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Abstract

The aim of this paper is to assess the influence of coffee shop availability on the prevalence and intensity of cannabis use, as well as the effectiveness of the ‘separation of markets’ policy. A convenience sample of nightlife visitors and a sub-selection of previous year cannabis users were used for analyses on cannabis and hard drugs use. Logistic regression analyses showed that coffee shop proximity does not seem to be linked to prevalence of cannabis use or intensity of use. In addition, proximity of coffee shops does not seem to be linked directly to hard drugs use.

Keywords

cannabis, coffee shop, drugs policy, proximity

Introduction

Across Europe, the illicit retail market in cannabis is similar, with various levels of distribution ranging from social suppliers to profit-making sellers (Sifaneck et al., 2007; Stevenson, 2008; Werse, 2008). The Netherlands is an exception, however, because retail sales of cannabis for personal consumption by adults are condoned in ‘coffee shops’,

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which are allowed to sell cannabis under certain conditions. From previous studies, it remains undetermined whether or not the exceptional situation in the Netherlands influences the prevalence of cannabis use. Whereas some authors have suggested that the presence of coffee shops causes an increase in the prevalence of use (MacCoun and Reuter, 1997; MacCoun and Reuter, 2001), others have argued that, across Western countries, trends in cannabis prevalence seem to develop independently of drugs policy (Korf, 2002; Reinerman and Cohen, 2007; Reuband, 1995). These studies have several limitations. First, some studies base their conclusions on prevalence among minors, who are not allowed in coffee shops. Second, they are mostly based on *aggregate* data (with the exception of those using arrest rates). On an *individual* level, however, other factors might play a role and aggregate data will not identify the underlying mechanisms. Third, several of the studies are based on formal policies, but different conclusions may be reached when considering policy in practice.

In the Netherlands, the sale of cannabis in coffee shops is tolerated only when certain (nationally determined) criteria are met: no advertising, no sale of hard drugs, no nuisance, a minimum of 18 years of age to enter a coffee shop and buy cannabis there, and no sale or stock of large quantities (>5 grams per person per transaction, >500 grams in stock). Another part of the coffee shop policy is determined at a local level, where municipalities have the authority to determine if and where coffee shops can be established. As a result, coffee shops are not evenly spread throughout the Netherlands, as can be seen in Figure 1 (Bieleman and Nijkamp, 2010). Almost 80 percent of Dutch municipalities have no coffee shops and, of all coffee shops ($n = 666$), one-third are located in Amsterdam (Bieleman and Nijkamp, 2010).

A recent evaluation of Dutch drugs policy concluded that decreases in the prevalence of cannabis use within the Netherlands developed in parallel with a reduction in the number of coffee shops, and that these developments might (also) be influenced by other factors, such as the decrease in tobacco smoking (Van Laar and Van Ooyen-Houben, 2009). Given the presence of coffee shops, one might expect cannabis users in the Netherlands to buy there rather than on the illicit market. However, the limitations in the availability of coffee shops (for example, minimum age, uneven geographical spread) might induce users to (also) buy cannabis through illegal channels. Several studies show that a substantial proportion indeed do (Abraham et al., 2002; Cohen and Kaal, 2001; Korf et al., 2003; Monshouwer et al., 2004; Wouters and Korf, 2009). Availability entails several aspects: the physical availability (to what extent is a coffee shop present and accessible, including distance), availability in time (to what extent does someone have the opportunity to visit a coffee shop, considering daily activities and opening hours) and social availability (to what extent is someone motivated or inhibited to buy at a coffee shop). In an earlier study, we looked at cannabis availability through (legal) coffee shops and other (illegal) suppliers. A survey among current cannabis users was conducted in seven Dutch cities (Wouters and Korf, 2009). Unsurprisingly, in municipalities without coffee shops, significantly less cannabis was purchased through coffee shops. Significant predictors of buying cannabis illegally were coffee shop *density* (a measure for availability: the number of coffee shops per 100,000 inhabitants), age (minors) and sex (male) (Wouters and Korf, 2009).

