Using multi criteria decision analysis to estimate relative drug risks and harms

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Drugs are controlled because ...

They are harmful

They might be harmful

The media wants it?

... as do the majority of politicians

... and some of the public
So getting the best estimate of harms is vital

But difficult

• Poor data on existing controlled drugs because illegality $\rightarrow$ covert use

• And less for new entrants to the field, “legal highs”
4 key issues

1. Relative harms of drugs
   - and comparisons with alcohol and tobacco

2. Comparative harms –v- other risky activities

1. Proportionality of penalties cf health harms

2. Benefit-harm equation of the law?
A short history of what we have done
First - the 9 point scale

2000 Runciman report: develop the 9 point harm assessment scale

2001-2006 – Home Office ACMD group systematically reviews a range of drugs using this scale
Nutt, DJ; King, LA; Saulsbury, W; Blakemore, C [2007] Developing a rational scale for assessing the risks of drugs of potential misuse Lancet 369:1047-1053 PMID: 17382831
# The nine point scale

<table>
<thead>
<tr>
<th>Parameter</th>
<th>One</th>
<th>Two</th>
<th>Three</th>
<th>Four</th>
<th>Five</th>
<th>Six</th>
<th>Seven</th>
<th>Eight</th>
<th>Nine</th>
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</thead>
<tbody>
<tr>
<td>Physical harm</td>
<td>Acute</td>
<td>Chronic</td>
<td>Intravenous harm</td>
<td>Intensity of pleasure</td>
<td>Psychological dependence</td>
<td>Physical dependence</td>
<td>Intoxication</td>
<td>Other social harms</td>
<td>Health-care costs</td>
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<td>Dependence</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Social harms</td>
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</tr>
</tbody>
</table>

Table 1: Assessment parameters
Drug harm ranking

Nutt et al 2007 Lancet

Figure 1: Mean harm scores for 20 substances
The respective classification under the Misuse of Drugs Act, where appropriate, is shown above each bar. Class A drugs are indicated by black bars, B by dark grey, and C by light grey. Undlassified substances are shown as unfilled bars.
A short history of what we have done
First - the 9 point scale

Two problems:-
  – no weightings of different harms....
  - and were these the right harms?

2001-2006 – Home Office ACMD group systematically reviews a range of drugs using this scale

Nutt, DJ; King, LA; Saulsbury, W; Blakemore, C [2007] Developing a rational scale for assessing the risks of drugs of potential misuse  Lancet 369:1047-1053 PMID: 17382831
March & June 2009

- Medical Research Council and Home Office co-sponsor research project
- Advisory Council on the Misuse of Drugs, (ACMD), David Nutt as Chair, meets to develop an MCDA model and to test its potential for evaluating drug harms

July 2010

- ACMD publishes the MCDA framework developed in 2009
The 16 criteria of harm

Harm to self

Harm to others

Figure 1: Evaluation criteria organised by harms to users and harms to others, and clustered under physical, psychological, and social effects.
Drug specific mortality

Index of toxicity = deaths per million users

heroin >>>>cocaine > amph - MDMA - Cannabis
20,000 - 170 - 70 - 50 - 5

1 in 50 heroin users die of drug

King L ACMD report 2008
Amy Winehouse's death due to acute alcohol poisoning = drug SPECIFIC mortality

Blood alcohol 450mg/\% = 5.5 x legal driving limit

+ Imperial College student last year

Despite being in “recovery”
Drug RELATED mortality

Tobacco – lung disease

Alcohol - liver disease
Drug related mortality

Estimates of the Prevalence of Opiate Use and/or Crack Cocaine Use, 2009/10: Sweep 6 report. The Centre for Drug Misuse Research
Deaths for people under age 65 from major diseases compared with 1970 – UK

