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NATIONAL INSTITUTE FOR HEALTH AND CARE EXCELLENCE (NICE)

Alcohol interventions in secondary and further education: Economic Model Report

Final Report

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INVESTORS IN PEOPLE

Contents

Preface: Non-Intervention-Specific Approach

A non-intervention-specific approach was taken to develop this model. This is because there is a paucity of data, especially UK-based data, in this subject area. When trying to address the specific research questions from the final scope, there was considerable uncertainty and the modelling required a number of assumptions. The approach taken is not designed to deliver one 'true' cost-effectiveness result but is aimed towards proving helpful patterns to identify themes. The non-intervention-specific approach also allows for the model to return results for multiple scenarios and to undertake threshold analysis under different scenarios. Because, there is a lot of uncertainty from assumptions, the model is flexible and allows for these assumptions to be varied around ranges ('optimistic', 'pessimistic', 'most likely', etc.). The approach also allows for very specific examples to be modelled if the evidence becomes available.

This approach was proposed at PHAC 1 and again at PHAC 3 when it was agreed as an appropriate way forward. The model structure and assumptions were presented to the Committee and NICE at PHAC 4 and it was agreed that this was a suitable approach.

Of course, there are limitations with this approach. As stated above, it does not aim to provide robust base case results for specific interventions, since the data would not allow that. As such, the results presented in this report should be interpreted with some degree of caution. That is, they should not be interpreted as definitive results. Rather, the analysis presented provides useful information on the relationship between the cost-effectiveness of potential interventions and their characteristics, namely their cost and any potential reduction in problematic drinking they generate.

The economic model also provides a 'calculator' intended to be made available to the various decision makers to determine if an intervention is likely to be cost-effective under different scenarios and conditions. The model will allow the user to input values and generate results specific to particular situations.

Executive Summary

1. INTRODUCTION

The work presented in this report contributes towards updating the guidance produced in 2007 (PH7) on interventions delivered in secondary schools to prevent and/or reduce alcohol use by young people between the ages of 11 and 18 years old.

2. OBJECTIVES

The key questions were outlined in the final scope:

Question 1: Which school-based alcohol programmes are effective and cost-effective at preventing or reducing alcohol use among children and young people aged 11 to 18?

Question 2: Which school-based alcohol programmes are effective and cost-effective at preventing or reducing alcohol use among children and young people aged 18 to 25 with special educational needs or disabilities?

Question 3: Does effectiveness and cost-effectiveness vary for different population groups, (for example, by gender, age, socioeconomic group, ethnicity, geographical area, or for children and young people with special educational needs and disabilities?

Question 4: Are there any adverse or unintended effects?

Question 5: What factors influence the acceptability of interventions and do they differ between groups or settings?

It was not possible, due to a lack of available data, to address all of the questions outlined in the scope. The cost-effectiveness model developed, aimed to address Question 1 and Question 3 in particular. However, Question 4 is also discussed within the results section of this report. The gaps in the data were also highlighted throughout the report.

3. METHODS

3.1 Model Structure

Three potential outcomes associated with problematic drinking were included in the model:

- Hospitalisation
- Crime
- Unprotected sex

The intermediate rates for each outcome and its associated costs were applied to the proportion of each age group predicted to be engaging in problematic drinking. The incremental rate of change in problematic drinking associated with each intervention was applied directly to the intermediate outcome rates because it was assumed that an increase/reduction in problematic drinking would have the same effect on related outcomes.

The change in the rate of problematic drinking after implementing the intervention was included as the measure of effectiveness because it was consistently measured across the effectiveness studies. Furthermore, data were obtained on the percentage of students that report outcomes such as crime and hospitalisation occurring as a consequence of problematic drinking. This enabled us to use a measure of alcohol consumption, problematic drinking, and make an assumption on its association with the reported intermediate outcomes such as crime and hospitalisation.

3.2 Baseline Alcohol Use

The Smoking, Drinking and Drug Use among Young People in England Survey (SDDS) was used to generate estimates of baseline alcohol use in young people aged 11 to 18 years. Because the SDDS only included participants between the ages of 11 and 15 years, it was necessary to extrapolate the data to estimate drinking behaviour up to the age of 18 years using the trends in the three groups: (i) drank alcohol but not been drunk; (ii) been drunk once or twice; and (iii) been drunk 3+ times, between the ages of 12 and 15.

3.3 Population

The model included a cohort of 1,000 students and allows the user to select between the following age subgroups: 11 to 12 years, 13 to 14 years, 15 to 16 years, 17 to 18 years or 11 to 18 years. A weighted average of drinking behaviour was calculated for each group based on the number of students at each age within secondary schools in England.

3.4 Interventions

In the absence of new data from interventions it was agreed with the Committee to use the interventions included within the previous guidance produced in 2007 (PH7 [2]). Furthermore, the web-based alcoholic alert intervention [8] was identified as a result of the cost-effectiveness review conducted for the current PH7 guideline update. The Climate Schools: Alcohol and Cannabis course [9] was suggested by NICE staff. The inclusion of these four studies allowed us to include interventions from studies with different methods of delivery and were also in different population age-groups allowing for a range of results.

The interventions included within the model are as follows:

STAMPP

STAMPP is a classroom-based intervention combined with a brief parental intervention that was conducted in Northern Ireland and Glasgow/Inverclyde Educational Authority areas. Schools were randomised to receive either 'STAMPP' or 'education as normal' (EAN). The intervention was carried out in two phases over two years. The first phase was carried out during secondary school when pupils were around 12 years of age. Phase two was implemented in the following year when pupils were around 13 to 14 years of age. The classroom-based intervention consisted of a number of skill-based activities (e.g. group decision making). The brief parental intervention included a short presentation on alcohol use in young people delivered at a school parents evening. The main outcome of the study was self-reported heavy episodic drinking. This was assessed at baseline and 33 months from baseline. Results showed an incremental reduction in problematic drinking using STAMPP of 8.4%.

STARS

STARS is a multicomponent intervention that was applied over two years in two school sites within the United States. Participants were randomised to receive either STARS or a minimal intervention control. STARS involved a health consultation during the fall semester of sixth grade (11 to 12 years old) regarding avoiding alcohol consumption. Furthermore, in the spring semester of sixth grade the children's parents or guardians received postcards with information on how to talk to their child about avoiding alcohol. A follow up health consultation was carried out in the fall semester of seventh grade (12 to 13 years old). Finally, in the spring semester of seventh grade, the children were provided with four family activities to take home on alcohol prevention skills and knowledge. Participants were surveyed one year after the conclusion of the intervention to record 30-day heavy alcohol use. Results showed a 3.7% reduction in problematic drinking using the intervention compared with the control.

Alcoholic Alert

Alcoholic Alert is a web-based programme used in the Netherlands to reduce alcohol use in students aged 15 to 19 years. Schools were randomised to receive the intervention or care as usual. The first stage of the programme included a questionnaire and a game regarding the consequences of heavy drinking. The intervention involved three game scenarios within three game sessions. A week after the final game scenario, participants were asked about their recent drinking behaviour and received feedback. Subsequently, participants were challenged to drink less at an upcoming event. If the participant failed, they received feedback and had the opportunity to take on a new challenge. If the participant succeeded, they received congratulations and the intervention was over. Questionnaires at baseline and four months after baseline recorded binge drinking sessions in the 30 days prior to questionnaire completion. Results showed a 17.9% reduction in problematic drinking using the intervention compared with the control.

Climate

The Climate Schools: Alcohol and Cannabis course is a combination of web and classroom-based activities implemented within a number of schools in Australia. Schools were randomly allocated to receive either the Climate course or health education as usual. Six lessons of the Alcohol module were delivered in one term of year 8, when students were around 13 years of age, and six lessons of the Alcohol and Cannabis module were delivered around six months later. Climate modules consist of both online cartoon scenarios and teacher-led activities. Outcome measures included alcohol and cannabis knowledge and use. Outcomes were recorded at baseline and around six months after baseline, immediately following the completion of the intervention. The rate of binge drinking in the six months prior to follow up was divided by six to capture a monthly change in the rate of problematic drinking. Results show a small increase (0.2%) in the rate of problematic drinking in relation to the control group.

3.5 Costs

Intervention costs were based on one secondary school or 1,000 students (assumed to be a typical number of students within a secondary school). As PSHE education is EAN within UK secondary schools, any associated costs were not included within the model as they would be required both for EAN and the interventions.

The data used to calculate the cost per event for each of the intermediate outcomes (crime, hospitalisation and unprotected sex) was sourced from standard publicly available sources wherever possible. Costs were obtained through: NHS Reference Costs for most hospital-based activity such as treatment for alcohol poisoning; Personal Social Services Research Unit (PSSRU) data on unit costs for primary care such as general practitioner (GP) visits; and British National Formulary data for the majority of pharmaceutical costs.

4. RESULTS

The results are presented over a one year time horizon from the perspective of the NHS, personal social services (PSS) and local authority. Results show that with the current base case inputs, STAMPP consistently displayed a low incremental total cost and was cost-saving for the age group 17 to 18 year olds. The remaining interventions were not predicted to be cost-saving for any of the age groups. However, the STAMPP effectiveness study highlighted that the intervention had no significant effect on self-reported harms (e.g. getting into fights, damaging property or having a hangover). Therefore, these results should be interpreted with caution. The Climate intervention had consistently low costs. However, the intervention was not successful in reducing problematic drinking. Furthermore, the costs associated with this intervention were likely to be underestimated. The school registration fees for STAMPP were used as the total intervention cost. This was because no costs were identified for STAMPP that incorporated resource use, such as teacher time.

The parameters varied within the sensitivity analysis included: the effectiveness of the interventions in reducing problematic drinking, the number of events for each intermediate outcome and the cost of the intervention. Each parameter was varied ±50%. Monthly crime and hospital events were a key driver of results, for all interventions, due to the high associated costs. The cost of the intervention also substantially affected the results, particularly when the intervention was effective in reducing problematic drinking.

5. DISCUSSION

The results show that interventions are most likely to be cost-saving in older age groups when baseline alcohol use is higher. However, STAMPP was the only intervention to achieve a cost-saving result.

Due to the limitations of the model such as the paucity of data to generate model inputs and the variance in aspects of the effectiveness studies (e.g. follow up period, country and age of participants), the results should be interpreted with caution. However, the analysis presented provides valuable information on the relationship between the cost-effectiveness of potential interventions and their characteristics, namely their cost and the reductions in problematic drinking they generate.

Acknowledgements

The authors would like to thank members of the PHAC for their valuable contributions in developing the economic model.

