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Cannabis use and co-use in tobacco smokers and non-smokers: prevalence and associations with mental health in a nationally representative sample of adults in Great Britain, 2020

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Abstract

Background and aims: Cannabis and tobacco use is common in Great Britain. Use of both substances has been associated with mental health problems, but prevalence of their co-use and implications on mental health are unknown. We aimed to 1) estimate prevalence of cannabis use, frequency of use and routes of administration (ROA) among smokers and non-smokers; 2) to investigate mental health problems amongst non-users, tobacco-only, cannabis-only and co-users of both substances.

Design: National online survey fielded in February–March 2020.

Setting: Great Britain

Participants: Adults in Great Britain aged ≥ 18 year (n = 12,809)

Measurements: Tobacco use status (smoker [daily or non-daily] or non-smoker [never or ex-smoker]), cannabis use frequency (never to daily), detailed ROAs of cannabis, mental health disorders (depression, anxiety, and any). Weighted prevalence estimates were computed and correlates assessed using chi-squared tests and logistic regression.

Findings: In Great Britain in 2020, 7.1% of British adults had used cannabis in the past year. Tobacco smokers has greater odds of using cannabis in the past year (21.9%) and using cannabis daily (8.7%) than non-smokers (past-year: 4.7%; aOR=10.07, [95% CI: 8.4 -12.0]; daily: 0.7%; aOR=24.6, [95% CI: 17.96-35.55]). Co-administration with tobacco was common (46.2% of non-smokers, 80.8% of smokers). Co-users reported the highest prevalence of any mental health problem (54.2%) in comparison to cannabis-only (45.8%), tobacco-only (33.2%) and non-users (22.7%; all $p \leq 0.05$).

Conclusion: In a representative sample of Great Britain in 2020, tobacco smokers and non-smokers show significant exposure to combusted smoke and tobacco smoke. Self-identified non-smokers who regularly consume combusted cannabis, and smoked cannabis with tobacco warrant further attention. Co-use was associated with greater daily cannabis use, co-administration and mental health problems. Cannabis users should be considered a vulnerable

population where rates of tobacco smoking are much higher than in the general population.

Introduction

Globally, there are approximately 219 million cannabis users and 1.1 billion tobacco users[1]. Two and a half million individuals in England and Wales used cannabis in the last year according to the Independent Review of Drugs [2][3]. There was a recent 16% increase in cannabis use between 2016/17 and 2018/192 and currently, cannabis is one of the most cited problematic substance amongst those entering substance misuse treatment in the UK[2]. Moreover, across Europe, cannabis is the primary drug cited by first-time clients presenting at addiction services, increasing by 76% in the last decade[4]. In contrast, there are an estimated 7.7 million adult smokers in the UK, with the current rate of smoking being 14.7% in 20185. Smoking remains the leading cause of preventable ill health[5]. Both cannabis use and tobacco use have been associated with mental health disorders[6][7][8][9]. It is estimated that 34% of people with depression, and 29% of people with anxiety in the UK, smoke tobacco cigarettes[5] which is higher than the population average.

Cannabis and tobacco are commonly used together, by the same individuals, and in the same period, globally[10][11][12][13][14][15]. In the UK and Europe, it is also common to co-administer cannabis with tobacco in the same product (a joint/spliff). Data from a sample of illicit drug users collected in 2014 suggests that 77.2% of past-year cannabis users in the UK mix cannabis with tobacco[11]. The harms of cannabis are exacerbated by its relationship with tobacco[16]. Co-users are at greater risk of poorer health-related, psychiatric, psychosocial and cessation outcomes for both drugs [17][18].

Whist nationally representative data exist on cannabis and tobacco use individually, data regarding the vast overlap of these substances, and its relationship to mental health, is rare/non-existent in Great Britain. Our aim was to provide estimates of prevalence of cannabis use in the population, as well as within tobacco users and non-users by providing a detailed assessment of frequency of use, routes of administration and the prevalence of mental health disorders amongst co-users, exclusive cannabis or tobacco-only groups and non-users.

