European Monitoring Centre
for Drugs and Drug Addiction

INSIGHTS

MONITORING DRUG USE IN THE DIGITAL AGE: STUDIES IN WEB SURVEYS

The Global Cannabis Cultivation Research Consortium (GCCRC): a transnational online survey of cannabis growers

Tom Decorte [a] and Gary R. Potter [b]

[a] Ghent University, Belgium
[b] Lancaster University, United Kingdom

Abstract: Worldwide, patterns of cannabis cultivation have shifted from production for international markets concentrated in certain developing countries, to decentralised production in almost every country. In response to the synchronous expansion of cannabis cultivation in many industrialised countries, cross-national research is needed to develop a better understanding of the characteristics of those involved in cannabis cultivation. This need for further research forms the context within which the Global Cannabis Cultivation Research Consortium (GCCRC) was created and the International Cannabis Cultivation Questionnaire (ICCQ) was developed. The ICCQ was developed to bridge the gap in international comparative research, as early empirical studies on cannabis cultivation in the global north focused on large-scale, commercially oriented growers, or examined small samples. This paper presents some of the key findings from the first wave of the ICCQ, the methodological lessons learned from implementing online surveys targeted at drug producers and the policy implications of the survey results. As this study shows, the survey has generated important substantive findings about cannabis cultivation, along with policy insights and methodological lessons, that would likely have been unattainable through other methods.

Introduction

Globally, cannabis is the most widely used illicit drug, and most countries remain committed to the prohibition of both its production and use. Against this backdrop, worldwide patterns of cannabis cultivation have shown an interesting development, with a shift from production for international markets concentrated in certain developing countries, to more decentralised production in almost every country (Decorte et al., 2011; Potter et al., 2011).

Early empirical studies on cannabis cultivation in the global north focused on large-scale, commercially oriented growers (e.g. Bovenkerk and Hogewind, 2002; Weisheit, 1991), or examined small samples (e.g. Hough et al., 2003; Potter, 2010). These studies often relied on police data to draw conclusions about the prevalence of cultivation. This may have led to false perceptions regarding the prevalence of different types of growers and growing operations and related criminal behaviours (Wilkins and Casswell, 2003), with possible implications for future policy choices.

In response to the synchronous expansion of cannabis cultivation in many industrialised countries around the world, cross-national research is needed to gain a better understanding of who is involved in domestic cultivation, the diversity of cultivation practices and motivations, and cultivators' experiences with and involvement in other criminal activities as well as their interaction with different cannabis control policies. This need for further research forms the context within which the Global Cannabis Cultivation Research

Consortium (GCCRC) was created and the International Cannabis Cultivation Questionnaire (ICCQ) was developed and implemented.

Although successful online surveys into cannabis cultivation have taken place in Belgium (Decorte, 2010), Denmark and Finland (Athey et al., 2013; Hakkarainen and Perälä, 2011; Hakkarainen et al., 2011), there has generally been a lack of significant international comparative research in this area. The ICCQ was designed to address this knowledge gap by facilitating international comparisons of small-scale cannabis cultivation (Barratt et al., 2012). While large-scale cultivation, often linked to serious and organised crime, may account for the majority of cannabis produced domestically, smaller-scale growers ([1]), involved in personal, medical and social supply as well as commercial cultivation ([2]), are present in much larger numbers (Potter and Klein, 2020). Through its first wave of online surveys, the ICCQ produced important findings that have helped to build a better understanding of who grows cannabis, their reasons for and methods of growing, their experience with the criminal justice system, and how these factors differ across countries (Potter and Decorte, 2015).

This paper presents some of the key findings from the first wave of the ICCQ (2012–2013), the methodological lessons learned from implementing online surveys targeted at drug producers and the policy implications of the survey results. First, the paper presents a brief methodological overview of the ICCQ. Second, some of the main findings from the ICCQ are presented, highlighting how large-scale international online surveys can be successfully conducted with hidden populations of drug producers to generate new information on a number of issues related to illicit drug production. Finally, the methodological lessons and policy implications of our findings are discussed. While methodological questions in relation to the generalisability of results and the preservation of participant anonymity remain, particularly when collecting data on highly sensitive and proscribed areas such as drug supply, this paper highlights the utility of web surveys in studying issues related to drug production in a global context (see also Coomber, 2011; Kalogeraki, 2012; Miller and Sonderlund, 2010).

Methodology of the International Cannabis Cultivation Questionnaire

The Global Cannabis Cultivation Research Consortium (GCCRC) is a group of researchers interested in better understanding domestic cannabis cultivation, especially by small-scale growers ([3]). Formed by scholars through global academic and research engagements, the GCCRC created the International Cannabis Cultivation Questionnaire (ICCQ) to develop a keener insight into the characteristics and motivations of small-scale cannabis growers. While the methodology of the ICCQ has been described in detail elsewhere (Barratt et al., 2012, 2015), a brief overview is presented here.

Building on previous studies of cannabis cultivation using online surveys (Decorte, 2010; Hakkarainen et al., 2011), the ICCQ authors approached cannabis growers to inform the study, pilot the questionnaire and build legitimacy around the survey. 'Participatory online research' methods (Barratt and Lenton, 2010; see also Potter and Chatwin, 2011; Temple and Brown, 2011) were thus used through online engagement and dialogue with cannabis users and growers as part of the research process (for more detail, see Barratt et al., 2012, 2015).

The core ICCQ includes 35 questions across eight modules: experiences with growing cannabis; methods and scale of growing operations; reasons for growing; personal use of cannabis and other drugs; participation in cannabis and other drug markets; contact with the criminal justice system; involvement in other (non-drug-related) illicit activities; and, demographic characteristics. Some participating countries added additional items to address other research interests, for example questions concerning grower networks and whether the respondent was growing cannabis for medicinal purposes or in relation to career transitions (Hakkarainen et al., 2015; Lenton et al., 2015; Nguyen et al., 2015; Paoli et al., 2015). The ICCQ also includes items to test eligibility ([4]) and recruitment source.