Abbreviations

BNF	British National Formulary
CJS	Criminal Justice System
DfE	Department for Education
EAN	Education as normal
GLM	Generalised linear model
GP	General practitioner
HED	Heavy episodic drinking
IUCD	Intrauterine contraceptive devices
MCS	Millennium Cohort Study
NHS	National Health Service
NICE	National Institute for Health and Care Excellence
PCA	Prescription Cost Analysis
PHAC	Public Health Advisory Committee
PSHE	Personal, Social, Health and Economic Education
PSS	Personal Social Services
PSSRU	Personal Social Services Research Unit
SDDS	Smoking, Drinking and Drug use Among Young People in England Survey
SEND	Special Educational Needs and Disabilities
STAMPP	Steps Towards Alcohol Misuse Prevention Programme
STARS	Start Taking Alcohol Risks Seriously
STI	Sexually transmitted infection
YHEC	York Health Economics Consortium

Section 1: Background

Children and young people risk disease, injury, poisoning, violence, depression and damage to their development from drinking alcohol, especially those who drink heavily [1]. Drinking at an early age is also associated with a higher likelihood of alcohol dependence.

The work presented in this report contributes towards updating the guidance produced in 2007 (PH7 [2]) on interventions delivered in secondary schools to prevent and/or reduce alcohol use by young people between the ages of 11 and 18 years old.

The economic model outlined in this report will contribute toward the achievement of the objectives set out in the NICE scope [3]. The key questions from the final scope are as follows:

Question 1: Which school-based alcohol programmes are effective and cost-effective at preventing or reducing alcohol use among children and young people aged 11 to 18?

Question 2: Which school-based alcohol programmes are effective and cost-effective at preventing or reducing alcohol use among children and young people aged 18 to 25 with special educational needs or disabilities?

Question 3: Does effectiveness and cost-effectiveness vary for different population groups, (for example, by gender, age, socioeconomic group, ethnicity, geographical area, or for children and young people with special educational needs and disabilities (SEND)?

Question 4: Are there any adverse or unintended effects?

Question 5: What factors influence the acceptability of interventions and do they differ between groups or settings?

The expected outcomes from the NICE scope include measures of alcohol use, intermediate outcomes (e.g. alcohol-related hospitalisation), views and experiences of teachers, practitioners and young people and adverse or unintended effects of the interventions (e.g. increased interest in trying alcohol). It was not possible, due to a lack of available data, to address all of the questions outlined in the scope. The cost-effectiveness model developed, aimed to address Question 1 and Question 3 in particular. However, Question 4 is also discussed within the results section of this report. The gaps in the data were also highlighted throughout the report.

A de novo model is produced using updated evidence linking alcohol consumption to adverse outcomes and is able to evaluate the impact of interventions on young people aged 11 to 18 years. The aim of the model will be to provide decision-makers with information on how cost-effective an intervention will be, given its levels of cost and efficacy in reducing problematic alcohol consumption.

Cost-effectiveness in this model will be measured through the costs and savings associated with the intervention including the cost offsets resulting from the intervention. The reported results will show whether the intervention is likely to be cost-saving given a certain set of assumptions.

Section 2: Methods

2.1 MODEL STRUCTURE

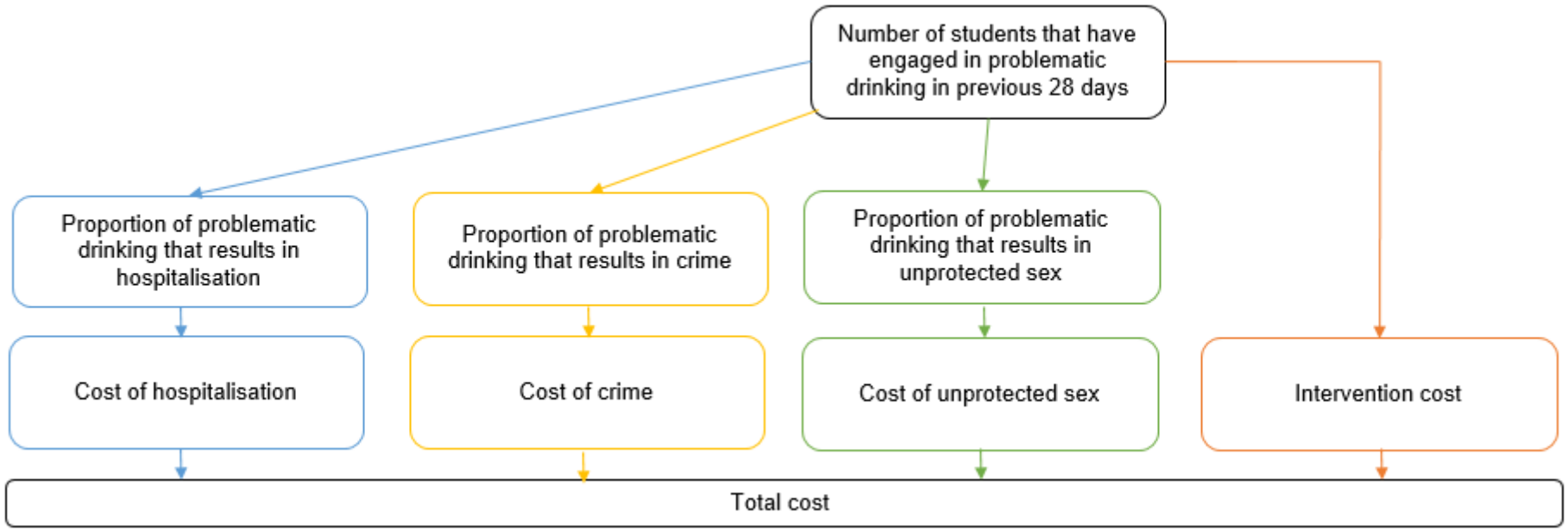
The model structure is shown in Figure 2.1. The approach was taken to apply the cost per secondary school or per 1,000 students of each intervention. This cost was then combined with the cost of three potential outcomes of problematic drinking. The intermediate outcomes included were chosen based on the data available and were agreed with the committee.

The intermediate outcomes included in the model were:

- Hospitalisation
- Crime
- Unprotected sex

Although these outcomes do not encompass all possible negative consequences of problematic drinking, the model does have two placeholders so that further outcomes can be included within the analyses should data become available. Furthermore, due to the paucity of data in this area the inclusion of further outcomes would only increase the uncertainty in the model inputs. The details regarding the costs included for each of the potential outcomes are included in Section 0.

Figure 2.1: Model structure



2.2 MODEL INPUTS

This section outlines the data that have been used to populate the economic model, and also highlights any areas in which there are thought to be gaps in the evidence.

2.2.1 Baseline Alcohol Use

The Smoking, Drinking and Drug Use among Young People in England survey (SDDS) [4] was utilised to generate estimates of baseline alcohol use in young people aged 11 to 18 years. The SDDS is an annual survey of around one in seven secondary schools in England that are randomly chosen to take part. Participants are between the ages of 11 and 15 years and complete the survey in exam conditions. The survey includes questions on a range of factors surrounding smoking, drinking and drug taking among school children.

In the 2016 SDDS, this included whether pupils had been "drunk" in the four weeks prior to survey completion. Information was obtained from 12,051 pupils in 177 schools throughout England, predominantly in the autumn term of 2016. Results of the survey show the percentage of students that answered: (i) "Drank alcohol but not been drunk", (ii) "Been drunk once or twice", or (iii) "Been drunk 3+ times". For the purposes of the economic model, respondents that answered that they had been drunk in the last four weeks irrespective of the frequency were categorised as engaging in "Problematic drinking". Those who had "drank alcohol but had not been drunk" were categorised as engaging in "Non-problematic drinking". It was assumed that the remaining proportion of students consumed no alcohol in the four weeks prior to survey completion. The proportion of pupils within each category is displayed in Table 2.1.

Table 2.1: Drinking behaviour in 28 days (SDDS data)

Measures of use (28 days)	Age				
	11	12	13	14	15
No alcohol consumed (%)	97.0	94.3	87.0	74.8	57.3
Non-problematic drinking (%)	2.7	4.9	9.4	13.7	20.0
Problematic drinking (%)	0.2	0.8	3.6	11.5	22.7

Because the SDDS [4] only included participants between the ages of 11 and 15 years, it was necessary to extrapolate the data to estimate drinking behaviour up to the age of 18 years. The data for 11 year olds was an outlier, with the data for 12 to 15 year olds forming a fairly linear curve. In order to increase the accuracy of the extrapolation of the observations a piecewise approach was used by extrapolating the linear 12 to 15 year old section of the curve separately. This was undertaken for each of the groups:

- Drank alcohol but not been drunk
- Been drunk once or twice
- Been drunk 3+ times.

All statistical analyses were performed in the software package 'R', version 3.4.2 [5]. The association between the proportion of students in the three different groups and age was assessed using a generalised linear model (GLM) with a Gamma error distribution and an identity link function. The model contained the main effects of age and group (Drank alcohol but not been drunk; Been drunk once or twice; and Been drunk 3+ times) as well as the statistical interaction between age and group.

The estimated proportion of students in each category are displayed in Table 2.2. The model allows the user to apply either the raw or the modelled data. Where data were not available, alcohol consumption was set at 0%.

Due to a general paucity of data regarding alcohol use within the SEND population, this population was not included within the model.

Table 2.2: Drinking behaviour in 28 days (modelled data)

Measures of use (28 days)	Age							
	11	12	13	14	15	16	17	18
No alcohol consumed (%)	100	94.4	84.6	74.1	62.7	50.5	37.4	23.1
Non-problematic drinking (%)	0.0	4.7	9.5	14.7	20.2	26.2	32.7	39.7
Problematic drinking (%)	0.0	0.9	5.9	11.3	17.0	23.3	30.0	37.3

2.2.2 Population

The model includes a cohort of 1,000 students assumed to attend one school. The model allows the user to select between the following age subgroups: 11 to 12 years, 13 to 14 years, 15 to 16 years, 17 to 18 years or 11 to 18 years. In order to determine the proportion of each age within each subgroup, data on the number of students of each age within secondary schools in the England was sourced from the 2018 national tables [6]. A weighted average of drinking behaviour was calculated based on the number of students at each age (Table 2.3).