80% ALCOHOL
20% HEPATITIS

Drug related mortality

Nick Sheron
More than 20% of all male deaths 16-44 yrs due to alcohol

Male deaths from alcohol by age band

Alcohol the most common reason for death in men under 50

http://www.nwph.net/nwpho/publications/alcoholattributablefractions.pdf
Drug related morbidity

Heroin ➔

AIDS
Hep B and C
Skin infections
Anthrax
Clostridia
Drug specific morbidity – alcohol brain damage

Normal

Alcohol addiction
Drug SPECIFIC mental impairment

Keith Campbell – one of the creators of Dolly the Sheep hanged himself in a drunken rage

Professor Campbell was a "regular" drinker who suffered from hypertension, high blood pressure and a heart condition
Alcohol - Harms to others
Even Ascot not immune!

Royal Ascot June 16th 2011  Metro
MP arrested after brawl in commons bar

22/Feb/2012

Ed Joyce
Labour member
For Falkirk - no longer!
Environmental damage from alcohol

Exxon Valdez = largest environmental disaster before the Gulf Spill - 1989

Captain drunk
Community damage

In UK many MPs careers ruined including George Brown and Charles Kennedy
THE ISCD DRUG HARMS MODEL
(Independent Scientific Committee on Drugs)

## The 20 drugs

<table>
<thead>
<tr>
<th>Heroin</th>
<th>Crack</th>
<th>Cocaine</th>
<th>Alcohol</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tobacco</td>
<td>Amphetamine</td>
<td>Mephedrone</td>
<td>Buprenorphine</td>
</tr>
<tr>
<td>Benzodiazepines</td>
<td>Cannabis</td>
<td>Anabolic Steroids</td>
<td>Ecstasy</td>
</tr>
</tbody>
</table>
| Ketamine     | LSD         | Mushrooms   | Methylamphet-
| Khat         | Butane      | Methadone   | amine        |

- Heroin
- Crack
- Cocaine
- Alcohol
- Tobacco
- Amphetamine
- Mephedrone
- Buprenorphine
- Benzodiazepines
- Cannabis
- Anabolic Steroids
- Ecstasy
- Ketamine
- LSD
- Mushrooms
- Methylamphetamine
- Khat
- Butane
- Methadone
- GHB
Scoring the drugs

• The most harmful drug on each criterion was scored at 100.
• All other drugs were scored relative to that drug.
• E.g., a drug considered half as harmful was given a score of 50.
• This creates a unique ratio scale for each criterion.
Weighting the criteria

- Some criteria represent more harm than others.
- Swing-weights equate the units of harm on all the criteria: the swing in harm from the ‘no harm’ drug on a criterion to the ‘most harmful’.
- The group considered this question to compare the levels of ‘most harm’ on the criteria:
  - “How big is the difference in harm and how much do you care about that difference?”
Weighting Harms to Others

Options:
1. Alcohol
2. Heroin
3. Crack
4. Methylamphetamine
5. Cocaine
6. Tobacco
7. Amphetamine
8. Cannabis
9. GHB
10. Benzodiazepine
11. Ketamine
12. Methadone
13. Crystal Meth
14. Butane
15. Khat
16. Anabolic Steroids
17. Ecstasy
18. LSD
19. Buprenorphine
20. Mushrooms

Options:
- ENVIRONM DAMAGE
- INTERNATIONAL DAMAGE
- COMMUNITY

Options:
- CRIME
- FAMILY ADVERSITIES
- ECONOMIC COST

Input Values:
- Heroin: 80
- Alcohol: 30
- Alcohol: 70
- Crack: 30
- Alcohol: 100
- Alcohol: 25

Options:
- Butane
- Benzodiazepines
- Mushrooms
- GHB
- Mephedrone
- Methylamphetamine
### The resulting criteria weights

