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# CANNABIS CONSUMERS IN POLAND

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**Abstract**

The purpose of this study is an attempt to answer the following questions: (1) Is there a regional differentiation of cannabis consumers in Poland? (2) What is the scale of this differentiation? (3) What factors affect this differentiation? Our empirical study is based on the analysis of an anonymous online survey. The coefficient of variation, taxonomic measures of similarity, synthetic index and Spearman correlation coefficient are used in the analysis. It is observed that cannabis consumption in Poland is most popular among men, youth and young adults (Generation Y), as well as among those who are well-educated, relatively well-off and live in cities. The structure of selected demographic and socio-economic features of the respondents is poorly differentiated regionally. Regional differentiation in the structure of cannabis consumption frequency is at an average level. The spatial distribution of features characterizing the respondents is highly consistent with the spatial distribution of city dwellers aged 15–44, their sex and 5-year age ranges, the level of education, the size of cities and the level of gross domestic product.

## 1. Introduction

Nowadays, consumption of various psychoactive substances has become a mass phenomenon (Motyka, Marcinkowski, 2014). Among them, cannabis[1] is one of the most popular in the world. It belongs to the so-called "soft" drugs. In the EU countries, slightly more than a quarter (27.4%) of their residents aged 15–64 (i.e. 91.2 million) declared that they consumed cannabis at least once in their lifetime and 24.7 million of them (7.4%) used cannabis in the last year (EMCDDA, 2019). The global population of cannabis consumers is estimated to be over 180 million, amounting to 3.8% of the world's population (UNODC, 2016). In Poland, the scale of cannabis-based products consumption is close to the European average and this consumption is highest among youth and young adults. 16.3% of Polish residents aged 15-64 admit to using cannabis at least once in their lifetime, 4.6% during the preceding year (i.e. just over

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[1] Throughout this study, the term "cannabis" is used to describe all psychoactive products obtained from *Cannabis indica*, such as marijuana and hashish.

1.5 million people) and 2.1% during the preceding month (Sierosławski et al., 2015).

Illegal drug trafficking, together with international organized crime, accounted for 1.5% of all money circulating within the global financial system (UNODC, 2011). The US legal marijuana market reached a value of USD 6.7 billion in sales in 2016 and the sale of USD 22 billion is predicted in 2020 (Kang et al., 2016). In Europe the lowest value of the drug market was estimated to be of EUR 24 billion in 2013, with the share of cannabis accounting for about 38% of the total drug market (EUR 9.3 billion but other probable estimates fall in a range from EUR 8.4 to 12.9 billion (EMCDDA, 2016, 2018)). Expenses for the treatment of drug-related damage to health in the European countries have in recent years ranged from 0.01% to 0.5% of gross domestic product (GDP), with about half of these estimates being in a range between 0.05% and 0.2% of GDP. Cannabis consumption, both global and in Europe, showed a steady, increasing trend in the period from 1990 to 2009 (EMCDDA, 2016, 2018, 2019). After this period, cannabis consumption was stabilized and even it declined in certain countries for a short time but recently it increased again. The current level of cannabis consumption is still high compared to that observed 10 or 15 years ago (Griffiths et al., 2018). Cannabis consumption in Poland essentially corresponds to the average level reported for the EU countries.

Until recently, the production, distribution and use of cannabis were illegal in all countries of the world, with the penalties of imprisonment. However, many countries have lately commuted the penalties for the possession and use of cannabis, under social pressure. Furthermore, the sale and consumption of cannabis is permitted under controlled conditions in several countries, e.g. the Netherlands (in the so-called coffe shops), the Czech Republic, Portugal, Mexico, Uruguay, Canada (from October 2018), as well as in many states of the US (Mróz, 2012). In Poland, as in many other countries of the world, there is growing social pressure to legalize cannabis consumption. This social pressure manifests itself in social movements to legalize cannabis (e.g. Cannabis Liberation Marches), in the increasing social tolerance for the use of cannabis, sale offers on the Internet, downplaying the harmfulness of cannabis consumption by the press and some public figures, etc. (Motyka, Marcinkowski, 2014). In Poland the purchase of cannabis for medical purposes was legally permitted in 2017 and the first deliveries appeared in pharmacies at the beginning of 2019.

The aim of this study is to answer the following questions: (1) Is there a regional differentiation of cannabis consumers in Poland (in terms of who is a cannabis consumer, how often such a person consumes it and where the consumer lives)? (2) What is the scale (or size) of this differentiation? (3) What variables (or factors) affect this differentiation?

## 2. Review of the literature

The production, sale and consumption of drugs, including cannabis, and the consequences of their use are an important social, medical, legal, criminological and moral problem in the modern world. It is of interest to many scientific disciplines: psychology, sociology, pedagogy, medicine, law, etc. Numerous reports have been published for many years by international and national institutions, non-governmental organizations (NGOs), universities and research centers, e.g. United Nations Office on Drugs and Crime (UNODC), European Monitoring Centre for Drugs and Drug Addiction (EMCDDA), European School Survey Project on Alcohol and Other Drugs (ESPAD), the National Bureau for Drug Prevention in Poland, the Information Center for Drugs and Drug Addiction being the national EMCDDA contact point in Poland, Polish Centre for Public Opinion Research (commonly known as CBOS), to mention only a few most important in the world and in Poland. Specialized journals dealing with drugs and drug consumption are available, e.g. the international "Journal of Drug Issues", "International Journal of Drug Policy" or the Polish "Alcoholism and Drug Addiction". The current research on drugs concerns (1) the situation on the drug market and the distribution of drugs, (2) patterns and effects of drug use, (3) the identification of factors determining consumption, (4) the health, legal and other risks of drug use, (5) various actions to reduce the consumption of drugs (development of appropriate social and legal policies), (6) the loss reduction model (Jędrzejko, 2011). Methodological issues in the research on drugs were also raised in many publications reported by UNODC, EMCDDA and ESPAD.