Table 2.3: Drinking behaviour in 28 days (subgroups)

Measures of use (28 days)	Age groups				
	11 to 12 years	13 to 14 years	15 to 16 years	17 to 18 years	11 to 18 years
No alcohol consumed	97.2%	79.4%	59.2%	36.2%	68.0%
Non-problematic drinking	2.3%	12.0%	21.9%	33.2%	17.4%
Problematic drinking	0.5%	8.6%	18.8%	30.5%	14.6%

2.2.3 Effectiveness

In the absence of new data from interventions it was agreed with the Committee to use the interventions included within the previous guidance produced in 2007 (PH7 [2]). The cost-effectiveness review carried out by Jones *et al*. [7] was an output of the review conducted for PH7. Three interventions were included in the published cost-effectiveness analysis: School Health and Harm Reduction Project (SHAHRP), Start Taking Alcohol Risks Seriously (STARS) and Lion's Quest 'Skills for Adolescence'. Lion's Quest and SHAHRP were both classroom based curriculum interventions. Lions Quest was associated with a higher cost and was less effective than SHAHRP so was not included in the current model. The web-based alcoholic alert intervention [8] was identified as a result of the cost-effectiveness review conducted for the current PH7 guideline update. The Climate Schools: Alcohol and Cannabis course [9] was suggested by NICE staff. The inclusion of these four studies allowed us to include interventions from studies with different methods of delivery including:

- Classroom-based curriculum delivery
- School-based (but not in the classroom) delivery
- Web-based delivery

The four intervention studies were also in different population age-groups allowing for a range of results.

NICE staff subsequently found a UK based study, Steps Towards Alcohol Misuse Prevention Programme (STAMPP), which was the UK equivalent of the SHAHRP study so this was used in the model instead of SHAHRP. The Committee did not identify any additional interventions and agreed that the selected interventions were appropriate to be included in the model.

Therefore, four interventions were deemed relevant and included in the model. These were:

- Steps Towards Alcohol Misuse Prevention Programme (STAMPP)
- Start Taking Alcohol Risks Seriously (STARS)
- Alcoholic alert
- Climate Schools: Alcohol and Cannabis course

These will all be compared against education as normal (EAN). Personal, Social, Health and Economic (PSHE) education has been identified as the current intervention aiming to reduce alcohol misuse within the target age group (11 to 18 years). The Department for Education (DfE) now requires that schools publish the details of their PSHE education provision [10].

The change in the rate of problematic drinking after implementing the intervention was included as the measure of effectiveness because it was consistently measured across studies. Furthermore, data were obtained on the percentage of students that report outcomes such as crime and hospitalisation occurring as a consequence of problematic drinking. This enabled us to use a measure of alcohol consumption, problematic drinking, and make an assumption on its association with the reported intermediate outcomes such as crime and hospitalisation. This is discussed further in Section 0.

2.2.3.1 Included studies

Sumnall *et al*. (2017) - Steps Towards Alcohol Misuse Prevention Programme (STAMPP) [11]

STAMPP is a classroom based intervention combined with a brief parental intervention that was conducted in Northern Ireland and Glasgow/Inverclyde Educational Authority areas. Schools were randomised to receive either STAMPP or EAN. The intervention was carried out in two phases over a period of two years. The first phase of the intervention was carried out during year nine of secondary school when pupils were around 12 years of age. Phase two was implemented in the following year when pupils were around 13 to 14 years of age. The classroom-based intervention consisted of a number of skill-based activities (e.g. individual and small group decision making). The brief parental intervention included a short presentation on alcohol use in young people delivered by trained facilitators at a school parents evening.

The main outcome measure of the study was self-reported heavy episodic drinking (HED, defined as self-reported consumption of ≥ 6 units for male students and ≥ 4.5 units for female students in a single episode in the previous 30 days) assessed at baseline and 33 months from baseline. For the purpose of the economic model, data on this outcome measure was extracted. The efficacy data included within the model are shown in Table 2.4.

Table 2.4: Change in rate of problematic drinking following STAMPP intervention

	Baseline	Follow up
Intervention: rate of problematic drinking[1] (%)	7.6	17.0
Control: rate of problematic drinking[1] (%)	7.8	25.6
Incremental rate of change (%)		**-8.4**

[1]. Within the study this was described as “heavy episodic drinking”.

The number of self-reported harms (harms caused by own drinking) was also recorded at baseline and 33 months following baseline. These included: getting into fights, damaging property or having a hangover. The study displayed that the intervention did not reduce self-reported harms associated with own drinking. This contradicts the assumption within the model that a change in the rate of problematic drinking results in the same change in the rate of intermediate outcomes. In order to address this, the model allows the user to select whether to use the rate of change in problematic drinking or the change in self-reported harms to calculate the rate of intermediate outcomes. If the user selects to use the change in self-reported harms, this would result in no changes in intermediate outcomes from baseline.

Werch *et al*. (2003) - Start Taking Alcohol Risks Seriously (STARS) [12]

STARS is a multicomponent intervention that was applied over two years in two school sites (Neighbourhood and Magnet) within the United States. Participants were randomised to receive either the STARS intervention or a minimal intervention control. STARS involved a health consultation with a nurse during the fall semester of sixth grade (11 to 12 years old) regarding why and how the children should avoid alcohol consumption. Furthermore, in the spring semester of sixth grade the children's parents or guardians received postcards with information on how to talk to their child about avoiding alcohol. A follow up health consultation was carried out in the fall semester of seventh grade (12 to 13 years old). Finally, in the spring semester of seventh grade, the children were provided with four family activities to take home and carry out with their parents on alcohol prevention skills and knowledge.

The Youth Alcohol and Drug Survey [13] was used one year after the conclusion of the intervention to collect data (e.g. alcohol and drug consumption), to determine the intervention's efficacy. The survey recorded the percentage of pupils that had engaged in the "heavy use" of alcohol in the 30 days prior to the survey. This measure was included in the economic model and the data are displayed in Table 2.5. In order to determine an overall rate of change across the two school sites, a weighted average was calculated based on the number of pupils included from each school [12]. Because the baseline rate of problematic drinking was not reported in the study this was not accounted for in the model. However, the study does indicate that there were no significant differences in alcohol use between intervention groups at baseline.

Table 2.5: Change in rate of problematic drinking following STARS intervention

	Neighbourhood	Magnet
Intervention: rate of problematic drinking[1] (%)	6.0	4.7
Control: rate of problematic drinking[1] (%)	9.3	8.7
Incremental rate of change (%)		**-3.7**

1. Within the study this was described as "30-day heavy use".

Drost *et al*. (2016) - Alcoholic Alert [8]

Alcoholic Alert is a web-based, computer-tailored programme that was used in the Netherlands to reduce alcohol use in school pupils aged 15 to 19 years. Schools were randomised to receive the intervention or care as usual. The first stage of the programme involved all participants completing a web-based questionnaire. Participants then completed a game where the aim was to determine what happened after a heavy night of drinking. During the game, participants were asked questions regarding alcohol-related socio-cognitive factors. Based on their answers the pupils received computer-tailored feedback. The intervention involved three game scenarios within three game sessions.

One week after the final game scenario, participants were asked to revisit the intervention website to answer several questions. In this fourth session, they were asked about their recent drinking behaviour and then received computer-tailored feedback on their alcohol use compared with Dutch drinking guidelines. Subsequently, participants were challenged to drink less than usual at an upcoming event (e.g. party, wedding). During a fifth session, participants were asked to visit the intervention website and fill in their alcohol use at the aforementioned event. If the participant failed the challenge, they received computer-tailored feedback and advice and had the opportunity to take on a new challenge. If the participant met the challenge, he or she received congratulations and the intervention was over.

Web-based questionnaires were employed at baseline and four months after baseline to determine the efficacy of the intervention. This questionnaire included a measure on the number of binge drinking sessions in the 30 days prior to questionnaire completion. The data from this measure were included in the economic model and are displayed in Table 2.6.

Table 2.6: Change in rate of problematic drinking following Alcoholic alert intervention

	Baseline	Follow up
Intervention: problematic drinking sessions[1]	2.00	1.84
Control: problematic drinking sessions[1]	2.40	2.73
Incremental rate of change (%)		**-17.9**

[1]. Within the study this was described as “binge drinking sessions”.

Champion *et al*. (2016) – Climate Schools: Alcohol and Cannabis [9]

The Climate Schools: Alcohol and Cannabis (Climate) course is a combination of web and classroom-based activities implemented within a number of schools in Australia. Schools were randomly allocated to receive either the Climate course or health education as usual. Six lessons of the Alcohol module were delivered in one term of year 8, when students were around 13 years of age, and six lessons of the Alcohol and Cannabis module were delivered around six months later. Climate modules consist of both online cartoon scenarios and teacher-led activities.

Outcome measures included alcohol and cannabis knowledge and use. Outcomes were recorded at baseline and around six months after baseline, immediately following the completion of the intervention. The rate of binge drinking in the six months prior to follow up was divided by six to capture a monthly change in the rate of problematic drinking. The data included in the model are displayed in Table 2.7. Results show a small increase in the rate of problematic drinking in relation to the control group who received health education as usual.

Table 2.7: Change in rate of problematic drinking following Climate intervention

	Baseline	Follow up
Intervention: rate of problematic drinking[1] (%)	4.0	7.8
Control: rate of problematic drinking[1] (%)	3.4	6.1
Incremental rate of change (%)		**0.2**

[1]. In the paper this was described as "binge drinking".

2.2.4 Intervention Cost

The intervention costs included in the model are provided in Table 2.8. The cost per student for the STAMPP intervention and the Alcoholic alert intervention were extracted from the effectiveness studies [8, 11]. The cost of Alcoholic alert was converted from euros to pounds sterling at an exchange rate of 0.89 [14]. The per student cost of the STARS intervention was extracted from a cost-effectiveness review carried out by Jones *et al*. [7]. The cost of implementing the Climate intervention was not available. Registration fees for the intervention were extracted from the website and were used within the model as the total cost for Climate. An annual cost was calculated from the average of the joining and first year fee and the annual renewal fee. However, because this does not consider teacher's time, it is likely that this cost has been underestimated. Furthermore, the cost was converted from Australian dollars to pound sterling at an exchange rate of 0.56 [15]. In order to address uncertainty in the intervention costs, each cost will be varied significantly within the sensitivity analysis to determine its impact on overall results.

As PSHE education is EAN within UK secondary schools, any associated costs were not included within the model as they would be required both for EAN and the interventions.

Table 2.8: Intervention costs

Intervention	Cost per school/1,000 students (£)	Source
STAMPP	15,000	Sumnall *et al*. 2017 [11]
STARS	20,300	Jones *et al*. 2007 [7]
Alcoholic alert	47,099	Drost *et al*. 2016 [8]
Climate	521.05	Climate schools website [16]

2.2.5 Intermediate Outcomes

Data were sourced on the percentage of students that reported each outcome occurring as a consequence of problematic drinking over a four week period. However, the data did not report on whether these students only had one event or multiple events. Therefore, the model assumes that, for students who reported an outcome, each outcome occurred only once over the four week period and, therefore, the model may underestimate the number of events if some students had multiple events. For example, if a student reported being in trouble with police, this is recorded as one incident. However, the student may have been in trouble with the police on multiple occasions during the four-week period. If the model does underestimate the number of events at baseline this would mean that the model also underestimates the effect of the intervention.

