



Goranitis, I., Coast, J., Day, E., Copello, A., Freemantle, N., & Frew, E. (2017). Maximizing Health or Sufficient Capability in Economic Evaluation? A Methodological Experiment of Treatment for Drug Addiction. *Medical Decision Making*, 37(5), 498-511.  
<https://doi.org/10.1177/0272989X16678844>

Peer reviewed version

Link to published version (if available):  
[10.1177/0272989X16678844](https://doi.org/10.1177/0272989X16678844)

[Link to publication record on the Bristol Research Portal](#)  
PDF-document

This is the author accepted manuscript (AAM). The final published version (version of record) is available online via Sage at <http://journals.sagepub.com/doi/full/10.1177/0272989X16678844>. Please refer to any applicable terms of use of the publisher.

## University of Bristol – Bristol Research Portal

### General rights

This document is made available in accordance with publisher policies. Please cite only the published version using the reference above. Full terms of use are available:  
<http://www.bristol.ac.uk/red/research-policy/pure/user-guides/brp-terms/>

# **Maximising health or sufficient capability in economic evaluation? A methodological experiment of treatment for drug addiction**

*Ilias Goranitis,<sup>a</sup> PhD, Joanna Coast,<sup>b</sup> PhD, Ed Day,<sup>c,d</sup> PhD, Alex Copello,<sup>c,e</sup> PhD, Nick Freemantle,<sup>f</sup> PhD, Emma Frew,<sup>a</sup> PhD*

<sup>a</sup> Health Economics Unit, Institute of Applied Health Research, University of Birmingham, UK; <sup>b</sup> School of Social and Community Medicine, University of Bristol, UK; <sup>c</sup> Birmingham & Solihull Mental Health Foundation Trust, Research & Innovation Department, UK; <sup>d</sup> Addictions Department, National Addiction Centre, London, UK; <sup>e</sup> School of Psychology, University of Birmingham, UK; <sup>f</sup> Department of Primary Care and Population Health, University College London, UK

Address correspondence to Emma Frew, Health Economics Unit, Institute of Applied Health Research, University of Birmingham, Edgbaston, Birmingham B15 2TT, UK; E-mail address: [E.Frew@bham.ac.uk](mailto:E.Frew@bham.ac.uk)

Word count: 4,997

Financial support for this study was provided by the National Institute for Health Research (NIHR) under its Research for Patient Benefit (RfPB) Programme (Grant Reference Number PB-PG-0610-22392). The funding agreement ensured the authors' independence in designing the study, interpreting the data, writing, and publishing the report.

Conflicts of interest: IG, NF, ED, AC and EF have no conflicts of interest. JC was one of the developers of the ICECAP-A capability index.

## **ABSTRACT**

Conventional practice within the United Kingdom and beyond is to conduct economic evaluations with 'health' as evaluative space and 'health maximisation' as the decision making rule. However, there is increasing recognition that this evaluative framework may not always be appropriate, and this is particularly the case within public health and social care contexts. This paper presents a methodological case study designed to explore the impact of changing the evaluative space within an economic evaluation from health to capability wellbeing and the decision making rule from health maximisation to the maximisation of sufficient capability. Capability wellbeing is an evaluative space grounded on Amartya Sen's capability approach and assesses wellbeing based on individuals' ability to do and be the things they value in life. Sufficient capability is an egalitarian approach to decision making that aims to ensure everyone in society achieves a normatively sufficient level of capability wellbeing. The case study is treatment for drug addiction and the cost-effectiveness of two psychological interventions relative to usual care is assessed using data from a pilot trial. Analyses are undertaken from a health care and a government perspective. For the purpose of the study, Quality-Adjusted Life-Years measured using the EQ-5D-5L, Years of Full Capability equivalent and Years of Sufficient Capability equivalent, both measured using the ICECAP-A, are estimated. The study concludes that different evaluative spaces and decision making rules have the potential to offer opposing treatment recommendations. The implications for policy makers are discussed.

**Keywords:** economic evaluation; wellbeing; ICECAP; health maximisation; capability

## INTRODUCTION

Health economic evaluations predominantly adopt an extra-welfarist approach, aiming to maximise health in a resource constrained environment. This approach is advocated by all national health technology assessment bodies that use economic evaluation to inform decision making, such as the UK National Institute for Health and Care Excellence, the Dutch National Health Care Institute, the Canadian Agency for Drugs and Technologies in Health, and the Australian Pharmaceutical Benefits Advisory Committee [1]. Although national submission guidelines may differ on whether health care costs, with or without personal social services costs, or broader societal costs should be included in economic analyses, they all advocate the maximisation of health, using Quality-Adjusted Life-Years (QALYs) as the standard unit of outcome. This approach to economic evaluation and resource allocation may be appropriate for the assessment of health care technologies or services that have cost and outcomes that fit neatly within the health sector, but there is a burgeoning literature outlining the reasons why 'health' as evaluative space and 'health maximisation' as the decision making rule might not be appropriate at least in some circumstances [2-10].

The realisation that the conventional toolbox for health economic evaluations might not be appropriate where interventions have spill-over effects on family members or informal carers [3], where interventions are aimed at the community rather than individuals [4-6], and where interventions lead to an improvement in outcomes that go beyond the traditional health focus [7-10] has led to an increased interest in how to adapt methods for capturing broader evaluative spaces. A major contribution in this direction has been the development of a number of capability instruments, including ASCOT [11], OxCap-MH [12], and the ICECAP measures [13-15]. The ICECAP measures

are intended to provide a generic measure for use in economic evaluations, while ASCOT and OxCap-MH were developed for application in social care and mental health respectively. These outcome measures have all been developed on the theoretical foundations set out by Amartya Sen's capability approach to human wellbeing [16], and aim to offer an alternative and broader evaluative space with a focus on people's capability to function in terms of their wider wellbeing (capability wellbeing) rather than their actual functioning in terms of health only.

A recently published study looked at the relative impacts of a number of common health conditions on health and capability wellbeing [17]. It concluded that changing the evaluative space from a health-focused metric, such as the EQ-5D-5L, to one focused on capability wellbeing, such as the ICECAP measure for adults (ICECAP-A), could have a significant impact on funding priorities, and this was likely to positively affect the case for mental health conditions. The work also showed that the choice of evaluative space for economic evaluation is an important value judgement that can have a large impact on resource allocation decisions.

Evidence that capability wellbeing can potentially offer a more suitable evaluative space than health in certain contexts continues to emerge. A study has just been published showing that capability wellbeing, measured using the ICECAP-A, can incorporate into economic evaluations broader wellbeing impacts of addiction treatments that may be missed within the evaluative space of health, measured using the EQ-5D-5L [18].

Having close people to discuss personal issues and socialise with, and having personal self-esteem, were some of the broader determinants of capability wellbeing that were missed within the evaluative space of health. This study concluded that the ICECAP-A was at least as sensitive in capturing impacts on health-related clinical indicators as the

EQ-5D-5L and significantly more sensitive for clinical indicators of broader wellbeing, advocating capability wellbeing as a more suitable evaluative space for substance use disorder treatments [18].

Apart from the choice of evaluative space, the choice of health maximisation is another value judgment that may have a large impact on the way resources are allocated. The maximisation of health is only one approach to decision making and evidence shows that society might value different approaches more highly [19-24]. It is this thinking that has led some health economists to move away from this conventional approach of health maximisation and to explore alternative more 'egalitarian' approaches that give a greater allowance to distributional concerns [25-29]. One such approach, which was influenced by Rawls's theory of justice [30] and can be traced as far back as 1985 [31], is aiming to bring the members of society to a 'sufficient' threshold level of health.

Notions of sufficiency have also been advocated within the capability approach [32]. A recently published literature review highlighted that the sufficiency goal was more commonly encountered in the capabilities literature than maximisation [33], and indeed, sufficiency is closely related to the equality in the space of capabilities that Amartya Sen advocated [34]. A method for incorporating this within an economic evaluation framework has recently been developed [35]. This 'Sufficient Capability' approach prioritises individuals below a normatively sufficient level of capability and aims to maximise the number of people in society that achieve sufficient capability [35].

