TREATMENT

Methodological Assessment of Economic Evaluations of Alcohol Treatment: What Is Missing?

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Abstract — Aim: The aim of this study is to review the methodology that has been adopted in previous economic evaluations of alcohol treatment and offer research recommendations with a view to enhancing the consistency and harmonization of economic evaluations in the alcohol field. Methods: Published full economic evaluations of alcohol treatment were retrieved using a systematic search. The studies were analysed in terms of the identification, measurement and valuation methods used to assess the society-level consequences and the methods used to carry out the analysis of individual-level consequences and costs of the intervention. A taxonomy of alcohol-related consequences was developed and used as a framework for the methodology extraction. Results: Twenty-seven studies were selected. Almost half of the studies did not include society-level consequences in their analysis. Some consequences of alcohol treatment at a societal level, such as the impact of treatment on health-related quality of life of family and friends of the drinker, have never been considered in the economic analysis. There was no agreement regarding the individual health consequences used in the evaluations. Measures capturing life years and morbidity have not been extensively used in the alcohol field. The level of reporting treatment costs on the reviewed studies is generally well detailed. Conclusion: The literature is still rather sparse in this area and further research is required to fulfil the gaps. If a common methodology is adopted in future economic evaluations of alcohol treatment, more stable cost-effectiveness estimates will be produced and informed decisions for resources allocation to alcohol treatments will be possible.

INTRODUCTION

Cost-effectiveness analysis of treatments is becoming increasingly important in prioritizing the allocation of scarce medical resources (Taylor et al., 2004). The social costs of alcohol have been widely described and many studies provide a framework for the identification, measurement and valuation of many of the consequences of hazardous and harmful alcohol consumption (Leontaridi, 2003). However, to date, there is no general agreement on which of these consequences should be identified and how they should be measured and valued in economic evaluations of alcohol treatment (Ensor and Godfrey, 1993; Lehto, 1997; Babor et al., 2003). This study reviews the methodology used in published full economic evaluations of alcohol treatment retrieved through a systematic search of the literature. Within health economics, only full economic evaluations, where the costs and consequences of at least two alternatives are compared, can help on resource allocation and decision-making on which strategy represents better value for money (Gold et al., 1996b; Drummond et al., 2005c). Most of the economic literature of alcohol interventions consists of partial economic evaluations and even though cost studies provide useful information for a full economic evaluation (Popovici et al., 2008), they are not reviewed here. This review aims at detecting the challenges based upon previous full economic evaluations of alcohol treatment. By suggesting pathways to harmonized methodology, and calling for higher quality economic evaluations, it is hoped that evidence will be generated which will help decisions that might involve an increase in funding for cost-effective alcohol treatments. For example, in England, there is a large gap between the need for alcohol treatment and actual access to treatment with only approximately 1 in 18 (5.6%) alcohol-dependent individuals accessing specialist alcohol treatment nationally per annum (Drummond et al., 2005a).

Full economic evaluations can be classified as cost-effectiveness analysis (CEA), cost-benefit analysis (CBA) or cost-utility analysis (CUA). The three analytical approaches are distinguished based on the way health benefits associated with alternative interventions under comparison are measured and valued (Tsuchiya and Williams, 2001; Drummond et al., 2005b). A CEA is based on a single, common health outcome that may differ in magnitude between the alternative programmes. Studies where costs and consequences are presented disaggregated and not brought together as a ratio are classified as cost-consequences analysis and with this technique no simple recommendations can be made to aid decision-making. When two or more programmes generate the same outcome, cost-minimization analysis estimates and compares the costs of alternative programmes. However, because there are techniques to compare the variability of individual health outcomes even when mean outcomes between two interventions are similar, this type of analysis is no longer recommended (Drummond et al., 2005c). In a CUA, utilities are employed as a measure of the value of the intervention effects. Quality-adjusted life years (QALYs) are a widely used measure of health benefits used in CUA. The UK National Institute for Health and Clinical Excellence, in the UK (NICE, 2004), and the US Public Health Service Panel on Cost-Effectiveness in Health and Medicine, in the United States (Gold et al., 1996a), recommend the use of generic QALYs based on a health state classification system with preference weights assigned by the public. Cost per QALY estimates are particularly useful when comparing different healthcare interventions that compete for the same pool of funding. Finally, in CBA, the health benefits are measured in monetary units as are all other costs and consequences in all three types of economic evaluations. A CBA reports a net monetary gain (or loss) or a cost/benefit ratio, using approaches such as ‘willingness-to-pay’ or ‘human capital’ to value health outcomes.

Other reviews of substance abuse treatments, including alcohol treatment, have been conducted for adolescent programmes (Homer et al., 2008), continuing care interventions (Popovici et al., 2008), alcohol services (French, 2000) and economic benefits of addiction interventions (McCullister and French,
2003). All those reviews provide an important insight into the methodological challenges of economic evaluations in the field. A distinguishing feature of this review is the focus on full economic evaluations of alcohol treatment and on the methods used for the identification, measurement and valuation of consequences. Other reviews also included partial economic evaluations and/or were not focusing solely on alcohol treatment.

In this review, three areas of costs and consequences are considered. Society-level consequences are here defined as the consequences that arise from individuals’ drinking behaviour and that affect society, including alcohol-related victims and drinkers’ families. Individual-level consequences are the consequences falling on the drinkers themselves. Finally, to complete the economic evaluation, input costs are the costs directly related to the intervention under evaluation.

