

# Estimating the burden of disease attributable to illicit drug use and mental disorders: what is 'Global Burden of Disease 2005' and why does it matter?

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## ABSTRACT

**Background** The estimated impact of illicit drug use and mental disorders upon population health needs to be understood because there is evidence that they produce substantial loss of life and disability, and information is needed on the comparative population health impact of different diseases and risk factors to help focus policy, service and research planning and execution. **Aims** To provide an overview of a global project, running since the end of 2007—Global Burden of Disease (GBD) 2005. **Methods** The new GBD aims to update comprehensively the findings of the first GBD exercise. It aims to provide regional and global estimates of the burden of disease attributable to hundreds of diseases, injuries and their risk factors. Groups have been assembled to provide expert advice on the parameters needed to inform these estimates; here, we provide a brief summary of the broad range of work being undertaken by the group examining illicit drug use and mental disorders. **Discussion** The estimates of the contribution of mental disorders and illicit drugs to GBD will inform and potentially shape the focus of researchers, clinicians and governments in the years to come. We hope that interested readers might be encouraged to submit new data or feedback on the work completed thus far, as well as the work that is still under way and yet to be completed.

**Keywords** Burden of disease, dependence, illicit drugs, mental disorders, policy, population health.

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## INTRODUCTION

The estimated impact of illicit drug use and mental disorders upon population health needs to be understood, because there is evidence that they produce substantial loss of life and disability. Governments, policy makers and funding bodies need information on the comparative population health impact of different diseases and risk factors when making decisions about where to focus policy, service and research planning and execution. It is important that illicit drugs and mental health are placed on that stage.

Previous 'burden of disease' studies have brought into prominence the large proportion of disease burden arising from mental disorders and illicit drug use [1,2]. The high prevalence and chronic nature of some drug

use and mental disorders led to them being prominent in the league table of disorders, ranked in order of burden, in the first Global Burden of Disease (GBD) study [3]. The often-quoted reference to depression being a leading cause of disability in the world has been used repeatedly to promote funding for mental disorders [4]. Burden of disease estimates have been even more important in countries where disease advocacy groups are not well established, and where external agencies [such as the World Health Organization (WHO) and World Bank] have been influential in setting priorities for health spending.

Since the end of 2007, a new global project—Global Burden of Disease 2005—has been running and aims to update comprehensively the findings of the first GBD exercise. It aims to provide regional and global estimates of the burden of disease attributable to hundreds of

diseases, injuries and their risk factors. Groups have been assembled to provide expert advice on the parameters needed to inform these estimates (this followed a call for interest [5]). In this paper, we provide a brief summary of the broad range of work being undertaken by the group examining illicit drug use and mental disorders in the hope that interested readers might be encouraged to submit new data or feedback on the work completed thus far, as well as the work that is still under way and yet to be completed.

### THE CONCEPT OF 'BURDEN OF DISEASE' AND THE HISTORY OF BURDEN OF DISEASE STUDIES

Until the early 1990s, guidance on public health funding allocation came largely from studies of population mortality, thereby ignoring morbidity arising from disorders and injuries that were not fatal but none the less affected a person's functioning significantly [6]. Measuring the impact of disease was revolutionized in 1993, when the World Bank provided estimates of causes of global disease burden using a new summary measure, the disability adjusted life year (DALY) [7]. The DALY is a summary measure of population health, integrating mortality with morbidity and disability information in a single unit. DALYs show the relative importance of health problems. One DALY represents the loss of one healthy year of life. For each disease or injury, DALYs are calculated as the sum of years lost due to premature mortality and the years of lost health due to severity-weighted disability for incident cases. The DALY combined measures of premature mortality [years of life lost (YLL)] and morbidity [years lived with disability (YLD)] that were attributable to diseases (e.g. depression, cancer and heart disease) or risk factors such as cigarette smoking, alcohol use and high blood pressure. The DALY allowed the mortality and morbidity of various diseases to be compared, with the aim of 'disconnecting advocacy from epidemiology' [3]. It is used by the World Bank and the WHO to estimate both disease burden and the cost-effectiveness of interventions [8–10]. The cost of interventions and the extent to which they reduce the burden of a particular disease or injury are critical for decisions about priority-setting in health.

A revised set of estimates was published in 1996 as part of the first Global Burden of Disease (GBD) study [3], and regular updates have been published within the WHO's World Health Reports [11] and the Disease Control Priorities publications [10]. In 2002, the World Health Report provided estimates of disease burden attributable to various risk factors—the so-called 'comparative risk assessment' (CRA) exercise which was finalized in 2006 [12]. The CRA, which was intended to estimate the burden attributable to major risk factors for

diseases or injuries, suggested that alcohol, tobacco and injecting drug use were important risk factors for global disease burden [12].