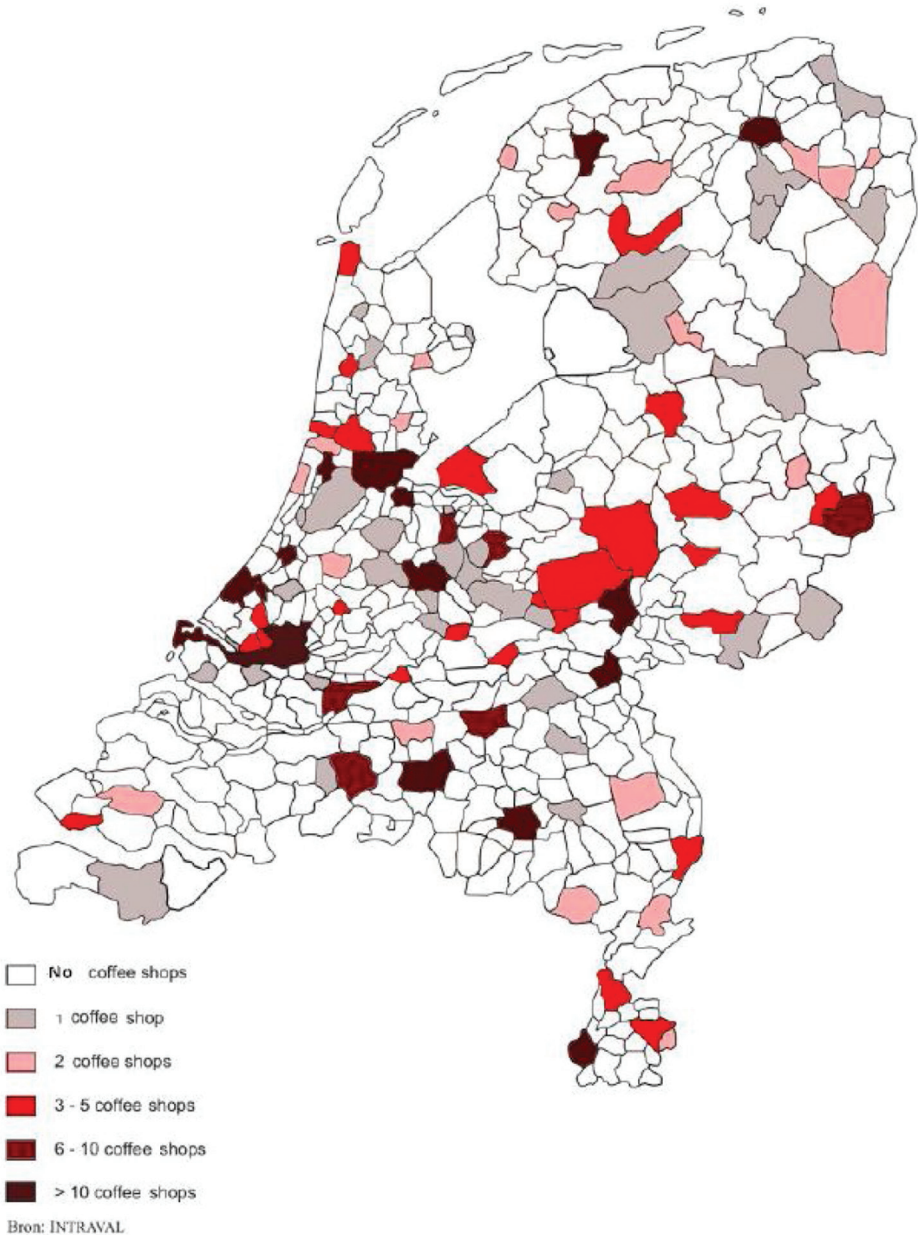


Figure 1. Geographical spread of coffee shops in the Netherlands in 2009.

In criminology, two theories dominate the study of availability and proximity: routine activity theory and rational choice theory. The first is based on the notion of individuals encountering opportunities for crime during their daily life and taking these opportunities,

resulting in criminal behaviour (Cohen and Vila, 1996). The second states that criminals actively search for targets and base their movements on this search (Cornish and Clarke, 1986), thus the aim of criminal behaviour precedes the travel. Empirical studies have shown that travel distance to crime locations varies according to type of crime (Morselli and Royer, 2008; Snook, 2004), but also within crime types (Morselli and Royer, 2008; Snook, 2004). Generally, there are greater gains for greater distances travelled (Bernasco and Block, 2011). However, there also is distance decay, which means that offenders commit fewer crimes as the distance from home increases (Van Daele and Beken, 2011). Differences have also been found according to the type of offender: younger offenders travel shorter distances, and more experienced offenders travel longer distances (Snook, 2004). Travelling to crime seems to be influenced by three factors: (1) expected profits, (2) expected risk, and (3) the ease with which the target can be reached (Van Daele and Beken, 2011). This third point includes both attractors and barriers that make the target more or less accessible.

The relationship between availability and consumption has also been studied in the field of addiction. In summary, both density and proximity seem to increase substance use and gambling (Chuang, 2005; Henriksen et al., 2004; Pokorny et al., 2003; West et al., 2010), although there also have been contradictory findings (Popova et al., 2009; West et al., 2010). In addition, social factors (sex, age, ethnicity and socioeconomic status, for example) often are more important (Abbott and Volberg, 2000; Gerstein et al., 1999; Room et al., 1999; Sévigny et al., 2008).

The rationale behind the Dutch coffee shop policy is to reduce the risk of cannabis users being exposed to hard drugs, which are viewed as more hazardous to health; this is referred to as the 'separation of markets'. This approach appears to be effective as hard drugs are very rarely found in coffee shops (Broekhuizen et al., 2006; Reinerman and Cohen, 2007). With illegal cannabis retailers – the illicit market – the risk of being exposed to hard drugs could be higher. More specifically, not allowing minors in coffee shops might undermine the separation of markets philosophy.

