Modelling the Cost-Effectiveness of Alcohol Screening and Brief Interventions in Primary Care in England

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Abstract — Aims: To estimate the cost-effectiveness and resourcing implications of universal alcohol screening and brief intervention (SBI) programmes in primary care in England. Methods: This was a health economic model, combining evidence of the effectiveness and health care resource requirements of SBI activities with existing epidemiological modelling of the relationship between alcohol consumption and health harms. Results: Screening patients on registration with a family doctor would steadily capture ~40% of the population over a 10-year programme; screening patients at next primary care consultation would capture 96% of the population over the same period, but with high resourcing needs in the first year. The registration approach, delivered by a practice nurse, provides modest cost savings to the health care system of £120 m over 30 years. Health gains over the same period amount to 32,000 quality-adjusted life years (QALYs). This SBI programme still appears cost-effective (at £6900 per QALY gained) compared with no programme, under pessimistic effectiveness assumptions. Switching to a consultation approach, delivered by a doctor, would incur an incremental net cost of £108 m, with incremental health gains equivalent to 92,000 QALYs, giving an incremental cost-effectiveness ratio of £1175 per QALY gained compared with current practice. Conclusion: A universal programme of alcohol SBI in primary care is estimated to be cost-effective, under all but the most pessimistic assumptions for programme costs and effectiveness. Policymakers should ensure that SBI programmes are routinely evaluated and followed up, given the substantial uncertainty over the effects of many of the implementation details.

INTRODUCTION

Alcohol misuse is associated with significant adverse clinical and social consequences, alcohol consumption being identified as a risk factor for over 50 health conditions, including alcoholic disorders, cancers, circulatory diseases, accidents and deliberate harmful effects (Rehm et al., 2004). The resulting burden affects both drinkers themselves, in terms of duration and quality of life, and health care systems (UK Department of Health, 2008). In England, there were just over a million alcohol-attributable hospital admissions in 2009/2010 (NHS Information Centre, 2011). Alcohol misuse also has wider effects in terms of crime and anti-social behaviour, absenteeism from work and unemployment. This overall burden of harm was estimated to cost between £18.5b and £20b in England in 2003 prices (Cabinet Office/Strategy Unit, 2003). Beyond these costs, the harmful effects on a drinker’s family, friends and colleagues are increasingly being recognized (Room et al., 2010).

Screening and brief intervention (SBI) has been proposed as an effective and cost-effective means of preventing alcohol misuse (Babor et al., 2003). The National Institute for Health and Clinical Excellence (NICE) defines screening as ‘…a systematic process of identifying people whose alcohol consumption places them at increased risk of physical, psychological or social problems and who would benefit from a preventative intervention’ (National Institute for Health and Clinical Excellence, 2010). Screening may be undertaken using a questionnaire or sampling of biomarkers. People who screen positive for hazardous or harmful drinking (World Health Organisation, 1994) are referred for a brief intervention. Those people screening positive for dependent drinking are referred to specialist treatment services (National Institute for Health and Clinical Excellence, 2010). Brief interventions can be classified into two main types: structured brief advice and extended brief intervention. The former involves a short conversation between the practitioner and the patient, possibly drawing on visual aids (e.g. showing how a person’s drinking compares with the rest of the population), providing practical advice on how to reduce consumption and giving the patient a self-help leaflet or workbook (National Institute for Health and Clinical Excellence, 2010). Extended brief interventions are based on motivational interviewing principles, typically involving counselling sessions (Miller and Rollnick, 2002). In England, screening is recommended when a patient newly registers with a family doctor (a general practitioner—GP), as detailed in the 2008/2009 clinical directed enhanced services (DES) guidance (BMA & NHS Employers, 2008). SBI may be conducted in a number of environments, both within and outside the health care system. For example, hospital accident and emergency departments, educational colleges, police custody suites and—the focus of this paper—primary care.

We were commissioned by the Centre for Public Health Excellence (CPHE) at NICE to review the effectiveness and cost-effectiveness of alcohol SBIs, supporting the development of guidance by a Programme Development Group (PDG) on the prevention and early identification of alcohol use disorders in adults and young people (National Institute for Health and Clinical Excellence, 2010). Our review of systematic reviews (Jackson et al., 2009) identified that a particular screening tool—the Alcohol Use Disorders Identification Test (AUDIT)—is effective in identifying hazardous and harmful drinking and also that brief interventions delivered in primary care are effective in reducing alcohol consumption and health harms (Babor et al., 2004). The resulting burden affects both drinkers themselves, in terms of duration and quality of life, and health care systems (UK Department of Health, 2008). In England, there were just over a million alcohol-attributable hospital admissions in 2009/2010 (NHS Information Centre, 2011). Alcohol misuse also has wider effects in terms of crime and anti-social behaviour, absenteeism from work and unemployment. This overall burden of harm was estimated to cost between £18.5b and £20b in England in 2003 prices (Cabinet Office/Strategy Unit, 2003). Beyond these costs, the harmful effects on a drinker’s family, friends and colleagues are increasingly being recognized (Room et al., 2010).
consumption and alcohol-related harmful effects. However, the effects of important implementation factors (such as intervention duration, intensity or repetition and the type of staff delivering the intervention) remain inconclusive. Meanwhile, our systematic review of the cost-effectiveness literature (Latimer et al., 2008) identified that many published estimates of cost savings were based on statistically non-significant data (particularly relating to motor-vehicle accidents).

