

**Cost-effectiveness of universal interventions which aim to promote emotional and social wellbeing in secondary schools.**

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## **CONTENTS**

### **EXECUTIVE SUMMARY**

#### **1. INTRODUCTION**

#### **2. REVIEW OF PREVIOUS ECONOMIC STUDIES**

#### **3. ECONOMIC MODEL - PROBLEM STRUCTURING**

#### **4. ECONOMIC MODEL - EVIDENCE**

#### **5. RESULTS**

#### **6. DISCUSSION**

#### **7. CONCLUSION**

## **EXECUTIVE SUMMARY**

An economic model was developed in order to estimate the cost-effectiveness of whole school interventions to promote emotional and social well-being in secondary schools. More specifically, due to the evidence available and its relevance to UK schools, a model was developed which provides a framework for assessing the impact of interventions to prevent bullying victimisation. The model incorporates evidence that bullying victimisation has a negative effect on both educational outcomes and, independently of educational attainment, also on adult wages. The effect of educational attainment and income on mortality are estimated. The model also uses evidence of the effect of childhood abuse on adult health-related quality of life.

The evidence for the effectiveness of interventions is poor for several reasons. It is very heterogenous in terms of the objectives of the interventions, the types of intervention and the outcomes measured. The interventions are not well defined and the evidence is of mixed quality (see systematic review). It was therefore not possible to synthesise the study results. Only better quality positive impact studies were considered for evidence of effect size for the economic model. Of these only one reported results from which it was possible to infer the effectiveness of an intervention in reducing the proportion of children victimised (Evers et al. 2007). Thus the baseline model results may be interpreted as illustrating what the cost-effectiveness of an intervention might be, *if* effective.

In common with most studies the outcomes in the Evers study were measured shortly after the intervention. The results suggest the intervention reduced the proportion of children victimised by 21-22%. For the model baseline it has been assumed that a reduction of 15% might be sustained, assuming an ongoing intervention programme.

Several other assumptions have been made in developing the economic model. Critical amongst these are that the results of the study used as the basis of the

relationship between victimisation and adult outcomes (based on a population born in 1958) are generalisable to modern cohorts, in schools with varying prevalences of bullying, and that changing victimisation levels will result in the estimated change in outcomes i.e that the study results are unbiased estimates of the direct relationship between victimisation and adult outcomes.

Interventions aimed at bullying or conflict resolution were either a limited number of classroom sessions and/or a peer mediation programme. It has been assumed for the costing of the intervention that in order to achieve a sustained reduction in victimisation an ongoing programme consisting of both a classroom intervention and training of a small group of peer mediators is required. A small time saving for teachers resulting from a reduced number of incidents requiring their intervention has also been included.

The estimated net total cost for a school with 600 pupils aged 11-16 is £9,300 per year, or £15.50 per pupil per year. The model results show that *if* the intervention is effective in delivering a sustained reduction of victimisation of 15%, the ICER is £9,600 per QALY. At a threshold of £20,000 it is 82% probable that the intervention is cost-effective, and at a threshold of £30,000, 92% probable.

The estimation of the effectiveness of an anti-bullying intervention is based on very limited evidence, and estimates of victimisation prevalence are highly variable. A sensitivity analysis on these two key parameters show that for a cost-effectiveness threshold of £20,000 an intervention which is 5% effective in reducing victimisation is only cost-effective if initial victimisation prevalence is greater than 35%, whereas an intervention that is 20% effective is cost-effective with victimisation prevalence greater than 10%. This relationship is illustrated in Figure 3, Section 4.2.2.

Given the uncertainty around effectiveness of an intervention it is recommended that schools monitor victimisation to establish initial levels and whether any interventions they introduce are effective.

## **1. INTRODUCTION**

This study was undertaken to support the development of NICE guidance on promoting emotional and social well-being in secondary schools. It was undertaken in parallel with a systematic review of the published literature of the effectiveness of school-based interventions to modify behaviour in children attending secondary schools. The systematic review focuses on universal approaches to promoting prosocial skills and the prevention of bullying and disruptive behaviour, with wellbeing outcomes. Interventions with specific mental wellbeing objectives and healthy schools/school safety were excluded from the systematic review. This study comprises a review of previous economic studies of such interventions and a novel economic analysis based on the literature identified by the systematic review.

## **2. REVIEW OF PREVIOUS ECONOMIC STUDIES**

### **2.1 METHODS**

To retrieve papers on the economics of interventions designed to improve prosocial behaviours and/or prevent bullying and disruptive behaviours, the searches in Iteration Two of the systematic review of effectiveness were rerun in economic databases (EconLit, NHS EED). Iteration one of the systematic review search was used to map potential interventions to be considered, whilst iteration two focused on interventions to address prosocial behaviours and skills, bullying and disruptive behaviours. For more details see the Systematic Review. For the search strategy see Iteration 1, Appendix 1. All studies were selected at abstract sifting of direct relevance to secondary school interventions, or that might contribute to linked themes in an economic model. Studies were not excluded at abstract stage for lack of economics in the abstract. The effectiveness reviewers also provisionally retained any papers with potential economic content that were identified by the effectiveness searches for consideration for inclusion in the economic review.

## **2.2 RESULTS**

A total of 53 studies were identified by the search of economic databases. None presented an economic analysis of a school intervention. Of twelve initially selected as being potentially relevant to broader issues in the economic modelling only two included any economic analysis, neither of which proved pertinent (Economic analysis of a pre-school intervention(Manning, Homel, & Smith 2006), suicide prevention(Sari, de Castro, & Newman 2008)).

## **3. ECONOMIC MODEL – PROBLEM STRUCTURING**

### **3.1 METHODS OVERVIEW**

In this section the work undertaken to develop the approach to the analysis are described. The final approach was partially dependent on what was found: in the systematic review of the evidence for intervention effectiveness, in subsequent searches to link intervention outcomes to those of interest from the cost-effectiveness modelling point of view, and the availability of additional primary data that might inform the model. Two general approaches were outlined in the protocol.

#### Primary data analysis

It was known by the authors that the British Household Panel Survey (BHPS) collected data on youths and also utility on adults. It was thought that this might potentially allow analysis of the relationship between well-being in childhood and adult health-related utility.

#### Literature based analysis

Literature that links short-term study outcomes with adult outcomes, including utilities would be sought. It was anticipated that some intervention outcomes that were not within the scope of the systematic review, such as educational attainment, might nevertheless be critical in linking the effectiveness of school

interventions with adult outcomes. It was envisaged that a network of links would be required in order to be able to estimate health economic outcomes.

The primary perspective of the analysis is the education system, NHS and PSS. The intervention costs are likely to be incurred principally by the education system, whereas successful interventions may result in changed demand for NHS and PSS services.

The results of the exploratory work leading to the final modelling approach adopted are described in Sections 3.2 and 3.3.

### **3.2 PRIMARY DATA ANALYSIS**

The British Household Panel Survey (BHPS) is an annual survey undertaken on a sample of British households recruited in 1991 (BHPS 2008). The original cohort consisted of approximately 10,000 individuals. Since 1994 youths aged 11 to 15 are also included, completing a youth questionnaire. Since 1995 youths have consistently been asked how much they worry about bullying at school. Individuals who leave the original household are followed up and their new households included in the survey. Data has been collected on a wide range of issues including family life, employment, income, social relationships, use of technology and health. Each year different topics are explored in more detail. In fact data on adult health-related quality of life (measured using the SF-36) was only collected in two waves: in 1999 and 2004. In the years 1994 to 1997 the number of children who responded to the questionnaire each year was around 750 (Taylor et al. 2008). Given the small effect size in utility expected, and the large number of confounding factors the data available was considered insufficient to warrant further investigation.

Other longitudinal datasets listed on the Economic and Social Data Service (ESDS) website were also considered (Economic and Social Data Service 2008). As well as the BHPS six other datasets are listed. Of these, only two have data



on both youths and adults: the 1970 British Cohort Study (BCS70) and the National Child Development Study (NCDS).

#### *1970 British Cohort Study (BCS70)*

This study followed individuals born in a week in 1970 at ages 5, 10, 16, 26, 30 and 34. There are no youth questions on bullying or violent behaviour, but does record criminal behaviour. Self -assessed health was measured in adults at ages 26 and 30.

#### *National Child Development Study (NCDS)*

The NCDS follows a cohort of children born in a particular week in March 1958. Participants were followed at ages 7, 11, 16, 23, 33 and 42. Parents of children were asked about whether they were bullied at ages seven and 11, and also about bullying behaviour at age 16. Other questions included fighting with other children and destruction of either their own, or others', belongings. Self -assessed health was measured in adults.

A study was identified in the literature searches which used NCDS data to examine the relationship between bullying victimisation, bullying and educational attainment and adult income (see Section 3.3.1). Given the short timescales of the study, the availability of a published analysis which relates bullying behaviours to adult outcomes, and the lack of data to explore a direct relationship between bullying behaviours and adult utility, it was decided to pursue a literature-based approach to the economic analysis.

### **3.3 LITERATURE BASED ANALYSIS**

#### **3.3.1 Literature searches**

Searches were conducted to retrieve papers on longitudinal studies that linked children's negative behaviours with various outcomes in later life, for example, health, employment and relationship status. Search terms relating to longitudinal

studies were also included. The search was undertaken on Medline and the Social Science Citation Index. See Iteration 2, Appendix 1 for the full search strategy. The search retrieved 392 references.

Thirty-two references were selected as being of potential interest. With the outcomes of the intervention studies as yet unknown when the selection was made, the selection was very inclusive. Citation searching was then undertaken on these papers, yielding an additional 200 references, giving a total of 592 references.

The intervention studies included in the systematic review were examined for reported intervention effect sizes that might be useful to the economic study. These studies included interventions aimed at the prevention of bullying, studies addressing a wide range of negative behaviours including violence and substance abuse, as well as studies of interventions to promote prosocial behaviours (see section 4.1).

The literature identified in the searches was sifted to identify studies that related the short-term, limited outcomes reported by the intervention studies to broader outcomes relevant to an economic analysis.

The outcomes of the intervention studies are extremely heterogenous. Most report outcomes in terms of scores, either based on questions regarding individual behaviour on a range of items, or based on frequencies of occurrences of e.g. bullying or victimisation. None of them used established measures e.g. of self esteem. No literature was identified which related any of the scoring systems used in the intervention studies to other outcomes. After examination of the intervention studies (see Appendix 2) bullying and drug abuse emerged as the only behaviours for which it was possible to estimate an intervention effect size. The project timescales dictated that the economic study had to commence in parallel with the effectiveness review, so the outcome measure of the

intervention studies had to a certain extent be anticipated. Bullying emerged relatively early in the systematic review process as a probable dominant theme of the analysis, and this informed the path taken in the development of the economic model. The evidence for bullying victimisation is discussed in Section 4.1 – A. The Case Study report shows that interventions to modify bullying behaviour are relevant to current programmes in schools.

Flay (Flay, Graumlich, & et al 2004) reported a significant reduction in the proportion of boys (but not girls) reporting substance use in deprived African-American pupils in Chicago. The intervention was aimed at addressing a wide range of risk behaviours including violence, substance use, sexual intercourse and condom use, but achieved significant results only for a minority of behaviours, and in boys only. It was more successful in combination with a community intervention. The school intervention was more intensive (16-21 lessons per year) than anti-bullying interventions. The results are of more limited relevance to the scope of this study and was not possible to pursue this within the timescales of the project.

From the searches two studies were identified which were particularly relevant to the estimation of the effects of bullying on victims' life course. The first, Brown and Taylor (Brown & Taylor 2008), estimates of the effect of bullying on educational attainment and income, outcomes for which it seemed plausible there may be lifetime mortality risk and health-related quality of life consequences. A further focussed search was undertaken for literature to establish if this was the case, and to estimate the effect size. These searches are shown in Appendix 1, Iteration 4. The second study (Corso et al. 2008), relates adult utility with recall of experience of childhood maltreatment. The studies are discussed in more detail in Section 4.1, where the model inputs are described.