A clinical area where broader evaluative spaces and egalitarian rules for decision making may be more pertinent to clinical and policy objectives is drug addiction [36, 37]. In this context, clinical and policy objectives are about achieving a broader notion of wellbeing from multifaceted psychosocial approaches that aim to 'nudge' clients into

making better choices, and broader measurable effects on the physical and mental health of user's family and friends are commonly evident [38, 39]. This paper is building on a previous study that found important differences in the psychometric performance of the ICECAP-A and EQ-5D-5L in drug dependency [18], and aims to explore whether different evaluative spaces and decision making rules in economic evaluations based on the capability approach have the potential to impact on treatment recommendation. The economic evaluation of two active psychological interventions offered in addition to standard care for heroin users in opioid substitution treatment is used as a case study.

## **METHODS**

### **Trial design and participants**

Detailed information about the study design and participants can be found elsewhere [40]. In brief, this was a pilot study with a pragmatic, multicentre, randomised parallel group design comparing two active psychological interventions, offered as adjunct to usual care, with usual care. Clients who had been receiving opioid substitution treatment for more than 12 months but still reported opiate use in the preceding 28 days were recruited. This represented a population that had failed to receive maximum benefit from standard treatment. All participants provided written informed consent and were followed-up for 12 months. Ethical approval was received from the National Research Ethics Committee [REC Ref: 12/WM/0046]. Information about the three interventions is presented below.

1. Treatment as usual (TAU): Participants received methadone or buprenorphine in addition to an individual session with a drug worker every 1-2

weeks covering topics related to case management, signposting of other services, structured psychosocial interventions, and other activities (e.g. medication issues).

2. Brief Social Behaviour and Network Therapy (B-SBNT) + TAU: B-SBNT therapy was delivered according to a purpose-designed manual. Clients were invited to attend four 50-minute B-SBNT sessions over a period of 6 weeks in addition to medication and TAU sessions as described above. The aim was to assess the participant's social support network, and to involve key members in helping them attain personal goals [41].

3. Personal Goal Setting (GS) + TAU: GS involved an additional active component to usual care through a structured process of setting personal goals and monitoring their attainment, and was delivered according to a purpose-designed manual. Participants were expected to attend four 50-minute sessions over a period of 6 weeks in addition to receiving medication and TAU as above.

### **Resource use and costs**

Resource use information was collected using the Client Service Receipt Inventory [42]. The resource use questionnaire was administered during face-to-face interviews at baseline, 3 months, and 12 months post-randomisation, with participants having to recall resource use 'over the last 3 months'. In order to avoid a high drop-out rate associated with multiple follow-up periods in this clinical context, while still assessing the short and long-term impact of interventions, intermediate follow-up periods were not included within the trial.



Resource use was collected from both a national health service and personal social services (NHS/PSS) perspective and a government perspective. For pragmatic reasons discussed at the end of the manuscript, resource use associated with a societal perspective, such as out-of-pocket expenditure, was not collected. Unit costs for health and social care services were obtained from national sources [43-45], and are shown in Table 1. Unit costs of criminal justice services and social security benefits came from government sources [46-50], and are detailed in Table 2. As supported living costs are funded by the state [51] these were included in the analysis (Table 2) [52, 53]. Medication costs were calculated according to patient-specific dosage and frequency, and unit costs were obtained from the British National Formulary [54].

*(Tables 1 and 2 about here)*

Costs related to the training of therapists and the delivery of interventions were calculated using a standard micro-costing approach [55]. The time supervisors and therapists spent in training, supervision and delivery of interventions were valued using salary information [44, 56, 57], and the total staff training costs for each intervention were spread across the number of participants in each trial-arm. To incorporate the opportunity cost of staff time for each missed appointment, a conservative estimate of 5 minutes of therapists' time was assumed in cases where participants did not attend a session [58]. All unit costs were evaluated in UK pounds sterling at a 2012/13 price base. Given that baseline costs were likely to be predictors of follow-up costs, differences in total costs between trial-arms were adjusted for variations in the costs occurring during the 3 months prior to baseline [59].

## **Outcome measures**

In line with the conventional health care decision making principle of outcome maximisation described earlier, two units of outcome were estimated for the analysis. The first outcome is QALYs, estimated based on participants' responses to the EQ-5D-5L [60]. The EQ-5D-5L is a measure used to capture the evaluative space of health through the dimensions of mobility, self-care, usual activities, pain and discomfort, and anxiety and depression, with each dimension having five possible levels of health. Individual response permutations to the EQ-5D-5L were used to calculate health index scores based on the UK crosswalk value set [61]. This value set was developed by mapping responses to the EQ-5D-5L measure to the UK value set developed for the EQ-5D-3L using the time trade-off method [62].

The second outcome is Years of Full Capability equivalent (YFC), which means that a gain of one year in full capability is the equivalent to a shift from one year with no capability to a year with full capability. YFC were estimated based on participants' responses to the ICECAP-A measure [14]. The ICECAP-A is a measure used to capture the evaluative space of capability wellbeing through the dimensions of stability, attachment, autonomy, achievement, and enjoyment, with each dimension having four possible levels of capability. The ICECAP-A measure is shown in Appendix 1. Response permutations to the ICECAP-A were translated into capability index scores based on the UK population value set developed using the best-worst scaling method [63]. Capability index scores are anchored at full capability and no capability. They are, therefore,

conceptually different from health index scores, which are anchored at full or perfect health and death. In terms of dealing with death within the capability wellbeing approach, it is important to acknowledge the philosophical assumption that a year of death would be seen as conceptually equivalent to a year of no capability.

To explore an alternative decision making rule that is focused on everyone achieving a sufficient level of capability, Years of Sufficient Capability equivalent (YSC) were estimated based on individual responses to the ICECAP-A measure. The difference between YFC and YSC is that full capability (i.e. scoring of 44444) is substituted with sufficient capability (e.g. scoring of 33333). The methodology for setting a sufficient capability threshold is described elsewhere [35], and involves an adjustment to the ICECAP-A value set in a way that improves the relative value of capability wellbeing states below a stated threshold of sufficient capability. For the purposes of this study, the sufficient capability threshold was set where individuals had at least *'a lot'* of capability on all attributes of the ICECAP-A (i.e. scoring of 33333). QALYs, YFC and YSC were estimated using the standard area under the curve approach [55], whereby quantity of time is adjusted for health-related quality of life, in the case of QALYs, and for full or sufficient capability, in the case of YFC or YSC respectively. Given that QALYs are influenced by baseline health-related quality of life [64], and the calculation of YFC and YSC is underpinned by the same principles as QALYs, differences in mean outcomes between trial-arms were adjusted for baseline imbalances in the respective health or capability index score. Both the EQ-5D-5L and the ICECAP-A were administered at baseline, 3 months, and 12 months post-randomisation.

## **Missing data**

Logistic regressions and *t*-tests were used to explore whether missingness for cost and outcome variables could be predicted by other variables in the dataset. In the absence of statistically significant associations at the 5% level, data were assumed to be missing completely at random. To avoid, however, any loss of efficiency or potential bias of the results with the exclusion of participants with missing data [65, 66], multiple imputation for cost components [67], health, capability and sufficient capability index scores [68] was performed using chained equations with predictive mean matching [69]. In addition to including the treatment group, covariates for each imputed variable were selected separately with stepwise regressions from baseline health or capability, age, gender, receiving state benefits, employment status, type of accommodation, contacts to the criminal justice services and length of time in treatment. Ten different imputed datasets were developed.

## **Cost-effectiveness analysis**

Economic analyses were conducted on an intention-to-treat basis. A time-horizon of one year was used and thus, costs and outcomes were not discounted. The study conducted the following explorations:

1. Exploring the impact of a broader costing perspective on treatment recommendation (moving from a NHS/PSS perspective to a government perspective);

2. Exploring the impact of a broader evaluative space on treatment recommendation (moving from QALYs to YFC within a NHS/PSS perspective);
3. Exploring the impact of both broader costing perspective and broader evaluative space on treatment recommendation (moving from QALYs to YFC within a government perspective);
4. Exploring the impact of a different decision making rule on treatment recommendation (moving from QALYs and YFC to YSC within a NHS/PSS and a government perspective).

For the purposes of this study, the cost-effectiveness analysis concentrated on the economic evaluation of the long-term impact of interventions, incorporating all cost and outcome data collected as part of the trial. Differences in the mean cost and mean outcomes between trial-arms and 95% confidence intervals (CIs) from the 10 multiply imputed datasets were obtained according to Rubin's rules [70]. Due to the presence of influential observations in a modest sample size, standard methods for estimating differences in costs and outcomes (OLS-based multiple regression) and surrounding uncertainty (BCa bootstrapping) could lead to misleading inferences [71, 72] and so a robust regression analysis using iteratively reweighted least squares was performed [73]. The cost-effectiveness was evaluated by comparing the costs and outcomes of the three interventions using incremental cost-effectiveness ratios (ICERs) as appropriate [55, 74].