Methods

Design and Procedure

We conducted analyses of data from a cross-sectional online survey carried out in Great Britain between 17th February - 11th March 2020. The survey is commissioned annually by the charity Action on Smoking and Health (ASH) and included questions relevant to cannabis and tobacco co-use for the first time in 2019. Selected findings have been published [19] [20] [21]. The 2020 survey used a panel of over 1,630,000 UK adults maintained by the market research company YouGov Plc which abides by British Polling Council and ESOMAR (World Association of Opinion and Marketing Research Professionals) guidelines. To represent the national profile of adults over 18 years old (including people without internet access), YouGov Plc statistically weight data by respondents' age, sex, social class, region, level of education, and ethnicity. Weights are validated by 3 key sources: 2011 Census; large scale probability surveys; and population estimates from the Office for National Statistics (https://yougov.co.uk/about/panel-methodology/). The YouGov Panel members were

emailed an invitation to participate without information on survey content. Panel members consent to completing surveys in return for a modest financial incentive. Additional ethical approval was not sought due to this pre-existing consent. Recodes and analyses for the present manuscript were run by the authors using data collected by YouGov.

Sample

A sample of 12,809 people completed the survey and responses were weighted to be representative of the adult population.

Measures

Socio-demographics: Age (18-24; 25-34; 35-44; 45-54; 55 years and over), sex (men, women), and socioeconomic status recorded as AB (higher or intermediate managerial, professional and administrative), C1 (supervisory, clerical, junior managerial, administration or professional) and C2 (Skilled manual workers) DE (semi and unskilled manual workers, state pensioners, trainees, never workers and long-term unemployed). Ethnicity was recorded as white vs. black and ethnic minority (BAME), location was recorded was England, Scotland or Wales (based on home postcode), education was recorded as low (No certifications/ GCSEs & equivalents), medium (A-levels & equivalents/ technical qualifications below degree) or high (University degree or above).

Smoking status: "Smoking in this survey refers to all burnt tobacco products. It does NOT include e-cigarettes. Which of the following statements BEST applies to you?" Responses were: I have never smoked; I used to smoke but I have given up now; I smoke but I don't smoke every day; I smoke every day. This was treated as "Non-smokers" (never and ex-smokers) and "Smokers" (non-daily and daily smokers) for analysis

Frequency of cannabis use: "In the last 12 months, how often have you used marijuana/ cannabis in ANY WAY?" Responses were: I have never used cannabis; I have used cannabis, but not in the past year; less than once a month; about once a month; about once a week; daily; prefer not to say; don't know. Past-year cannabis users defined as to those using less than monthly or more for analysis.

Route of administration: "Which option best describes your use of cannabis over the past year?" Responses were: Smoked it without tobacco; Smoked it with tobacco e.g. (joints/spliffs) or in a blunt (cigar); Vaped it in liquid form in an e-cigarette or other vaping device; Used a vapouriser to heat the leaves or dried plant material; Used a vapouriser to heat hash oil; Dabbed concentrates such as shatter, budder, or wax; Consumed it in food or drinks; Some other way; prefer not to say; don't know. Participants ticked the options that applied to them.

Mental health: "The following questions are about your health. We understand that this is a highly sensitive topic and would therefore like to remind you that any information you give is strictly confidential and will be used for research purposes only. Some questions asked may not necessarily apply to you. In the last 12 months, which of the following conditions, if any, have you had any treatment or taken any prescribed medication for? Please select all that apply." Depression; Anxiety; Obsessive Compulsive disorder; Panic disorder or phobia; Post-traumatic stress disorder; psychosis; personality disorder; attention deficit hyperactivity disorder; an eating disorder; alcohol misuse or dependence; drug

misuse or dependence; problem gambling; none of these; prefer not to say; don't know. Participants ticked all options that applied to them. The last three were exclusive i.e. only available to be ticked if none of the others were ticked.