METHODS

The primary literature was scoped and no similar comprehensive methodological review identified. Strict selection criteria were defined for this review in terms of type of study, type of participants, types of interventions and types of costs and consequences. Only studies that met all inclusion criteria and none of the exclusion criteria were included in the review (see Table 1 and text below).

Types of studies. Only full economic evaluations were included. Studies that did not present a single summary measure of costs and benefits were also included if they compared the costs and consequences of at least two alternatives; hence, cost-consequences analysis and cost-minimization analysis were also included. Studies that were not full economic evaluations such as partial economic evaluations, cost-of-illness studies, systematic reviews and methodological studies were excluded.

Type of participants. For a study to be included, the population of interest had to be classified as having alcohol problems and had to be the target of alcohol treatment.

Types of interventions. Included interventions were alcohol treatments delivered at the individual level consisting of psychosocial and/or pharmacological approaches. Interventions that consist of screening followed by counselling were also included. Excluded studies were those that evaluate interventions delivered at a population level. Treatment studies involve individuals voluntarily changing behaviour. Other policies directed at all drinkers whether having problems or not and involving some coercion, e.g., taxation, could be thought of having different individual impacts. While much of the content of this paper is relevant for such studies, this review was restricted to treatment interventions.

Combined alcohol and drug or tobacco interventions were excluded due to the mixed identification, measurement and valuation procedures for the different treatments or population types.

Types of costs and consequences. Studies that were a methodological extension of another one were excluded and only the published study with a more complete description of the methodology applied was selected.

Search strategy for the identification of studies

The focus of this review was only on published studies. All relevant articles were retrieved. Searches were undertaken of the following sources:

(1) Electronic databases- NHS Economic Evaluation Database (EED) and MEDLINE. NHSEED identifies all potential economic evaluations by searching the following databases: MEDLINE (from 1995 to present), EMBASE (from 2002 to present), PsychINFO (from 2006 to present) and CINAHL (from 1995 to present). The search ran in MEDLINE was restricted to records added in 2008 and 2009, in case there were relevant records not yet reviewed and added to the NHSEED.

(2) Handsearching of key journals: Journal of Studies on Alcohol, Alcoholism: Clinical and Experimental Research and the British Journal of General Practice.

(3) Reference lists and citation tracking: Bibliographic search for reference lists of retrieved studies and citation tracking of key papers.

### Table 1. Study exclusion and inclusion criteria

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Inclusion criteria</th>
<th>Exclusion criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of study</td>
<td>Studies that report both costs and consequences of alternatives (cost consequence analysis)</td>
<td>Cost minimization analysis</td>
</tr>
<tr>
<td>Participants</td>
<td>Individual patients to which alcohol treatment is directed, which include: harmful, hazardous or dependent</td>
<td>Methodological studies</td>
</tr>
<tr>
<td>Intervention</td>
<td>Treatment of alcohol abuse, problem drinking or alcohol dependence (pharmacological or/and psychosocial), including relapse prevention programmes and screening followed by brief interventions</td>
<td>Review studies</td>
</tr>
<tr>
<td>Costs and consequences</td>
<td>Clear description of identification, measurement and valuation methods</td>
<td>Alcohol interventions at a population level: (1) alcohol policy and legislative intervention, (2) enforcement measures of legislation, (3) prevention of alcohol misuse and (4) screening and detection studies</td>
</tr>
</tbody>
</table>

*CEA, cost effectiveness analysis; CUA, cost utility analysis; CBA, cost benefit analysis.*
The search strategy is provided in Appendix 1. The selection criteria were first applied to all citations generated from the electronic searching to decide whether full copies of potentially relevant references should be obtained. Once these copies were obtained, the inclusion/exclusion criteria were applied to all collated literature and decisions of inclusion were made.

Methods for the methodology extraction

Studies classification. Firstly, studies were classified according to the type of economic evaluation. Secondly, studies were divided into two groups: primary versus modelling studies. The first group included studies based mainly on primary data collection. These studies usually measure costs and effects over a maximum of a 12-month period. Modelling studies usually pool the effects from previous published studies and use models to estimate long-term health and economic consequences. The different study design has an impact on how the costs and consequences are identified and subsequently measured and valued.

Alcohol-related consequences stratification. For each study, data were extracted for society-level consequences and individual-level consequences, separately. We developed a taxonomy of the alcohol-related societal- and individual-level consequences (see Appendix 2). The aim of this stratification was to prevent double counting that occurs when the same consequence is accounted for in more than one domain.

The taxonomy of alcohol consequences for cost-effectiveness analysis of alcohol treatment combines the theoretical framework described for social cost studies, as these studies can provide a framework for the cost estimation in economic evaluations (Luce et al., 1996; Rice, 2000), with the framework used in full economic evaluations. All alcohol-related consequences that can be affected by alcohol treatment were included in this taxonomy.