We updated our cost-effectiveness review searches in 2012 and found limited evidence relating to the cost-effectiveness of SBI in a UK primary care setting. Freemantle et al. (1993) conducted a systematic review to support an appraisal of the costs and effectiveness of an opportunistic SBI programme to be delivered by GPs, estimating an average cost (in 1993 prices) of between £15 and £47 per heavy drinker given the intervention. The study identified an average consumption reduction of 24%, but did not go on to consider the health-related quality of life (HRQoL) effects or downstream resource use impacts that are important for policy-making. Ludbrook et al. (2001) combined evidence from New Zealand on SBI effectiveness, measured in life-years, with evidence from a US clinical trial on the costs of SBI, in which US unit costs were replaced with UK National Health Service (NHS) equivalents, suggesting that SBI would provide health benefits and also give a net cost saving to the NHS. The cost calculations were tied strongly to the US study, in terms of the structure of the SBI—which is very different from that described in DES guidance—and the observed ratio of patients screened to patients treated. Lock et al. (2006) reported on a cluster randomized controlled trial of a brief intervention involving 127 patients in UK primary care with follow-up at 6 and 12 months after intervention. However, the study lacked power because of the small patient numbers and was unable to detect a statistically significant difference between health care resource use in the control and intervention arms during the short follow-up period. Drummond et al. (2009) described a prospective pragmatic randomized controlled trial of SBI involving 1794 male primary care patients in Wales (of whom 112 received an intervention) with follow-up at 6 months. The study measured the implementation and delivery costs of the programme, the social costs incurred by drinkers and changes in HRQoL—measured in quality-adjusted life years (QALYs)—but although the authors reported that the intervention was cost-effective, such a conclusion is difficult to make because of the short-term nature of the trial and the economic analysis.

Our study presents a new health economic model of the cost-effectiveness of SBI in the setting of primary care in England with two aims: (a) to understand over what range of delivery mechanisms (delivery by different staff types, for different durations) and effectiveness assumptions SBI is likely to be cost-effective; (b) to understand the likely scale of a programme of universal screening in primary care in England.

METHODS

We extended an existing model for alcohol policy appraisal—the Sheffield Alcohol Policy Model—which was previously used to appraise minimum unit pricing policies in both England and Scotland (Meier et al., 2010; Meng et al., 2010; Purhhouse et al., 2010). The model considers pre-intervention distributions of mean and heavy episodic alcohol consumption and estimates how these distributions are changed over time by an intervention. Epidemiological evidence (e.g. Rehm et al., 2004) is used to translate from alcohol consumption to risk of incurring 47 harmful health effects (ICD-10 codes are provided as a footnote to Table 2). The method of potential impact fractions (Gunning-Schepers, 1989) can then be used to modify the mortality and morbidity rates for these harms. We then use life tables to estimate future population outcomes with the intervention compared with a future without the intervention. Forty-eight population subgroups are used, defined by sex, age (16–17, 18–24, 25–34, 35–44, 45–54, 55–64, 65–74, 75+) and baseline drinking status (moderate, hazardous and harmful), enabling reporting by subgroups such as 18–24-year-old hazardous male drinkers. In this analysis, we adopt a traditional NICE technology appraisal perspective: the HRQoL gains to the drinkers and the costs to the health care system (the NHS and Personal Social Services—PSS). We consider the effects on health and NHS/PSS over a 30-year period (sufficient to cover the impact of a 10-year screening programme) and take account of society’s preference for earlier outcomes over later outcomes by discounting both costs and QALYs at 3.5%. All costs take account of savings to the NHS from reduced morbidity prevalence for the 47 harmful health effects and are in 2007 prices (Curtis, 2008).

Model structure

Screening

The structure incorporates two general scenarios for screening: (a) screening at next GP registration (when patients change GP) and (b) screening at next primary care appointment. Both scenarios are opportunistic (i.e. patients are not invited to special appointments) and apply to all of the English population aged 16 years and over. A screening arrival profile is constructed in which a proportion of each subgroup is screened in each of the 10 years of the programme. The population, which is represented by individual-level survey data [drawn from the 2006 General Household Survey (Office for National Statistics, 2009)], is screened only once. The actual samples selected for screening in each year are chosen randomly within the model, accounting for both the household sampling weight from the survey and the need to screen only once.

