

# BMJ Open Cannabis use among a nationally representative cross-sectional sample of smokers and non-smokers in the Netherlands: results from the 2015 ITC Netherlands Gold Magic Survey

Brian Vincent Fix,<sup>1</sup> Danielle Smith,<sup>1</sup> Richard O'Connor,<sup>1</sup> Bryan W Heckman,<sup>1,2</sup> Marc C Willemsen,<sup>3,4</sup> Michael Cummings,<sup>5,2</sup> Geoffrey Fong<sup>5,6</sup>

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For numbered affiliations see end of article.

## Correspondence to

Dr Brian Vincent Fix;  
[brian.fix@roswellpark.org](mailto:brian.fix@roswellpark.org)

## ABSTRACT

**Objectives** Existing evidence shows that co-occurring use of tobacco and cannabis is widespread. Patterns of co-use of tobacco and cannabis may change as more jurisdictions legalise medicinal and/or recreational cannabis sales. This analysis examined predictors of current cannabis use and characterised methods of consumption among smokers and non-smokers in a context where cannabis use is legal.

**Setting** The 2015 International Tobacco Control Netherlands—Gold Magic Survey conducted between July and August 2015.

**Participants** Participants (n=1599; 1003 current smokers, 283 former smokers and 390 non-smokers) were asked to report their current (past 30-day) use of cigarettes and cannabis. Cigarette smokers reported whether they primarily used factory made or roll-your-own cigarettes. Those who reported any cannabis use in the last 30 days were asked about forms of cannabis used. X<sup>2</sup> and logistic regression analyses were used to assess relationships among combustible tobacco and cannabis use.

**Results** Past 30-day cannabis use was somewhat higher among current tobacco (or cigarette) smokers (n=57/987=5.8%) than among former or never smokers (n=10/288=3.5% and n=6/316=1.9%, respectively). Joints were the most commonly used form of cannabis use for both current cigarette smokers (96.9%) and non-smokers (76.5%). Among those who smoked cannabis joints, 95% current smokers and 67% of non-smokers reported that they 'always' roll cannabis with tobacco.

**Conclusions** In this Netherlands-based sample, most cannabis was reported to be consumed via smoking joints, most often mixed with tobacco. This behaviour may present unique health concerns for non-cigarette smoking cannabis users, since tobacco use could lead to nicotine dependence. Moreover, many non-cigarette smoking cannabis users appear to be misclassified as to their actual tobacco/nicotine exposure.

## INTRODUCTION

Cannabis is a commonly used drug across the globe. In 2017, the WHO estimated that there

## Strengths and limitations of this study

- The study collected data from 1599 participants, including current cigarette smokers, former cigarette smokers and never cigarette smokers.
- The inclusion of non-cigarette smokers allowed for a measure of potential misclassification in terms of actual exposure to nicotine and tobacco smoke.
- The data collected did not include an extensive characterisation of cannabis use patterns.

were 147 million consumers of cannabis, equivalent to 2.5% of the world's population.<sup>1</sup> The legal environment for use of cannabis, for either medicinal or recreational purposes, is rapidly evolving and in a number of jurisdictions, becoming less restrictive.

The long-term health impacts of chronic cannabis use are unclear.<sup>2</sup> A recent report by the National Academies of Science, Engineering and Medicine suggests that there is substantial evidence that chronic cannabis smoking is linked to poorer respiratory health, lower birth weight of offspring born to mothers who smoke cannabis during pregnancy; in addition, there is a greater likelihood of the development of psychotic disorders among heavy users.<sup>3</sup> Risk factors for developing problematic cannabis use include earlier age of cannabis use, being male and smoking tobacco cigarettes.<sup>3</sup>

With the rise in the number of jurisdictions, both subnational and national, in legalisation of cannabis, it is important to measure and understand the interactions between cannabis and tobacco use (especially cigarettes). Existing evidence shows that co-occurring use of tobacco and cannabis ('co-use') is widespread, with as many as 90% of cannabis users reporting a history of

tobacco smoking.<sup>4</sup> Co-use of these substances can take several forms, including concurrent use of tobacco and cannabis (ie, 'dual users' of both substances). Co-administration through use of 'blunts' (cigar wrappers partially or fully emptied and replaced with cannabis), 'spliffs'/'mulled cigarettes' (joints filled with tobacco and cannabis), or waterpipes is commonplace, with use of mulled cigarettes being significantly more common in areas outside of the USA.<sup>5</sup> More recent reports suggest low-level prevalence of co-use occurs by the delivery of cannabis plant material and/or concentrates via personal vaporisers and electronic nicotine delivery systems such as e-cigarettes.<sup>6,7</sup> Chronic co-use is associated with greater dependence on both substances,<sup>5,8</sup> greater difficulty in quitting cannabis,<sup>5,8</sup> and potentially increased health risks.<sup>3,7</sup> As more jurisdictions permit medicinal and/or recreational cannabis sales, examining tobacco-cannabis associations and co-use becomes particularly relevant due to the prospect of increasing cannabis use<sup>9</sup> and potentially, tobacco product use and dependence.