Hospital admission

The results of the SDDS [4] displayed that 1.7% of the participants that had engaged in problematic drinking in the four weeks prior to the survey had been admitted to hospital as a result. The diagnoses for alcohol-related hospital admissions (Table 2.9) were sourced from the 2018 publication of Statistics on Alcohol in England [17]. Data on the age groups: under 16 and 16 to 24 year olds were included to capture relevant admissions for the age group of interest (11 to 18 year olds). However, it was believed that the data lacked external validity because no alcohol-related unintentional injuries were recorded for under 16s. In order to address this, the data from the two age groups were summed. For the purposes of costing, diagnoses were grouped into the categories “alcohol poisoning” and “unintentional injuries”. The total number of events (hospital admissions) in each category were used to calculate the proportion of each category in all alcohol-related admissions (Table 2.10). The cost of unintentional injuries was assumed to be made up equally from the costs of concussions, cuts and broken bones which were sourced from a recent Home office publication on the economic and social costs of crime [18]. The cost of alcohol poisoning was sourced from the National Schedule of Reference Costs 2016-17 [19]. All costs relating to hospital admissions are displayed in Table 2.11. Unit costs were multiplied by their proportion within all alcohol-related hospital admissions (Table 2.10) to calculate an overall unit cost of hospitalisation of £831.02.

Table 2.9: Alcohol-related hospital admissions

Reason for admission	Age group	
	Under 16	16 to 24
Alcohol poisoning		
Acute intoxication	800	1,940
Ethanol poisoning	100	120
Toxic effect of alcohol, unspecified	20	20
Accidental poisoning by and exposure to alcohol	80	530
Intentional self-poisoning by and exposure to alcohol	290	4,900
Poisoning by and exposure to alcohol, undetermined intent	0	20
Poisoning	0	350
Unintentional injuries		
Road/pedestrian traffic accidents	0	1,460
Fall injuries	0	1,430
Other unintentional injuries	0	4,680
Assault	0	1,020

Source: Statistics on Alcohol, England, 2018 [17].

Table 2.10: Proportion of condition within all alcohol-related hospital admissions

Category of admission	Events	Proportion
Alcohol poisoning	9,170	52%
Unintentional injuries	8,590	48%
Concussion	*N/A*	*16%*
Cuts	*N/A*	*16%*
Broken bones	*N/A*	*16%*

Table 2.11: Hospital costs

Reason for admission	Unit cost (£)	Source
Alcohol poisoning	497.24	NHS reference costs 2016-17 [19] Weighted average of codes WH21A and WH21B, total HRGs
Concussion	724.00	Heeks *et al*. 2018 [18]
Cuts	315.00	
Broken bones	2,523	

Crime

The results of the SDDS [4] showed that 4.8% of the participants that had engaged in problematic drinking in the four weeks prior to the survey had been in trouble with the police as a result.

The Youth Justice Statistics 2016-17 [20] displayed that, out of 74,784 arrests, 47% were proceeded against. Therefore, 53% of the crime events within the model were assumed to not be proceeded against and, therefore, are not attributed a cost.

The percentage of crimes committed by children and young people that are motivated by alcohol consumption was extracted from the Jones *et al.* cost-effectiveness review (2007 [7]). These percentages were applied to the total number of arrests included in the Youth Justice Statistics [20] to estimate the number of alcohol-related offences. The proportion of each offence within all alcohol-related crime committed by children and young people is displayed in Table 2.12.

All crime costs were sourced from a recent Home office publication on the economic and social costs of crime [18]. The costs associated with each crime are shown in Table 2.13. In order to be consistent with the data available on the proportion of crimes motivated by alcohol consumption (Table 2.12) these were aggregated into five overall categories of crime: assault without injury, assault with injury, vehicle related thefts, other thefts and criminal damage. The unit cost for each category is displayed in Table 2.14. Furthermore, the unit cost for each category was multiplied by its proportion within all alcohol-related crime committed by children and young people (Table 2.12) to calculate a unit cost of crime of £1,118.

Table 2.12: Proportion of crimes motivated by alcohol consumption

Category of offence	% of all offences motivated by alcohol consumption	Events	Proportion of alcohol related crime
Assault without injury	2%	1,496	35%
Assault with injury	2%	1,496	35%
Vehicle related thefts	0%	75	2%
Other thefts	1%	449	11%
Criminal damage	1%	748	18%

Source: Jones *et al*. 2007 [7]

Table 2.13: Crime costs (disaggregated)

Crime	Police costs (£)	Other CJS costs (£)	Total response cost (£)
Violence with injury[2]	1,130	1,370	2,500
Violence without injury[1]	810	1,250	2,060
Robbery[4]	1,010	3,670	4,680
Domestic Burglary[4]	530	1,270	1,800
Theft of Vehicle[3]	2,030	1,870	3,900
Theft from vehicle[3]	80	100	180
Theft from person[4]	40	390	430
Criminal damage -arson[5]	1,080	3,900	4,980
Criminal damage - other[5]	150	350	500
Commercial robbery[4]	1,010	3,670	4,680
Commercial burglary[4]	530	2,240	2,770
Commercial theft[4]	40	200	240
Theft of commercial vehicle[3]	2,030	1,870	3,900
Theft from commercial vehicle[3]	80	100	180
Commercial criminal damage arson[5]	1,080	3,900	4,980
Commercial criminal damage -other[5]	150	350	500

[1]. Assault without injury; [2]. Assault with injury; [3]. Vehicle related thefts; [4]. Other thefts; [5]. Criminal damage. Abbreviations: CJS; Criminal Justice System. Source: Heeks *et al*. 2018 [18]

Table 2.14: Crime costs (aggregated)

Category of crime	Unit cost (£)	Source
Assault without injury	2,060	Heeks *et al*. 2018 [18]
Assault with injury	2,500	
Vehicle related thefts	2,040	
Other thefts	2,433	
Criminal damage	2,740	

Unprotected sex

The 2011 report of the European School Survey Project on Alcohol and Other Dugs [21] stated that 13% of the students surveyed (aged around 16 years) had engaged in unprotected sex due to their alcohol use in the 12 months prior to completing the survey. Because the data for problematic drinking were collected for one month, we scaled down the probability of unprotected sex to monthly. Normally, when converting a probability, a formula would be required to account for the potential compounding of the probabilities from month to month (i.e. monthly probability would be equal to *1-EXP(LN(1-0.13/12))* which would be 1.154%). However, because the value is immediately scaled back up to an annual rate in the results the probability for 12 months has just been divided by 12 to provide a monthly probability of 1.083%. This does not affect the results because there are no monthly cycles to consider. For example, if:

- a = annual probability of unprotected sex
- b = monthly probability of problematic drinking

Then:

- (a/12) multiplied by b = c = monthly probability of problematic drinking and having unprotected sex
- c multiplied by 12 = annual probability of problematic drinking and having unprotected sex meaning the a/12 and c*12 cancel each other out

The potential outcomes of unprotected sex included in the model were:

- No consequence
- Sexually transmitted infection (STI)
- Abortion
- Emergency contraception
- Miscarriage

These outcomes are not mutually exclusive. Therefore, the proportion of unprotected sex events that result in each outcome surpass 100%. No data were identified on the likelihood of each outcome as a result of unprotected sex, so the model is currently populated with assumptions (no consequence: 60%, STI: 10%, abortion: 5%, emergency contraception: 25% and miscarriage: 5%). The unprotected sex events that had no consequence were attributed no cost.

STI diagnoses in young people aged between 13 and 19 years were sourced from the Public Health England (PHE) STI annual data tables [22] and were used to calculate the proportion of each STI within all STI diagnoses in young people. Data on STIs were available for the age groups: 13 to 14 year olds and 15 to 19 year olds. However, because these data do not encompass the whole age group considered within the model (11 to 18 year olds) and because the probability of each STI within all STIs is not thought to vary substantially between the age groups, the data were summed. The STI diagnoses included were: chlamydia (75%), gonorrhoea (8%), genital herpes (6%), syphilis (0.3%) and genital warts (10%). The cost of STIs consisted of testing, GP and Genitourinary medicine (GUM) appointments and treatment.

The type and number of diagnostic tests required were sourced from either the 2017 NICE guideline (NG68) on the effect of condom distribution schemes on STIs [23] (chlamydia, gonorrhoea and syphilis) or from the NICE clinical knowledge summary (genital herpes [24] and genital warts [25]). The cost of testing was sourced from the NHS reference costs 2016-17 [19].

The number of appointments required for each STI were sourced from NG68 [23]. The number of appointments required for genital herpes and genital warts were assumed to be equal to the number extracted for chlamydia. The cost of a GP appointment was sourced from the Personal Social Services Research Unit (PSSRU) [26]. The cost of a GUM appointment was sourced from the NHS Reference Costs 2016-17 [19]. Because no data were identified on the proportion of young people presenting at either the GP or GUM, the cost of appointments were calculated by assuming all appointments were GP or GUM then taking an average.

The costs of treatment for Chlamydia, Gonorrhoea and Syphilis were sourced from NG68 [23] and inflated from 2016 to 2017 costs using the PSSRU inflation index [26]. The treatment included for Genital herpes was Aciclovir based on the NICE clinical knowledge summary [24] and the cost was sourced from the BNF [27]. The treatment included for Genital warts was Imiquimod cream based on the NICE clinical knowledge summary [25] and the cost was sourced from the BNF [27]. The costing of STIs is displayed in Table 2.15. Each STI cost was multiplied by its proportion within all STIs and summed to give a weighted cost of £165.28.

Table 2.15: Costing of STIs

	Chlamydia	Gonorrhoea	Herpes	Syphilis	Warts
Testing (£)	7.50	15.00	7.50	10.56	0.00
Appointment (£)	141.71	236.18	141.71	236.18	141.71
Treatment (£)	2.97	9.14	2.39	14.07	48.60
Total cost (£)	152.18	260.33	151.60	260.81	190.31
Cost as a proportion of all STIs (£)	114.72	21.77	9.09	0.66	19.05

The cost of abortion (£611.54) was calculated using a weighted average of termination of pregnancy costs within the NHS reference costs [19] (MA18C, MA18D, MA20Z). The cost of miscarriage (£160.99) was calculated using a weighted average of NHS Reference Costs (MB08A, MB08B). The weighted average was then multiplied by 25% as 75% of miscarriages occur in the first trimester [28] and are, therefore, not likely to require hospitalisation, so are not attributed a cost.

