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

Using the Global Drug Survey for harm reduction

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Abstract: The Global Drug Survey (GDS) is a detailed annual online survey of psychoactive substance use that first ran in 2011. The 10 GDS surveys to date have collected data from more than 900 000 respondents, containing information that can answer key and novel questions related to the epidemiology of psychoactive substance use as well as inform the development of pragmatic harm reduction resources that put people first. This paper looks at the history of the GDS and the range of harm reduction tools that have been created using data from the survey, highlighting the importance of disseminating peer expertise to inform positive behaviour change. This includes several mobile health applications developed from GDS data, aiming to dismantle barriers to behaviour change by considering individual risk factors. For example, the Drugs Meter tool allows people to compare their last month's use of cannabis, cocaine or MDMA to those of tens of thousands of other people, enabling people who use drugs to become involved in a dialogue about their use. This highlights the potential of using data collected from online surveys to develop practical online tools for promoting harm reduction among people who use drugs.

The Global Drug Survey

The Global Drug Survey is an independent, self-funded research organisation based in London. Through the support of its Executive Research Committee ([1]), the organisation's mission is to make drug use safer, regardless of the legal status of drugs and their use. Its related research promotes honest conversations about both the beneficial and the harmful effects of psychoactive substances. The Global Drug Survey achieves these goals through a number of products, most notably the *Global Drug Survey* (GDS) ([2]), a highly detailed annual online survey of psychoactive substance use that first ran in 2011 (Winstock and Barratt, 2013). While illicit drug use is commonly underreported in general household surveys, with no or little information included on specific use patterns, about two-thirds of people who complete the GDS are experienced with the use of illicit drugs and keen to share their experiences. The 10 surveys to date have collected data from more than 900 000 respondents. This large dataset contains invaluable information that can answer key and novel questions related to the epidemiology of psychoactive substance use as well as inform the development of pragmatic harm reduction resources that put people first. In this paper, we look at the history of the GDS and the range of harm reduction tools that have been created using data from the survey. Further,

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([2]) As both the survey – Global Drug Survey (GDS) – and our research organisation bear the same name, the survey is referred to by the acronym 'GDS'.

we consider the importance of disseminating peer expertise to inform positive behaviour change. Finally, we discuss the ethical challenges of using the information gleaned from online surveys for harm reduction purposes.

Making drug use safer

The Global Drug Survey was set up to promote honest conversations about drug use and help people who use drugs to do so more safely, in addition to minimising the harms associated with drug use, regardless of the legal status of the drug. Our annual survey, the GDS, collects detailed and in-depth information on licit and illicit drug use across the globe. It is independent of governments or industry and, thus, we believe, trusted by participants around the world. This trust enables us to gather rich data that is otherwise not available from national surveys (Barratt et al., 2017). Support for the GDS comes from grassroots harm reduction organisations, scientists from various disciplines and countries with limited access to national data on psychoactive substance use. The most recent survey at the time of writing, GDS2021, was conducted at the end of 2020 and made available in 11 languages: Danish, Dutch, English, Finnish, French, German, Hungarian, Italian, Portuguese, and Romanian.

The fact that GDS is an open-access online survey with no specific predefined sampling strategy means that certain kinds of epidemiological conclusions cannot be drawn, such as the substance use prevalence rates for a specific country. However, diverse methods of recruiting participants (e.g., news media, social media) and the detailed information collected about them provide a basis for addressing research questions related to illicit drug use that cannot easily be dealt with through population sampling approaches. In this way, data from the GDS are complementary to data drawn from other epidemiological methods. The GDS has been cited in the World Drug Report (UNODC, 2017, 2018, 2019, 2020, 2021) and the European Drug Markets Report (EMCDDA and Europol, 2016) as a demand-side indicator for drug market trends.