Non-parametric bootstrapping with robust regression was used to generate a joint distribution of incremental mean costs and mean outcomes for the interventions compared [75, 76]. The 5,000 paired estimates produced from the bootstrapping of

each multiply imputed dataset were then used to calculate the probability of each intervention being cost-effective at different threshold values of willingness to pay (WTP) per additional unit of outcome, which was subsequently estimated across the imputed datasets based on Rubin's approach. This information was used to derive cost-effectiveness acceptability frontiers (CEAFs), which reflect the uncertainty around the *a priori* decisions [77, 78].

## **RESULTS**

### **Participants**

In total, 83 patients, with a mean age of 37 years (SD = 6.5), were recruited and randomised to TAU (n = 30), GS (n = 27) and B-SBNT (n = 26). Most participants were male (86.8%), single (90.4%), of white ethnicity (84.3%), and were receiving opioid substitution treatment for more than five years (80%). Participants were mostly living in an owned or rented accommodation (90.4%), with 3 (3.6%) participants living in a hostel and 5 (6%) being homeless, were unemployed (76%), and were receiving state benefits (82%). Post-randomisation, 5 (6%) participants were lost to follow-up.

Missing cost and outcome data existed for another 4 (4.8%) and 8 (9.6%) participants at 3 and 12 months follow-up. Consequently, missing data for 9 (10.8%) and 13 (15.6%) participants at the two follow-up periods were imputed.

### **Resource use and costs**

The most frequent contacts with health and social care services were with a drug team (97% of the sample), community pharmacists (93%), general practitioners, either as a face-to-face contact (48%) or telephone contact (37%), and other drug-related services (18%). Approximately 15% of participants reported a contact with the criminal justice system. A breakdown of the mean total per-client costs is presented in Table 3.

Primary care, medication and community care in particular were the most substantial cost components from a NHS/PSS perspective, while state benefits and criminal justice contacts were the most significant additional cost components from a government perspective. As shown in Table 3, at 12 months follow-up, B-SBNT was found to be £420 (95% CIs: -£334 to £1,175) more expensive than TAU from a NHS/PSS perspective and £443 (95% CIs: -£1,044 to £1,931) from a government perspective. On the contrary, compared to TAU, GS was cheaper by £198 (95% CIs: -£955 to £559) and £405 (95% CIs: -£1,905 to £1,094) from a NHS/PSS and a government perspective, respectively. Differences in treatment cost from either perspective were not statistically significant.

*(Table 3 about here)*

## **Outcome measures**

Mean per-client outcomes for the three interventions at baseline and 12 months follow-up are presented in Table 4. At baseline, imbalances between trial-arms for all outcomes were evident and therefore all incremental analyses were adjusted for baseline differences. At 12 months post-randomisation, GS was the most effective intervention in terms of QALYs with a difference of 0.037 (95% CIs: -0.059 to 0.133)

compared with TAU. In terms of YFC and YSC, TAU was the most effective intervention with B-SBNT being -0.038 (95% CIs: -0.117 to 0.041) and -0.028 (95% CIs: -0.110 to 0.054) less effective compared with TAU in the two outcome measures, and with GS being -0.017 (95% CIs: -0.091 to 0.056) and -0.010 (95% CIs: -0.088 to 0.067) less effective compared with TAU in the two outcome measures.

*(Table 4 about here)*

### **Cost-effectiveness analysis**

1. *Exploring the impact of a broader costing perspective on treatment recommendation (moving from a NHS/PSS perspective to a government perspective)*

With health as an evaluative space, GS was found to be the cheapest intervention and the one that produced the greatest QALY gain. In cost-effectiveness terms, GS dominated the other two interventions. As shown in the CEAF of Figure 1, at the conventional threshold level of £20,000 per additional QALY [79], GS had a 77% probability of being cost-effective. Taking a government perspective, with the inclusion of additional costs related to accommodation, state benefits and the criminal justice system, did not change this result. GS remained the dominant strategy with a 78% probability of being cost-effective at the same threshold level of WTP per additional QALY.

*(Figure 1 about here)*



2. *Exploring the impact of a broader evaluative space on treatment recommendation (moving from QALYs to YFC within a NHS/PSS perspective)*

With capability wellbeing as an evaluative space, GS and B-SBNT produced 0.017 (95% CIs: -0.091 to 0.056) and 0.038 (95% CIs: -0.117 to 0.041) **less** YFC compared with TAU respectively. B-SBNT was also £420 (95% CIs: -£334 to £1,175) more expensive compared with TAU from a NHS/PSS perspective, and therefore was dominated by the other two interventions. GS produced a more 'unusual' cost-effectiveness result as it was £198 (95% CIs: -£955 to £559) cheaper than TAU from the same costing perspective. This meant that GS produced cost-savings for a small reduction in outcome. The optimal strategy under this scenario depends on decision makers' willingness to offset outcome to make cost-savings. For a WTP above £11,500 per additional YFC, TAU was the optimal intervention with a probability of being cost-effective ranging between 50% and 60% as the WTP increased (Figure 2).

*(Figure 2 about here)*

3. *Exploring the impact of both broader costing perspective and broader evaluative space on treatment recommendation (moving from QALYs and YFC within a government perspective)*

From a wider government perspective and capability wellbeing as an evaluative space, if decision makers were willing to pay more than £23,500 per additional YFC, TAU would be the optimal intervention with a probability of being cost-effective ranging between 43% and 57% as the WTP threshold increased (Figure 3). If decision makers'

WTP per additional YFC was below £23,500, GS would be the optimal intervention with more than 51% probability of being cost-effective.

*(Figure 3 about here)*

4. *Exploring the impact of a different decision making rule on treatment recommendation (moving from QALYs and YFC to YSC within a NHS/PSS and a government perspective)*

Changing the decision rule from health and full capability maximisation to the maximisation of sufficient capability, with the use of YSC as the outcome of the economic evaluation, showed that GS and B-SBNT produced 0.010 (95% CIs: -0.088 to 0.067) and 0.028 (95% CIs: -0.110 to 0.054) **less** YSC compared with TAU, respectively. B-SBNT was also more expensive than TAU from both an NHS/PSS and government perspective and, therefore, was dominated. GS was cheaper from both costing perspectives and thus, similar to the YFC, would require decision makers' to make a judgement about how many YSC would be willing to forego to make a cost-saving. If decision makers were willing to pay above £19,700 per YSC from a NHS/PSS perspective and above £40,200 from a government perspective, then TAU would be the optimal strategy with the probability of being cost-effective being nearly 50% for both perspectives (Figure 4).

*(Figure 4 about here)*

## **DISCUSSION**

Several studies have raised the importance of using broader costing perspectives in the economic analysis of treatments for drug addiction, as substantial costs are incurred by different government bodies [80-83]. Except for these intersectoral costs, interventions are also likely to generate benefits that extend beyond the health domain of the client and impact on wider personal and interpersonal wellbeing. The National Institute for Health and Care Excellence in the UK has recently acknowledged that broader preference-weighted measures of social care outcomes or capability wellbeing may be more appropriate in the economic evaluation of social care interventions [84]. Nevertheless the empirical analysis of these broader evaluative spaces remains an underexplored area in health economics [4].

This paper conducted an economic evaluation of drug addiction treatments and explored the impact that broader evaluative spaces and costing perspectives as well as different rules for decision making may have on treatment recommendations. A summary of the results and subsequent treatment recommendations are provided in Table 5. From a NHS/PSS perspective, using QALYs as the unit of outcome, GS dominated all other treatment options. Broadening the perspective for costs did not alter this treatment recommendation. Therefore, using a conventional application of economic evaluation (cost per QALY within a NHS/PSS perspective), GS produced a greater health benefit and costed less than the other two interventions, and this result was not sensitive to a change in the costing perspective.

The treatment recommendation, however, did alter with capability wellbeing as an evaluative space. When outcomes moved from a health focus (QALYs) to a broader measure of capability wellbeing (YFC), and compared to NHS/PSS costs, TAU became the optimal strategy for a WTP greater than £11,500 per additional YFC. Broadening

the analysis for both costs (government) and outcomes (YFC) had the effect of maintaining TAU as the optimal strategy, but this time for a greater WTP per additional YFC (£23,500). Therefore, it appears that the recommendation for treatment is sensitive to the choice of evaluative space.