In the current study, our aim is to assess the relationship between proximity of coffee shops (a measure of availability: travel distance to coffee shop) and cannabis use. Cannabis use will be analysed in relation to three different aspects: prevalence of use, frequency of use and amounts used. As stated above, it has been suggested that easier access to cannabis might stimulate use. Therefore, our first hypothesis is that higher coffee shop proximity is associated with a higher prevalence of cannabis use, more frequent use and larger amounts used. Regarding the 'separation of markets' policy, we hypothesize that buyers in the illicit market are more likely to use hard drugs than those who buy in coffee shops.

Methods

Sample

A general population survey would yield too few numbers of cannabis and hard drugs users to study the relationship between proximity of coffee shops and prevalence of cannabis and hard drugs use.¹ In addition, existing general population surveys in the Netherlands do not contain information on frequency of use or the amounts used. To

avoid the problem of inadequate sample size, we conducted a study into the use of drugs among people between 15 and 35 years of age who visit nightlife venues (Van der Poel et al., 2010). Respondents were purposely recruited at nightlife locations (primarily clubs), geographically spread out across the Netherlands. Recruitment took place between spring 2008 and autumn 2009. A total of 26 clubs and discos were selected, based on the type of music, number of visitors and geographical spread.

Trained interviewers administered questionnaires. The interviewers approached those who appeared to fit the age range, asked if they were willing to participate in a survey and assured them of anonymity. Those who agreed received a flier with a URL for a website where they could fill out the questionnaire online, or a paper questionnaire, which could be returned by mail. This resulted in 2027 respondents. All statistical analyses were performed using PASW 17.0.

Measures

We recoded continuous or ordinal variables (frequency of cannabis use, amounts of cannabis used, age of first cannabis use, coffee shop proximity and urbanicity) as dichotomous variables. Recoding these variables into two categories was motivated by the lack of linearity of the variables in their original form with the logit of previous year cannabis use, frequency of cannabis use, amounts of cannabis use and previous year hard drugs use. For frequency of cannabis use, amounts of cannabis used, coffee shop proximity and urbanicity, almost half or more of the respondents were actually in the lowest category and therefore this was chosen as a cut-off point. For age of first cannabis use, we chose 13 years of age based on studies that showed that starting cannabis use earlier is linked to several forms of deviant behaviour (Henriksen et al., 2004; Leatherdale and Strath, 2007; Lovato, 2007).

Proximity of coffee shops: Distance by transport (bike, on foot, etc.) between respondent's residence and the nearest coffee shop (0 = <5 km, 1 = ≥5 km).

Cannabis buying behaviour: Places of cannabis purchases (0 = coffee shop only, 1 = non-buyers, 2 = (also) elsewhere).

Cannabis use: Previous year cannabis use (0 = no previous year use, 1 = previous year use). Frequency of cannabis use (0 = seldom/almost never, 1 = more frequent). Amounts used per occasion (0 = ≤1 cannabis cigarette, 1 = >1 cannabis cigarette). Early starter: first cannabis use before the age of 13 (0 = first cannabis use ≥13 years, 1 = first cannabis use <13 years).

Hard drugs use: Previous year use of any hard drug (ecstasy, powder cocaine, amphetamines, heroin, crack, GHB, LSD, ketamine) (0 = no previous year use, 1 = previous year use).

Demographics: Sex (0 = female, 1 = male), age (years), being a minor (0 = 18 years and older, 1 = under 18 years), ethnicity (0 = non-Western, 1 = Western),² living situation (0 = other than with parents, 1 = with parents), attending school, college or university (0 = not student, 1 = student), unemployment (0 = work, 1 = no work) and educational level (0 = finished or following lower vocational or below, 1 = higher).

Frequent attendance at nightlife venues: Number of times going out 30 days prior to survey (0 = fewer than 4 times, 1 = 4 times or more).

Urbanicity: Number of inhabitants in respondent's place of residence (0 = than <25,000, 1 = >25,000).

Tobacco smoking behaviour: Daily tobacco smoking (0 = no daily tobacco smoking, 1 = daily tobacco smoking).

Analysis

To determine the relationship between coffee shop availability and prevalence, we performed a logistic regression analysis with previous year cannabis use as a dependent variable, using coffee shop proximity as an independent variable. In addition, logistic regression analyses with frequency of cannabis use and with amounts of cannabis used as outcome variables were performed; again, proximity of coffee shops was an independent variable and cannabis buying behaviour was also included. Finally, we performed a logistic regression analysis with previous year hard drugs use to determine the relationship between coffee shop proximity and the use of hard drugs. In all analyses, we used demographic characteristics as independent variables to account for confounder effects. Frequent attendance at nightlife venues served as a measure for lifestyle. Since in the Netherlands cannabis is mostly used with tobacco, we introduced daily tobacco smoking to account for the effects of being a regular tobacco user. Finally, we introduced urbanicity, because cannabis use tends to be higher in more urban areas (Chuang, 2005; Gerstein et al., 1999; Henriksen et al., 2004; Leatherdale and Strath, 2007; Pokorny et al., 2003; West et al., 2010). All analyses were performed for previous year cannabis users only.