Data from the GDS should never be used to estimate drug use prevalence in the general population as people who respond to the survey are more likely than the general population to report use of illicit drugs. Furthermore, the GDS sample of people who use drugs is typically more likely to be male, young and better educated than respondents captured in representative general population surveys about drug use in participating countries. Nevertheless, having detailed information on the patterns of psychoactive substance use among this sample can inform about the main factors driving use. In addition, the data gathered can shed light on the transition from occasional and non-problematic substance use to potentially more harmful and regular drug-taking behaviour. The survey

results also provide insights into ways in which harm is arising from use and how it can be mitigated. In a paper, we compared the substance use patterns of participants in three national household surveys using probability sampling with respondents in the GDS, which uses non-probability sampling (Barratt et al., 2017). The similar patterns of cannabis use shown in the last 12 months and the last 30 days among people who indicated having ever used cannabis in the GDS, as well as those recruited from representative samples in Australia, Switzerland and the United States inspire confidence in the capacity of non-probability sampling methods in large-scale surveys like the GDS to produce samples that are sufficiently diverse and can provide meaningful results. More importantly, the GDS provides a sample of people who use less-common drugs, such as butane hash oil (Chan et al., 2017), methoxetamine (Winstock et al., 2016), poppers (Davies et al., 2016) or GHB (Winstock, 2015), with numbers large enough to explore dose-response curves and acute harm. Applying reoccurring special sections in the GDS, such as the one on substance use for cognitive enhancement (Maier et al., 2018), enables researchers to follow recent trends across countries. In addition, GDS is able to explore substance use and harms in minority groups who are less represented in other studies, for example in transgender and non-binary people (Connolly et al., 2020, 2021).

Different drug use realities

The fact that 90 % of people who use illicit drugs do not develop a substance use disorder (Grant et al., 2016) is a real challenge for zero tolerance drug policies, which are premised on the notion that the best way of reducing drug-related harm is to abstain from drug use. Despite many countries making progress on cannabis law reform (Asbridge et al., 2016; Hughes et al., 2018; Ogrodnik et al., 2015), and a widening acceptance that global drug prohibition has failed (Mostyn and Gibbon, 2018), many governments have difficulties embracing harm reduction beyond syringe access services and opioid agonist therapy. Some governments may still find it hard to be honest about the actual effects of currently illicit drugs, and people who use drugs still feel stigmatised in most parts of the world (Collins et al., 2018). This combination creates missed opportunities for the provision of honest information to support positive behaviour change. As described in a *Lancet* editorial covering some of the key findings from GDS2018 (*The Lancet*, 2018), the Global Drug Survey supports safer use strategies for people who decide to use drugs. Moreover, analysis of GDS data has shown that drug policy liberalisation could help to increase access to substance use disorder treatment (Benfer et al., 2018).

One of the first challenges of the status quo that prompted our group to develop its vision was the recognition that as

a society we pay relatively little attention to people who use drugs until they either break the law or develop health problems. In fact, the dynamically changing substance use patterns of the majority of those who engage in the occasional use of psychoactive substances had rarely been addressed in depth. Further, most governments target primary prevention (preventing initiation into psychoactive substance use), while secondary prevention (preventing harmful use among those who continue to use drugs) is often neglected. In this context, a large part of the community that is most at risk of developing pathological substance use patterns after initiating licit and/ or illicit substance use lacks help and support to monitor and self-regulate their consumption. In addition, young people generally take more risks and can feel less vulnerable to harm (Albert et al., 2013; Tymula et al., 2012). Overestimating their personal invulnerability to harm means that people engage in risky behaviour, such as polysubstance use, unprotected sex or driving without seatbelts, while neglecting the available protective measures. To account for this youthful sense of invulnerability, data should, whenever possible, not only be used to monitor risky behaviour but also to stimulate the development and uptake of measures known to reduce potential harms.

While drug use realities inevitably change over time, in 2020 the COVID-19 pandemic caused a seismic shift in people's daily lives. The Global Drug Survey team recognised that widespread lockdown orders, the closing of entertainment venues, and the resulting reduced social contact would impact on people's substance use and wellbeing. The GDS 'Special Edition' on COVID-19 was able to launch rapidly. Almost 60 000 people took part over a 7-week period, with data being used to understand important effects of the pandemic, including the impacts of changing alcohol consumption for people with and without mental health conditions (Davies et al., 2022). Being able to initiate a large-scale global survey within a few months of the pandemic was made possible because of the Global Drug Survey's network of experts and media partners.

