Cannabis control: consequences for consumption and cultivation

Wouters, M.

Citation for published version (APA):

General rights
It is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), other than for strictly personal, individual use, unless the work is under an open content license (like Creative Commons).

Disclaimer/Complaints regulations
If you believe that digital publication of certain material infringes any of your rights or (privacy) interests, please let the Library know, stating your reasons. In case of a legitimate complaint, the Library will make the material inaccessible and/or remove it from the website. Please Ask the Library: https://uba.uva.nl/en/contact, or a letter to: Library of the University of Amsterdam, Secretariat, Singel 425, 1012 WP Amsterdam, The Netherlands. You will be contacted as soon as possible.
Chapter 5: Effects of raising the minimum age for coffee shops on cannabis use and cannabis buying behaviour among minors

M. Wouters, A. Benschop & D.J. Korf
Submitted to Drugs: Education, Prevention & Policy
Abstract

Aims This study examines the effect of raising the minimum age for ‘coffee shops’ in the Netherlands in 1996 from 16 to 18 years on the prevalence rates among 16 and 17 year old students in Amsterdam, and buying behaviour among current cannabis users of all ages. Methods A school survey, held several times between 1993 and 2007, with a total of 908 respondents 16-17 years, and 792 current cannabis users was used. Findings After 1997, a downward trend can be seen in cannabis use prevalence rates. When looking at prevalence rates per subgroup (sex, ethnicity, educational level), different developments in prevalence rates could be seen. Data analyses including multivariate logistic regression analyses showed that changes in population were more important in explaining this downward trend than the change in policy. Buying behaviour shifted from coffee shops to other sources. Conclusions A downward trend in prevalence rates for cannabis use among students can be seen after raising the minimum age for coffee shops. Changes in ethnic composition of the population are more strongly associated with declining prevalence rates than raising the minimum age.

5.1 Introduction

Internationally, markets for psychoactive substances exist both as legal and illegal. Legal markets have their own possibilities for regulation, of which price, minimum age, and laws on advertisement are just a few examples. The Netherlands has a unique situation; although cannabis is illegal, there is a retail market where several forms of regulation are imposed, among which a minimum age. The cafe-like places where the sale of cannabis to consumers is allowed under certain conditions are known as ‘coffee shops’. During the 1980s coffee shops took over the Dutch cannabis market, and several national criteria were introduced to direct the sale appropriately. These criteria were: no advertisement, no hard drugs, no nuisance and no youth under minimum age. Originally, 16 years was the minimum age to be allowed in coffee shops. In 1996, after ongoing discussions about the increasing percentage of under-aged cannabis users, the minimum age for coffee shop visitors was raised from 16 to 18 years. It became forbidden to persons under 18 years to buy cannabis; if the police find minors in a coffee shop, it will be closed (Van Laar & Van Ooyen-Houben, 2009). The aim was to diminish the number of minors that use cannabis. And by increasing the age of initiation, the Dutch government also aimed at reducing the risk of youth starting to use cannabis at a young age.

In many countries it is forbidden for young people under the age of 16, 18 or 21 to buy alcohol. In a review article considering the literature from 1960 to 2000, Wagenaar & Toomey (2002) discuss 241 studies on the effects of minimum drinking age laws. A significant inverse relationship was found between the minimum drinking age and alcohol consumption. Wolfson & Hourigan (1997) discuss the consequences of raising the age limit for alcohol use. The figures for arrest rates for alcohol possession among 18-21 year olds show an increase after the age limit was raised to 21 years in almost all of the USA. Overall, one can conclude that raising the minimum legal drinking age does reduce alcohol consumption among youth. However, young people are still able to acquire alcohol (Willner & Hart, 2001). These findings for alcohol might be generalizable to cannabis, which would imply that raising the minimum legal age would lead to lower prevalence rates among youth and – for those youth that do use cannabis – to a shift in buying behaviour among youth.
To investigate whether this is true, we will address the following questions: 1) Are trends in prevalence rates of cannabis use for 16 and 17 year olds related to raising the minimum age, and do other factors play a role? 2) Did the location of cannabis purchase change after raising the minimum age for coffee shops? These questions will be addressed using data from Amsterdam ‘Antenna’; an annual monitor which keeps track of trends and patterns in substance use amongst adolescents and young adults in Amsterdam since 1993. Part of this monitor is an annual survey with an alternating group of young people each year. Only data from the school surveys are used. The current study is in part a reproduction of an earlier study by Korf et al. (2001), in which the effects of raising the minimum age were studied using data from the same survey. They concluded that after controlling for several confounder variables (e.g. sex and ethnicity), the use of cannabis among minors had stabilised after an initial increase between 1992 and 1999. The minors less often bought from coffee shops. However, at the time of this earlier study the long-term effects of the change in policy were not yet clear since only limited time had passed.