The most important recruitment method was to engage with cannabis users or cannabis cultivation groups, usually through their websites and online forums. Facebook, news articles and referrals from friends were other important sources from which participants were enlisted. Overall, survey promotion strategies varied across the participating countries (see Barratt et al.,

([1]) 'Large-scale' and 'smaller-scale' are subjective terms with no clear definitions or cut-off points. Table A3 provides a number of indicators of the scale of our respondents' cannabis cultivation.

([2]) There is also no agreed definition of what constitutes 'commercial cultivation'. We use the term in this paper to cover all cultivation where some financial profit is a primary motivation for growing cannabis. Social supply refers to the distribution of cannabis to friends and acquaintances without profit being a primary motivation.

([3]) The first collaboration of this consortium was the compendium *World Wide Weed*, drawing on original studies from a variety of perspectives and from different countries and regions around the world, namely the Caribbean and Morocco from the global south, and Australia, Belgium, Canada, Denmark, Finland, the Netherlands, New Zealand, Spain, the United Kingdom and the United States from the global north (Decorte et al., 2011).

([4]) We used three eligibility questions: (a) Have you ever grown cannabis? (b) Are you 18 years or older? (c) In which country do you reside?

2015). In 2012–2013, the ICCQ was successfully implemented in 11 countries (Australia, Austria, Belgium, Canada, Denmark, Finland, Germany, the Netherlands, Switzerland, the United Kingdom and the United States), producing usable data from 6 530 respondents ([5]). Since then it has also been implemented in New Zealand and Israel (Wilkins et al., 2018).

We have previously discussed the limitations of our internet-based research methods (Barratt et al., 2015) and the strategies used to mitigate these (Barratt and Lenton, 2015). In particular, our sample consists only of those growers who had become aware of the survey and opted to participate. As cannabis growers are a hidden population, it is impossible to know how representative our sample is of all growers across the various countries. It is most probably the case that growers involved in more serious levels of criminal activity (e.g. those operating on a larger scale or generating higher levels of profit), and thus facing greater risks of serious punishment if detected by the authorities, would be less likely to participate. Such growers may be best reached by alternative methods, such as prison interviews or ethnographic research.

ICCQ: main findings

Through the first wave of online surveys (2012–2013), the ICCQ produced findings that have helped to create a better understanding of who grows cannabis, covering their reasons for growing, methods of growing and experience with the criminal justice system, as well as how these factors differ across the countries involved in the survey. The following sections present key findings from the first wave of the ICCQ.

Sample characteristics and patterns of growing across 11 countries

The study provided a number of comparisons across patterns of cannabis cultivation in 11 countries (Potter et al., 2015). Overall, there were many similarities across countries in terms of demographic characteristics (Appendix) ([6]); experience of growing cannabis (Table A2); methods and scale of growing operations (Table A3); use of cannabis and other drugs (Table A4); participation in cannabis and other drug markets (Table A5); contacts with the criminal justice system (Table A6); and reasons for growing (Table A7). In particular, a clear majority of the small-scale cannabis cultivators described being primarily motivated by reasons other than making money from cannabis supply and reported minimal involvement in drug dealing or other criminal activities. Nevertheless, some differences did exist between the country-level results, suggesting that local factors (political, geographical, cultural, legal, among others) may have some influence on how small-scale cultivators operate, although divergence in recruitment strategies may also account for some of the variations observed (Potter and Decorte, 2015).

Comparing recreational and medical growers

The production and consumption of cannabis for the treatment of medical conditions is of increasing importance internationally. However, research on this phenomenon among cannabis growers operating outside the legal medical industry remains scarce. The ICCQ survey showed that growing cannabis for medical purposes was widespread among the respondents, with the analysis in this area indicating that the majority of these (self-reported) growers were cultivating the drug for their own use to treat a range of serious conditions (Hakkarainen et al., 2015). A majority reported having a formal diagnosis for these conditions. One fifth had a recommendation from their doctor to use cannabis, but in most cases, respondents had chosen to self-medicate with cannabis and had not discussed this decision with a medical professional. Based on this finding, one of the study's conclusions was that there is potentially a wider demand for licit access to medicinal cannabis than is currently met in the countries included in the ICCQ. From a harm-reduction perspective, it is worrying that, in the context of present health and drug control policies in these countries, many medical growers are using cannabis to treat potentially serious conditions without proper medical advice.

The characteristics of 'recreational' versus 'medical' growers were explored in another analysis. Survey participants were divided into three groups for this purpose: those who reported growing for recreational use; those cultivating for medical purposes who also reported the use of other illicit drugs; and those who reported cultivation for medical use and did not use other illicit substances (Hakkarainen et al., 2019). The groups were compared using multinomial logistic regression.

In comparison to recreational growers, the two groups of medical growers included more females, consumed cannabis more frequently and were more likely to cite health-related motivations for growing (Table A8). The medical growers who reported no other illicit drug use shared some common features with the medical growers who did use other illicit drugs, but in comparison to both other groups they were older,

([5]) Our total number of respondents was much higher. To be included in our analyses, respondents had to be 18+ years old, resident in the country where they completed the survey, and involved in growing cannabis at least once. Over 8 400 respondents met these criteria; however, our final analyses only included those who had grown cannabis within the previous five years and who completed at least 50 % of the questions in the core ICCQ.

([6]) All tables can be found in the Appendix. The tables presented in this paper have been adapted from their original published versions (Tables A1–7, Potter et al., 2015; Table A8, Hakkarainen et al., 2019; Table A9, Lenton et al., 2015).

used less alcohol and tobacco and were less likely to have been involved in illicit activities other than cannabis-related crimes.

Growing practices and the use of potentially harmful chemical additives

With the growth of legal cannabis markets internationally, there has been a recognition of the adverse impacts of certain cannabis growing practices, notably the use of harmful chemicals. A major concern has been the use of plant growth regulators (PGRs), which improve yield. These chemicals, many of which have been banned from food crops, are found in cannabis-growing nutrients sold online or in hydroponic stores. This study analysed the cannabis growing practices of small-scale cannabis growers and their self-reported use of chemicals (Lenton et al., 2018), with 44 % of the sample reporting some use of chemical fertilisers, supplements or insecticides. Logistic regression indicated that the unique predictor of the use of chemicals was growing hydroponically ([7]). Problems associated with product labelling and uncertainty regarding product constituents made it difficult for growers (and researchers) to determine which products were likely to contain PGRs or other harmful chemicals. Further research is needed to analyse the constituents of chemical products marketed to cannabis growers.