The emergency contraception cost (Table 2.16) included all treatments classified as emergency contraception within the prescription cost analysis (PCA) [29] and the three most prescribed Intrauterine Contraceptive Devices (IUCD) [29]. The IUCD Mirena was excluded because, although it is highly prescribed, it has alternate indications and a high cost [27]. A weighted average was calculated based on the PCA [29] and the BNF [27]. It was also assumed that a GP appointment occurred in order to prescribe the treatment, the cost was sourced from the PSSRU [26].

The costs relating to unprotected sex are displayed in Table 2.17. Each unit cost was multiplied by its proportion within all unprotected sex (Table 2.17) to calculate an overall unit cost of £66.49.

Table 2.16: Emergency contraception costs

Item	Number of items	Item cost (£)
EllaOne 30mg tablets	39,097	14.05
Emerres Una 1.5mg tablets	2	13.83
Emerres 1.5mg tablets	472	3.65
Ezinelle 1.5mg tablets	7	9.64
Levonelle One Step 1.5mg tablets	3,271	13.83
Levonelle 1500microgram tablets	22,575	5.20
Levonorgestrel 1.5mg tablets	80,111	5.20
Upostelle 1500 microgram tablets	8,562	3.75
Nova-T 380 Iucd	8,103	15.20
T-Safe 380A QL Iucd	21,602	10.55
TT380 Slimline Iucd	5,133	12.46
Weighted average (£)	8.35	
Total cost (Inc. GP appointment; £)	**45.35**	

Table 2.17: Unprotected sex costs

Outcome	Unit cost (£)	% of unprotected sex	Weighted cost (£)
No consequence	0.00	60	0.00
STI cost	165.28	10	16.53
Abortion	611.54	5	30.58
Emergency contraception	45.35	25	11.34
Miscarriage	160.99	5	8.05

Truancy

An annual cost to the education system per persistent truant was identified as £706 in 2005 prices [30]. However, due to the uncertainty regarding what classified a "persistent" truant and because the cost calculation is now considerably outdated, this cost was not included within the model. Furthermore, due to the paucity of data regarding the relationship between problematic drinking and frequency of truancy, data on truancy was not included within the model. Instead, a placeholder was included that allows the user to input data once they become available.

2.2.6 Long-term outcomes

As discussed throughout Section 2.2.5, many assumptions were required to estimate the effects of changes in alcohol use and the correlating change in intermediate outcomes associated with these changes. It was agreed that to add in further assumptions about any long-term outcomes would add in too much uncertainty to the modelling and would not be helpful to form recommendations or as an aid for decision makers.

It was acknowledged that there are likely be some long-term benefits associated with sustained behaviour change around alcohol such as:

- Reduced hospitalisation from alcohol related illnesses
- Reduced cancer rates
- Improved employment status if education attainment was affected

However, there was no good longitudinal evidence that could be drawn on that could reliably demonstrate that the reduction of alcohol observed in the studies would have had a measureable effect on long-term outcomes. Therefore, any long-term benefits of alcohol reduction would need to be considered separately to the analysis provided in this report.

Section 3: Results

3.1 SUMMARY OF RESULTS

The results in this section are presented over a time horizon of one year from the perspective of the NHS, Personal Social Services (PSS) and local authority. The cost-effectiveness results for each intervention are presented in full for the age groups that the intervention targeted within the associated effectiveness study. For the remaining age groups a table of total costs is included. The STAMPP intervention is deemed the most relevant of the interventions as it is UK based and recently published. Therefore, the cost-effectiveness results of this intervention are explored in further detail.

These results are reported as the total cost of the intervention or whether the intervention is cost-saving. Total costs include the total cost to deliver the intervention minus the cost offsets from avoided intermediate outcomes. Willingness to pay to avoid intermediate outcomes is not discussed in the results section but is discussed in Section 4.1.

3.1.1 STAMPP

The STAMPP intervention was delivered to students aged 12 to 13 years. Table 3.1 and Table 3.2 detail the results for the relevant age groups: 11 to 12 year olds and 13 to 14 year olds. These tables show that STAMPP is not cost-saving in these age groups. However, the intervention does predict a reduction of up to 4.15 crime events, 1.47 hospital events and 0.93 unprotected sex events in 1000 students over one year.

The STAMPP effectiveness study [8] highlighted that the intervention had no significant effect on self-reported harms (e.g. getting into fights, damaging property or having a hangover). Therefore, these results should be interpreted with caution. If the model assumed that the STAMPP intervention had no effect on the intermediate outcomes then the incremental cost would be £15,000. This is because the number of events would not change so the only difference in cost would be that incurred by the intervention.

Table 3.1: Results summary for students 11 to 12 years (STAMPP vs EAN)

	EAN	Intervention	Incremental
Annual crime events	2.60	2.39	-0.22
Annual hospital events	0.92	0.84	-0.08
Annual unprotected sex events	0.59	0.54	-0.05
Annual crime costs	£2,911	£2,666	-£244
Annual hospital costs	£766	£701	-£64
Annual unprotected sex costs	£39	£36	-£3
Annual intervention cost	£0	£15,000	£15,000
Total	**£3,715**	**£18,403**	**£14,688**

Note: 5 of the 1000 students modelled in this age range were estimated to engage in problematic drinking.

Table 3.2: Results summary for students 13 to 14 years (STAMPP vs EAN)

	EAN	Intervention	Incremental
Annual crime events	49.35	45.21	-4.15
Annual hospital events	17.46	15.99	-1.47
Annual unprotected sex events	11.12	10.18	-0.93
Annual crime costs	£55,167	£50,533	-£4,634
Annual hospital costs	£14,511	£13,292	-£1,219
Annual unprotected sex costs	£739	£677	-£62
Annual intervention cost	£0	£15,000	£15,000
Total	**£70,417**	**£79,502**	**£9,085**

Note: 86 of the 1000 students modelled in this age range were estimated to engage in problematic drinking.

Table 3.3 to Table 3.5 show the results for the remaining age groups. The results show that, with the current base case inputs, STAMPP was only cost-saving for the age group 17 to 18 year olds.

Table 3.3: Results summary for students 15 to 16 years (STAMPP vs EAN)

	EAN	Intervention	Incremental
Annual crime events	108.63	99.51	-9.13
Annual hospital events	38.44	35.21	-3.23
Annual unprotected sex events	24.47	22.41	-2.06
Annual crime costs	£121,435	£111,235	-£10,201
Annual hospital costs	£31,941	£29,258	-£2,683
Annual unprotected sex costs	£1,627	£1,490	-£137
Annual intervention cost	£0	£15,000	£15,000
Total	**£155,003**	**£156,983**	**£1,980**

Note: 188 of the 1000 students modelled in this age range were estimated to engage in problematic drinking.

Table 3.4: Results summary for students 17 to 18 years (STAMPP vs EAN)

	EAN	Intervention	Incremental
Annual crime events	176.27	161.46	-14.81
Annual hospital events	62.37	57.13	-5.24
Annual unprotected sex events	39.71	36.37	-3.34
Annual crime costs	£197,045	£180,493	-£16,552
Annual hospital costs	£51,828	£47,475	-£4,354
Annual unprotected sex costs	£2,640	£2,418	-£222
Annual intervention cost	£0	£15,000	£15,000
Total	**£251,514**	**£245,387**	**-£6,127**

Note: 305 of the 1000 students modelled in this age range were estimated to engage in problematic drinking.

Table 3.5: Results summary for students 11 to 18 years (STAMPP vs EAN)

	EAN	Intervention	Incremental
Annual crime events	84.21	77.14	-7.07
Annual hospital events	29.80	27.29	-2.50
Annual unprotected sex events	18.97	17.38	-1.59
Annual crime costs	£94,140	£86,232	-£7,908
Annual hospital costs	£24,761	£22,681	-£2,080
Annual unprotected sex costs	£1,261	£1,155	-£106
Annual intervention cost	£0	£15,000	£15,000
Total	**£120,162**	**£125,069**	**£4,906**

Note: 146 of the 1000 students modelled in this age range were estimated to engage in problematic drinking.

3.1.2 Other Interventions

The other interventions included within the model were STARS, Alcoholic alert and Climate. These interventions were not cost-saving for any of the age groups included. Results for the age groups that the interventions were applied to are presented in full in Table 3.6, Table 3.7, Table 3.9, Table 3.10, Table 3.12 and Table 3.13. The total costs for the remaining age groups are displayed in Table 3.8, Table 3.11 and Table 3.14.

The Climate intervention displayed a consistently low incremental cost. However, the intervention does not reduce problematic drinking. The low incremental cost is due to the low intervention cost. However, this was likely underestimated for the Climate intervention due to a lack of available data. Further limitations of the model are discussed within Section 4.

STARS

Table 3.6: Results summary for students 11 to 12 years (STARS vs EAN)

	EAN	Intervention	Incremental
Annual crime events	2.60	2.51	-0.10
Annual hospital events	0.92	0.89	-0.03
Annual unprotected sex events	0.59	0.56	-0.02
Annual crime costs	£2,911	£2,803	-£108
Annual hospital costs	£766	£737	-£28
Annual unprotected sex costs	£39	£38	-£1
Annual intervention cost	£0	£20,300	£20,300
Total	**£3,715**	**£23,877**	**£20,162**

Table 3.7: Results summary for students 13 to 14 years (STARS vs EAN)

	EAN	Intervention	Incremental
Annual crime events	49.35	47.52	-1.83
Annual hospital events	17.46	16.81	-0.65
Annual unprotected sex events	11.12	10.70	-0.41
Annual crime costs	£55,167	£53,118	-£2,049
Annual hospital costs	£14,511	£13,972	-£539
Annual unprotected sex costs	£739	£712	-£27
Annual intervention cost	£0	£20,300	£20,300
Total	**£70,417**	**£88,101**	**£17,685**

Table 3.8: Total costs for each remaining subgroups (STARS vs EAN)

Subgroup	EAN (total cost)	Intervention (total cost)	Incremental
15 to 16 years	£155,003	£169,546	£14,543
17 to 18 years	£251,514	£262,472	£10,958
11 to 18 years	£120,162	£135,999	£15,837

Alcoholic alert

Table 3.9: Results summary for students 15 to 16 years (Alcoholic alert vs EAN)

