

How should prevalence of alcohol use disorders be assessed globally?

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Abstract

Alcohol is a major risk factor for global burden of disease, and alcohol use disorders make up a considerable portion of this burden. Up to now, prevalence of alcohol use disorders has been estimated based on general population surveys with the Composite International Diagnostic Interview (CIDI) as the gold standard for assessment. However, three major problems have been identified with the current conceptualization of alcohol use disorders and its measurement via CIDI: cultural specificity of key criteria measured such as loss of control; lack of convergence of diagnoses identified by CIDI with clinically relevant diagnoses in primary health care; and impact of stigma on measurement. As a solution, it is proposed to measure alcohol use disorders via heavy drinking over time, with thresholds taken from the European Medicines Agency (60 and more grams on average per day of pure alcohol for men, and 40+ grams for women). Current data on level of drinking (*per capita* consumption) assessed via taxation and other means allow for a measure of less bias. If these thresholds are considered too low and there is more emphasis on need for specialized treatment, then thresholds for very heavy drinking can be taken as alternatively (100+, and 60+ grams per day pure alcohol for men and women, respectively). Copyright © 2016 John Wiley & Sons, Ltd.

Definition of alcohol use disorders (AUD) and alcohol dependence

Alcohol use is one of the major risk factors for burden of disease (Lim *et al.*, 2012; GBD 2013 Risk Factors Collaborators, 2015), and alcohol use disorders (AUD) are one of the major burden associated with alcohol use (Rehm *et al.*,

2013b; World Health Organization, 2014). AUD are defined differently in different global exercises (see for Global Burden of Diseases, Injuries and Risk Factors (GBD) studies: Lim *et al.*, 2012; GBD 2013 Risk Factors Collaborators, 2015; and for Global Status Reports on Alcohol and Health: World Health Organization, 2014), but to date have always included alcohol dependence as a

major component. Alcohol dependence can be defined as a maladaptive pattern of substance use, leading to clinically significant impairment or distress, and has been defined via a list of potential criteria, which included behavioural, cognitive and physiological phenomena that develop after repeated heavy alcohol use and that typically include a strong desire to drink, difficulties in controlling its use, persistence in its use despite harmful consequences, a higher priority given to alcohol use than to other activities and obligations, increased tolerance, and a physical withdrawal state (see definitions in the International Statistical Classification of Diseases and Health-Related Problems – ICD-10: World Health Organization, 1993, 2004; or in the Diagnostic and Statistical Manual of Mental Disorders DSM-IV-TR: American Psychiatric Association, 2000). The latter two criteria – tolerance and withdrawal – are biological indicators, and while alcohol dependence is defined by a threshold of fulfilling three or more such criteria, tolerance is usually included, as it develops quickly after starting alcohol consumption. Recently, one of the medical definition systems changed by establishing only one integrated definition of AUD, which included all of the criteria for alcohol dependence plus most of the criteria of alcohol abuse, plus craving as a new criterion (American Psychiatric Association, 2013 – DSM-5).

Measurement of AUD

While there have been a number of conceptual criticisms to the way, AUD in general, and alcohol dependence in particular, have been defined (for instance, see the discussions following Martin *et al.*, 2014; or Rehm *et al.*, 2013a), we will focus on measurement of AUD, and cover underlying concepts and theories only to the degree as they are relevant for measurement. All global statistics on incidence, prevalence and indirectly burden of AUD (most recently Whiteford *et al.*, 2013; World Health Organization, 2014; Global Burden of Disease study 2013 Collaborators, 2015) are based on surveys of the general population, where the earlier mentioned criteria of alcohol dependence or AUD are assessed by standardized questions. A number of standardized questionnaires exist for these purposes, most notable the Composite International Diagnostic Interview (CIDI: Robins *et al.*, 1988; World Health Organization, 1990; current version most often used Kessler and Üstün, 2004) and the more clinically oriented Schedules for Clinical Assessment in Neuropsychiatry (SCAN: Wing *et al.*, 1990), and all of its variants. In the United States, a similar instrument, the Alcohol Use Disorder and Associated Disabilities Interview Schedule (AUDADIS) has been used in

the large national surveys initiated by the National Institute on Alcohol Abuse and Alcoholism over the last two decades (Grant *et al.*, 1995). All these instruments were developed in the late 1980s and early 1990s; they have undergone multiple revisions and changes, and their reliability and validity has been found in general to be acceptable (Wittchen, 1994; Grant *et al.*, 1995; Pull *et al.*, 1997; Üstün *et al.*, 1997). The reliability and validity studies mentioned also show in general also high agreement with clinicians' judgement.