The choice of using data from Amsterdam is in part a pragmatic one; there are no national data sets available of 16 and 17 year olds that have such an extensive time-series and that have used the same sampling method over the years. Also, some Dutch municipalities already applied an age limit of 18 before 1996 while Amsterdam did not, which complicates interpreting national data. Amsterdam gradually implemented the minimum age of 16 during the course of 1996. Although there are no official sources, it can be assumed the minimum age was fully implemented during 1997. Using data from Amsterdam only admittedly leads to a limited generalizability of our study; however, in our opinion it is the best available option. First, prevalence rates among 16 and 17 year old students will be studied. Since the age was raised from 16 to 18, this group is expected to show the most marked changes. Because demographic characteristics might have influenced the prevalence rates, we will then study the prevalence rates for different subgroups. Finally, purchasing behaviour will be studied.

5.2 Method

5.2.1 Sample
Data for this research are from the school survey of the Antenna study. This survey, using the standardized ESPAD questionnaire as a general framework, was held in 1993, 1995, 1997, 1999, 2002 and 2007. A multi-stage sampling design was used to provide a representative cross-section of secondary school youth of Amsterdam. The secondary school enrolment ratio is about 90% in the Netherlands. First, a random sample of schools was drawn, stratified by educational level and geographical spread. The number of schools per year varied from 11 to 14 schools. Within schools, classes were selected from available educational levels and grades. The number of classes selected depended on the total number of students for that geographical area, educational level and grade in the population. Within the selected classes all students were asked to fill out a questionnaire. A weighting procedure was applied by comparing the sample distributions and known population distributions of educational

---

level, sex and grade of the corresponding year, thus sample characteristics reflect the total school population.

When looking at prevalence of cannabis use, we use a selection of 16 and 17 year olds from all years (n=908). For our analyses of buying behaviour we use aggregate data from all students that have used cannabis in the past month (n=792), since the data on buying behaviour are no longer available for the sub selection of 16 and 17 year olds before 1997. The proportion of 16 and 17 year olds among current users was more or less stable over the years.

5.2.2 Data collection
The surveys were administered in class by university staff, in an exam-situation that guaranteed anonymity of the respondents, and reduced the risk of influence by other students through interaction. The surveys were distributed during subjects of the core curriculum (which all students of the school should attend), hereby avoiding selection of subgroups of students. The response rates are generally high, with around 90% of students participating.

5.2.3 Measures
Cannabis use items were recalculated to indicate last year and last month prevalence. Sex was asked. Ethnicity was measured using the standardized procedure in the Netherlands (i.e. 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). Educational level was dichotomized into lower (vmbo, which is lower vocational) and higher (havo and vwo, which is higher vocational and pre-university) level of education. These two higher levels of education (havo and vwo) are often combined in schools, therefore it makes sense use them as one category.

Buying behaviour was measured in two ways. First, respondents who had used cannabis in the last month were asked whether they bought their own cannabis, got it for free or procured it in another way (for example both getting it for free and buying, growing their own). In 2007 this question was asked somewhat differently, with the option “I let others buy it for me” asked separately. Last month cannabis users were asked where they acquired their cannabis (from friends, in a coffee shop, in a café or disco, in the streets, at school, or ‘other’).