The results of these studies were used to estimate the effect of changes in victimisation prevalence on quality adjusted life years (QALYs). The evidence

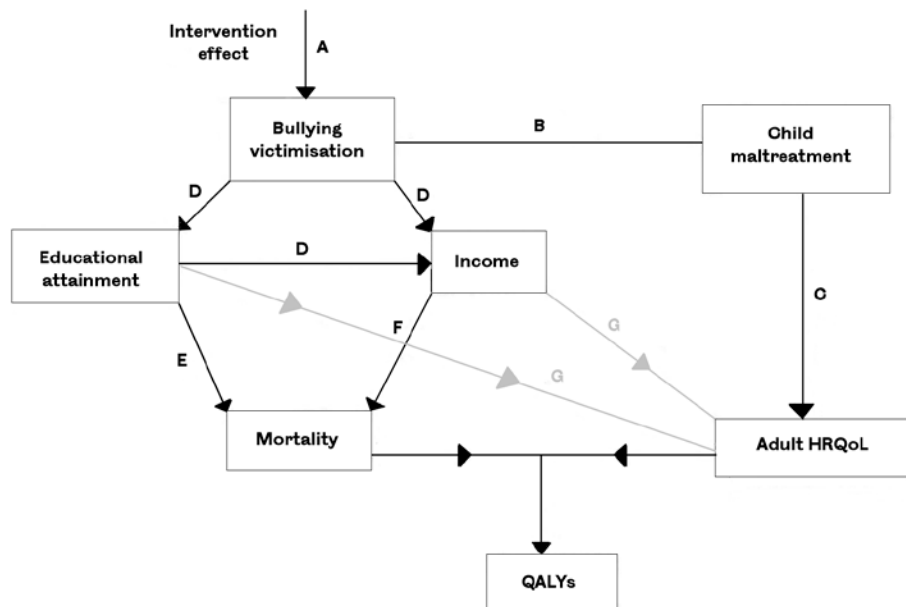
structure used in the model is illustrated in Figure 1. The letters against the arrows correspond to the letters in Section 4 to identify the description of the evidence used for each link in the model.

The timeframe of the model is lifetime, and the primary perspective of the economic analysis is the education system, NHS and PSS. The perspective of the individual victim is also considered.

Other references identified from the searches, together with additional material, were used to provide an overview of the literature of the broader short- and long - term effects of bullying on victims and perpetrators. See Section 5.1.

Figure 1

**Schematic of QALY estimation in the cost-effectiveness model**



**4.0 ECONOMIC MODEL – EVIDENCE**

**4.1 QALY ESTIMATION**

### **A Intervention Effectiveness**

Studies quality rated as at least + and showing significant positive results on at least some outcome measures (impact A or B) in the systematic review were considered for evidence of effectiveness that could be used in an economic evaluation. For interventions to avoid negative behaviours these studies are Evers (Evers, Prochaska, Van Marter, Johnson, & Prochaska 2007), Baldry (Baldry & Farrington 2004), Flay (Flay, Graumlich, & et al 2004), Farrell (Farrell & Meyer 1997), O'Donnell (O'Donnell, Stueve, & et al 1999) and Komro (Komro et al. 2004). However, the latter two studies were only effective in combination with a community intervention which is outside the scope of this analysis, so they were not considered further. Whilst Evers and Baldry are concerned with bullying and victimisation, Flay and Farrell studied violent behaviour. Violent behaviour as defined in these studies shares common elements with bullying (physical violence) but also includes more extreme behaviour such as carrying weapons, and does not always include verbal aggression. None of them include rejection. Flay and Farrell also include other problem behaviour including drug use. Studies of interventions to promote positive behaviours are Stevahn (Stevahn & And 1996), Stevahn (Stevahn et al. 2002) and Smith (Smith et al. 2002).

All intervention studies are from the US, with the exception of Baldry (Baldry & Farrington 2004)(Italy). The studies are each discussed in Appendix 2, with emphasis on the effect size of outcomes relevant to the economic analysis.

In fact it was possible to estimate an effect size for bullying victimisation from only one published study, that of Evers (Evers, Prochaska, Van Marter, Johnson, & Prochaska 2007). Supporting (weak) evidence from a case study is also presented.

**Evers** (Evers, Prochaska, Van Marter, Johnson, & Prochaska 2007) (Impact A, population: US - mixed rural, suburban, urban)

Study participants, recruited from 12 middle schools (grades 6-8) and 13 high schools were given the opportunity to interact with an Internet-based expert system on three occasions. Participant's families were given a guide to the programme, and teachers were given a staff guide. The teachers' main responsibility was to support students in using the Internet programme, but additional worksheets were available to them if they chose to use them. Teachers received no training.

Bullying was defined as treating people in mean ways and/or pushing, hitting or kicking people. Bullying behaviours (bully, victim, bystander) were measured prior to the intervention and the reduction in such behaviours compared in 3 groups:

- treatment 1 (intervention, post-test) [N=792]
- treatment 2 (pre-test, intervention, post-test) [N=863]
- control (pre-test, post-test) [N=797]

Thus the difference between treatment groups 1 and 2 was the inclusion of the pre-test in group 2, but not group 1. The results for treatment groups 1 and 2 were very similar. The results of group 2 are used as they are consistent with the pre-testing of the control group. The average time between the last interaction and the post-test assessment was one month.

The initial prevalence of all behaviours (bully, victim, bystander) was high. In high schools there were 70% bullies, 71% of victims and 75% bystanders. In middle schools the proportions of bullies and victims were slightly higher. Overall, only about 10% of pupils did not report any bullying behaviour. Clearly most pupils were involved in several bullying behaviours, but the proportions engaging in multiple roles are not reported. For comparisons of prevalence estimates in UK schools see Section 4.2.1.

To avoid double counting the benefits of reduction in all forms of bullying only one behaviour, victimisation, will be considered for the economic analysis. Table 1 shows the reductions achieved in middle and high school victims following the intervention. In fact the reduction in pupils reporting bullying is very similar.

Table 1 Effect of an anti-bullying intervention (Evers, Prochaska, Van Marter, Johnson, & Prochaska 2007)

|   | <b>Middle School</b> | <b>High school</b>  |
|---|----------------------|---------------------|
| Initial prevalence (%)                          | 81                   | 71                  |
| % change intervention group (I)                 | -35                  | -37                 |
| % change control group (C)                      | -17                  | -22                 |
| <i>p</i> (I vs C)                               | <i>p</i> <0.001      | <i>p</i> <0.001     |
| % relative reduction attributed to intervention | $(35 - 17)/81 = 22$  | $(37 - 22)/71 = 21$ |

Thus in both middle and high schools a reduction in the number of pupils reporting being victimised of 21-22% can be attributed to the intervention. It must be noted however that the prevalence of bullying behaviour reported is very high, possibly due to the broad definition of the behaviour. It cannot be assumed that where reported prevalences of victimisation are much lower that a similar magnitude of intervention effect can be assumed.

Other evidence for the effectiveness of anti-bullying programmes in secondary schools is from a case study identified in the Case Study report. John Hanson Community School, Andover, Hampshire introduced a peer listening initiative, training 22 listeners in year 9 (13-14 year-olds) for 2.5 days. A survey conducted by Hampshire County Council reports 92.6% of pupils in year 9 of this school said they had not been bullied compared to 80.7% of year 9 pupils across all

participating schools. This suggests that a particularly effective implementation of the programme compared to standard implementation may result in approximately 12% absolute difference in victimisation rate, or a relative difference of 60%, *assuming comparability of the schools, including initial victimisation rates and pupil characteristics.*

### **Implications of the intervention effectiveness data for the model**

Only one of the published studies reports results that can be used to estimate the effect of an intervention (Evers, Prochaska, Van Marter, Johnson, & Prochaska 2007). It indicates that immediately following a bullying intervention a relative reduction in victimisation of 21-22% may be achieved. This study is of good quality (rated + in systematic review) and recruited schools from a variety of different environments (urban, rural, suburban). However it has some critical limitations from the perspective of this economic analysis including the high initial incidence of bullying behaviour and the short time over which the success of the intervention was measured. Supporting evidence from a case study suggests that a particularly successful implementation of a program may result in an even greater reduction in victimisation, although the validity of the comparison between schools is highly uncertain. A somewhat lower (arbitrary) rate than that reported by Evers, of 15% relative reduction, has been used in the model as the baseline value for the reduction in victimisation that might be sustained long term, assuming an ongoing programme. (For assumptions regarding the programme for the estimation of resources see Section 4.3.1.) Overall the evidence for the effectiveness of all interventions is weak (see systematic review), and thus the model baseline may be interpreted as illustrating what the cost-effectiveness of an anti-bullying intervention might be, *if* effective. As intervention effectiveness is a key parameter with a high degree of uncertainty a bi-variate sensitivity analysis, with victimisation prevalence, was undertaken.

### **B/C Estimation of Utility**



Our searches identified a study (Corso, Edwards, Fang, & Mercy 2008) which relates adult utility with recall of experience of childhood maltreatment. In this study participants were asked whether parents or other adults subjected them to physical, sexual or emotional abuse, or emotional or physical neglect. Utility was measured using the SF-6D, a preference based measure. The study shows that adults who recall childhood maltreatment suffer a loss of utility throughout their lives compared to those who were not maltreated.

Whilst not concerned with peer bullying or violence this study does establish that childhood experience of emotional or physical maltreatment has a lifetime effect on utility. Based on the discussion presented in Section 5.1 it is plausible to assume that adolescents who are bullied suffer not only immediate disutility, but also longer term effects, although they may be of a lesser magnitude than the victims of the type of abuse studied by Corso.

The Corso study, as well as reporting the effect of any childhood maltreatment on adult utility, also reports utility loss associated with different forms of maltreatment. The two types of maltreatment that are most similar to peer bullying and violence are “emotional abuse” and “physical abuse”. To be categorised as having suffered emotional abuse study participants responded “often” or “very often” to any of the following questions:

“Did a parent or other adult in the household:

- Swear at, insult, or put you down?
- Act in a way that made you afraid you would be physically hurt?
- Threaten to hit or throw something at you but didn’t?”

Similarly, to be categorised as having suffered physical abuse study participants responded “often” or “very often” to the first question below, or “sometimes”, “often” or “very often” to the second question.

- “Did a parent or other adult in the household:
- Push, grab, shove, or slap you?
- Hit you so hard that you had marks or were injured?”

The utility decrement associated with any type of maltreatment was 0.028 (95% CI 0.022, 0.034). Similar figures for physical and emotional abuse are 0.015 (95% CI 0.007, 0.023) and 0.010 (95% CI -0.005, 0.025). Note that the latter effect is not statistically significant at the 95% level, but those emotionally abused formed only a small proportion of the abused sample (10%). The size of the effect for emotional abuse is dominated by the utility decrement for persons aged seventy or more (-0.051), which is considerably greater than for other age groups (range 0.003 – 0.007). In the model, for adults bullied in childhood the central estimate of utility decrement is 0.005, with a plausible range of 0 - 0.025. Similar figures for victimised adolescents are central estimate 0.02, plausible range 0 – 0.093. These plausible ranges have been used to define the upper and lower bounds of the distributions used in the probabilistic sensitivity analysis (see Appendix 3).

#### **D The effect of bullying on educational attainment and income**

The estimates of the effect of bullying on educational attainment and income is taken from a study by Brown and Taylor (Brown & Taylor 2008). The analysis is based on the National Child Development Survey (NCDS), a British cohort study of children born in 1958. Data was collected on the participants six times between the ages of seven and 42 years. Participants' mothers were asked whether their child was being bullied by other children at ages seven and 11 years. The data also included information regarding the family background, participants' educational attainment, employment and income.

The raw data show considerable differences between bullied and non-bullied children. For example at age 23 67% of children who were bullied at age 11 have no educational qualification compared to 42% who were never bullied. In an ordered probit model with educational attainment at age 23 as the dependent variable the coefficient for being bullied at age 11 was statistically significant for both attaining no educational qualifications and for a reduced probability of achieving a degree. Analysis also showed that being bullied at age 11 reduced

average wages at age 23 by 2.8%, an effect that was independent of educational attainment. The coefficients for these analyses are used in the model to estimate the effect of an intervention on educational attainment and on adult income. The total effect for the latter is comprised of a direct effect, and an indirect effect mediated by educational attainment.

