Original Paper

European rating of drug harms

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Abstract

Background: The present paper describes the results of a rating study performed by a group of European Union (EU) drug experts using the multi-criteria decision analysis model for evaluating drug harms.

Methods: Forty drug experts from throughout the EU scored 20 drugs on 16 harm criteria. The expert group also assessed criteria weights that would apply, on average, across the EU. Weighted averages of the scores provided a single, overall weighted harm score (range: 0–100) for each drug.

Results: Alcohol, heroin and crack emerged as the most harmful drugs (overall weighted harm score 72, 55 and 50, respectively). The remaining drugs had an overall weighted harm score of 38 or less, making them much less harmful than alcohol. The overall weighted harm scores of the EU experts correlated well with those previously given by the UK panel.

Conclusion: The outcome of this study shows that the previous national rankings based on the relative harms of different drugs are endorsed throughout the EU. The results indicates that EU and national drug policy measures should focus on drugs with the highest overall harm, including alcohol and tobacco, whereas drugs such as cannabis and ecstasy should be given lower priority including a lower legal classification.

Keywords

Illicit drugs, recreational drugs, tobacco, alcohol, ranking, risk assessment

Introduction

The harm of the recreational use of a drug depends on many factors, including the toxico-pharmacological properties and the purity of the drug, the frequency, dose and setting of use, and the condition of the user. When taken in excess, the use of both licit and illicit drugs may lead to adverse health effects in the user. The relatively more harmful drugs with a high prevalence rate may also put a larger burden on society. Being aware of the putative burden on public health and society, drug policy makers, public health authorities and politicians try to regulate the uncontrolled use of licit and illicit drugs. Where for example restriction of advertisement and selling points and increased taxation apply to the licit drugs alcohol and tobacco, the control measures taken for illicit drugs vary from a more liberal approach directed at harm reduction to a complete ban of all drugs.

The overall harm of a specific illicit drug is determined by a variety of variables, such as its prevalence of use, intrinsic (individual and social) harm, local availability, social-cultural background, involvement of crime and supply from neighbouring states. It is therefore conceivable that the overall harm of different illicit drugs varies largely among EU member states which may lead to, or have contributed to, important differences in drug control policies, and oppose a common future EU approach in drug policy.

The different drugs may call for different strategies and policies, because there are large differences in toxicity, addiction potential and societal burden between them. Consequently, the most efficient approach to limit the health and economic burden of licit and illicit drug use is to focus the policy measures on drugs with the highest overall harm, including the physical, psychological and social harm to users and society (i.e. non-users).

The overall harm of a drug may differ across the EU making it difficult to establish the relative harm of drugs for the EU as a whole. For example, a drug may be used at a high rate in one region implying high overall harm, but only scarcely used in another region with limited overall harm. Still, the European Commission is mandated to propose binding and non-binding measures and guidelines to establish drug politics at the EU level.

The aim of the expert conference, of which the outcome will be described in the present article, was to explore whether EU-wide consensus could be reached about the relative overall harm of the 20 most popular drugs and to rank them accordingly from a European perspective thus providing a rational basis and guidance for future European drug policy. In order to achieve this goal, 40 delegates from 21 EU member states with expertise on licit and/or illicit drugs shared their experience and knowledge

