate how different smoking cessation interventions influence withdrawal symptoms.

PRISMA



Discussion

4.1 Among the studies, the medication “varenicline” has the most articles.

4.2 The medication treatments show great heterogeneity:

- Medication treatments were largely combined into different pairs/groups to test the joint effectiveness of relieving withdrawal symptoms.
- The trial results were very diverse, with some effective and some ineffective, which requires more studies.

4.3 Most medication and non-medication treatment are conducted with a relatively small sample size, and many of the authors suggest a wider scale study for the specific treatment in the future.

4.4 The short-term effects were largely significant, but many showed a lack of sustainability in the long term.

Main Gaps:

- In the medication studies, withdrawal symptoms and adverse events can be difficult to distinguish.
- Different from what was expected, studies on financial incentives are rare.
- Most studies focus on reducing the discomfort of smoking cessation, with few addressing the underlying psychological mechanisms.

Materials & Methods

2.1 PRISMA

- Records identified: 1767
- Studies included: 107

2.2 Data Source

- PubMed database

2.3 Selection

- Screening via Covidence
- Title/abstract → full-text

2.4 Criteria

- Inclusion
 - RCTs
 - Smoking cessation
 - Withdrawal outcomes
- Exclusion
 - Clinical population
 - Reviews
 - Protocols
 - Non-cigarette tobacco products (e.g., e-cigarettes, vaping, waterpipe, smokeless tobacco)

2.5 Analysis

- Data extracted into Excel
- Outcomes: withdrawal symptoms, adverse events, abstinence
- Meta-analysis performed

Results

Overall, we have the following findings:

3.1 Medications are a large portion of the interventions:

- varenicline, nicotine replacement therapy (e.g. nicotine patch), bupropion, cytosine, etc.

3.2 Some studies used non-medication treatment such as:

- exercise, mindfulness training, quitline, mobile health solution, electrical stimulation therapy, scheduled smoking

3.3 Harm reduction is also a frequently studied way:

- reduced-nicotine cigarettes
- e-cigarettes

3.4 As for e-cigarettes:

- Considered a way of smoking cessation.
- Can be effective in terms of smoking cessation in a short term compared to other approaches such as nicotine patch.
- May result in lower risk of relapse and dependency on nicotine.

3.5 Gene-treatment is also a way, although not widely studied.

Future directions

5.1 Gap identified:

Financial incentives are shown to promote cessation broadly, but no existing studies have examined their direct effect on withdrawal symptom relief → underexplored area requires further investigation

5.2 Proposed Step 1:

Map the trajectory of smoking withdrawal symptoms over time → understand how symptom severity evolves throughout the cessation process → identify critical peak distress periods (most painful periods)

5.3 Proposed Step 2:

Design an RCT to evaluate financial incentives as a targeted intervention → strategically allocate incentives at peak distress periods → maximize intervention efficiency, participant adherence & cost-effectiveness

SCHOOL-BASED TOBACCO INTERVENTION FOR PARENTS OF SCHOOL CHILDREN

RUOJIN WANG, JOHN SIMONEAUX

Introduction

Smoking, and by association, second-hand smoke (SHS), remains one of the leading causes of death around the world. Parental smoking in particular is a strong factor for childhood smoking and future nicotine addiction.

Currently, the present literature focuses on combating home-based smoking in two ways. The first is by school-based interventions directed toward school children. This approach aims to prevent the uptake of smoking or to promote smoking cessation among the children instead of targeting the parental behavior directly. The other approaches found in the literature are home-based interventions for parents. Both intervention types recognize that parental smoking cessation is imperative for children's health, but the optimal setting for the intervention is still unclear.

We assert that schools have been overlooked as a setting for smoking cessation interventions. Schools are one of the only institutions where parents have repeated mandatory contact for long periods of time, making long-term interventions possible.

Materials and Methods

We analyzed a total of 47 articles. Among them:

39 were school-based studies, primarily examining the effectiveness of several interventions in reducing smoking among students and teachers.

The remaining 8 were family-based studies, mostly exploring how reducing parental smoking can lower children's exposure to secondhand smoke.