As a consequence, the CIDI has since been used as the gold standard in most global epidemiological exercises, from the World Mental Health Survey (Kessler and Üstün, 2008) to the already mentioned GBD studies (Whiteford *et al.*, 2013). The status of the CIDI as the gold standard has prevailed despite doubts about its validity in older interviewees since the early 1990s (Wittchen, 1994), and despite the heavy criticism of its specific application in the World Mental Health Survey by two directors of the National Institutes of Health (NIH) (Grant *et al.*, 2007). The latter has led to statistical adjustments of older CIDI data for most comparative overviews [e.g. via meta-regression in the GBD studies – Flaxman *et al.* (2015) or by correction via neighbouring countries estimates in Rehm *et al.* (2015d)], and to a change in its implementation at the World Mental Health Surveys in the most recent years.

Problems with the current measurement

There are a number of problems with the current concept and its operationalization via CIDI as the gold standard however, and we will try to give a summary of the most important ones: cultural specificity of the criteria measured (Rehm and Room, 2015), which is of course not only a measurement problem, but also a conceptual problem; lack of association between diagnoses of primary health care physicians and CIDI (Rehm *et al.*, 2015b, 2015c), as evidenced by missing severe cases with manifest somatic co-morbidity such as liver problems; and measurement biases resulting from stigma.

Cultural specificity of key criteria

Modern diagnosis of disease, no matter if made according to the ICD or the DSM, claims objectivity and universality; diseases are supposed to be defined independently of country or culture where the diagnosis is made. This premise may not hold true for AUD. As indicated earlier, the current definitions rely on a number of criteria which are mostly consequences – behavioural, cognitive and physiological -- of heavy drinking over time. Such symptoms have different social meanings in different cultures, which lead to surprising comparisons such as the more than 20-

fold difference in prevalence of alcohol dependence in Latvia compared to Italy (Rehm *et al.*, 2015d). As has been laid out elsewhere (Rehm *et al.*, 2013a), such a difference is implausible, given the relatively similar *per capita* consumption as well as rates of liver cirrhosis and heavy drinking; none of these indicators varies by more than three-fold with Latvia always showing higher levels. A better explanation of the divergent dependence rates relies on cultural differences and norms, which prescribe that in Italy one would not admit to losing control over one's drinking, whereas losing control may be the very reason why many Latvians drink heavily (Room, 2006). This example may be seen as a one-time exception, an empirical aberration, similar to studies which find no elevated risk for lung cancer associated with tobacco smoking. However, it can be shown, that prevalence of alcohol dependence in countries with cultural norms about drinking to feel the effects (Nordic countries, Eastern European countries) in general is much higher compared to Southern European countries, where there is a norm of not losing control (Rehm *et al.*, 2015d). These differences become especially marked, when controlled for drinking levels.

To give one more example: as indicated earlier, all Southern European countries show low prevalence of AUD and alcohol dependence in general population surveys, when compared to the European Union average or other regions (Rehm *et al.*, 2015d). These differences disappear, however, if primary health care physicians are asked to diagnose alcohol dependence or AUD among their patients (see the examples of the three sites in Italy and Spain in a recent large study in primary health care in six European countries – Manthey *et al.*, 2016; Rehm *et al.*, 2015c).

In sum, the different cultural interpretations of losing control and other criteria of AUD lead to biased estimates of prevalence. Part of this is a measurement issue, part a conceptual issue of defining a disorder by social consequences, which are always differentially interpreted in different cultures.

Lack of association with clinical judgments

In the aforementioned study, the 12-month prevalence of alcohol dependence was the same, around 5%, when assessed by the physician [5.1%; 95% confidence interval (CI), 4.7–5.5%; $n = 13,003$] or via the CIDI interview (DSM-IV: 5.5%, 95% CI, 5.1–6.0%; $n = 9098$). However, although the physician assessment and the CIDI yielded a similar prevalence, they identified different patient populations. Less than one-fifth of the cases were identified by both methods (Rehm *et al.*, 2015b, 2015c). Similar

patterns could be found for AUD in general, as defined by either qualifying for a diagnosis of alcohol dependence or alcohol abuse or both in DSM-IV (Manthey *et al.*, in press). The study also assessed DSM-5 diagnosis and the difference between general practitioners (GPs) and CIDI persisted.