We used multivariate logistic regression analyses to model associations with previous year cannabis use, frequency of cannabis use, amounts of cannabis used and previous year hard drugs use. Because hypotheses were being tested, all variables were introduced through forced entry. We entered different types of variables in blocks: demographics (sex, Western ethnicity, living with parents, being a student, no work, higher education and age), frequent nightlife attendance, substance use measures (daily tobacco use, early starter), coffee shop measures (coffee shop proximity, cannabis purchasing behaviour), urbanicity and interaction terms. A significance level of .05 was used for all the analyses and, hence, a two-tailed 95 percent confidence interval (95% CI) is provided for each odds ratio. Only statistically significant results have been reported.

Differences in dynamics for minors and adults are to be expected. Since minors are not allowed in coffee shops, it is likely that minors are less (or not at all) affected by coffee shop proximity. Therefore, the regression analysis for previous year cannabis use was performed for the total group, followed by adults and minors separately.

To ensure all influences were considered, we included in the analyses all interaction terms that were deemed likely to influence the relationships studied: interactions between demographic characteristics, proximity, buying behaviour and urbanicity.

Results

Approximately half of the sample was female, the mean age was 21.9 years, two-thirds of the respondents were students and one in five was unemployed (Table 1). Almost

Table 1. Sample characteristics (percent)

	Total (n = 2027)	Adult (n = 1651)	Minor (n = 355)
<i>Substance use measures</i>			
Daily tobacco use	29.7	29.7	29.0
Previous year cannabis use	37.8	37.2	41.1
Early starter ^a (<13 years)	12.1	10.4	18.8
Higher frequency ^a	28.4	28.9	24.8
Larger amounts ^a (>1 cannabis cigarette)	32.3	31.9	31.8
Previous year hard drugs use	16.7	18.7	8.8
<i>Coffee shop measures</i>			
Proximity (>5 km from residence)	58.7	60.3	52.5
<i>Cannabis purchasing behaviour^a</i>			
Coffee shop only	27.4	31.7	9.0
Non-buyer	48.3	41.8	75.2
(also) buys elsewhere	24.3	26.5	15.9
<i>Demographics</i>			
Male	47.7	49.6	37.8
Western ethnicity	94.2	93.9	95.5
Living with parents	58.3	50.0	96.9
Student	64.0	57.5	94.6
Unemployment	21.8	20.7	27.5
Higher education (> VMBO)	54.8	56.2	48.3
Age: mean (SD)	21.9 (5.6)	23.1 (5.5)	16.4 (0.7)
Minor (<18 yrs)	17.7		
Frequent nightlife attendance	59.1	60.4	53.8
Urbanicity (>25,000 inhabitants)	57.4	60.4	43.4

^aPrevious year cannabis users only (n = 755).

two-thirds lived with their parents or other caretakers (such as family or guardians), while the remaining one-third lived on their own or with others (such as a partner or friends). One in six was under the age of 18 and thus considered a minor in the Netherlands.

Almost two-thirds of all respondents had used cannabis at least once in their lives, and 37.8 percent had used it in the year before the survey. Two-thirds of the previous year cannabis users reported a low frequency of use. The average age of initiation into cannabis use was 16.2 years. A quarter of the sample had used at least one hard drug at least once in their lives, and 16.7 percent had done so in the year before the survey.

Almost half of previous year cannabis users did not buy cannabis themselves. A little over a quarter bought exclusively from coffee shops, and less than a quarter (also) bought elsewhere. Somewhat less than half, 41.3 percent, of previous year cannabis users lived less than 5 kilometres from a coffee shop; the rest lived further away. A little over half of the respondents lived in a town or city with more than 25,000 residents.

When proximity and the use of cannabis and hard drugs are studied by using bivariate analyses, there seemed to be a relationship (Table 2). Among previous year cannabis

Table 2. Use of cannabis and hard drugs by proximity to coffee shop and urbanicity