To explore the impact of changing the criteria for decision making from a health maximisation to the maximisation of sufficient capability, YSC were also estimated. With this analysis, TAU remained the optimal strategy for a WTP per additional YSC above £19,700 from a NHS/PSS perspective and above £40,200 from a government perspective.

*(Table 5 about here)*

The principal finding from this study, therefore, is that broadening the evaluative space or altering the decision making rule has the potential of changing the treatment recommendation qualitatively. From the conventional cost per QALY health-focused evaluation, decision makers should be willing to fund GS. From a broader capability wellbeing evaluative space, it is unlikely that decision makers would be willing to fund GS, not only because TAU may offer more value for money at potentially acceptable thresholds of willingness to pay per additional YFC or YSC, but mainly because the uncertainty associated with the decision to fund any intervention other than usual care is prohibitive enough for rational decision makers.

This is the first study to explore the sufficient capability approach within an economic evaluation. The wide range of primary data benefited the exploration of the impact of broader evaluative frameworks and alternative rules for decision making on treatment recommendation. The study, however, had limitations. Given that the purpose of the

pilot trial was to explore the feasibility of delivering psychological interventions in this clinical group, the economic evaluation relied on a modest sample size. Since studies relying on modest sample sizes may lack external validity, the purpose of this paper was less to draw conclusions on the cost-effectiveness of the interventions, and more to use it as a case-study.

A further limitation relates to the inherent difficulty in following-up heroin users. For pragmatic reasons, a trade-off between exploring the short as well as the long-term impact of interventions while avoiding informative censoring was required by omitting intermediate follow-up periods. In terms of costs, the resource use questionnaire provided information for the past 3 months of each follow-up period. Thus, the absence of information between the 3<sup>rd</sup> and the 9<sup>th</sup> month of the trial was translated into the assumption that differences in costs between trial arms during this period remained constant. Similarly, fluctuations in health-related quality of life and capability wellbeing between the 3<sup>rd</sup> and the 12<sup>th</sup> month could not be taken into consideration.

Another limitation concerns the fidelity of interventions as participants failed to attend the required number of sessions. Given that neither intervention was fully implemented, outcome differences represent the 'noise' between what happened and what was supposed to happen, especially in light of the modest sample size and baseline imbalances. Furthermore, out of pocket costs were not collected due to the extra respondent burden imposed on this particular hard to reach study population. Information about the impact from the different addiction treatments on family and close friends was also not obtained due to practical difficulties in recruiting and retaining this group throughout the study duration.

Also, concerns have been expressed about the appropriateness of the EQ-5D in the fields of drug misuse [83, 85] and mental health [7, 86]. A study exploring the psychometric properties of the EQ-5D-3L in a heroin-dependent population found that nearly 91% and 82% of participants reported no problems in the self-care and mobility dimensions [87]. The proportion of participants with no problems in the remaining EQ-5D-3L dimensions ranged between 52% (pain/discomfort) and 62% (usual activities). These findings appear to be consistent in this context. A study exploring the measurement properties of the EQ-5D-5L and ICECAP-A, using the outcome data of this study, found that the proportion of heroin users in opioid substitution treatment reporting no problems in terms of self-care, mobility and usual activities was nearly 89%, 75%, and 72% respectively [18]. The study found important differences in the sensitivity of the two measures to capture changes in clinical indicators, and therefore it is likely that these differences in psychometric performance drive the findings of this paper.

There is also uncertainty with respect to the appropriate WTP threshold for a QALY in this context, as the conventional threshold, in theory, reflects the opportunity cost of spending from a fixed health budget. There is a lack of evidence about the opportunity cost of spending when the QALYs fall outside the health context. The UK Medical Research Council funded a review of the different methods for improving cross-sector comparisons using QALYs and other measures [88], and a research aiming to determine what society is willing to pay for a unit of full, and sufficient, capability has also recently been funded (see <https://www.mrc.ac.uk/funding/how-we-fund-research/highlight-notices/improving-cross-sector-comparisons-beyond-qaly/successfully-funded-proposals/>). Until these results are known, one option, albeit somewhat arbitrary, is to

assume the same WTP threshold as that used for a QALY in health. As more evidence is produced, future research can explore these assumptions.

Finally, a new EQ-5D-5L value set for England has been developed since the conduct of this study. This new value set is based on preferences elicited from a sample of 996 adult members of the English general adult population using the time trade-off and discrete choice experiment methods [89]. This value set differs from the UK crosswalk value set in that only 5%, rather than nearly 27%, of health states are considered worse than death, namely having a health index score lower than zero. However, given the large proportion of participants clustered at the high end of health-related quality of life, the choice between the two value sets is thought unlikely to have an appreciable impact on the findings of this study. Further work could examine this issue.

Decision making bodies, such as the UK National Institute for Health and Care Excellence, are currently assessing methods and adapting guidance to allow for the inclusion of non-health sector costs and outcomes [84, 90], and incorporate additional perspectives for analyses that go beyond the patient and the strictly defined health perspective [84]. Their operationalisation, however, remains unclear. Capability wellbeing has so far been utilised alongside health-related measures of quality of life using the maximisation principle and not in terms of equalisation or sufficient capability as recommended [91]. Even as such, a parallel use of the ICECAP measures in economic evaluations alongside the commonly used instruments may act as a safety-pillar to base-case analyses if results are verified [92, 93]. The two instruments, however, are quite distinct in what they measure and, therefore, the health effects of an intervention may not always be translated into a capability improvement, and similarly an absence of a health effect may not always imply the absence of important capability wellbeing gains.

This paper provides evidence that the two measures offer differing perspectives. This, therefore, raises key questions concerning the implications of this result from a decision maker perspective.

## **ACKNOWLEDGEMENTS**

Early versions of this paper were presented at the Health Economists' Study Group (HESG) meeting hosted by the Academic Unit of Health Economics at the University of Leeds and the 11<sup>th</sup> international Health Economics Association (iHEA) world congress hosted by the Bocconi University. We would like to acknowledge the feedback from those who participated in both sessions, Prof. Mireia Jofre-Bonet, Prof. Colin Green and particularly the paper discussant at HESG, Prof. Claire Hulme. We would also like to thank the editor and the two anonymous reviewers for their constructive comments and suggestions. Finally, we are grateful to all the participants who took part in the study and to the community drug and alcohol teams located at Leicester (Leicestershire Partnership NHS Trust) and Solihull (Birmingham & Solihull Mental Health NHS Foundation Trust). This work represents independent research funded by the National Institute for Health Research (NIHR) under its Research for Patient Benefit (RfPB) Programme (Grant Reference Number PB-PG-0610-22392), and the views expressed are those of the authors and not necessarily those of the NHS, the NIHR or the Department of Health.



**Table 1. Health-related categories of resource use and associated unit costs (£, 2012/2013 prices)**

Unit	Cost*	Source
<b>Primary care</b>		
GP (per consultation)	41	PSSRU [44]
GP (per telephone consultation lasting 7.1 minutes)	25	<i>Ibid.</i>
Dentist (per consultation)	116	NHS Reference Cost [45]
Community Pharmacist (per hour of patient-related activities)	64	PSSRU [44]
<b>Outpatient care</b>		
Accident and emergency (A&E) visit	117	NHS Reference Cost [45]
Hospital outpatient visit	135	PSSRU [44]
Psychiatric outpatient visit †	100	<i>Ibid.</i>
<b>Inpatient care</b>		
Inpatient stay	369‡	PSSRU [43]
Drug/ Alcohol rehabilitation-related stay	326	NHS Reference Cost [45]
<b>Community care</b>		
Mental health centre (per contact) ‡	117	<i>Ibid.</i>
Drug team (per community contact)	104	<i>Ibid.</i>
Alcohol team (per community contact)	119	<i>Ibid.</i>
Individual counselling (per hour of client contact)	63	PSSRU [44]
Group counselling (per consultation)	58	<i>Ibid.</i>
Mental health team (per hour with a team member)	36	<i>Ibid.</i>
Psychologist (per hour of client contact)	134	<i>Ibid.</i>
Nursing services (per hour of patient-related work)	50	<i>Ibid.</i>
Social worker (per hour of patient-related work)	55	<i>Ibid.</i>
Physiotherapist (per hour of patient contact)	30	<i>Ibid.</i>
Home care worker (per hour weekday)	24	<i>Ibid.</i>
Outreach worker (per hour of patient contact)	49	<i>Ibid.</i>
Contact with a charitable organisation; Drug treatment day centre; Educational classes (drug or alcohol related); Other drug services (per user session)†	38	<i>Ibid.</i>