The choice of inclusion of some consequences will depend on the type of services available in the setting where the treatment is delivered, on the perspective on costs of the study and may be limited by data availability. The perspective of the analysis dictates the range of costs and consequences included in an economic evaluation. Whilst a societal perspective is wider in terms of the costs and consequences included, the health service’s perspective, for example, is much narrower. Alcohol-related consequences impose a cost to different spheres of society. We divided the societal burden into the following seven domains: (1) criminal activity, (2) road traffic accidents, (3) workplace and productivity losses, (4) health-related quality of life losses, (5) general health care utilization, (6) other specific alcohol treatment utilization and (7) social services and non-statutory care utilization. In order to prevent double counting, some variables within the domains of criminal activity and road traffic accidents were allocated to other domains. Therefore, the loss of productive output due to injury and premature death of the victims, the psychological impacts of crime or road accidents on victims and victim’s families and friends and the increase in demand of health services induced by crime or road accidents were allocated to the domains of workplace and productivity losses, health-related quality of life and general healthcare utilization, respectively.

For individual impacts of treatment, two domains were identified: health consequences and patients’ expenditure. The domain of health consequences involves different variables and therefore was subdivided into clinical consequences and health-related quality of life (HRQoL). Clinical consequences encompass three types of variables: alcohol consumption, alcohol-related problems and life expectancy. According to HRQoL measurement and valuation, this category was separated into: utility approach, monetary approach and health profile approach. Usually, only one primary outcome from the health consequences domain is considered in an economic analysis. The type of individual health measure chosen and how it is valued in the analysis classify the type of economic evaluation as cost-effectiveness analysis, cost benefit analysis or cost utility analysis.

Patients’ expenditures related to their alcohol misuse can also be affected by alcohol treatment. These include out-of-pocket healthcare costs, travel and time costs due to other healthcare use, higher health insurance premiums and criminal justice-related costs (e.g. lawyers fees, penalties and so on). In order to avoid double counting, the taxonomy included loss of earnings to the alcohol misuser under society-level consequences (workplace and productivity losses domain).

Costing alcohol treatments. Alcohol interventions’ costs do not differ from other healthcare interventions, in terms of methodology and challenges (see Luce et al., 1996 for costing in economic evaluations). The treatment costs to which this section refers to are the inputs and resources used in the specific treatment for which the cost-effectiveness analysis was conducted. It must be emphasized that the taxonomy of alcohol-related consequences described in the previous section was concerned with the consequences of alcohol treatment and not with any input or resources used in the specific treatment for which the economic evaluation was drawn.

RESULTS

Results of the systematic search

The study selection process is presented in the flow chart (Fig. 1), where the number of studies retrieved in each stage is indicated. A total of 27 full economic evaluations of alcohol treatment were included in the methodological review.

Table 2 divides the selected studies (27 economic evaluations) into primary and modelling studies. In addition, the classification of the studies as CEA, CBA and CUA is provided.
The majority of published economic evaluations of alcohol treatment are primary studies (19 studies) and perform a cost-effectiveness analysis (18 studies). Within the eight modelling studies identified, six of these are cost-effectiveness analysis and there is not a modelling study that can be classified as a cost-benefit analysis.

### Society-level consequences

From the 27 reviewed studies, 11 studies excluded society-level consequences from their analysis (Long et al., 1998; Wutzke et al., 2001; Shakeshaft et al., 2002; Sobell et al., 2002; Alwyn et al., 2004; Corry et al., 2004; Doran et al., 2004; Kunz et al., 2004; Mortimer and Segal, 2005; Babor et al., 2006), mainly justified by adopting an agency or National Health Service perspective. One exception is the study by Mortimer and Segal (2005) that stated a societal perspective, although this was not the perspective actually undertaken in the analysis. A summary of the society-level consequence domains included in the studies, as stratified in the taxonomy of alcohol consequences, is presented in Table 3.

#### Criminal activity

Alcohol-related crime consequences were included in five studies. Measurement in all studies was based on the number of events reported in criminal justice records during follow-up. The costs of operating the criminal justice system in Fleming et al. (2002) were not reported separately from other crime-related costs such as medical care and mental health services costs. Therefore, for this study, it is not possible to disentangle the costs falling on criminal justice from other crime-related costs. None of the studies identified actions taken in anticipation of crime, which would include measures that reduce the probability or risk to potential victims.

#### Road traffic accidents

Road traffic accident costs were included in one study (Fleming et al., 2002) and focused on quantifying the costs incurred directly by or on behalf of the crime victim (Miller et al., 1996). However, these estimates were calculated for healthcare costs due to accidents, productivity losses and quality of life losses and, hence, allocated to their corresponding domain in the taxonomy in order to prevent double counting.

#### Workplace and productivity costs

Productivity losses related to the impact of alcohol misuse were included in four studies. The estimates for the Fleming et al. (2002) study were derived from Miller et al. (1996) and included victims’ reduced productivity due to absenteeism, calculated through the human capital approach (HCA) (Rice and Cooper, 1967). Barrett et al. (2006) also used the HCA and production losses were valued based on the individual gross daily salary. Nalpas et al. (2003) valued the work time lost due to alcohol problems, valuing these productivity losses according to the socioprofessional category and the corresponding salary of governmental employees. Lock et al. (2006), despite identifying absences from work, did not provide information regarding methods and valuation. Only productivity losses due to morbidity, and more specifically absenteeism, were included in the studies.

### Health-related quality of life

Health-related quality of life (HRQoL) losses to the victims of crime or drink-driving accidents were only taken into account in one study (Fleming et al., 2002). These estimates were taken from the aforementioned report conducted by Miller et al. (1996) where HRQoL valuation was based on jury awards to victims. HRQoL losses to friends and family were not included in any of the reviewed studies.