In 1976, the Netherlands was among the first countries to relax restrictions on cannabis use through revisions to its Opium Act, in conjunction with government decisions to discontinue prosecuting cannabis-related offences under specific circumstances.<sup>10</sup> During this time, the Netherlands introduced its coffee-shop model, which permitted such establishments to sell cannabis in small quantities for personal consumption. Coffee shops are subject to numerous restrictions, including bans on the sale of alcohol, hard drugs (such as heroin, cocaine, amphetamine, ecstasy and GHB), advertising, youth sales and restrictions on the quantity of cannabis sold per day as well as intolerance of public nuisances.<sup>11</sup> Use of tobacco is not permitted in coffee shops, although most have a designated section where smoking is allowed, in accordance with the current Dutch tobacco law, which permits smoking in separately ventilated smoking sections in hospitality industry venues.<sup>11</sup>

This study examined co-use of cannabis and tobacco in a country where cannabis use is legal. The objectives were to examine predictors of current cannabis use and characterise methods of consumption among smokers and non-smokers.

## METHODS

### Sample

Respondents to the baseline wave (W1) of the International Tobacco Control (ITC) Netherlands Gold Magic Survey were recruited by a commercial online survey research firm (TNS NIPO) in April 2014. The sampling frame was constructed to provide a nationally representative sample of smokers and non-smokers age 16 years and older in the Netherlands. The W1 survey was initiated around the expected launch of a very low nicotine content cigarette (VLNC) in the Netherlands (Gold Magic). The survey was re-fielded after approximately 1 year (W2), at which point questions on cannabis use

were added to assess potential co-use of cannabis with VLNC. However, Gold Magic was never introduced into the marketplace, so we were not able to examine use of cannabis and VLNC. However, the inclusion of the cannabis questions in the W2 survey allowed us to examine cannabis use and its association with regular cigarette use, which in the Netherlands often includes use of roll-your-own (RYO) tobacco. Participants were compensated via the survey firm's internal points redemption system. Additional information about the survey questions, methods and sample can be found in other papers published from the Gold Magic Survey and the survey's technical report.<sup>12,13</sup>

### Outcome measures

Participants were asked to report their current (past 30-day) use of cigarettes and cannabis. Cigarette smokers reported whether they primarily used factory made (FM) or RYO cigarettes. Those who reported any cannabis use in the last 30 days were asked in what form cannabis was used (smoked in a joint, smoked with waterpipe, vaped with e-cigarette). Those who smoked cannabis were asked how frequently the joint was rolled with tobacco (mulling).

### Data analysis

Weighted data were analysed among 1599 participants in the ITC Netherlands—Gold Magic W2 survey (1003 current smokers, 283 former smokers and 390 non-smokers), conducted in July–August 2015.  $\chi^2$  and logistic regression were used to assess relationships among combustible tobacco and cannabis use. Model covariates are listed in [table 1](#).

### Patient and public involvement

No patients were involved in the development, design and recruitment of this study.

## RESULTS

*Past 30-day cannabis use and cigarette smoking status.* Cigarette use was split between primary FM (51.2%) and primary RYO (44.8%). Past 30-day use of cannabis use was substantially higher among current cigarette smokers ( $n=57/987=5.8\%$ ) than among former or never smokers ( $n=10/288=3.5\%$  and  $n=6/316=1.9\%$ , respectively) ( $\chi^2(2)=9.22$ ,  $p=0.010$ ). There was evidence for marginally higher cannabis use among FM compared with RYO smokers (7.3% vs 4.3%,  $p=0.087$ ). [Table 1](#) illustrates the factors independently associated with current cannabis use. Current cigarette smoking was the strongest predictor of cannabis use (OR=4.13). Older respondents (aged 25+) were less likely to use cannabis (OR=0.36). We saw no differences in use by sex, income or education (all  $p<0.08$ ).

### Cannabis consumption methods and cigarette smoking status

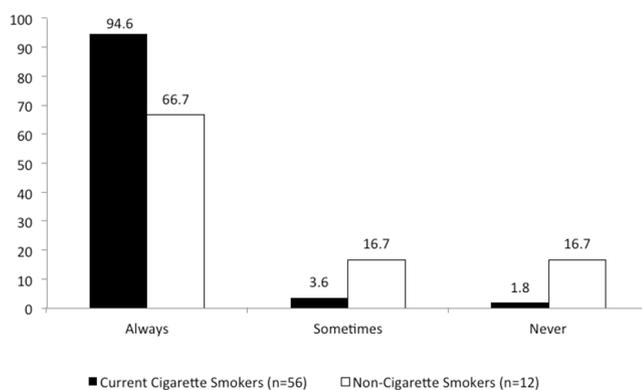
Among cannabis users, joints were by far the most prevalent use method for both current tobacco