To the best of our knowledge, no broader geographical studies of drug issues have been carried out so far despite the fact that cannabis consumption has an important geographical aspect (Taylor et al., 2013; Richardson, 2008). This aspect includes the different levels of cannabis consumption in various countries and the identification and detailed knowledge of factors determining these levels. Within individual countries, cannabis consumption also shows interregional differences for which determining factors, such as socio-economic and cultural conditions, should be recognized. The progress in

the legalization of cannabis consumption for recreational purposes in Europe (the Netherlands, the Czech Republic, Portugal) and in Americas (Canada, the US, Uruguay) poses new research challenges for geography (Taylor et al., 2013; Morrison et al., 2014). These require further studies on the spatial effects of cannabis consumption (levels of consumption, subjective experiences with consumption, etc.), which in turn is associated with undertaking more extensive research into the problem of production (new producers, increase in tetrahydrocannabinol (THC) content, synthetic cannabinoids, etc.), distribution and sale (the role of Darknet, drug trafficking, etc.) and changes in national and international policies towards cannabis. Today, the consumption of cannabis for recreational purposes is related to mass culture, tourism, social practices and the socio-economic development of countries and regions. These relations can be explained to a great extent by geographical analyses.

The assessment of the number, structure and distribution of cannabis consumers is difficult. It is most often based on field observations, surveys, questionnaire interviews, police and court statistics, and on the results of the chemical determination of narcotic substances (mainly amphetamines) in municipal wastewater (Kłos et al., 2010; Ort et al., 2014). These methods have their own limitations. Surveys and questionnaire interviews are important tools in recognizing patterns and trends in drug consumption but they face the problem of representativeness. Police and court statistics include only reports of drug-related crimes and convictions, respectively. The results obtained from the chemical determination of narcotic substances in municipal wastewater are unbiased yet underestimated and difficult to make unambiguous comparisons (Griffiths et al., 2018). It seems that, if possible, combining the aforementioned methods (that is, triangulation) is a good approach to analyzing and assessing the problem of drug consumption.

Existing empirical, survey studies of cannabis consumers (EMCDDA, 2016, 2018; Griffiths et al., 2018; Czapiński, Panek (eds.), 2016; Malczewski et al. (eds.), 2015; Wieczorek et al., 2018) indicate the following determining factors:

1. Sex and age. Men are more likely to be cannabis consumers than women are. The ratio of male cannabis users to female ones varies however between countries significantly, e.g. 6.4:1 in Portugal and 1.4:1 in Austria. Cannabis consumption is most popular among adolescents and young adults (15- to 34-year-old), with the highest level of consumption for the age category between 15 and 24 years old. The awareness of health risks resulting from cannabis consumption increases with age.
2. Place of residence. Cities, especially large metropolises, create conditions that are favorable to cannabis consumption.
3. Direct neighborhood with a country that legalized cannabis consumption. Growing interest in traveling (especially in borderlands) to purchase and consume cannabis is noticeable in Poland, France, Germany and the US.
4. Higher levels of education and income also have a significant impact on the level of cannabis consumption.

## 3. Data and methods

Empirical research was carried out using an anonymous online survey. It concerned Polish citizens whose tourist travels were motivated by their desire to consume cannabis. The survey was carried out in March 2016. The analysis of the survey was restricted to the respondents being Polish citizens who lived in the country at that time (excluding those staying abroad then) and who already had some experience in cannabis consumption (they were consumers at that time and/or before). In consequence, 886 respondents fulfilled these criteria. Data from the respondents' particulars (sex, age, level of education, source of income, place of residence) and answers to the question about the frequency of cannabis consumption in the country were analyzed in detail. This analysis allowed us to characterize the level of regional differentiation of consumers and the frequency of cannabis consumption in Poland in terms of the sex, age, level of education, source of income and place of residence of the respondents.

We are aware that there are some methodological issues associated with the survey. First, the survey was carried out in 2016. This year was one of the declining years of particular interest in cannabis in Poland. It was the time of intense media discussions, the development of social movements to legalize cannabis consumption and the widening social liberalization of its use despite the restrictive law, hence the great interest in the survey among cannabis-consuming Polish citizens. It seems that repeating this survey on such a large scale is currently much more difficult than it was in 2016, which in retrospect should be recognized as an advantage of the survey. Second, the survey was addressed to a group of volunteers (spontaneous selection) who completed an online survey. The survey covered a large group of volunteers recruited through various social media, websites and discussion groups

on the Internet. It was ensured that the subject of the survey was interesting for potential respondents who were also convinced that this subject directly concerned them and the results of the survey might contribute to influencing public opinion. The survey was relatively short, composed of nine main questions. Third, the subject of the survey actually concerned significantly broader issues than those presented here. The aim of the survey was in fact to answer to what extent the possibility of cannabis consumption had an impact on participation in tourist trips and their nature. Therefore, the conclusions drawn on its basis should be interpreted with some caution. In the context of the increasing liberalization of cannabis consumption for medical and recreational purposes, the aforementioned question becomes an important cognitive problem for socio-economic geography. This problem still requires broader and substantive recognition and a search for a valid research methodology.