		Proximity: <5 km to coffee shop			Urbanicity: >25,000 inhabitants		
		Percent	χ^2	<i>p</i>	Percent	χ^2	<i>p</i>
Previous year cannabis use (<i>n</i> = 2027)	No	55.0	16.372	<.001	53.2	25.245	<.001
	Yes	64.4			64.7		
Frequency of use (<i>n</i> = 757)	Seldom / almost never	61.9	4.272	.039	62.6	2.695	.101
	More frequent	70.0			69.1		
Amount used (<i>n</i> = 757)	≤ 1 cannabis cigarette	65.4	0.000	1.000	65.9	0.415	.520
	> 1 cannabis cigarette	65.4			63.5		
Previous year hard drugs use (<i>n</i> = 2027)	No	57.1	8.066	.005	55.2	16.166	<.001
	Yes	65.5			67.1		

users, proximity is lower than among those who did not use cannabis in the 12 months prior to the survey ($\chi^2 = 16.372$, $p < .001$). Among previous year cannabis users who had used more often than once a week, proximity to coffee shops was closer than among less frequent users ($\chi^2 = 4.272$, $p < .05$). Proximity to coffee shops was similar for previous year users who use more than one cannabis cigarette per occasion and those who use lower amounts ($\chi^2 = 0.000$, $p = 1.000$). Respondents who used hard drugs in the year prior to the survey generally lived closer to coffee shops ($\chi^2 = 8.066$, $p < .01$). However, when controlling for other factors – for example sex, ethnicity and urbanicity – it remains to be seen whether this relationship between proximity and the use of cannabis and hard drugs still remains. This will be explored in multiple logistic regression analyses.

Predictors of previous year cannabis prevalence

In the logistic regression for all respondents and with previous year cannabis prevalence as the outcome variable (Table 3), neither proximity of coffee shops nor urbanicity were of influence. Tobacco smoking increases the chance of previous year cannabis use by 3.6 times, being a student by 1.4 times, and frequent nightlife attendance by 1.5 times. Being of non-Western ethnicity increases the chances of previous year cannabis use by 4.2 times. Among adults, Western ethnicity, living with parents and age decrease the chances of previous year cannabis use, while daily tobacco smoking and frequent nightlife attendance increase it. Daily tobacco smoking was the only remaining significant variable for the minors.

Predictors of frequency of cannabis use

In the logistic regression analysis using frequent cannabis use as the outcome variable (Table 4), only previous year cannabis users were included. Proximity is not a significant

Table 3. Multivariate logistic regression analyses with previous year cannabis use as the dependent variable: Total group, adults and minors

	Previous year cannabis use																		
	Total ^a						Adults ^b						Minors ^c						
	B	OR	95% CI	p	B	p	B	OR	95% CI	p	B	OR	95% CI	p	B	OR	95% CI	p	
<i>Background factors</i>																			
Male	0.181	1.199	0.497–2.888	.686	0.484	1.622	0.614–4.287	.329	-0.794	0.452	0.023–8.950	.602							
Western ethnicity	-1.438	0.237	0.082–0.686	.008	-1.276	0.279	0.084–0.926	.037	-1.098	0.334	0.018–6.184	.461							
Living with parents	-0.179	0.836	0.652–1.072	.158	-0.544	0.580	0.432–0.779	< .001	-0.808	0.446	0.075–2.644	.374							
Minor	1.157	3.182	0.936–10.814	.064	-	-	-	-	-	-	-	-							
Student	0.367	1.444	1.122–1.859	.004	0.047	1.048	0.795–1.382	.741	-0.399	0.671	0.187–2.415	.542							
Unemployment	0.240	1.272	0.987–1.638	.063	0.263	1.301	0.976–1.734	.073	-0.075	0.928	0.517–1.666	.802							
Higher education	0.255	1.291	0.520–3.204	.582	0.657	1.930	0.715–5.207	.194	-0.145	0.865	0.021–35.454	.939							
Age	-	-	-	-	-0.088	0.916	0.887–0.946	< .001	-0.063	0.939	0.654–1.349	.735							
Frequent nightlife attendance	0.425	1.530	1.232–1.901	< .001	0.341	1.406	1.100–1.798	.007	0.373	1.451	0.866–2.431	.157							
<i>Substance use measures</i>																			
Daily tobacco use	1.276	3.584	2.846–4.512	< .001	1.246	3.447	2.684–4.503	< .001	1.636	5.134	2.852–9.243	< .001							
Urbanicity	-0.562	0.570	0.194–1.680	.308	-0.318	0.727	0.220–2.403	.602	-2.445	0.087	0.002–3.847	.206							
<i>Coffee shop measures</i>																			
Proximity	-0.444	0.641	0.241–1.706	.373	-0.671	0.511	0.176–1.485	.217	1.433	4.190	0.181–97.000	.371							
<i>Interaction terms</i>																			
Western * Higher education	-0.056	0.945	0.373–2.396	.905	-0.515	0.598	0.217–1.650	.321	0.670	1.955	0.046–83.185	.726							
Male * Western	0.516	1.675	0.679–4.134	.263	0.327	1.387	0.512–3.757	.520	1.433	4.191	0.200–87.680	.356							
Student * Minor	-0.820	0.440	0.126–1.537	.198	-	-	-	-	-	-	-	-							
Western * Coffee shop distance	0.376	1.456	0.559–3.788	.441	0.678	1.970	0.701–5.534	.198	-1.882	0.152	0.007–3.552	.241							
Western * Urbanicity	0.677	1.968	0.667–5.807	.220	0.594	1.812	0.544–6.033	.333	1.794	6.012	0.142–254.648	.348							
Urbanicity * Coffee shop distance	0.433	1.541	0.968–2.454	.068	0.306	1.358	0.800–2.305	.257	1.074	2.928	0.961–8.915	.059							

^aCox & Schnell R² = .131; Nagelkerke R² = .178, n = 1788.
^bCox & Schnell R² = .148; Nagelkerke R² = .201, n = 1476.
^cCox & Schnell R² = .174; Nagelkerke R² = .234, n = 312.