Brief intervention

All individual samples screening positive in the model are immediately offered and assumed to accept a brief intervention, reflecting expert advice from the PDG that SBI takes place as part of a more general conversation with a patient, with no explicit separation of the screening and intervention steps. The effect of delivery of a brief intervention in year Y on the consumption of an individual sample in year Y+1 was modelled as a relative reduction in mean consumption, regardless of whether or not the screened individual was a true positive or false positive. Mean consumption in future years for the individual sample is then incrementally returned to the pre-intervention level over a number of years, using a ‘rebound’ assumption. Changes in heavy episodic consumption are modelled indirectly on the basis of the changes in mean consumption (Purhhouse et al., 2010).
Table 1. Model parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Evidence/assumption</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Screening arrival profiles for next registration and consultation</td>
<td>See Figure 1 [refer to Purshouse et al. (2009) for subgroup breakdown]</td>
<td>Next registration profiles derived from UK migration statistics for 2001 (Office for National Statistics, 2005); next consultation profiles derived from UK Department of Health bespoke data</td>
</tr>
<tr>
<td>Screening instrument diagnostic properties</td>
<td>Sensitivities between 67 and 95%; specificities between 75 and 96% (depending on choice of instrument and cut-off point)</td>
<td>Simulated findings for individuals in the 2006 General Household Survey (Office for National Statistics, 2005), using statistical models fitted to 2000 Psychiatric Morbidity Survey data (Office for National Statistics, 2003)</td>
</tr>
<tr>
<td>Duration of screening</td>
<td>0.5–4.5 min, depending on choice of instrument and patient responses</td>
<td>NICE Programme Development Group expert opinion</td>
</tr>
<tr>
<td>Effectiveness of brief intervention</td>
<td>Base case scenario: Initial 12.3% consumption reduction, linearly returning to pre-intervention level over 7 years; Alternative scenarios: 5.9% reduction in consumption; linear rebound to baseline in 3 years</td>
<td>Base case scenario: Fleming et al. (2002); alternative scenarios derived from evidence in both Fleming et al. (2002) and Kaner et al. (2007)</td>
</tr>
<tr>
<td>Duration of brief intervention</td>
<td>Base case scenario: 5 min; Alternative scenario: 24.9 min</td>
<td>BMA &amp; NHS Employers (2008); Kaner et al. (2007)</td>
</tr>
<tr>
<td>Unit cost of GP</td>
<td>£2.72 per minute</td>
<td>Curtis (2008)</td>
</tr>
<tr>
<td>Unit cost of practice nurse</td>
<td>£0.55 per minute</td>
<td>Curtis (2008)</td>
</tr>
<tr>
<td>Material costs</td>
<td>£8.84 per intervention</td>
<td>Lock et al. (2006) with material costs adjusted to a 2007 cost year using standard RPI (rather than a health care specific index, since this cost does not relate to health products) and are annuitized (assuming a 10-year replacement period and a 3.5% discount rate)</td>
</tr>
<tr>
<td>Consumption and harmful effects</td>
<td>Uses the Sheffield Alcohol Policy Model version 2</td>
<td>Purshouse et al. (2009, 2010)</td>
</tr>
</tbody>
</table>

**Model parameters**

The core model parameter assumptions relate to the screening arrival profile, the diagnostic properties of the screening instrument, the effectiveness of the brief intervention and the resource requirements for SBI (both time and materials). A summary of model parameters is provided in Table 1.

**Screening arrival profile**

**Screening at next GP registration.** The proportion of the population newly registering in each year was derived from UK migration statistics for 2001 (Office for National Statistics, 2005). The statistics report the percentage of the population who have changed address during the last 12 months, split by sex and age group. Information on alcohol consumption levels is not available, and therefore, it is not possible to differentiate the profiles for moderate, hazardous and harmful drinkers within each sex/age category.

**Screening at next primary care appointment.** UK Department of Health analysts constructed consultation frequencies for patients in England for the period 2004–2008, split by sex and age group. The anonymized data show the proportion of registered patients attending each year, i.e., at least once in each of the 5 years, in 4 out of 5 years and so on, through to those patients who did not attend at all in the 5-year period. This data are then used to simulate a 10-year arrival profile for new GP attendances. Again, information on alcohol consumption or diagnosis is not available, and therefore, it is not possible to differentiate the profiles for moderate, hazardous and harmful drinkers within each sex/age category.

**Screening instrument diagnostic properties**

The probability of screening positive needs to be estimated for every individual in the model and should be dependent on the individual’s baseline alcohol consumption. The 2000 Psychiatric Morbidity Survey (PMS; Office for National Statistics, 2003) contains data for respondents on both mean consumption (in units of alcohol) and scores on the individual questions of the AUDIT screening tool. We used the English data within the survey to fit a statistical relationship between mean consumption and the probability of a positive score, for any chosen screening threshold, for any instrument derived from AUDIT questions (including AUDIT, AUDIT-C and FAST). Full details of the logistic regression models are provided in Purshouse et al. (2009). Across the instruments we obtained sensitivities between 67 and 95% and specificities between 75 and 96%, for detecting hazardous and harmful drinking. These results are comparable with those identified in our systematic review of the AUDIT and related instruments literature (Jackson et al., 2009).

