Global patterns of domestic cannabis cultivation: a cross-national analysis of sample characteristics and patterns of growing

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Abstract (updated from original submission)

While there has been research on cannabis grower typologies (Weisheit, 1991; Nguyen and Bouchard, 2010; Potter and Dann, 2005) and national studies of specific aspects of domestic cannabis cultivation (Bouchard, 2007; Bouchard et al., 2009; Decorte, 2010; Hakkarainen, et al., 2011a; Hakkarainen et al., 2011b; Plecas et al., 2005; Potter, 2010a; Weisheit, 1992; Douglas and Sullivan, 2013; Hammersvik et al., 2012), there has to date been an absence of international comparative research in this area. The study currently being conducted by the Global Cannabis Cultivation Research Consortium (GCCRC) aims to develop this aspect by collecting comparable data in a number of countries in order to compare who grows cannabis, reasons for growing, methods of growing, and experiences with the criminal justice system – and how these factors differ across a number of European, North American and Oceanian countries.

While all cannabis growers of at least 18 years of age are eligible to participate, we expect to access mainly small-scale cultivators through employing internet research methods to access hidden populations and facilitate anonymous data collection. Our expectation is based on previous research using a similar methodology, where mainly small-scale cannabis cultivators responded (Decorte, 2010; Hakkarainen, et al., 2011a); however, we might see a more varied range of respondents with the inclusion of other countries like Canada and USA where large - scale indoor and outdoor cannabis cultivation is present (Decorte et al., 2011).

In this paper we will present an initial comparative analysis of cannabis growers recruited in a sub-set of the countries participating in this project, namely the US, Canada, Belgium and Australia. We will compare their demographic characteristics, general features of participants' experiences with growing cannabis, their methods and the scale of growing operations, the reasons for growing, the participant's personal use of cannabis and other drugs and their participation in cannabis and other drug markets, and their contacts with the criminal justice system. Significant similarities and differences between the national samples recruited will be discussed.

Intro

The traditional view of global cannabis market consisting of production in developing world countries for export to consumers in the developed world is increasingly redundant. Large scale outdoor cultivation has been long established in countries like Australia, Canada, the USA and New Zealand. With the advent of indoor cultivation techniques and the wide dissemination of both technical expertise and growing technologies cannabis is now produced on a significant level across most of the industrialised world (Decorte et al., 2011). With 'traditional' producer countries in the developing world continuing to cultivate, the UN confirmed cannabis production to be a truly global phenomenon with 172 countries and territories reporting cultivation in the 2008 World Drug Report (a year where particular attention was given to the phenomenon of cannabis cultivation; UNODC, 2008). This globalisation of cannabis cultivation continues to be a significant feature in global drug markets (UNODC, 2012).

Much research to date has consisted of nationally focused work generating typologies of cannabis growers in the industrialised world (e.g. Weisheit, 1991; Nguyen and Bouchard, 2010; Potter and Dann, 2005), or national studies focusing on specific aspects of cultivation in individual countries (e.g. Bouchard, 2007; Bouchard et al., 2009; Decorte, 2010; Hakkarainen, et al., 2011a; Hakkarainen et al., 2011b; Plecas et al., 2005; Potter, 2010; Weisheit, 1992; Douglas and Sullivan, 2013; Hammersvik et al., 2012). Whilst there is some work that discusses cultivation in neighbouring states (Hakkarainen et al., 2011a on Finland and Denmark; Jansen, 2002 on Switzerland and the Netherlands), and a compendium that draws on studies from a dozen different countries and regions (Decorte et al., 2011), there has been an absence of any significant internationally comparative research. However, such a global phenomenon would clearly benefit from some coordinated international research, a point also recognised by the United Nations Commission on Narcotic Drugs in a recent report calling specifically for further "research on the different methods of cannabis cultivation and the role of cannabis seeds therein" (INCB, 2013, para. 69).

Internationally comparative approaches to research provide many benefits, particularly around providing insights into how national legal and cultural variations impact on both patterns of (specific types of) crime and on assessing policy responses to (specific) crime(s) (e.g. Heidensohn, 2008). Indeed, Hardie-Bick *et al.* (2005:1 cited in Heidensohn, 2008:199) assert that "[a]ny criminology worthy of the name should contain a comparative dimension. The contents of cultural meanings that are loaded into the subject of criminology are too variable for it to be otherwise. It is fair to say that *most of the important points made by leading scholars of criminology are comparative in nature*" (emphasis added by Heidensohn). Specifically, we can begin to see how patterns of this particular crime, both common and similar in terms of macro-level trends, may differ within and between different countries and regions (i.e. in terms of micro-level trends and patterns). This research aims to address how different cultural, political, social and economic contexts, and in particular different policy regimes, may influence approaches to and patterns of cannabis cultivation, and also particular responses to cannabis cultivation. The potential to inform future policy responses is obvious.

This paper reports on the design and preliminary findings of the (semi-)standardised International Cannabis Cultivation Questionnaire (ICCQ, Decorte et al. 2012) developed by the Global Cannabis Cultivation Research Consortium (GCCRC) and conducted in nine countries. We begin

with a brief outline of our methodology before outlining some interesting early findings. Findings presented are preliminary, drawing on data from four participating countries (Belgium, Australia, the United States and Canada) recognising both that data-collection (in some countries) is on-going and that our analysis is in its early stages. Although we accept that sampling and other methodological issues necessitate some caution, we believe we can make a number of interesting and valid observations about national and international patterns of domestic cannabis cultivation in in our data set of respondents from this limited number of developed nations, at least for those that we might loosely think of as 'small-scale cannabis growers'. In particular, we provide some comparative commentary on who grows cannabis, reasons for growing, methods of growing, and market involvement ('dealing') offering some tentative hypotheses regarding how and why these factors may differ across national borders.