5.2.4 Analysis
Students from the same class were drawn as a cluster. A cluster sample will not affect point estimates, such as prevalence rates and hazard rates, but it does affect variance-related estimates, such as sample errors, 95% confidence intervals and p-values (Monshouwer et al., 2005). In addition weights had been applied. For these reasons, we used a conservative significance level (p<.01).

Because we wanted to explore the influence of the change in minimum age on prevalence of cannabis use, we chose to perform a logistic regression analysis. Last year and last month cannabis use were chosen as dependent variables, while the year of the survey was chosen as a measure of the change in minimum age. Stepwise multivariate logistic regression analyses with forward elimination
of variables were conducted. As confounder variables, sex, ethnicity and educational level were introduced. The interaction between ethnicity and educational level was included because the majority of non-western students follow lower level education. All analyses were conducted with SPSS 17.0.

5.3 Results

5.3.1 Sample characteristics
Of the total group of 16 and 17 year olds, half was female (see table 1). One third was following lower education at the time of the survey. Almost half was of non-western ethnicity. Their mean age was 16.6 (sd=0.3) years.

The gender distribution was stable over the years. The percentage of non-western students increased until 1999, after which it stabilized. The educational level among the 16 and 17 year old students increased over the years. Since it is known from a previous study that non-western students in Amsterdam use less cannabis than western students (Korf, Nabben & Benschop, 2003), and that students in higher educational levels use less cannabis (Nabben, Benschop & Korf, 2008), it can be expected that these changes in the population affect prevalence rates. If there are shifts in the size of a subgroup, this might influence the prevalence rates for the total group, while the prevalence rates for the subgroups remain the same.

Table 1. Demographic characteristics 16 and 17 year olds (weighed)(%)

<table>
<thead>
<tr>
<th></th>
<th>1993</th>
<th>1995</th>
<th>1997</th>
<th>1999</th>
<th>2002</th>
<th>2007</th>
<th>Total</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex (n)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>127</td>
<td>123</td>
<td>187</td>
<td>139</td>
<td>213</td>
<td>113</td>
<td>902</td>
<td>n.s.</td>
</tr>
<tr>
<td>Female</td>
<td>53.5</td>
<td>48.8</td>
<td>44.9</td>
<td>51.1</td>
<td>51.2</td>
<td>48.7</td>
<td>50.4</td>
<td></td>
</tr>
<tr>
<td>Ethnicity (n)</td>
<td>119</td>
<td>104</td>
<td>188</td>
<td>141</td>
<td>214</td>
<td>113</td>
<td>879</td>
<td>.000</td>
</tr>
<tr>
<td>Western</td>
<td>66.4</td>
<td>63.5</td>
<td>54.3</td>
<td>39.7</td>
<td>45.3</td>
<td>47.8</td>
<td>51.6</td>
<td></td>
</tr>
<tr>
<td>Non-western</td>
<td>33.6</td>
<td>36.5</td>
<td>45.7</td>
<td>60.3</td>
<td>54.7</td>
<td>52.2</td>
<td>48.4</td>
<td></td>
</tr>
<tr>
<td>Education (n)</td>
<td>127</td>
<td>122</td>
<td>190</td>
<td>141</td>
<td>215</td>
<td>113</td>
<td>908</td>
<td>.000</td>
</tr>
<tr>
<td>Lower</td>
<td>58.3</td>
<td>46.7</td>
<td>33.2</td>
<td>35.5</td>
<td>28.4</td>
<td>23.0</td>
<td>36.5</td>
<td></td>
</tr>
<tr>
<td>Higher</td>
<td>41.7</td>
<td>53.3</td>
<td>66.8</td>
<td>64.5</td>
<td>71.6</td>
<td>77.0</td>
<td>63.5</td>
<td></td>
</tr>
<tr>
<td>Age (n)</td>
<td>127</td>
<td>123</td>
<td>190</td>
<td>141</td>
<td>214</td>
<td>113</td>
<td>908</td>
<td>.000</td>
</tr>
<tr>
<td>Mean (SD)</td>
<td>16.92 (n/a)</td>
<td>16.92 (n/a)</td>
<td>16.47 (.33)</td>
<td>16.51 (.30)</td>
<td>16.46 (.29)</td>
<td>16.47 (.30)</td>
<td>16.60 (.33)</td>
<td>.000</td>
</tr>
<tr>
<td>Total</td>
<td>127</td>
<td>123</td>
<td>190</td>
<td>141</td>
<td>214</td>
<td>113</td>
<td>908</td>
<td></td>
</tr>
</tbody>
</table>