**Effectiveness estimates**

The Cochrane review of brief interventions in primary care by Kaner et al. (2007) presented a meta-analysis that suggested that the mean reduction in alcohol consumption for people receiving an intervention of mean duration 24.9 min was 38.4 g per week (compared with people in control arms). Since the mean baseline consumption in the included trials was 313 g per week, the reduction is equivalent to 12.3%—which we assume is representative of the average effect in the first year following the intervention. There is inconclusive evidence for the relationship between intervention...
duration and level of effectiveness (Jackson et al., 2009) so, in our base case scenario, we assume that a 12.3% reduction is achieved even for an intervention of shorter duration. However in a pessimistic analysis of this uncertainty, we consider the non-statistically significant Kaner et al. (2007) meta-regression finding that an increase in intervention duration of 1 min was associated with a 1 g per week reduction in consumption, and from this estimate that a 5.9% reduction would be achieved for a 5 min intervention. There is limited evidence for the sustainability of the effects of a brief intervention: in a randomized controlled trial, Fleming et al. (2002) measured the effects over a 4-year period from intervention delivery and observed a progressive narrowing of effect size between the intervention and non-intervention arms of the trial over time, mainly due to declining consumption in the non-intervention group. Using a simple extrapolation of this evidence and assuming that the non-intervention decline is an ageing effect, the base case scenario assumes that consumption returns steadily to a level appropriate to a person’s age over a period of 7 years. Given the considerable uncertainty, a more rapid rebound (3 years) is also considered in some of the more pessimistic scenarios. Two potential intervention variables were excluded from the scope of the modelling because of inconclusive evidence: (a) any analysis of the potential impact of booster sessions and (b) any variation in effectiveness according to the types of staff delivering the intervention (Jackson et al., 2009).

Cost estimates
The cost of screening is assumed to be comprised purely of the staff time required to perform the screen. Unit costs are taken from Curtis (2008). Screening tools that are fully self-completed by patients were excluded from the analysis because of a lack of evidence for their effectiveness. On the basis of expert input from the NICE PDG, it was assumed that the interviewer first establishes whether or not the patient abstains from alcohol (AUDIT Q1, requiring 30 s on average). If the patient is not an abstainer, the interviewer then introduces the screening tool (30 s), asks the appropriate number of questions (20 s each) and goes through the results with the patient (60 s, where this is assumed not to form part of the intervention). The staff type assumed to perform the screening varies: in the base case next registration scenario, we assume that the staff type is a practice nurse (£0.55 per minute); in some of the pessimistic uncertainty analyses and in the next consultation setting, we make the conservative assumption that the staff type is a GP (£2.72 per minute). A 5 min intervention duration is used in the base case analysis (following the DES recommendation), but pessimistic uncertainty analyses use a 24.9 min duration, which is the closest match to the effectiveness evidence. The staff type for the intervention is assumed to be the same as for screening (since SBI is assumed to take place as a single conversation). Material costs were sourced from the UK economic evaluation of an alcohol brief intervention (Lock et al., 2006).

RESULTS
In England, current practice on the provision of alcohol SBI in primary care is not well established, the clinical DES guidance suggesting a variety of pathways for implementation (BMA & NHS Employers, 2008; HAGA, 2011). We have therefore developed a base case scenario that is broadly aligned with the DES, in which newly registering patients are screened and then subsequently given a 5-min brief intervention if they score 3 or more on AUDIT-C followed by 8 or more on the full AUDIT questionnaire. The whole process is assumed to be administered by a practice nurse. Given the non-uniformity of SBI provision in England, we compare the base case scenario with a counterfactual ‘do nothing’ scenario of no SBI provision at all, and also consider the marginal costs and benefits of replacing a registration-based programme with screening of all patients on next consultation. We also appraise a range of alternative screening instruments in both settings.