It has been assumed that for all those who change qualification categories (none, O-level, A-level, tertiary) as a result of the intervention move up just one level. Thus it is assumed that those who would have had no qualifications achieve at least one O-level and so on. It is assumed that the coefficient for A-levels is the same as that for achieving a degree.

Note that the analysis by Brown (Brown & Taylor 2008), in common with others (see section 5.1) also showed that being bullied when young was a risk factor for being a bully at age 16. Being a bully at age 16 was associated with low educational attainment. In order to avoid double counting only the effects on victims have been considered. The effect of being bullied at age 11 on educational attainment was stronger than that of being bullied at age 7. Brown and Taylor hypothesise that the effect on educational attainment may be stronger closer to the time that the exams are taken. If this was the case the co-efficients at age 11 may underestimate the effect of bullying at older ages.

As discussed in Section 4.1 bullied pupils, compared with others, report more absenteeism from school. An Australian study also found that in girls (but not boys) bullying and starting physical fights were two key factors determining leaving school early (Le AT et al. 2005). These may be factors contributing to the greater probability of bullies and their victims leaving school without any qualification compared to their peers.

Clearly there are many assumptions that have been made in using the results of the Brown study in the economic model. The three main assumptions relate to

the assumed causal nature of the relationship between bullying and outcomes, the use of historic data, and the assumption that reducing the prevalence of bullying will result in similar effect sizes in other cohorts.

1. The analysis by Brown includes several co-variates, including family background, health problems and educational aptitude (represented by test scores age 7). Their inclusion is intended to give an unbiased estimate of the effect of bullying, but clearly bias is still possible.

2. The study participants were born in 1958. The effects of bullying and educational attainment on their lifetime experience may be different to later generations, with different educational and employment opportunities. Bullying also is not well-defined and may have been interpreted differently in this study compared to later studies. In the NCDS maternal reports of child bullying was used, which may have underestimated bullying, although the prevalence of 24% is in line with contemporary estimates.

3. With no other data it has been assumed that the effects of changes in victimisation prevalence are independent of the baseline prevalence. It is possible that this is not necessarily the case. Differences in the definition of bullying will yield varying estimates of prevalence and also possibly more or less severe cases. Equally the effect of bullying on students may vary depending on its prevalence. In the model the prevalence rate from Brown has been used as the baseline value, a value which is in line with other estimates (see section "other model parameters").

## **E Education to Mortality**

Three UK studies were identified which report the association between educational attainment and mortality Davey-Smith (Davey et al. 1998d), McFadden (McFadden et al. 2008), Kuh (Kuh et al. 2002)).

### **Davey Smith** (Davey et al. 1998c)

*Population* Cohort of 5766 men aged 35-64 recruited from workplaces in the West of Scotland 1970-1973.

*Results* With age of completing full time education in four groups (age 12-14, 15-16, 17-18, 19+) a significant trend of reduced mortality with increasing age was found ( $p=0.0001$ ). In proportional hazards models the age-adjusted relative mortality rates for age at completing full time education were 1.21 (CI 1.10 -1.32) for each one category decrease in age for study participants aged 35 to 49, and 1.17 (CI 1.09 -1.25) for study participants aged 50-64. However, when the analysis was stratified by social class (4 groups) the age-adjusted relative mortality rates for age at completing full time education were not significant at the 95% confidence level (1.04 (CI 0.92 – 1.16) for each one category decrease in age for study participants aged 35 to 49, and 1.07 (CI 0.98-1.17) for study participants aged 50-64).

**McFadden** (McFadden, Luben, Wareham, Bingham, & Khaw 2008)

*Population* 22,486 residents of Norfolk aged 39-79 recruited between 1993 and 1997 from General Practice registers.

*Results* For both men and women the mortality rates across the different educational groups were significantly different ( $p<0.001$ ). However in the proportional hazards model, using the Wald test to examine the effect of education on mortality, education was only significant in the model for men adjusted only for age. The unadjusted and adjusted relative risks of mortality by education for both men and women are shown in Table 2. The other analyses show non-statistically significant trends of decreasing mortality with increased education.

Table 2 relative risk of mortality by level of education (95% confidence intervals)

|              |  | Level of education |                      |                      |                   | P-value |
|--------------|--|--------------------|----------------------|----------------------|-------------------|---------|
|              |  | <O-level           | O-level              | A-level              | Degree            |         |
| <b>men</b>   | Adjusted for age                             | 1.0                | 0.92<br>(0.74, 1.15) | 0.84<br>(0.74, 0.95) | 0.66 (0.54, 0.81) | <0.001  |
|              | Adjusted for age, smoking, BMI, social class | 1.0                | 1.01<br>(0.81, 1.26) | 0.92<br>(0.81, 1.04) | 0.87 (0.69, 1.10) | 0.11    |
| <b>women</b> | Adjusted for age                             | 1.0                | 0.82<br>(0.65, 1.03) | 0.98<br>(0.83, 1.16) | 0.76 (0.57, 1.02) | 0.17    |
|              | Adjusted for age, smoking, BMI, social class | 1.0                | 0.85<br>(0.68, 1.08) | 1.02<br>(0.86, 1.21) | 0.84 (0.62, 1.14) | 0.53    |

**Kuh 2002** (Kuh, Hardy, Langenberg, Richards, & Wadsworth 2002)

*Population* 2132 women and 2322 men from a prospective cohort all born in March 1946 and followed until the age of 55.

*Results* The purpose of the study was to examine mortality by socio-economic conditions in childhood and adulthood. However, hazard ratios for mortality between the ages of 26 and 54 years are reported for educational qualification (adjusted only for sex). The hazard ratio for mortality for those with no qualifications compared to those with any qualification was 1.7 (95%CI 1.2-2.4),  $p=0.002$ . The effect in women was less pronounced than in men with hazard ratios of 1.5 and 1.9 respectively.

None of these studies examine the relationship between educational attainment and mortality, whilst controlling for childhood circumstances and income. Both Davey-Smith (Davey et al. 1998b) and McFadden (McFadden, Luben, Wareham, Bingham, & Khaw 2008) control for social class, but in the case of McFadden only shows relative risks adjusted for social class in conjunction with health

behaviours, which are themselves associated with educational attainment. Thus whilst the unadjusted rates are likely to be overestimates of the relationship of educational attainment with mortality (they do not control for the effect of childhood deprivation affecting both educational attainment and mortality directly), the adjusted rates may underestimate the relationship (educational attainment influencing social class).

Further opportunistic searches of the literature using the related studies feature in Medline was used to identify studies, including those from other countries, to support the limited UK evidence identified in the search, and in particular to try to identify unbiased estimates of the relationship between educational attainment and mortality (studies which control for childhood SES, income and age). It is recognised, however, that studies from other countries may be biased in other ways due to potentially differing relationships between education and mortality.

Only one study was identified that controlled for all the required confounders, a US study of women (Beebe-Dimmer et al. 2004)). Another US study (Zajacova 2006), although not controlling for all the required confounders includes both men and women.

**Beebe-Dimmer** (Beebe-Dimmer, Lynch, Turrell, Lustgarten, Raghunathan, & Kaplan 2004)

*Population* A cohort of 3087 women recruited in 1959 from an area probability sample in Alameda County, California. The cohort was followed up on several occasions, the latest being 1994.

*Results* Compared to those with a high level of education those with a medium level of education had an increased hazard of death of 1.14 (95%CI 0.98- 1.31), and those with the lowest level of education had an increased hazard of 1.23 (95%CI 1.04-1.46). The level of education was age-adjusted as average levels of education have changed with time. The definitions are shown in Table

3. The estimates are adjusted for age, household income, childhood socio-economic position and occupation.

Table 3 Age-dependent definitions of educational level (Beebe-Dimmer, Lynch, Turrell, Lustgarten, Raghunathan, & Kaplan 2004))

| <b>Educational attainment group</b> | <b>Age &lt; 55 years</b> | <b>Age &gt; 55 years</b> |
|-------------------------------------|--------------------------|--------------------------|
| <b>Low</b>                          | Some high school         | No grammar school        |
| <b>Medium</b>                       | Finished high school     | Some high school         |
| <b>High</b>                         | College                  | Finished high school     |

#### **Zajacova** (Zajacova 2006)

*Population* 12,036 white participants aged 25 to 74 in the National Health and Nutrition Examination Survey I (NHANES I). It was a panel study of a nationally representative (US) probability sample of adults.

*Results* In a model adjusted for age and sex only an odds ratio of 0.95 (95% CI 0.94-0.96) is reported for every additional year of education ( $p < 0.01$ ). In a model adjusted for household income, demographic variables as well as health behaviours the odds ratio is 0.98 (95% CI 0.96-0.99,  $p < 0.01$ ). The interaction term of gender with education was not significant. Note that whilst odds ratios are reported, as there is a low event rate they will be a reasonable approximation of relative risk.

#### **Summary Results**

The results of all the studies discussed are summarised in Table 4. The relative risks reported in the studies have been adjusted, where necessary, so that mortality risk for increasing educational attainment is expressed relative to the lowest attainment group.



Table 4 Summary Results of Relative Mortality Risks by Educational Attainment

| Population  | Level of education                           | age 12-14         | Age 15-16          | Age 17-18 | Age 19+ | P-value    |
|---|--|-------------------|--------------------|-----------|---------|------------|
| <b>Davey Smith</b><br>(Davey et al. 1998a)                          |  |                   |                    |           |         |            |
| Men aged 35-49  | Adjusted for age                             | 1.0               | 0.83               | 0.68      | 0.56    |            |
| Men aged 50-64  | Adjusted for age                             | 1.0               | 0.85               | 0.73      | 0.62    |            |
| Men aged 35-49  | Stratified by social class, Adjusted for age | 1.0               | 0.96               | 0.92      | 0.89    |            |
| Men aged 50-64  | Stratified by social class, Adjusted for age | 1.0               | 0.93               | 0.87      | 0.82    |            |
| <b>McFadden</b><br>(McFadden, Luben, Wareham, Bingham, & Khaw 2008) | Level of education                           | <O-level          | O-level            | A-level   | Degree  |            |
| men   | Adjusted for age                             | 1.0               | 0.92               | 0.84      | 0.66    | <0.001     |
|   | Adjusted for age, smoking, BMI, social class | 1.0               | 1.01               | 0.92      | 0.87    | 0.11       |
| women   | Adjusted for age                             | 1.0               | 0.82               | 0.98      | 0.76    | 0.17       |
|   | Adjusted for age, smoking, BMI, social class | 1.0               | 0.85               | 1.02      | 0.84    | 0.53       |
| <b>Kuh</b> (Kuh, Hardy, Langenberg, Richards, & Wadsworth 2002)     |  |                   |                    |           |         |            |
|   | Level of education                           | No qualifications | Any qualifications |           |         |            |
| Men & women   | Adjusted for sex (all same age)              | 1.0               | 0.59               |           |         | 0.002      |
| Men   | (all same age)                               | 1.0               | 0.53               |           |         | Not stated |
| Women   | (all same age)                               | 1.0               | 0.67               |           |         | Not stated |
| <b>Beebe- Dimmer</b>  | Level of                                     | Some high         |                    | Finished  | College |            |

|  |  |        |                        |                        |                        |  |
|--|--|--------|------------------------|------------------------|------------------------|--|
| (Beebe-Dimmer, Lynch, Turrell, lustgarten, Raghunathan, & Kaplan 2004) | education  | school |                        | high school            |                        |  |
| US Women   | Adjusted for age, household income, childhood SES, occupation.                     | 1.0    |                        | 0.88                   | 0.81                   |  |
| <b>Zajacova</b><br>(Zajacova 2006)                                     |  | Basic  | Assume basic + 2 years | Assume basic + 4 years | Assume basic + 7 years |  |
| US men & women   | Adjusted for age and gender  | 1.0    | 0.90                   | 0.81                   | 0.70                   |  |
|  | Adjusted for age, gender household income, demographic variables, health behaviour | 1.0    | 0.96                   | 0.92                   | 0.87                   |  |

The results of the US studies are consistent with those from the UK, and as the Beebe- Dimmer (Beebe-Dimmer, Lynch, Turrell, lustgarten, Raghunathan, & Kaplan 2004) model is the closest to that required in terms of adjustment for the required co-variates it will be used for the central estimate of relative mortality risk by educational attainment. It is based on a female population, but another study (Zajacova 2006) shows that the relationship is independent of gender (in the US). The Beebe-Dimmer study reports a 20% reduction in the mortality risk with those completing some tertiary education compared with those with no qualifications. Other studies (Davey Smith (aggregated results men and women), Zajacova) suggest the relationship is approximately linear, albeit on different scales. Thus it will be assumed that for each additional educational level there is a 5% ( $1-0.8^{0.25}$ ) reduction in mortality risk. Plausible range 3.7 % ( $1-0.86^{0.25}$ ), 7.3% ( $(1-0.74^{0.25})$ )

**F Income to mortality**

No UK estimates of the relationship between income and mortality, independent of educational attainment were found. A Finnish study (Martikainen P et al. 2001) was identified which estimates the increase in mortality for each decile decrement in income, controlling for age, household structure, spousal economic activity, social class and education. This is 1.065 for men and 1.043 for women. An average of the two figures was used.