#### General healthcare utilization and other alcohol treatment utilization

The increased use of general healthcare from alcohol consumption and/or alcohol victims was identified in 10 of the selected full economic evaluations. Specific alcohol treatment, other than the treatment under analysis, was identified in five of the selected full economic evaluations. This is presented in Table 3.

Services differ between countries depending upon current practice, institutional arrangements, setting and health system organization, among other factors. Resource quantities were measured with different levels of precision. In general, studies using primary data used the more detailed ‘micro-costing’ methods while modelling studies used ‘gross-costing’ methods (see Raftery (2000) for levels of costing in economic evaluations).

#### Social services and non-statutory care

Social services and non-statutory care were included in 3 of the 27 studies. Quantities of social services and non-statutory care used were, generally, recorded from patient questionnaires or retrieved from service records. Unit costs were then applied to the volume of resources used in order to get a monetary valuation for the identified variables.

### Individual-level consequences

Table 4 shows the individual outcomes identified in each one of the 27 full economic evaluations.

The variables concerning alcohol consumption meet definitions that vary widely between studies and international literature in general. Table 4 shows that for many cases, the same study reports a variety of alcohol consumption variables without a justification for the use of specific variables instead of others. Two of the eight modelling studies (Schadlich and
Breith, 1998; Palmer et al., 2000) and two of the 19 primary studies (Nalpas et al., 2003; Rychlik et al., 2003) estimated the proportion of relapsing (any alcohol consumption) patients as the endpoint of the economic evaluation. Many studies identify alcohol-related problems using different questionnaires, such as: Severity of Alcohol Dependence (Stockwell et al., 1983), Leeds Dependence Questionnaire (Raistrick et al., 1994), Alcohol Use Disorders Identification Test (Babor et al., 2001), Alcohol Dependence Scale (Skinner and Allen, 1982), Alcohol Problems Questionnaire (Drummond, 1990) amongst others. Life years saved was the endpoint used in three modelling studies (Lindholm, 1998; Schadlich and Brecht, 1998; Palmer et al., 2000; Fleming et al., 2002; Rychlik et al., 2003; Gentilello et al., 2005; UK ATT Research Team, 2005; Barrett et al., 2006; Lock et al., 2006; Parrott et al., 2006). Mortimer and Segal (2005) computed QALYs with disability weights taken from a published study (Sanderson et al., 2004). Three studies measured and valued health-related quality of life (HRQoL) with the health profile approach using tools such as the General Health Questionnaire 28 (GHQ-28) (Goldberg, 1988) and the Short Form 12 (SF-12) (Ware et al., 1996). General health profiles are not preference-based measures so they cannot be used to calculate QALYs; however, methods exist to convert the SF-12 score into a single health utility index (Brazier et al., 2002).

Only one study made a reference to the effect of alcohol treatment on patient’s expenditure (Lock et al., 2006).

Costing the alcohol treatments analysed in the economic evaluation

Identification, measurement and valuation of treatment costs are generally well detailed. The methodology used for costing alcohol treatment depends on the type of treatment delivered and services available in the setting where it is provided. The health systems organization and geographical location of the economic evaluation determine the type of costing and values used.

Patients’ costs due to treatment uptake, such as the time spent in and getting to and from treatment and the travel costs, were included in three studies (Fleming et al., 2002; Rychlik et al., 2003; Fals-Stewart et al., 2005). Patient costs related to the intervention under analysis should be considered when a societal perspective is adopted in the study.

DISCUSSION

Before discussing the implications of the results, some limitations of the approach taken should be pointed out. This review only focused on published studies that may lead to the loss of studies due to publication bias. However, it aims to compare systematically retrieved studies in terms of the methods used to carry out the analysis of the costs and the individual and

<table>
<thead>
<tr>
<th>Domain</th>
<th>Study reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workplace and productivity losses</td>
<td>Due to morbidity:</td>
</tr>
<tr>
<td></td>
<td>Absenteism</td>
</tr>
<tr>
<td></td>
<td>Reduced efficiency</td>
</tr>
<tr>
<td></td>
<td>Reduced employment</td>
</tr>
<tr>
<td></td>
<td>Workplace accidents</td>
</tr>
<tr>
<td></td>
<td>Due to mortality:</td>
</tr>
<tr>
<td></td>
<td>Premature death</td>
</tr>
<tr>
<td></td>
<td>Workplace fatalities</td>
</tr>
<tr>
<td></td>
<td>Due to criminal career</td>
</tr>
<tr>
<td>Social services and non-statutory care</td>
<td>E.g. social workers interventions, occupational therapists.</td>
</tr>
<tr>
<td>Health-related quality of life (HRQoL)</td>
<td>HRQoL of family and friends</td>
</tr>
<tr>
<td>General healthcare utilization</td>
<td>E.g. accident and emergency services, hospital out-patient, inpatient and day patient visits.</td>
</tr>
</tbody>
</table>

Not all reviewed studies included society-level consequences; N, number of studies; NA, not applicable.
society-level consequences. This is not a standard systematic review, as the objective is not to calculate a summary measure or provide a qualitative description of the results of the different studies. Reviewing published studies provides a sufficient description of the methodological pathways that have been under use in economic evaluations of alcohol treatment and publication bias should not be a cause of concern. The main database used in the search, NHS EED, identifies all economic evaluations published after 1995. Therefore, studies published before 1995 have not been detected in the review. However, given that the evaluation of the methods used in full economic evaluations is the aim of the present review, it can be expected that more recent studies provide an improved description and selection of the methods used for the evaluation.