What are the main differences between cases of alcohol dependence identified by physicians (on physicians' ability to detect patients with alcohol dependence, see Rumpf *et al.*, 2001; Mitchell *et al.*, 2012) or by CIDI? First, there was a striking age difference in that the CIDI identified the highest prevalence in the youngest age category, decreasing prevalence with age, whereas physicians had the opposite trend (Rehm *et al.*, 2015c). The problem of standardized instruments in identifying adolescents and younger adults, many of whom are not in need of clinical interventions, had been identified before (Caetano and Babor, 2006; Winters *et al.*, 2011; Pabst *et al.*, 2012), and there were also some indications of under-identifying older cases in earlier reviews of the validity of the CIDI (Wittchen, 1994). As for adolescents and young adults, there seems to be a confounding of developmental phenomena among younger drinkers rather than pathological processes. For instance, the rapid increase in alcohol quantity needed to maintain the desired effects among relatively inexperienced drinkers is not comparable with the progressive development of tolerance to alcohol in experienced heavy or very heavy drinkers (Martin and Winters, 1998), and these age-specific criteria can be identified when adjusting for level of drinking (Pabst *et al.*, 2012).

Second, there were other socio-demographic differences, with physicians' diagnosis being associated with higher unemployment, and lower education (Rehm *et al.*, 2015b, Web appendix 4; Hapke *et al.*, 1998). In addition, somatic diagnoses, hypertension and especially liver problems (as strongest predictor), were markedly stronger associated with physicians diagnosis, while there were no differences in mental co-morbidity between the different modes of diagnosis (Rehm *et al.*, 2015b, Web appendix 4). In sum, physicians seem to identify more severe cases of AUD with somatic co-morbidity (see also Hapke *et al.*, 1998), which the CIDI missed. Thus, it seems that people in their mid- or later adulthood with manifest alcohol problems including somatic co-morbidities such as hypertension or liver problems do not endorse CIDI items based on criteria such as tolerance, problems with fulfilling roles because of alcohol, time spent with alcohol or feel the need to cut down their alcohol consumption (Rehm *et al.*, 2015b, Web appendix 4). These results are in line with empirical results on treatment seeking, where the

majority of people with AUD did not seek treatment because they were not aware of a problem, which could not be solved by themselves (Probst *et al.*, 2015; Schuler *et al.*, 2015).

In sum, recent results comparing the CIDI with diagnoses of primary health care physicians cast doubt on the use of the CIDI as the gold standard. The CIDI missed many of the more severe AUD cases with manifest somatic co-morbidities, but identified younger adults with less severe AUD and mental problems. Independent of conceptual issues, it may be valuable to create an instrument to measure AUD which is closer to clinical reality.

The role of stigma

AUD are a particularly severely stigmatized mental disorder. In a recent review, Schomerus *et al.* (2011) found that compared with people suffering from other substance-unrelated mental disorders, alcohol-dependent persons are less frequently regarded as mentally ill, are held much more responsible for their condition, provoke more social rejection and more negative emotions, and they are at particular risk for structural discrimination. Contrary to other mental disorders, the severe stigma against AUD did not change in the last decades (Schomerus *et al.*, 2014). Stigma has been found as one of the important barriers for treatment seeking and disclosure of one's disease condition to the medical system (Wallhed Finn *et al.*, 2014; Probst *et al.*, 2015), resulting in the lowest treatment rate of all mental disorders (Alonso *et al.*, 2004; Kohn *et al.*, 2004; Cohen *et al.*, 2007; Rehm *et al.*, 2012, 2013b). In such a situation of high stigma, it is highly probable, that stigma not only reduces the probability to disclose problems with alcohol to health care professionals, but also in a survey situation, even if such a situation is anonymous. This may also in part explain the higher rates for adolescents and young adults, who seem to live with a cultural norm where heavy use of alcohol and subsequent loss of control is not as stigmatized as adult "alcoholism". However, we need more research to test these hypotheses.