Scale of SBI provision
Figure 1 shows that screening on next registration is likely to have a relatively smooth profile of screening volumes over time, with ~2.5 million people screened annually at an average annual cost of ~£10 million. Since patients tend to consult their GP much more frequently than they change their GP, the volumes associated with screening on next consultation are skewed heavily towards the early years of the screening programme; ~35 million people would be screened in the first year, with attendant front-loading of the £700 million implementation costs. Note that, while the registration setting offers a more comfortable resourcing profile, by the end of the 10-year programme, the majority of the population has not been screened (26 million people, compared with around 1.5 million people left out of the consultation-based programme). The volumes of the population actually receiving the brief intervention are dependent on the diagnostic properties of the screening tool used in addition to the setting. For the consultation-based programme, between 71 and 89% of hazardous and harmful drinkers would have received an intervention, compared with between 33 and 40% for next registration.
Estimated impacts on morbidity

Table 2 shows the estimated difference (versus no SBI programme) in the number of cases of alcohol-related conditions in England, in the 10th year of a next registration SBI programme. Of approximately 4800 cases of illness prevented by the programme in this year, 3500 are in male patients and 2500 are reductions in chronic diseases in people aged 45 and over (accounting for any increased cases of ischaemic heart disease). Reductions are also achieved in alcoholic conditions (1200 cases) and injuries arising from drinking to intoxication (600 cases). We anticipate a small additional number of cases of type 2 diabetes.

Cost-effectiveness results: current practice

We first consider the cost-effectiveness of the next registration SBI programme compared with a counterfactual ‘do nothing’ scenario. Using base case assumptions (AUDIT-C screening and a 5 min intervention that reduces mean consumption by 12.3% with rebound to baseline in 7 years, all delivered by a practice nurse), we estimate that the £95 million cost to the NHS of delivering SBI over 10 years is outweighed by the longer term (30 year) NHS savings of £215 million in alcohol-related costs (e.g. due to hospitalizations). HRQoL gains of 32,000 QALYs also accrue, and therefore, the next registration strategy is estimated to be both cost-saving and health-improving.

The assumptions in the base case represent a best attempt at representing the evidence base. However, given that the effects of some implementation details are subject to uncertainty, Table 3 also presents the results for a family of scenarios with more pessimistic assumptions over both intervention effectiveness and programme costs. The table shows the incremental cost-effectiveness ratios (ICERs) of each scenario compared with the ‘do nothing’ counterfactual. The base case scenario is shown in the top left: this ‘dominates’ the counterfactual since it leads to both greater population health and lower NHS costs. Looking down the table, we see the effect of progressively more pessimistic assumptions about the effectiveness of the brief intervention, while looking across the table, we see the effect of more pessimistic assumptions about programme costs. Under reasonably

Table 2. Estimated impact on annual alcohol-related conditions in England of a programme of SBI for patients newly registering with a GP (base case scenario) 10 years after implementation

<table>
<thead>
<tr>
<th>Condition</th>
<th>16–24 years</th>
<th>25–44 years</th>
<th>45–64 years</th>
<th>65 years or older</th>
<th>Total</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alcoholic disorders</td>
<td>−80</td>
<td>−20</td>
<td>−290</td>
<td>−90</td>
<td>−280</td>
<td>−100</td>
</tr>
<tr>
<td>Alcoholic poisoning</td>
<td>−20</td>
<td>−20</td>
<td>−30</td>
<td>−30</td>
<td>−10</td>
<td>−10</td>
</tr>
<tr>
<td>Neoplasm</td>
<td>0</td>
<td>0</td>
<td>−10</td>
<td>0</td>
<td>−30</td>
<td>−10</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>0</td>
<td>0</td>
<td>−10</td>
<td>0</td>
<td>20</td>
<td>0</td>
</tr>
<tr>
<td>Epilepsy and status epilepticus</td>
<td>−20</td>
<td>−10</td>
<td>−90</td>
<td>−60</td>
<td>−40</td>
<td>−20</td>
</tr>
<tr>
<td>Hypertensive diseases</td>
<td>0</td>
<td>0</td>
<td>−220</td>
<td>−70</td>
<td>−690</td>
<td>−170</td>
</tr>
<tr>
<td>Other diseases of the circulatory system</td>
<td>0</td>
<td>0</td>
<td>−50</td>
<td>−20</td>
<td>−160</td>
<td>−40</td>
</tr>
<tr>
<td>Diseases of the digestive system</td>
<td>0</td>
<td>0</td>
<td>−40</td>
<td>0</td>
<td>−30</td>
<td>−10</td>
</tr>
<tr>
<td>Diseases of the skin and subcutaneous tissue</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Road traffic accidents</td>
<td>−10</td>
<td>0</td>
<td>−20</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Other accidents</td>
<td>−30</td>
<td>0</td>
<td>−40</td>
<td>−10</td>
<td>−20</td>
<td>−20</td>
</tr>
<tr>
<td>Intentional self-harm</td>
<td>−20</td>
<td>−20</td>
<td>−30</td>
<td>−30</td>
<td>−10</td>
<td>−10</td>
</tr>
<tr>
<td>Assault</td>
<td>−30</td>
<td>0</td>
<td>−30</td>
<td>0</td>
<td>−10</td>
<td>0</td>
</tr>
</tbody>
</table>