Perceived risk of arrest and deterrence

Little research exists on the relationship between criminal justice penalties and the behaviours of cannabis growers. In a separate analysis of our North American data, the study authors examined restrictive deterrence (changing, as opposed to desisting from, illegal behaviour in response to a perceived risk of sanctions) in the context of cannabis cultivation by modelling the relationship between the threat of criminal penalties and the size of the cultivation site and number of co-offenders (Nguyen et al., 2015). The results suggested that state-level sanctions have a structuring effect by restricting the size of cultivation sites, but also that efforts to increase the intensity of enforcement directed at growers may not have the deterrent impact expected. Seemingly, growers do respond to variations in policies and enforcement practices to a certain extent, tending to restrict the scale of their activities rather than desisting from cannabis cultivation altogether. These findings may be used to frame policies (e.g. legal plant limits) aimed at disincentivising growers from escalating from small-scale to commercially oriented large-scale cultivation.

Social networks of growers and risk perceptions

An additional analysis explored a subset of 359 cannabis growers who operated within networks ([8]), extracted from the subsamples recruited in Belgium, the Netherlands and the United States (Malm et al., 2017). This study highlighted the importance of social network structures on risk perceptions, with findings suggesting that growers with more structural holes in their co-worker network (i.e. fewer connections between individuals in the network) perceive higher risks of apprehension from law enforcement bodies. Furthermore, growers in large, cohesive networks reported feeling more protected than growers in large networks with weak ties. Specifically, some growers are able to acts as brokers between otherwise disconnected individuals who have access to more information on risks and detection in the industry. These results further support the extension of 'networked criminology' (Papachristos, 2011) (i.e. the notion that social networks are key in understanding crime and deviance) and the utility of social network analysis in, specifically, criminological research regarding the study of perceptual deterrence and risks, and in self-report surveys more generally.

Discussion

Methodological lessons

As well as substantive findings and policy insights, important methodological lessons emerged from the research group's experiences with the ICCQ studies, and we explore some of these below.

Recruitment

As discussed earlier, we attribute much of our success in recruiting participants to our participatory research approach. Lessons can also be learned from other aspects of our recruitment processes. Finding respondents seemed to be harder in English-speaking countries than non-English-speaking ones, with lower sample sizes (relative to population) generated in the former. The most effective recruitment modes were cannabis websites and online forums (33 %), Facebook (14 %) and news articles (11 %). While participants recruited through news articles tended to be older, growing practice variables were strikingly similar across these main recruitment modes.

([7]) This is not to say that only hydroponic growers used chemicals, nor that all hydroponic growers used chemicals.

([8]) Respondents to the survey who reported participating in networks of growers consisting of two or more individuals (Malm et al., 2017).

We noted the trade-offs between hosting multiple surveys in each country versus using one integrated database. We would strongly advise the latter approach to allow greater control of survey uniformity in participating countries and for ease of data processing. We also found that although perceived anonymity is routinely assumed to be a benefit of using digital research methodologies, there are significant limits to preserving research participant anonymity in the current era of mass digital surveillance, especially when the target group is particularly concerned with evading law enforcement agencies. Our experiences have allowed us to share a number of recommendations and observations with future researchers wishing to conduct comparative transnational and internet-mediated research targeting hidden populations. These recommendations include piloting surveys with the target population, having researchers in place in each participant country to respond to issues as they arise, devising methods for preserving anonymity, researching various recruitment methods, and including a question about recruitment sources and the use of in-person research group meetings (Barratt et al., 2015).

Analysis of feedback comments on the survey

Including a general, open and non-directive question at the end of a structured questionnaire is common practice, but the analysis of this type of data is rarely discussed in the methodological literature, and most researchers fail to report on this part of the survey. In our study, 35 % of the sample left a feedback comment. Such comments can challenge the (implicit or explicit) views and assumptions that researchers build into their questionnaires and can therefore contribute to substantive findings and theoretical developments. In the ICCQ, analysis of the feedback comments highlighted how participants offered alternative readings of their practices to those provided by 'mainstream' discourses, which greatly contributed to the value of the survey (Decorte et al., 2019). Analysis of the comments helped to detect residual distrust, identify questions that provoked negative feelings among some participants or seemed to be misread or misunderstood, and highlighted issues that were not covered in the survey. Together, these findings helped us to improve the survey for a second round in 2020–21.

The process of analysing and coding this type of data also underlines the importance of developing an explicit methodological strategy for analysing feedback comments at the design stage of the study. Feedback questions to the broader survey can shed further light on the data and inform the ensuing analysis. Consequently, the contribution of such questions can be vast if they are strategically used by the research team and if sufficient resources for coding and analysing them are allocated at the outset.

Policy implications

Contemporary cannabis cultivation takes many different forms, with variations in approach identifiable both within and between countries. It is notable that increases in domestic cannabis cultivation have been observed equally in countries identified as having repressive or tolerant policies (Bouchard et al., 2011). Clearly, the reasons for the expansion of cannabis cultivation and its broader industry are complex, and there are undoubtedly numerous economic, technological, social, cultural and political factors at play.

As countries are increasingly experimenting with cannabis regulation, faced with a burgeoning cannabis industry and rising numbers of growers and users, findings from the ICCQ have implications across several policy areas, such as criminal justice (e.g. around policing and sentencing for cannabis cultivation) and health (e.g. in relation to the health impacts of consuming domestically produced cannabis).

Although there were some between-country differences in terms of support for the policy options with regard to cultivation, the findings indicated that there was noteworthy consistency in respondents' support for a number of options in relation to possible future forms of legalised and regulated cannabis markets (Table A9). Notably, age restrictions and the licensing of commercial (but not personal) cultivation were widely supported regulatory options.