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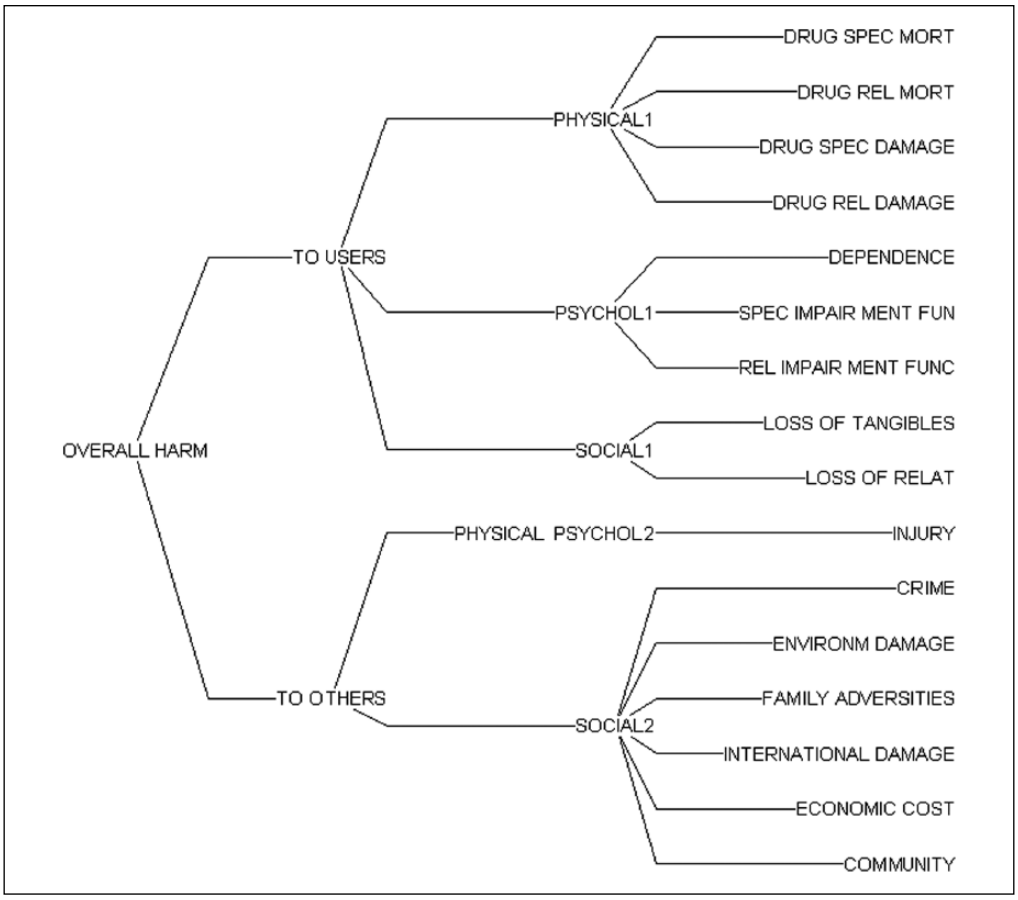

Figure 1. The evaluation criteria organised by harms to users and harms to others, and clustered under physical, psychological (psychol) and social effects (see Nutt et al., 2010 for detailed criteria). Mort: mortality; rel: related; spec: specific; fun/func: function.

about the overall harm of these drugs as experienced at a national level, and explored the feasibility to reach consensus about a common rating of overall harm of the 20 drugs for Europe as a whole.

Methods

Forty experts, representing 21 EU member states (AT, BE, BU, CZ, DE, DK, ES, FI, FR, GR, HU, IE, IT, LV, NL, NO, PL, PT, SI, SK and UK), were invited by the Independent Scientific Committee on Drugs (ISCD; DrugScience.org.uk) to take part in this assessment. Experts were selected from the network of the ISCD, and the criteria applied to select and invite the expert were (a) to have high expertise in illicit drugs, (b) to bring in expertise from a broad variety of disciplines e.g. basic scientists, epidemiologists, toxicologists, addiction health care workers and policy makers and (c) to originate from a wide range of EU member states. The criteria to select a drug in the set to be assessed were: (a) considerable prevalence of its use in the EU and (b) availability of sufficient knowledge about the harm of the drug. The experts attended a two-day meeting to assess the relative harm of 20 drugs from a European perspective. Of the 40 experts, two British experts had previously participated in the May 2010 decision conference of the Independent Scientific Committee on Drugs (ISCD) (Nutt et al., 2010) and one expert who participated in the Dutch ranking study (van Amsterdam et al., 2010). Except for two experts, the 40 experts were not (well) informed about how to use the Multi-criteria Decision Analysis (MCDA) model so that they were guided through the methodology and the principles of the MCDA process by two authors of this paper (DN, LP) who did, however, not participate in the scoring of the harms in the current study. Similarly, before giving their scores the experts were not briefed about the scores given in May 2010 (Nutt et al., 2010).