\* Costs involving duration of contact with health professionals were adjusted to the duration reported by participants

† Excluding elderly people

‡ Inflated using the UK Hospital and Community Health Services pay and prices index [94]

‡ Excluding inpatient services, services for children and adolescents and secure mental health services. Costs have been calculated based on the weighted average cost of services and the proportion of patients (activity) in each group

† These are commissioned and run by third sector or charitable organisations. Therefore, there is a cost to the NHS, although lower than a contact with a drug team, which is more qualified. In the absence of a robust estimate, and given that many participants receive mental health-related medication, a cost of local authority social services day care for people with mental health problems was assumed

**Table 2. Other resource use categories and their unit costs (£, 2012/2013 prices)**

Unit	Cost	Source
<b>Criminal justice</b>		
Contacts with police*	226	Metropolitan Police [80]
Psychiatric assessment while in prison or custody †	195	NHS Reference Cost [45]
Criminal and civil court appearance ‡	754	Harries [47]
Night in a police cell or prison	95	Ministry of Justice ([49]
<b>Supported accommodation (per day)</b>		
Living in a hostel	16	Shelter [52]
Living in a supported lodging	22	Bristol City Council [53]
<b>State benefits (per day)</b>		
Income support (≥ 25 years old participants)	10	Department of Work and Pensions [50]
Income support plus disability premium	4	<i>Ibid.</i>
Income support plus severe disability premium	9	<i>Ibid.</i>
Jobseeker's allowance	10	<i>Ibid.</i>
Disability working allowance	12	<i>Ibid.</i>
Disability working allowance (care component)	7	<i>Ibid.</i>
Disability working allowance (mobility component)	5	<i>Ibid.</i>
Attendance allowance	9	<i>Ibid.</i>
Statutory sick pay	12	<i>Ibid.</i>
Housing benefit	13	<i>Ibid.</i>
Council tax benefit	2	<i>Ibid.</i>
State retirement pension	13	<i>Ibid.</i>
Child benefit	3	<i>Ibid.</i>
Family credit	2	<i>Ibid.</i>

\* Cost of £183.84 in 2005 was inflated to 2012/13 using inflation price indices from the Office for National Statistics [95]

† Criminal Justice Liaison Services, Adult and Elderly

‡ Assuming all cases took place in a Magistrates' court. 1997/98 cost of £550 was inflated to 2012/13 using inflation price indices from the Office for National Statistics [95]

**Table 3. Mean per-client costs over the 12-month follow-up period (£, 2012/13 prices)**

Cost categories	TAU (n = 30)	B-SBNT (n = 26)	GS (n = 27)	Difference (B-SBNT minus TAU)	Difference (GS minus TAU)
	Raw Mean (SE)	Raw Mean (SE)	Raw Mean (SE)	Adjusted Mean* (95% CIs)	Adjusted Mean* (95% CIs)
<b>NHS/PSS perspective</b>					
Intervention	14 (2)	133 (6)	131 (4)	<b>119 (107, 131)</b>	<b>117 (105, 129)</b>
Inpatient care	41 (28)	53 (51)	14 (14)	<b>12 (-103, 128)</b>	<b>-27 (-90, 36)</b>
Outpatient care	236 (85)	119 (69)	75 (31)	<b>-100 (-332, 132)</b>	<b>-167 (-340, 7)</b>
Primary care	675 (153)	988 (222)	785 (147)	<b>198 (-263, 659)</b>	<b>51 (-361, 462)</b>
Community care	1,508 (214)	1,816 (341)	1,376 (299)	<b>317 (-473, 1,106)</b>	<b>-37 (-757, 683)</b>
Medication	676 (165)	637 (125)	476 (34)	<b>56 (-193, 305)</b>	<b>-74 (-160, 12)</b>
<i>Total NHS/PSS costs</i>	<i>3,149 (381)</i>	<i>3,747 (448)</i>	<i>2,856 (390)</i>	<b><i>420 (-334, 1,175)</i></b>	<b><i>-198 (-955, 559)</i></b>
<b>Additional cost components of governmental perspective</b>					
Accommodation	197 (127)	173 (159)	60 (42)	<b>-37 (-250, 176)</b>	<b>-147 (-363, 69)</b>
State benefits	3,293 (338)	3,099 (389)	3,049 (385)	<b>-192 (-1,056, 671)</b>	<b>-102 (-822, 619)</b>
Criminal justice	508 (319)	374 (223)	303 (264)	<b>-134 (-870, 602)</b>	<b>-204 (-1,044, 636)</b>
<i>Total government costs</i>	<i>7,148 (652)</i>	<i>7,393 (776)</i>	<i>6,268 (682)</i>	<b><i>443 (-1,044, 1,931)</i></b>	<b><i>-405 (-1,905, 1,094)</i></b>

TAU: Treatment as usual; B-SBNT: Brief social behaviour and network therapy; GS: Goal setting; SE: Standard error; CIs: Confidence intervals; NHS: National health service; PSS: Personal social services

\* Adjusted for baseline differences in the same cost category. For individual cost components, a linear regression with robust standard errors based on Huber-White sandwich estimators was performed. For total costs, a robust regression using iteratively reweighted least squares was performed

**Table 4. Mean per-client outcomes over the 12-month follow-up period**

Outcomes (Evaluative space)	TAU (n = 30) Raw Mean (SE)	B-SBNT (n = 26) Raw Mean (SE)	GS (n = 27) Raw Mean (SE)	Difference (B-SBNT minus TAU) Adjusted Mean* (95% CIs)	Difference (GS minus TAU) Adjusted Mean* (95% CIs)
<b>Baseline index scores</b>					
EQ-5D-5L (Health)	0.769 (0.040)	0.684 (0.056)	0.720 (0.053)	<b>-0.067 (-0.192, 0.057)</b>	<b>-0.030 (-0.153, 0.093)</b>
ICECAP-A (Full capability)	0.694 (0.033)	0.610 (0.041)	0.677 (0.033)	<b>-0.083 (-0.189, 0.024)</b>	<b>-0.025 (-0.131, 0.081)</b>
ICECAP-A (Sufficient capability)	0.775 (0.034)	0.690 (0.044)	0.774 (0.035)	<b>-0.082 (-0.193, 0.028)</b>	<b>-0.006 (-0.116, 0.103)</b>
<b>Outcomes at the end of the trial</b>					
QALYs (Health)	0.813 (0.037)	0.730 (0.057)	0.812 (0.046)	<b>0.010 (-0.091, 0.112)</b>	<b>0.037 (-0.059, 0.133)</b>
YFC (Full capability)	0.770 (0.029)	0.673 (0.044)	0.738 (0.033)	<b>-0.038 (-0.117, 0.041)</b>	<b>-0.017 (-0.091, 0.056)</b>
YSC (Sufficient capability)	0.853 (0.030)	0.759 (0.048)	0.836 (0.036)	<b>-0.028 (-0.110, 0.054)</b>	<b>-0.010 (-0.088, 0.067)</b>

TAU: Treatment as usual; B-SBNT: Brief social behaviour and network therapy; GS: Goal setting; SE: Standard error; CIs: Confidence intervals; QALYs: Quality-adjusted life-years; YFC: Year of full capability equivalent; YSC: Year of sufficient capability equivalent

\* Adjusted for baseline differences in utility, capability-wellbeing or sufficient capability wellbeing

**Table 5. Summary table of results**

Evaluative space (Decision making rule)	Costing perspective	
	NHS/PSS	Government
Health (Maximisation)	GS is the optimal intervention for any WTP per QALY	GS is the optimal intervention for any WTP per QALY
Capability wellbeing (Maximisation)	TAU is the optimal intervention for WTP $\geq$ £11,500 per YFC	TAU is the optimal intervention for WTP $\geq$ £23,500 per YFC
Capability wellbeing (Sufficiency)	TAU is the optimal intervention for WTP $\geq$ £19,700 per YSC	TAU is the optimal intervention for WTP $\geq$ £40,200 per YSC

NHS: National health service; PSS: Personal social services; TAU: Treatment as usual; GS: Goal setting; QALY: Quality-adjusted life-year; YFC: Year of full capability equivalent; YSC: Year of sufficient capability equivalent; WTP: Willingness to pay

