Screening and treatment to prevent depression in retirees (age over 65 years)

Matrix Insight, in collaboration with Imperial College London, Kings College London and Bazian Ltd, were commissioned by Health England to undertake a research study to develop and apply a method for prioritising investments in preventative interventions for England. Seventeen preventative health interventions were included in the study. Each intervention was evaluated in terms of the following criteria: reach; inequality score; cost-effectiveness; and affordability. This report presents the results of the analysis for one of the interventions: screening and treatment to prevent depression in retirees (age over 65 years). The full report of the study is available from the ***H.E.L.P.*** website.

Summary

Description of the intervention
Detection of depression through a one-off screening of retirees presenting at primary medical care providers (Valenstein, 2001), compared to detection of depression through usual care in a UK setting.

Criteria	Measure	Value	Certainty
1. Reach			
Percentage of population affected by the condition and that could potentially benefit from the intervention.	Depressed older people as a percentage of the population aged 15 and above in England (Mental Health Observatory, 2008)	1.49%	★★★
2. Inequality score			
Ratio of the percentage of disadvantaged population to the percentage of the general population that could potentially benefit from the intervention.	Ratio of GP visits per annum in older people in social grades D and E to GP visits per annum in older people (McNiece and Majeed, 1999)	1.08	★★
3. Cost-effectiveness			
Cost of the intervention per QALY gained (in £2007/08)	See cost-effectiveness	£47,621	★★
Net cost of the intervention per QALY gained (in £2007/08)	See cost-effectiveness	£70,120[1]	★★
Timing of benefits	QALY gains are estimated to occur in the short-run (between 1 and 5 years after the intervention).		
4. Affordability			
Total cost of implementing the intervention, as a percentage of the public health budget.	Multiple of eligible individuals and unit cost of the intervention	Less than £100 million	★★

[1] Gilbody et al (2006) suggest that screening for depression will be cost-effective if *"Administration, scoring, and feedback for screening instruments (printing, administrative staff time, and increased doctor time) would … cost less than $3.00 (£1.80) per patient. The prevalence of depression would need to be more than 13% (higher than is usually seen in primary care). Screening would need to result in intervention in more than 80% of patients, and therapeutic benefit and remission would need to be seen in more than 85% of patients who screened positive."* When these conditions are mimicked in the model constructed here (Intervention cost =£1.80, Detection of major depression = 0.8, P(remission)= 0.85, P(relapse) = 0) the net cost of the intervention per QALY is £29,633.

Key to certainty grading scales

★ Low quality evidence
★★ Medium quality evidence
★★★ High quality evidence

Box 1. Cost per QALY gained

A quality adjusted life year (QALY) is a simple way of combining quality of life with length of life.
One QALY is equivalent to one year in full health. The cost per QALY gained is therefore the cost of achieving one extra year of full health. Its calculation is based on the following formula:

$$cost\ per\ QALY\ gained = \frac{incremental\ cost\ of\ intervention}{QALYs\ gained}$$

The net cost per QALY gained is the cost per QALY considering the incremental cost of the intervention as well as the cost saved through health treatment avoided. Its calculation is based on the following formula:

$$net\ cost\ per\ QALY\ gained = \frac{incremental\ cost\ of\ intervention - cost\ savings}{QALYs\ gained}$$

Cost effectiveness

Cost. One-off screening and treatment of retirees attending GP surgeries costs £118.74 more than usual care (£2007/08) per person with major depression.

Effect. Compared to usual care, it was estimated that screening increases the percentage of cases of major depression detected from 37.5% to 56%. This effect was obtained from a review undertaken to identify evidence on the effectiveness and cost-effectiveness of screening for depression in a primary care setting.