Table 4. Multivariate logistic regression analysis with frequency of cannabis use, amounts of cannabis used and previous year hard drugs use as dependent variables: Cannabis users only

	Frequency of cannabis use ^a				Amounts of cannabis used ^b				Previous year hard drugs use ^c			
	B	OR	95% CI	p	B	OR	95% CI	p	B	OR	95% CI	p
<i>Background factors</i>												
Male	0.679	1.973	0.939–4.143	.073	1.034	2.814	1.342–5.898	.006	0.692	1.998	1.103–3.619	.022
Western ethnicity	-0.623	0.536	0.256–1.124	.099	-0.428	0.652	0.320–1.327	.238	-0.714	0.490	0.250–0.958	.037
Living with parents	-0.243	0.784	0.484–1.271	.323	-0.042	0.959	0.605–1.518	.857	-0.857	0.425	0.281–0.642	<.001
Minor	1.100	3.004	1.559–5.789	.001	0.703	2.021	1.104–3.700	.023	-0.210	0.811	0.111–5.944	.837
Student	-0.133	0.876	0.534–1.435	.598	-0.017	0.983	0.617–1.567	.943	-0.152	0.859	0.575–1.282	.456
Unemployment	-0.039	0.962	0.595–1.555	.874	0.067	1.069	0.676–1.690	.776	-0.363	0.696	0.458–1.056	.089
Higher education	-0.493	0.611	0.386–0.966	.035	-0.229	0.795	0.519–1.219	.293	-0.566	0.568	0.388–0.830	.004
Frequent nightlife attendance	-0.238	0.789	0.504–1.235	.299	-0.013	0.987	0.645–1.511	.953	0.479	1.615	1.100–2.371	.014
<i>Substance use measures</i>												
Daily tobacco use	0.734	2.083	1.359–3.191	.001	0.501	1.650	1.104–2.466	.015	0.293	1.340	0.941–1.908	.104
Early starter cannabis	0.527	1.695	0.929–3.090	.085	0.769	2.158	1.217–3.826	.008	1.305	3.688	2.160–6.295	<.001
Urbanicity	-0.055	0.946	0.571–1.568	.830	-0.474	0.622	0.388–0.999	.050	-0.580	0.560	0.303–1.034	.064
<i>Coffee shop measures</i>												
Proximity	0.332	1.394	0.646–3.011	.398	0.234	1.264	0.591–2.704	.546	-0.443	0.642	0.303–1.362	.248
Buying behaviour				<.001				.001				
Coffee shop buyers		1.000				1.000						
Non-buyers	-2.511	0.081	0.025–0.268	<.001	-2.198	0.111	0.034–0.360	<.001				
(Also) elsewhere	-1.155	0.315	0.100–0.990	.048	-0.618	0.539	0.176–1.648	.279				
<i>Interaction terms</i>												
Proximity * Buying behaviour				.576				.816				
Non-buyers * Proximity	-0.339	0.713	0.235–2.162	.550	-0.306	0.737	0.267–2.035	.556				
(Also) elsewhere buyers *	0.258	1.294	0.469–3.569	.618	-0.523	0.776	0.289–2.081	.615				
Proximity												

Table 4. (Continued)

	Frequency of cannabis use ^a			Amounts of cannabis used ^b			Previous year hard drugs use ^c					
	B	OR	95% CI	p	B	OR	95% CI	p	B	OR	95% CI	p
Male * Buying behaviour				.665				.720				
Non-buyers * Male	-0.472	0.624	0.206–1.892	.404	0.314	1.369	0.475–3.947	.561				
(Also) elsewhere buyers *	-0.043	0.958	0.337–2.725	.936	-0.106	0.899	0.321–2.520	.840				
Male												
Minor * Student									-0.443	0.642	0.083–4.986	.672
Proximity * Urbanicity									0.580	1.786	0.772–4.133	.175
Proximity * Male									0.058	1.060	0.506–2.221	.878

^aCox & Schnell R²: .272; Nagelkerke R²: .392, n = 681.

^bCox & Schnell R²: .223; Nagelkerke R²: .315, n = 654.