Statistical analysis

Data were weighted by age, sex, social class, region and level of education. These weights were applied in all analyses. Prevalence of cannabis use, frequency of use, routes of administration and mental health outcomes were assessed using valid percentages overall and split by smoking status. We conducted 2x2 chi squared ($\chi 2$) test of independence to compare the proportion of smokers and non-smokers across cannabis use frequency categories and to compare prevalence of different routes of administration of cannabis by smoking status. Significance was assessed with a P-value < 0.05. Cramer's V is reported as a measure of the strength of association using traditional thresholds for effect sizes (small: V=0.1, moderate: V=0.3, large, V=0.5)[22].

We applied adjusted logistic regression models, controlling for age (18-24, 25-39, 40-49, 50-65, 65+), sex, education (low, mid, high), ethnicity (white vs. BAME), GB location (England, Wales, Scotland) and Social Grade (AB, C1, C2, DE) to assess the association between smoking status (smoker vs. non-smoker) and cannabis use frequency status versus never used cannabis (e.g. daily vs never, weekly vs. never). Significance was assessed for all models using Wald test statistics with a P-value < 0.05 and by assessing non-overlapping confidence intervals (CIs). No model selection processes were utilized.

As prevalence was low for many mental health disorders, we restricted our results to the most prevalent response option: "depression", "anxiety" and "none of these" which was inverted into "any mental health problem" i.e. those who said yes to any of the preceding conditions. We used chi-squared tests of independence to compare four groups: non-smokers and non-cannabis users (non-users), tobacco users (who did not use cannabis), cannabis users (who did not use tobacco) and a co-using sample (those who reported being a smoker and had used cannabis in the past year). Column proportions were compared using bonferroni-corrected pairwise tests.

"Don't know" and "prefer not to say" response were excluded throughout thus some totals do not equal 100%. Percentages calculated from cells with under 50 individuals are subject to a larger degree of uncertainty.

The analysis presented here was not pre-registered, thus results should be considered exploratory.

Results

Overall, 13.9% of the sample were tobacco smokers whilst 43.3% of cannabis users were smokers. Social grade was numerically comparable across the full sample and the subsample of past-year cannabis users. Visual inspection shows age and gender were skewed towards younger males in the cannabis-using sub-sample compared to the full sample (Table 1).

Table 1: Demographics (gender, age, social grade and tobacco use) of the whole sample and past-year cannabis users.

N	Whole sample (N=12809)	Past-year cannabis users (N=904)
Gender (F)	6954 (51.5%)	385 (42.6%)
Age		
18-24	1441 (11.25%)	242 (26.8%)
25-39	3209 (25.1%)	386 (42.7%)
40-49	2165 (16.9%)	140 (15.5%)
50-65	3047 (23.8%)	90 (10%)
65+	2945 (23%)	46 (5.1%)
Social Grade		
AB	2913(22.7%)	216 (23.9%)
C1	3905 (30.5%)	305 (33.7%)
C2	2692 (21%)	148 (16.3%)
DE	3297 (25.7%)	235 (26.0%)
Tobacco use		
Never smoked	6815 (53.2%)	239 (26.4%)
Ex-smokers	4210 (32.9%)	274 (30.3%)
[Non-smokers]	*11 025 (86.1%)*	*513 (56.7%)*
Non-daily smokers	540 (4.2%)	152 (16.8%)
Daily smokers	1243 (9.7%)	213 (26.5%)
[Smokers]	*1783 (13.9%)*	*391 (43.3%)*
Cannabis use		
Never cannabis use	8805 (68.7%)	-
Ever use but not in the past 12m	2688 (21.0%)	-
Less than monthly*	402 (3.1%)	44.5%
Once a month*	121 (0.9%)	13.4%
Once a week*	154 (1.2%)	17.1%
Daily*	227 (18%)	25%
Routes of administration*		
Smoked without tobacco	245 (1.91%)	27.1%
Smoked it with tobacco e.g. (joints/spliffs) or in a blunt (cigar)	553 (4.31%)	61.1%
Smoked overall (at least 1 method)[a]	687 (5.34%)	75.9%
Vaped it in liquid form in an e-cigarette or other vaping device	85 (0.66%)	9.4%
Used a vaporiser to heat the leaves or dried plant material	105 (0.82%)	11.6%
Used a vaporiser to heat hash oil	41 (0.32%)	4.6%
Vaped overall (at least 1 method)[a]	191 (1.49%)	21.1%
Dabbed concentrates such as shatter, budder or wax	44 (0.34%)	4.9%
Consumed it in food or drinks	196 (1.53%)	21.7%
Some other way	65 (0.51%)	7.2%