Data-driven web-based harm reduction resources

Intervention development

Since the inception of the GDS, one of the project's aims has been to ensure that meaningful outputs from the data collected are made available to people who use drugs in the form of an annual key findings report posted on the website (www.globaldrugsurvey.com), as well as through

country-specific local and comparative international news media reports. This strategy was implemented to show our gratitude to survey participants for their time and effort in taking the survey and, at the same time, to differentiate us from traditionally funded research organisations. The output was intended to offer the participants an added value that was consistent with our core mission of helping people who use drugs to do so more safely. The process of developing these resources involved fostering an objective understanding of the various underlying motives for psychoactive substance use, including pleasure from use or as a coping strategy. However, our organisation has always been transparent in communicating that every form of psychoactive substance use carries a potential risk to health. While the best way to reduce risk is not to use, for those who do take drugs, they can reduce (but not eliminate) the risks incurred by adapting their drug-use practices in line with safer use rules. Further, we acknowledged early on that supportive information derived from the data had to be easily and freely available online, in an anonymised yet personalised form (see below for descriptions). Our main goals became (a) to collect and share information about substances that is relevant to the international communities of people who use drugs and the public at large; and (b) to reduce harm related to substance use considering country differences in accessing drug markets.

Back in 2011 research on digital health interventions and mobile health (m-health) applications addressing substance use was just beginning to emerge, with randomised controlled trials following later (Kazemi et al., 2017). Drawing on experiences with delivering training in identification and brief advice (IBA) and harm reduction strategies in the clinical context, we alighted on the fact that people usually compare their own drinking and other drug use patterns with those in their peer group, which can cause biased perceptions of the actual prevalence of their own use among other people of similar age (Garnett el al. 2015; Shiner and Winstock, 2015). Therefore, offering comparative feedback on the use patterns of a similar cohort based on sex, age and country was considered helpful to engage people in the m-health applications developed by the Global Drug Survey. The Global Drug Survey has always been keen to provide the results of the survey swiftly and directly to the public, including to people who use drugs. This goal has been supported through the relationships we developed with our global media partners, who have promoted both the survey and the results, often within a harm reduction context.

Mobile health applications developed from GDS data

In 2011, the first GDS data were collected and used to feed into the newly developed prototypes of the first two m-health

applications — Drinks Meter and Drugs Meter (see Table 1). In addition, we aimed to use our data to provide people with harm reduction information in an engaging, meaningful way. Both applications dismantle barriers to behaviour change by considering individual risk factors, such as age, polysubstance use patterns, co-morbid mental and physical health conditions or receipt of a prescription medication and adjusting a person's level of use upwards to reflect their increased vulnerability to harm. The feedback is thus very personal, making it more difficult to dismiss as 'that's about other people, not me'. Rather, the applications make sure that 'it's all about you'. This personalisation can increase cognitive dissonance and create ambivalence — the fuel that drives motivation for change (Brehm, 2007). Because those using these m-health applications' immediate aim is rarely to quit substance use, suggestions are instead made for achieving a reduction in use with a focus on making feasible changes in patterns of behaviour.

To date over 300 000 people from around the world have used the m-health applications listed in Table 1 and described below. Over 90 % reported finding them useful and would recommend them to their friends, and one third considered reducing their use when utilising the tools.

The Drinks Meter provides people with instant feedback on their drinking habits. It compares their drinking against the Drinks Meter community to give unbiased and anonymous feedback. This comparison is relevant because of the normative misperception that can occur when we only compare ourselves with our friends, who do the things we like to do (Garnett et al., 2015). People look at their friends to normalise the risks they take and find comfort in thinking that they are just 'one of the herd'. They may also think that their group is special and not representative of the wider population of people who drink alcohol, which could bias comparison. The Drinks Meter application provides an estimation of drinking in the last week, shown in amounts, costs and calories. The initial screening is followed by a brief intervention and advice

considering personal risk factors. The Drinks Meter has undergone three revisions, with the latest version, launched in May 2019, offering a drinks diary, goal-setting strategies, push notifications and a virtual drink pourer tool. In a 2016 review of digital apps offering evidence-based brief interventions and screening for alcohol, the Drinks Meter was the app most often praised and least often criticised (Milward et al., 2016). An Australian version of the app was commissioned by New South Wales (NSW) Health to offer state-wide delivery in 2018 and continues to be used to provide early intervention and signposting into treatment ([3]). The app was also recently used as part of an NSW campaign to raise awareness about the link between alcohol and cancer ([4]).