Methods

Our methodology has been described in some depth elsewhere (Barratt et al., 2012), so a brief overview will suffice for current purposes. Following on from successful online surveys into cannabis cultivation in Belgium (Decorte, 2010) and Denmark and Finland (Hakkarainen et al., 2011a), we (the GCCRC) sought to develop a standardised questionnaire format for an online survey to allow for the collection of meaningfully comparative data in all participating countries, the International Cannabis Cultivation Questionnaire (ICCQ; Decorte et al. 2012).

The 35 item ICCQ includes items on: 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; contacts with the criminal justice system; involvement in other non-drug related illegal activities and demographic characteristics. The ICCQ also includes items to test eligibility and recruitment source.

While all members of the GCCRC have a shared interest in studying cannabis cultivation, we are not governed by a homogenous set of research goals. Therefore, all countries are using the ICCQ, but many countries have also added their own additional items or modules. For example, surveys in the US and Canada are exploring the criminal careers of cultivators; the Belgian team is exploring the extent to which cannabis cultivators are also involved in other criminal behaviours. Various surveys in other countries address detailed description of growing practices, medical reasons for growing cannabis, and how growers think cultivation should be regulated if prohibition were repealed.

The questionnaire design drew from Dillman's Tailored Design method (Dillman, 2007) which treats the questionnaire as a conversation between the respondent and the researcher. Various trade-offs have to be considered. Although incentives are commonly provided to online survey respondents due to their positive effect on participant recruitment and retention (Göritz, 2006; Heerwegh, 2006), we chose not to reward respondents with payments or similar incentives because we would need to collect IP addresses in order to guard against increased multiple responding (see Bowen et al., 2008; Gosling et al., 2004). Piloting and our familiarity with the target group has demonstrated the critical importance of anonymity, especially not collecting IP addresses. Furthermore, using IP addresses to screen out multiple responders is problematic because individuals intent on responding multiple times could simply assign themselves a new IP address for each occasion using an IP anonymiser like Tor and appear to come from unique locations. Therefore, rather than attracting respondents through a monetary incentive which

could increase multiple responding, the success of the ICCQ depends more heavily upon the participants' enjoyment, satisfaction and interest in the survey (Galesic, 2006).

Cannabis cultivators are a hidden population. There are good reasons for them to be secretive about their activities and suspicious of people who ask them to share detailed information about their cultivation practices. It is a critical part of our methodology that we acknowledge these concerns of our participant group, as our international comparative study has the capacity to tell more nuanced and varied narratives about cannabis cultivation. Experiences from previous studies on cannabis cultivation using online surveys (Decorte, 2010; Hakkarainen, et al., 2011a) demonstrated the importance of establishing legitimacy to carry out the research. Researchers had discussions with moderators of web forums, responded to individual emails about the research, contacted different cannabis organisations in order to inform about the research before it went online, met with important stakeholders who debate cannabis online, etc.

This process was part of a wider approach to online methods described previously as 'participatory online research' (Barratt and Lenton, 2010; see also Potter and Chatwin, 2011; Temple and Brown, 2011). This emerging body of work explores online engagement and dialogue with drug users as part of the research process. More meaningful involvement of participant groups in health and medical research has been advocated (Boote et al., 2002), but this kind of involvement in research is more difficult for groups who must identify themselves with a stigmatised and illegal activity (Singer, 2006). The internet may facilitate increased and more meaningful participant information in research through anonymous public dialogue and a reduction in power differences between researcher and participant (Bakardjieva and Feenberg, 2001).

In order to recruit as varied a sample of cannabis growers as possible and benefit from each country's efforts, we have implemented a broad-based recruitment strategy and techniques to minimise duplication between research teams. Promotion strategies include: an international project website and blog hosted at a .nl address to highlight our association with a model of cannabis control supported by our respondents; Twitter recruitment involving following prominent cannabis Twitter accounts and engaging with cannabis users; discussions hosted on cannabis culture and cultivation online forums where the researchers continue to engage with respondents while answering questions about the study; posting to and engaging with Facebook groups associated with cannabis culture; mainstream media coverage (television, radio, newspaper) planned for halfway through recruitment; alternative media coverage through provision of flyers to alternative music shops, head shops, street press, festivals; distribution of flyers to grow shops; online and hard-copy advertising in cannabis-related magazines and websites; providing social media sharing buttons so respondents can easily share the survey with their social networks; and providing a link to printable flyers so respondents who wish to pass details of the survey to their friends can do so more privately. The mix of strategies will vary from country to country; however many of these strategies are international, leading people to the global website (www.worldwideweed.nl) where they can then choose the survey associated with their country of residence.

It is important to acknowledge the limitations of the internet-based research methods reported here. Most importantly, samples of cannabis cultivators are volunteers, and not all cultivators have an equal chance of being included in the sample, resulting in coverage error. Our findings, therefore, cannot be said to represent all cannabis growers, and it is difficult to precisely estimate the importance of bias in our samples. Nevertheless there are various strategies we have taken to minimise sampling limitations. Firstly, we are using a wide variety of recruitment and

promotion strategies and we are monitoring where each respondent found out about the study so we will be aware if any one promotion method may bias the findings. Secondly, by removing any financial incentive to respond to the survey, we have reduced the likelihood of fraudulent responding. Thirdly, wherever possible, we will compare results obtained through our online methodology with other sources of information about cannabis cultivation in each country.

While it can be helpful to compare multiple datasets, it does not solve the problem of understanding which is the most representative, as none of the data on cannabis cultivation uses probability sampling frames. Straus (2009) notes that it is common for cross-national comparisons to be made using convenience or purposive sampling, and argues that the overall context effects associated with living in that specific nation may still be discernible in comparative analyses, even though the representativeness of the resultant samples from each country is unknown. It is also important to note that many of the limitations faced by online purposive sampling are broadly similar to 'traditional' face-to-face methods of studying hidden populations. Representative sampling methodology, as used in household surveys, is also prohibitively expensive to administer to the general population in ways that would access large numbers of cannabis cultivators. Additionally, most existing national and transnational research on cannabis cultivation is based on detections and arrests by law enforcement which obviously has its own biases. It is hoped that the results of the current research with self-selected samples of cannabis cultivators completing an online questionnaire will produce a useful counterpoint to the available law enforcement data.