The following is a summary of the limitations associated with the studies reviewed. Methodological recommendations for future full economic evaluations are then drawn based on the detected gaps.

### Summary of limitations with existing full economic evaluations of alcohol treatment

1. A societal perspective has never been taken into full account and almost half of the studies totally excluded society-level consequences from their analysis. Despite the relatively small contribution of change in health services utilization, in comparison with reduced criminal activity, this outcome domain was the most used within society-level consequences. This latter finding has also been reported by McCollister and French (2003).

2. The economic data were limited either by a short-term prospective study or by retrospective collection methods. Clinical estimates were derived from studies with a short follow-up (12 months or less).

3. Some studies used abstinence as the only endpoint of the economic evaluation.

4. Most of the reviewed studies were cost-effectiveness analyses. Full evaluations included in previous reviews were

### Table 4. Summary of individual-level consequences variables

<table>
<thead>
<tr>
<th>Domains</th>
<th>Domain variables</th>
<th>Study reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alcohol consumption&lt;sup&gt;a,b&lt;/sup&gt;</td>
<td>Drinks/drinking day (DDD)</td>
<td>Humphreys and Moos, 1996; Pettinati et al., 1999; Alwyn et al., 2004; Lock et al., 2006; Parrott et al., 2006</td>
</tr>
<tr>
<td></td>
<td>Total quantity (grams)/X time</td>
<td>Alwyn et al., 2004; Doran et al., 2004; Parrott et al., 2006; Bischof et al., 2008</td>
</tr>
<tr>
<td></td>
<td>Drinks/X time</td>
<td>Fleming et al., 2002; Shakeshaft et al., 2002; Sobell et al., 2002; Kunz et al., 2004; Babor et al., 2006; Barrett et al., 2006</td>
</tr>
<tr>
<td></td>
<td>Drinking days/X time</td>
<td>Pettinati et al., 1999; Sobell et al., 2002</td>
</tr>
<tr>
<td></td>
<td>Drinking intensity</td>
<td>Long et al., 1998; Sobell et al., 2002</td>
</tr>
<tr>
<td></td>
<td>Binge drinking episodes/ heavy drinking</td>
<td>Humphreys and Moos, 1996; Fleming et al., 2002; Shakeshaft et al., 2002; Sobell et al., 2002; Kunz et al., 2004; Fals-Stewart et al., 2005; Babor et al., 2006; Bischof et al., 2008; Zarkin et al., 2008</td>
</tr>
<tr>
<td></td>
<td>Time to first drink</td>
<td>O’Farrell et al., 1996; Long et al., 1998; Parrott et al., 2006; Zarkin et al., 2008</td>
</tr>
<tr>
<td></td>
<td>% Days abstinent (PDA)</td>
<td>L’Farrell et al., 1996; Long et al., 1998; Parrott et al., 2006; Zarkin et al., 2008</td>
</tr>
<tr>
<td></td>
<td>Alcohol status: abstinence versus relapse</td>
<td>Schadlich and Brecht, 1998; Palmer et al., 2000; Nalpas et al., 2003; Rychlik et al., 2003</td>
</tr>
<tr>
<td></td>
<td>Biochemical markers</td>
<td>Long et al., 1998</td>
</tr>
<tr>
<td>Alcohol-related problems&lt;sup&gt;a,b&lt;/sup&gt;</td>
<td>General alcohol-related problems</td>
<td>Humphreys and Moos, 1996; Long et al., 1998; Shakeshaft et al., 2002; Alwyn et al., 2004; Kunz et al., 2004; Gentilello et al., 2005; Lock et al., 2006; Zarkin et al., 2008</td>
</tr>
<tr>
<td></td>
<td>Alcohol dependence</td>
<td>Humphreys and Moos, 1996; Long et al., 1998; Alwyn et al., 2004; Kunz et al., 2004; Lock et al., 2006; Parrott et al., 2006</td>
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<tr>
<td></td>
<td>Relationship satisfaction/marital functioning</td>
<td>O’Farrell et al., 1996; Fals-Stewart et al., 2005</td>
</tr>
<tr>
<td></td>
<td>Social satisfaction and/or self-esteem</td>
<td>Alwyn et al., 2004</td>
</tr>
<tr>
<td>Life expectancy&lt;sup&gt;a,b&lt;/sup&gt;</td>
<td>Life years/mortality</td>
<td>Lindholm, 1998; Palmer et al., 2000; Wutzke et al., 2001; Fleming et al., 2002</td>
</tr>
<tr>
<td>HDQoL&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Utility approach (QALYs)</td>
<td>Mortimer and Segal, 2005; UKATT Research Team, 2005; Parrott et al., 2006</td>
</tr>
<tr>
<td></td>
<td>Utility approach (DALYs)</td>
<td>Corry et al., 2004</td>
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<tr>
<td></td>
<td>Monetary approach</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>Health profile approach</td>
<td>Babor et al., 2006; Lock et al., 2006; Parrott et al., 2006</td>
</tr>
<tr>
<td>Patients’ expenditure</td>
<td>Out of pocket healthcare cost</td>
<td>Lock et al., 2006</td>
</tr>
<tr>
<td></td>
<td>Travel and time costs due to other health care use</td>
<td>Lock et al., 2006</td>
</tr>
<tr>
<td></td>
<td>Higher health insurance premium</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>Criminal justice-related costs</td>
<td>NA</td>
</tr>
</tbody>
</table>

HRQoL, health-related quality of life; QALYs, quality-adjusted life years; DALYs, disability-adjusted life years; NA, not applicable.