Estimates of the extent and distribution of disease burden for different disorders are likely to shape global and regional health policy development. Existing estimates were used recently in debates to evaluate (and justify) WHO's global funding distribution [13,14] and have been used in multiple discussions of funding allocation and priorities [15–17]. Further, there have been consistent increases over time in the extent of funding on an international basis for non-communicable diseases: a search of the World Bank site for health-related lending shows a steady increase in lending for non-communicable diseases since 1990 [18]. No doubt they will be used in future to justify shifts in, or maintenance of, funding allocation from multiple sources across multiple sectors, including the drug and alcohol field.

### GBD 2005

The new GBD study is led by a core team of researchers from a consortium that includes Harvard University (USA), the Institute for Health Metrics and Evaluation at the University of Washington (USA), Johns Hopkins University (USA), the University of Queensland (Australia) and the WHO (Switzerland). It is the first major effort since the original GBD study to produce systematic and comprehensive estimates of the burden of diseases and injuries. It will update the comparative estimates of the burden of risk factors for *both* 1990 and 2005—the 1990 estimates will be recalculated due to the improvements in methods and data availability since the original study was undertaken. The new GBD study will produce estimates for more than 200 diseases and injuries, and more than 25 risk factors, for 21 regions of the world (for details of the overall GBD project design, methods, structure and time-lines of the work being undertaken, see [19]). The project's estimates will be published in late 2010.

The study will include epidemiological reviews of all diseases, injuries and risk factors and estimates of the mortality and cause of death for all countries in the world. This involves multiple systematic reviews across the major epidemiological parameters (incidence, prevalence, duration/remission and mortality) for each disorder, and the critical synthesis of existing evidence. The intent of the GBD is to understand and incorporate all *existing* data on the epidemiology of diseases and risk factors; it is not to conduct new studies to estimate these parameters.

Experts across the range of diseases and injuries included in the study provide input to this core team. Disease/disorder groups have been organized into 44 working groups [19]. The expert groups are asked to syn-

thesize existing data on the incidence and prevalence of diseases and disabling sequelae, exposures to important risk factors, and then to assess critically the estimates of disease burden produced by the core project team (more information on the process is provided at [20]).

## **THE WORK OF THE MENTAL DISORDERS AND ILLICIT DRUG USE EXPERT GROUP**

The Expert Group on Mental Disorders and Illicit Drug Use advises the core team on the epidemiology of mental disorders, illicit drug use and conceptual and methodological issues in estimating the prevalence, incidence, duration and mortality caused by these disorders. It comprises core and corresponding members. Additional input has already been obtained from dozens of experts in content or method areas.

The group has been involved in: making decisions about the disorders for which there are sufficient data for estimates to be made; considering the possible outcomes for which mental disorders and illicit drug use may be risk factors; and informing the systematic reviews upon which epidemiological estimates will be based. All this work has been led by research teams at the Universities of Queensland and New South Wales.

Advances in our understanding of disease epidemiology has allowed the group to expand the number of mental disorders and illicit drugs beyond that for which specific estimates of burden were made in the original GBD study. For example, a greater number of anxiety disorders and childhood mental disorders will be included in the current project. In the original GBD study, cannabis and other forms of drug dependence were not considered; instead, it focused upon heroin dependence, because this was the form of illicit drug use for which there were the best prevalence estimates and mortality data [3]. This time, estimates of disease burden will be made for heroin and other illicit opioid use, cocaine, amphetamines and cannabis.

Some drugs will not be included because of limitations in the data or in our understanding of the risks of dependence and other harms. This does not imply that the use of these drugs is without risk to users. This is true, for example, of 3,4 methylenedioxymethamphetamine [MDMA (ecstasy)], hallucinogenic substances and inhalants [21]. Although there are case reports of deaths associated with MDMA intoxication [22–24], these appear to be rare by comparison with overdose deaths due to opioids and cocaine in developed societies with a moderate prevalence of illicit drug use and good mortality data, such as Australia [25] and, furthermore, such cases are extremely poorly captured in routine data collection systems of most countries. There is also continuing debate about the existence of an MDMA dependence

syndrome. There is no MDMA dependence syndrome included in the American Psychiatric Association's Diagnostic and Statistical Manual (DSM-IV) or by the World Health Organization in the ICD.

The illicit use of anabolic steroids has been excluded from further analysis because of difficulties in measuring (i) the prevalence of their harmful use [26]; and (ii) mortality attributable to such use [27]. The failure to include solvents reflects the lack of good evidence on the prevalence and extent or harms attributable to their use across many countries. Finally, the decision was taken not to make specific estimates for illicit benzodiazepine dependence because of a lack of data for defensible global epidemiological estimates of prevalence and harm (see also [20]). There are some data (varying in quality across countries and poorly collected at the global level) on supply of benzodiazepines for 'licit' purposes but there is no way to make defensible estimates of the proportion of these supplies that (i) may be used illicitly; (ii) in a dependent manner; and (iii) by how many individuals.