While all cannabis growers of at least 18 years of age were eligible to participate, we expect to access mainly small-scale cultivators through employing internet research methods to access hidden populations and facilitate anonymous data collection. Our expectation is based on previous research using the same kind of method, where mainly small-scale cannabis cultivators responded (Decorte, 2010; Hakkarainen, et al., 2011a); however, we might see a more varied range of respondents with the inclusion of other countries like Canada and USA where large - scale indoor and outdoor cannabis cultivation is present (Decorte et al., 2011).

Findings presented in the current paper are based on the data acquired through three of the ICCQ surveys – North America (covering Canada and the US), Belgium (covering both major language groups found in the country) and Australia. These three datasets were merged for the ICCQ questions – this involved ensuring different datasets used the same coding structures, e.g. recoding North American data to ordinal to match the ICCQ, recoding questions from imperial into metric. Questions with 'other please specify' string variables were recoded where possible into existing categories, and some new recoded categories were created.

Selecting eligible samples:

Three rules were used to determine eligible samples for analysis in this paper:

1. Respondents answered 3 eligibility questions at the beginning of the questionnaire. These were: (a) aged 18 years or over, (b) resided in the country of the survey, (c) reported that they had grown cannabis at least once. Respondents who did not meet these criteria were not presented with the remaining questionnaire.

2. Q3 of the ICCQ asked 'how long ago did you last grow cannabis?' In order to reflect only recent trends in growing, we have excluded the participants who reported last growing cannabis more than 5 years ago and those who did not know, refused or skipped this question.
3. The samples reported here completed at least half of the core ICCQ questions. There were 35 questions in the ICCQ (excluding 3 eligibility questions). 27 questions were asked of all participants, 1 was used for criteria 2, so 26 were included in missing data analysis. Dichotomous indicators of nonmissingness or completeness were calculated for each question, where 1 = any response recorded including a 'don't know' or 'refused' response, and 0 = 'no response' recorded including missing or skipped. Respondents were retained in the sample if they had completed 14 or more of the 26 core ICCQ questions.

This process is shown in Table 1.

	North America	Belgium	Australia	Total
Total respondents	*1278*	*1454*	*865*	*3597*
Eligibility criteria				
Have you ever grown cannabis?	1181	1454	821	3456
Are you 18 years or over?	1082	1454	791	3327
In which country do you reside?				
United States	971			971
Canada	99			99
Belgium		1454		1454
Australia			821	821
Other country	208		44	252
Drop ineligible respondents	*240*	*0*	*107*	*347*
Total eligible	*1038*	*1454*	*758*	*3250*
Time since last grow				
Current or last 12 months	613	957	398	1968
1-5 years ago	201	315	193	709
More than 5 years ago	95	81	85	261
Don't know, Refused, Missing	129	101	82	312
Drop + 5 years ago & missing	*224*	*182*	*167*	*573*
Total eligible	*814*	*1272*	*591*	*2677*
Completeness count				
0-6 complete	10	118	9	137
7-13 complete	98	98	77	273
14-20 complete	31	56	12	99
21-26 complete	675	1,000	493	2168
Drop < 14 items completed	*108*	*216*	*86*	*410*
Final sample	***706***	***1056***	***505***	***2267***

Analysis

Results are presented for a selection of comparable ICCQ items for North America, Belgium and Australia. Categorical or ordinal responses are presented as percentages of valid cases. Medians and interquartile ranges (IQR) are presented for continuous 'count' variables, such as age, number of plants, yield and surface area, as these are less-biased descriptors than means/standard deviations. A dash (-) in the table indicates the item was not asked in that country.

Recruitment success: reflections on recruitment methods

For practical and logistic reasons largely beyond the control of the researchers, the surveys remained open for different periods in different locations. In North America, the survey remained open from May 2012 to Feb 2013 (10 months). In Belgium, the survey remained open Jun to Dec 2012 (7 months). In Australia, the survey remained open from Jul 2012 to Feb 2013 (8 months). Strategies employed in Belgium were relatively successful. In North America, online recruitment methods were the core methods used, including an incidental mention on the alternative news site, Reddit. In Australia the main methods that worked were running media releases on interim findings which received national news coverage and engaging with online communities of cannabis growers.

Different recruitment methods were utilised across the three countries: see Figure 1, which shows all respondents who answered this question (regardless of whether they were included in the final sample). Cannabis cultivation and cannabis culture websites and forums recruited the bulk of the North American sample, whereas the Belgian and Australian samples were more equally divided between other recruitment methods. General news articles in print, online or on radio recruited a third of the Australian sample, whereas flyers and posters recruited nearly a third of the Belgium sample. A posting about the study on Reddit by a Reddit user resulted in a fifth of the North American sample. Facebook strategies were successful in Australia and Belgium. In Australia, significant efforts were put into recruitment via Twitter, YouTube and Google AdWords, but these strategies were relatively unsuccessful.

The large differences between the recruitment methods could potentially confound our interpretation of country comparisons, which may instead be attributed to accessing different subpopulations of growers. Both despite and because of this, some reflection on the relative successes of different recruitment methods is invaluable, particularly as the testing and development of online research methods (particularly as applied to hidden populations) has always been one of the academic driving forces behind this project.