The survey results have relevance for any provisions regarding cannabis cultivation in the design of new regulatory models of cannabis policy, which are increasingly under consideration at a time when many jurisdictions around the world are enacting more liberal approaches to this issue (with the legal commercial cannabis markets in Uruguay, Canada and a number of US states being the most extreme examples of this) (Lenton et al., 2015). The findings suggest that many cannabis growers would want to continue growing cannabis under non-prohibitionist policy models and that they also accept the need for some regulation (Table A9).

Finally, cannabis growers can be a valuable part of the policymaking process. Although they are only one of many categories of potential stakeholders, the views expressed by the cannabis growers accessed in this study could be useful to policymakers in considering what place cannabis cultivation might have in a legal regulated market.

Conclusion

The GCCRC experience of running the ICCQ provides a number of insights into the use of online survey methods in drug research. The number of respondents recruited across a range of countries demonstrates that large-scale and international online surveys can be conducted with hidden populations of drug-supply-involved individuals across multiple countries, at least in the case of cannabis growers. While larger surveys of drug users exist, this may be the largest sample to date of respondents involved in the ostensibly more serious offences of drug production and supply.

Questions remain about how representative of the wider population of cannabis growers this sample is, but such questions are, by definition, inherent to all research into hidden populations. While care must be taken to avoid generalising beyond the sample, the size and geographical spread of this dataset allows for some confidence in claiming the findings as meaningful. Among other outcomes, the survey shows that the majority of cannabis growers who reported that they cultivate cannabis for their own medicinal use do so to treat a range of serious conditions. Most of these had chosen to self-medicate with cannabis without consulting their doctor, which may point to a wider demand for licit access to medicinal cannabis than is currently available in the countries surveyed here. Further, the results manifest a noteworthy consistency in our respondents' support for a number of policy options within possible versions of legal and regulated cannabis markets. These include restrictions around age and commercial cultivation.

In conclusion, as outlined in this paper and discussed in detail in a number of published articles based on ICCQ data, this survey has generated important substantive findings about cannabis cultivation, along with policy insights and methodological lessons, that would likely have been unattainable through other methods.

References

Athey, N., Bouchard, M., Decorte, T., Frank, V. and Hakkarainen, P. (2013), 'Cannabis cultivation and detection: a comparative study of Belgium, Finland, and Denmark', *Drugs: Education, Prevention, Policy* 20, pp. 203–215, doi:10.3109/09687637.2012.760532.

Barratt, M. J. and Lenton, S. (2010), 'Beyond recruitment? Participatory online research with people who use drugs', *International Journal of Internet Research Ethics* 12(3), pp. 69–86.

Barratt, M. J. and Lenton, S. (2015), 'Representativeness of online purposive sampling with Australian cannabis cultivators', *International Journal of Drug Policy* 26(3), pp. 323–326, doi:10.1016/j.drugpo.2014.10.007.

Barratt, M. J., Bouchard, M., Decorte, T., Asmussen Frank, V., Hakkarainen, P., Lenton, S. and Malm, A. (2012), 'Understanding global patterns of domestic cannabis cultivation', *Drugs and Alcohol Today* 12(4), pp. 213–221, doi:10.1108/17459261211286627.

Barratt, M. J., Potter, G. R., Wouters, M., Wilkins, C., Werse, B., Perälä, J. and Pedersen, M. M. (2015), 'Lessons from conducting trans-national internet-mediated participatory research with hidden populations of cannabis cultivators', *International Journal of Drug Policy* 26(3), pp. 238–249, doi:10.1016/j.drugpo.2014.12.004.

Bouchard, M., Potter, G. and Decorte, T. (2011), 'Emerging trends in cannabis cultivation – and the way forward', in: Decorte, T., Potter, G. and Bouchard, M. (editors), *World wide weed: global trends in cannabis cultivation and its control*, Ashgate Publishers, Farnham, pp. 273–285.

Bovenkerk, F. and Hogewind, W. I. M. (2002), *Hennepteelt in Nederland: het probleem van de criminaliteit en haar bestrijding [Cannabis cultivation in the Netherlands: the problem of criminality and law enforcement]*, Willem Pompe Instituut voor Strafwetenschappen, Utrecht.

Coomber, R. (2011), 'Using the internet for qualitative research on drug users and drug markets: the pros, the cons and the progress', in: Fountain, J., Frank, V. A. and Korf, D. (editors), *Markets, methods and messages: dynamics in European drug research*, Pabst Science Publishers, Lengerich, pp. 85–103.

Decorte, T. (2010), 'Small scale domestic cannabis cultivation: an anonymous web survey among 659 cannabis cultivators in Belgium', *Contemporary Drug Problems* 37, pp. 341–370, doi:10.1177/009145091003700208.

Decorte, T., Potter, G. and Bouchard, M. (editors) (2011), *World wide weed: global trends in cannabis cultivation and its control*, Ashgate Publishers, Farnham.

Decorte, T., Malm, A., Sznitman, S., Hakkarainen, P., Barratt, M., Potter, G. and Werse, B. (2019), 'The challenges and benefits of analyzing feedback comments in surveys: lessons from a cross-national online survey of small-scale cannabis growers', *Methodological Innovations*, pp. 1–16, doi:10.1177/2059799119825606.

Hakkarainen, P. and Perälä, J. (2011), 'With a little help from my friends: justifications of small-scale cannabis growers', in:

Decorte, T., Potter, G. and Bouchard, M. (editors), *Global trends in cannabis cultivation and its control*, Ashgate Publishers, Farnham, pp. 75–89.

Hakkarainen, P., Frank, V. A., Perälä, J. and Dahl, H. V. (2011), 'Small-scale cannabis growers in Denmark and Finland', *European Addiction Research* 17, pp. 119–128, doi:10.1159/000322920.

Hakkarainen, P., Frank, V. A., Barratt, M. J., Dahl, H. V., Decorte, T., Karjalainen, K. and Lenton, S. (2015), 'Growing medicine: small-scale cannabis cultivation for medical purposes in six different countries', *International Journal of Drug Policy* 26(3), pp. 250–256, doi:10.1016/j.drugpo.2014.07.005.