<sup>a</sup>Categories within the health consequences domain.

<sup>b</sup>Variables within the clinical consequences category.
5. Individual-level consequences were not consistently identified, measured and valued. Previous reviews have also noted the lack of consistency and standardization in methods in studies of substance abuse interventions (French, 2000; Popovici et al., 2008).

6. Measures of HRQoL capturing life years and morbidity have not been extensively used in the alcohol field. Few studies present their results in terms of the costs required to achieve one extra QALY.

Recommendations for future full economic evaluations of alcohol treatment

The recommendations provided here are those related to the findings of this particular review. For more general recommendations in economic evaluation, the interested reader should examine this paper conjointly with previous reviews in the field (French, 2000; McCollister and French, 2003; Homer et al., 2008; Popovici et al., 2008) and other general economic evaluation literature (Gold et al., 1996b; Drummond and McGuire, 2001; Drummond et al., 2005c).

1. The perspective adopted by an economic evaluation determines which costs and consequences are considered and should be clearly stated. With a limited perspective, the study may be less tractable for the evaluator and of direct relevance to the decision maker. However, alcohol treatment yields large overall social benefits due to the range of problems that alcohol consumption causes. There is evidence that when adopting a societal perspective, alcohol treatment can be cost saving (Slattery et al., 2003; Heather et al., 2006). Homer et al. (2008) and French (2000) have also recognized the importance of a broad societal perspective and McCollister and French (2003) pointed out the importance of including criminal activity in economic evaluations as it represents the greatest economic benefit of addiction interventions. Society-level consequences should be identified early-on in studies, using the taxonomy of consequences in Appendix 2 and a societal perspective should be adopted. With a broader perspective, the analyst can also explore the impact of taking a narrower perspective that may be required by a decision maker, for example NICE in England or other healthcare financing regulators.

2. Alcohol treatment has long-term health and social benefits that should be included in an economic evaluation. Long-term outcomes can be assessed when a long-term follow-up study is conducted, usually combined with modelling techniques. Previous reviews have also mentioned the need for long-term data and modelling techniques (French, 2000; Homer et al., 2008; Popovici et al., 2008). Moving away from short-term outcomes will make it possible to know the trend of economic benefits in the long-term and assess whether the immediate effects of treatment lead to other long-term outcomes. In fact, we can even go further to say that both short and long-term consequences may be difficult to measure in a prospective study with patients. For example, while those drinking hazards may frequently drink and drive, the probability of an accident on each individual occasion is low. In addition, only modelling can capture the potential gain in life years achieved with a treatment for alcohol problems. Therefore, we argue that a modelling approach is paramount to the economic evaluation of alcohol treatment. In addition, the uncertainty in the economic evaluation inputs should be incorporated in the modelling results through the use of sensitivity analysis. A recent study uses long-term modelling techniques to establish a link between drinking patterns, health consequences, alcohol treatments effectiveness and cost-effectiveness (Barbosa et al., in press). The recently developed framework presented in Barbosa et al. (in press) provides a dynamic model that allows for relapse and natural recovery.

3. All full economic evaluation should include a measure of the impact of treatment on the individuals under treatment. Many earlier economic evaluations of drug and alcohol treatments were confined to population level consequences and the omission of individual level consequences could distort the assessment of the relative worth of different interventions, just as the exclusion of population level or long-term consequences could (Godfrey and Parrott, 2000).

4. A wider population with alcohol problems is eligible for treatment and confining treatment effectiveness to abstinence neglects other potential individual and social benefits. A treatment that has the potential to reduce drinking should represent a value to society and economic evaluations should be able to reflect this.

5. The extensive use of natural effectiveness estimates for the economic evaluation of alcohol treatment has some fundamental problems. CEA is based on a single program outcome but alcohol treatment results in a variety of outcomes and this poses numerous problems related to comparability and standardization (Sindelar et al., 2004). Therefore, cost benefit analysis and cost utility analysis, because they address the issue of outcome valuation, might be preferable as they allow an assessment of broader choices than a simple CEA.

6. Healthcare providers and policy makers use full economic evaluations to make decisions on the allocation of scarce resources between competing programmes. For such a decision to be made, treatment outcomes should be comparable and a single outcome measure should be used. Preference-based measures such as QALYs have been advocated as a comprehensive health measure that permits comparison between different health technologies (Gold et al., 1996b; Drummond and McGuire, 2001; NICE, 2004; Drummond et al., 2005c). Therefore, outcome scales/tests should be replaced by a health measure that facilitates comparison between interventions and captures quality and quantity of life, such as QALYs.