5.3.2 Prevalence rates
Of all 16 and 17 year olds, 33.4% used cannabis in the past year and 20.8% in the past month. Last year cannabis use prevalence shows a steady decline over the years (figure 1). Last month prevalence has peaked between 1997 and 2002, after which it shows a rapid decrease. If each year is compared to the previous year, only the decrease in 2007 for last month use is significant.
5.3.3 Changes in population characteristics

Ethnicity of the students changed from one third (33.6%) of students being of non-western ethnicity in 1993 to 52.2% in 2007. In addition, in 1993 almost two thirds followed a lower education (58.3%), in 2007 this had declined to 23%.

What impact will these changes in the sample (and population) have on the prevalence rates? Girls usually have lower prevalence rates than boys. However, the lower prevalence rates among girls will not have an influence on the changes over time, because the percentage of girls has remained stable over the years. What is interesting, is the narrowing gender gap (Van Laar et al., 2011), which can lead to higher total prevalence rates while the percentages of girls are stable.

The ethnic groups that have increased in size most in the past decade in Amsterdam can be expected to have lower drug use prevalence rates than western students, because they often are Muslim youth (Moroccan and Turkish) who structurally show lower prevalence rates for alcohol and drugs (Korf et al., 2003). Therefore, an increase in the percentage of Muslim youth can result in lower prevalence rates.

In general surveys of school youth, cannabis use prevalence does not differ according to educational level (Van Laar et al., 2011). However, in Amsterdam students following lower education often show lower prevalence rates (Nabben et al., 2008).

The next step is to examine the prevalence rates for the subgroups separately, to see how these developed over time.

5.3.4 Prevalence rates per subgroup

Sex

If boys and girls are compared, different patterns appear; girls show an increase in last year prevalence of cannabis use until 1997, after which it declines (figure 2). However, in 2007 last year cannabis use shows a steep increase again, while last month prevalence actually declines even further (fig-
ure 3). Among boys an increase until 2002 can be seen, after which a sharp decrease is apparent among both prevalence measures. When each year is compared to the previous, the only significant change is the sharp decrease among boys in last month use between 2002 and 2007.

**Ethnicity**

Western students show a peak in cannabis use in 1997, after which both prevalence measures decrease but last month use shows a sharper decline than last year use (figure 4 & 5). The difference in last year prevalence is significant between 1995 and 1997, while other years do not show significant changes.

Non-western students show an increase in last year and last month prevalence until 1999. After that, both last year and last month prevalence decrease, of which the decrease in last month prevalence is steep. Among non-western students, there was a significant increase between 1997 and 1999, followed by a significant decrease between 2002 and 2007.
Educational level
Students following a lower education show a peak in the prevalence of both last year and last month use in 2002, followed by a sharp decline in 2007, which is significant (figure 6 & 7). Those following a higher education show a relatively steady decline since 1997, although in 2007 last year prevalence showed a slight significant increase. Other differences were not significant.

5.3.5 Conclusion
On face value, it seems that after 1997, last year and last month prevalence show a steady decline for the total group. When significance is taken into account, only the decline of last month use between 2007 and 1997 is significant. Furthermore, when the prevalence rates are studied for several subgroups separately, some of these show this decline after 1997, however, many subgroups show a peak at a later year, either instead of, or in addition to a peak in 1997.
One thing that becomes clear is that the different subgroups show different patterns. It seems that changes in the population influence prevalence rates of cannabis use. To determine the extent in which the raising of the minimum legal age for coffee shops has influenced cannabis use prevalence rates, a logistic regression was performed in which demographic characteristics are controlled for.