Notes: AB – high/intermediate managerial, administrative, or professional; C1 – Supervisory, clerical and junior managerial, administrative or professional; C2 – Skilled manual workers; DE: Semi or unskilled manual workers; E – State pensioners, causal or lowest grade workers, unemployed with state benefits only [a] "Smoked overall" and "vaped overall refers to use of at least 1 method, participants could have reported more than 1 within smoked or vaped. *N is equivalent for total sample and past 12-month cannabis users so only the % is presented in the past-year

Cannabis use among smokers and non-smokers

Overall, 28% of respondents had ever used cannabis, 7.1% had used cannabis in the past year, 3.1% used less than monthly, 3.9% were using at least monthly, 1.2% were using weekly and 1.8% were using daily. Of past year cannabis users [n=904], 44.5% were using less than once per month, 13.4% were using about monthly, 17.1% were using weekly, and 25% were using daily (Table 1).

Amongst those identifying as non-smokers [n=11025], 24.5% reported ever using cannabis of which, 19.9% reported using cannabis, but not in past year. 4.7% reported past-year use, 2% reported at least monthly use, 1.3% reported at least weekly use, and 0.7% were daily users (Table 2).

Within the smokers [n=1783], 49.8% had ever used cannabis, 27.8% had used cannabis, but not in the past year. 21.9%

were past-year users, 15.5% were at least monthly users, 13.1% at least weekly users and 8.7% were daily cannabis users (Table 2).

Bivariate associations in Table 2 show that there were more smokers in each cannabis use frequency group than non-smokers. Adjusted odds ratios show that the association between smoking status and cannabis use frequency became stronger the more frequently cannabis was used. Smokers have 10.07 (95% CI: 8.40 – 12.00; p ≤ 0.001) times greater odds of being a past year cannabis users in comparison to non-users and had 24.6 (95% CI: 17.96 – 33.55, p ≤ 0.001) times greater odds of being a daily cannabis user in comparison to non-smokers (Figure 1).

Table 2: Cannabis use status by tobacco use status. Bivariate associations represent each cannabis use category vs. never cannabis users

	Non-Smokers (N=11025)	Smokers (N=1781)	Bivariate association
Never used cannabis	8059 (73.1%)	746 (41.9%)	$\chi2(1)=588.65$, $p\leq0.001$, $V=0.22$
Ever used but not in the past 12m	2191 (19.9%)	496 (27.8%)	$\chi2(1)=213.01$, $p\leq0.001$, $V=0.14$
Less than monthly	288 (2.6%)	114 (6.4%)	$\chi2(1)=179.53$, $p\leq0.001$ $V=0.14$
Once a month	78 (0.7%)	43 (2.4%)	$\chi2(1)=108.50$, $p\leq0.001$, $V=0.11$
Once a week	75 (0.7%)	79 (4.5%)	$\chi2(1)=332.03$, $p\leq0.001$, $V=0.19$
Daily	72 (0.7%)	154 (8.7%)	$\chi2(1)=874.35$ $p\leq0.001$, $V=0.31$

Notes: % represents the number within the tobacco smoker group. Percentages calculated from cells with under 50 individuals are subject to a larger degree of fluctuation. Prefer not to say and don't know responses not shown.