Through comparative analysis, we aimed to identify the intervention strategies that are most likely to succeed in school settings and those that are most effective when targeting parents.

Results

For both contexts of tobacco control, health education programs have demonstrated consistently positive outcomes. In multiple cases, they effectively reduced smoking behaviors among adolescents and parents.

For reducing smoking in school-based settings, peer-led focus group discussions and the establishment of school rules have shown strong intervention effects. In family-based contexts, interventions targeting parental and sibling smoking behaviors—particularly those involving parent-child interaction—have proven significantly more effective than other approaches.

Notably, one study conducted in a school in Hanoi, Vietnam, implemented a school-based intervention in which children were taught about the harms of secondhand smoke and how to communicate with their fathers to discourage smoking at home. As a result, the proportion of fathers smoking at home decreased significantly from 83% before the intervention to 59.8% afterward.

Among the 47 existing studies, discussions on student smoking in school settings and parental smoking in family contexts are relatively comprehensive. However, there is a clear gap in addressing parents' smoking behaviors within school environments. For instance, little attention has been paid to behaviors such as parents smoking near school gates while waiting to pick up their children.

Discussion

Schools are integral centers of community and trust. Parents trust schools to be catalysts for the future of their children. Furthermore, school-based interventions allow for greater scaling and communal interventions. Instead of targeting just one family, interventions can target the school community together.

Unfortunately, in China, schools often are also smoking areas. When waiting to pick up their children, parents smoke, releasing harmful chemicals into the air and dropping cigarette butts on the floor.

We implore researchers to move from the model of educating children with a pamphlet into school messaging directed towards parents, posting air quality monitors outside school gates, and information about other parents who have quit smoking.

Conclusion

By calling attention to the deficit of school-based interventions directed toward parents, we hope to galvanize researchers to consider schools as an avenue for a generation of healthier parents and children.



Tobacco Control in the Workplace: A Mapping Review

Gele Cheng, Yufei Zhang
Bass Connections | Instructor: Prof. Claudia Nisa

Introduction

The workplace is a key environment where smoking behaviors are reinforced and transmitted, making it an important setting for tobacco control and smoking cessation interventions. Existing studies have examined various workplace-based strategies including behavioral counseling, pharmacotherapy, smoking bans, incentive programs, etc. However, most previous reviews focus on specific intervention types or controlled clinical-style evaluations, which may not fully reflect diverse real-world workplace settings such as service work, manual labor, and delivery work.

To address this gap, this mapping review provides a broader overview by including multiple study designs and intervention categories. We aim to identify **publication trends**, **geographic distribution**, **study design patterns**, **intervention types**, and **which workplace-based interventions are most effective** in supporting smoking cessation.

Materials and Methods

Data Source and Study Selection:

Studies were identified from the PubMed database and screened using Covidence through title/abstract review, full-text review, and manual data extraction. Original studies from related systematic reviews, secondary analyses, and protocols were also searched. A total of 109 studies were included, of which 92 were experimental studies used for effectiveness analysis.

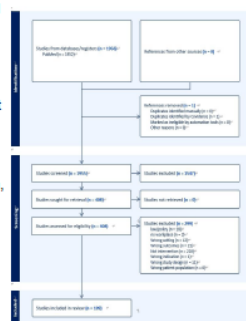
Eligibility Criteria:

Studies were included if they involved workplace-based smoking cessation interventions, focused on employees or workplace settings, reported smoking-related behavioral outcomes (e.g., cessation, reduction, SHS exposure), and targeted general non-clinical populations.

Studies were excluded if they focused on pregnant women, clinical populations, vaping/e-cigarettes, substances other than tobacco, attitudes only, or one-time assessments of smoking bans without pre-post evaluation.

Analysis

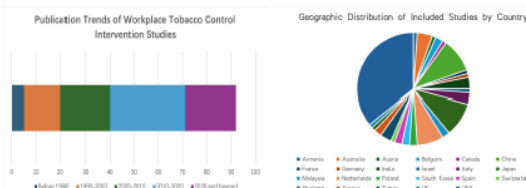
This mapping review examined publication trends, country distribution, study design, intervention types, and effectiveness across nine intervention categories. Intervention outcomes were classified as positive, mixed, or not effective to compare which workplace tobacco control strategies showed the most consistent results.