5.3.6 Logistic regression
The logistic regression analyses show that for last year and last month use, ethnicity is the strongest predictor (table 2). Being of western ethnicity increases the chance for last year cannabis use by 5.4 times, and for last month 4.2 times. Sex was the second most important predictor, being a boy increased chances for last year cannabis use by 2.0 times and for last month use by 3.2 times. For last month use we see that compared to 1997, 2007 levels of last month use are 3.1 times lower. For the
other years this does not seem to hold true. Educational level has no influence.
For last year cannabis use, raising the minimum age seems to not have had any effect after controlling for ethnicity and sex. For last month use, only the last year (2007) seems to show a decline after controlling for the changes in population characteristics.
From these analyses we can conclude that the changes in the ethnic composition of the student population in Amsterdam are most strongly associated with changes in prevalence rates, while the change in minimum legal age for coffee shops is less strongly associated than ethnicity and sex.

Table 2. Multivariate logistic regression analyses cannabis use

<table>
<thead>
<tr>
<th></th>
<th>Last year cannabis use</th>
<th>Last month cannabis use</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cox &amp; Schnell R²: .106</td>
<td>Cox &amp; Schnell R²: .102</td>
</tr>
<tr>
<td></td>
<td>Nagelkerke R²: .147, n=935</td>
<td>Nagelkerke R²: .160, n=930</td>
</tr>
<tr>
<td>B</td>
<td>OR</td>
<td>95% CI</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Girl</td>
<td>-.704</td>
<td>.495</td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-western</td>
<td>-1.680</td>
<td>.186</td>
</tr>
<tr>
<td>Educational level</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Higher</td>
<td>-.415</td>
<td>.660</td>
</tr>
<tr>
<td>Year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1993 vs 1997</td>
<td>-.517</td>
<td>.596</td>
</tr>
<tr>
<td>1995 vs 1997</td>
<td>-.423</td>
<td>.655</td>
</tr>
<tr>
<td>2002 vs 1997</td>
<td>-.106</td>
<td>.899</td>
</tr>
<tr>
<td>2007 vs 1997</td>
<td>-.428</td>
<td>.652</td>
</tr>
<tr>
<td>Ethnicity * educational level</td>
<td>.675</td>
<td>1.964</td>
</tr>
</tbody>
</table>

5.3.7 Buying behaviour
It is to be expected that cannabis users who are under the minimum age for coffee shops acquire their cannabis through other channels. Studies conducted after the 1996 policy change show that cannabis users under 18 years, more often than adults, acquire their supply through friends and relatives rather than from coffee shops (Abraham, Kaal & Cohen, 2002; Korf et al., 2005; Monshouwer et al., 2004). We will now explore whether buying behaviour changed in Amsterdam after the raising of the minimum age. As stated in the method section, we were not able to use a sub selection of 16 and 17 year olds for the data concerning buying behaviour, but we will look at the total group.

Contrary to what one would expect, the percentage of last month users that indicates they buy their own cannabis has increased slightly after 1997 (table 3). Because the percentage of cannabis users has declined, the total number of secondary school pupils actually buying cannabis is smaller. When looking at where respondents get their cannabis, there seems to be a steady decline when it concerns getting from coffee shops, although around half of the cannabis users still usually acquire their cannabis there after the policy change (table 4).
5.4 Discussion

After 1997, a downward trend can be seen in cannabis use prevalence rates among 16 and 17 year olds in Amsterdam. The changes in population characteristics are more strongly associated with this decrease than the change in policy. Buying behaviour changed as well, but in an opposite direction than what one would expect. The proportion of user buying their cannabis (instead of getting it for free) increased. There was however a shift from buying in coffee shops to buying at ‘other’ sources, including illegal dealers. The absolute number of buyers decreased, since the total group of users has grown smaller. This perhaps resulted in a different type of user – those school youths that kept using after raising of the minimum legal age might have more tendencies towards risk-taking behaviour, among which buying at illegal dealers.