In order to use this data to estimate the change in mortality resulting from a change in the mean cohort income, the proportion of a decile that the change in income represented for different points on the income cumulative density function (HM Revenue and Customs 2008) was calculated. A population weighted average of the effect size was calculated. At the baseline model values of an increase in cohort income of 0.126% this yields a relative reduction in mortality through the effect of income of 0.99964.

The method outlined above is a simple estimate of how changing income may impact mortality. The results reported by Martikainen et al. (Martikainen P, Makela P, Kosinen S, & Valkonen T 2001) show how mortality changes by income decile. By definition, if a proportion of the cohort increases their income relative to the rest, other members of the cohort will fall in to a lower decile. Similarly the method used to estimate the effect of income change on mortality is simple. However the method described allows an approximate estimate of what is a very small effect size.

Note the combined effects of educational attainment and income on mortality (E and F) are only applied in the model from age 30 and upwards. Much of the data for the estimation of this parameter is based on adults aged 25 or more, and may not apply to younger ages.

## **G Education and income to HRQoL**

Dotted lines are shown in the model diagram between educational attainment and income to adult HRQoL. This is not operationalised in the model to avoid double counting, as any effects should be accounted for in the direct estimate of the effect of childhood abuse on utility (see link C in Figure 1). However it is pertinent to highlight that there is a relationship, one that is clearly illustrated by the utilities by educational qualification that are reported by Kind (Kind P, Hardman G, & Macran S 1999). The mean utility for those with a higher educational qualification is 0.94 compared to 0.78 for those with none. These figures are not adjusted for other factors, but do show a larger effect than social class (using the groups reported by Kind) on utility (non-manual 0.88, manual 0.82). Using the Kind utility estimates and the central values of the model approximately 14% of the estimated effect of bullying on adult utility may be explained by educational outcomes alone.

## **4.2 OTHER MODEL PARAMETERS**

### **4.2.1 Prevalence of bullying victimisation**

The study used in the model to estimate the effects of bullying on education and income found prevalence of victimisation of 24% for youths born in 1958, based on maternal reports of their child being bullied (Brown & Taylor 2008)). A study in Sheffield in 1993 estimated a range between 10-20% in secondary schools (Whitney & Smith 1993). The case study of John Hanson Community School mentioned in Section 4.1 -A (intervention effectiveness) reports 92.6% of pupils in year 9 of the school with a particularly effective intervention said they had not been bullied compared to 80.7% of year 9 pupils across all participating schools. Thus in these schools where an intervention was already in place victimisation rates were 7.4% and 19.3% respectively.

Two very recent national studies by UNICEF and OFSTED report higher figures of approximately 35% (UNICEF Innocenti Research Centre 2007) and 39% (Ofsted 2008)) respectively. Whilst these two figures appear similar the former is

based on experience of bullying in the previous two months, and the latter on the previous 12 months. According to the OFSTED figures a smaller proportion, of 14%, reported being bullied in school at least once or more in the previous four weeks. One of the intervention studies from the US (Evers, Prochaska, Van Marter, Johnson, & Prochaska 2007) reports rates as high as 70%, albeit with a fairly broad definition of what constitutes bullying. The large variation in the victimisation prevalence figures highlights the difficulty of making comparisons across different studies.

The baseline value in the model is 24%; that reported in the study used to estimate the effects of bullying on educational attainment and income (Brown & Taylor 2008).

#### **4.2.2 Baseline Mortality and Utility**

Baseline mortality by age is from National Statistics (National Statistics 2008a), and utility from Kind (Kind P, Hardman G, & Macran S 1999) UK population norms. For the latter adults aged 18 and over were sampled. The utility estimate for persons aged under 25 has been used in the model for children aged 11 or more.

Baseline mortality and utility were not varied in the probabilistic sensitivity analysis. Their effect on outcomes is negligible.

#### **4.2.3 Income by age**

In order to provide a simple estimate of loss of lifetime earnings to victims of bullying median earnings by age were obtained from HM Revenue and Customs (HM Revenue and Customs 2008). The latest data available is for 2005-6. These values were inflated by the retail price index (National Statistics 2008b) relative to 2005. A value for 2008 is not yet available, so this was estimated as the average of the previous two years. Real growth rate in earnings was not been considered, nor labour force participation. The effect of both of these is to potentially underestimate lost earnings of victims. The Brown analysis indicates there is

effect of victimisation on employment as well as wages (Brown & Taylor 2008). In fact predicting future earnings of a cohort is extremely uncertain, with many variables such as business cycle, cohort size and economic cycle effects. Plausible estimate of earnings may vary by as much as 50% (Glied 1996).

### **4.3 ESTIMATION OF THE COSTS OF INTERVENTIONS**

#### **4.3.1 Costs of delivering an intervention**

None of the intervention studies reported resources used in detail, or costs. The information of resource use that was reported for the studies is shown in Table 5. The interventions vary in intensity from additional material being presented in usual lessons, to several sessions a year for three years. The more intensive interventions were aimed at a wider range of behaviours including violence. Interventions aimed at bullying or conflict resolution were either a limited number of classroom sessions and/or a peer mediation programme. It has been assumed for the costing of the intervention that in order to achieve a sustained reduction in victimisation an ongoing programme consisting of both a classroom intervention and training of a small group of peer mediators is required.

Table 5 Intervention resources

| <b>Intervention</b>   | <b>Staff Resource</b>  | <b>Other materials</b>  |
|---|--|---|
| Evers(Evers, Prochaska, Van Marter, Johnson, & Prochaska 2007)<br>Anti-bullying, Internet-based programme | Teachers assisted students in starting in completing the Internet programme. Students interacted with the program three times. Optional extra classroom materials were available to use.   | Internet-based program; printed materials: family guide staff guide |
| Baldry(Baldry & Farrington 2004)<br>Anti-bullying, video-based programme                                  | The author, with an assistant, took 3 * 3-hour sessions  | Three videos, one pupil booklet                                     |
| Flay(Flay, Graumlich, & et al 2004)<br>High risk behaviours, classroom based programme                    | 16-21 lessons per year for 3 years, delivered by university-based health educators. Two training sessions were held before each lesson for the educators, taken by senior staff. Weekly debriefings educators/senior staff. Senior staff conducted observations to monitor fidelity.<br><br>Teachers received 4 hour overview each year. |   |
| Farrell(Farrell & Meyer 1997)<br>Violence reduction   | 18 * 45- minute sessions taken by prevention specialists   |   |
| Stevahn 1996(Stevahn & And 1996)<br>Conflict resolution, classroom based programme                        | All teachers were trained in the programme which was integrated into an English literature course, which was delivered in the same time without the programme to the control group.  |   |
| Stevahn 2002(Stevahn, Johnson, Johnson, & Schultz 2002)<br>Conflict resolution, classroom based programme | The study author delivered the programme as part of a social studies class on the second world war, which was delivered in the same time without the programme to the control group. Both intervention and control had 17.5 hours instruction.   |   |
| Smith 2002(Smith, Daunic, Miller, & Robinson 2002)<br>Conflict resolution, peer mediation                 | 5 lessons. Additionally 25 to 30 students in each school (from populations ranging from 780-1140) were given a 2-day workshop by school personnel trained by project staff.  |   |

The case studies also reported little information regarding intervention intensities or resource use. The John Hanson Community School, Andover who implemented a peer listening programme, report that listeners completed two and a half days of training. This is similar to the training given to peer mediators in the intervention reported by Smith (Smith, Daunic, Miller, & Robinson 2002).

The baseline resource and cost assumptions are shown in Table 6. The costs have been based on a school with four classes of 30 pupils each in each year, and assuming that the intervention is given each year to pupils aged 11-16. It is assumed for the classroom intervention that one teacher will give the intervention to all four classes in each year, so a total of five teachers will need some training and preparation time. It is assumed that the school co-ordinator will provide the training. Salary costs for a classroom teacher and a more experienced co-ordinator are those used by McCabe (McCabe C 2007).

For the peer mediation training it has been assumed that three pupils from each class from three year groups will be trained each year, requiring two workshops to be held if no more than 20 pupils are trained in each workshop. It is assumed that two members of staff, a teacher and the school co-ordinator will deliver the workshop training together.

There is little information in the literature regarding study materials used. The study on which the effect size was based (Evers, Prochaska, Van Marter, Johnson, & Prochaska 2007) used an Internet-based expert system which was commercially available. The suppliers were contacted, but the programme is no longer available and they were unable to supply a price. None of the case studies identified report use of Internet-based expert systems. For the classroom-based intervention a total of £1800 has been allowed, which would cover the purchase of a £15 book for each pupil in a year group (assuming the books are used for 5 years) or a workbook for all pupils at £2. For the workshops a total of £80 was allowed, based on £2 per participant.



One study (Smith, Daunic, Miller, & Robinson 2002)) reported a significant downward trend in disciplinary incidents resulting from a peer mediation programme, and anecdotally, that teachers spent time mediating in student disputes. George Mitchell School, East London, discussed in the Case Study Report, reports an example of a teacher referring a bullying complaint to the student mediator group, resulting in a successful resolution. Thus it seems plausible that a successful intervention may result in some time saving for classroom teachers. It has been assumed that a bullying/peer mediation programme will result in an average time saving of 5 minutes of classroom teacher time per class per week.

Table 6 Baseline resource and cost assumptions

|  |               |  |                   |
|--|---------------|--|-------------------|
| <b>Classroom intervention</b>                        |               |  |                   |
| <b>Teacher</b>                                       |               | <b>School co-ordinator</b>             | <b>Materials</b>  |
| Salary plus on-costs                                 | £43,070       | Salary plus on-costs                   | £57,670           |
| Number of classes per year                           | 4             | Weekly hours program administration    | 1                 |
| Number of years                                      | 5             | Weeks                                  | 40                |
| Number of hours per class per year                   | 5             | Staff training (including preparation) | 5                 |
| Training hours per teacher                           | 1             |  |                   |
| Prep time per session                                | 1             |  |                   |
| Total teacher time pa                                | 130           |  | 45                |
| Hours worked pa                                      | 1500          |  | 1500              |
| Intervention hours as proportion of total hours      | 0.087         |  | 0.030             |
| Salary cost attributable to intervention             | £3,733        |  | £1,730            |
|  |               |  | Total cost £1,800 |
| <b>Total cost</b>                                    | <b>£7,263</b> |  |                   |
| Number of children participating                     | 600           |  |                   |
| <b>Total cost per pupil class intervention</b>       | <b>£12.10</b> |  |                   |
| <b>Peer Mediation</b>                                |               |  |                   |
| <b>Teacher</b>                                       |               | <b>School co-ordinator</b>             | <b>Materials</b>  |
| Workshop duration (hours)                            | 15            |  |                   |
| Number of workshops                                  | 2             |  |                   |
| Prep time as proportion of workshop time             | 0.5           |  | 0.5               |
| Teacher/co-ordinator time (hours)                    | 37.5          |  | 37.5              |
| Ongoing support                                      |               |  |                   |
| Time per week  | 0.5           |  | 0.5               |
| Time pa  | 20            |  | 20                |
| Total time peer mediation                            | 57.5          |  | 57.5              |
| Intervention hours as proportion of total hours      | 0.038         |  | 0.038             |
| Salary cost attributable to intervention             | £1,651        |  | £2,211            |
|  |               |  | Total cost £80    |
| <b>Total cost</b>                                    | <b>£3,942</b> |  |                   |
| <b>Total cost per pupil peer mediation</b>           | <b>£6.57</b>  |  |                   |
| <b>Teacher time saved from reduced interventions</b> |               |  |                   |
| Time per class per week (mins)                       | 5             |  |                   |
| Time saved per year (hours)                          | 66.7          |  |                   |
| Time saved as a proportion of total hours            | 0.044         |  |                   |
| <b>Salary costs saved</b>                            | <b>£1,914</b> |  |                   |
| <b>Salary costs saved per pupil</b>                  | <b>£3.19</b>  |  |                   |
| <b>Total net cost per pupil</b>                      | <b>£15.48</b> |  |                   |

For the probabilistic sensitivity analysis the total teacher time for the intervention was aggregated, and the total varied. Time saving from the intervention is treated as a separate variable. Teacher salaries and total material costs were also varied.