Preliminary findings

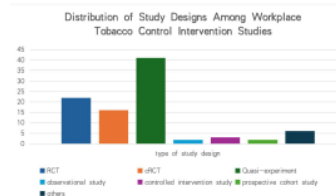
Publication Trends:

Among the 92 experimental studies, publications on workplace tobacco control interventions have **increased over time**, particularly after 2010, reflecting growing research attention to workplace-based smoking cessation strategies.



Geographic Distribution (By Country):

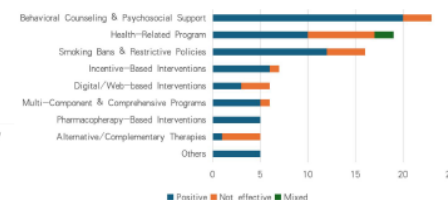
Among the 92 experimental studies, most were conducted in **high-income countries**, with the United States contributing the largest number of studies (n = 33), followed by Japan (n = 9), China (n = 9), and the Netherlands (n = 7). Evidence from low- and middle-income countries remains limited, particularly in regions such as South America, Africa, and Central Asia. This geographic imbalance suggests that the current evidence base may not fully capture the diversity of workplace contexts and smoking behaviors across different socioeconomic and cultural settings.



Type of Study Design:

The total 92 experimental studies used seven types of study designs. **Quasi-experimental studies** dominated the literature (n = 41), followed by **randomized controlled trials** (n = 23), and **cluster-randomized controlled trials** (n = 16). The inclusion of a considerable proportion of randomized controlled trials suggests a relatively strong level of methodological quality, although quasi-experimental designs remain predominant.

Effectiveness of Workplace Tobacco Control Interventions by Intervention Type



Intervention Type and Effectiveness:

Among the 92 experimental studies, workplace tobacco control interventions were grouped into **nine major categories** and were **generally effective**, with 67 of total studies (72.83%) show positive intervention effect, but **effectiveness varied by intervention type**.

Behavioral counseling and psychosocial support and were the most common (n = 23) and the most consistently effective category, with 20 studies reporting positive outcomes. Health-related workplace programs that included smoking cessation components (n = 19) and smoking bans and restrictive policies (n = 16) were also common but showed mixed effectiveness.

Pharmacotherapy-focused interventions, multi-component programs, incentive-based interventions and other intervention types also showed strong effectiveness. In contrast, digital interventions and alternative therapies showed more mixed or negative results based on a very small sample size.

Conclusion and Future Directions

Workplace tobacco control interventions were generally effective, with 72.83% of studies reporting positive outcomes. Behavioral counseling, psychosocial support, multi-component programs, and pharmacotherapy showed the strongest effectiveness, suggesting that **targeted and intensive strategies are most effective** for smoking cessation. Health programs and smoking bans showed mixed results while digital interventions and alternative therapies were less effective, likely due to weak engagement and limited intervention intensity. Most evidence comes from **high-income countries and quasi-experimental studies**, limiting generalizability.

Future research should focus more on low- and middle-income countries, especially South America, Africa, and Central Asia, as well as informal and mobile work settings. Studies should also compare effectiveness across occupations and explore why some workers respond better than others. A broader mapping review using multiple databases will be conducted in Summer 2026.

Summary of informal interviews conducted around (more details attached)



*"I am too old to quit... I am already retired, and I don't think those (cigarettes) could harm me any longer."
"I have learned how to smoke since the age of 16."*



"Even my closest friend doesn't think that I can quit smoking: he said that even if I quit for sometime, I will relapse one day."

"You want everyone to quit smoking? Great! Let's ask the government to ban the cigarette factory!"

"Chain smokers could never resist cigarettes," "They are even willing to eat less to afford the high taxation for cigarettes."

"Money? No...No no no, if you simply give a heavy smoker money for them to quit, you will get a heavier smoker with more cigarettes in his hands."