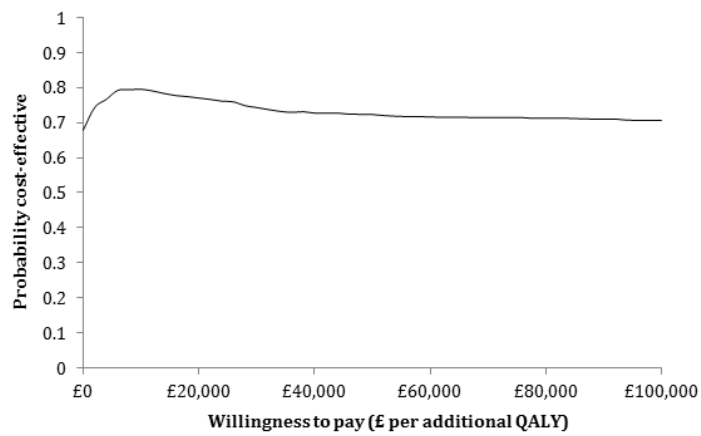


Figure 1. Cost-effectiveness acceptability frontier (CEAF) indicating the probability of the optimal strategy (i.e. GS) being cost-effective across different willingness to pay thresholds per additional QALY at 12 months and from a NHS/PSS perspective

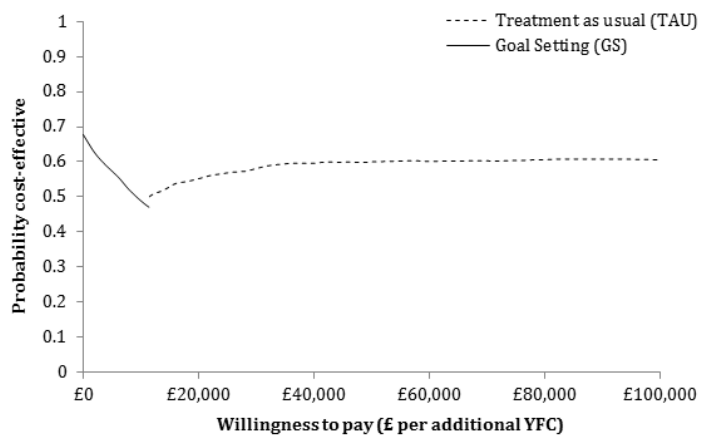


Figure 2. Cost-effectiveness acceptability frontier (CEAF) indicating the probability of the optimal strategy being cost-effective across different willingness to pay thresholds per additional YFC at 12 months and from a NHS/PSS perspective

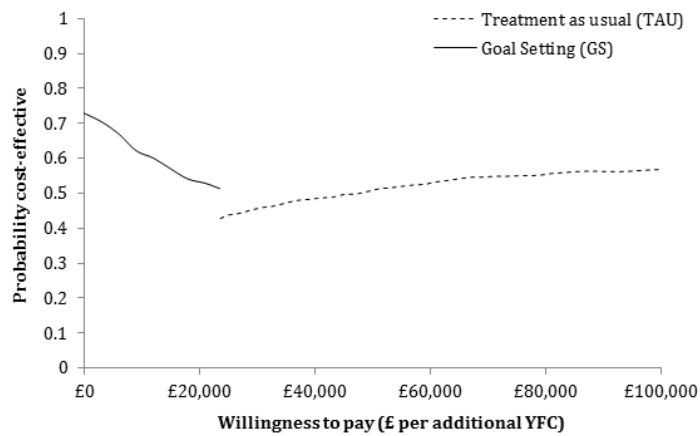


Figure 3. Cost-effectiveness acceptability frontier (CEAF) indicating the probability of the optimal strategy being cost-effective across different willingness to pay thresholds per additional YFC at 12 months and from a government perspective

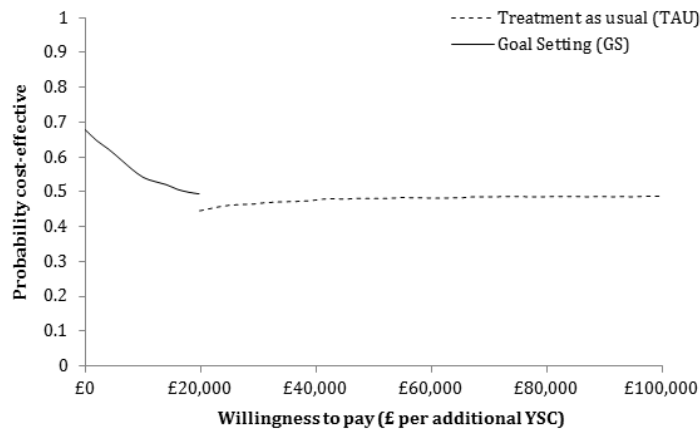


Figure 4. Cost-effectiveness acceptability frontier (CEAF) indicating the probability of the optimal strategy being cost-effective across different willingness to pay thresholds per additional YSC at 12 months and from a NHS/PSS perspective

## Appendix 1. The ICECAP-A questionnaire [14]<sup>1</sup>

### ABOUT YOUR OVERALL QUALITY OF LIFE

Please indicate which statements best describe your overall quality of life at the moment by placing a tick (✓) in **ONE** box for each of the five groups below.

1. Feeling settled and secure	
I am able to feel settled and secure in <b>all</b> areas of my life	<input type="checkbox"/> 4
I am able to feel settled and secure in <b>many</b> areas of my life	<input type="checkbox"/> 3
I am able to feel settled and secure in <b>a few</b> areas of my life	<input type="checkbox"/> 2
I am <b>unable</b> to feel settled and secure in <b>any</b> areas of my life	<input type="checkbox"/> 1

2. Love, friendship and support	
I can have a <b>lot</b> of love, friendship and support	<input type="checkbox"/> 4
I can have <b>quite a lot</b> of love, friendship and support	<input type="checkbox"/> 3
I can have a <b>little</b> love, friendship and support	<input type="checkbox"/> 2
I <b>cannot</b> have <b>any</b> love, friendship and support	<input type="checkbox"/> 1

3. Being independent	
I am able to be <b>completely</b> independent	<input type="checkbox"/> 4
I am able to be independent in <b>many</b> things	<input type="checkbox"/> 3
I am able to be independent in <b>a few</b> things	<input type="checkbox"/> 2
I am <b>unable</b> to be at all independent	<input type="checkbox"/> 1

4. Achievement and progress	
I can achieve and progress in <b>all</b> aspects of my life	<input type="checkbox"/> 4
I can achieve and progress in <b>many</b> aspects of my life	<input type="checkbox"/> 3
I can achieve and progress in <b>a few</b> aspects of my life	<input type="checkbox"/> 2
I <b>cannot</b> achieve and progress in <b>any</b> aspects of my life	<input type="checkbox"/> 1

5. Enjoyment and pleasure	
I can have a <b>lot</b> of enjoyment and pleasure	<input type="checkbox"/> 4
I can have <b>quite a lot</b> of enjoyment and pleasure	<input type="checkbox"/> 3
I can have a <b>little</b> enjoyment and pleasure	<input type="checkbox"/> 2
I <b>cannot</b> have <b>any</b> enjoyment and pleasure	<input type="checkbox"/> 1

Please ensure you have only ticked **ONE** box for each of the five groups.

<sup>1</sup> Reproduced with permission of the authors



## REFERENCES

- [1] Mathes T, Jacobs E, Morfeld J-C, Pieper D. Methods of international health technology assessment agencies for economic evaluations-a comparative analysis. *BMC health services research*. 2013; 13(1):371.
- [2] Coast J. Maximisation in extra-welfarism: A critique of the current position in health economics. *Social science & medicine*. 2009; 69(5):786-92.
- [3] Al-Janabi H, Flynn TN, Coast J. QALYs and carers. *Pharmacoeconomics*. 2011; 29(12):1015-23.
- [4] Weatherly H, Drummond M, Claxton K, Cookson R, Ferguson B, Godfrey C, et al. Methods for assessing the cost-effectiveness of public health interventions: Key challenges and recommendations. *Health policy*. 2009; 93(2):85-92.
- [5] Lorgelly PK, Lawson KD, Fenwick EA, Briggs AH. Outcome measurement in economic evaluations of public health interventions: a role for the capability approach? *International journal of environmental research and public health*. 2010; 7(5):2274-89.
- [6] Chalkidou K, Culyer A, Naidoo B, Littlejohns P. Cost-effective public health guidance: asking questions from the decision-maker's viewpoint. *Health economics*. 2008; 17(3):441-8.
- [7] Knapp M, Mangalore R. The trouble with QALYs.... *Epidemiologia e psichiatria sociale*. 2007; 16(04):289-93.
- [8] Coast J, Flynn T, Sutton E, Al-Janabi H, Vosper J, Lavender S, et al. Investigating Choice Experiments for Preferences of Older People (ICEPOP): evaluative spaces in health economics. *Journal of health services research & policy*. 2008; 13(suppl 3):31-7.
- [9] Coast J. Strategies for the economic evaluation of end-of-life care: making a case for the capability approach. *Expert review of pharmacoeconomics & outcomes research*. 2014; (0):1-10.