Hakkarainen, P., Decorte, T., Sznitman, S., Karjalainen, K., Barratt, M., Frank, V. and Lenton, S. (2019), 'Examining the blurred boundaries between medical and recreational cannabis: results from an international study of small-scale cannabis cultivation', *Drugs: Education, Prevention and Policy* 26(3), pp. 250–258, doi:10.1080/09687637.2017.1411888.

Hough, M., Warburton, H., Few, B., May, T., Man, L. and Witton, J. (2003), *A growing market: the domestic cultivation of cannabis*, Joseph Rowntree Foundation and National Addiction Centre, London.

Kalogeraki, S. (2012), 'On the benefits and constraints of the web-based illicit drug survey', *International Journal of Interdisciplinary Social Sciences* 6(5), pp. 239–252, doi:10.18848/1833-1882/CGP/v06i05/52079.

Lenton, S., Frank, V. A., Barratt, M. J., Dahl, H. V. and Potter, G. R. (2015), 'Attitudes of cannabis growers to regulation of cannabis cultivation under a non-prohibition cannabis model', *International Journal of Drug Policy* 26(3), pp. 257–266, doi:10.1016/j.drugpo.2014.08.002.

Lenton, S., Frank, V. A., Barratt, M., Potter, G. and Decorte, T. (2018), 'Growing practices and the use of potentially harmful chemical additives among a sample of small-scale cannabis growers in three countries', *Drug and Alcohol Dependence* 192, pp. 250–256, doi:10.1016/j.drugalcdep.2018.07.040.

Malm, A., Bouchard, M., Decorte, T., Vlaemynck, M. and Wouters, M. (2017), 'More structural holes, more risks? Network structure and risk perceptions among marijuana growers', *Social Networks* 51, pp. 127–134, doi:10.1016/j.socnet.2017.01.006.

Miller, P. G. and Sonderlund, A. L. (2010), 'Using the internet to research hidden populations of illicit drug users: a review', *Addiction* 105, pp. 1557–1567, doi:10.1111/j.1360-0443.2010.02992.x.

Nguyen, H., Malm, A. and Bouchard, M. (2015), 'Production, perception, and punishment: restrictive deterrence in the context of cannabis cultivation', *International Journal of Drug Policy* 26, pp. 267–276, doi:10.1016/j.drugpo.2014.08.012.

Paoli, L., Decorte, T. and Kersten, L. (2015), 'Assessing the harms of cannabis cultivation in Belgium', *International Journal of Drug Policy* 26, pp. 277–289, doi:10.1016/j.drugpo.2014.12.003.

Papachristos, A. V. (2011), 'The coming of a networked criminology?', in: MacDonald, J. (editor), *Measuring crime and criminality: advances in criminological theory*, Routledge, London.

Potter, G. R. (2010), *Weed, need and greed: a study of domestic cannabis cultivation*, Free Association Books, London.

Potter, G. R. and Chatwin, C. (2011), 'Researching cannabis markets online: some lessons from the virtual field', in: Fountain, J., Frank, V. A. and Korf, D. J. (editors), *Markets, methods and messages: dynamics in European drug research*, Pabst Science Publishers, Lengerich, pp. 69–84.

Potter, G. R. and Decorte, T.(editors) (2015), 'Special issue: domestic cannabis cultivation', *International Journal of Drug Policy* 26(3) (https://www.sciencedirect.com/journal/international-journal-of-drug-policy/vol/26/issue/3).

Potter, G. R. and Klein, A. (2020), 'Coming out of the closet: risk management strategies of illegal cannabis growers', in: MacGregor, S. and Thom, B. (editors), *Alcohol and drugs: framing dangerous classes and dangerous spaces — historical and cross-cultural perspectives*, Routledge, London, pp. 201–221.

Potter, G. R., Bouchard, M. and Decorte, T. (2011), in: Decorte, T., Potter, G. and Bouchard, M. (editors), *The globalization of cannabis cultivation*, Ashgate Publishers, Farnham, pp. 1–20.

Potter, G. R., Barratt, M. J., Malm, A., Bouchard, M., Blok, T., Christensen, A.-S. and Decorte, T. (2015), 'Global patterns of domestic cannabis cultivation: sample characteristics and patterns of growing across eleven countries', *International Journal of Drug Policy* 26(3), pp. 226–237, doi:10.1016/j.drugpo.2014.12.007.

Temple, E. C. and Brown, R. F. (2011), 'A comparison of internet-based participant recruitment methods: engaging the hidden population of cannabis users in research', *Journal of Research Practice* 7(2).

Weisheit, R. A. (1991), 'The intangible rewards from crime: the case of domestic marijuana cultivation', *Crime and Delinquency* 37(4), pp. 506–527, doi:10.1177/0011128791037004006.

Wilkins, C. and Casswell, S. (2003), 'Organized crime in marijuana cultivation in New Zealand: an economic analysis', *Contemporary Drug Problems* 30, pp. 757–777, doi:10.1177/009145090303000403.

Wilkins, C., Sznitman, S., Decorte, T., Hakkarainen, P. and Lenton, S. (2018), 'Characteristics of cannabis cultivation in New Zealand and Israel', *Drugs and Alcohol Today* 18(2), pp. 90–98, doi:10.1108/DAT-03-2018-0010.

Acknowledgements

This paper draws heavily on the accumulated work of the Global Cannabis Cultivation Research Consortium (GCCRC), and we wish to acknowledge our collaborators and co-authors on those various publications. A full list of GCCRC members and publications is available on our project website https://www.worldwideweed.nl/.

Appendix

The tables presented below have been adapted from their original published versions (Tables A1–7, Potter et al., 2015; Table A8, Hakkarainen et al., 2019; Table A9, Lenton et al., 2015).