	EAN	Intervention	Incremental
Annual crime events	108.63	89.13	-19.50
Annual hospital events	38.44	31.54	-6.90
Annual unprotected sex events	24.47	20.08	-4.39
Annual crime costs	£121,435	£99,639	-£21,796
Annual hospital costs	£31,941	£26,208	-£5,733
Annual unprotected sex costs	£1,627	£1,335	-£292
Annual intervention cost	£0	£47,099	£47,099
Total	**£155,003**	**£174,280**	**£19,278**

Table 3.10: Results summary for students 17 to 18 years (Alcoholic alert vs EAN)

	EAN	Intervention	Incremental
Annual crime events	176.27	144.63	-31.64
Annual hospital events	62.37	51.17	-11.19
Annual unprotected sex events	39.71	32.58	-7.13
Annual crime costs	£197,045	£161,678	-£35,367
Annual hospital costs	£51,828	£42,526	-£9,303
Annual unprotected sex costs	£2,640	£2,166	-£474
Annual intervention cost	£0	£47,099	£47,099
Total	**£251,514**	**£253,469**	**£1,955**

Table 3.11: Total costs for remaining subgroups (Alcoholic alert vs EAN)

Subgroup	EAN (total cost)	Intervention (total cost)	Incremental
11 to 12 years	£3,715	£50,147	£46,432
13 to 14 years	£70,417	£104,877	£34,460
11 to 18 years	£120,162	£145,693	£25,531

Climate

Table 3.12: Results summary for students 11 to 12 years (Climate vs EAN)

	EAN	Intervention	Incremental
Annual crime events	2.60	2.61	0.00
Annual hospital events	0.92	0.92	0.00
Annual unprotected sex events	0.59	0.59	0.00
Annual crime costs	£2,911	£2,916	£5
Annual hospital costs	£766	£767	£1
Annual unprotected sex costs	£39	£39	£0
Annual intervention cost	£0	£521	£521
Total	**£3,715**	**£4,243**	**£528**

Table 3.13: Results summary for students 13 to 14 years (Climate vs EAN)

	EAN	Intervention	Incremental
Annual crime events	49.35	49.44	0.09
Annual hospital events	17.46	17.49	0.03
Annual unprotected sex events	11.12	11.14	0.02
Annual crime costs	£55,167	£55,268	£101
Annual hospital costs	£14,511	£14,537	£27
Annual unprotected sex costs	£739	£741	£1
Annual intervention cost	£0	£521	£521
Total	**£70,417**	**£71,067**	**£650**

Table 3.14: Total costs for each subgroup (Climate vs EAN)

Subgroup	EAN (total cost)	Intervention (total cost)	Incremental
15 to 16 years	£155,003	£155,808	£805
17 to 18 years	£251,514	£252,496	£982
11 to 18 years	£120,162	£120,904	£741

3.2 SENSITIVITY ANALYSIS

The parameters varied within the sensitivity analysis included: the effectiveness of the interventions in reducing problematic drinking, the number of events for each intermediate outcome and the cost of the intervention. Each parameter was varied ±50% in order to determine the effect on the incremental total cost. The total cost included the cost of the intervention and the costs of the intermediate outcomes (crime, hospitalisation and unprotected sex). The 50% range was chosen to reflect the considerable uncertainty around these inputs. Each parameter was varied on the x-axis and the effect on the incremental total cost can be observed, which was included on the y-axis. For example, in Figure 3.1 as the annual intervention cost was increased the incremental total cost increased.

STAMPP

The STAMPP intervention was applied to students aged between 12 and 14 years. Therefore, the subgroups 11 to 12 and 13 to 14 years were most relevant. The results for these age groups (Figure 3.1) suggest that the intervention is unlikely to be cost-saving. However, results suggest that the intervention may be cost-saving for 13 to 14 year olds when the crime events are reduced to around three or fewer per month (base case: 3.77). This is likely because of the high unit cost attributed to crime events (£1,118). The likelihood of the intervention being cost-saving increases as the age of the subgroup increases with the results for 17 to 18 year olds suggesting that the intervention is likely to be cost-saving until the intervention cost surpasses approximately £21,000 (base case: £15,000).

STARS

The STARS intervention was delivered to students aged around 11 to 13 years. The results for the age group 11 to 12 (Figure 3.2) suggest that the intervention is unlikely to be cost-saving when any of the parameters are varied. Although the results for some older age groups (15 to 16 and 17 to 18 year olds) suggest that the intervention may be cost-saving when the number of hospital events is reduced. Furthermore, the results for all other age groups suggest that the intervention may be cost-saving when the number of crime events is reduced. Conversely, varying the number of unprotected sex events does not substantially alter the incremental total cost. This is because the unit cost associated with an unprotected sex event is low (£66.49) so cannot outweigh the intervention cost (£20,300).

Alcoholic alert

The Alcoholic alert intervention was delivered to students aged between 15 and 19 years. Therefore, the subgroups 15 to 16 and 17 to 18 were most relevant. Results for the 15 to 16 year olds (Figure 3.3) suggest that the intervention is only cost-saving when the intervention cost is considerably reduced to around £28,000 (base case: £47,099). Whereas the intervention is only predicted to be cost-saving for 17 to 18 year olds when the intervention cost is reduced to around £45,000. The results for the age group 15 to 16 years suggest that the intervention may be cost-saving when the number of crime events is reduced. All parameters when varied, apart from the number of unprotected sex events, suggest that the intervention may be cost-saving for 17 to 18 year olds.

Climate

The Climate intervention was applied to students around 12 to 14 years of age. Therefore, the subgroups 11 to 12 and 13 to 14 years were most relevant. The results for these age groups (Figure 3.4) suggest that the intervention may be cost-saving in some instances when the number of hospital and crime events are reduced. However, the effectiveness study [9] highlighted that the intervention was associated with a marginal increase in problematic drinking and the intervention cost was likely underestimated (see Section 2.2.4) so these results should be interpreted with caution.