As such, it is worth noting that the Belgian team was able to obtain significant funding for their project through a national funding agency (Belgian Science Project) which enabled the recruitment of a full-time researcher for twelve months, of which over six months was spent on full-time promotion

of the survey.[1] The North American team received a small internal grant to support recruitment[2] while the Australian team had no specific funding for this project. Nevertheless, the Australian team spent more time on promotion and recruitment than the North Americans, but significantly less than the Belgians. Therefore, the Belgian team was able to put more effort into face-to-face promotion strategies, such as handing out flyers (almost 10,000 flyers distributed personally and 3000 posters used) and at the same time take the opportunity to talk at length with potential participants. This allowed them to spend time on building trusting relationships with potential participants and key gatekeepers, and explain in face-to-face encounters the goals and design of the project, stress the importance of giving growers a voice, and decrease distrust and paranoia. This also might explain why 'through a friend' was a relatively successful strategy in Belgium: their personal approach also stimulated social sponsoring of the survey through participants, generating a snowball sampling effect.

A key factor in recruitment differences seemed to be the reputations of the research teams. The ISD (Institute for Social Drug Research), in Belgium, and Prof. Tom Decorte personally, have participated frequently over the last decade in public debate, always arguing in favour of alternative drug policies, and promoting debate on alternative regulation of cannabis in particular. Anyone who wished to engage in some online research of their own could quickly find the institute's website, read its mission statement and scan their publications. The Australian team equally drew heavily on the reputations of Prof. Simon Lenton and the NDRI (National Drug Research Institute) for conducting research into cannabis policy reform, which probably particularly helped recruitment drives through the national mainstream media. Conversely, it was felt that Profs. Aili Malm and Martin Bouchard's established research interests and publication record in policing and criminal justice may have, on face value, potentially alienated some hesitant would-be participants.

Other points may go some way to explaining the significantly more successful recruitment strategy (relative to country population) in Belgium. Following legal reform in Belgium in 2003 and 2004 there is a general climate of tolerance to talk about cannabis use. Indeed many people think cannabis is already somehow legalized, as the law says possession of 1 female plant will not be prosecuted (Gelders and Vander Laenen, 2007). The idea that a political and or cultural climate that is more tolerant of cannabis use and cannabis cultivation, or perhaps a difference in levels of trust in those who research these areas, seemed to be important: although it is too soon to comment with certainty, it was notable across the other participating countries (not included in the data analysed here) that recruitment seemed much quicker and easier in the countries of mainland Europe (Finland, Denmark, Belgium, Germany, the Netherlands) than in the Anglophone countries (Australia, the UK, and the US and Canada).

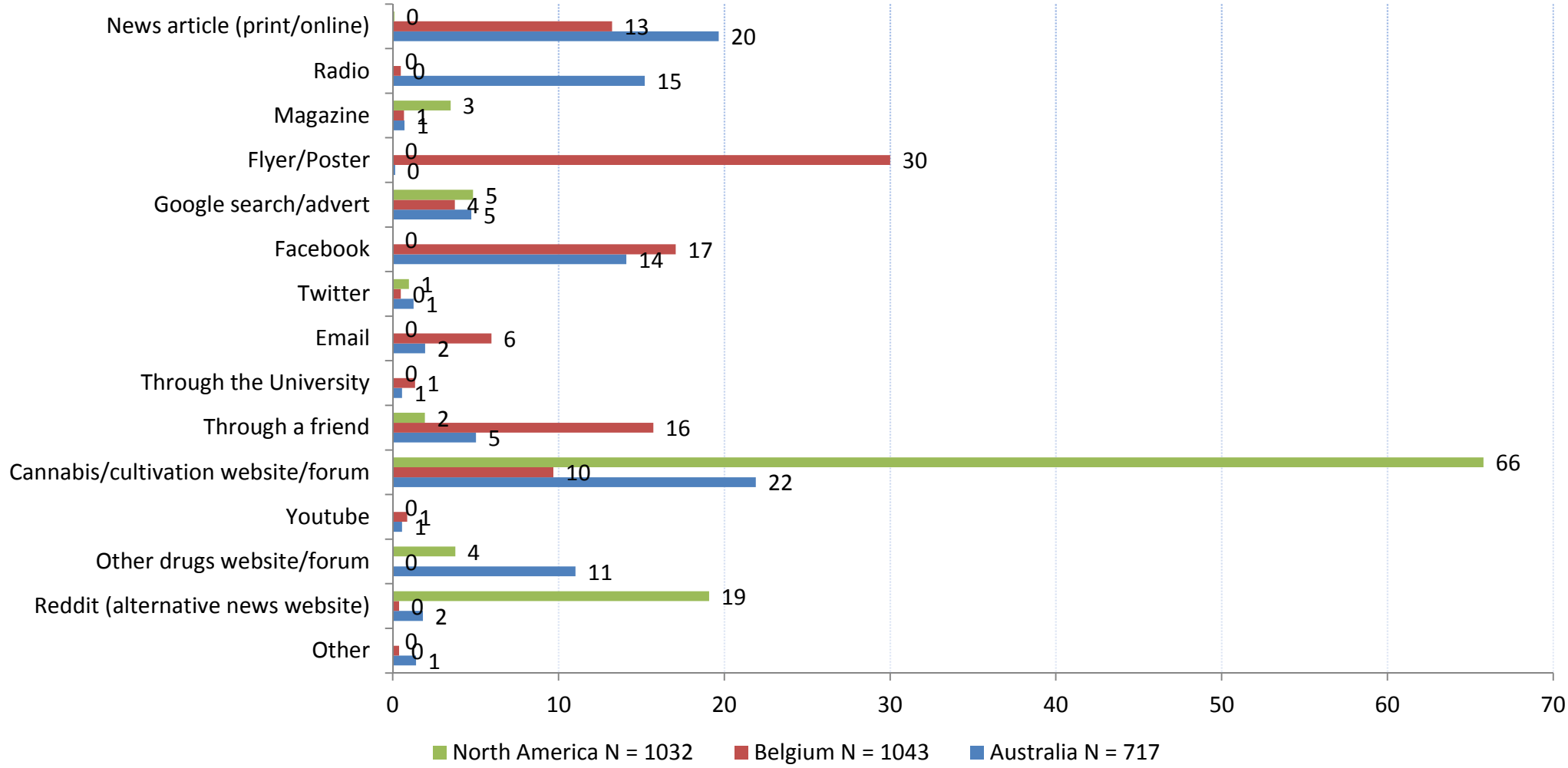
A final factor that may explain Belgian success rates is that the Belgian team had already performed a web survey on cannabis cultivation in 2007. This could have effects in two ways: on the one hand some growers told us they had already participated in the previous survey, and didn't feel they wanted to spend time on completing a survey again; others wanted to readily participate again, or

1 The Belgian study was commissioned and financed by the Belgian federal Science Policy, within the framework of the 'Research programme in support of the federal drugs policy document' (see http://www.belspo.be); grant no. DR/00/063).