TABLE A1

Personal characteristics of growers (data from first ICCQ-wave, collected in 2012–2013)

	Australia	Austria	Belgium	Canada	Denmark	Finland	Germany	Netherlands	Switzerland	United Kingdom	United States	Total
Sample size	491	129	1 065	63	814	1 179	1 348	277	101	418	645	6 530
Gender (%)												
Male	88	91	91	93	91	90	95	90	93	95	88	92
Female	12	9	9	7	9	10	5	10	7	5	12	8
Total *n* [a]	489	117	988	58	810	1 147	1 266	261	95	397	572	6 200
Age (years)												
Median	26	25	26	25	31	26	26	32	25	33	26	27
Range	18–71	18–55	18–81	18–65	18–70	18–71	18–74	18–70	18–53	18–63	18–86	18–86
Total *n* [a]	485	117	986	63	810	1 152	1 243	252	94	381	645	6 228
Employment status (%) [b,c]												
Full-time work	44	39	40	51	38	–	43	–	47	41	33	41
Part-time or casual work	13	13	10	16	11	–	12	–	18	8	20	12
Self-employed	17	13	8	18	9	–	10	–	14	17	21	12
Student	12	35	38	22	27	–	33	–	33	12	17	27
Unemployed (looking for work)	5	9	7	9	8	–	6	–	4	9	13	7
Benefits/pension/disability	9	3	3	2	9	–	3	–	1	16	5	6
Home duties	2	0	1	0	2	–	2	–	1	8	5	2
Retired	4	0	1	4	8	–	0	–	0	1	4	3
Not seeking work	9	3	1	4	3	–	2	–	1	1	2	3
Total *n* [a]	488	118	989	45	811	–	1 282	–	97	398	451	4 679

[a] Total *n* refers to the number of respondents who answered individual questions.
[b] Respondents invited to tick more than one option; columns can total more than 100 %.
[c] Question not asked in a comparable way in Finland and the Netherlands.

TABLE A2

Experiences of growing cannabis (data from first ICCQ-wave, collected in 2012–2013)

	Australia	Austria	Belgium	Canada	Denmark	Finland	Germany	Netherlands	Switzerland	United KIngdom	United States	Total
Age when first grew cannabis												
Median age in years	20	19	20	20	21	21	20	21	18	22	20	20
Interquartile range	17–25	17–23	18–25	17–24	18–26	19–24	17–24	18–30	16–20	18–30	17–24	18–25
Total *n* [a]	456	129	993	59	661	1 175	1 346	277	101	408	602	6 207
How many crops ever grown? (%) [b]												
I have not yet harvested my first crop	3	2	10	11	1	7	6	8	2	2	13	7
1 crop	12	18	20	16	11	14	18	15	14	10	12	15
2–5 crops	33	41	46	33	37	45	47	42	52	36	36	42
6–10 crops	19	25	14	16	21	18	14	15	16	20	14	17
11–20 crops	17	9	5	6	14	9	8	9	8	13	11	10
More than 20 crops	16	6	6	18	16	7	7	12	8	18	14	10
Total *n* [a]	478	122	1 038	63	796	1 124	1 260	256	96	398	640	6 303

[a] Total *n* refers to the number of respondents who answered individual questions.
[b] Columns can total more than 100 % due to rounding.

TABLE A3

Methods and scale of growing operations (data from first ICCQ-wave, collected in 2012–2013)

	Australia	Austria	Belgium	Canada	Denmark	Finland	Germany	Netherlands	Switzerland	United Kingdom	United States	Total
Do you typically grow indoors or outdoors? (%) [a]												
Indoors	27	44	34	68	39	62	47	33	32	76	80	49
Outdoors	41	11	36	32	29	3	10	34	25	5	20	20
Both	32	45	30	–	33	36	43	33	43	19	–	31
Total *n* [b]	462	120	929	56	764	1 041	1 170	232	93	386	558	5 811
Number of mature plants per crop												
Median	4	9	3	5.5	6	4	6	5	9	4	6	5
Interquartile range	2–6	5–12	2–6	4–21.5	4–12	2–6	4–12	3–5	5–20	2–6	3–12	3–9
Total *n* [b]	426	91	814	52	702	1 000	1 004	211	82	358	535	5 275
Space typically used to cultivate cannabis (square metres)												
Median	3.3	2	2	3.15	4	2	2	2	3	2	1.9	2
Interquartile range	1–8	1–5	1–5	0.7–9.1	1–9	1–3	1–5	1–5	1–7.5	1–4	0.9–9.3	1–5
Total *n* [b]	399	66	802	52	676	0.5–21	676	205	65	337	519	4 775
Typical yield (i.e. usable dried cannabis) per crop (ounces) [a, c]												
Median	10	8.8	3.6	3.5	10.6	7.1	7.1	10.6	10.6	8	7.1	7.1
Interquartile range	4–25	4.4–16.8	1.8–10.6	1.5–23.5	3.5–21.2	2.5–12.3	3.5–14.1	3.5–21.2	7.1–27.3	4–18	2.1–19.8	3.2–17.6
Total *n*	415	113	731	36	700	540	1 114	700	89	294	339	4 572

[a] Columns can total more than 100 % due to rounding.
[b] Total *n* refers to the number of respondents who answered individual questions.
[c] Ounces were often the preferred unit of measurement among growers, even in countries using the metric system; 1 ounce = 28 grams.

TABLE A4

Use of cannabis and other drugs (data from first ICCQ-wave, collected in 2012–2013)