Figure 3.1: STAMPP sensitivity analysis

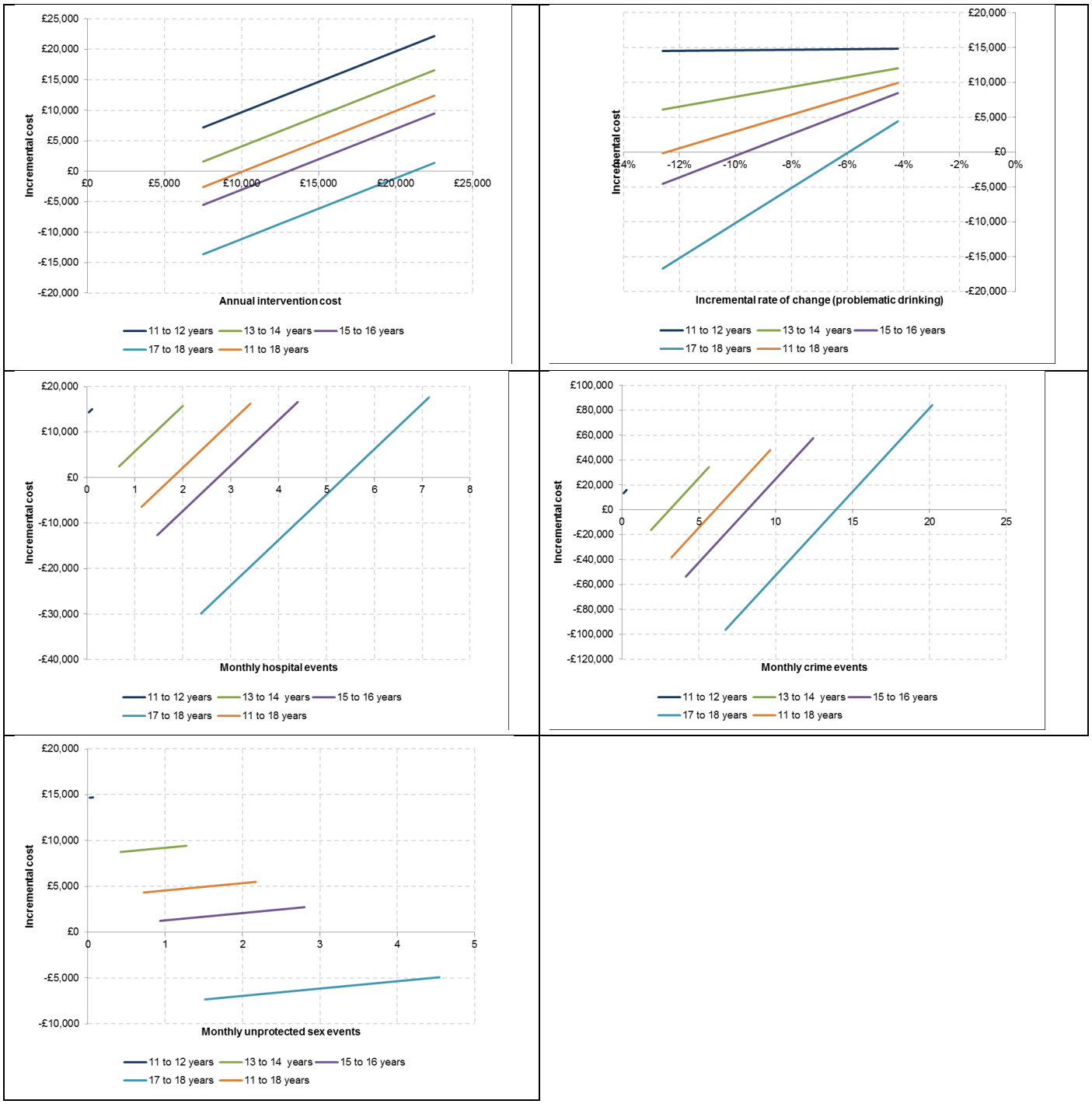


Figure 3.2: STARS sensitivity analysis

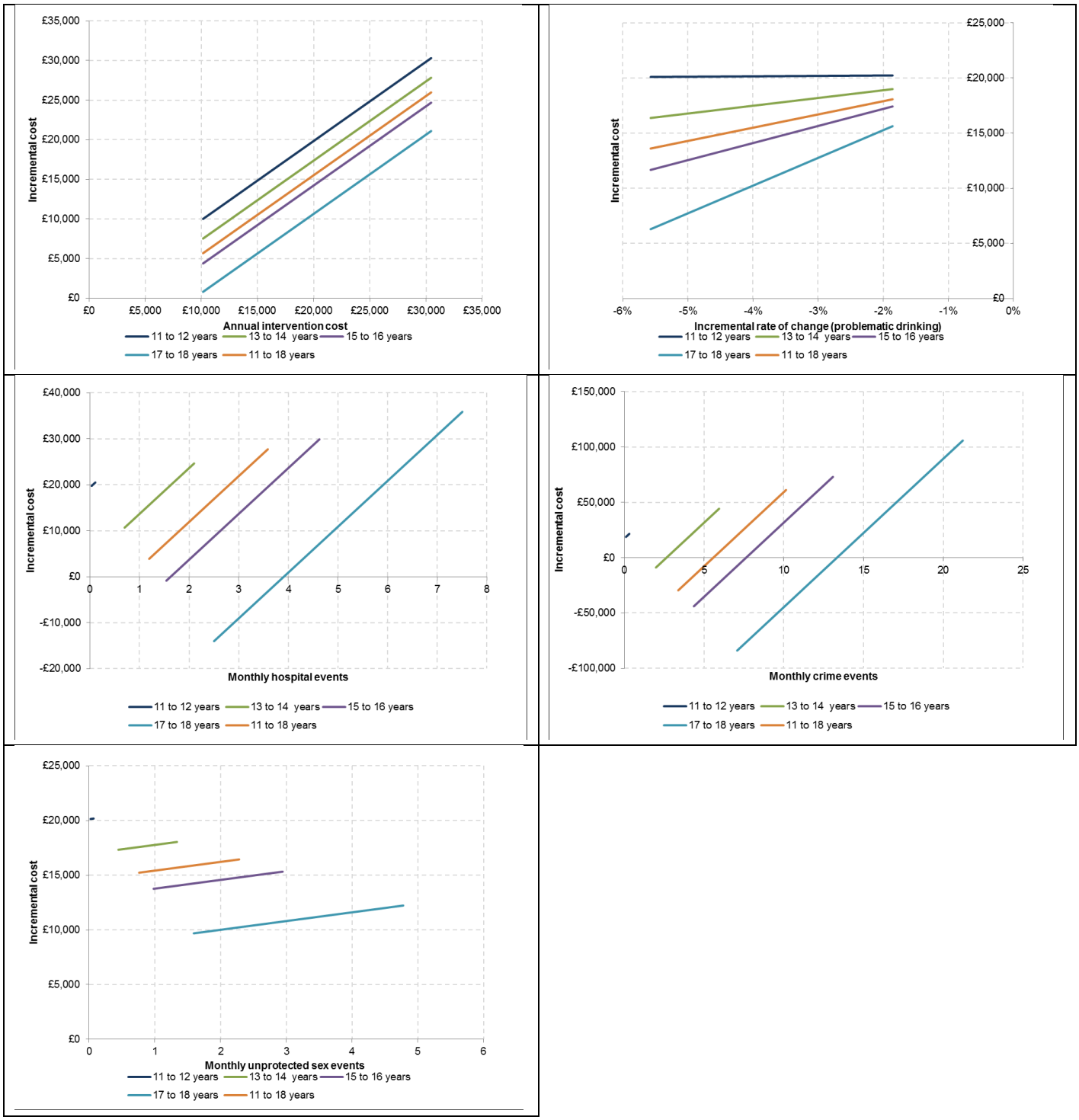


Figure 3.3: Alcoholic alert sensitivity analysis

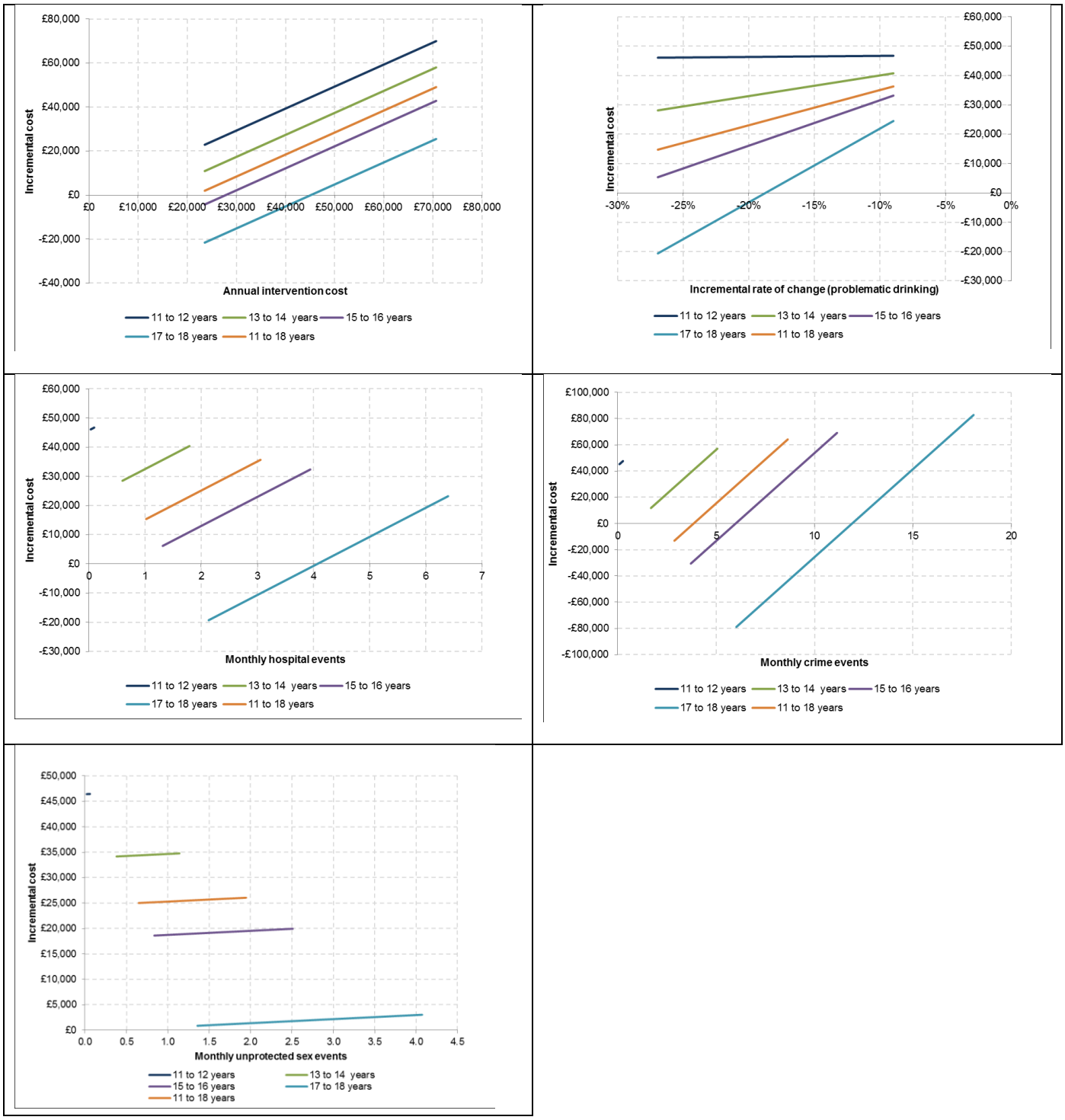
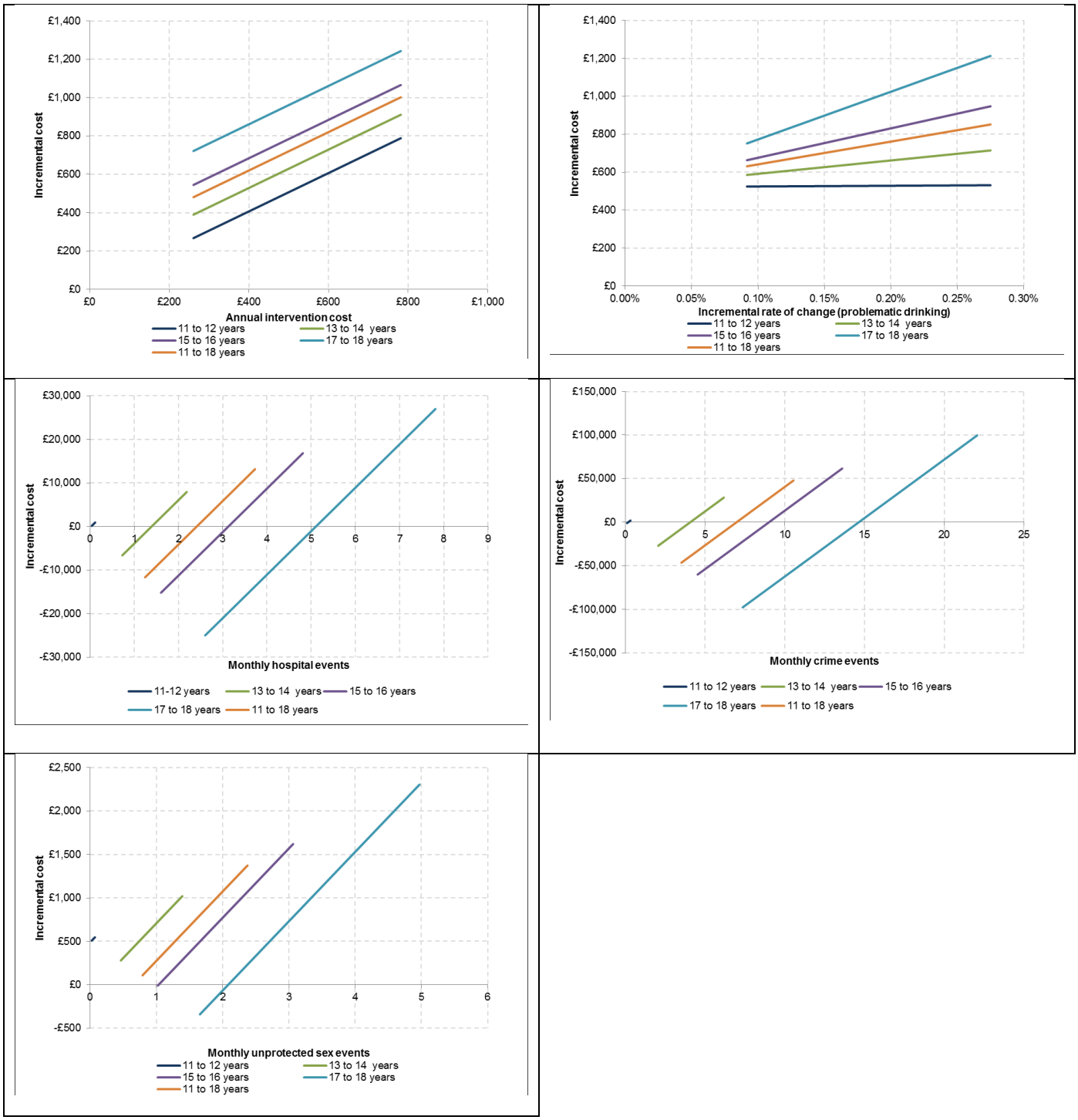


Figure 3.4: Climate sensitivity analysis



3.3 ADVERSE OR UNINTENDED EFFECTS

Adverse or unintended effects of the included interventions were not included in the model because they were not explicitly analysed in the effectiveness studies. However, a number of potential negative effects have been identified after reviewing the studies and are, therefore, outlined subsequently.