2 California State University grant (CSULB RSCAA 2012 grant - PI Malm).

were happy to participate for the first time, as they saw how the previous data was used to promote political debate on alternative regulation of cannabis. What is more, the experience of participating in the earlier survey without suffering negative repercussions (such as identification to law enforcement agencies) can only have improved levels of trust and confidence.

Figure 1: ‘How did you first find out about this study?’ by country, using all respondents (N = 2792), %



Further analysis of recruitment successes drawing on data from all participating countries and factoring in key variables such as internet penetration and estimated rates of cultivation within different countries will, we hope, give some insight into the interplay between research strategies, political and cultural conditions and success rates for different recruitment strategies.

Findings

Here we consider data from the three surveys dealing with six key topics relating to the experiences and characteristics of cannabis growers: demographic profiles; cannabis and other drug use; growing experience; methods and scale of cultivation; reasons for growing, and; market participation ('dealing').

Demographics characteristics (Table 2)

There is some broad commonality across our samples (which suggests comparison of the samples will give meaningful insights into differences and similarities in growing experiences, even if questions remain as to how representative each sample is of its parent (national) population of cannabis growers). Gender ratios are very similar across the three surveys. Ages were similar for Belgium and North America, but the median age of respondents was significantly higher for the Australian sample. Patterns of employment status were not dissimilar, although Belgium recruited a notably larger proportion of students, and North America more unemployed people. Belgium also had a notably higher proportion of respondents living with family. Age, employment (particularly student) status and living with family are probably related to each other, and the different recruitment strategies may explain much of the difference. In particular, Belgium targeted student populations in many of its recruitment strategies. Australia's greater use of mainstream media may have contributed to targeting an older sample (also less likely to be students or to live with parents or siblings).

Table 2: Demographic characteristics

	North America	Belgium	Australia	Total
Gender (%)				
Male	89	91	87	89
Female	11	9	12	10
Refused	-	0	0	0
Total N	630	992	490	2112
Age				
Median	26	26	35	28
IQR	21-36	22-34	27-47	22-37
Range	18-86	18-81	18-71	18-86
Refused	-	0	0	0
Total N	706	994	487	2187
Employment status (%)				
Full-time work	35	39	44	39
Part-time or casual work	19	10	13	13
Self-employed	20	8	17	13
Full-time student	14	33	9	22
Part-time student	4	4	2	4
Unemployed - looking for work	14	8	5	9
Benefits/pension/disability	5	3	9	5
Home duties	7	1	2	3
Retired	4	1	4	3
Not seeking work	4	4	13	6
Other	-	3	1	2
Refused	-	1	0	1
Total N	496	993	488	1977
I live with: (%)				
My spouse/partner/boyfriend/girlfriend	45	37	59	45
My child/ren	19	17	29	20
My parents	21	31	10	23
My grandparents	3	0	0	1
My siblings or other family members	13	22	7	16
My friends	7	5	4	5
My housemates	11	9	11	10
No-one, I live alone	20	18	14	17
Other	0	0	1	0
Refused	-	3	3	2
Total N	384	988	488	1860

Note. Educational level and ethnicity were not comparable between countries and are therefore not reported in this paper.

Cannabis and other drug use (Table 3)

In general, North American respondents reported an earlier average age of first use of cannabis, broadly reflective of other research looking at initiation into drug use in these three countries. Clearly most respondents in all three surveys were regular or even heavy users of cannabis (e.g. use today or in last week), but the North Americans were most, and Belgian's least, likely to have smoked very recently. Belgians were most likely to have used most other drugs, including alcohol and nicotine, except for various amphetamines and hallucinogens. This broadly reflects different national drug markets and (sub-)cultural norms. We have not yet done the analysis, but comparisons of first age of use and of other patterns of drug use to national drug-use surveys is one way we can draw inferences as to how representative our samples are of broader drug-involved populations.

Table 3: Cannabis and other drug use characteristics

	North America	Belgium	Australia	Total
How old were you when you first used cannabis? (%)				
I have never used cannabis	1	2	0	1
Less than 16 years old	49	35	34	39
16 to 17 years old	24	40	35	34
18 to 25 years old	22	21	26	22
More than 25 years old	4	3	4	3
Don't know	-	0	0	0
Refused	-	0	0	0
Total N	704	1055	499	2258
When was the last time you used cannabis? (%)				
Today	66	44	56	53
Not today, but in the last week	21	36	22	28
Not in the last week, but in the last 30 days	6	11	7	8
Not in the last 30 days, but in the last 12 months	6	7	11	8
I have not used cannabis in the last 12 months	2	3	3	3
Don't know	-	0	0	0
Refused	-	0	1	0
Total N	690	1035	488	2213
*In the past 12 months, have you used any of the following drugs? (%) **				
Alcohol	68	88	74	79
Cigarettes	53	71	57	62
Cannabis that is not home-grown	58	78	57	67
Hash (resin)	52	60	27	50
Methamphetamine (meth, crystal, ice)	3	1	7	3
Amphetamine (speed)	6	8	12	8
Cocaine (includes crack cocaine)	6	13	7	10
Ecstasy (MDMA)	11	18	18	16
LSD	10	7	13	9
Magic mushrooms	20	13	16	16
Synthetic cannabinoids (Spice, Kronic, K2, etc)	7	1	13	6
Heroin	1	0	1	1

Other opioids (e.g. OxyContin™, codeine, buprenorphine)	9	1	8	5
Benzodiazepines and sedatives (e.g. Valium™, Stilnox™)	7	2	8	5
Other pharmaceutical drugs	1	1	1	1
Other drugs not elsewhere classified **	5	6	4	5
None of the above	4	2	6	3
Don't know	-	0	0	0
Refused	-	0	0	0
Total N	659	1049	498	2206

* These responses excluded 'any pharmaceutical drugs that you are taking as directed by your doctor or other specialist'.