	Australia	Austria	Belgium	Canada	Denmark	Finland	Germany	Netherlands	Switzerland	United Kingdom	United States	Total
How old were you when you first used cannabis? (%)												
I have never used cannabis	0	0	2	3	1	0	0	0	2	0	1	1
<16 years old	35	49	35	43	42	22	37	34	44	46	50	36
16–17 years old	35	30	40	22	31	29	36	32	37	25	24	32
18–25 years old	26	18	21	22	23	44	23	24	15	25	22	27
>25 years old	4	2	3	10	3	5	4	10	1	4	3	4
Total *n* [a]	490	125	1 056	63	812	1 179	1 312	269	99	404	643	6 452
When was the last time you used cannabis? (%)												
Today	57	50	43	57	43	27	39	46	42	66	66	44
Not today, but in the last week	22	32	36	28	34	42	38	39	41	24	20	34
Not in the last week, but in the last 30 days	7	10	11	8	11	17	13	7	5	4	5	11
Not in the last 30 days, but in the last 12 months	11	7	7	3	9	11	7	6	7	6	6	8
I have not used cannabis in the last 12 months	3	2	3	0	3	3	3	2	3	1	2	3
Never used cannabis	0	0	2	3	1	0	1	0	2	0	1	1
Total *n* [a]	478	124	1 052	60	804	1 174	1 305	270	98	397	635	6 397
In the last 12 months, have you used any of the following drugs? (%) [b,c]												
Alcohol	75	83	88	76	74	90	76	76	75	72	68	79
Cigarettes	57	74	71	50	68	80	71	71	61	67	53	69
Ecstasy (MDMA)	18	20	18	19	6	15	15	20	28	16	11	15
Amphetamine (speed)	12	17	8	10	6	15	14	12	14	5	6	11
Cocaine (includes crack cocaine)	7	12	13	10	8	5	6	11	13	13	6	8
Heroin	1	2	0	0	1	1	0	0	6	1	2	1
Total *n* [a]	488	125	1 049	58	811	1 178	1 309	276	99	404	601	6 398

[a] Total *n* refers to the number of respondents who answered individual questions.
[b] Respondents invited to tick more than option; columns total more than 100 %.
[c] Selected drugs. For full results see Potter et al. (2015).

TABLE A5

Participation in cannabis and other drug markets (data from first ICCQ-wave, collected in 2012–2013)

	Australia	Austria	Belgium	Canada	Denmark	Finland	Germany	Netherlands	Switzerland	United Kingdom	United States	Total
What did you do with the cannabis you grew in the last 12 months? (%) [a]												
Consume for personal use	97	96	96	94	97	98	97	92	96	99	98	97
Swap with other growers	18	35	30	25	15	28	20	73	32	15	28	26
Give away (or share)	65	76	81	75	64	84	78	15	79	54	69	71
Sell	24	32	33	34	17	32	34	23	39	22	38	29
Keep in your possession	18	49	59	–	23	26	46	46	49	17	–	35
Total *n* [b]	314	72	634	32	614	681	781	199	72	257	364	4 014
Have you sold any drugs other than cannabis or cannabis products in the last 12 months (%)												
No	93	97	96	72	99	92	96	94	91	96	82	93
Yes	7	3	4	28	1	8	4	6	10	4	18	7
Total *n* [b]	338	78	735	43	141	799	932	206	74	270	489	4 105

[a] Respondents invited to tick more than one option; columns total more than 100 %.
[b] Total *n* refers to the number of respondents who answered individual questions.

TABLE A6

Contacts with the criminal justice system (data from first ICCQ-wave, collected in 2012–2013)

	Australia	Austria	Belgium	Canada	Denmark	Finland	Germany	Netherlands	Switzerland	United Kingdom	United States	Total
Have you ever come into contact with the police because of your cannabis growing? (%)												
No	80	97	96	72	99	92	96	94	91	96	82	93
Yes	20	3	4	28	1	8	4	6	9	4	18	7
Total *n* [a]	481	78	735	43	141	799	932	206	74	270	489	4 105
As an adult, have you ever been convicted of a crime other than minor traffic violations? (%)												
No	74	64	87	95	71	75	73	85	71	82	83	74
Yes	26	36	13	5	29	25	27	15	29	18	17	26
Total *n* [a]	490	120	999	60	806	1 169	1 282	264	97	396	618	6 306

[a] Total *n* refers to the number of respondents who answered individual questions.

TABLE A7

Reasons for growing (a) (data from first ICCQ-wave, collected in 2012–2013) (%)

	Australia	Austria	Belgium	Canada	Denmark	Finland	Germany	Netherlands	Switzerland	United Kingdom	United States	Total
It provides me with cannabis for personal use	89	90	79	76	86	90	84	76	87	93	76	84
I get pleasure from growing cannabis	78	87	84	78	80	84	86	85	94	82	76	83
Cheaper than buying cannabis	72	80	79	92	60	73	74	64	71	84	90	75
To avoid contact with criminals	66	85	66	54	80	81	77	36	63	83	57	72
The cannabis I grow is healthier than the cannabis I buy	67	76	67	56	68	62	82	63	77	75	60	68
Because the plant is beautiful	56	68	–	68	58	49	64	–	70	65	70	48
To provide myself with cannabis for medical reasons	54	41	19	56	43	53	35	42	26	53	81	44
I wanted to see whether I could grow it	35	34	39	67	39	37	44	43	43	55	64	43
The cannabis I grow is a more consistent product than the cannabis I can buy	45	41	15	56	29	49	45	24	42	66	60	41
So I can share it/give it to my friends and acquaintances	37	35	41	70	44	41	30	44	37	26	59	40
For activist reasons (e.g. ecological ideology, fair trade)	28	41	40	29	34	44	43	32	41	31	35	38
I can flush the cannabis I grow to remove chemical residue (b)	41	56	21	64	26	–	50	25	49	61	57	33
Because the plant is easy to take care of	26	28	37	54	32	31	26	27	30	37	45	32
Growing your own cannabis is not as risky as buying it	35	28	36	44	30	23	26	8	22	40	41	30
Because it is easier to grow than to buy	26	23	45	38	12	46	15	14	8	27	35	29
The cannabis I grow is stronger than the cannabis I can buy	20	15	10	49	26	17	21	12	18	28	55	23
To provide others with cannabis for medical reasons	20	14	8	38	18	17	13	15	16	18	49	18
The cannabis I grow is milder than the cannabis I can buy	12	8	24	10	11	5	10	16	16	12	9	12
So I can sell it	9	7	8	33	5	14	7	14	8	9	28	11
The cannabis I grow will never contain adulterants	–	91	–	–	–	–	94	–	85	–	–	0
The cannabis I can grow tastes better than the cannabis I can buy	–	–	35	–	–	–	–	44	–	–	–	0
Legally cultivating medical marijuana	–	–	–	3	–	–	–	–	–	–	12	0

(a) Values cited are the percentage of respondents choosing each reason. The question asked respondents to tick all options that apply. A '–' indicates that the option choice was unavailable in that country. 'Total' values for response options that were not included in each country are reported for the sample as a whole — as such these totals likely under-represent (in some cases, significantly under-represent) the overall prevalence of these reasons for growing.