People with heavy patterns of illicit substance use tend to underestimate their levels of consumption compared to others (Shiner and Winstock, 2015). In light of this issue, the Drugs Meter tool allows people to compare their last month's use of cannabis, cocaine or MDMA to those of tens of thousands of other people who have either used the Drugs Meter or completed the GDS. Unpublished GDS data suggest that about 75 % of people who use drugs more than monthly find the types of comparative feedback provided by the tool as interesting. The tool was initially developed for addressing the use of cannabis, cocaine, MDMA, mephedrone, ketamine, GHB and amphetamine. Research has shown that stigma and guilt can have a detrimental effect on the well-being of people who use drugs (Kulesza et al., 2013). When activities are illegal or frowned upon by society as immoral or stupid, most people feel less inclined to seek help because of the fear of being judged (Stringer and Baker, 2015). Disclosure to healthcare professionals, family or friends can become yet another hurdle to overcome in a person's journey towards achieving positive behaviour change. As with many other healthcare problems, the longer people wait before seeking help and advice the more difficult the treatment. By taking a non-judgemental

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[3] https://druginfo.sl.nsw.gov.au/alcohol/drinks-meter
[4] https://www.cancercouncil.com.au/wellness/drinks-meter/

TABLE 1

Six harm reduction resources using GDS data to inform people who use drugs

Intervention	Year	Substance(s)	User statistics (*N*)
Drinks Meter	2012	Alcohol	> 50 000 completions
Drugs Meter	2012	Alcohol, tobacco, cannabis, MDMA, amphetamine, mephedrone, ketamine, cocaine and GHB	> 140 000 visits
YouTube Channel	2014	Any psychoactive substance	6 240 subscribers >1 200 000 views (most popular videos with >300 000 views)
The High-way Code	2014	Alcohol, cannabis, MDMA, stimulants, LSD, ketamine, new psychoactive substances and GHB	Downloaded over 150 000 times
One Too Many	2014	Alcohol	>300 000 visits
Safer Use Limits	2015	Cannabis	>35 000 visits

approach to people's use of alcohol and other drugs, the Drugs Meter enables people who use drugs to become involved in a dialogue about their use that is not driven by the need or desire to quit. The application has undergone two revisions, with new versions of the app developed for MDMA, GHB and ketamine along with updated apps for cocaine, mephedrone and ketamine. No evaluation of engagement with these apps has been performed as yet. The apps are currently available only on the Drugs Meter website, and funding is being sought is to update the app versions and integrate the databases used for comparison. To date, the tool contains data on over 350 000 people who use cannabis, over 180 000 who use MDMA and cocaine and 120 000 who use ketamine.

In 2014, a GDS YouTube Channel was created to enable informed discussions about psychoactive substances and harm reduction. The Drugs Meter Minutes video-series on this channel hosted interviews with the Global Drug Survey founder and other experts that addressed issues of interest to people who use drugs as well as sharing commentary on the results of the annual survey. The channel has never been officially promoted, which means that it lacks a wide reach and can thus only be effective in facilitating harm reduction among the small population of people who engage actively with the content. No evaluation of engagement has been performed so far. To date the channel has received over 1.3 million views, while a series of videos offering advice on alcohol, opioids and cannabis has heralded a new focus on delivering consumer-focused harm reduction strategies and information for those with substance use problems.

The High-Way Code is a harm reduction guide based on peer feedback derived from data collected as part of the GDS2014, with more than 70 000 participants. The Global Drug Survey was aware that pleasure is typically the main driver for substance use. The idea for the guide's creation was based on the belief that for many people the most credible source of drug information (especially how to reduce drug-related harm) is not 'drug experts' but other people who use drugs. By sharing the behaviours and harm reduction strategies adopted by thousands of peers across different substance types, we hoped to nudge others to consider the adoption of such behaviours and strategies. Safer use strategies were presented for each drug, with the intention of raising participants' awareness about the effects of the most commonly used substances, considering dose, time to onset, time to peak and duration of the effect. The High-Way Code shows how commonly harm reduction strategies were adopted among people who reported using the drug, the perceived importance of reducing risk when using each respective substance, and the impact on pleasure related to substance use. This code represents an effort to describe pleasure related to the use of both licit and illicit psychoactive substances and to highlight that safer use is usually more pleasurable use, which is an

important message in making the case for switching from regular to occasional use if quitting is not an option. The messaging here was prompted by the desire to increase the well-being of people who use drugs, and the code is still referred to as a resource today. However, no formal evaluation of the code's effects on actual substance use behaviour among people who have engaged with it has been carried out.