The regional differentiation of the demographic, socio-economic and spatial structure of respondents declaring cannabis consumption and the frequency of cannabis consumption were analyzed using the coefficient of variation ($V$), various taxonomic measures of similarity ($d_{ik}$, $W_o$), a synthetic indicator ($x''_{kj}$), Spearman's rank correlation coefficient ($r_s$) and Kendall's coefficient of concordance ($r_k$). The formula defining $W_o$ was taken from (Rogacki, 2009) and the formulas for the remaining aforementioned quantities were from (Runge, 2006).

The $V$ coefficient was calculated according to the formula:

$$V = \frac{S}{\bar{x}} \cdot 100$$

where $S$ was a standard deviation and $\bar{x}$ denoted an arithmetic mean. The $V$ values were expressed in percentage points and they were interpreted as low (< 20%), medium (between 20% and 40%), high (between 40% and 100%) and very high (> 100%).

The "city block" distance ($d_{ik}$) between voivodeships $i$ and $k$ was defined by:

$$d_{ik} = \sum_{j=1}^{p} |y_{ij} - y_{kj}|$$

where $y_{ij}$ and $y_{kj}$ denoted the magnitude of feature $j$ for the $i$-th and $k$-th voivodeships ($i, k = 1, 2, \ldots 16$; $j = 1, 2, \ldots p$).

The structural difference indicator ($W_o$) was defined as:

$$W_o = \frac{1}{200} \sum_{i=1}^{n} |a_i - b_i|$$

where $a_i$ and $b_i$ were the shares of voivodeships $a$ and $b$ in a given group of cannabis consumption frequency. The $W_o$ values were normalized to fall in the range $0 < W_o < 1$. The lower limit meant identical structures. When $W_o$ grew, the difference between two structures became larger and larger.

The $x''_{kj}$ indicator was calculated according to the formula:

$$x''_{kj} = \frac{\sum_{j=1}^{m} x'_{kj}}{m}$$

where $x'_{kj}$ was the normalized $j$-th empirical indicator of the $k$-th form of concentration and $m$ was the number of features. $x'_{kj}$ was defined by:

$$x'_{kj} = \frac{x_{kj}}{\sum_{i=1}^{m} x_{ij}} \cdot 100$$

where $x_{kj}$ was the empirical value of the $j$-th indicator of the $k$-th form of concentration and $\sum_{i=1}^{m} x_{ij}$ was the overall magnitude of the $j$-th indicator.

The structure of was examined by which was calculated as:

$$x'''_{kj} = \frac{x'_{kj}}{\sum_{j=1}^{m} x'_{kj}} \cdot 100 \cdot$$

The values of $r_s$ and $r_k$ were computed from:

$$r_s = 1 - \frac{6\sum_{i=1}^{n} d_i^2}{n^3 - n}$$

$$r_k = \frac{12\sum_{i=1}^{n} R_i^2 - 3m^2 n(n+1)^2}{m^2 n(n^2 - 1)}$$

where $d_i$ was the difference between two ranks, $n$ was the number of voivodeships, $R_i$ was the sum of the ranks for $i$-th voivodeship and $m$ was the number of features.

## 4. Results

### 4.1. Characteristics of respondents declaring cannabis consumption

The respondents declaring cannabis consumption were characterized by a set of demographic, social, economic and spatial features. Generally,

they belonged to the so-called Generation Y, born between 1981 and 2001. Thus, they were between 15 and 34 years old at the time of conducting the survey. The respondents born in the 1970s in Poland (the so-called Generation X) were marginally represented in the survey, constituting 4.4% of all respondents. Within the respondents belonging to Generation Y, those aged 15–29 formed a dominating group, constituting 88.5% of all respondents. The respondents of this group demonstrated high openness to new products and innovations, and flexibility in relation to the high dynamics of changes in modern times. Therefore, this generation is particularly inclined towards experimenting with cannabis. The respondents represented mostly by Generation Y, and its central age range in particular, started education or were born after the political transformation of the year 1989. In that year Poland opened up to Western Europe and global modernization processes. This rapidly resulted in significant changes in the structure of stimulants consumption in the country. In addition to alcohol consumption (especially beer), experimentation with drugs and their frequent consumption appeared on a larger scale.

Table 1 presents the characteristics of respondents declaring cannabis consumption. It shows that men were definitely more numerous than women. The age structure of the respondents grouped according to their sex reveals several differences between the two groups. Among women, the younger ones, especially in the 20–24 age range, most often responded in the survey. The participation of older women in the survey was significantly smaller. Among men, the share of the age range 20–24 was lower and a decrease in the shares of older age ranges was slower than among women. The respondents were mainly characterized by higher levels of education. The vast majority of respondents graduated from secondary schools or universities. Among men, the share of secondary education was greater than that of university education. Conversely, the share of university education was greater among women. It should be assumed that due to the young age of the respondents, many of them will increase their education level in the future. The young age of respondents also indicates significant dependence on family for their livelihood. Financial independence was more often declared by men (nearly half) than women (one third). Over one third of women declared the complete dependence on family for their livelihood. On the other hand, the participation of combined sources of livelihood was equally declared by men and women. They were most often working and/or learning, having sufficient income (from work and family support) for a high level of consumption.