The 16 criteria (see Nutt et al., 2010 for the criteria in detail) involved in the overall harm to users and non-users (the latter described as 'others') were clustered under five subheadings covering elements of physical, psychological and social harm to users and physical and social harm to others (see Figure 1). The criteria had previously been defined by the UK Advisory Committee on the Misuse of Drugs (ACMD) and used by the ISCD in their May 2010 decision conference. Each criterion was carefully explained to the experts who accepted them without changes. This enabled them to evaluate the 20 drugs in a consistent and meaningful way (for definitions see Nutt et al., 2010)). The 20 drugs that were assessed were alcohol, amphetamine, anabolic steroids, benzodiazepines, buprenorphine, butane, cannabis, cocaine, crack, ecstasy, gamma-hydroxy-butyric acid (GHB), heroin, ketamine, khat, lysergic acid diethylamide (LSD), magic mushrooms, mephedrone, methamphetamine, methadone and tobacco.

Table 1. Comparison of the final normalised weights for the UK and Europe criteria.

Criterion	UK (Nutt et al., 2010)	Europe (current study)	Difference
Drug-specific mortality	5.1	7.3	+2.2
Drug-related mortality	6.4	8.7	+2.3
Drug-specific damage	4.1	5.6	+1.5
Drug-related damage	4.1	4.3	+0.2
Physical harm	*19.7*	*25.9*	*+6.2*
Dependence	5.7	7.0	+1.3
Drug-specific impairment of mental functioning	5.7	4.5	−1.2
Drug-related impairment of mental functioning	5.7	4.5	−1.2
Psychological harm	*17.1*	*16.0*	*−1.1*
Loss of tangibles	4.5	5.6	+1.1
Loss of relationships	4.5	5.6	+1.1
Social harm-1	*9.0*	*11.2*	*+2.2*
Injury	11.5	11.6	+0.1
Physical-psychological harm	*11.5*	*11.6*	*+0.1*
Crime	10.2	2.9	−7.3
Environmental damage	3.8	1.2	−2.6
Family adversities	8.9	11.6	+2.7
International damage	3.8	4.1	+0.3
Economic cost	12.8	11.6	−1.2
Community	3.2	4.1	+0.9
Social harm-2	*42.7*	*35.5*	*−7.2*
	100.0	100.0	0.0

Totals calculated of criteria in bold.

Rating procedure

In scoring the harm of the 20 drugs, the experts first had to identify the most harmful drug on a given criterion, which was given a score of 100, with a score of zero defined as no harm. Judgements about the other 19 drugs on that criterion were assessed as ratios compared to the score of 100 of the most harmful drug.

Experts were instructed to give their rating from an EU-perspective which was enabled by supplying specific information about local factors by the experts themselves before the rating of the criterion was started. Diverging local conditions had to be respected by all experts to obtain a balanced EU based rating. Occasionally an expert proposed a rating discordant from that of the rest of the experts, because of a specific diverging local condition. If the argumentation was valid, the group rating was adjusted accordingly to account for this fact.

The criteria were rated by the experts one by one following the scheme shown in Figure 1 from top to bottom. Per criterion each expert had first to consider his/her rating together with an argumentation before sharing the score with the group. After sharing the ratings and subsequent discussions about the proposed scores applying the Delphi procedure the final integral rating of the expert group was obtained. As such, no individual expert ratings were collected; the presented final ratings were group-based scores obtained via consensus. This procedure applied both to harm scores as well as to the rating of weighting factors.

These final scores were generated through group discussion, with participants applying a mixture of expertise and evidence as available during the decision conference. This scoring process is specifically designed to minimise bias (Philips, 2007). As a second step, the group attributed relative weights for all criteria in order to indicate their relative importance for overall harm. If no EU-wide consensus about the rating (harm score or weight factor) could be reached, members of the group could propose to the group a higher or lower score or weight value which was discussed, further adjusted and finally agreed by the group. The procedure resulted in the rating of each of the 20 drugs based on the calculated weighted-average scores, representing 'overall harm' (see Figure 1). Once the European rating was accomplished and fixated, the experts discussed their results with particular reference to the UK scores assessed by the ISCD group in 2010 (Nutt et al., 2010). However, no changes in the original ratings were made on the basis of this discussion.