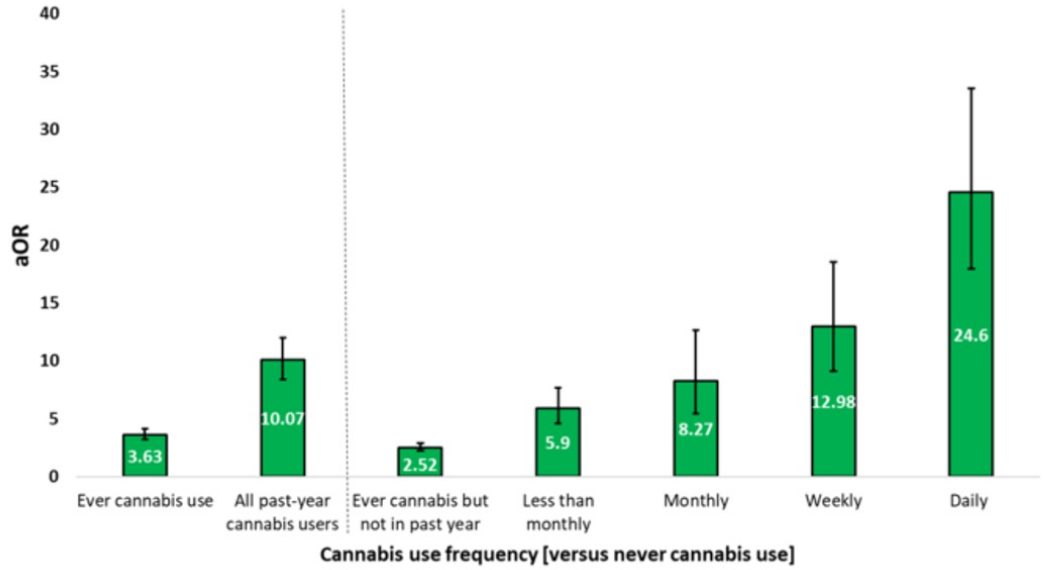

Figure 1: Adjusted odds ratio (aOR) of being a smoker based on cannabis use frequency category vs. never cannabis use. All models adjust for age, gender, education, ethnicity (white vs. BAME), GB location (England, Wales, Scotland) and Social Grade (AB, C1, C2, DE). Error bars represent 95% Confidence Intervals. All ORs are significant p≤0.05)

Figure

Routes of administration and co-administration

Of past year cannabis users, 75.9% of people reported at least one method of smoking cannabis, either with (61.1%) or without tobacco (27.1%). 21.1% reported having used some type of vaporizer (Table 1). Bivariate associations in Table 3 suggest there were significantly greater proportion of smokers (88.3%) who used a smoked method of administering cannabis than non-smokers (66.5%), there were opposite patterns with non-smokers significantly using cannabis without tobacco, whilst a greater proportion of smokers were cannabis with tobacco (Table 3). There was no significant difference between the proportion of people who vaped cannabis overall. More non-smokers were using dry-herb vaporisers, consumed cannabis in food and drink and used alternative methods than smokers.

Table 3: Routes of administration within past-year cannabis users stratified by smoking status. Bivariate associations represents those responding yes vs. no for each route. Data is also reported as a percentage of the whole cannabis-using sample and as a % of the whole sample.

Route of administration	Non-smokers (n=513)	Smokers (n=391)	Bivariate association
Smoked without tobacco	154 (30%)	91 (23.3%)	**$\chi^2(1)=5.11$, $p=0.024$, $V=0.08$**
Smoked it with tobacco e.g. (joints/spliffs) or in a blunt (cigar)	237 (46.2%)	316 (80.8%)	**$\chi^2(1)=111.96$, $p\leq0.001$, $V=0.35$**
Smoked overall (at least 1 method)[a]	341 (66.5%)	346 (88.3%)	**$\chi^2(1)=57.72$, $p\leq0.001$, $V=0.25$**
Vaped it in liquid form in an e-cigarette or other vaping device	45 (8.8%)	30 (10.2%)	$\chi^2(1)=0.544$ $p>0.05$
Used a vaporiser to heat the leaves or dried plant material	78 (15.2%)	27 (6.9%)	**$\chi^2(1)=14.81$, $p\leq0.001$, $V=0.13$**
Used a vaporiser to heat hash oil	26 (5.1%)	16 (4.1%)	$\chi^2(1)=0.489$ $p>0.05$
Vaped overall (at least 1 method)[a]	120 (23.3%)	72 (18.4%)	$\chi^2(1)=3.301$ $p=0.069$
Dabbed concentrates such as shatter, budder or wax	25 (4.9%)	19 (4.9%)	$\chi^2(1)=0.00$, $p>0.05$
Consumed it in food or drinks	138 26.9%	58 14.8%	**$\chi^2(1)=19.03$, $p\leq0.001$, $V=0.15$**
Some other way	49 (9.6%)	15 (3.8%)	**$\chi^2(1)=11.02$, $p=0.001$, $V=0.11$**