^cCox & Schnell R²: .142; Nagelkerke R²: .194, n = 686.

predictor of frequent cannabis use. Buying behaviour was the strongest predictor: coffee shop buyers have a 12.3 times higher chance of being a frequent cannabis user than those not buying for themselves at all, and a 3.2 times higher chance than those buying elsewhere. Other predictors are being a minor (3.0 times higher), daily tobacco use (2.1 times) and lower educational level (1.6 times).

Predictors of amounts of cannabis used

In the logistic regression analysis predicting larger amounts of cannabis used per occasion (Table 4), again only the previous year cannabis users were included. Again, proximity to coffee shops was not a significant predictor. Buying behaviour is significant, but coffee shop buyers differ only from non-buyers, not from those who buy elsewhere. Coffee shop buyers have a 9.0 times higher chance of using larger amounts. Other predictors are being male (2.8 times), being an early starter of cannabis (2.2 times), being a minor (2.0 times) and daily tobacco smoking (1.7 times).

Predictors of previous year hard drugs use

The logistic regression with previous year hard drugs use as the outcome variable for lifetime users of cannabis shows no influence of coffee shop proximity (Table 4). Being male increases the chance by 2.0 times, non-Western ethnicity (2.0 times), frequent nightlife attendance (1.6 times) and being an early starter (3.7 times) also increase this chance. Living with parents decreases the chance of previous year hard drugs use by 2.4 times and a higher education by 1.8 times.

Discussion

In this study, we explored the relationship between the proximity of coffee shops and cannabis use. We hypothesized that closer proximity to coffee shops would result in more cannabis consumption. This hypothesis was not confirmed, as we found no association between the distance from the coffee shop to place of residence and previous year cannabis use. In addition, coffee shop proximity did not predict more frequent cannabis use and larger amounts used. However, buying behaviour proved to be of influence: respondents who bought only in coffee shops were more regular users than non-buyers and (also) elsewhere buyers. In addition, they used more cannabis per occasion than non-buyers. When the logistic regression with previous year cannabis use as the outcome variable was performed for minors and adults separately, far fewer variables were of significance among minors, with previous year tobacco smoking as the only remaining variable. If, similar to what has been found in studies on crime (Broekhuizen et al., 2006; Reinerman and Cohen, 2007), younger cannabis users travel shorter distances, this difference could be explained by a lack of variation in the distances travelled by individual under-aged users, leading to less significant predictors in the analyses.

Our second hypothesis, that proximity of coffee shops is positively related to previous year use of hard drugs, was not confirmed either. First use of cannabis at an early age

(before 13 years), however, was an important predictor of hard drugs use. For both frequency of cannabis use and amounts of cannabis used, being a minor increased the chances of belonging to the group of more intense users. It is a possibility that minors who are part of the population we studied use more intensely than other minors because we recruited them in nightlife venues, where other, less regularly using, minors might not go. Also, the use of cannabis by minors may be part of a deviant or delinquent lifestyle (Erickson et al., 2006; Monshouwer et al., 2005). Tobacco smoking, which was a strong and stable predictor of previous year cannabis use, of more regular use and of larger amounts used, may share this deviant lifestyle as a common factor.

Although this study is the first that focuses on the relationship between the availability of coffee shops and cannabis use with such large numbers of respondents, it has some limitations. We studied a non-normative sample and, although this resulted in a sample size that would otherwise have been very difficult to achieve, the results may not be generalizable to the general population. Compared with a general population survey, the prevalence of drugs use was much higher in our sample (Van Laar and Van Ooyen-Houben, 2009). Also, even though the survey was conducted mainly in non-urban areas, a large proportion of the sample lived within a 5 km range of a coffee shop, thus not providing a large range of travel distances. The average distance to the nearest coffee shop is a little lower: 4 km. However, this distance is based on the distance as the crow flies, whereas the travel distance on foot or by bicycle will always be larger. To persons living in other, larger countries, distances below 5 km may not seem significant, but in the Dutch situation it might be important to make further distinctions. The Netherlands is the second most densely populated country in Europe (after Malta³) and many inhabitants are accustomed to having facilities they use near to their homes. In addition, many young people in the Netherlands travel by bicycle rather than car, and therefore travel shorter distances in their daily routine than in most other countries.

Another limitation is that two of the outcome measures (more regular cannabis use and larger amounts used) do not represent very frequent use or very high amounts used. The variable for frequency of use distinguishes the more regular users from those who seldom use cannabis, but because the cut-off point for amount used was low (one cannabis cigarette per occasion) this did not represent a very intensely using group. Regarding cannabis buying behaviour, we distinguished three groups: non-buyers, coffee shop only buyers and (also) elsewhere buyers. It should be noted that the last group still purchased most of their cannabis at coffee shops. Conclusions on the relationship between cannabis buying behaviour and intensity of use should therefore be treated with some caution and differentiation between coffee shop buyers and (also) elsewhere buyers may be limited. In this sense, the situation in the Netherlands does not necessarily differ from the situation in other countries. Coffee shops may be unique to the Netherlands but the situation of cannabis being resold to friends or distributed among minors is similar (Snook, 2004).