** Included psychedelics (DMT), GHB, Ketamine, 2C-x, novel psychoactive drugs like mephedrone, methoxetamine, etc.

Growing experiences (Table 4)

The median 'age of first grow' was identical in all three samples, and the broad spread of age very similar, again supporting the argument that comparative analysis of other aspects of our data sets is useful. The Belgian sample shows a higher proportion of quite inexperienced growers: 74% had not grown more than 5 crops compared to 61% in North-America and 47% in Australia. (11% of Belgian growers had more than 10 crops compared to 26% in America and 32% in Australia.) This may be a factor of the Belgian sample being younger but we have not yet done the analysis controlling for age.

Table 4: Growing experiences

	North America	Belgium	Australia	Total
Age of first grow				
Median age in years	20	20	20	20
IQR	17-25	18-25	17-25	18-25
Range	10-65	12-71	10-65	10-71
Don't know	-	0	0	0
Refused	-	0	0	0
Total N	704	985	470	2158
How many crops ever grown? (%)				
Not yet harvested first crop	13	10	3	9
1 crop	12	19	11	15
2 to 5 crops	36	45	32	39
6 to 10 crops	14	14	18	15
11 to 20 crops	11	5	17	9
21 to 50 crops	9	4	10	7
More than 50 crops	6	2	5	4
Don't know	-	1	2	1
Refused	-	1	1	1
Total N	701	1055	505	2261
How many times did you fail before you succeeded in getting a crop? (%)				
Not yet harvested first crop	13	10	3	9
Succeeded the first time	65	59	58	60
1 attempt	5	19	18	14
2 attempts	10	7	12	9

3 attempts	3	3	4	3
4 attempts	2	1	1	1
5 attempts	1	0	1	1
More than 5 attempts	1	1	2	1
Don't know	-	1	1	1
Refused	-	1	0	0
Total N	700	1053	493	2252

In all three samples, 70% or more succeeded on the first or second attempt (with the majority succeeding first time), which demonstrates how easy it is to grow cannabis for those who are motivated to do so (and have access to the internet cf. Potter, 2010; Bouchard et al. 2011; Decorte 2010).

Growing method and scale (Table 5)

North Americans were more likely to grow indoors than outdoors by a ratio of 4:1. Belgians, and especially Australians had a preference for growing outdoors (including indoor and outdoor in the same grow, which would normally mean starting the plants from seed or cutting indoors and then transplanting once established. This option was not offered in the North American version of the survey). It is likely that this reflects a combination of available favourable outdoor growing conditions (e.g. climate; available space) and concerns for avoiding detection (both likelihood of being detected and perceived risk of serious criminal justice intervention if detected), but also local preferences and sub-cultural traditions.

The number of mature plants grown per crop was similar for each country, with most people growing a relatively small number of plants but some respondents growing many more (100+). However North American respondents had a tendency to grow more even at the lower end of the scale. Australians had the largest amount of space typically given over to cannabis cultivation, with Americans having the least. Australians also averaged the largest typical yields both per plant and per crop. A possible explanation for the overall pattern here is that outdoor cultivation (as was more common for Australian respondents) tends to be more suited to growing larger plants, where indoor growers (most typical in North America) may have more, smaller plants occupying the available space (Potter, 2010).

Further analysis indicated that the median yield per plant was significantly higher (median = 1.8 ounces, IQR 0.7–4.7) for respondents who grew outdoors compared with those who grew indoors (median = 1.3 ounces, IQR 0.4–3.5; Wilcoxon signed-rank test: $z = -4.70$, $p < .001$).

Table 5: Growing method and scale

	North America	Belgium	Australia	Total
Do you typically grow indoors or outdoors? (%)				
Indoors	79	34	26	46
Outdoors	21	53	47	42
Both indoors and outdoors in the same grow	-	12	26	12
Don't know	-	0	0	0
Refused	-	0	0	0
Total N	617	950	490	2057
Number of mature plants per crop				
Median	6	3	4	4
IQR	3-12	2-6	2-6	2-8
Range	1-100+	1-100+	1-100+	1-100+
Total	589	829	444	1862
Space typically used to cultivate cannabis (in square metres)				
Median	1.9	2.0	3.2	2.0
IQR	0.9-9.3	1.0-4.0	1.0-8.0	1.0-5.6
Range	<0.1-100+	1-100+	<0.1-100+	<0.1-100+
Total	593	931	444	1968
Typical yield (i.e. usable dried cannabis) per plant (ounces)				
Median	1.0	1.4	3.0	1.7
IQR	0.1-3.2	0.6-3.5	1.3-5.5	0.5-4.0
Range	<0.1-58.8	<0.1-370.4	<0.1-270.4	<0.1-370.4
Total	586	656	407	1649
Typical yield (i.e. usable dried cannabis) per crop (ounces)				
Median	7.1	3.6	10.0	7.1
IQR	0.7-27.4	1.8-14.1	4.0-25.0	1.9-20.0
Range	<0.1-3527.4	<0.1-740.8	<0.1-811.3	<0.1-3527.4
Total	613	755	441	1809

Note: only includes those who have harvest their 1st crop

Numbers of plants only include those who reported growing 1 or more of each type, respectively.