Total: −210 −70 −840 −310 −1260 −390 −1230 −470 −3540 −1240 −4780

Included ICD-10 codes: Alcoholic disorders E24.4, F10, G31.2, G62.1, G72.1, I426, K29.2, K70, K86.0; Alcohol poisoning T51.0, T51.1, T519, X45; Neoplasms C00–C15, C18, C20, C22, C32, C50; Diabetes mellitus E11; Epilepsy and status epilepticus G40–41; Hypertensive disease I10–115; Other diseases of the circulatory system I20–I25, I47, I48, I50, I51, I60–I62, I63–I66, I69.0–I69.4, I85; Diseases of the digestive system K22.6, K73, K74, K80, K85, K86.1; Diseases of the skin and subcutaneous tissue L40, L40.5; Road traffic accidents V02.3–V89.9 (some intermediate codes excluded); Other accidents V90–V97, W00–W19, W24–W34, W65–W74, W78–W79, X00–X09, X31; Intentional self-harm X60–X84, Y10–Y33; Assault X85–Y09.

Table 3. Impact of pessimistic assumptions for SBI delivery costs and effectiveness: ICERs (£/QALY) compared with a ‘do nothing’ scenario

<table>
<thead>
<tr>
<th>Brief intervention effectiveness assumption</th>
<th>Downstream NHS/ PSS savings (£m)</th>
<th>HRQoL gains (’000 QALYs)</th>
<th>Base case assumptions</th>
<th>Longer intervention (24.9 min)</th>
<th>More expensive staff (GP)</th>
<th>Longer intervention and more expensive staff (24.9 min + GP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base case assumptions</td>
<td>215</td>
<td>32</td>
<td>Dominates</td>
<td>2100</td>
<td>11,200</td>
<td></td>
</tr>
<tr>
<td>Less initial effect (5.9% reduction)</td>
<td>107</td>
<td>16</td>
<td>Dominates</td>
<td>2900</td>
<td>29,100</td>
<td></td>
</tr>
<tr>
<td>Shorter duration (3-year rebound)</td>
<td>95</td>
<td>15</td>
<td>Weakly dominates</td>
<td>3900</td>
<td>31,800</td>
<td></td>
</tr>
<tr>
<td>Less initial effect for shorter duration</td>
<td>47</td>
<td>7</td>
<td></td>
<td>6900</td>
<td>75,000</td>
<td></td>
</tr>
</tbody>
</table>

| SBI programme costs (£ m)                   | 95                               | 154                       | 281                   | 572                          |

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realistic sets of pessimistic assumptions, SBI is estimated to remain cost-saving or cost-effective. For example, reducing the effectiveness of the 5 min intervention from 12.3 to 5.9% based on the evidence from Kaner et al.’s (2007) meta-regression leads to reduced downstream savings to the NHS of £107 million and reduced HRQoL gains of 16,000 QALYs—however, this still produces health gains for a net cost saving of £12 million. Under very pessimistic assumptions, in which reduced effectiveness is coupled with long interventions undertaken by a GP, the ICER increases to values beyond those considered cost-effective under the NICE technology assessment framework [typically £20,000–£30,000 per QALY gained (National Institute for Health and Clinical Excellence, 2008)]. For example, the scenario in which a 24.9 min intervention delivered by a GP can produce only a 5.9% consumption reduction which rebounds to baseline in 3 years is estimated to give an ICER of £75,000 per QALY gained.

Cost-effectiveness results: alternatives to current practice
Given that even under reasonably pessimistic assumptions we have demonstrated that a next registration strategy similar to the current DES guidance is likely to be cost-effective, we now consider potential alternative approaches in two areas: (a) using different, or recalibrated, screening instruments and (b) switching from a next registration to a next consultation strategy. Results are shown in Table 4, where the costs and benefits for nine alternatives are shown relative to current practice. The alternatives are presented in ascending order of the extra population health they deliver.

The modelling results suggest that the different screening instruments make only small differences to health in a next registration setting. Switching from AUDIT-C to FAST (alternative A) would constrain interventions slightly more to the higher risk end of the heavy drinking spectrum and therefore represents a very slight disinvestment option relative to current practice. Screening all non-abstainers with AUDIT (alternative B) would constrain interventions slightly more to heavy drinkers, but this comes at the price of asking seven more questions to heavy female drinkers (and therefore slightly more interventions to heavy drinkers), which produces only a 5.9% consumption reduction which rebounds to baseline in 3 years is estimated to give an ICER of £62,000 per QALY gained.