7. The methodological review included two CUA that used the EQ-5D to calculate the QALYs gained with the intervention (Parrott et al., 2006; UKATT Research Team, 2005). These two studies showed that the HRQoL of individuals with alcohol use disorders was poorer than that of a reference population and that there were QALY's
gained with treatment. However, this QALY gain was not statistically significant. In contrast, improvements in alcohol consumption variables were significant in those two studies. The variability in HRQoL is often greater than the variability in clinical endpoints and the sample size of the studies may be insufficient to detect significant differences in such economic endpoints (Fayers and Hand, 1997). Furthermore, generic HRQoL instruments might not be appropriate for a population with alcohol problems. Investigation on the relationship between QALYs and indicators of drinking behaviour, the extent to which improvement in alcohol consumption can be linked with QALYs gained and the time period for this to be detected warrants closer scrutiny. A longitudinal study, where an alcohol-drinking population is followed for a long period and where consumption levels and HRQoL are measured, would help in answering some of these questions. If alcohol treatment programs are to compete with other healthcare interventions for limited resources, the relationship between alcohol treatment outcomes and QALYs is of great importance so that there is a single, comparable outcome measure.

8. A previous review strongly recommends the use of CBA (Popovici et al., 2008). While the use of utility measures is currently limited, so is the use of monetary measures of individual health benefits or more global measures of the total value of treatment interventions through community level global willingness to pay measures. Most existing so-called CBA studies have not included any measure of individual health effects and have therefore been excluded from this review. Alcohol treatments are in general funded through healthcare mechanisms and CUA techniques are increasingly being used to assess other healthcare interventions so we would currently recommend the use of a CUA design.

CONCLUSION

We extended previous reviews by (1) depicting all alcohol-related consequences included in previous studies; (2) developing an alcohol-related consequences taxonomy that avoids double counting and helps on the standardization of the methods; (3) focusing on full economic evaluations of alcohol treatment; (4) providing a clear description of the systematic search; (5) not constraining the review to geographical areas, types of treatment or treatment populations; (6) expressing the need for always including individual-level health consequences of interventions in the economic evaluation; (7) stating the need to move away from abstinence-only measure; (8) mentioning the lack of consistency and standardization in methods with an emphasis on individual health outcomes; (9) calling for more cost-utility analysis with QALYs as a preferred outcome measure and (10) emphasizing the call for the development of modelling techniques in the economic evaluation of alcohol treatment. The literature is still rather scarce in this area and we hope that the recommendations provided in this paper will stimulate further work to harmonize between studies and will guide on the conduct of more and better economic evaluations of alcohol treatment. Only rigorous full economic evaluations can help on decision-making and on the allocation of resources to cost-effective alcohol treatments.

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APPENDIX 1. SEARCH STRATEGY

Searches of electronic databases used free-text terms and keywords (and where appropriate MESH headings) for economic evaluations. The study design terms are embedded in the NHSEED database, so these did not have to be specified.

Search terms used in the NHS EED (search conducted on 20 February 2009):

- MeSH Alcohol-Related Disorders EXPLODE 1
- MeSH Alcohol Drinking EXPLODE 1
- MeSH Temperance EXPLODE 1
- MeSH Alcohol Deterrents EXPLODE 1
- “alcohol drinking”
- alcoholism
dispomania
- “alcohol consumption”
drink∗ NEAR excess∗
drink∗ NEAR binge
drink∗ NEAR heavy
drink∗ NEAR hazard∗
drink∗ NEAR problem∗
drink∗ NEAR abuse
drink∗ NEAR misus∗
drink∗ NEAR dependen∗
drink∗ NEAR harm∗
alcohol∗ NEAR excess∗
alcohol∗ NEAR binge
alcohol∗ NEAR heavy
alcohol∗ NEAR hazard∗
alcohol∗ NEAR problem∗
alcohol∗ NEAR abuse
alcohol∗ NEAR misus∗
alcohol∗ NEAR dependen∗
alcohol∗ NEAR harm∗
“alcohol intake”

#1 or #2 or #3 or #4 or #5 or #6 or #7 or #8 or #9 or #10 or #11 or #12 or #13 or #14 or #15 or #16 or #17 or #18 or #19 or #20 or #21 or #22 or #23 or #24 or #25 or #26 or #27

Search term used in Ovid MEDLINE(R) <1996 to June Week 3 2009>

1 exp "Costs and Cost Analysis"/ (82400)
2 “Value of Life”/ (1918)
3 Economics/ (4946)
4 Economics, Nursing/ or Economics, Medical/ or exp Economics, Hospital/or Economics, Pharmaceutical/ (10206)
5 or/1–4 (92049)
6 (econom* or cost* or pric* or pharmacoeconomic*)/ti,ab.
(211115)
7 (expenditure$ not energy)/ti,ab. (7686)
8 (value adj 1 money)/ti,ab. (5)
9 budget$/ti,ab. (7551)
10 or/6–9 (218522)
11 5 or 10 (256051)
Methods in Alcohol Treatment Economic Evaluations