In an earlier study we found that lower coffee shop density (number of coffee shops per 100,000 inhabitants) was related to buying cannabis on the illegal market. In the current study, proximity of coffee shops did not influence cannabis use but buying cannabis in coffee shops was related to more regular cannabis use and larger amounts

used. In both studies, the objective was to identify the role of coffee shops but, whereas in the first study the emphasis was on buying behaviour, in the current study cannabis use was added. Even though minors are not allowed in coffee shops, they can still obtain cannabis through adults. Consequently, even for minors, proximity of coffee shops could still be of influence. We based our data on distance between respondents' residence and the nearest coffee shop. However, following the logic of the routine activity theory (Akers, 1984), there are other places people visit in their daily routines, such as work, school, shopping centres and other public places. Another criminological concept is 'awareness space', which refers to the places offenders know as they go about their daily life (Van der Poel et al., 2010). Within this space more crime is committed. Translating to cannabis, this would mean that users travel around places they are familiar with, taking coffee shops within this space into consideration only when looking for locations to buy and/or use cannabis. In the future, it would be challenging to consider daily routines, awareness space and nightlife activities and locations in analysing the relationship between proximity of coffee shops and cannabis consumption, including the times at which these activities are undertaken and the opening hours of coffee shops.

The 'separation of markets' policy does not seem to have much influence on the use of hard drugs. Having used cannabis at an early age was an important factor, confirming earlier findings (Van Laar and Van Ooyen-Houben, 2009) and thus indicating that this is a robust predictor of hard drugs use. It could be argued that coffee shops 'radiate' the concept of separation of markets to all cannabis users, meaning that this separation becomes the norm for all users, including those who buy (part of) their cannabis outside of coffee shops. Cannabis users might prefer sales points that sell only cannabis, even when these sales points are illegal.

In our present study, current cannabis use and the proximity of coffee shops were not correlated, but early use of cannabis might still be influenced by the proximity or availability of coffee shops. Findings from criminological studies show that criminal behaviour changes over time: there is a sharp increase in crime in mid-adolescence followed by a decrease in early adulthood (Cohen and Felson, 1979); studies on tobacco use show different results for the influence of proximity on *initiation* (Felson, 2006) or *continuation* (Baumeister and Tossman, 2005; Lynskey, 2003; Lynskey et al., 2006). Therefore, in future studies, the development of cannabis use and buying behaviour over time are of interest. Research with a longitudinal design, where different stages of using careers are studied, can perhaps shed some light on this specific issue.

It has been suggested that a greater availability of cannabis might stimulate demand (Blonigen, 2010). In line with routine activity theory, one would expect that living near a coffee shop increases the chance of cannabis use, more regular cannabis use and larger amounts of cannabis used. Rational choice theory leads to the assumption that coffee shops would have greater appeal to more frequent cannabis users. From the results of this study it remains unresolved whether the presence of coffee shops stimulates more intense cannabis use (routine activity), or whether more frequent users more often buy at coffee shops (rational choice). Proximity did not play a significant role in our analyses. However, buying in coffee shops did show a connection to more regular use and larger amounts used. One explanation is that cannabis users who use frequently prefer a continuous source of cannabis, which coffee shops provide. Thus, coffee shops may not cause but

rather facilitate frequent use. In addition, when using cannabis regularly, it seems less likely that cannabis is always procured from friends. Consequently, frequent cannabis users can buy from either the coffee shop or the illegal market. It is likely they prefer the coffee shop to illegal retailers, since the coffee shop provides a reliable and legal source of cannabis. Conversely, less frequent users of cannabis tend to be occasional cannabis smokers, who never buy cannabis. Additional analyses with respondents who lived with parents only, and thus had little say about the proximity of their homes to coffee shops, showed that those who bought in coffee shops again were the most frequent and intense users of cannabis.⁴ Therefore, coffee shops might stimulate both frequency of use and amounts used per occasion, but longitudinal studies are required to determine whether this is a causal relationship.

Notes

1. A problem is that they yield only small numbers of respondents who have used cannabis, and an even smaller number that have used hard drugs. For example, in the most recent Dutch general population survey on substance use, only 7.0 percent of 5769 respondents aged 15–64 were previous year cannabis users, and only 2.2 percent were previous year hard drugs users (Van Rooij et al., 2011).
2. Ethnicity was measured using the standardized procedure in the Netherlands (that is birth country of the respondents as well as that of their parents). The distinction between Western and non-Western ethnicity was applied as an alternative to race, which is not allowed to be registered in the Netherlands; in practice most Westerners are white (Benschop et al., 2006).
3. See Eurostat population density table at <http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&language=en&pcode=tps00003&plugin=1> (accessed 1 May 2012).
4. It could be argued that cannabis buying behaviour will be influenced strongly by coffee shop proximity. However, multicollinearity between these two variables was minimal.

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