In sum, stigma interferes with measurement of AUD in the general population.

A proposal for an alternative assessment of AUD in the general population

What are the potential consequences of the current situation where the proclaimed gold standard of assessment of AUD, the CIDI and similar instruments, have multiple measurement problems? We propose a situation similar to the assessment of drug use disorders in the GBD studies (Degenhardt *et al.*, 2011, 2013), where prevalence of use

data are key to determine prevalence of disorders (e.g. for cannabis use disorders as defined in the GBD, for countries without such data, it is estimated via a cross-walk from regular use). Thus we suggest taking consumption levels above a threshold as a less biased measure of AUD. Heavy drinking over time has been proposed as a better measurement for AUD in general (Rehm *et al.*, 2013a, 2014a, 2014c). Even if one does not agree with the general proposal, its advantages for epidemiological purposes seem to be convincing. First, level of drinking has shown to correlate highly with the number of criteria of AUD on the individual level (Rehm *et al.*, 2014a). Second, regulatory agencies for pharmaceuticals like the European Medicines Agency already use consumption measures as outcomes to evaluate effectiveness of medications for AUD (European Medicines Agency, 2010). Two thresholds are proposed for Europe: 60+ grams of pure alcohol a day for men, and 40+ grams for women as thresholds for heavy drinking, and 100+ grams or 60+ grams as thresholds for very heavy drinking, respectively. Third, level of consumption above both thresholds can be easily assessed without major biases via a triangulation of *per capita* consumption with survey data, where survey data will mainly be used for drinking status and not for drinking level (Rehm *et al.*, 2010; Kehoe *et al.*, 2012). The drinking level can be inferred via *per capita* consumption, which is mainly based on taxation of alcohol or on production, export and import (Rehm *et al.*, 2007; Poznyak *et al.*, 2013). Some bias may still enter via unrecorded consumption (Rehm *et al.*, 2014b), which makes up about one-fourth of total global adult alcohol *per capita* consumption (World Health Organization, 2014). However, measurement of this component has been standardized in recent years (Rehm and Poznyak, 2015), and data on all aspects of *per capita* alcohol consumption are available for all countries at two year intervals (World Health Organization, 2014). As indicated, the big advantage of these data is that *per capita* consumption measures do not rely on individuals admitting to heavy drinking or any other stigmatized behaviours.

The exact threshold taken will depend on the objective of the research: if this is to have an estimate of people in need for treatment given the current specialized treatment system, it should be the threshold for very heavy drinking [100+/60+ grams threshold of the European Medicines Agency (2010); see also Rehm *et al.*, 2015a], if we talk about level for interventions including brief advice or brief interventions (Rubinsky *et al.*, 2013), the 60+/40+ grams threshold for heavy drinking should be used. Fourth, the proposed measure has better convergent validity than the CIDI. For example, in a recent study in all European

Union countries, alcohol dependence prevalence was barely associated with liver cirrhosis rates, one of the main co-morbidity and sequela of alcohol dependence, with Pearson correlations of $r=0.08$ for women, and $r=0.25$ for men; the associations of liver cirrhosis rates with heavy drinking (defined via the European Medicines Agency threshold for heavy drinking and operationalized as described earlier) were $r=0.57$ for women and $r=0.58$ for men (Rehm *et al.*, 2015d).

The earlier arguments are based on using a triangulation or methods based on less-biased aggregate indicators. However, a reconceptualization of use disorders may also have advantages for the individual level (Rehm *et al.*, 2013a). Thus, relying on heavy drinking as the best definition for AUD may also reduce the high stigmatization on the individual level as described earlier (Schomerus *et al.*, 2011), as heavy drinking could be handled similarly to continuous disease indicators such as blood pressure (Nutt and Rehm, 2014; for the association between continuous indicators and stigma, see Schomerus *et al.*, 2013).

In sum, defining and assessing AUD via prevalence of heavy drinking promises to be less biased and more

public-health relevant operationalization, which could be implemented immediately, as the relevant data are collected as part of the global monitoring of alcohol and attributable harm (Poznyak *et al.*, 2013; World Health Organization, 2014).

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Declaration of interest statement

The views expressed here reflect only the author's and the European Union is not liable for any use that may be made of the information contained therein.

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