### Table 4. Model results for current practice and alternative setting and screening configurations

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Current practice</th>
<th>Alternative A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population screened (M/F %)</td>
<td>(40/39)</td>
<td>(38/34)</td>
<td>76/91</td>
<td>93/99</td>
<td>93/99</td>
<td>93/99</td>
<td>93/99</td>
<td>93/99</td>
<td>93/99</td>
<td></td>
</tr>
<tr>
<td>Heavy drinkers (M/F %)</td>
<td>95/81</td>
<td>92/87</td>
<td>92/72</td>
<td>93/99</td>
<td>93/99</td>
<td>93/99</td>
<td>93/99</td>
<td>93/99</td>
<td>93/99</td>
<td></td>
</tr>
<tr>
<td>Sensitivity (M/F %)</td>
<td>40/39</td>
<td>88/71</td>
<td>88/71</td>
<td>88/71</td>
<td>88/71</td>
<td>88/71</td>
<td>88/71</td>
<td>88/71</td>
<td>88/71</td>
<td></td>
</tr>
<tr>
<td>Specificity (M/F %)</td>
<td>93/81</td>
<td>86/85</td>
<td>92/80</td>
<td>92/80</td>
<td>92/80</td>
<td>92/80</td>
<td>92/80</td>
<td>92/80</td>
<td>92/80</td>
<td></td>
</tr>
<tr>
<td>Downstream benefits (M/F %)</td>
<td>36/30</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Downstream savings (£m)</td>
<td>215</td>
<td>−120</td>
<td>−76</td>
<td>−65</td>
<td>−65</td>
<td>−65</td>
<td>−65</td>
<td>−65</td>
<td>−65</td>
<td></td>
</tr>
<tr>
<td>Costs and benefits relative to current practice</td>
<td>−17</td>
<td>−1</td>
<td>−1</td>
<td>−1</td>
<td>−1</td>
<td>−1</td>
<td>−1</td>
<td>−1</td>
<td>−1</td>
<td></td>
</tr>
<tr>
<td>ICER (£/QALY) versus next-best alternative</td>
<td>32</td>
<td>18</td>
<td>10</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

**Cost-effectiveness results:**
- **Scenario A:** Switching from a next registration strategy to screening on a next consultation substantially increases the scale of both the costs and benefits of SBI. Compared with current practice, a consultation-based GP-led approach with FAST screening (alternative E) would cost five times as much to deliver (£497 million) but would also deliver three times the downstream NHS savings (£682 million) and HRQoL gains (108,000 QALYs). The net effect is that next consultation is cost-saving and health-improving compared with no SBI programme (NHS savings £682 million and HRQoL gains £497 million) but would also deliver three times the downstream benefits to make this alternative cost-effective.

- **Scenario B:** Switching from a next registration to a next consultation substantially increases the scale of both the costs and benefits of SBI. Compared with current practice, a consultation-based GP-led approach with FAST screening (alternative E) would cost five times as much to deliver (£497 million) but would also deliver three times the downstream NHS savings (£682 million) and HRQoL gains (108,000 QALYs). The net effect is that next consultation is cost-saving and health-improving compared with no SBI programme (NHS savings £682 million and HRQoL gains £497 million) but would also deliver three times the downstream benefits to make this alternative cost-effective.

- **Scenario C:** Switching from a next registration to a next consultation substantially increases the scale of both the costs and benefits of SBI. Compared with current practice, a consultation-based GP-led approach with FAST screening (alternative E) would cost five times as much to deliver (£497 million) but would also deliver three times the downstream NHS savings (£682 million) and HRQoL gains (108,000 QALYs). The net effect is that next consultation is cost-saving and health-improving compared with no SBI programme (NHS savings £682 million and HRQoL gains £497 million) but would also deliver three times the downstream benefits to make this alternative cost-effective.

- **Scenario D:** Switching from a next registration to a next consultation substantially increases the scale of both the costs and benefits of SBI. Compared with current practice, a consultation-based GP-led approach with FAST screening (alternative E) would cost five times as much to deliver (£497 million) but would also deliver three times the downstream NHS savings (£682 million) and HRQoL gains (108,000 QALYs). The net effect is that next consultation is cost-saving and health-improving compared with no SBI programme (NHS savings £682 million and HRQoL gains £497 million) but would also deliver three times the downstream benefits to make this alternative cost-effective.

- **Scenario E:** Switching from a next registration to a next consultation substantially increases the scale of both the costs and benefits of SBI. Compared with current practice, a consultation-based GP-led approach with FAST screening (alternative E) would cost five times as much to deliver (£497 million) but would also deliver three times the downstream NHS savings (£682 million) and HRQoL gains (108,000 QALYs). The net effect is that next consultation is cost-saving and health-improving compared with no SBI programme (NHS savings £682 million and HRQoL gains £497 million) but would also deliver three times the downstream benefits to make this alternative cost-effective.

- **Scenario F:** Switching from a next registration to a next consultation substantially increases the scale of both the costs and benefits of SBI. Compared with current practice, a consultation-based GP-led approach with FAST screening (alternative E) would cost five times as much to deliver (£497 million) but would also deliver three times the downstream NHS savings (£682 million) and HRQoL gains (108,000 QALYs). The net effect is that next consultation is cost-saving and health-improving compared with no SBI programme (NHS savings £682 million and HRQoL gains £497 million) but would also deliver three times the downstream benefits to make this alternative cost-effective.