**Table 1** Predictors of current cannabis use (n=1591 respondents who answered the cannabis use questions)

Predictor variable	% Current (past 30-day) cannabis users (n=73)	OR	95% CI		P values
			Lower bound	Upper bound	
<b>Age</b>					
16–24 Years old (n=561)	6.2	Ref.			0.024
25+ Years old (n=1030)	3.7	<b>0.36</b>	0.19	0.66	
<b>Sex</b>					
Male (n=826)	4.5	Ref.			0.812
Female (n=766)	4.8	1.11	0.64	1.90	
<b>Income</b>					
Low (n=376)	6.1	Ref.			0.395
Moderate (n=366)	4.9	0.78	0.40	1.50	
High (n=423)	4.0	0.67	0.34	1.32	
<b>Education</b>					
Low (n=291)	3.1	Ref.			0.089
Moderate (n=674)	3.9	1.95	0.77	4.93	
High (n=608)	5.9	<b>2.52</b>	1.01	6.32	
<b>Cigarette smoking status</b>					
Current non-smoker (n=604)	2.6	Ref.			0.004
Current smoker (n=987)	5.8	<b>4.13</b>	1.97	8.69	

The bold values are significant at the 0.05 level.

(or cigarette) smokers (96.9%) and non-smokers (comprised of former and never smokers) (76.5%). Among cannabis users, waterpipe was the use method for 8.8% of current smokers and 12.5% of non-smokers. Using a vaping product was the use method for 5.3% of smokers and 0% of non-smokers. Among those who used joints, nearly all current smokers (94.6%) and 2/3 of non-smokers (66.7%) reported ‘always’ rolling cannabis with tobacco when they used cannabis (see figure 1). There was no difference between mostly FM made cigarette users and mostly RYO users in whether they ‘always’ roll tobacco with cannabis (93.8% vs 95.2%, respectively; p=0.903).



**Figure 1** Per cent reporting rolling tobacco with cannabis among past 30-day cannabis users (n=68);  $\chi^2=8.70$ ; p=0.013.

## DISCUSSION

This study collected data from 1599 participants, including current cigarette smokers, former cigarette smokers and never cigarette smokers, which allowed for a measure of potential misclassification in terms of accrual exposure to nicotine and tobacco smoke. In this Netherlands-based sample, most cannabis was reported to be consumed via smoking joints, most often mixed with tobacco. The practice of mixing cannabis with tobacco is consistent with data from other European countries.<sup>14–16</sup> This behaviour may present unique health concerns for non-cigarette smoking cannabis users, since they are being exposed to tobacco, and that exposure could lead to nicotine dependence. Moreover, many non-cigarette smoking cannabis users appear to be misclassified as to their actual tobacco/nicotine exposure.

Although the sample size in this study was small, a high proportion of self-reported non-cigarette smokers reported always (66.7%) or sometimes (16.7%) rolling cannabis with combustible tobacco for consumption. This means that many non-cigarette smoking cannabis users are likely misclassified as to their actual tobacco/nicotine exposure in surveys. This has importance in terms of future research when considering the precision with which we measure tobacco use and cannabis use separately and together. Future studies should take into account the potential that cannabis users are being exposed to tobacco through joints but might not identify as tobacco users in a survey.

With respect to public health considerations, mixing tobacco with cannabis increases tobacco smoking among current cigarette smokers and might work to promote tobacco related toxicant exposure and nicotine dependence among non-cigarette smokers. Qualitative work<sup>15</sup> has suggested as much as 50% of a mulled cigarette consists of tobacco, which represents a significant opportunity for nicotine exposure among those who otherwise may not consider using tobacco or other nicotine-containing products to a substance with known addictive properties. Considering the relative differences in perceived harms<sup>17–19</sup> for smoking cannabis in contrast to smoking cigarettes, further studies should work to disentangle how such perceptions may influence co-use and design studies that would allow for a more precise measurement of exposure and dependence among cigarette smokers and non-cigarette smokers who engage in this type of consumption in various policy contexts.

A limitation of this study is the low-sample size of overall past 30-day cannabis users and non-cigarette smoking cannabis users limits the generalisability of the results, as well as the ability to conduct more sophisticated data analysis in terms of consumption methods and use patterns.

Further research is needed to examine the impact of mixing tobacco and cannabis on important outcomes such as the development of nicotine dependence and prospective sustained tobacco consumption.

#### Author affiliations

<sup>1</sup>Department of Health Behaviour, Roswell Park Comprehensive Cancer Center, Buffalo, New York, USA

<sup>2</sup>Department of Psychiatry and Behavioral Sciences, Medical University of South Carolina, Charleston, South Carolina, USA

<sup>3</sup>STIVORO, The Hague, The Netherlands

<sup>4</sup>Department of Health Promotion, Maastricht University, Maastricht, The Netherlands

<sup>5</sup>Department of Psychology, University of Waterloo, Waterloo, Ontario, Canada

<sup>6</sup>Ontario Institute for Cancer Research, Toronto, Ontario, Canada

**Contributors** KMC, RJO, MCW, GTF: conception and design of the work and acquisition of data. BVF, DS, RJO, BWH, MCW, KMC, GF: analysis and interpretation of the data. BVF, DMS, RJO, BWH, MCW, KMC, GF: drafting the manuscript and revising it critically for content. All authors have granted final approval for the work published in this manuscript.

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