Benefits. The benefits of the intervention derive from individuals entering remission earlier than would be expected by the natural time course of depression. QALYs are considered as the main benefit. One of the major cost savings of depression management is that of minimising lost productivity. As the population of interest were retirees these savings are considered here to be negligible. Based on the QALYs gained from screening for depression, an increase in the percentage of major depression detected from 37.5% to 56% is associated with the following benefits:

- An additional 0.0017 QALYs per person with major depression

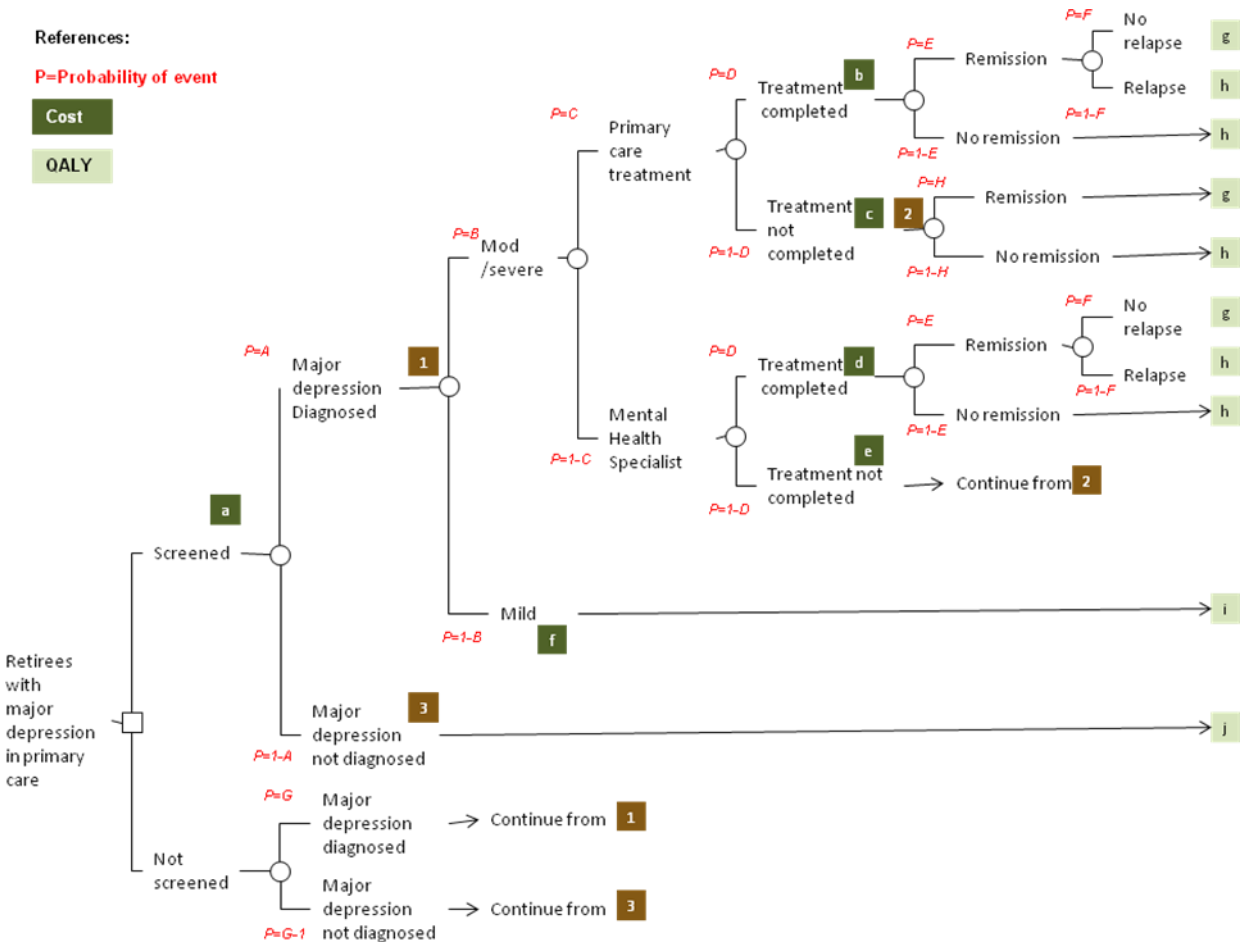
Please refer to the decision model for details on how the QALY gain and costs were calculated.