<table>
<thead>
<tr>
<th>Model Order</th>
<th>Criteria</th>
<th>Cum Wt</th>
<th>Diff</th>
<th>Wtd Diff</th>
<th>Sum</th>
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<tr>
<td>SOCIAL2</td>
<td>ECONOMIC COST</td>
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<td>0.0</td>
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<td>FAMILY ADVERSITIES</td>
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<td>0.0</td>
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<tr>
<td>PHYSICAL1</td>
<td>DRUG REL MORT</td>
<td>6.4</td>
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<tr>
<td>PSYCHOL1</td>
<td>DEPENDENCE</td>
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<td>PSYCHOL1</td>
<td>SPEC IMPAIR MENT FUN</td>
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<td>0.0</td>
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<tr>
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<tr>
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<td></td>
<td><strong>100.0</strong></td>
<td>0</td>
<td>0.0</td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>
Drugs ranked according to total harm

Figure 2: Drugs ordered by their overall harm scores, showing the separate contributions to the overall scores of harms to users and harm to others. The weights after normalisation (0-100) are shown in the key (cumulative in the sense of the sum of all the normalised weights for all the criteria to users, 46; and for all the criteria to others, 54). CW=cumulative weight. GHB=γ hydroxybutyric acid. LSD=lysergic acid diethylamide.
Why is alcohol so harmful?

<table>
<thead>
<tr>
<th>Model Order</th>
<th>Cum Wt</th>
<th>Diff</th>
<th>Wtd Diff</th>
<th>Sum</th>
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<tbody>
<tr>
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<td>12.8</td>
<td>100</td>
<td>12.8</td>
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<td>PHYSICAL_PSYCHOL2</td>
<td>11.5</td>
<td>100</td>
<td>11.5</td>
<td>24.2</td>
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<td>49.6</td>
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<tr>
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<td>3.3</td>
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<td>3.3</td>
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<td>62.7</td>
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<td>2.7</td>
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<td>5.1</td>
<td>50</td>
<td>2.6</td>
<td>67.9</td>
</tr>
<tr>
<td>PSYCHOL1</td>
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<td>30</td>
<td>1.7</td>
<td>69.6</td>
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<tr>
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<td>1.3</td>
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<tr>
<td></td>
<td>100.0</td>
<td></td>
<td>71.7</td>
<td></td>
</tr>
</tbody>
</table>

Half the harm from these four
Correlations of ISCD scores with...

...van Amsterdam population

...van Amsterdam individual

## ISCD input scores vs published studies

<table>
<thead>
<tr>
<th>Study</th>
<th>ISCD criterion vs study criterion</th>
<th>N</th>
<th>r</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gable 2004</td>
<td>Drug specific mortality vs $\log_{10}$ safety ratio</td>
<td>12</td>
<td>0.66</td>
</tr>
<tr>
<td>King &amp; Corkery 2010</td>
<td>Drug specific mortality vs fatality statistics (other substances mentioned on death cert.)</td>
<td>5</td>
<td>0.98</td>
</tr>
<tr>
<td></td>
<td>Drug specific mortality vs fatality statistics (sole mentions on death certificates)</td>
<td>5</td>
<td>0.99</td>
</tr>
<tr>
<td>Anthony et al 1994</td>
<td>Dependence vs lifetime dependence</td>
<td>5</td>
<td>0.95</td>
</tr>
</tbody>
</table>
No correlation of UK Drugs Act classification with ISCD results

linear $r = 0.04$
Main Implications

1. The UK MDAct1971 is fundamentally incorrect in many of its drug rankings → the law is unjust

2. The International Conventions are likely similarly wrong

3. Alcohol should be the major target for harm reduction in the UK
What about other countries?

EU funded European study

30 experts from 20 countries – May 2013

MCDA on same 20 drugs as UK experts
New European data – 2013

ISCD European study FP7 2013
Looking at different formulations of the same drug

Nicotine – tobacco – v- other delivery systems e.g. electronic cigarettes and gum/patches

• International Expert panel

• July 2013
Nicotine products
Thanks, questions & further reading

Follow us on
www.drugscience.org.uk
profdavidnutt@twitter.com

All proceeds to ISCD

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