% = within each smoking status. Percentages calculated from cells with under 50 individuals are subject to a larger degree of fluctuation. Prefer not to say and don't know responses not shown. [a] "Smoked overall" and "vaped overall refers to use of at least 1 method, participants could have reported more than 1 within smoked or vaped.

Figure

Mental health (Figure 2)

Rates of depression were highest in co-users (32%) of cannabis and tobacco, comparable across exclusive cannabis-only (18.3%) and tobacco-only (20.3%) categories, and lowest in non-users of both substances (12.3%; $\chi2(3)=178.91$, $p\leq0.001$, $V=0.12$) with a similar pattern across the percentage reporting anxiety ($\chi2(3)=144.82$, $p\leq0.001$, $V=0.11$) (Figure 2). For those reporting "any mental health problem, non-users reported the lowest percentage of any mental health problems (22.7%), followed by tobacco-only smokers (33.2%), followed by cannabis-only users (45.8%), no significant pairwise difference emerged between the cannabis-only group and the co-using group (54.2%; $\chi2(3)=361.80$, $p\leq0.001$, $V=0.17$) for any mental health problem.

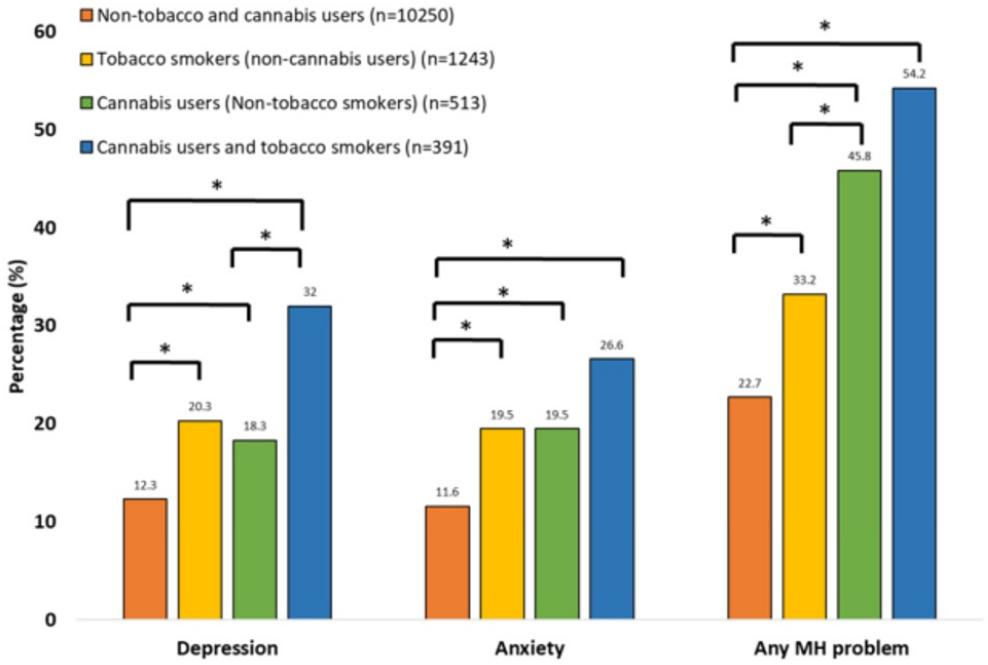

Figure 2: Percentage of those who reported mental health disorders (depression, anxiety or any mental health problems*) across tobacco and cannabis using groups. Any of these" refers to those self-reporting experiencing: depression, anxiety, obsessive compulsive disorder; panic disorder or phobia; post-traumatic stress disorder; psychosis; personality disorder; attention deficit hyperactivity disorder; an eating disorder; alcohol misuse or dependence; drug misuse or dependence; problem gambling. Prefer not to say and don't know responses not shown. *represents bonferroni-corrected p value < 0.05 comparing column proportions after chi-square test.