Despite a lack of statistical association between policy and prevalence, there was a steady decrease. When we look at the very diverse trends among the different subgroups, it is less likely the change in policy was the main cause. However, this downward trend is different from that in Europe in general, where an upward trend can be seen from 1995 to 2002, after which cannabis use prevalence rates stabilised (Hibell et al., 2012). Since the downward trend in the Netherlands is different from trends in other countries, it could be the result of raising the minimum legal age. This argues for a causal relationship between cannabis policy and cannabis use.

In this article, we used data from Amsterdam. The developments among school youth in this relatively large city are somewhat different from other cities in the Netherlands. Firstly, because the population characteristics are different. The percentage of ethnic youth increased much more compared to smaller cities. Also, population in urban areas is known to use cannabis more often (Van Laar et al., 2011). Thirdly, Amsterdam has a very high number of coffee shops which might influence the effect of raising the age limit.

From this and other studies we know that individuals that start using cannabis often do not buy can-
nabis themselves. Young cannabis users often get cannabis from friends (Abraham et al., 2002; Korf et al., 2003; Ogilvie, Gruer & Haw, 2005). From this, raising the age limit having little effect on prevalence rates is logical. Surprisingly, the percentage of cannabis users that bought their own cannabis did not decrease. However, they did buy from coffee shops less often than before. Apparently the policy change did not influence the extent to which minors buy cannabis, but it is likely it changed the sources from which they buy it.

From this study one cannot tell whether raising the age limit has had effect on the frequency with which minors use cannabis, or on the amounts that they use. Not having a legal source of cannabis might limit the cannabis intake.

Ideally, other types of data should be used to assess the influence of the change in minimum age for coffee shops; however, these were not available. The current data have shortcomings, among which the limited possibility to test the causality of the associations due to the methods used. Data from this study were collected in Amsterdam only, which is not representative of the rest of the Netherlands. Students that were absent because of illness, truancy or other reasons, did not complete a questionnaire. However, this risk is the same for all years, and therefore would not influence the developments over time. In 1993 and 1995 the measure for ethnicity differed from other years, students were asked for their subjective ethnicity. However, there are no reasons to assume the percentage of non-western students would have been different had it been determined as in later years.

In addition, the sharp increase of non-western students between 1990-1995 was seen in the entire Netherlands (Beker & Maas, 1998).

It remains somewhat unclear what respondents mean when they say they acquire cannabis at coffee shops. In earlier years, they might have meant that they let others buy cannabis for them at coffee shops. However, in 2007 this option was asked separately in that question, still resulting in a third of cannabis buyers that get from coffee shops. During police checks, underage youth is hardly ever found in coffee shops, and during surveys in coffee shops only very seldom respondents are underage.

The current study may underestimate the “true” effect of the policy change, since there may have been simultaneous changes that could affect cannabis consumption in the opposite direction, such as increased prosperity, more leisure time, or an increased perceived availability of cannabis among youth in the Netherlands.

As a general prevention measure raising the minimum legal age might have worked to a certain extent. However, when concerning targeted prevention, the measure may have contradictory effects. There is a substantial group of 16 and 17 year olds that still use cannabis, and that buy their own cannabis. They partially buy cannabis through illegal channels, thus experiencing marginalization.

In the future, it would be good to have more studies on the causal relation between the cannabis policy and cannabis use. In addition, studies into the consequences of changes in population characteristics and prevalence rates would be helpful in understanding changes in prevalence rates over time.
Acknowledgments
The authors would like to express their appreciation for the many years of data collection by the Jellinek Prevention team, and Jaap Jamin in particular. Also, we would like to thank Craig Reinarman and Patricia Erickson for their help and advice in the process of writing this article.