#### 4.3.2 Other costs

Costs to other sectors, particularly relating to health and crime, were also initially considered. A paper that costed the resources used in a longitudinal survey of

London children followed into adulthood (Scott et al. 2001a) demonstrates that significant extra costs are incurred in the education, health, social, and criminal justice system by children with conduct problems. Total costs (at 1998 prices) were £7423 for children with no problems, £24,324 for children with conduct problems, and £70,019 for children with conduct disorder at age 10. These costs illustrate the magnitude of costs incurred by severely disruptive children, but conduct disorder is a psychiatric definition, which although including bullying and fighting comprises a wider range of disruptive behaviour.

The Scott paper showed that the highest proportion of costs arose from the criminal justice system (34%). Although bullying has been associated with criminal behaviour (see section 4.1) it may not be the primary cause. In a longitudinal study of Finnish youths Sourander (Sourander et al. 2007b) reports that frequent bullies were responsible for a disproportionately high proportion of crimes perpetrated by 16-20 year-olds, but further analysis showed that it was only youths with psychiatric problems who had an elevated risk of criminality. Thus classroom interventions to reduce bullying are unlikely to influence criminal behaviour and these costs were not included in the economic model.

There is some indication that there may be causal links between victimisation and mental health disorders such as anxiety or depression (see section 4.1). The King's Fund (McCrone et al. 2008a) has recently published a report on the costs of mental health care. The care costs, for those identified, of children suffering from emotional disorders, which include depression, separation anxiety, specific phobias, social phobia and generalised anxiety, average £200 per year for non-inpatient health services, which are estimated to comprise 98% of total costs.

The mean cost to the health service for an adult with depression is £2,085 for those with the diagnosis in contact with services (65% of working age adults). The cost of lost employment was £9,311. Similarly the mean cost of adults with

anxiety disorder is £1104 for those in contact with services (49% with anxiety disorders), and the cost of lost employment is £1,298 per person per year.

Thus it is possible that the model underestimates the benefits of interventions to reduce bullying as costs of treating mental health are not included.

A summary of the intervention costs together with the other costs outlined in this section are shown in Appendix 3.

All costs and benefits were discounted by 3.5% (National Institute for Health and Clinical Excellence 2006)). A summary of the model parameters used is shown in Appendix 4.

## **5.0 RESULTS**

### **5.1 Overview of the short and long-term effects of bullying on young people**

In the economic model the evidence that was most directly relevant to long-term health-economic outcomes is used. However there is evidence that bullying may have wider consequences which are not captured in the model. This evidence is discussed in this section to give a broader context to the analysis. This section also describes evidence to support the use of a study (Corso, Edwards, Fang, & Mercy 2008) of adult recollection of childhood abuse to estimate the utility decrement suffered by victims of peer bullying. It uses literature identified by the searches (see Section 3.3.1), as well as additional material.

There is growing body of evidence on the shorter-, and to a lesser extent, the longer-term effects of bullying in childhood and adolescence, both on victims and bullies. The great majority of this evidence is based on self-reports (mostly from questionnaire surveys). Researchers have understandable concerns about the validity and reliability of asking participants to recall events, beliefs and attitudes, particularly over the longer term. However, there is evidence that people's recollections and reports across substantial periods of time are accurate and

stable. For example, in a study of the experiences of a sample of adults bullied at school, Rivers (Rivers 2001) found that participants' memories were stable over his 12–14-month test-re-test period. Similarly, in a longitudinal study Olweus (Olweus 1992) found that 23-year-old participants' recollections of being bullied at school were very similar to the reports that they produced when they were 16-year-olds. Further, these reports were largely corroborated at the time by their school age peers. Accepting these assurances, we now consider the shorter- and longer-term effects of bullying.

Regarding immediate and short-term effects of being bullied, a number of studies have shown that repeated victimization at school is related to low self-esteem (e.g., Olweus (Olweus 1993); O'Moore (O'Moore & Minton 2005), O'Moore & Hillery (O'Moore & Hillery 1991); Slee, & Rigby (Slee & Rigby 1993); Boulton & Smith (Boulton & Smith 1994)). A large-scale study in Australia asked pupils ( $n = c. 65000$ ) if they had been bullied at school "during the present school year and, if so, how they had felt about it" (Rigby 21997)). Around 40% ( $n = 25000$ ) of the pupils reported that they had been bullied with higher levels of victimization being directly related to lower self-esteem. However, a different outcome using multivariate analysis is reported in a British study ( $n = 904$  students, 12-17-year-olds). This research suggested that low self-esteem arises from self-perception of anxiety and/or depression (Salmon, Jones, & Smith 1998). However, the direction of causality in the findings of these studies is not clearly established.

Evidence about the direction of causality comes from a US 5-month test-re-test longitudinal study of 11-year-old children ( $n = 189$ ), which also considered the effects of being bullied on self-esteem (Egan & Perry 1998). This study found that low-self esteem is an effect of being bullied. There is one finding suggesting that a loss of self-esteem due to being bullied may persist over a much longer time period comes from another longitudinal study of a small number of Norwegian 13-year-olds ( $n = 15$ ) identified as often victimised (Olweus 1992).

There are other studies which have considered aspects of mental health other than self-esteem. In a short-term effects study of 1526 ethnically diverse 11-year-olds in California, Nishina, Juvonen, & Witkow (Nishina, Juvonen, & Witkow 2005) found that being a victim of bullying in the autumn “was associated with spring psychosocial maladjustment and physical symptoms, which in turn predicted poor spring school functioning” (p. 37). These authors also found that pupils’ psychosocial difficulties increased their risk of being bullied, but no ethnic group or gender differences were found.

A 3-year longitudinal study of 78 Australian secondary school adolescents considered the short-term effects of being bullied on mental health (Rigby 1999). The key finding of this research is that frequent victimization during the first two years of secondary school was related to psychological distress three years later. Similar outcomes have been reported in another Australian study of secondary school pupils ( $n = 2680$ ) in which the authors conclude that “a history of victimization is a strong predictor of the onset of self-reported symptoms of anxiety or depression and remains so after adjustment for other measures of social relations” (Bond et al. 2001). Lastly, in a recent study of 2307 pupils ( $M$  age = 11.5 years) in the US (Giang & Graham 2008) suggest that “the negative impact of a strong victim and moderate aggressor reputation is greater with regard to feelings of ... loneliness and social anxiety rather than ... self-esteem and depression”, as proposed by Kochenderfer-Ladd and Ladd (Kochenderfer-Ladd & Ladd 2001). In another recent study, this time of 9-11-year-olds ( $n = 1118$ ) in the Netherlands, the authors concluded that “victims of bullying had significantly higher chances of developing new psychosomatic and psychosocial problems than did children who were not bullied. Children with depressive or anxiety symptoms were significantly more likely to be victimized” (Fekkes et al. 2006).

Similar findings and conclusions come from a Scottish school-based cohort study of 11-, 13-, and 15-year-olds ( $n = 2586$ ) (Sweeting et al. 2006). Specifically, this

study found: that around 15% of the 11-year-olds were bullied at least weekly but that this proportion reduced with age (a finding which is consistent with other studies, e.g., Nansel, Overpeck, Pilla, Ruan, Simons-Morton, & Scheidt, (Nansel et al. 2001); and, positive associations between being bullied and depression score, although on the basis of the study data it is not possible to specify the direction of causality in this association. There are other studies that suggest that child bullies, compared with non-bullies, are more likely to suffer from depression (Salmon, Jones, & Smith 1998); (Slee 1995)) and suicidal ideation (Rigby & Slee 1999); (Rigby 1999). Although, as Rigby (Rigby 2003b) notes, it is unclear whether these experiences are consequences of being bullies, or of the negative parenting styles often experienced by child bullies, or some combination of both.

Some other studies, which are mostly correlational, have considered the short-term impact of being bullied on physical health. One such study was of bullying among primary school children in England ( $n = 2692$ ) (Williams et al. 1996). These researchers found that children who reported being bullied, compared with others, were more than twice as likely to report that they had head and stomach aches. Another study of English primary school children ( $n = 1639$ ) found associations between direct bullying (but not indirect bullying) and everyday health problems such as coughs and colds (Wolke, Woods, & Bloomfield 2001). Similar findings, although undifferentiated by type of bullying, have been obtained by Rigby (Rigby 1998) in his study of 819 Australian secondary school pupils. A small-scale 3-year longitudinal study of 78 adolescent pupils looked at changes in physical health and being bullied (Rigby & Slee 1999). These authors conclude that the cause of whether or not a pupil has relatively poor physical health is determined by whether or not s/he was bullied three years earlier.

Other short-term effects studies have shown that bullied children dislike school. In another US study, children ( $n = 200$ , mean age 5 years) named by their school peers as being targets of bullying were more likely than non-targets to report disliking school (Kochenderfer & Ladd 1996). A similar outcome has been

obtained among older (primary and secondary) pupils in an Australian study (Rigby & Slee 1993). Other Australian studies have found that bullied pupils, compared with others, report more absenteeism from school (Rigby 21997); (Zubrick et al. 1997)). These studies also show that absenteeism increases directly with the amount and severity of victimization.

There is also some evidence that being victimised in childhood and adolescence predicts offending and violent behaviours. In a correlational study of a cohort of 4300 adolescents in Edinburgh, Smith and Ecobs (Smith & Ecob 2007) found that victimization predicts later offending, a finding which is supported by the outcomes of a study of 18-26-year-olds ( $n = 14322$ ) involved in the US National Longitudinal Study of Adolescent Mental Health (Add Health) (Fang & Corso 2007). A 3-year longitudinal study in Chicago (Molnar et al. 2005)) found that the sampled girls ( $n = 637$ , 9-15-year-olds at baseline) were more likely to be violent if they had themselves been violently victimised. Again, there is no evidence from these studies for the causal relationship between childhood victim status and delinquency in adolescence.

There is a growing body of knowledge on the long-term effects of being bullied and abused in childhood and adolescence. Turning to this evidence, in his review of the literature Rigby (Rigby 2003a) p. 586 says that “retrospective studies have suggested an association and possible causal relation, which needs to be confirmed, between being bullied at school and long-term adjustment.” For example, in a US study of undergraduates ( $n = 206$ , 18-22-year-olds), those reporting being bullied at school ( $n = 26$ ) also reported being significantly more lonely as adults than others (Tritt & Duncan 1997). In another study of adults in the UK with stammering problems at school ( $n = 276$ , 15-66-year-olds), almost half reported long-term effects mostly on their personal relationships (Hugh-Jones & Smith 1999)). One tentative outcome of a retrospective study of US adults ( $n = 370$ ) is that the interpersonal difficulties (shyness and fear of intimacy) of men who were bullied at school is associated with their difficulties in forming



sexual relationships with other adults (Gilmartin 1987). This suggestion has since been largely supported by the findings of another Australian retrospective study of adult men and women (Dietz 1994).