Decision model

A decision model was built to estimate the cost-effectiveness of the intervention. The model estimates the QALY gain and costs associated with the intervention. Figure 1 illustrates the structure of the model, which is based on the following:

- The effect of the intervention is a change in the probability of major depression being detected in a primary care setting.
- When detected, major depression is detected for the first time (i.e. no history of depression) with the majority of new cases being of mild severity.
- The treatment received, and response to it, vary according to the severity of the depression. Individuals with mild major depression have shorter depressive episodes and are more likely to recover without treatment than those with moderate/severe major depression. Patients with moderate/severe major depression are more likely to be referred to a mental health specialist for psychological therapies.
- As noted by NICE (2004), the predominant treatment currently provided in primary care for major depression will be pharmacotherapy (although this is not recommended). If referred to a Mental Health Specialist, CBT is the most common psychological therapy that is delivered.

Figure 1. Screening and treatment model



The model draws the following estimates from the literature:

- The unit cost of the intervention (Table 1).
- The effect of the intervention on the detection of major depression (Table 1)
- The probabilities that those who are identified as depressed receive treatment (Table 2)
- The impact of depression on health care treatment costs (Table 3).
- The impact of depression on quality of life, measured in QALYs (Table 3).

Table 1. Intervention costs and effects (monetary values in £2007/08)

Ref	Description	Value	Calculation and source
a	Cost of intervention	£80.65	In line with the US modelling study of Valenstein et al (2001) it was assumed that screening is delivered as part of a two-stage process in which nurses administer the screening tool with a GP follow-up on the basis of a positive result[2]. Natural units were taken from Valenstein et al (2001) and converted into appropriate UK costs. 6 minutes of Practice Nurse time (£4.26 using £11 for a consultation of 15.5 minutes, including qualification costs, Curtis, 2008) and 1 minute of GP time (£3.00 per minute, including direct care staff costs and qualification costs, Curtis 2008): £4.26 + £3.00 = £7.26. Costs of screening were inflated according to the prevalence of major depression in our target population (over 65s).This estimate was taken from Dearman et al (2006) - a naturalistic study of the treatment of depression amongst the over 65s in the primary care environment in Manchester. A point prevalence of 9% was taken. The screening costs were inflated accordingly ((1/0.09)*£7.26 = £80.65)).
A	P(major depression diagnosed if screened)	0.56	Valenstein et al (2001) estimated that the probability of detecting major depression in primary care increases by 50% with screening. In a UK context, NICE (2004) estimate the probability of a depressive episode being identified at a primary care level as 0.375. The increased probability of detection due to screening that is used here is therefore 0.56 (= 0.375*1.5)[3]. It was assumed that all patients are willing to partake in the screening process.

[2] It has been suggested that such a model for screening doesn't reflect current UK practice and screening is instead conducted by a GP and takes 1 minute of their time as part of the normal consultation process (Gilbody et al, 2005). However, evidence provided as part of a recent Cochrane review suggests that GP only screening for depression has no effect upon the detection rate (Gilbody et al, 2005). It is only in instances in which a two-stage model is produced that the odds of detecting depression are increased following screening (Gilbody et al, 2005). The screening costs and detection rates are therefore built on this later model of delivering screening for depression, as used by Valenstein et al (2001).

[3] The model does not take into account the probability of false positives as a result of screening and the costs associated with these.

Ref	Description	Value	Calculation and source
G	P(major depression diagnosed if not screened)	0.375	NICE (2004) estimate the probability of a depressive episode being identified at a primary care level as 0.375.