One Too Many can be categorised as a digital intervention in the form of a fun quiz with reflective components that was developed to confront people who drink alcohol by prompting reflections on regrettable drinking experiences using 20 predefined questions and calculating an Alcohol Related Social Embarrassment (ARSE) score. A focus-group study with UK students showed that embarrassing experiences were a normalised part of drinking occasions (Davies et al., 2017a). While some were actively avoided, others were celebrated. Humour served as a device to engage and interest participants, but it remained unclear whether humour could, nevertheless, also diminish the effects of intervention messages. Overall, the intervention showed no impact in risky drinking among young adults when tested in a pilot randomised controlled trial (Davies et al., 2017b). The study highlighted the challenge of recruitment and follow-up with people who took the quiz and the need for further research on the efficacy of such playful interventions.

The app Safer Use Limits for cannabis was developed as a follow-up to the High-Way Code, acknowledging the need for lower risk guidelines for drug use as exist for alcohol. The tool aims at raising people's awareness of the level of risk related to different patterns of psychoactive substance use using data collected as part of GDS2015. Participants rate the risk of harm from different drugs (including alcohol) in relation to increasing levels of use. Risk refers to the probability, range and severity of harm. The higher the score the more likely it is that a person will experience some harm, while the number and severity of the problems that a person is likely to face also rises. The questions cover substance-related harm to their mental or physical health, their relationships and behaviours, their finances or their ability to work, study, or just do the things in life they aspire to do. The Safer Use Limits was the first tool that considered the amount of use, frequency of use, years of use, personal vulnerability and polysubstance use all together when assessing the risks related to drug use. People aiming to reduce their cannabis use have rated the resource as beneficial, but no formal evaluation of the intervention has been carried out to date. Data exist to create similar guidelines for alcohol, MDMA, ketamine and cocaine, and we await funding to allow us to develop and evaluate these.

Limitations and the need for guidelines

While Drinks Meter and Drugs Meter provide personalised feedback and advice on regulating use that complements the advice given in the High-Way Code, they do not represent the most widely adopted effort to promote self-regulation in terms of guidelines on low-risk use. For each psychoactive substance, a rational approach could lead to the development of guidelines on safer use supported by research findings. For alcohol, most countries, and even the WHO, have guidelines on its (recommended) use aimed at reducing the long-term risk of health harms. Therefore, it follows that such expert-informed guidelines could help people who use currently illicit drugs. However, safer use guidelines might challenge existing federal and/or international drug laws that are still based on the assumption that all illicit drug use is harmful and has no medical benefits. As cannabis regulation changes around the world, we hope our tools will become more acceptable to governments who may feel more comfortable discussing risk reduction strategies (as is done for alcohol).

The harm reduction resources created using data from the GDS represent a unique set of tools for providing people who use drugs with information about potential acute and long-term harms related to the use of psychoactive substances. As with all data derived from web surveys, limitations exist due to the self-selection of sample respondents' and the self-reporting of substance use patterns. It is also not possible to guarantee that people who complete the survey have provided their true age, meaning that web surveys may inadvertently collect information from individuals unable to provide fully informed consent (participation in the GDS is restricted to individuals aged 18 and over). However, through social media, adolescents are nowadays frequently exposed to the substance use of their peers and other people they follow (Jackson et al., 2018). Thus, taking a survey or using a harm reduction resource online that may increase reflection on their own use and the consequences of use can be beneficial in preventing problematic use, and access to information should always be open for people of all ages. Another limitation is the difficulty of evaluating the outcomes of harm reduction resources on actual substance use behaviour. While many people may benefit and gain autonomy through making better informed decisions about their personal substance use, there may also be null effects, or even iatrogenic effects in cases where people overestimate the safety of their use patterns. In addition, only a certain segment of the population can actually be reached by these digital resources, raising such issues as equal access to information presented solely online. While the GDS and associated interventions are digital in origin, we also aim to collaborate with hospitals, primary care settings, outreach teams and interested communities more closely in the future to make important harm reduction measures, as well as the survey, accessible for everyone.

Conclusion

In this paper, we have demonstrated the value of using data from the GDS to inform public health policy and internet-based tools aimed at promoting harm reduction among people who use licit and illicit psychoactive substances. For these tools to be used, they must be freely available, interactive and tailored to the target group. This way of communicating has shown to be especially attractive for young and well-educated people who use drugs. Future projects should focus on distributing important knowledge gained from the survey among populations who are not as active on social media. Ideally, community-based participatory research could help to identify ways to reach out to these groups of people who use drugs, who may otherwise have insufficient access to health and specific substance information. Overall, our work contributes to promoting healthy lifestyles and informed decision-making for all people who use drugs.

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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.

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