There are also possible long-term consequences for bullies. Olweus (Olweus 1993) claimed that child bullies were four times more likely than non-bullies to be charged with delinquency. Similar findings have been obtained from studies in the UK (Farrington 1993) and Finland (Sourander et al. 2007a). Farrington's study also found that men ( $n = 411$ ) who had been identified as school bullies, unlike other men, tended to have children who exhibited aggressive behaviour. The team working in Finland sought to study the correlations of childhood bullying and victimisation with late adolescent criminality using a longitudinal design and a population-based sample of boys ( $n = 2551$ ; 8-year-olds at baseline). The authors concluded that "frequent bullying in childhood predicts criminality in late adolescence" (p. 549) and that "although frequent bullies ... composed only 8.8% of the total sample, they were responsible for 33.0% of all offenses during the 4-year period between the ages of 16 and 20 years" (p. 550).

There is also evidence of the damaging long-term impact in adulthood of being physically and sexually abused (here considered to be bullying) in childhood and adolescence. For example, Denov (Denov MS 2004) reports that her 14 adult targets (7 men, 7 women) of their mothers' persistent abuse collectively had difficulties with substance abuse, self-injury, suicidal ideation, depression, rage, self-concept and identity, and sexual functioning. Banyard's (banyard 1997) US-based study of 237 mothers who were involved with child protective services for physical abuse or neglect of their children and a control group of non-abusive mothers, found that childhood sexual abuse of the mothers was related to their own negative parenting outcomes. In another case-control study of female adult students ( $n = 79$ ) in the UK (Henderson et al. 2002) found that the 22 (28%) who reported a history of childhood sexual abuse "were significantly more anxious,

depressed and angry ... than the control group (p. 129). Lastly, in a comprehensive questionnaire random sample study of 462 women in the US (Walker, Koss, & Katon 1995) non-targets compared with targets of childhood sexual and physical victimization, reported “higher rates of chronic pain, disability, teen pregnancies, abortions, miscarriages, sexually transmitted diseases, and sexual adjustment problems ... A significantly greater number of high risk behaviors including ... low seat-belt use, alcohol abuse ... (and) ... prescription medication use” (p. 77). Regarding the adulthood correlates of being the target of childhood bullying, the recent cross-national (Germany, Spain, UK) comparative study of 884 adults by Schäfer, Korn, Smith, et al. (Schafer et al. 2004) found that targets compared with non-targets scored lower on general self-esteem, higher on emotional loneliness, and that they reported more difficulties in maintaining friendships and were more fearfully attached.

## **5.2 Results of the economic model**

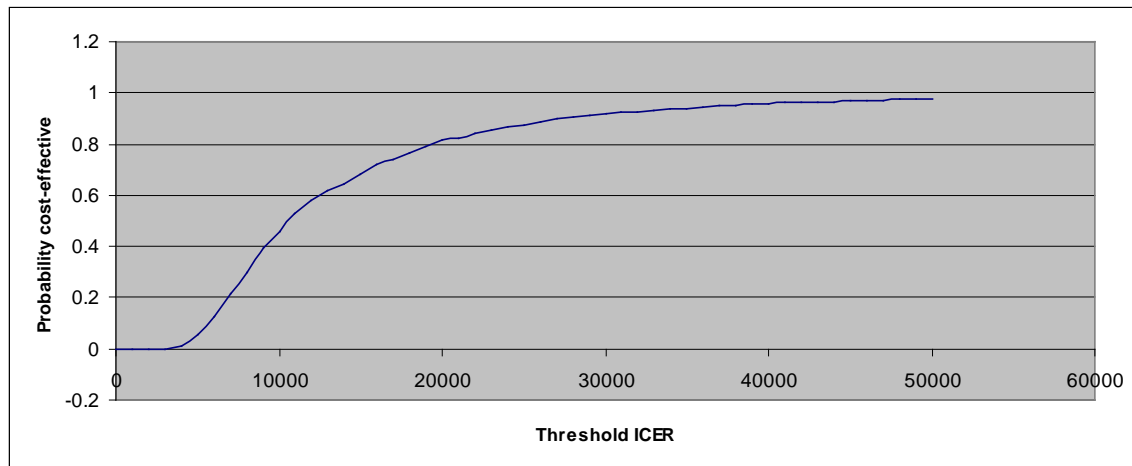
### **5.2.1 Costs of the intervention**

As shown in Table 6 (Section 4.3.1) the annual cost of the classroom intervention is estimated to be £7,300 and the peer mediation programme £3,900. It is estimated that reduction of time spent by teachers intervening in student disputes may save £1,900, giving a net total cost for a school with 600 pupils aged 11-16 of £9,300 per year. The estimated cost per pupil is £15.50 per year. Other potential cost-savings arising from reduced crime and mental health problems are not included in the model (see Section 4.3.2)

### **5.2.2 Cost-effectiveness of the intervention**

Given the assumptions used in the model, critical among which is that the intervention is effective in delivering a sustained reduction of victimisation of 15%, the ICER is £9,600 per QALY. The CEAC is shown in Figure 2. At a threshold of £20,000 it is 82% probable that the intervention is cost-effective, and at a threshold of £30,000, 92% probable.

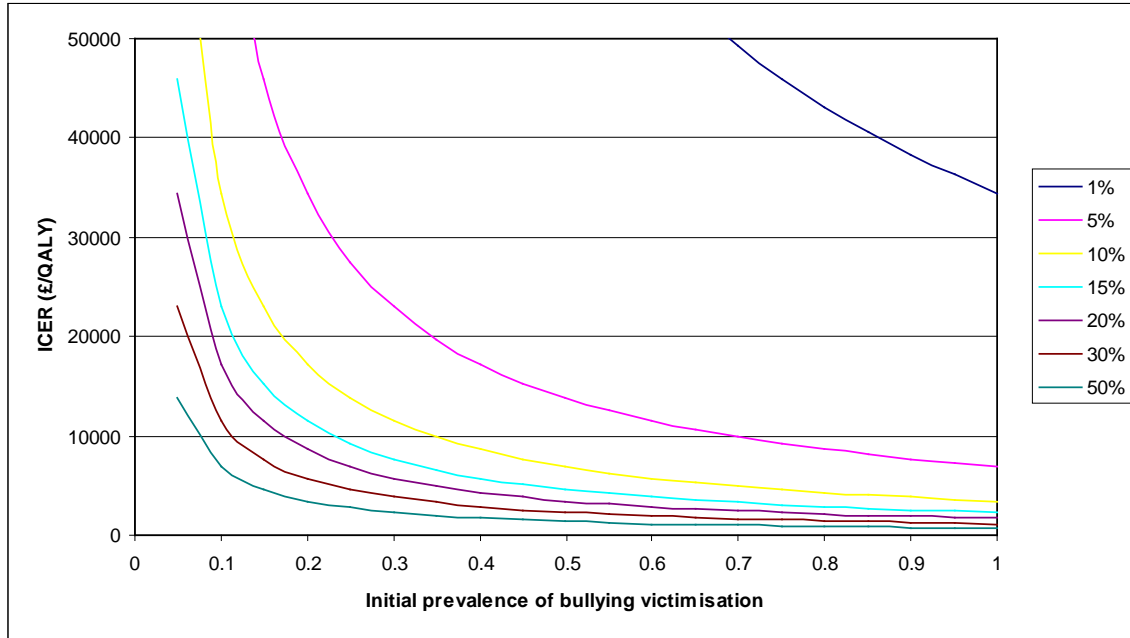
Figure 2 Cost-effectiveness acceptability curve (CEAC)



The cost-effectiveness of the intervention is clearly dependent on it being effective, but also varies with the initial prevalence of victimisation. Figure 3 shows how cost-effectiveness varies with these two key parameters. For reference, the baseline value for effectiveness in the model is 15%, and victimisation 24%. Victimisation prevalence in UK schools reported in the literature varies from 10-40%. For a cost-effectiveness threshold of £20,000 an intervention which is 5% effective is only cost-effective if victimisation prevalence is greater than 35%, whereas an intervention that is 20% effective is cost-effective with victimisation prevalence greater than 10%.

Note all results must be interpreted with caution given the limitations of the analysis presented in Section 6.

Figure 3 Variation in cost-effectiveness of the intervention with effectiveness and initial prevalence of victimisation



In order to test whether the estimated QALY gain in the model resulting from the intervention is derived principally from the estimated gain in mortality or improved quality of life a sensitivity analysis was carried out. Firstly the model was set so there was no difference in utility between bully victims or their peers, so the QALY difference from the intervention is derived solely from the estimated difference in mortality. This gave an ICER of £218,000, showing that the gain in mortality is very small. Secondly, the model was set so there was no difference in mortality between bully victims or their peers, so the QALY difference from the intervention is derived solely from the estimated difference in utility. This gave an ICER of £10,000, very close to the model baseline figure of £9,600, demonstrating that most of the QALY difference between bully victims and their peers is derived from the difference in utility. If there is no difference in mortality or utility between adult victims of childhood bullying and their peers (i.e. QALY difference arising solely from utility difference between child bullying victims and their peers) the ICER is £17,900.

Although the estimation of the utility loss to child victims of bullying is also uncertain, sensitivity analysis shows that this parameter is not critical to the results. With the central value of utility decrement at 0.02 the ICER is £9,600. A value of 0.01 (the lower bound of the plausible range) gives an ICER of £12,700.

### **5.2.3 Estimated effect of bullying on victims expected lifetime earnings and QALYs**

For victims of bullying their lifetime earnings may average around £50,000 less than their non-victimised peers (non-discounted), or £14,000 discounted to present value. Similarly, they may expect 0.54 less QALYs (non-discounted), or 0.22 QALYs after discounting.

## **6.0 DISCUSSION**

It has been necessary to make many assumptions in order to estimate the cost-effectiveness of a bullying intervention. These have been discussed in Section 4.1 with respect to each piece of evidence used in the model. The most important will be highlighted in this section, as well as more general issues regarding the applicability of the model.

It is assumed that both intervention effectiveness and the relationship between victimisation and outcomes are independent of initial prevalence of victimisation. Varying prevalence of victimisation may reflect not only varying behaviour but also variation in its definition. Where its definition is very different to that used by Brown (Brown & Taylor 2008) in the study used to estimate the outcomes of bullying, resulting in either only more severe cases being identified, or alternatively a large number of more minor cases, the relationship between victimisation and outcomes is unlikely to be the same. However, the victimisation prevalence reported by Brown of 24% is used as the model baseline (internal

validity) and is consistent with the range of other estimates in the literature (external validity).

The Brown study (Brown & Taylor 2008) is based on an analysis of a UK cohort who attended secondary school in the 1970's. The effects of bullying and educational attainment on their lifetime experience may be different to later generations, with different educational and employment opportunities. The results used in the model were based on being bullied at age 11, and are assumed to apply to ages 11 to 16. Brown and Taylor noted a greater effect on outcomes at age 11 than age 7, and hypothesise that the effect on educational attainment may be stronger closer to the time that the exams are taken. If this was the case the co-efficients at age 11 may underestimate the effect of bullying at older ages.

Only one published study considered reported results that could be used to estimate the effect of interventions on victimisation (Evers, Prochaska, Van Marter, Johnson, & Prochaska 2007). Although of good quality it has some limitations from the perspective of this economic analysis, including the very high initial incidence of bullying behaviour, the limited nature of the intervention and the short time over which the success of the intervention was measured. It is uncertain how effective of an ongoing intervention in a population with initially lower prevalence levels of victimisation will be in maintaining a sustained reduction in victimisation. The results of Evers, of a relative reduction of 21-22%, have been interpreted as an upper bound of effectiveness, and an arbitrary lower value of 15% used as the model baseline, assuming an ongoing intervention programme. Weak supporting evidence from a case study suggests some interventions may be more successful. There is almost no evidence in the literature as to whether interventions can sustain long-term change, as almost all interventions described were of short duration, with the results measured shortly after completion. An exception is a violence study (Flay, Graumlich, & et al 2004) which delivered a programme over three years, and showed a continuously

slower rate of growth in poor behaviour compared to the control. It is implausible that long term outcomes such as educational attainment and adult income can be modified unless a reduction in victimisation is sustained.

The resources required to deliver a successful anti-bullying intervention are also uncertain. The study from which the effect size was derived delivered only three sessions of an Internet –based programme. Two conflict resolution interventions (by the same author: (Stevahn, Johnson, Johnson, & Schultz 2002; Stevahn & And 1996) were integrated into normal coursework, and therefore would have very limited resource implications. The case studies also reveal little regarding resource implications of interventions. Both a published study (Smith, Daunic, Miller, & Robinson 2002) and a case study, John Hanson Community School, with peer mediation programmes did state mediators were trained for 2 and 2.5 days respectively, data that was used in the analysis. In the model it has been assumed that the intervention comprises both a classroom intervention and a peer mediator training programme.