Table 2. Transition probabilities[4]

Ref	Description	Value	Calculation and source
B	P(moderate/ severe depression, if detected)	0.30	Distribution of severity of major depression was based on those estimates reported by NICE (2004): Mild = 70%;Moderate = 20%;Severe = 10% The combined probability of having moderate/severe was assumed to be 0.30 (=0.10 + 0.20).
C	P(receiving treatment in primary care with moderate/severe depression)	0.56	Estimated from the naturalistic UK study by Dearman et al (2006) and NICE (2004)'s depression guidelines. 87% of over 65s whose depression is detected in primary care will be treated in primary care (Dearman et al, 2006). This estimate is taken from a naturalistic study of the treatment of depression amongst the over 65s in the primary care environment in Manchester, UK, in 2002. This is slightly lower than the 93% estimated by NICE using expert opinion, in terms of the general population (NICE, 2004). This reflects the assumption that the elderly are more likely to be referred on to specialist care. Data were not available by severity. On the basis of the depression guidelines (NICE, 2004), it is advised that 100% of individuals with mild depression will receive treatment in primary care (NICE, 2004). We have assumed that moderate/severe depression therefore makes up the 13% who receive treatment outside of primary care. NICE (2004) estimate that individuals with moderate/severe depression will constitute 30% of those diagnosed. Probability of receiving treatment in primary care with moderate/severe depression is therefore assumed to be 0.56 (= (0.30-0.13)/0.3)

[4] UK guidelines suggest selective screening of high priority groups, however there is no specific data available to model this strategy (Gilbody et al, 2005). Transition probabilities are based on data synthesised from a number of different countries and different contexts and inferred to a general primary care population unless stated otherwise.

Ref	Description	Value	Calculation and source
D	P(completing treatment for major depression)	0.70	Probability of completing treatment taken from a UK modelling exercise reported by Simon et al (2006) using data from the systematic literature review prepared by the NCCMH (2005) for the depression guidelines (NICE, 2004)[5]. Simon et al (2006) suggest that, from the NCCMH (2005) review, there is no additional clinical advantage of CBT in reducing depression symptoms by the end of treatment compared to pharmacotherapy. The probability of completing treatment, remission and relapse were therefore assumed to be the same for both treatment branches in the model (treatment in primary care with pharmacotherapy and treatment by mental health specialist with CBT).
E	P(remission from major depression with treatment)	0.43	Taken from Simon et al (2006) – see above.
F	P(continued remission with treatment – no relapse)	0.45	Taken from Simon et al (2006) – see above.

Table 3. Associated outcomes[6] (monetary values in £2007/08)

Ref	Outcome	Value	Calculation and Source
Costs were not discounted given the short time horizon of the model (1.25 years). This is in keeping with the relevant literature in this area (e.g. Simon et al, 2006).			
b	Cost of completed course of pharmacotherapy	£182.66	Depression is treated through a 3-month course of antidepressants, in line with the previous modelling of Valenstein et al (2001) and Simon et al (2006). There is an initial GP visit and on average three subsequent visits to the GP (NICE, 2004; Valenstein et al (2001). Costs were based on unit costs supplied by the PSSRU (Curtis, 2008). (£36 for surgery consultation of 17.2 minutes including qualification costs and direct care staff costs – Curtis, 2008) + 3 follow-up visits in a 15 month period (£108 including qualification costs and direct care staff costs) + 3-month supply of antidepressant medication (£11.62 per month (NICE, 2004) * 1.1089 (GDP Deflator in Treasury Green Book)

[5] The effectiveness data taken from Simon et al (2006) is based on receiving treatment in secondary care. This is used here as a proxy for the effectiveness of pharmacotherapy in primary care, however, there is the possibility that any effectiveness of treatment is lower in primary care than secondary care and that the effect is therefore overestimated.

[6] This model has been constructed from a healthcare perspective. Social care costs and direct costs to patients and their families have not been included. Lost productivity has not been considered as the target population are retirees. Suicide has not been included as a health outcome.