- [10] Payne K, McAllister M, Davies LM. Valuing the economic benefits of complex interventions: when maximising health is not sufficient. *Health economics*. 2013; 22(3):258-71.
- [11] Netten A, Burge P, Malley J, Potoglou D, Towers A-M, Brazier J, et al. Outcomes of social care for adults: developing a preference-weighted measure. *Health Technology Assessment*. 2012; 16(16):1-166.
- [12] Simon J, Anand P, Gray A, Rugkåsa J, Yeeles K, Burns T. Operationalising the capability approach for outcome measurement in mental health research. *Social science & medicine*. 2013; 98:187-96.
- [13] Coast J, Flynn TN, Natarajan L, Sproston K, Lewis J, Louviere JJ, et al. Valuing the ICECAP capability index for older people. *Social science & medicine*. 2008; 67(5):874-82.
- [14] Al-Janabi H, Flynn TN, Coast J. Development of a self-report measure of capability wellbeing for adults: the ICECAP-A. *Quality of life research*. 2012; 21(1):167-76.
- [15] Sutton E, Coast J. Development of a supportive care measure for economic evaluation of end-of-life care using qualitative methods. *Palliative medicine*. 2014; 28(2):151-7.
- [16] Sen A. Capability and well-being. In: (Eds.) MNAS, ed. *The quality of life*. Oxford: Oxford University Press 1993.
- [17] Mitchell PM, Al-Janabi H, Richardson J, Iezzi A, Coast J. The Relative Impacts of Disease on Health Status and Capability Wellbeing: A Multi-Country Study. *PloS one*. 2015; 10(12):e0143590.
- [18] Goranitis I, Coast J, Day E, Copello A, Freemantle N, Seddon J, et al. Measuring Health and Broader Well-Being Benefits in the Context of Opiate Dependence: The Psychometric Performance of the ICECAP-A and the EQ-5D-5L. *Value in health*. 2016. DOI:10.1016/j.jval.2016.04.010.
- [19] Nord E, Richardson J, Street A, Kuhse H, Singer P. Maximizing health benefits vs egalitarianism: an Australian survey of health issues. *Social science & medicine*. 1995; 41(10):1429-37.

- [20] Anand P, Wailoo A. Utilities versus rights to publicly provided goods: arguments and evidence from health care rationing. *Economica*. 2000; 67(268):543-77.
- [21] Freemantle N, Bloor K, Eastaugh J. A fair innings for NICE? *Pharmacoeconomics*. 2002; 20(6):389-91.
- [22] Coast J. Is economic evaluation in touch with society's health values? *BMJ: British medical journal*. 2004; 329(7476):1233.
- [23] Dolan P, Shaw R, Tsuchiya A, Williams A. QALY maximisation and people's preferences: a methodological review of the literature. *Health economics*. 2005; 14(2):197-208.
- [24] Coast J, Smith RD, Lorgelly P. Welfarism, extra-welfarism and capability: the spread of ideas in health economics. *Social science & medicine*. 2008; 67(7):1190-8.
- [25] Asaria M, Griffin S, Cookson R, Whyte S, Tappenden P. Distributional cost-effectiveness analysis of health care programmes– a methodological case study of the UK bowel cancer screening programme. *Health economics*. 2014.
- [26] Cookson R, Drummond M, Weatherly H. Explicit incorporation of equity considerations into economic evaluation of public health interventions. *Health economics, policy and law*. 2009; 4(02):231-45.
- [27] Gafni A, Birch S. Equity considerations in utility-based measures of health outcomes in economic appraisals: an adjustment algorithm. *Journal of health economics*. 1991; 10(3):329-42.
- [28] Williams A. Intergenerational equity: an exploration of the 'fair innings' argument. *Health economics*. 1997; 6(2):117-32.
- [29] Williams AH, Cookson RA. Equity–efficiency trade-offs in health technology assessment. *International journal of technology assessment in health care*. 2006; 22(01):1-9.
- [30] Rawls J. *A theory of justice*. Cambridge, Mass: Harvard University Press 1971.
- [31] Daniels N. *Just health care*: Cambridge University Press 1985.
- [32] Rugar JP. *Health and social justice*: Oxford University Press 2009.

- [33] Mitchell PM, Roberts TE, Barton PM, Coast J. Applications of the Capability Approach in the Health Field: A Literature Review. *Social indicators research*.1-27.
- [34] Sen A. *Inequality reexamined*: Harvard University Press 1992.
- [35] Mitchell PM, Roberts TE, Barton PM, Coast J. Assessing sufficient capability: A new approach to economic evaluation. *Social science & medicine*. 2015; 139:71-9.
- [36] Sindelar JL, Jofre-Bonet M, French MT, McLellan AT. Cost-effectiveness analysis of addiction treatment: paradoxes of multiple outcomes. *Drug and alcohol dependence*. 2004; 73(1):41-50.
- [37] De Maeyer J, Vanderplasschen W, Broekaert E. Quality of life among opiate-dependent individuals: a review of the literature. *International journal of drug policy*. 2010; 21(5):364-80.
- [38] Department of Health (DoH). *Drug strategy 2010. Reducing demand, restricting supply, building recovery: supporting people to live a drug free life*. London: DoH; 2010.
- [39] UK Drug Policy Commission (UKDPC). *The UKDPC recovery consensus group: a vision of recovery*. London: UKDPC; 2008.
- [40] Day E, Copello A, Seddon JL, Christie M, Bamber D, Powell C, et al. Pilot study of a social network intervention for heroin users in opiate substitution treatment: study protocol for a randomized controlled trial. *Trials*. 2013; 14(1):264.
- [41] Copello A, Orford J, Hodgson R, Tober G. *Social behaviour and network therapy for alcohol problems*: Routledge 2009.
- [42] Beecham J, Knapp M. Costing psychiatric interventions. In: G. Thornicroft, C. Brewin & J. Wing, *Measuring Mental Health Needs* (2nd edn.). London: Gaskell 2001:200–24.
- [43] Netten A, Curtis L. *Unit costs of health and social care*: University of Kent at Canterbury, Personal Social Services Research Unit 2002.
- [44] Curtis L. *Unit Costs of Health and Social Care* 2013.
- [45] Department of Health. *National Schedule of Reference Costs 2013-14 for NHS Trusts and NHS Foundation Trusts: NHS Own Costs*; 2013.

- [46] HM Inspectorate of Constabulary. What price policing? A study of efficiency and value for money in the police service. In: Mangalore R, and Knapp, M., ed. *Cost of schizophrenia in England*. Journal of mental health policy and economics 10, no. 1 (2007): 231998.
- [47] Harries R. The cost of criminal justice. London: Great Britain Home Office Research Development and Statistics Directorate 1999.
- [48] Ministry of Justice. Probation staff -pay bands and ranges as at June 2010. Available at [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/219809/probation-trusts-organogram-salaries.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/219809/probation-trusts-organogram-salaries.pdf) 2010.
- [49] Ministry of Justice. Costs per place and costs per prisoner. National Offender Management Service Annual Report and Accounts 2012-13 Management Information Addendum. Available at [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/251272/prison-costs-summary-12-13.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/251272/prison-costs-summary-12-13.pdf) 2013.
- [50] Department for Work and Pensions. Benefit and pension rates. Available at [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/255473/dwp035.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/255473/dwp035.pdf) 2013.
- [51] Byford S, Knapp M, Greenshields J, Ukoumunne OC, Jones V, Thompson S, et al. Cost-effectiveness of brief cognitive behaviour therapy versus treatment as usual in recurrent deliberate self-harm: a decision-making approach. *Psychological medicine*. 2003; 33(06):977-86.
- [52] Shelter. Research: briefing Immediate costs to government of loss of home. Available at [http://england.shelter.org.uk/\\_data/assets/pdf\\_file/0003/415596/Immediate\\_costs\\_to\\_government\\_of\\_losing\\_a\\_home.pdf](http://england.shelter.org.uk/_data/assets/pdf_file/0003/415596/Immediate_costs_to_government_of_losing_a_home.pdf) 2012.
- [53] Bristol City Council. Neighbourhoods supported lodgings scheme. Available at <http://www.bristol.gov.uk/page/housing/neighbourhoods-supported-lodgings-scheme> 2014
- [54] British National Formulary (BNF). London: BMJ Group and the Royal Pharmaceutical Society of Great Britain 2014.