Weighting

Some criteria were judged by the group to be more important determinants of overall harm than others. To accommodate this view, the swings in harm from 0–100 were compared and represented by weights. This effectively meant that the most harmful drugs on the criteria were compared to each other. For example, the family adversities harm associated with alcohol was assessed as four times that of the crime harm associated with heroin. A hierarchical process of comparing the most harmful criteria at each cluster led to the weights shown in Table 1, which compares the UK and European weights after normalising each set to sum to 1.0. In general, weights for individual criteria and clusters were rather similar for UK and European raters with the exception of the weight for the criterion of crime: UK 10.2 and Europe

Table 2. Differences in harm scores on a scale from 0–100 between the current European study and the 2010 UK study.

Name	Differences
Drug-specific mortality	None
Drug-related mortality	None
Drug-specific damage	None
Drug-related damage	None
Dependence	GHB 20→30
	Benzodiazepines 50→30
Drug-specific impairment of mental functioning	Amphetamine 60→40
	Methadone 20→50
	Ecstasy 40→30
Drug-related impairment of mental functioning	LSD 16→5
Loss of tangibles	Alcohol 30→40
	Cocaine 35→50
	Buprenorphine 5→20
Loss of relationships	Khat 40→20
Injury	Crack 15→7.5
	Tobacco 10→20
	Benzodiazepines 5→15
Crime	Crack 80→20;
	Methamphetamine 5→15
	Cocaine 10→20
	Tobacco 10→5
	Cannabis 20→10
Environmental damage	Amphetamine 5→10
	Ecstasy 0→10
Family adversities	Methamphetamine 2→5
	Cannabis 15→10
International damage	Methamphetamine 1→5
Economic cost	Methamphetamine 1→8
Community	Methamphetamine 0→4
	Tobacco 0→4
	Buprenorphine 0→1

2.9. The weight of the cluster nodes harm to users and harm to others were 45.8 and 54.2 for UK raters and 53.1 and 47.1 for European raters, respectively.

Results

Raw scores

As summarised in Table 2, the scores given by of the EU experts in the current study were generally very similar to the UK scores assessed by the ISCD group in 2010; only 27 of the 320 scores (6.4%) were different and the mean difference of these different scores was only 12.1 points on a scale ranging from 0–100. The two largest differences were the crime criterion for crack (80 and 20 by the UK and European panel, respectively) and the specific mental health impairment criterion for methadone (20 and 50 by the UK and the European panel, respectively).

In most cases consensus about the rating (and the weight factor) was reached with only minor regional differences. For example, due to regional differences in the prevalence rate of heroin, khat, GHB and methamphetamine, no EU-wide consensus could be reached.

Weighted overall harm

Based on the overall harm of the 20 drugs, calculated as the sums of weighted scores given to each criterion, the 20 drugs show a ranking order from high to low harm. This ranking has not been illustrated here, because such a figure would be illegible as it consists of 20×16 stacked bars. Figure 2, however, depicts this ranking in a less complex manner (see below). Alcohol, with an overall score of 72, is clearly judged to be most harmful, followed by heroin with a score of 55, and then crack with a score of 50. Just eight drugs score, overall, above 20. Drug-specific mortality is a substantial contributor to the harm related to alcohol, heroin, GHB, methadone, and butane, whereas economic costs contribute heavily to the harm related to alcohol, heroin, and tobacco. When compared with the other drugs, the contribution of injury, family adversities, economic cost and community related to alcohol is relatively high, whereas dependence is relatively important in the overall harm related heroin, crack and tobacco. Finally, LSD and magic mushrooms have a relatively high score for the criterion specific impairment of mental function.

The overall harm of the drugs can be split between harm to the users and harm to others with a weight factor of 0.53 and 0.47, respectively. The results depicted in Figure 2 show that, except for alcohol where the harm to users is ranked lower than the harm to others, the harm to users of the drugs is scored very much higher than their harm to others. Being the only drug where the harm of alcohol to others is higher than its harm to the users, alcohol's harm is primarily found at the social level. This further implies that if the weight on the harm to others node is decreased in favour of the harm to users node, the recalculated overall harm of heroin, crack and methamphetamine increases while the overall harm of alcohol decreases. Indeed, if the weight factor of harm to others declines below 0.10, alcohol drops to the fourth position on the ranking scale, whereas heroin, crack and methamphetamine appear in the top three (data not shown).