STAMPP

No adverse or unintended effects were reported in the STAMPP effectiveness study.

STARS

No adverse or unintended effects were reported in the STARS effectiveness study.

Alcoholic Alert

The results of the Alcoholic Alert intervention show the greatest reduction in problematic drinking. However, the costing analysis within the effectiveness study [8] displayed a significantly higher cost, relating to cigarettes, within the intervention group (€30.68) compared with the control group (€18.82). This pattern was also seen for costs associated with hard drug use, although the difference was less substantial, with costs of €1.15 and €0.20 for the intervention and control group respectively. However, the "Hard drugs" costs were quite low overall for both groups. This pattern was seen consistently within the study with adolescents within the intervention group also incurring higher costs in other areas such as mental health care, child health protection services and work absenteeism. Although, resource use was only measured through cost and no other effectiveness studies recorded these measures so the results of the costing analysis could not be compared.

Climate Schools

The effectiveness study [9] reported that participants in the intervention group had significantly greater alcohol and cannabis knowledge, were less likely to have consumed any alcohol and were less likely to intend on using alcohol in the future. However, the intervention was not successful in having a significant effect on binge drinking. This is labelled as "problematic drinking" within the current analysis. Instead, the results of the Climate schools intervention show a small increase in problematic drinking in relation to the control group of 0.2%.

Section 4: Discussion

4.1 OVERVIEW

There is a paucity of data, especially UK based data, in this subject area. When trying to address the specific research questions from the final scope there was considerable uncertainty and required a number of assumptions. The lack of data in the SEND population meant that NICE recommended there would be too many unknown assumptions for this population to be included in the model. The age-specific data showed heterogeneity across the different age groups meaning one meaningful result could not be applied across all ages. However, there were some results showing some interventions were more likely to be cost-effective in 17 to 18 year olds than 11 to 12 year olds.

This economic evaluation can be used to demonstrate the estimated base case cost-effectiveness of an intervention designed to reduce problematic drinking, given its effectiveness and cost. Cost-effectiveness in this model is measured through the costs and savings associated with the intervention including the cost offsets resulting from the intervention. The reported results show whether the intervention is likely to be cost-saving given a certain set of assumptions. This does not report on whether interventions that have an associated net cost are value for money. For example, the STARS intervention has a net incremental cost for 1000 students aged between 11 and 18 of approximately £16,000. The STARS intervention also avoids approximately three crime events and one hospitalisation. It may be considered cost-effective to spend £16,000 to avoid those four events but is not cost-saving. It is important to consider the ranges provided in the sensitivity analysis given the high levels of uncertainty around many of the assumptions.

The results show that, as would be expected, the cost of the intervention is a key driver of overall cost. The number of crime and hospital events also significantly affect the results due to their high associated costs. Furthermore, interventions are most likely to be cost-saving in students aged between 17 and 18 years, because baseline problematic drinking is highest in this subgroup. Interventions were least cost-saving when applied to students aged between 11 and 12 years. Problematic drinking within this age group was minimal (0.5%). Therefore, the reduction in intermediate outcomes is less likely to outweigh the cost of the intervention.

For most interventions, the direction of the results of the sensitivity analysis displayed in each set of graphs follow the same pattern. For example, an increasingly negative incremental rate of change or a reduction in intervention cost or intermediate outcomes results in a reduction in the incremental total cost. The incremental rate of change was calculated based on the difference in problematic drinking between the intervention and control arm of each effectiveness study. The difference between the two arms was adjusted based on the rate of problematic drinking at baseline. The use of incremental rate of change captured the change in problematic drinking as a result of the intervention, factoring in that the students will get older over the duration of the study and problematic drinking increases with age [4]. A negative incremental rate of change indicates that there was a reduction in problematic drinking in the intervention group in relation to the control group, but does not mean there was an absolute decrease in alcohol consumed in the intervention arm. A negative incremental rate of change is more likely to show a slower rate of increase in problematic drinking events when compared to the control group.

The graphs also show that, in most instances, when the age of the group is increased the incremental total cost is reduced. This is due to baseline problematic drinking increasing with age. Therefore, the percentage reductions in problematic drinking applied directly to intermediate outcomes have a bigger impact on overall cost. This pattern is not displayed for the Climate intervention as the incremental rate of change is positive. Therefore, the small percentage increase in problematic drinking observed for this intervention has a larger effect when applied to the higher baseline drinking rates of the older age groups.

4.2 LIMITATIONS

The model assumes that a change in problematic drinking results in a direct change in the intermediate outcomes that are a result of problematic drinking. However, the results of the STAMPP effectiveness study [11] showed that, although the intervention was effective in reducing problematic drinking, there was no significant difference in self-reported harms (e.g. getting into fights, damaging property or having a hangover) between the intervention and control group at the 33-month follow-up point. If these data were used, it would mean that there was a reduction in problematic drinking following the STAMPP intervention but not in the included intermediate outcomes, such as hospitalisation. Therefore, the results would include the additional cost of the intervention but no additional benefit beyond the reduction in problematic drinking for a proportion of the study participants. Furthermore, although this result cannot be generalised to other interventions it does challenge the underlying assumption regarding the relationship between changes in problematic drinking and changes in associated outcomes.

The baseline drinking behaviour was estimated based on data from the 2016 SDDS [4] which surveyed 11 to 15 year olds. It was therefore necessary to extrapolate the data, using statistical analyses described further in Section 2.2.1, to estimate drinking behaviour in students aged up to 18 years. The millennium cohort study (MCS) follows the lives of around 19,000 young people born in England, Scotland, Wales and Northern Ireland in 2000/01 [31]. The cohort has been surveyed at several time points including: age 11, age 14 and age 17. The survey includes questions on physical, socio-emotional, cognitive and behavioural development, including drinking behaviour. The problematic drinking rates for 11 and 14 year olds [32, 33] within the MCS are similar to those reported from the SDDS [4]. However, the extrapolation of the SDDS data to age 17 predicted a problematic drinking rate of 29.97% but initial findings of the most recent sweep of the MCS cohort (unpublished) suggest that the rate of problematic drinking remains around 10%. There are differences in how problematic drinking is assessed within each survey. The SDDS asks whether the responder has been "drunk" in the 28 days prior to survey completion whereas the survey for the MCS asks whether the responder has ever drank five or more drinks at a time. If the model has overestimated baseline problematic drinking then this would also overestimate the cost saved by implementing each intervention. However, the current results show that the interventions are not cost-saving in almost all cases so a decrease in baseline problematic drinking would only result in the interventions incurring further cost.

The model currently only includes universal interventions which are applied to all students. One targeted intervention, screening followed by a brief alcohol intervention (SIPS JR-HIGH)[34], was provided by NICE for consideration. However, as the study concluded that the intervention did not significantly affect alcohol consumption and the outcome measures within the study did not align with those within the model, the targeted intervention was not included. Although, the model does have the functionality to include a targeted intervention should the appropriate data become available.

Furthermore, the follow up periods included within each effectiveness study varied significantly from 4 months to 33 months. This was dependent on factors such as the duration of the intervention. Variation in the duration from the beginning of the intervention to the point when drinking behaviour is recorded could significantly affect the results. However, due to the variation in follow up points between interventions this could not be controlled for.

The age of the students involved in each intervention also significantly varied. However, due to the paucity of data, it was necessary to assume the same intervention effect, irrespective of the age group selected within the model. In practice this may not be the case. The results of the report outlined in Section 3: therefore, place emphasis on the age groups included in the relevant effectiveness studies because this is the age group that the results are likely to be most accurate for.

As mentioned previously, the results showed that interventions were least likely to be cost-effective for younger age groups. However, due to the short time horizon of the model (one year) and because it only factors in drinking at problematic levels, it does not capture the potential preventative effect of applying interventions to younger age groups. For example, interventions may delay the onset of drinking although there was insufficient evidence to capture this in the model. It was also not possible due to the short time horizon and a lack of evidence to assess the long-term impacts of alcohol use during adolescence.

Furthermore, the use of problematic drinking as the measure of effectiveness may not be relevant for all interventions. For example, if the intervention is predominantly aimed at improving alcohol-related education and skill development, measuring the rate of problematic drinking may not capture the benefit of the intervention. This may be relevant for the younger age groups in particular because only a small proportion of the group are engaging in problematic drinking [4]. In this instance, age of first drink may be a more relevant measure of effectiveness.

There was a general issue of paucity of the data needed to generate model inputs. This meant that we could not determine the cost-effectiveness of the intervention in a SEND population, as described in the final scope [3]. Furthermore, as there were no appropriate data on certain intermediate outcomes, such as truancy, these could not be included in the model although included in the final scope.

The effectiveness studies utilised within the model were also based in different countries such as the United States and Australia. There is no reason to believe that the efficacy of the interventions will not be generalisable to the United Kingdom, however, this has not been confirmed. Similarly to the United Kingdom, evidence suggests that alcohol use in young people is on a downward trend in all of the countries where the interventions were based [4, 35-37].

Furthermore, it is possible that the control condition typically “education as normal” will be significantly different to that utilised within the United Kingdom. Within the United Kingdom, alcohol education is included within PSHE. However, education as normal was not always explicitly described within the effectiveness studies based in alternate countries. If this is less effective in other countries than PSHE then this could mean that applying the incremental effectiveness to a UK population could overestimate the intervention’s effectiveness.

Another consideration that is not included in the model is that there has been a downward trend in alcohol use in the 11 to 18 year old population over the last 15 years [4]. This may be due to effective school-based interventions already in place during that period. Researchers acknowledge the cause of this downward trend has not been fully investigated [38]. However, this downward trend likely means that the comparator arm in our model may already be relatively effective at reducing problematic drinking.

4.3 CONCLUSION

The specific results of the model should be interpreted with caution due to the limitations described above. However, the analysis presented here provides valuable information on the relationship between the cost-effectiveness of potential interventions and their characteristics, namely their cost and the reductions in problematic drinking they generate. We can also identify certain patterns in the data such as the effectiveness is likely to be greater in the populations with higher baseline levels of drinking (e.g. the 17 to 18 year old age group).

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