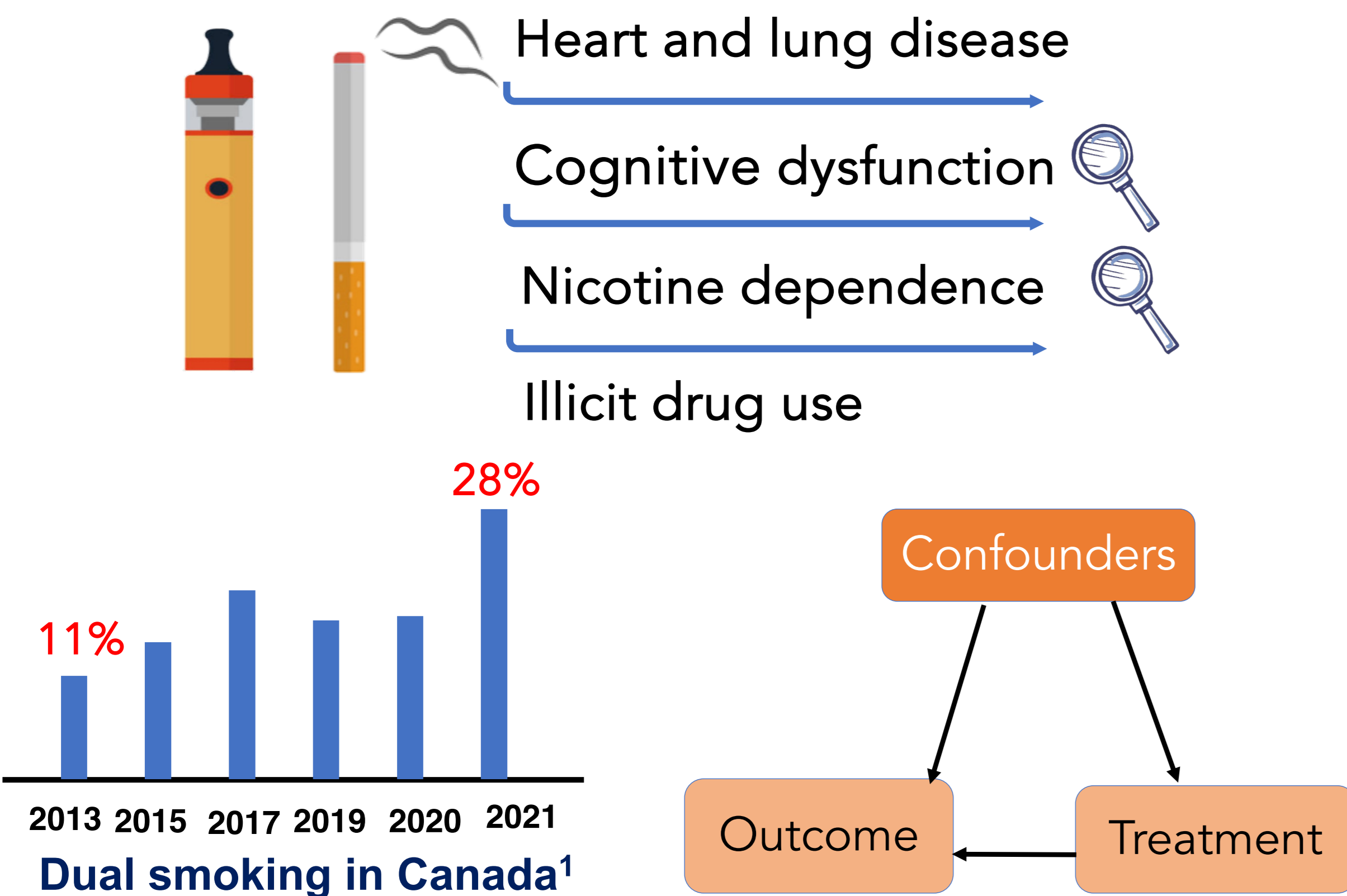


Effects of dual smoking on smoking behaviors and mental health: A machine learning approach

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Background



Existing studies may suffer from self-selection bias and confounding, little/no information on smokers' daily variance in cigarette consumption and mental health

Research questions

1. Difference of nicotine dependence between exclusive cigarette smokers and dual cigarette and e-cigarette smokers?
2. Impact of dual smoking on smoking quit intentions and mental health?
3. Explorative study on between-day smoking variance among smokers.