The present European weighted scores of the overall harm is very similar to that obtained in 2010 for the UK with a correlation of 0.993 between the two ratings. The most prominent differences are found for methadone and khat with methadone ranking two positions higher in the UK (10 versus 12) and khat ranking two positions lower in Europe (15 versus 17). Also, tobacco ranks fourth highest in overall harm for Europe, but sixth for the UK.

Sensitivity analysis

Sensitivity analyses on the individual criteria show that alcohol remains most harmful even if the weight on any single criterion is increased from its cumulative weight all the way to 100. Also decreasing the criterion weight of injury, environmental damage, family adversities, economic cost and community down to zero has no effect on alcohol's position as being the most harmful substance. Decreasing the weight on any of the remaining 11 criteria causes heroin, tobacco or crack to move into the position of the most harmful drug. Thus, it is clear that substantial differences of opinion about any individual criterion weight leave alcohol, heroin, crack and tobacco as the most harmful drugs overall for the EU.

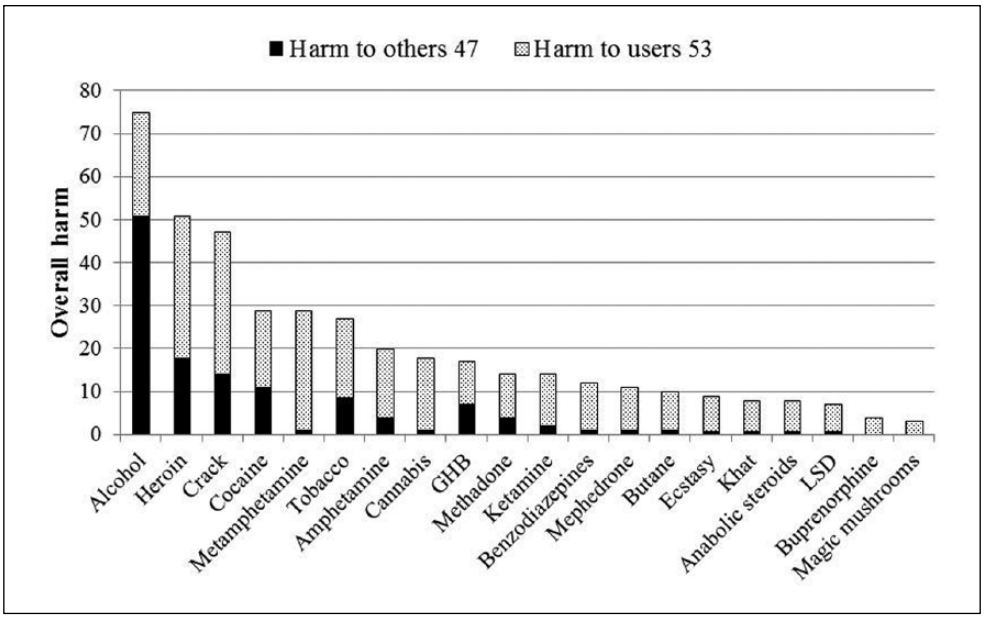

Figure 2. The drugs ordered by their overall harm scores, with the stacked bar graphs showing the contribution to the overall score of harm to others and harms to users with a cumulative weight of 47 and 53, respectively. GHB; gamma-hydroxy-butyric acid; LSD: lysergic acid diethylamide.

Discussion and conclusions

The aim of the current study was to test the feasibility of an EU-wide ranking of the harm related to specific psychoactive drugs. Despite concerns that regional differences in values might make this an impossible task, the group of experts succeeded in developing scores and weights reflecting current knowledge and expertise. Although the model relies heavily on the individual judgements of the participating experts, and although hard evidence is lacking for most drugs on most of the 16 criteria for the 20 drugs (requiring 320 judgements by each of the 40 experts), the overall ranking in the current study correlates very highly with the UK study (r=0.99). A similarly high correlation (r=0.87) was previously found between a group of UK raters and an independent group of raters from The Netherlands using a slightly different and simpler rating procedure (van Amsterdam, et al., 2010). To allow for direct comparison of the findings with previous work, we preferred to maintain the term 'dependence' as criterion although 'substance use disorder' is now the preferred term in Diagnostic and Statistical Manual of Mental Disorders-5 (DSM-5).