Ref	Outcome	Value	Calculation and Source
c	Cost of incomplete course of pharmacotherapy	£48.89	Treatment is on average discontinued after 3 weeks when treatment isn't completed - taken from Elkin et al (1980) as cited by Simon et al (2006). Costs include an initial prescription for the first month of medication (£11.62 per month (NICE, 2004) which is £12.89 in 2007/2008 prices (using 1.1089 from the GDP Deflator in Treasury Green Book) and an initial visit to the GP (£36).
d	Cost of completed course of CBT	£996	Depression is treated through a 3-month course of CBT, consisting of 16 sessions with each session lasting 50 minutes – taken from McCullough, 1995 as cited by Simon et al (2006). A clinical psychologist was used as most representative example of therapists providing this treatment in the UK as per Simon et al (2006). Unit cost of clinical psychologist per hour of patient contact is £72 (Curtis, 2008). Cost of 16, 50 minute sessions in a 3 month period, is therefore estimated as £960. An initial visit to the GP was also included (£36): £960+£36=£996.
e	Cost of incomplete course of CBT	£156	Treatment is discontinued after 3 weeks when treatment isn't completed - Elkin et al (1980) as cited by Simon et al (2006). On the basis that a full course lasts 12 weeks and consists of 16 sessions. It is assumed here that CBT is discontinued after 2 sessions with a cost of £120 (see above for unit costs) with an initial visit to the GP also included (£36): £120+£36=£156.
f	Mild depression treatment cost	£115.78	NICE (2004) suggest that mild depression is treated exclusively in primary care and that most common current practice is to prescribe antidepressants (although this is not advised by the depression guidelines). NICE (2004) estimate that 50% of those with mild depression that are prescribed antidepressants will comply with the course. Unit costs for pharmacotherapy that is completed and not completed were taken from above (completed = £182.66, and not completed= £48.89). Unit cost for treatment of mild depression in primary care was therefore estimated as £115.78 (=(182.66*0.5)+(48.89*0.5)

Ref	Outcome	Value	Calculation and Source
g	QALYs: moderate/severe major depressive episode in remission	0.93	It was assumed that the depressive episode persisted until the end of treatment (3 months) and remission lasted the course of the following year (12 months). The distribution of severity in a moderate/severe population was taken from estimates in the depression guidelines (NICE, 2004): Moderate = 67%; and Severe = 33%. Utility weights were taken from the mid-point of ranges provided by Revicki & Wood (1998): Moderate = 0.63; Severe = 0.30; and Remission with treatment = 0.80. A weighted average utility weight of 0.52 for moderate/severe depression was calculated through a combination of the severity and the utility ((0.67*0.63)+(0.33*0.30) = 0.52).
h	QALYs: moderate/severe depressive episode with unsuccessful treatment[7]	0.88	Without treatment, or with unsuccessful treatment (including relapse), it was given that the depressive episode would resolve itself at some point in the time horizon. Estimates by NICE (2004) suggest that mild/moderate depressive episodes last 6 months, whilst a severe episode lasts 9 months. A weighted average of these was taken, according to severity, using the same approach as above. (6 months*0.67)+(9 months*0.33)=6.99 months (0.58 years). With no treatment, or unsuccessful treatment, 6.99 months were therefore spent in the average depressive episode with the remaining 8.01 months spent in remission across the 15 month period (15 months – 6.99 months = 8.01 months). The weighted average utility for depression was 0.52 (see above), and the utility weight of depression in remission (with no treatment) was 0.86[8] from Revicki & Wood (1998)

[7] This includes treatment with no remission; treatment with relapse; and no treatment.
[8] The utility weight associated with remission is higher if it is achieved without treatment than with treatment (Revicki & Wood, 1998).