Tab. 1. Characteristics of respondents declaring cannabis consumption. All values are given in percentage points

| Items | Men | Women | Total |
|---|---|---|---|
| Sex | 72.6 | 27.4 | 100.0 |
| | | | |
| Age range: | | | |
| 15-19 | 23.4 | 22.9 | 23.2 |
| 20-24 | 45.3 | 54.2 | 47.7 |
| 25-29 | 19.4 | 12.8 | 17.6 |
| 30-34 | 6.9 | 7.2 | 7.0 |
| 35-39 | 3.6 | 2.4 | 3.3 |
| 40-44 | 1.4 | 0.4 | 1.1 |
| Total | 100.0 | 100.0 | 100.0 |
| | | | |
| Education: | | | |
| primary | 12.6 | 6.5 | 10.9 |
| vocational | 10.1 | 7.7 | 9.4 |
| secondary | 44.2 | 42.0 | 43.6 |
| BSc | 18.6 | 22.9 | 19.8 |
| MSc | 14.6 | 20.8 | 16.3 |
| Total | 100.0 | 100.0 | 100.0 |
| | | | |
| Livelihood: | | | |
| from work | 48.2 | 33.8 | 44.0 |
| from work and family support | 29.7 | 29.2 | 29.6 |
| family support | 22.0 | 36.9 | 26.4 |
| Total | 100.0 | 100.0 | 100.0 |
| | | | |
| Place of residence: | | | |
| City population (in thousands): | 96.6 | 97.8 | 96.7 |
| Up to 10 | 2.7 | 4.0 | 3.1 |
| 10–19.9 | 12.0 | 11.0 | 11.0 |
| 20–99.9 | 21.7 | 17.6 | 20.5 |
| 100–499.9 | 26.5 | 22.0 | 25.6 |
| 500 and over | 33.7 | 43.2 | 36.5 |
| Countryside | 3.4 | 2.2 | 3.3 |
| Total | 100.0 | 100.0 | 100.0 |

Source: Own study.

The respondents participating in the survey lived in all voivodeships of Poland. Each voivodeship was represented by an average of 53.1 respondents, with a standard deviation of 38.2 and a variation rate of 71.9%. The lowest numbers of respondents came from the sparsely populated voivodeships (Świętokrzyskie, Opolskie, Lubuskie) and the highest numbers were ascribed to the voivodeships with large populations and cities having over 0.5 million inhabitants (Dolnośląskie, Łódzkie, Małopolskie, Mazowieckie, Wielkopolskie) or highly urbanized

(Śląskie, Pomorskie), totalling nearly two third of all respondents. The respondents mainly lived in large cities, especially in those with more than 0.5 million inhabitants (Warsaw, Cracow, Łódź, Wrocław and Poznań – 36.5% of all respondents in total) and in other major cities (in the Śląskie Voivodeship, Szczecin, Gdańsk and others). All these cities are large, with well-developed services providing the best prospects for working, learning (large academic centers), entertainment (night life) and easy access to various stimulants (Matczak, Pawlicki, 2016). Few respondents came from small towns and rural areas.

## 4.2. Regional differentiation of the demographic and socio-economic structure of cannabis consumers

Men clearly dominated among the respondents in all voivodeships. The ratio of male to female cannabis consumers reached very high values in the following voivodeships: Świętokrzyskie (9:1), Podlaskie, Lubelskie, Pomorskie, Śląskie, and Zachodniopomorskie (3.5–5:1). In contrast, the Łódzkie, Opolskie, Warmińsko-Mazurskie and Dolnośląskie voivodeships demonstrated significantly lower values of this ratio (1.2–2:1). The inter-voivodeship diversity within given sex was small. The $V$ coefficient was 11.1 and 32.7% for men and women, respectively.

The age structure of respondents declaring cannabis consumption was clearly differentiated between voivodeships. Six five-year ranges were distinguished within the age from 15 to 44. The representatives of all these ranges lived in only eight of the most socio-economically developed and most urbanized voivodeships. On the other hand, the respondents from the first three age ranges (that is, 15–19, 20–24 and 25–29 years old) lived in all voivodeships. The respondents aged 20–24 were most numerous. Only in the Podkarpackie voivodeship the youngest consumers turned out to be most numerous. This group of respondents was more numerous than the respondents aged 25–29 in 10 voivodeships. There were no women among the respondents aged 15–19 and 25–29 in the Lubuskie and Świętokrzyskie voivodeships. Generally, the lower levels of socio-economic development and urbanization rate are presented by a voivodeship, the fewer respondents over 30 years old declared cannabis consumption, e.g. there were no respondents over 40 in Pomorskie, over 35 in Podlaskie and Świętokrzyskie and over 30 in Lubuskie. The calculated values of $V$ indicate that the inter-voivodeship diversity of individual age ranges was significantly higher than in the case of sex. This differentiation was lowest for young age ranges ($V$=17.2% for 20–24 years, 32.8% for 15–19, 41.3% for 25–29) and highest for older age ranges ($V$>70% for over 30 years old). In general, the value of $V$ became higher and higher as the age of respondents increased gradually.

The respondents having a secondary education predominated in most voivodeships. Higher education (both Bachelor's and Master's degrees) was most common among the respondents residing in the Łódzkie, Małopolskie and Mazowieckie voivodeships. The largest share of primary and vocational education occurred for those voivodeships in which the respondents aged 15–19 were numerous (Podkarpackie, Warmińsko-Mazurskie, Lubelskie, Śląskie and also Mazowieckie, Wielkopolskie, Lubuskie, Podlaskie). The $V$ coefficient was at a medium level. The regional differentiation of education level was much smaller among the respondents having a secondary education (15.5%) than among those having either university (38.5% for BSc and 48.3% for MSc) or primary (58.9%) or vocational (43.7%) education.