Methods

Design Linear regression with machine learning method, Post-Double Selection Lasso to address self-selection bias

Data Canadian Tobacco Alcohol & Drugs Survey (CTADS), 2013-2017

Population Current daily smokers; age subgroups: ≤ 24 and ≥ 25 years

Outcome

- Nicotine dependence: 1. Average number of cigarettes smoked in a day and all 7 days in a week; 2. Time to smoke the first cigarette in a day.
- Quit intentions in the next 6 months
- Self-rated mental health status

Results

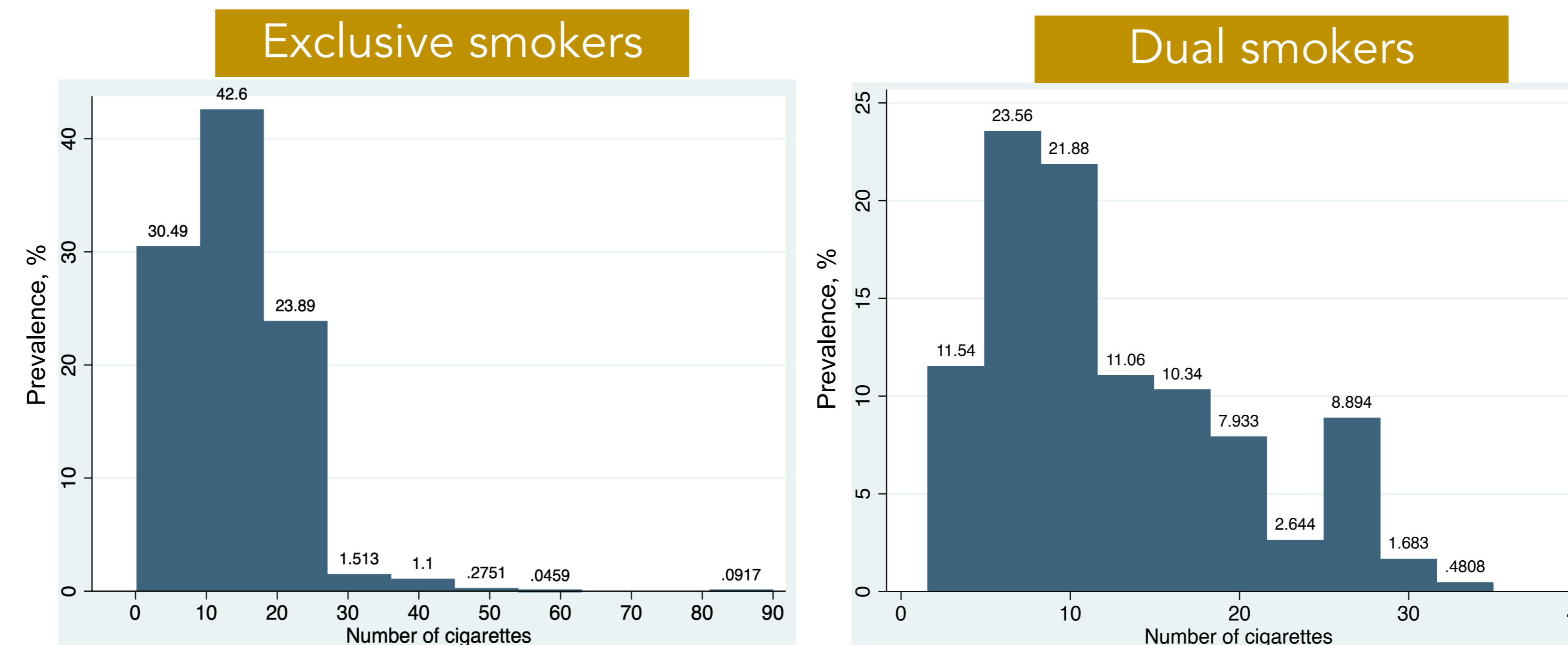


Figure 1. Prevalence of cigarette smoking

Table 1. Effect of dual smoking on nicotine dependence: Number of cigarettes smoked

Panel A: Full study sample								
	Mean no. /day	Mon	Tue	Wed	Thur	Fri	Sat	Sun
β estimate	-0.400 (0.368)	-0.432 (0.383)	-0.451 (0.386)	-0.452 (0.375)	-0.524 (0.379)	-0.349 (0.397)	-0.116 (0.425)	-0.337 (0.417)
No. of controls	19	18	17	17	18	18	16	15
N	2,597	2,597	2,597	2,597	2,597	2,597	2,597	2,597
Panel B: Subgroup of adolescents and young adults (24 years or less)								
β estimate	-0.994* (0.501)	-0.997 (0.529)	-1.126* (0.524)	-1.250* (0.518)	-1.253* (0.519)	-0.966 (0.555)	-0.644 (0.607)	-0.865 (0.594)
No. of controls	6	6	6	7	9	6	8	7
N	989	989	989	989	989	989	989	989
Panel B: Subgroup of adults (25 years and above)								
β estimate	-0.133 (0.537)	-0.117 (0.559)	0.015 (0.570)	0.016 (0.559)	-0.008 (0.547)	0.047 (0.570)	-0.080 (0.576)	-0.279 (0.575)
No. of controls	16	13	16	14	14	13	14	13
N	1,608	1,608	1,608	1,608	1,608	1,608	1,608	1,608

Table 2. Effect of dual smoking on nicotine dependence: Time to smoke first cigarette of the day

	All sample	Adolescents and young adults (24 years or less)	Adults (25 years and above)