- [55] Drummond MF, Sculpher MJ, Torrance GW, O'Brien BJ, Stoddart GL. *Methods for the economic evaluation of health care programmes*. Oxford: Oxford University Press 2005.
- [56] NHS Careers. *Pay for Doctors*. London: NHS Careers. 2013.
- [57] NHS Careers. *Paying for psychological therapies staff*: NHS Careers 2013.
- [58] Coyle D, Godfrey C, Hardman G, Raistrick D. Costing substance misuse services. *Addiction*. 1997; 92(8):1007-15.
- [59] Assmann SF, Pocock SJ, Enos LE, Kasten LE. Subgroup analysis and other (mis) uses of baseline data in clinical trials. *The Lancet*. 2000; 355(9209):1064-9.
- [60] Herdman M, Gudex C, Lloyd A, Janssen M, Kind P, Parkin D, et al. Development and preliminary testing of the new five-level version of EQ-5D (EQ-5D-5L). *Quality of life research*. 2011; 20(10):1727-36.
- [61] van Hout B, Janssen M, Feng Y-S, Kohlmann T, Busschbach J, Golicki D, et al. Interim scoring for the EQ-5D-5L: mapping the EQ-5D-5L to EQ-5D-3L value sets. *Value in health*. 2012; 15(5):708-15.
- [62] Dolan P. Modeling valuations for EuroQol health states. *Medical care*. 1997; 35(11):1095-108.
- [63] Flynn TN, Huynh E, Peters TJ, Al-Janabi H, Clemens S, Moody A, et al. Scoring the ICECAP-A Capability instrument. Estimation of a UK general population tariff. *Health economics*. 2015; 24:258-69.
- [64] Manca A, Hawkins N, Sculpher MJ. Estimating mean QALYs in trial-based cost-effectiveness analysis: the importance of controlling for baseline utility. *Health economics*. 2005; 14(5):487-96.
- [65] Briggs A, Clark T, Wolstenholme J, Clarke P. Missing... presumed at random: cost-analysis of incomplete data. *Health economics*. 2003; 12(5):377-92.
- [66] Marshall A, Billingham LJ, Bryan S. Can we afford to ignore missing data in cost-effectiveness analyses? *The European journal of health economics*. 2009; 10(1):1-3.

- [67] Burton A, Billingham LJ, Bryan S. Cost-effectiveness in clinical trials: using multiple imputation to deal with incomplete cost data. *Clinical trials*. 2007; 4(2):154-61.
- [68] Simons CL, Rivero-Arias O, Yu L-M, Simon J. Multiple imputation to deal with missing EQ-5D-3L data: Should we impute individual domains or the actual index? *Quality of life research*. 2014:1-11.
- [69] White IR, Royston P, Wood AM. Multiple imputation using chained equations: issues and guidance for practice. *Statistics in medicine*. 2011; 30(4):377-99.
- [70] Rubin DB. *Multiple imputation for nonresponse in surveys*. New York: John Wiley & Sons 1987.
- [71] Dunn G, Mirandola M, Maddeo F, Tansella M. Describing, explaining or predicting mental health care costs: a guide to regression models Methodological review. *The British journal of psychiatry*. 2003; 183(5):398-404.
- [72] O'Hagan A, Stevens JW. Assessing and comparing costs: how robust are the bootstrap and methods based on asymptotic normality? *Health economics*. 2003; 12(1):33-49.
- [73] Hoch JS, Briggs AH, Willan AR. Something old, something new, something borrowed, something blue: a framework for the marriage of health econometrics and cost-effectiveness analysis. *Health economics*. 2002; 11(5):415-30.
- [74] Johannesson M, Weinstein MC. On the decision rules of cost-effectiveness analysis. *Journal of health economics*. 1993; 12(4):459-67.
- [75] Briggs A, Gray, AM. Handling uncertainty when performing economic evaluation of healthcare interventions. *Health Technol Assess*. 1999; 3(2):1-134.
- [76] Glick H, Briggs, AH., Polsky, D. . Quantifying stochastic uncertainty and presenting results of cost-effectiveness analyses. *Expert review of pharmacoeconomics & outcomes research*. 2001; 1:25-36.
- [77] Fenwick E, Claxton K, Sculpher M. Representing uncertainty: the role of cost-effectiveness acceptability curves. *Health economics*. 2001; 10(8):779-87.

- [78] Barton GR, Briggs AH, Fenwick EA. Optimal Cost-Effectiveness Decisions: The Role of the Cost-Effectiveness Acceptability Curve (CEAC), the Cost-Effectiveness Acceptability Frontier (CEAF), and the Expected Value of Perfection Information (EVPI). *Value in health*. 2008; 11(5):886-97.
- [79] National Institute for Health and Care Excellence (NICE). *Social Value Judgements: Principles for the Development of NICE Guidance* (2nd edn). London: NICE; 2008.
- [80] Healey A, Knapp M, Astin J, Gossop M, Marsden J, Stewart D, et al. Economic burden of drug dependency. Social costs incurred by drug users at intake to the National Treatment Outcome Research Study. *The British journal of psychiatry*. 1998; 173(2):160-5.
- [81] Godfrey C, Stewart D, Gossop M. Economic analysis of costs and consequences of the treatment of drug misuse: 2-year outcome data from the National Treatment Outcome Research Study (NTORS). *Addiction*. 2004; 99(6):697-707.
- [82] Godfrey C. Evidence-based illicit drug policy: the potential contribution of economic evaluation techniques. *De economist*. 2006; 154(4):563-80.
- [83] Byford S, Barrett B, Metrebian N, Groshkova T, Cary M, Charles V, et al. Cost-effectiveness of injectable opioid treatment v. oral methadone for chronic heroin addiction. *The British journal of psychiatry*. 2013; 203(5):341-9.
- [84] National Institute for Health and Care Excellence (NICE). *Process and methods guides: The social care guidance manual*. London: NICE; 2013.
- [85] Dijkgraaf MG, van der Zanden BP, de Borgie CA, Blanken P, van Ree JM, van den Brink W. Cost utility analysis of co-prescribed heroin compared with methadone maintenance treatment in heroin addicts in two randomised trials. *Bmj*. 2005; 330(7503):1297.
- [86] Chisholm D, Healey A, Knapp M. QALYs and mental health care. *Social psychiatry and psychiatric epidemiology*. 1997; 32(2):68-75.
- [87] van der Zanden BP, Dijkgraaf MG, Blanken P, de Borgie CA, van Ree JM, van den Brink W. Validity of the EQ-5D as a generic health outcome instrument in a heroin-dependent population. *Drug and alcohol dependence*. 2006; 82(2):111-8.



- [88] Brazier J, Tsuchiya A. Improving Cross-Sector Comparisons: Going Beyond the Health-Related QALY. *Applied health economics and health policy*. 2015; 13(6):557-65.
- [89] Devlin N, Shah K, Feng Y, Mulhern B, van Hout B. Valuing Health-Related Quality of Life: An EQ-5D-5L Value Set for England. London: Office of Health Economics; 2016.
- [90] National Institute for Health and Care Excellence (NICE). Guide to the methods of technology appraisal 2013. London: NICE; 2013.
- [91] Coast J, Smith R, Lorgelly P. Should the capability approach be applied in health economics? *Health economics*. 2008; 17(6):667-70.
- [92] Henderson C, Knapp M, Fernández J-L, Beecham J, Hirani SP, Cartwright M, et al. Cost effectiveness of telehealth for patients with long term conditions (Whole Systems Demonstrator telehealth questionnaire study): nested economic evaluation in a pragmatic, cluster randomised controlled trial. *BMJ: British medical journal*. 2013; 346.
- [93] Makai P, Looman W, Adang E, Melis R, Stolk E, Fabbrocetti I. Cost-effectiveness of integrated care in frail elderly using the ICECAP-O and EQ-5D: does choice of instrument matter? *The European journal of health economics*. 2014:1-14.
- [94] Department of Health (DoH). Hospital and Community Health Services (HCHS) Pay and Prices Index. London: DoH; 2013.
- [95] Office for National Statistics (ONS). Price Indices and Inflation. Available at <http://www.ons.gov.uk/ons/taxonomy/index.html?nscl=Price+Indices+and+Inflation>. London: ONS; 2013.