Only the costs of the intervention programme are included in the model. Other costs (to the NHS) may include mental health care of victims, both as children and adults. There is some evidence that victimised children are at increased risk of negative psychological outcomes (see Section 5.1), although the direction of causality is not clear. The care costs for children with emotional disorders are relatively low at approximately £200 per year, so given the very small proportion, if any, of children who would avoid such a diagnosis as a result of a school intervention, the effect on the results is negligible. There is less evidence of the psychological outcomes of childhood victimisation on adults, but the costs of care for adults with depression or anxiety disorders are greater, and taking a broader perspective there is also potential loss of income. Exclusion in the model of the costs of poor adult mental health resulting from victimisation may result in the net costs of an intervention being overestimated, but as these mental health costs

are incurred in the future, after discounting their effect on the model results are also likely to be small.

The model assumes that intervention benefits only accrue to victims of bullying. There is very little evidence to support a universal effect, although Stevahn (Stevahn, Johnson, Johnson, & Schultz 2002; Stevahn & And 1996) showed improvement in academic achievement following a conflict resolution programme, but in a very limited context. One of the case studies, that of George Mitchell Community School, describes pupil mediators participating in a wide range of activities including training staff and pupils about bullying, selecting new members, discussing school bullying policy, as well as acting as mediators in peer disputes. These pupils may also derive benefits from the programme which are not captured in the model.

The model does not differentiate between male and female pupils as there was insufficient evidence to do so. However in three of the four violence studies considered for this analysis the intervention was only effective in boys, at least partially due to the higher initial prevalence of poor behaviour. No such differences are reported in the bullying studies, but Smith (Smith, Daunic, Miller, & Robinson 2002) found that whilst boys were more likely to use physical aggression than girls, girls were more likely to be involved in conflicts arising from gossip and broken friendships. Boys were less likely to agree to get along following conflict mediation. Thus there are likely differences between genders in the effectiveness of different approaches to prevent bullying victimisation, but no evidence to suggest what those differences may be.

Only better quality studies showing a positive impact were considered for estimation of effect size for the economic analysis. Due to the considerable heterogeneity between the studies in all key aspects (intervention objectives, interventions, outcomes, study design) of the studies it was not possible to synthesise the evidence. Clearly ineffective interventions will not be cost-



effective. It was not possible in the systematic review to discern study characteristics which determine success. Thus the baseline results presented illustrate the potential cost-effectiveness of school interventions to prevent bullying, *assuming they are successful*, without being able to identify what makes a successful intervention. Sensitivity analysis presented in Figure 3 demonstrates how cost-effectiveness varies both with intervention effectiveness and initial victimisation prevalence. Given the uncertainty around effectiveness it is recommended that schools monitor victimisation to establish initial levels and whether any interventions they introduce are effective.

#### Effect of interventions on inequality

The literature (see Section 5.1) suggests a bi-directional relationship between health and social disadvantage and victimisation. Those already disadvantaged are more likely to be bullied, as well as victims suffering negative effects from bullying. Assuming interventions are equally effective at reducing victimisation of all children they potentially can help to reduce inequalities between disadvantaged children and their peers.

## 7.0 CONCLUSION

The evidence for the effectiveness of school interventions to promote social and emotional wellbeing provides a poor basis from which to conduct an economic analysis of their cost-effectiveness. It is very heterogenous in terms of the objectives of the interventions, the types of intervention and the outcomes measured. The interventions are not well defined and the evidence is of mixed quality (see systematic review). Almost all studies measured outcomes using their own scales, with results being reported as changes to the group mean score as a result of the intervention. Whilst (some of) these studies may show a statistically significant beneficial effect of an intervention it is not clear what these scores actually mean to childrens' social and emotional wellbeing, and they are not designed to inform health-economic outcomes. Nevertheless a health-

economic model was developed which provides a framework to assess the cost-effectiveness of interventions to prevent bullying. Bullying is the focus of the economic model as one published intervention study reported an effect size that could be related to individuals (reduction in proportion victimised) and, through another study based on an analysis of longitudinal data, to outcomes (education, income) that could in turn be related to health-economic outcomes. Anti-bullying interventions comprised an important part of the literature identified by the systematic review on the promotion of social and emotional wellbeing in secondary school children, and case studies show that they are relevant to the UK context (see Case Study report). Other interventions in the literature describe interventions aimed at a wider spectrum of behaviour such as violence (including carrying weapons), delinquency, and drug abuse. There were few studies with the objective of promoting prosocial behaviours. Evidence from one of them has been incorporated into the economic model in terms of an assumption regarding a reduction in teacher time spent dealing with disciplinary incidents or intervening in student disputes as a result of the intervention.

Thus the economic analysis developed as part of this study is not fully representative of all the interventions reported in the literature and case studies. However it does provide a framework for assessing the cost-effectiveness of interventions aimed at a common behaviour problem, bullying, and demonstrates, albeit with many caveats as to the assumptions made in the economic model, that such interventions may be cost-effective.

## Appendix 1 Literature Search Strategies

### Iteration One

| Positive and Negative Behaviour Interventions  | Sources Searched           | Other comments  |
|--|----------------------------|---|
| <p>Positive Behaviour Search Strategy example – Cochrane</p> <p>#1 MeSH descriptor Adolescent explode all trees</p> <p>#2 (adolescent* OR adolescence):ti,ab,kw</p> <p>#3 (juvenile*):ti,ab,kw</p> <p>#4 (teen*):ti,ab,kw</p> <p>#5 (teenager*):ti,ab,kw</p> <p>#6 (youth*):ti,ab,kw</p> <p>#7 (middle school*):ti,ab,kw</p> <p>#8 (senior school* ):ti,ab,kw</p> <p>#9 (secondary school*):ti,ab,kw</p> <p>#10 (high school*):ti,ab,kw</p> <p>#11 (#1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8 OR #9 OR #10)</p> <p>#12 (approach OR approaches):ti,ab,kw</p> <p>#13 MeSH descriptor Intervention Studies explode all trees</p> <p>#14 (intervention*):ti,ab,kw</p> <p>#15 MeSH descriptor Public Policy explode all trees</p> <p>#16 (policy OR policies):ti,ab,kw</p> <p>#17 (program OR programs OR programme OR programmes):ti,ab,kw</p> <p>#18 (universal):ti,ab,kw</p> <p>#19 (#12 OR #13 OR #14 OR #15 OR #16 OR #17 OR #18)</p> <p>#20 (#11 AND #19)</p> <p>#21 (conflict resolution*):ti,ab,kw</p> <p>#22 (peer support*):ti,ab,kw</p> <p>#23 (resilien*):ti,ab,kw</p> <p>#24 (health right*):ti,ab,kw</p> <p>#25 (positive behavior* ):ti,ab,kw</p> <p>#26 (positive behaviour*):ti,ab,kw</p> <p>#27 (#21 OR #22 OR #23 OR #24 OR #25 OR #26)</p> <p>#28 (#20 AND #27)</p> <p>Negative Behaviour Search Strategy example – Cochrane</p> <p>#1 MeSH descriptor Adolescent explode all</p> | <p>EconLit<br/>NHS EED</p> | <p>Population terms (1-10) were combined intervention terms (12-18) and then terms to describe these interventions (21-28).</p> |

|   |  |  |
|---|--|--|
| <p>trees</p> <p>#2 (adolescent* OR adolescence):ti,ab,kw</p> <p>#3 (juvenile*):ti,ab,kw</p> <p>#4 (teen*):ti,ab,kw</p> <p>#5 (teenager*):ti,ab,kw</p> <p>#6 (youth*):ti,ab,kw</p> <p>#7 (middle school*):ti,ab,kw</p> <p>#8 (senior school* ):ti,ab,kw</p> <p>#9 (secondary school*):ti,ab,kw</p> <p>#10 (high school*):ti,ab,kw</p> <p>#11 (#1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8 OR #9 OR #10)</p> <p>#12 (approach OR approaches):ti,ab,kw</p> <p>#13 MeSH descriptor Intervention Studies</p> <p>explode all trees</p> <p>#14 (intervention*):ti,ab,kw</p> <p>#15 MeSH descriptor Public Policy explode all trees</p> <p>#16 (policy OR policies):ti,ab,kw</p> <p>#17 (program OR programs OR programme OR programmes):ti,ab,kw</p> <p>#18 (universal):ti,ab,kw</p> <p>#19 (#12 OR #13 OR #14 OR #15 OR #16 OR #17 OR #18)</p> <p>#20 (bullying):ti,ab,kw</p> <p>#21 MeSH descriptor Violence explode all trees</p> <p>#22 MeSH descriptor Violence, this term only</p> <p>#23 (violence):ti,ab,kw</p> <p>#24 (violent behavior*):ti,ab,kw</p> <p>#25 (violent behaviour*):ti,ab,kw</p> <p>#26 (aggression):ti,ab,kw</p> <p>#27 (aggressive behavior*):ti,ab,kw</p> <p>#28 (aggressive behaviour*):ti,ab,kw</p> <p>#29 (victimisation OR victimization):ti,ab,kw</p> <p>#30 (delinquency OR delinquent*):ti,ab,kw</p> <p>#31 (truancy OR truant*):ti,ab,kw</p> <p>#32 (antisocial behavior*):ti,ab,kw</p> <p>#33 (antisocial behaviour*):ti,ab,kw</p> <p>#34 (anti-social behavior*):ti,ab,kw</p> <p>#35 (antisocial behaviour*):ti,ab,kw</p> <p>#36 (#20 OR #21 OR #22 OR #23 OR #24 OR #25 OR #26 OR #27 OR #28 OR #29 OR #30 OR #31 OR #32 OR #33 OR #34 OR #35)</p> <p>#37 (#11 AND #19 AND #36)</p> |  |  |
|---|--|--|

**Iteration Two**

| Longitudinal Searches   | Sources Searched                                      | Other comments |
|---|---|----------------|
| <p>Search Strategy Example - Medline</p> <ol style="list-style-type: none"> <li>1. bullying.tw.</li> <li>2. Violence/</li> <li>3. violence.ab. or violence.ti.</li> <li>4. (violent adj1 (behavior\$ or behaviour\$)).tw.</li> <li>5. Aggression/</li> <li>6. aggression.tw.</li> <li>7.(aggressive adj1 (behavior\$ or behaviour\$)).tw.</li> <li>8.(victimisation or victimization).tw.</li> <li>9. Juvenile Delinquency/</li> <li>10. (delinquency or delinquent\$).tw.</li> <li>11. (truancy or truant\$).tw.</li> <li>12. anti-social behaviour\$.tw.</li> <li>13. anti-social behavior\$.tw.</li> <li>14. antisocial behavior\$.tw.</li> <li>15. antisocial behaviour\$.tw.</li> <li>16. bull\$.tw.</li> <li>17. *"Costs and Cost Analysis"/</li> <li>18. Crime/</li> <li>19. Employment/</li> <li>20. Educational Status/</li> <li>21. relationship\$.tw.</li> <li>22. Income/</li> <li>23. quality-adjusted life years/</li> <li>24. Health Status/</li> <li>25. (wellbeing or well-being).tw.</li> <li>26. Social Isolation/</li> <li>27. Health Services/ut [Utilization]</li> <li>28. 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27</li> <li>29. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16</li> <li>30. 28 and 29</li> <li>31. longitudinal.tw.</li> <li>32. Longitudinal Studies/</li> <li>33. 31 or 32</li> <li>34. 30 and 33</li> <li>35. limit 34 to (humans and yr="2003 - 2008")</li> </ol> | <p>Medline<br/>Social Sciences<br/>Citation Index</p> |                |

**Iteration Four**

| Mortality Searches   | Sources Searched | Other comments   |
|--|------------------|--|
| 1. (income and mortality).ti.<br>2. (income and education).ti.<br>3. (united kingdom or england or scotland or wales or northern ireland or great britain or GB or UK).tw<br>3. (1 or 2) and 3 | Medline          | Reviewer requested a very specific search for this issue |

## **Appendix 2 Intervention evidence considered for estimation of effect size in the economic review**

### *Bullying Prevention Interventions*

**Evers**(Evers, Prochaska, Van Marter, Johnson, & Prochaska 2007) (Impact A, population: US - mixed rural, suburban, urban)

See Section 4.1 of report.