Estimates will be made for 1990 and 2005; this is to allow some comparison of changes for two time-periods—re-estimates of the 1990s is necessary because of the improvements in methods and data used. This is likely to be important for mental disorders such as post-traumatic stress disorder (PTSD), because countries in conflict are likely to have increased population prevalence of PTSD and depression. Estimates of burden attributable to illicit drug dependence may have also changed because there have been significant increases in the manufacture of amphetamines [28], particularly in South East Asia and in some countries of the Middle East [28]. These have been accompanied by increases in dependent methamphetamine use in these countries [28] that are likely to be reflected in estimates of burden attributable to amphetamine dependence in 2005. There have also been shifts in opium production, and particularly heroin trafficking routes, across that time [29]. African countries are now being used as transshipment countries for drugs supplying European markets [29,30] which has reportedly affected levels of drug use in those countries.

To date the work of the group has been focused upon informing the systematic searches under way for each parameter. The research teams have adhered to high standards using multiple internationally developed criteria for systematic reviews, and have developed strategies to improve data coverage. A summary of the major steps is listed in Table 1.

## **LIMITATIONS**

There have been major advances in the quality and scope of evidence on the incidence, prevalence, disease duration, remission and associated mortality for mental and

**Table 1** Example of broad literature search process for illicit drugs: summary of the process for prevalence.*Systematic search (adhered to MOOSE guidelines [31])*

1. Three electronic databases were searched (Medline, EMBASE, PSYCInfo), following process where search strings developed with advice from specialist archivists (for search strings see [32])
2. Hand-searching of reference lists of review articles and articles of importance
3. Initial cull of peer-reviewed literature
4. Shortlist of peer-reviewed studies were given initial review for gaps by at least one member of the Expert Group
5. Grey literature web-based searches (as per protocol, which was developed following an extensive process of identification of websites and online catalogues; see [33] for catalogue)
6. Shortlist of grey literature studies reviewed by at least one member of the Expert Group
7. Compilation of list of articles and studies and circulation for comment (including members of the Mental Disorders and Illicit Drug Use Expert Group) on completeness of included studies from electronic database search and grey literature search

*Data extraction (adhered to STROBE guidelines [34,35])*

8. Data extraction was undertaken using a Microsoft Access Database developed for use in the study, to ensure consistency of extraction and that all parameters and study characteristics of interest included (for the manual outlining the features of the database, and the detailed protocol developed to ensure consistency of extraction across researchers, see [36])
9. Data were graded according to a quality index modelled from previous reviews of schizophrenia epidemiology [37,38] and derived via consultation with the Expert Group and with feedback, final agreement and approval from the Expert Group as well as the leaders of the cluster to which the expert group belongs as part of the GBD study (for details of the quality index used to classify prevalence studies, see [39])
10. Cross-checking of extracted data was undertaken with a random 10% of studies from each researcher checked independently through double entries by another member of the research team. Any inconsistencies were resolved by consensus
11. For countries that had no data on prevalence of mental disorders or drug use/dependence, web-wide searches for any evidence of use were undertaken according to an agreed protocol (see [20] for process)

*Further expert consultation (ongoing; preliminary lists sent to GBD core team in November 2008)*

12. Data requests were also made to the headquarters of World Mental Health Survey Consortium, United Nations Office on Drugs and Crime (UNODC) and WHO
13. Shortlists of studies sent to researchers with expertise in the area
14. Full draft list re-sent to people working in the Survey and Statistics Section of UNODC
15. The final list was again sent to the Expert Group for any further comments

GBD: Global Burden of Disease; MOOSE: Meta-analysis of Observational Studies in Epidemiology; STROBE: Strengthening the Reporting of Observational Studies in Epidemiology; WHO: World Health Organization.

drug use disorders, but significant gaps remain. In most countries there may be only a single measure of prevalence and limited knowledge of the natural history of the disorder; in others, such as the Caribbean and Pacific regions and Africa, there are no data. Expert opinion and advice have been and will be sought continually to produce the most plausible estimates and uncertainty bounds for countries without data. This will be facilitated through the methods used by the research teams involved in the systematic reviews. In all stages of data extraction, all available study details are extracted into an access database that has been designed specifically for the project (see [36] for a snapshot of the database, and for a list of variables and details of the protocol used to guide the extraction process). These will facilitate the use of modelling and regression techniques to estimate error around the estimates. We are developing decision rules to apply throughout the process for imputation of data. These are being recorded in a decision rules document that will be made available on our website. Data imputa-

tion is being examined using Bayesian techniques as well as standard regression approaches; this work is being led by expert statisticians, programmers and modellers in the core GBD team. Obviously, in geographic areas with fewer data the estimates themselves will be less certain, and uncertainty levels will be reflected in the lower and upper ranges of the estimates.

## NEXT STEPS

The estimates of the contribution of mental disorders and illicit drugs to GBD will inform and potentially shape the focus of researchers, clinicians and governments in the years to come. We want your thoughts on the work we are doing and the decisions we are making; data sets have been compiled of existing parameters and submitted in June 2009; estimates will be made and finalized for review by the end of 2009. In the following year, a comprehensive review will be undertaken by the core GBD team. Our work is outlined on our website (<http://>

www.gbd.unsw.edu.au), and we welcome feedback and debate via email: gbd@unsw.edu.au.

#### Declarations of interest

None.

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