Figure

Discussion

In Great Britain in 2020, 7.1% of British adults had used cannabis in the past year. Three quarters of these individuals reported smoking cannabis in some format with 61% reported co-administering cannabis with tobacco. Twenty-two percent of tobacco smokers and 4.7% of non-smokers had used cannabis in the past year; smokers had 10 times the odds of being a past-year cannabis user than non-smokers. Amongst past-year cannabis users, approximately 90% of smokers and 67% of non-smokers reported a combustible form of cannabis inhalation. Eighty-one percent of the smokers and nearly half the non-smokers reported co-administering cannabis with tobacco, exposing themselves to tobacco. They are also exposing themselves to nicotine, increasing the potential of nicotine addiction. Co-administration, in the forms of joints/spliffs or as blunts are a particular form of co-use that is associated with higher dependence and poorer outcomes [23][24]. The association between smoking status and cannabis use frequency increased across frequency of use. In this sample, tobacco smokers had 24.6 times greater odds of being a daily cannabis user, than non-smokers.

Forty-three percent of past-year cannabis users identified as tobacco smokers. This is in comparison to the population level of tobacco smoking which was 14.7%5 in 2018, and 13.9% in this sample. This suggests that tobacco smoking in past-year cannabis users is roughly three times that of the population. The prevalence is comparable to the 44.4% smoking prevalence in adults presenting to community treatment for alcohol[25], although these cannabis users were not treatment-seeking. One in four past-year cannabis users were using cannabis daily, this is far higher than in data from the Governments Independent Review of Drugs and Crime Survey from England and Wales[2][3] which suggests that 1 in 10

used cannabis daily. Importantly, 57% of past-year cannabis users described themselves as non-smokers but almost half of these reported co-administering cannabis with tobacco which suggests non-smokers are being exposed to tobacco through their cannabis use. This tobacco exposure increases with frequency of use and as does the odds of more frequent cannabis use.

Prevalence of vaporiser use of any sort was at ~20% and this was slightly more common in non-tobacco smokers than tobacco smokers consistent with non-smokers attempting to avoid combustible products. Non-smokers had significantly higher prevalence of using dry-herb vaporisers as well as other alternative routes whilst smokers only had a significantly higher prevalence of smoking cannabis with tobacco. Past-year dry-herb vaporising was the most common type of vaporising cannabis (11.6%). 9.4% had used cannabis in an e-cigarette in a liquid form. It is important to monitor the use of cannabis e-liquids given the recent outbreak of 'e-cigarette or vaping associated lung injury' (EVALI) in the US. The Medicines and Health Regulatory Agency (MHRA) have only reported two fatal EVALI cases, there were 60 deaths in the US [26]. Amongst these 60 individuals, 86% reported use of THC, and vitamin E acetate has also been identified as one of the causes[26]. Therefore, it is important to continue to monitor the chemical composition and prevalence of use of illicit THC e-liquids in the UK, however, it should be noted that Vitamin E is not permitted in e-cigarettes in the UK. Population level statistics on edible cannabis preparations are not available in the UK. However, these rates are similar to those seen in the 2017 International tobacco Control Policy Evaluation Youth Tobacco and Vaping Survey completed in England, and recruited via a consumer panel[27].