**Baldry** (Baldry & Farrington 2004) (Impact B, population: Rome, Italy)

Bullying and victimisation behaviour was measured in a population of middle school and first-year high school pupils before and after an intervention. Pupils were asked about their experience of different bullying and victimisation behaviours in terms of the frequency of incidents on a scale of 0 (none) to 4 (several times a week).

Bullying behaviour included physical (punching, kicking), verbal, and indirect bullying (rejection). The prevalence of bullying was below 40% and victimisation below 50%. Changes in the group means of the prevalence scores for the intervention and control group are reported. The intervention was not effective in middle school pupils, and in fact both reported bullying and victimisation increased in the intervention group and not in the control group. In high school pupils the intervention decreased victimisation and stabilised bullying, when both increased in the control group. The reporting of the results of this study in terms of mean scores of a non-linear scale of prevalence frequency of bullying or victimisation experience mean the results can not be applied in the economic model.

### *Violence Prevention Interventions*

**Flay** (Flay, Graumlich, & et al 2004) (Impact B, population: US - Inner city African Americans)

The intensive intervention involved several lessons a year from grades five to eight. Behaviours targeted included violence, provoking, safe sex, substance abuse and school delinquency. Pupils were scored for each of these behaviours on the basis of the questionnaire, before starting the intervention, during, and at the conclusion of the study. All of the poor behaviours increased with age, but the intervention was significantly effective in reducing the growth of violence and substance use and marginally significantly effective in reducing the growth of provoking behaviour ( $p = 0.10$ ), school delinquency ( $p = 0.06$ ) and recent sexual intercourse in boys (but not girls) compared with the control. In another cohort where the school intervention was combined with a community intervention the effect sizes were greater and statistically more significant. Violence, provoking behaviour and school delinquency are not defined.

The results are presented in terms of the percent relative reduction in growth of the behaviour scores comparing the intervention to control. For violence, provoking behaviour and school delinquency mean the results can not be applied in the economic model.

A significant 32% relative reduction in the proportion of boys (but not girls) reporting substance use in deprived African-American pupils in Chicago was also reported.

**Farrell** (Farrell & Meyer 1997), (Impact B, population: US – majority deprived African Americans)

The intervention, aimed at violence prevention, was given to pupils in either the fall or spring semester of grade 6. Frequency of participation in violence, victimisation, problem behaviour and drug use was assessed by a questionnaire and scored on a 6 point scale (1 = never, 6 = 20 times or more) for both groups prior to the intervention and at the end of the Fall and Spring semesters.



Violent behaviour included fighting, threatening with a weapon and bringing a weapon to school. Victimization included being threatened or injured by someone with a weapon and missing school because of fear of violence. Problem behaviour included vandalism and shoplifting, and drug use included alcohol and marijuana.

The intervention was not effective in girls. For boys, significant reductions were found for being threatened with a weapon, fighting, drug use and problem behaviour. The reporting of the results of this study in terms of mean scores of a non-linear scale of prevalence frequency of bullying or victimisation experience mean the results can not be applied in the economic model.

*Promotion of pro-social skills and behaviours*

**Stevahn 1996** (Stevahn & And 1996) (impact B, population: Canada, rural)

Pupils were randomly assigned to one of four groups: a conflict resolution program integrated in to an English literature unit, no program, with or without a co-operative ethos. The programme was successful in teaching the negotiation procedure and in pupils applying the procedure to conflict scenarios. Academic achievement as measured by a test at the end of the English course, and eight weeks later, was improved. The cooperative learning groups enhanced performance on most measures, including academic performance. The pupils in the co-operative intervention group had a mean score 39% greater than the individualistic control group on the eighth week course retention test.

**Stevahn 2002** (Stevahn, Johnson, Johnson, & Schultz 2002) (impact B, population: US suburban)

Students in three schools were assigned either to a conflict resolution and peer mediation intervention as a component of a social studies course, or a social studies course only. The content of the social studies course was the Second World War. The intervention was effective in teaching negotiation and mediation procedures and their use in conflict scenarios. Academic achievement, as

measured by mean scores on an end of course test, a retention test conducted seven months later, as well as an English test were significantly improved by 43%, 148% and 39% respectively.

Whilst both Stevahn studies show the intervention was very successful in improving educational outcomes, it is in a very narrow context (short-term results of courses related to conflict), so it is not apparent that any effect on wider educational outcomes can be assumed.

**Smith 2002** (Smith, Daunic, Miller, & Robinson 2002) (impact B, population: US rural)

The reported results of this conflict resolution and peer mediation intervention are principally from a pre-test/post-test analysis at three schools. The intervention was not effective in changing student attitudes or teacher views of school climate. However in two of the three schools there was a significant downward trend in disciplinary incidents following the programme implementation. Peer mediation was used on several occasions, principally to resolve verbal harassment and gossip. The authors note that teachers reported spending instructional time resolving these types of disputes.

#### *Other – Case Studies*

John Hanson Community School, Andover, Hampshire

This program was identified in the search for case studies (see Case Study report), although not included in the final three selected for discussion. The school introduced a peer listening initiative, training 22 listeners in year 9 (13-14 year-olds) for 2.5 days. A survey conducted by Hampshire County Council reports 92.6% of pupils in year 9 of this school said they had not been bullied compared to 80.7% of year 9 pupils across all participating schools. This suggests that a particularly effective implementation of the program compared to standard implementation may result in approximately 12% absolute difference in

victimisation rate, or a relative difference of 60%, *assuming comparability of the schools, including initial victimisation rates and pupil characteristics.*

Further details of the studies are shown in the systematic review report.

### Appendix 3 Summary of intervention costs and possible costs averted as a result of the intervention

#### Intervention costs per year

|                        | School<br>(600 pupils 11-16) | Pupil         |
|------------------------|------------------------------|---------------|
| Classroom intervention | £7,263                       | £12.11        |
| Peer mediation         | £3,942                       | £6.57         |
| <b>Total cost</b>      | <b>£11,205</b>               | <b>£18.68</b> |
| Teacher time saved     | £1,914                       | £3.19         |
| <b>Net cost</b>        | <b>£9,291</b>                | <b>£15.49</b> |

For details of costs see Table 6.

#### Costs of conduct disorder/crime

Illustrative costs of crime are taken from a study by Scott (Scott et al. 2001) in which costs were applied to an inner London longitudinal study of disadvantaged children followed from age 10 to 28. The analysis was done according to whether the children had no problems, conduct problems or conduct disorder at age 10. Total costs included social care, education services, benefits and health services. The crime costs comprise convictions and prison costs.

Total and crime costs of individuals with no problems, conduct problems or conduct disorder aged 10, costs to age 28

| 1998         | No problems           | Conduct problems | Conduct disorder |
|--------------|-----------------------|------------------|------------------|
| <b>Total</b> | £7,423                | £24,324          | £70,119          |
| <b>Crime</b> | £2,541                | £8,604           | £44,821          |
| <b>2008</b>  | (Inflated at 2.5% pa) |                  |                  |
| <b>Total</b> | £9,502                | £31,137          | £89,758          |
| <b>Crime</b> | £3,253                | £11,014          | £57,375          |

Note there is no evidence that the intervention reduces crime. Whilst there is evidence that bullies and their victims are at increased risk of crime, it is not clear that bullying behaviour is causal (see section 5.1)

If it is assumed that criminal behaviour can be avoided as a result of the intervention, and the costs saved are represented by the difference between individuals with conduct problems and those with no problems (£11,014 - £3,253 = £7761), to be cost neutral 1.2 pupils in each year group of 120 (or 1%) would need to "avoid" crime for the intervention to be cost neutral on this issue alone. To put this in perspective the baseline model assumption of 15% reduction in victimisation on an initial prevalence of 24% victimisation results in an absolute reduction in victimisation prevalence of 3.6%.

### **Mental health care costs for affected individuals**

The costs incurred by people with mental health disorders have recently been estimated by McCrone et al. (McCrone et al. 2008). Costs for childhood emotional disorders comprise hospital care, GP services and prescribed drugs. Costs for depression and anxiety also include supported accommodation, social services and lost employment.

### **Annual costs of mental health**

|                                      | <b>Treatment cost</b> | <b>% in contact with services</b> | <b>Lost employment</b> |
|--------------------------------------|-----------------------|-----------------------------------|------------------------|
| <b>Childhood emotional disorders</b> | £200                  | Not reported                      | NA                     |
| <b>Depression</b>                    | £2,085                | 65%                               | £9,311                 |
| <b>Anxiety disorder</b>              | £1,104                | 49%                               | £1,298                 |

Note there is no evidence that the intervention improves mental health. There is some evidence that suggests there may be a causal association between

bullying victimisation and mental health, but children with depressive or anxiety symptoms are also more likely to be victimised (see Section 5.1).

To be cost neutral 9.3 pupils in each year group of 120 (or 8%) would need to avoid childhood emotional disorder for the intervention to be cost neutral on this issue alone (the costs of treating the disorder have assumed treatment for 5 years (age 11-16)).

To be cost neutral 1.6 pupils in each year group of 120 (or 1.3%) would need to avoid childhood emotional disorder and (5 years) of adult depression for the intervention to be cost neutral (education and health service perspective) on this issue alone, assuming the depression occurs between ages 20-24, with a discount rate of 3.5%. If lost wages are assumed to represent a loss to society, then from a societal perspective to be cost neutral 0.23 pupils in each year group of 120 (or 0.19%) would need to avoid childhood emotional disorder and (5 years) of adult depression for the intervention to be cost neutral, with the same assumptions as before.

As noted above at baseline the model assumes 3.6% of children avoid victimization as a result of the intervention.

**Appendix 4 Summary of model parameters**

| Variable      | Distribution | Parameter 1 |         | Parameter 2 |          | Parameter 3 |       | Parameter 4 |       |
|---------------|--------------|-------------|---------|-------------|----------|-------------|-------|-------------|-------|
|               |              | Parameter   | Value   | Parameter   | Value    | Parameter   | Value | Parameter   | Value |
| initialV      |              | mean        | 0.2375  |             |          |             |       |             |       |
| intVreduce    |              | mean        | 0.15    |             |          |             |       |             |       |
| victimnoO     | LNN          | mean        | -3.6249 | sd          | 0.5      |             |       |             |       |
| victimnoD     | LNN          | mean        | -5.3841 | sd          | 0.5      |             |       |             |       |
| Owage_effect  | NORM         | mean        | 0.0642  | sd          | 0.0066   |             |       |             |       |
| Awage_effect  | NORM         | mean        | 0.0831  | sd          | 0.0085   |             |       |             |       |
| Dwage_effect  | NORM         | mean        | 0.1531  | sd          | 0.0156   |             |       |             |       |
| Vwage_effect  | NORM         | mean        | -0.028  | sd          | 0.0029   |             |       |             |       |
| Vutdec11_16   | BETA         | alpha       | 1.1804  | beta        | 4.3085   | min         | 0     | max         | 0.093 |
| Vutdecadulds  | BETA         | alpha       | 1.05    | beta        | 4.2      | min         | 0     | max         | 0.025 |
| RRmort_red_ed | NORM         | mean        | 0.8     | sd          | 0.0306   |             |       |             |       |
| mort_income   | NORM         | mean        | 1.054   | sd          | 0.0175   |             |       |             |       |
| teacher_sal   | LNN          | mean        | 10.6593 | sd          | 0.15     |             |       |             |       |
| coord_sal     | LNN          | mean        | 10.9512 | sd          | 0.15     |             |       |             |       |
| teachertime   | NORM         | mean        | 187.5   | sd          | 19.1327  |             |       |             |       |
| coordtime     | NORM         | mean        | 102.5   | sd          | 10.4592  |             |       |             |       |
| teachmaterial | NORM         | mean        | 1880    | sd          | 287.7551 |             |       |             |       |
| teachtimesave | NORM         | mean        | 66.67   | sd          | 10.2041  |             |       |             |       |

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