Respondents from almost all voivodeships mainly earned their livelihood from work. Only respondents from the Podkarpackie voivodeship indicated family support as the dominant source of income (46.2%). Respondents from the Kujawsko-Pomorskie and Świętokrzyskie voivodeships also declared a share of one third for the family support in the structure of their income sources. In the remaining voivodeships, the family support provided about 1/5–1/4 means of livelihood (except for the Zachodniopomorskie voivodeship where this share was only 13.3%). The mixed sources of income (both from work and family support) applied to over 40% of the respondents from the Lubelskie, Podlaskie and Warmińsko-Mazurskie voivodeships. In other voivodeships, the share of the mixed sources of income was around 1/4–1/3. The $V$ coefficient showed a relatively small variation between voivodeships in the source of income: 19.6% for work, 25.4% for mixed sources and 28% for family support.

The above analysis of spatial diversity in terms of demographic and socio-economic features enabled the division of voivodeships into groups. The so-called "city block" distance was chosen as the taxonomic measure of similarity between voivodeships. A matrix of such distances was calculated for all voivodeships. The smallest element was searched in each column (or row) of the matrix in order to identify the voivodeship that was most similar to all consecutive voivodeships in the 16-dimensional space of "city block" distances. The voivodeships were arranged in pairs, which were then combined into larger groups being first-order clusters.

As the result of the first-order clustering, three groups of voivodeships were obtained (fig. 1). The Łódzkie and Mazowieckie voivodeships were most
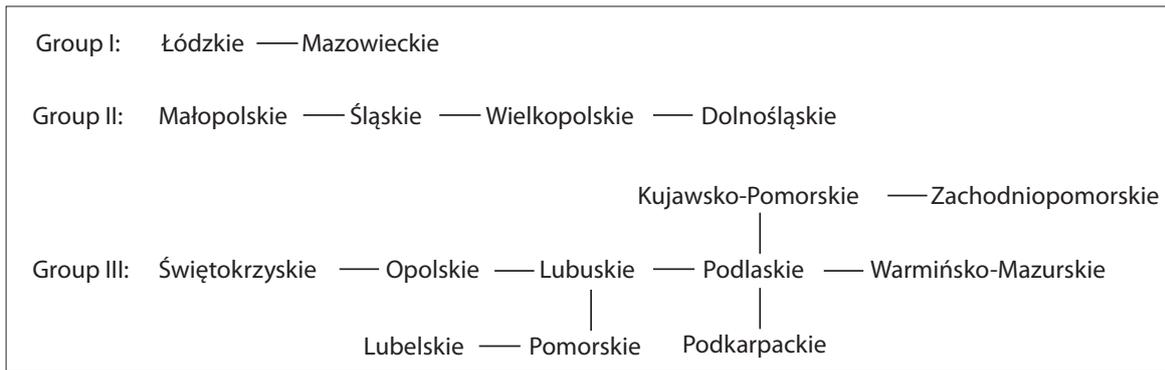
Fig. 1. Dendrite of voivodeships presenting the highest degree of similarity in the demographic and socio-economic features of cannabis consumers being their residents.
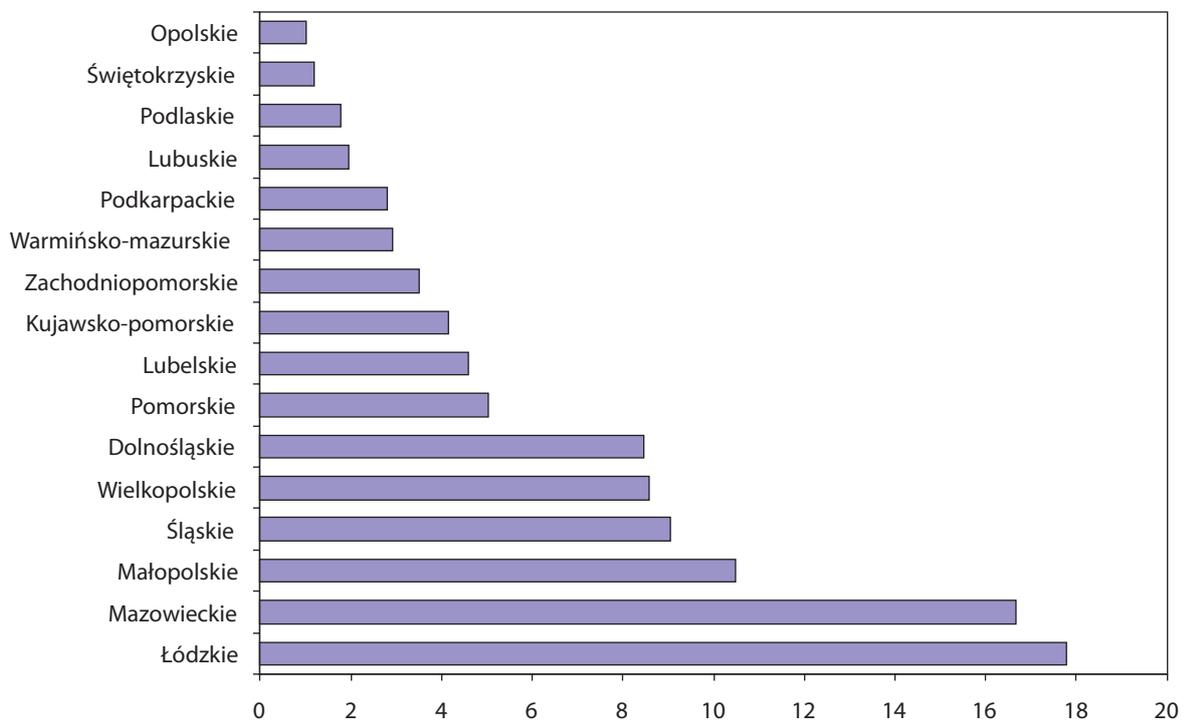
Source: Own study.