- **Scenario G:** Switching from a next registration to a next consultation substantially increases the scale of both the costs and benefits of SBI. Compared with current practice, a consultation-based GP-led approach with FAST screening (alternative E) would cost five times as much to deliver (£497 million) but would also deliver three times the downstream NHS savings (£682 million) and HRQoL gains (108,000 QALYs). The net effect is that next consultation is cost-saving and health-improving compared with no SBI programme (NHS savings £682 million and HRQoL gains £497 million) but would also deliver three times the downstream benefits to make this alternative cost-effective.

- **Scenario H:** Switching from a next registration to a next consultation substantially increases the scale of both the costs and benefits of SBI. Compared with current practice, a consultation-based GP-led approach with FAST screening (alternative E) would cost five times as much to deliver (£497 million) but would also deliver three times the downstream NHS savings (£682 million) and HRQoL gains (108,000 QALYs). The net effect is that next consultation is cost-saving and health-improving compared with no SBI programme (NHS savings £682 million and HRQoL gains £497 million) but would also deliver three times the downstream benefits to make this alternative cost-effective.

- **Scenario I:** Switching from a next registration to a next consultation substantially increases the scale of both the costs and benefits of SBI. Compared with current practice, a consultation-based GP-led approach with FAST screening (alternative E) would cost five times as much to deliver (£497 million) but would also deliver three times the downstream NHS savings (£682 million) and HRQoL gains (108,000 QALYs). The net effect is that next consultation is cost-saving and health-improving compared with no SBI programme (NHS savings £682 million and HRQoL gains £497 million) but would also deliver three times the downstream benefits to make this alternative cost-effective.
discussed

Section 3.1

The results of the analysis of the Sheffield Alcohol Policy Model are presented in Table 3.1. Table 3.1 shows the incremental cost-effectiveness ratios (ICERs) for different policies compared with the no-screening policy. The ICER is calculated as the additional cost of the policy divided by the additional health gain (in terms of quality-adjusted life years, or QALYs). The results indicate that policies targeting higher-risk drinkers are more cost-effective, with ICERs below £13,600 per QALY gained for all policies considered. The policy of self-screening is the most cost-effective, with an ICER of £5,705 per QALY gained. Higher-risk policies such as self-matching and self-referral are also cost-effective, with ICERs below £13,600 per QALY gained. Lower-risk policies such as social screening are less cost-effective, with higher ICERs (above £13,600 per QALY gained). The analysis also shows that the effectiveness and cost-effectiveness of different policies are influenced by the effectiveness and cost of alternative treatments for alcohol-related conditions. The costs and health gains for different policies are calculated using the Sheffield Alcohol Policy Model, which includes the costs of screening, brief intervention, and treatment, as well as the health gains from reduced alcohol consumption and reduced incidence of alcohol-related conditions.
alongside implementation in emergency care) or interaction of SBI with other policies, such as minimum unit pricing (Purshouse et al., 2010).

Policymakers and local decision-makers will need to balance the timing and scale of impact on the NHS in implementing such programmes with the health costs and health gains which are expected to accrue. Our model suggests that opportunistically screening patients on next GP consultation would be cost-effective compared with current DES guidance, but this must be balanced against the challenge of implementing SBI on such a scale. Analysis of simultaneous implementation of SBI in multiple settings has not been undertaken and policymakers should be mindful that such an approach may risk incurring substantial extra costs for little extra benefit in cases where patients are screened multiple times. There is currently no conclusive evidence of differential effectiveness of delivery of the intervention by different types of staff. On this basis, decision-makers might consider the less-costly staffing options that were modelled for screening and intervention to be attractive. Evidence for the differential effectiveness of interventions of different duration is also inconclusive. Uncertainty analysis shows that even fairly long brief interventions (e.g. 25 min) appear cost-effective versus doing nothing and that shorter duration interventions remain cost-effective even when it is assumed that the reduced duration gives reduced effectiveness. As argued by National Institute for Health and Clinical Excellence (2010), there is a clear need for evaluation of SBI implementations in practice, and we would emphasise the importance of evaluation particularly where less costly staffing and shorter interventions have been chosen. In terms of AUDIT screening thresholds, National Institute for Health and Clinical Excellence (2010) recommend that practitioners use professional judgment when deciding whether to use lower thresholds in certain population subgroups, including women. Our analysis is supportive in suggesting that selection of a lower AUDIT threshold of six in females may be more cost-effective than a threshold of eight.

In summary, our study was the first robust appraisal of the cost-effectiveness of SBI in a UK primary care setting. Similar to studies in the USA and the Netherlands, we conclude that SBI is likely to meet the standard criterion for cost-effectiveness, even under pessimistic scenarios around both cost and effect. As such, we would recommend that decision-makers implement SBI programmes in primary care in England, while recognizing that the resource implications of universal opportunistic screening will require careful management.

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