At this point, it is important to recognise that the experts in the current study were asked to provide assessments that would represent the average European experience. Discussions during the meeting revealed substantial country differences, not only in the preferences of users for particular drugs, drug availability and pricing, but also in the legal framework which undoubtedly influences individual behaviour. That said, the current work could be taken into any country or region and reassessed to suit local conditions. This does not exclude the possibility that the current result is suitable to develop an EU model for drug control, because the model turned out to be very robust with only minor changes in the ranking even after extreme variations in the criterion weights.

First, this European drug harm scale appears to confirm that this approach of combining structured MCDA modelling with deliberative discourse in a decision conference provides a useful framework for further work. Though it is advocated to provide the assessors with fact sheets about the 20 drugs as sound and defensible inputs for the scores as done in the Dutch ranking procedure, the Dutch ranking proved to be very comparable to the present and previous (Nutt et al., 2007, 2010) rankings.

Second, it is important to note that weighting is exclusively a matter of judgement; data cannot provide weights. While the magnitude of harm of the most harmful drug on each criterion can be informed by data, how much that difference matters requires an act of judgement. In this way, MCDA tries to separate facts from value judgements. On the other hand, however, direct comparisons of harm scores can be misleading and one should remain careful not to over-interpret the findings. Moreover, the currently used MCDA approach has been criticised by others (Caulkins et al., 2011). Caulkins et al. (2011) proposed an alternative approach which included the benefits of the substances, the legal status and drug interactions. Though this approach would indeed partly solve some of the methodological and conceptual limitations of our approach and provide a refined analysis, it is would be very hard to do. With respect to their point that a single ranking score is of little value, it should be noted that the composite score obtained (individual and societal harm) provides a clear and simple perspective on drug harms which is useful to inform policy makers in a balanced and science-based way about the relative overall harm of the most popular drugs.

Third, the results indicate that policy measures should be aimed at those drugs which result in the highest overall harm, i.e. the EU policy should be focussed either on those drugs which have medium harm and burden, but are frequent used, or on those drugs which are very harmful, even if they are used by a relatively small number of people. Policy measures should focus less on drugs that are only rarely used, provided they are not very harmful (e.g. 4-methylamphetamine).

The results of the present study show that the ranking based on the relative harms of different drugs found in previous studies in UK and the Netherlands is endorsed throughout the EU. It further clearly confirms that alcohol should be considered to be the most harmful of all drugs. Indeed, the latest global report of the World Health Organisation (WHO) reported that about 3.3 million deaths (5.9% of all global deaths) and 139 million Disability-Adjusted Life Years (DALYs) (5.1% of the global burden of disease and injury) were attributable to (excessive) alcohol consumption in 2012 (WHO, 2014). Moreover, the social costs attributable to alcohol are enormous ranging from 1.3–3.3% of the gross domestic product (Rehm et al., 2009; WHO, 2014). Finally, we highlighted before the high negative health impact of alcohol use as compared with that of illicit drugs (van Amsterdam and van den Brink, 2013).

As value judgements are at the heart of political debate, it might be instructive to engage in a public consultation exercise to allow different constituencies to express their views about the weights. This could be a first step in initiating a structured thoughtful discourse about drugs and drug-related harms; it might well turn out that the politicians, the lawmakers and the public attach different weights to the harm criteria used in the current study or that they feel the need to add other criteria. In addition, including the benefits of using psychoactive drugs along with the harmful criteria could provide insights into the nature of the benefit-harm balance.

Finally, it was broadly agreed that EU and national drug policy measures should focus on drugs with the highest overall harm, including the illicit drugs heroin, crack (cocaine), and (met)amphetamine and the legal drugs alcohol and tobacco, whereas other drugs such as cannabis, ketamine, ecstasy and magic mushrooms should be given lower priority including a lower legal classification.

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