Fig. 2. Plot of the synthetic indicator in the demographic and socio-economic features of cannabis consumers residing in 16 voivodeships.

Source: Own study.

similar in terms of respondents' sex, age, level of education and source of income and simultaneously they were most different from other voivodeships. The second group consisted of four voivodeships: Śląskie, Wielkopolskie, Małopolskie and Dolnośląskie. The remaining 10 voivodeships formed a third group. The grouping scheme based on the "city block" distance was supported by a linear ordering scheme based on the synthetic indicator. The plot of the synthetic indicator for the demographic and socio-economic features of cannabis consumers residing in 16 voivodeships is presented in Figure 2. This figure confirms the division of voivodeships into three groups. The respondents living in the Łódzkie

(especially Łódź) and Mazowieckie (mainly Warsaw) voivodeships formed very similar communities in terms of sex, age, level of education and source of income. The two voivodeships differed in the higher shares of women and respondents having a higher education for Łódzkie and in the higher share of respondents over 34 years old for Mazowieckie. Both voivodeships showed the synthetic indicator between 16.7 and 17.8 points and these values were much greater than those of the second group of voivodeships: Małopolskie, Śląskie, Wielkopolskie and Dolnośląskie (8.5–10.5 points). These voivodeships had a highly similar demographic and socio-economic structure of their residents. Among the

voivodeships of the second group the Małopolskie voivodeship exhibited a slightly higher share of older respondents and those having a higher education, whereas the Śląskie voivodeship presented the highest share of the oldest respondents and those with lower levels of education. 10 remaining voivodeships belonged to the third group, with the synthetic indicator in the range from 1 to 5 points. These voivodeships exhibited similar demographic and socio-economic structures of respondents. However, some of them had larger shares of women (Opolskie, Warmińsko-Mazurskie), young respondents (Podkarpackie, Lubelskie, Opolskie, Podlaskie, Warmińsko-Mazurskie), the dependent on family support (Podkarpackie, Podlaskie) and respondents with lower levels of education (Podkarpackie).

## 4.3. Declared frequency of cannabis consumption

It is well established (EMCDDA, 2008) that the frequency of drug use can be expressed by three indicators:

Lifetime experience with drugs. This indicator determines the number (or share) of people who used drugs at least once in their lives. In our study this indicator includes the respondents who consumed cannabis very rarely, or several times in their lives or only in the past.

The recent use of drugs. This indicator expresses the number (or share) of people who used drugs within the last 12 months. In our study this indicator includes the respondents declaring occasional cannabis consumption.

The current use of drugs. This indicator determines the number (or share) of people who used drugs within the last 30 days. In our study this indicator includes the respondents who consumed cannabis often or even almost every day.

Table 2 presents the frequency of cannabis consumption by the respondents in relation to their sex, age, level of education, source of income and place of residence. As can be seen in this table, the current use of cannabis was declared by more than half of respondents (62.7%). 27.2% of the respondents stated that they consumed cannabis recently. 10.1% of the respondents regarded cannabis consumption as lifetime experience. Nearly one third of the respondents experimenting with cannabis use (i.e. 3.5% of all respondents declaring cannabis consumption) gave up consuming cannabis.

Men consumed cannabis three times more often than women did. This ratio was essentially retained among the current and recent cannabis users. On the other hand, experimentation with cannabis was equally attractive for men and women. In addition

to sex, the age of respondents was also a determining factor for the frequency of cannabis consumption. The current cannabis consumption decreased as the respondents got older. A similar yet less pronounced trend was observed among the recent cannabis users. However, the share of the experimenters increased with the age of the respondents. Similarly, the increasing level of education was associated with the decreased share of current consumption and with the increased shares of recent consumption and experimentation. The current cannabis users usually earned their livelihood from work and they less often were fully or partially dependent on the financial support of their families. Compared to the current consumers, the recent ones and the experimenters more often depended on families for their livelihood.

The frequency of cannabis consumption varied between voivodeships. The current cannabis users were most common in all voivodeships. The regional differentiation of current users was large, ranging from 48.4–48.6% (Kujawsko-Pomorskie, Łódzkie) to 80.7–77.8% (Świętokrzyskie, Warmińsko-Mazurskie). The $V$ coefficient was equal to 75.0%. The share of recent users showed larger differences between voivodeships; from 11.1% (Świętokrzyskie) to 42.9% (Łódzkie) for the $V$ coefficient of 69.7%. The share of experimenters fell in a range from 3.1% (Warmińsko-Mazurskie) to 28.9% (Łódzkie) for the $V$ coefficient of 90.9%. The $W_o$ indicator of cannabis consumption frequency between voivodeships indicated that the greatest similarity occurred between the Wielkopolskie voivodeship and Małopolskie (0.038), Dolnośląskie (0.048), Mazowieckie (0.081), Lubelskie (0.096) and between the Łódzkie voivodeship and Kujawsko-Pomorskie (0.063), Zachodniopomorskie (0.077). The most distinct structures of cannabis consumption frequency were detected for Warmińsko-Mazurskie, Świętokrzyskie, Podkarpackie, Podlaskie and also for Pomorskie, Łódzkie, Opolskie, and Lubuskie (the corresponding $W_o$ values were between 0.2 and 0.5). Based on the calculated $W_o$ values (see the upper triangle of tab. 2) the dendrite of similarities was generated (fig. 3).