Hidden Tobacco Exposure

The practise of co-administering cannabis with tobacco, but not identifying as a tobacco user, has been found in other studies [10][27]. In qualitative studies, young cannabis users who co-administer with tobacco but do not consider themselves smokers or indeed co-users [28] [29] describe that this was the way they learned to smoke cannabis and it facilitates burning. However, co-administration can increase the amount of THC uptake[30]. Recent research suggests that UK-based, non-dependent, recreational users of cannabis with tobacco (but who do not necessarily smoke tobacco on its own), include about 0.35g tobacco per joint, equivalent to roughly one third of a cigarette[31]. This exposes participants to cotinine (a nicotine metabolite) levels that are suggestive of moderate tobacco exposure - equivalent to that found in light or moderate cigarette smokers[32]. This is an important observation because the development of nicotine dependence symptoms has also been observed in occasional (light and intermittent) smokers[33] who do not smoke cigarettes daily. Whilst co-administration of cannabis and tobacco is not necessarily more acutely rewarding [34] [35], it does produce more negative acute cardiovascular effects [35]and is associated with chronic bronchitis even at low exposure[36]. Overall, this research suggests there is an additional but hidden level of tobacco exposure in smokers and non-smokers, with approximately 81% and 46% respectively reporting co-administration. This has implications for population-level estimates of tobacco prevalence. Prevalence of tobacco smoking has been consistently declining in the general population, but remains higher amongst those in high risk populations who often experience psychiatric co-morbidities [37]. Since reducing tobacco smoking prevalence remains an important public health goal, cannabis users should be considered a vulnerable population where rates of tobacco smoking are much higher than in the population, and use of cannabis and tobacco

should be considered together in the development of policy approaches and treatment interventions.

Mental health

Independently, both cannabis and tobacco use are more common in those with mental health disorders[6][7][8][9]. When adjusting for pre-birth confounders in past research, the association between cannabis and depression was stronger than that of tobacco and depression[38]. Large scale, longitudinal, epidemiological research from the US, suggests that past-month cannabis use is twice as common amongst people with depression than without [39]. Reasons for higher prevalence of cannabis (e.g. recreational/medical) and tobacco use in people with mental health disorders remains unclear.

In the present study, approximately, one in three (32%) tobacco smokers who reported past-year cannabis use (i.e. co-users) reported depression in comparison to 1 in 5 tobacco-only and cannabis-only users (~20%) and 12% of non-users of both substances. These co-users also reported more than double the prevalence of anxiety (26.6%) in comparison to non-users (11.6%). Just over 20%of non-users of both substances reported having any mental health problems whilst just over half of co-users reported any problems. For depression and anxiety, there were no differences between tobacco-only and cannabis-only users, however, for those reporting any mental health problems cannabis users (45.8%) had a significantly higher proportion of mental health problems than tobacco-only users (33.2%) (54.2%) Moreover, cannabis-only users did not significantly differ from co-users (45.8%) suggesting that whether one uses cannabis alone or also smokes cigarettes, the proportion of any mental health problems were similar. However, given the cross-sectional nature of these data, directionality and causality cannot be inferred.

Limitations

Limitations of this study include that some estimates are based on relatively small numbers of respondents, any percentage reported based on less than 50 individuals are subject to a larger degree of fluctuation. However, we have included these estimates because these are the first nationally representative data focussed upon Great Britain. We have highlighted where this is the case, and we have not made conclusions about these particular statistics. Therefore, they should be considered preliminary. Another potential limitation is the impact of the COVID-19 outbreak, which coincided with data collection (Feb-March 2020), which may have influenced use of tobacco and cannabis, although the direction of influence is not yet known. Moreover, we acknowledge there is great variation in types of co-use including great variation in the types of products assessed in this analysis which we not able to capture. There may have also been some misunderstanding regarding edible cannabis products because of the prevalence of CBD products available that utilise cannabis symbols in marketing strategies, however, these estimates seem similar to that of 2017[27]. In regard to mental health problems, the response “none of these” which was subsequently inverted into “any mental health problem”, suggests none of the above listed problems thus, those responding none of these may have experienced another mental health problem, though the frequency is likely to be low since we covered the most prevalent mental health problems.

Conclusions

In conclusion, a representative survey of the adult population in Great Britain in 2020 found cannabis and tobacco co-use to be common. Smokers had ten times the odds of being a past-year cannabis user than non-smokers and 24 times the

odds of being a daily cannabis user. Both smokers and non-smokers expose themselves to carcinogens via combustible smoke due to smoking routes of administration. Co-users of cannabis and tobacco had the highest prevalence of poor mental health and daily cannabis use compared with those using one or none of the substances.

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