Ref	Outcome	Value	Calculation and Source
i	QALYs: mild depressive episode	0.99	As per NICE guidance (2004) it is assumed that mild depression lasts 6 months, with the remaining 9 months of our time horizon spent in remission. It is assumed that treatment has no effect on mild depression, that is, that the outcomes of patients with detected and undetected mild depression are the same over 12 months see Gilbody et al (2005). It is assumed here that this finding extends to our time horizon of 15 months. Mild depression has a utility weight of 0.68 (as per Revicki & Wood, 1998) and the utility weight of remission without treatment is used here – 0.86 (Revicki & Wood, 1998).
j	QALYs: undiagnosed major depression	0.95	Estimates by NICE (2004) suggest that mild/moderate depressive episodes last 6 months if not treated, whilst a severe episode lasts 9 months if not treated. A weighted average of these was taken, according to severity, using the same approach as above. ((0.7*6 months)+(0.2*6 months)+(0.1*9 months))=6.3 months. It was therefore taken that without diagnosis 6.3 months would be spent in the average depressive episode with 8.7 months spent in remission across the 15 month period (15 months – 6.3 months = 8.7 months). A weighted average utility of depression was also calculated based on the data reported above. (0.7*0.68)+(0.2*0.63)+(0.1*0.3)=0.63 The utility weight of depression in remission (with no treatment) of 0.86 was used (Revicki & Wood, 1998).

Effectiveness evidence

A literature review was undertaken by Bazian to identify evidence on the effectiveness and cost-effectiveness of screening for depression in primary care settings. Further details are available on the evidence methods page of the ***H.E.L.P.*** website.

The review of the evidence on the effectiveness of screening for depression in primary care settings identified no review of studies. The review of the evidence on the cost-effectiveness of screening for depression in primary care settings identified one economic model. Table 4 provides the following details of the studies identified:

- Population, intervention and model
- Perspective, discounting, inflation, cost year
- Utility/benefit
- Unit costs
- Efficiency

Table 5 provides a quality assessment of the effectiveness and cost-effectiveness studies. Further details are available on the quality appraisal methods page.

The following criteria were applied to select effectiveness evidence for undertaking the economic analysis:

- Location. Studies from the UK were preferred over studies from other locations.
- Population. Studies applied to the general population were preferred over studies applied to restricted population groups (e.g. pregnant women; individuals from specific communities/nationalities).
- Counterfactual. Studies for which the counterfactual intervention was ‘usual care’ or ‘do nothing’ in a UK setting were preferred over studies for which the counterfactual was different from ‘usual care’ or ‘do nothing’.
- Method. Studies using more rigorous design methods (e.g. randomised control trials or quasi experimental designs with regression models controlling for confounders) were preferred over studies using less rigorous design methods (e.g. before-after studies or simple correlation analysis).

Table 4. Cost-effectiveness of screening and treatment to prevent depression in retirees (age over 65 years)

Study reference	Population, intervention and model	Perspective, discounting, inflation, cost year	Utility/benefit	Unit costs	Efficiency
Valenstein, 2001; USA ▪ cost utility study	Annual screening consisting of completion of a self-administered depression questionnaire by the patient, followed by assessment by a nurse and primary care provider. Other screening frequencies were explored, including screening at each visit (opportunistic screening); one-time screening; and screening every 2, 3, or 5 years vs. no screening and usual care. Various data points from literature – including sensitivity and specificity of the screening instrument, incidence of depression, detection, referral, hospitalisation, response and costs Nonstationary Markov model using published literature for data points	▪ Health care payer and society perspective ▪ Don't know whether adjusted for inflation ▪ 3% annual discount ▪ Cost year: USD1999	Utilities for health states with depressive illness from literature: ranged from 0.3 to 0.7 Health states without depression or with depression in remission have utilities of 0.81 to 0.90	▪ Initial visit to primary care physician: 45.85 ▪ Treatment of depression in the primary care setting: 99.68 ▪ Treatment of depression by mental health specialist: 370.96 ▪ Medication on outpatient basis: 169.29 ▪ Hospital charges: 11,610.00 ▪ Physician professional fees (hospital): 878.99 ▪ Medication in hospital: 21.83 ▪ Administration of depression screening instrument: 4.88 ▪ Indirect costs (decreased productivity): 400.00 for patients receiving treatment; 840.00 for patients not receiving treatment	*Payer perspective:* ▪ Annual depression screening v no screening in settings with usual care: 82 more quality-adjusted days gained per 1000 patients at an incremental cost of $50,730 [cost-utility ratio: $225,467/QALY gained] ▪ Periodic screening every 3 years: $115,930/QALY gained ▪ Periodic screening every 5 years: $85,679/QALY gained *Societal perspective:* ▪ Annual depression screening vs. no screening in settings with usual care: cost-utility ratio: $192,444/QALY gained ▪ Periodic screening every 3 years: $81,686/QALY gained ▪ Periodic screening every 5 years: $50,988/QALY gained ▪ One-time screening: cost-utility ratio: $32,053 ▪ Screening every 5 years vs. one-time screening (rather than no screening): ICUR: $310,909/QALY