## 4.4. Factors affecting the level of cannabis consumption

The above spatial distribution of cannabis consumers residing in individual voivodeships was compared with the spatial distribution of the number of either drug crimes or adults convicted on the basis of the Act on Counteracting Drug Addiction (Malczewski et al., 2015). A significant correlation between these distributions occurred. The $r_s$ coefficient between the spatial distribution of cannabis consumers and that

Tab. 2. Frequency of cannabis consumption declared in the survey. All values are given in percentage points

| Items | Frequency of cannabis consumption | | | |
|---|---|---|---|---|
| | Often or very often | Occasionally | Very rarely or a few times in life or only in the past | Total |
| Sex: | | | | |
| men | 46.0 | 20.9 | 5.7 | 72.6 |
| women | 16.7 | 6.3 | 4.4 | 27.4 |
| Total | 62.7 | 27.2 | 10.1 | 100.0 |
| | | | | |
| Age range: | | | | |
| 15-19 | 15.8 | 6.1 | 1.7 | 23.6 |
| 20-24 | 29.9 | 12.2 | 5.3 | 47.4 |
| 25-29 | 11.0 | 5.3 | 1.4 | 17.7 |
| 30-34 | 4.1 | 1.7 | 1.0 | 6.8 |
| 35-39 | 1.1 | 1.6 | 0.6 | 3.3 |
| 40-44 | 0.8 | 0.3 | 0.1 | 1.2 |
| Total | 62.7 | 27.2 | 10.1 | 100.0 |
| | | | | |
| Education: | | | | |
| primary | 6.7 | 4.0 | 0.5 | 11.2 |
| vocational | 6.3 | 2.7 | 0.6 | 9.6 |
| secondary | 29.4 | 11.7 | 3.1 | 44.2 |
| BSc | 12.5 | 4.1 | 2.9 | 19.5 |
| MSc | 7.8 | 4.7 | 3.0 | 15.5 |
| Total | 62.7 | 27.2 | 10.1 | 100.0 |
| | | | | |
| Livelihood: | | | | |
| from work | 30.7 | 8.9 | 4.5 | 44.1 |
| from work and family support | 17.1 | 10.1 | 2.6 | 29.8 |
| family support | 14.9 | 8.2 | 3.0 | 26.1 |
| Total | 62.7 | 27.2 | 10.1 | 100.0 |
| | | | | |
| Place of residence: | | | | |
| City population (in thousands): | | | | |
| Up to 10 | 2.0 | 0.7 | 0.4 | 3.1 |
| 10–19.9 | 6.6 | 3.2 | 1.2 | 11.0 |
| 20–99.9 | 14.1 | 4.7 | 1.7 | 20.5 |
| 100–499.9 | 15.4 | 7.1 | 3.1 | 25.6 |
| 500 and over | 22.9 | 10.4 | 3.2 | 36.5 |
| Countryside | 1.7 | 1.1 | 0.5 | 3.3 |
| Total | 62.7 | 27.2 | 10.1 | 100 |

Source: Own study.

of drug crimes amounted to 0.729. The $r_s$ value of 0.815 was found for the spatial distributions of cannabis consumers and drug-related convictions. Both $r_s$ values were statistically significant (the critical area of $r_s(0.025; 15) = 0.5179$). The total interdependence of the three spatial distributions was determined using the $r_k$ coefficient. The calculated value of $r_k$ was equal to 0.879 and it was statistically significant ($\chi^2_{calculated} = 39.555 > \chi^2_{tabular} = 24.996$). The agreement between the three spatial distributions clearly lent support to the reasonableness of our online survey.

Małopolskie

Group I:  Śląskie —— Dolnośląskie —— Wielkopolskie —— Lubelskie —— Podlaskie

Opolskie  Mazowieckie  Podkarpackie

Group II:  Lubuskie —— Zachodniopomorskie —— Łódzkie —— Kujawsko-Pomorskie

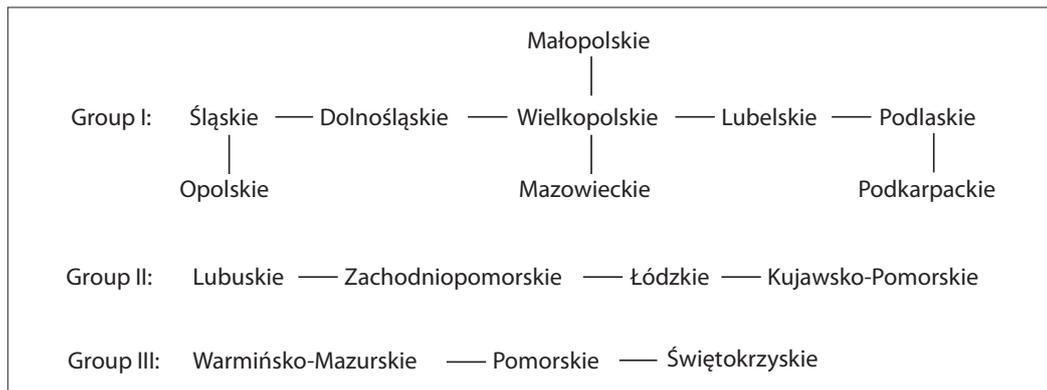Group III:  Warmińsko-Mazurskie —— Pomorskie —— Świętokrzyskie

Fig. 3. Dendrite of voivodeships presenting the high degree of similarity in their structures of cannabis consumption frequency

Source: Own study.