12 letter.pt. (345003)
13 editorial.pt. (157702)
14 historical article.pt. (87278)
15 12 or 13 or 14 (582776)
16 11 not 15 (242581)
17 Animals/ (1855341)
18 Humans/ (5020366)
19 17 not (17 and 18) (1233871)
20 16 not 19 (222896)
21 (metabolic adj cost).ti,ab. (324)
22 ((energy or oxygen) adj cost).ti,ab. (1055)
23 20 not (21 or 22) (221855)
24 “Alcohol Drinking/ (12245)
25 exp Alcohol-Related Disorders/ (26846)
26 “Temperance/ (477)
27 Alcohol Deterrents/ (671)
28 exp Self-Help Groups/ (3755)
29 “alcohol drinking” .mp. (20904)
30 Alcoholism.mp. (20011)
31 dipsomania.mp. (7)
32 “alcohol consumption”.mp. (11894)
33 (drink$ adj excess$).tw. (59)
34 (drink$ adj binge).tw. (48)
35 (drink$ adj heavy).tw. (61)
36 (drink$ adj hazard$).tw. (31)
37 (drink$ adj problem$).tw. (319)
38 (drink$ adj abuse).tw. (10)
39 (drink$ adj misus$).tw. (1)
40 (drink$ adj dependen$).tw. (7)
41 (drink$ adj harm$).tw. (9)
42 (alcohol$ adj excess$).tw. (61)
43 (alcohol$ adj binge).tw. (45)
44 (alcohol$ adj heavy).tw. (20)
45 (alcohol$ adj hazard$).tw. (4)
46 (alcohol$ adj problem$).tw. (1451)
47 (alcohol$ adj abuse).tw. (4908)
48 (alcohol$ adj misus$).tw. (686)
49 (alcohol$ adj dependen$).tw. (4500)
50 (alcohol$ adj harm$).tw. (41)
51 “alcohol intake”.tw. (4549)
52 or/24–51 (56921)
53 23 and 52 (2454)
54 Rehabilitation Centers/ (2426)
55 Health Behavior/ (16257)
56 Health Education/ (17506)
57 Preventive Health Services/ (4364)
58 Preventive Psychiatry/ (25)
59 Directive Counseling/ (403)
60 exp Behavior Therapy/ (18354)
61 exp Cognitive Therapy/ (7964)
62 exp Evidence-Based Medicine/ (33317)
63 Hospitalization/ (26490)
64 (Referral and Consultation).mp. [mp=title, original title, abstract, name of substance word, subject heading word] (21707)
65 Health Promotion/ (24792)
66 Health Maintenance Organizations/ (7158)
67 “relapse prevention” .mp. (976)
68 “harm reduction” .mp. [mp=title, original title, abstract, name of substance word, subject heading word] (1410)
69 (naltrexone or acamprosate or disulfiram or opioid-antagonist).tw. (3630)
70 campral.mp. [mp=title, original title, abstract, name of substance word, subject heading word] (12)
71 anti?craving.tw. (52)
72 dis?firam.tw. (506)
73 disulfiram.tw. (506)
74 disulfiram.tw. (1)
75 disulfiram.mp. [mp = title, original title, abstract, name of substance word, subject heading word] (2)
76 “brief intervention” .tw. (616)
77 “motivational interviewing” .tw. (582)
78 “motivational enhancement therapy” .tw. (96)
79 “social behavior".tw. (2120)
80 “cognitive behavio?ral therapy".tw. (2355)
81 “aversions therapy” .tw. (28)
82 “relapse prevention” .tw. (976)
83 “skills training” .tw. (1531)
84 treatment.mp. (1322331)
85 or/54–84 (1448580)
86 53 and 85 (1076)
87 limit 86 to yr="2008–2009" (110)
## APPENDIX 2. TAXONOMY OF ALCOHOL CONSEQUENCES

Alcohol consequences in an economic evaluation of alcohol treatment

<table>
<thead>
<tr>
<th>Study/project ID</th>
<th>Domains</th>
<th>Perspective</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Society-level consequences</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Criminal activity</td>
<td>Acquisition of security products, Precautionary behaviour,</td>
</tr>
<tr>
<td></td>
<td>Anticipation of crime</td>
<td>Prevention, Insurance administration, Prosecution service</td>
</tr>
<tr>
<td></td>
<td>Response to crime</td>
<td>Courts, Defence, Prison and probation services, Damaged/stolen property</td>
</tr>
<tr>
<td></td>
<td>Road traffic accidents</td>
<td>Consequence of crime, Drink driving offences, Property damage</td>
</tr>
<tr>
<td></td>
<td>Workplace and productivity losses</td>
<td>Due to morbidity, Absenteeism, Reduced efficiency, Workplace accidents</td>
</tr>
<tr>
<td></td>
<td>Health-related quality of life</td>
<td>Due to mortality, Reduced employment, Premature death, Workplace fatalities</td>
</tr>
<tr>
<td>(HRQoL)</td>
<td>General healthcare utilization</td>
<td>General healthcare is specific to setting, current practice and other conditions, The healthcare resources here are other than those related to the inputs of the alcohol treatment under analysis.</td>
</tr>
<tr>
<td></td>
<td>Specific alcohol treatment</td>
<td>Specific alcohol treatment is specific to setting, current practice and other conditions, The specific alcohol treatment uptake is other than the alcohol treatment under analysis.</td>
</tr>
<tr>
<td></td>
<td>Social services and non-statutory care</td>
<td>Social services and non-statutory care are specific to setting, and other conditions.</td>
</tr>
<tr>
<td></td>
<td>Health consequences</td>
<td>Individual-level consequences Alcoholic consumption, Alcohol-related problems, Life expectancy, Utility approach, Monetary approach, Health profile approach</td>
</tr>
<tr>
<td></td>
<td>Clinical consequences</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Out-of-pocket healthcare cost</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Travel and time costs due to other healthcare use</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Higher health insurance premium</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Criminal justice-related costs</td>
<td></td>
</tr>
</tbody>
</table>

*Used in cost effectiveness analysis or in cost benefit analysis if a monetary valuation is applied. *Used in cost utility analysis or in cost benefit analysis if a monetary valuation is applied. *Used in cost benefit analysis.

### REFERENCES