Reasons for growing (Tables 6 and Figure 2)

Again, there are some strong similarities across the three countries but also some striking differences. Cost, provision for personal use, and pleasure were the top reasons for growing across all three countries with over 70% of respondents reporting each of these factors in each country. However, there was some interesting variation even within these categories: Americans were particularly likely to report growing as cheaper than buying; Australians were most likely to be concerned with providing for their personal use, and; Belgians were particularly likely to report pleasure from growing cannabis – both here and elsewhere we might speculate how our data reflect general social, political and cultural differences. Over 50% of respondents in all three nations also reported healthiness of product and avoidance of criminals as reasons for growing their own. Taken together, these

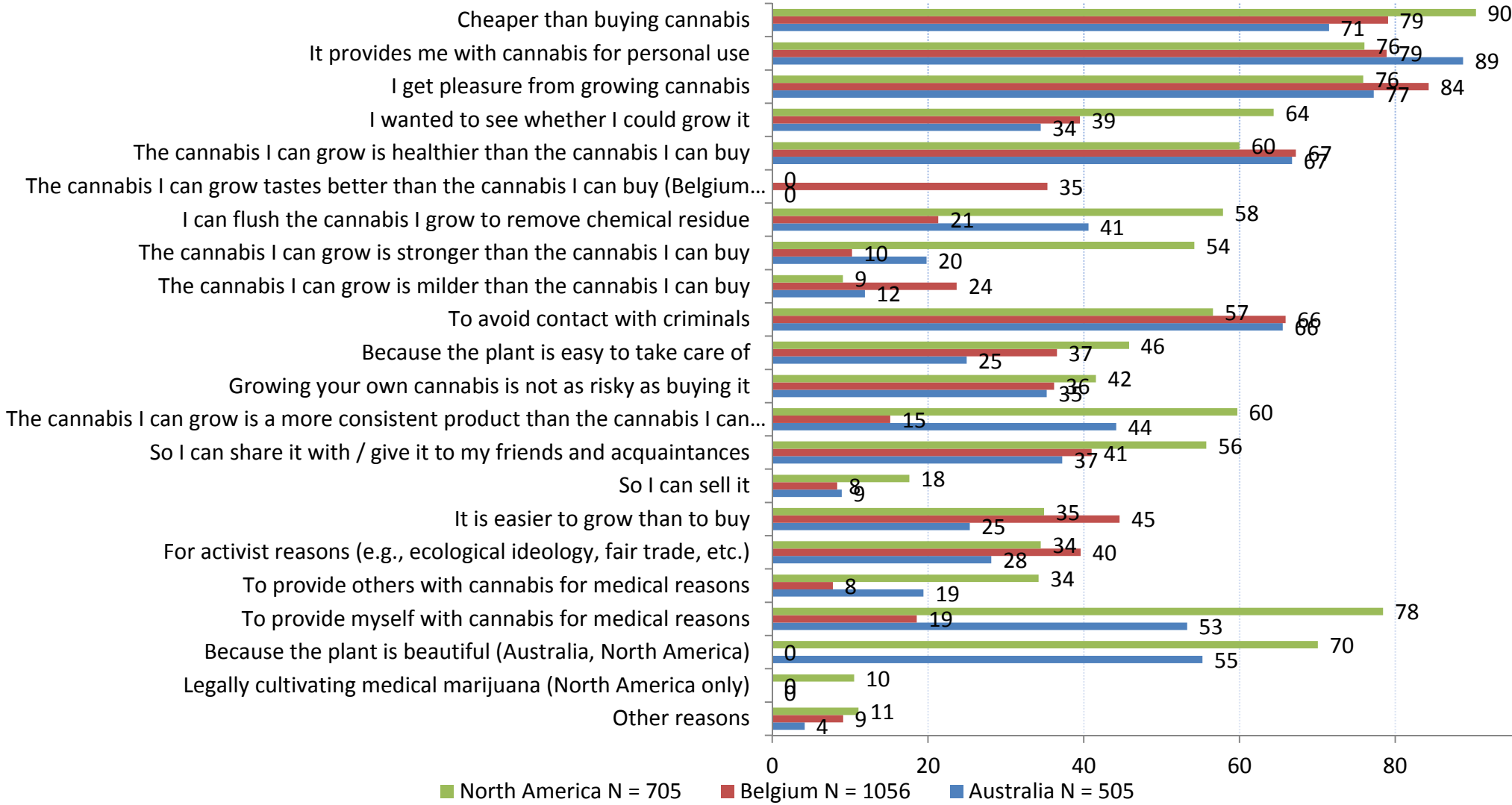
and other features of the data support the repeated observations in the literature that cannabis cultivation is in some ways a rational choice for cannabis users who wish to minimise the harm associated with buying cannabis (cost, criminal involvement associated with buying cannabis, uncertainty or undesirability of quality of cannabis available on the black-market).

Notable differences between countries include wide variations in those reporting cultivating for their own or somebody else's medical use (much more likely in America; least likely in Belgium). We might speculate that in America, where (in some states) there is legal provision for medical cannabis use, claiming medical use reduces some of the stigma associated with being a cannabis user akin to a sophisticated 'neutralisation' technique (cf. Sykes and Matza, 1957). The desire to grow cannabis that was weaker, rather than stronger, than that available on the black-market was peculiar to Belgium, whereas the desire to grow cannabis that was stronger than available on the market was particularly important in America). At the same time, Belgians were least concerned with wanting to ensure consistency of product when compared to what they could buy. Both these and other factors seem to point to the role that features of the domestic market have in influencing (motivating) growers: in Belgium, there is easy access to the de-criminalised 'coffee-shop' market in the Netherlands, dominated by a wide selection of consistently strong varieties of cannabis. More traditional black-markets, however, are not known for consistency of product and, indeed, are often associated (fairly or not, cf. Coomber, 2006) with concerns around adultery and general inconsistency of standards (e.g. strength and purity). Curiosity was more important in America than elsewhere, we do not know why.