(b) 'Flushing' refers to the practice of providing the cannabis plants with clean water (i.e. without nutrients or other additives) for a period of time before harvest. Many growers believe that this reduces the chemical residue within the plants, thus producing a purer end product, although the actual effectiveness of such a process is limited (Lenton et al., 2018).

TABLE A8

Recreational versus medical growers (data from first ICCQ-wave, collected in 2012–2013)

	Recreational growers (*N* = 3 637)	Medical growers with other illicit drug use (*N* = 1 026)	Medical growers without other illicit drug use (*N* = 1 959)	χ^2	*p*
Gender					
Male	93.2 %	90.3 %	89.4 %	24.232	<0.001
Female	6.8 %	9.7 %	10.6 %		
Age (years)					
Mean (standard deviation)	29.2 (10.2)	28.4 (9.1)	33.8 (11.8)		<0.001 [a]
Median	26	25	31		
Interquartile range	22–34	22–32	24–42		
Substance use (last 12 months)					
Alcohol	85.9 %	83.7 %	65.6 %	326.538	<0.01
Cigarettes	71.0 %	75.1 %	63.5 %	51.359	<0.01
Cannabis use during last month [b]					
Less than weekly	23.1 %	11.9 %	15.7 %	223.476	<0.01
1–3 times per week	24.9 %	20.5 %	18.2 %		
4–6 times per week	30.5 %	35.6 %	26.6 %		
Daily	21.4 %	32.0 %	39.4 %		
Motivation					
Health motivation	16.5 %	37.4 %	38.4 %	395.406	<0.01
Other motivation	83.5 %	62.6 %	61.6 %		
Engagement in other illicit activities (excluding cannabis-related ones)					
Any crime	22.5 %	21.7 %	8.5 %	167.319	<0.01
Violation	19.3 %	15.7 %	6.6 %	155.043	<0.01
Property offence	2.9 %	4.3 %	1.0 %	32.144	<0.01
Violent offence	0.8 %	2.0 %	0.5 %	16.428	<0.01

[a] The Kruskal-Wallis test was used to assess the differences in age.
[b] The United States and Canada are excluded since this question was not asked in those countries.

TABLE A9

Attitudes of cannabis growers to regulation of cannabis cultivation under a non-prohibition cannabis model (data from first ICCQ-wave, collected in 2012–2013)

If prohibition were repealed, how do you think cannabis growing should be regulated (if at all)?	Endorsement (%)
Response options	
There should be no regulation: anyone should be able to grow cannabis for personal use or sale	14.4
Only adults (18+) should be legally able to grow cannabis	69.9
Individual growers could buy a licence to enable them to legally grow cannabis	29.5
There should be no restriction on the number of plants one could legally grow	24.4
Licensed individual growers would be restricted to growing only for personal use	22.6
Licensed individual growers would be restricted to growing up to 10 mature plants	16.7
Licensed individual growers would be restricted to growing up to 20 mature plants	8.1
Anyone could be able to grow for personal use but only licensed businesses could sell	63.7
Approved commercial growers could get a licence to grow and sell cannabis	41.4
Other (specify) _____	7.4
I don't know	1.0
I don't want to answer	0.1
Further responses recoded after analysis of 'Other' responses:	
Licensed growers restricted to (unspecified) plant numbers	0.5
Licensed growers restricted to 3–6 plants	0.6
Personal growers should not need licence	2.5
Comments regarding medicinal cannabis policy issues	0.9
Commercial growers should be taxed	0.4

Values cited are the percentage of respondents choosing each reason. Sample size was 1 722. This question was only asked in Australia, Denmark and the United Kingdom. Respondents were asked to tick all options that apply.

About the EMCDDA

The European Monitoring Centre for Drugs and Drug Addiction (EMCDDA) is the central source and confirmed authority on drug-related issues in Europe. For over 25 years, it has been collecting, analysing and disseminating scientifically sound information on drugs and drug addiction and their consequences, providing its audiences with an evidence-based picture of the drug phenomenon at European level. Based in Lisbon, the EMCDDA is one of the decentralised agencies of the European Union.

About this series

EMCDDA Insights are topic-based reports that bring together current research and study findings on a particular issue in the drugs field. This paper is published as part of *Monitoring Drug Use in the Digital Age: Studies in Web Surveys*, an EMCDDA Insights that provides an overview of current knowledge and the latest developments in the field of web surveys on drug topics. The Insights contains in-depth reports on the methodology of web surveys, the available studies being carried out in different drug topics and analyses of the European Web Survey on Drugs. The Insights will be of interest to researchers and scientists, people who use drugs, policymakers and their advisors, specialists and practitioners, and all those concerned with the issue of drugs and innovative methods.

EMCDDA project group: João Matias, Alexander Soderholm, Katerina Skarupova,André Noor and Jane Mounteney.

Recommended citation: Decorte, T. and Potter, G. R. (2022), 'The Global Cannabis Cultivation Research Consortium (GCCRC): a transnational online survey of cannabis growers', in *Monitoring drug use in the digital age: Studies in web surveys,* EMCDDA Insights, (htpps://www.emcdda.europa.eu/publications/insights/web-surveys/global-cannabis-cultivation-research-consortium-gccrc-transnational-online-survey-cannabis-growers_en).

Publications Office of the European Union, Luxembourg

PDF ISBN 978-92-9497-807-3 ISSN 2314-9264 doi:10.2810/235591 TD-XD-22-010-EN-N

This publication is only available in electronic format.

EMCDDA, Praça Europa 1, Cais do Sodré, 1249-289 Lisbon, Portugal
Tel. (351) 211 21 02 00 | info@emcdda.europa.eu
emcdda.europa.eu | twitter.com/emcdda | facebook.com/emcdda

Publications Office of the European Union