β estimate	-0.115* (0.050)	-0.060 (0.074)	-0.147* (0.068)
No. of controls	10	7	11
N	2,587	980	1,607

Table 3. Effect of dual smoking on intention to quit smoking in next 6 months

	All sample	Adolescents and young adults (24 years or less)	Young adults (25 years and above)
β estimate	0.102** (0.025)	0.134** (0.036)	0.092* (0.036)
No. of controls	4	7	6
N	2,597	989	1,608

Table 4. Effect of dual smoking on mental health

	All sample	Adolescents and young adults (24 years or less)	Young adults (25 years and above)
β estimate	-0.113* (0.042)	-0.153** (0.057)	-0.091 (0.061)
No. of controls	19	15	14
N	2,597	989	1,608

Key findings

- Compared to young exclusive smokers, young dual smokers smoked fewer cigarettes, especially on weekdays.
- Dual smokers likely to smoke their first cigarette sooner than exclusive smokers; no effect on young smokers.
- Dual smokers show a greater intent to quit smoking.
- Dual smoking is associated with poorer mental health, with greater impacts on young smokers.
- Smokers may not prefer variations in between-day smoking.

Health implications

- Dual smoking likely reduces cigarette dependence, especially among young smokers, but exacerbates nicotine dependence.
- Dual smoking may motivate smokers to quit smoking.
- Dual smoking may contribute to mental health crisis, especially among young smokers.
- Smokers averse to variations in their daily smoking despite facing smoking restrictions and prohibitions over the week.

Note:
* $p < 0.05$; ** $p < 0.01$
1. Data taken from the Canadian Tobacco Alcohol & Drugs Survey (CTADS), 2013-2017 and the Canadian Tobacco and Nicotine Survey (CTNS), 2019-2021