Both our results and the findings of previous studies indicate that cannabis consumption is a widespread phenomenon among men, youth and young adults and among the well-educated, relatively well-off and living in cities. Therefore, cannabis consumption can be regarded as an urban phenomenon. Based on this assumption, the voivodeships in which the respondents resided were correlated with the number of inhabitants in Polish cities and then analyzed in terms of sex, age ranges (15–44), levels of education and GDP. The resulting $r_s$ values indicate a high correlation between the spatial distribution of cannabis consumers residing in individual voivodeships and the spatial distribution of the number of city dwellers aged 15–44 ($r_s = 0.909$), with this correlation being slightly higher among men ($r_s = 0.941$) than among women ($r_s = 0.809$). The correlation between the spatial distribution of the respondents from small towns (up to 20,000 inhabitants) and the spatial distribution of the number of their inhabitants was at a relatively low level ($r_s = 0.41$). For larger cities the interrelation between the spatial distribution of respondents and the number of their inhabitants reached high levels ($r_s = 0.8$ for cities with 20-99.9 thousand inhabitants, $r_s = 0.94$ for cities with 100.0–199.9 thousand inhabitants, $r_s = 0.92$ for cities with more than 200 thousand inhabitants). However, no significant differences in the age of cannabis consumers and cities dwellers were found. The interrelation between the spatial distribution of respondents and city dwellers was significant ($r_s = 0.973$ for the age range 15–24, $r_s = 0.823$ for 25–34 and $r_s = 0.85$ for 35–44). High $r_s$ values were also found between the respondents and city dwellers in terms of their education level; $r_s = 0.832$ for lower levels of education (primary, secondary and vocational), $r_s = 0.941$ for secondary education and $r_s = 0.862$ for university education (both BSc and MSc). The spatial distribution of respondents and GDP in voivodeships were

also correlated ($r_s = 0.89$). All in all, the $r_s$ values presented in this section justify the application of the aforementioned variables to estimate the level of cannabis consumption in individual voivodeships.

## 5. Discussion and conclusions

Despite the restrictions inherent in an online survey, it gave us opportunity to identify selected demographic (sex, age), socio-economic (level of education, source of income) and spatial (place of residence) features of cannabis consumers in Poland and the associated frequency of cannabis consumption. The results of our analysis are essentially in agreement with the findings of previous studies. Cannabis consumption in Poland was more popular among men, youth and young adults (Generation Y) and among the well-educated, relatively well-off and living in cities. It was an urban phenomenon, especially widespread in regional metropolises. The regional differentiation of sex, age, education level and sources of livelihood for the respondents declaring cannabis consumption showed a relatively low level of this differentiation ($W_o < 0.37$).

The frequency of cannabis consumption was, however, different from the findings of previous studies, according to which 16.3% of the Polish aged 15–64 admitted to using cannabis at least once in their lifetime, 4.6% during the preceding year and 2.1% during the preceding month (Sierosławski et al., 2015). The respondents participating in our survey declared cannabis use in the last month (62.7%) and the last year (27.2%). It implies that mainly current and recent consumers of cannabis responded to our survey. Therefore, our analysis applies to this group of cannabis users. The structure of cannabis consumption frequency was more regionally differentiated ($W_o$ was at the level of 0.04–0.5) than the

structure of sex, age, education and income source for the respondents.

The spatial distribution of respondents declaring cannabis coexisted with the spatial distribution of the number of crimes identified by the police and the prosecutor's office, and adults convicted on the basis of the Act on Counteracting Drug Addiction. The interdependence of these distributions was significant. The spatial distribution of selected demographic and socio-economic features characterizing the respondents was very similar to the spatial distribution of city dwellers aged 15–44, their sex, individual age ranges, the size of cities, the level of education and the amount of GDP. The high values of statistically significant Spearman correlation coefficients indicate the usefulness of these quantities in estimating and describing the spatial distribution of cannabis consumers in Poland.

Polish society has been changing its behavior patterns since the beginning of the 1990s. This also applies to cannabis consumption. This soft drug has been gradually spreading over Poland on the basis of diffusion of innovation since the beginning of the 1990s. Generation Y is the main group of cannabis consumer in Poland. Cannabis consumption among the Polish being over 40 years old almost completely disappears due to the short tradition of cannabis consumption in Poland. Cannabis is usually consumed by well-educated and relatively well-off people who live in large urban centers in Poland. Such social and territorial environments are the first to adopt new behavior patterns from the outside. For Polish cannabis consumers the distribution of the place of their residence concentrates around the largest urban centers (Matczak, Pawlicki, 2016). This points to the penetration of cannabis consumption, along with the progressing suburbanization of rural areas surrounding the largest metropolises. The most urbanized voivodeships and the large and medium cities with the high level of GDP show many similarities in their demographic and socio-economic structure of respondents declaring cannabis consumption. These environments are recognized as conducive to cannabis consumption.

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