Table 6: Reasons for growing – top 5 for each country

	North America		Belgium		Australia	
1	Cheaper than buying cannabis	90%	I get pleasure from growing cannabis	84%	It provides me with cannabis for personal use	89%
2	To provide myself with cannabis for medical reasons	78%	Cheaper than buying cannabis	79%	I get pleasure from growing cannabis	77%
3	It provides me with cannabis for personal use	76%	It provides me with cannabis for personal use	79%	Cheaper than buying cannabis	71%
4	I get pleasure from growing cannabis	76%	The cannabis I can grow is healthier than the cannabis I can buy	67%	The cannabis I can grow is healthier than the cannabis I can buy	67%
5	Because the plant is beautiful	70%	To avoid contact with criminals	66%	To avoid contact with criminals	66%

Figure 2 – Reasons for cannabis cultivation (%)



Market participation (Table 7)

Although there were significant differences in growers' involvement in the distribution of cannabis, overall profiles were broadly similar in this area. Unsurprisingly, the vast majority of growers reported consuming at least part of their crops for personal cannabis use.

Table 7: Market participation

	North America	Belgium	Australia	Total
*What did you do with the cannabis you grew in the last 12 months? (%) **				
Consume for personal use	97	96	97	96
Swap with other growers	27	30	18	26
Give away (or share)	70	81	65	73
Sell (includes both cover costs and for profit)	38	33	24	32
Sell to cover costs of growing	-	25	20	16
Sell for profit	-	18	12	11
Keep in your possession	-	59	18	32
Total N	389	634	315	1349
*What percentage of your crop did you consume for personal use? ***				
Median	80	60	80	70
IQR	50-95	30-80	50-99	40-90
*What percentage of your crop did you swap with other growers? ***				
Median	10	5	10	10
IQR	5-15	5-10	5-19	5-10
*What percentage of your crop did you give away or share? ***				
Median	10	10	20	10
IQR	5-25	5-25	10-30	7-25
*What percentage of your crop did you sell? ***				
Median	40	20	20	25
IQR	15-70	10-49	10-45	10-50
*What percentage of total income came from cultivation activities? (% last 12 months) ****				
0-10%	55	77	68	67
11-50%	24	11	18	18
51-100%	21	12	14	16
Total N	139	152	57	348
Have you sold any drugs other than cannabis or cannabis products in the last 12 months?				
No	82	94	91	90
Yes	18	4	9	9
Don't know	-	1	0	0
Refused	-	1	0	1
Total N	688	967	494	2149

* Only includes participants who reported growing currently or in the last 12 months, and who reported harvesting one crop or more.

** Medians and ICQs for respondents who reported at least 1% of their crop was used in this way.

*** Only includes participants who reported selling cannabis (to cover costs or for profit) in the last 12 months.

All three surveys identified significant majorities who gave away cannabis, and significant minorities of respondents who swap some of their cannabis with other growers, ranging from 18% in Australia to 30% in Belgium. Although the precise reasons for the variation in responses is unclear, the overall picture supports the idea of cannabis use – and even cannabis growing – as a social experience (cf. Weisheit, 1991, 1992; Potter, 2010a, 2010b) and are involved in what we might think of as 'social supply' (a key element of non-commercial cannabis cultivation noted by both Potter, 2010 and Hough *et al.* 2003 in the UK). Perhaps more significantly from a criminal justice perspective, between 24% (Australia) and 38% (North America) reported selling cannabis to others, although only 12% of Australians and 18% of Belgians reported selling for profit as opposed to selling to cover their own costs of growing (North America did not make this distinction in their questionnaire).

There are a number of indicators to suggest that growers in the US and Canada are more active in actually selling, whether to cover their costs or for profit, than those in the two other nations. This can be seen in table 6, but also in Figure 2 (reasons): 18% of North-American growers indicated that they grow so they can sell. They also sell larger proportions of the cannabis they grow. The proportion that earns a considerable percentage of their income (more than 50%) from cultivation is also higher in US/Canada, and North American respondents have also more often sold other drugs in the last 12 months.

Selling (either for profit or to cover costs) was associated with higher total crop yield (Wilcoxon signed-rank test: $z = -7.34$, $p < .001$). Sellers reported a median crop yield of 10.6 ounces (IQR 3.5–27.4; n = 402) while non-sellers reported a median crop yield of 4.6 ounces (IQR 1.4–15.9; n = 771). This pattern was the same for each country analysed separately.

Conclusions

This paper reports some initial findings from work that is very much on-going. So far only three of the nine data sets utilising the ICCQ have been combined and analysed, and as such conclusions are tentative and of limited generalisabililty. Nevertheless, we would draw attention to a number of key points.

There are some conclusions to draw from the methodological experience. We claim some success in developing a core questionnaire – itself constructed partly with input from cannabis cultivators – that successfully works across nine countries (so far) and a range of languages. It seems clear that comparative analysis is producing some meaningful insights about differences between our samples, although we must remain cautious in claims of how representative our samples are of wider cannabis cultivating populations within these countries.

There are some interesting early results suggesting some important similarities, but also some key differences, as to approaches to cannabis cultivation (methods, motives, market involvement) in different countries. It seems likely that some of these result to national differences around political, cultural and legal contexts – and also climatic conditions – in different nations although it is also likely that some of these differences may also be explained by sample variations relating to different recruitment techniques.

The next stages for us are therefore:

1. Include data from the other participating countries to further explore differences and similarities across nations.

2. Conduct analyses to provide indicators as to how representative our samples are of parent populations of cannabis cultivators in each country. One part of this will be to compare our samples characteristics to those of respondents to national drug surveys where available and of other indicators of cannabis cultivation populations (e.g. police records).

3. Analysis of the relationship between variables in the ICCQ and political and cultural contexts of different countries.

4. Multivariate analyses to tease out the relationships between methods, motives and market participation. In particular we wish to explore the differences between 'small' and 'large' scale, or 'commercial' and 'non-commercial' cultivation.

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