Table 5. Quality assessment for economic studies

Study reference	QA for economic studies						Score	Grading (++ 4-6; + 3; -0-2)
	All costs of intervention included?	Market values used for costs?	Perspective reported?	Sensitivity analysis?	Reports base year adopted?	Effectiveness data from RCT or MA?		
Valenstein, 2001; USA	Yes	Don't know	Yes	Yes	Yes	No	4	++

References

Curtis L (2008) Unit Costs of Health & Social Care, University of Kent: *Personal Social Services Research Unit*.

Dearman, S.P., Waheed, W., Nathoo, V., Baldwin, R.C. (2006) Management strategies in geriatric depression by primary care physicians and factors associated with the use of psychiatric services: A naturalistic study, *Aging & Mental Health*, Vol.10, 521-524pp.

Elkin, I., Shea, M.T., Watkins, J. (1989) National Institute of Mental Health: Treatment of Depression-Collaborative Research Program, *General effectiveness of treatments (Archives of General Psychiatry)*, Vol.46, 971-982pp.

Gilbody, S., Sheldon, T., Wessely, S. (2006) Should we screen for depression? *British Medical Journal*, Vol.332, 1027-1030pp.

Gilbody, S.M., House, A.O., Sheldon, T.A. (2005) Screening and case finding for depression, *Cochrane Database Systematic Reviews*, Issue. 4, CD002792.

HM Treasury (2003) The Green Book. Appraisal and Evaluation in Central Government. London: The Stationary Office.

HM Treasury (2008) Gross Domestic Product Deflator Series. Available from: http://www.hm-treasury.gov.uk/data_gdp_index.htm

McNiece, R., Majeed, A. (1999) Socioeconomic differences in general practice consultation rates in patients aged 65 and over: prospective cohort study. *BMJ* 319:3, 26p.

Mental Health Observatory (2008) Brief 4 - Estimating the Prevalence of Common Mental health Problems. North East Public Health Observatory.

National Collaborating Centre for Mental Health (2005) Depression: Management of Depression in Primary and Secondary Care, National Clinical Practice Guideline 23, London: British Psychological Society & Gaskell.

NICE (2004) Costing Clinical Guidelines: Depression (England and Wales), London: NICE.

Revicki, D.A., Woodm M. (1998) Patient-assigned health state utilities for depression-related outcomes: differences by depression severity and antidepressant medications, *Journal of Affective Disorders*, Vol.48, 25-36pp.

Simon, J., Pilling, S., Burbeck, R., Goldberg, D. (2006) Treatment options in moderate and severe depression: decision analysis supporting a clinical guideline, *British Journal of Psychiatry*, Vol.189, 494-501pp.

Valenstein, M., Vijan, S., Zeber, J.E., Boehm, K., Buttar, A. (2001) The cost-utility of screening for depression in primary care, *Annals of Internal Medicine*, Vol.134, Nr. 5, 345-60.